



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

## *2012 Summary Report*

Natural Resource Data Series NPS/WRST/NRDS—2013/433



**ON THE COVER**

Kennecott Mines National Historic Landmark.

Photograph by: Kaitlin Parker

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AnnMarie Lain & Miranda L. N. Terwilliger

National Park Service  
Wrangell-St. Elias National Park & Preserve  
Mile 106.8 Richardson Hwy/ PO Box 439  
Copper Center, AK 99573

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## **Abstract**

This report describes the work performed by the Alaska Exotic Plant Management Team in Wrangell-St. Elias National Park and Preserve during the 2012 season. Three Alaska Exotic Plant Management Team members were stationed at Park Headquarters in Copper Center while working at various locations within the park and preserve. Invasive plant inventories and treatments occurred around the following locations: along the Nabesna road, Kennecott Mines National Historic Landmark, park-owned operations facilities, and several backcountry destinations within park lands. Invasive plant infestations were mapped using Trimble GeoXT units. Manual treatments were performed with the help of volunteers, a Southeast Alaska Guidance Association crew, Youth Conservation Corps interns, two Student Conservation Association interns, and a term National Park Service employee. Data was edited and analyzed using GPS Pathfinder Office and ArcGIS 10. A total of 2,581 pounds of pulled weeds were bagged and then taken to an incinerator in Anchorage to be burned. Gross acres treated increased to 10.8 acres in 2012 from 8 acres in 2011.

## **Acknowledgments**

The Wrangell-St. Elias National Park and Preserve Exotic Plant Management Team members would like to extend a big thanks to all who helped us weed this year. First, thank you to the Student Conservation Association interns for all of their hard work in the field. We also appreciate the Southeast Alaska Guidance Association crew members and Youth Conservation Corps interns for providing lots of person power to pull our largest and most persistent infestations. We would also like to recognize Tim Federal, acting regional Alaska Exotic Plant Management Team coordinator for the enormous amount of data he crunched and analyzed and for his on the ground support in the park.

## **Abbreviations**

AKNHP	Alaska Natural Heritage Program
DOT	Alaska Department of Transportation
EPMT	Exotic Plant Management Team
GPS	Global Positioning System
NHL	National Historic Landmark
NPS	National Park Service
ORV	Off-road vehicle
RZ	Reporting zone
SAGA	Southeast Alaska Guidance Association
SCA	Student Conservation Association
WMC	Wrangell Mountain Center
WRST	Wrangell-St. Elias National Park and Preserve
YCC	Youth Conservation Corps

# Introduction

While invasive plants are mostly limited to areas of human disturbance in Alaska, several species have begun to infest undisturbed ecosystems (Carlson et al. 2008). The potential for these species to disperse via glacial river systems and potentially benefit from climatic change presents a real ecological threat to Alaska's wildlands (Spellman and Wurtz 2010). Climate change could play a direct role to the success of invasive species as they are better able to adjust the timing of their annual activities in regards to propagation than native species (Willis et al. 2010). As climate changes, invasive species impacts may alter in severity and direction, posing greater threats to natural ecosystems and biodiversity (YISC 2011). As time passes impacts and management costs are increasing, in response to these threats the National Park Service (NPS) Alaska Exotic Plant Management Team (EPMT) has adopted the management approach of early detection and rapid response to invasive plant infestations.

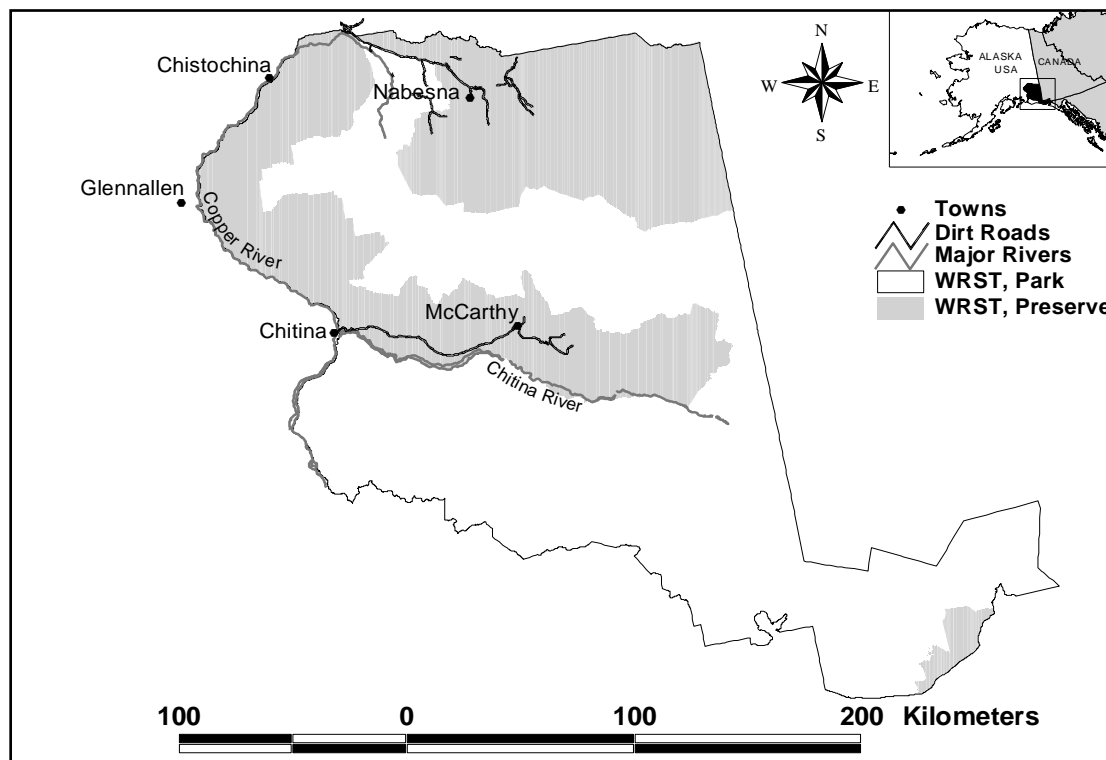


Figure 1. Map of Wrangell-St. Elias National Park and Preserve with inset of location within Alaska.

Wrangell-St. Elias National Park & Preserve (WRST) in Alaska is the largest U.S. national park. Encompassing 13.3 million acres, WRST is slightly bigger than Switzerland. In conjunction with Kluane and Glacier Bay National Parks and Provincial Park Tatshenshini-Alsek in Canada, WRST is part of a World Heritage Site containing one of the largest protected ecosystems on the planet. In addition WRST contains the largest amount of designated wilderness in the country (over 9 million acres) and the Kennecott Mines National Historic Landmark (NHL), the site of the richest copper mine in U.S. history. Two roads, eleven distinct off-road vehicle (ORV) trails, and 19 maintained backcountry landing strips (and numerous unmaintained landing sites)

provide access to WRST, although the majority of park lands remain inaccessible to all but foot, river, and floatplane traffic (Figure 1).

Existing roads, trails, rivers, and airstrips are the primary vectors for invasive plants in the park. Human disturbed areas, such as the patchwork of private and native corporation lands within the park that have been developed, logging areas, landing strips, abandoned homesteads, or camping and mining sites, offer a welcome home to invasive plants. The land status within WRST is one of the most complex situations of any unit in the NPS with over 800,000 acres of private, state, native corporation, and university lands inside the park boundaries. Due to the Alaska Native Claims Settlement Act of 1971 and the Alaska National Interest Lands Conservation Act of 1980 the ownership of these lands has not been static. Lands within the WRST boundaries have been selected for conveyance to the state of Alaska, Native Villages, and Native Corporations. Until these lands have been surveyed and conveyed they are still considered park-managed. Land conveyances began in 1971 and continue today. Likewise the park continues to buy and acquire lands from individuals who wish to sell. Access to non-federal lands across park lands via ORVs or aircraft, plus land uses such as commercial and residential development, logging, and mining add to the challenge of invasive species management.



Figure 2. EPMT mapping the Green Hills airstrip for invasive plants.

Remote airstrips are potential locations for introduction and dispersal of invasive plants onto park lands. WRST has 19 park-maintained remote airstrips, four state-maintained strips (Chisana, May Creek, and two strips in McCarthy), several privately maintained strips, and perhaps 100 or more airstrips/ landing spots that are not maintained but used regularly. There are at least six state-maintained airstrips adjacent to park lands from which visitors, residents, and staff members all access the interior of the park: Beaver Creek, Canada; Chistochina; Chitina; Gulkana; Tok; and Yakutat.

Invasive plant species are a concern to resource managers because they threaten the genetic integrity of native flora through hybridization, can out-compete resident plant species for limited resources, can change the structure and function of ecosystems through alterations of geochemical

and geophysical processes, and can impact fish and wildlife habitat (Vitousek et al. 1996, Gordon 1998). From 2000-2004, 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 first obtained funding for a seasonal position specific to the EPMT program in 2005 (Gilmore 2005). Since then the program has grown mostly through youth internship programs. The 2012 WRST EPMT field season crew consisted of three members: one term hire and two youth interns.

## Objectives

The primary objectives of the WRST EPMT are to a) monitor known infestations of invasive weeds; b) contain, control and where possible eradicate these infestations; c) to inventory areas with known human disturbance where invasive plants are likely to appear and d) to prevent the further spread of invasive species through NPS activities.

Control work is principally prioritized using the invasiveness rank from the Invasiveness Ranking System for Non-Native Plants of Alaska (Carlson et al. 2008). Under direction of NPS Management Policy Section 4.4.4, high priority is given to managing invasive species that 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 almost no impact on park resources or that cannot be successfully controlled. Where an invasive species cannot be successfully eliminated, EPMT seeks to contain the invasive species to prevent further spread or resource damage (NPS 2006). In order to make this objective reasonable the park prioritizes infestations in each reporting zone utilizing the AKNHP species ranking and infestation occurrences as well as taking into account park projects and management priorities. Relatively small populations with a high risk of infestation are targeted for eradication while large populations of species of high risk are targeted for containment. All other occurrences are targeted as time allows.

Some of the most aggressive known infestations that are monitored and controlled every year in WRST are white sweetclover (*Melilotus alba*) at the junction of the Tok Cutoff, oxeye daisy (*Leucanthemum vulgare*) in Kennecott, common tansy (*Tanacetum vulgare*) at the Glennallen park maintenance yard, and scentless false mayweed (*Tripleurospermum*

*inodorum*) at the Betty Freed property, NPS seasonal park housing in Slana.



Figure 3. Common Tansy in the Glennallen Maintenance Yard.

Areas with high visibility, human activity, or probable pathways (areas likely to transfer invasive plants or seeds to other areas of the park) are also a priority. Annual monitoring and control efforts continue around WRST visitor centers in Slana, Copper Center, Chitina, McCarthy, and Kennecott Mines NHL. This year's survey efforts were focused on the Nabesna Road and Kennecott Mines NHL. Prevention measures were focused around the activity of re-routing and stabilizing ORV trails in the Nabesna District (based on the 2011 Nabesna Off-road Vehicle Environmental Impact Statement's Record of Decision), and the continued work on the Twin Lakes/ Kendesnii Campground at mile 27.8 on the Nabesna Road (NPS 2005).

## Methods

Invasive plants were inventoried and monitored following the 2012 Alaska EPMT field protocol (Million and Federal 2012). Both areas with and without invasive plants were mapped with detail sufficient to analyze any changes to infestation size. The data were collected for incorporation into two databases: Alien Plant Control and Management Database – the nationwide NPS database for invasive plant data – and Alaska Exotic Plant Information Clearinghouse – a collaborative, web-based database for tracking invasive weed infestations in Alaska. Attributes are based on North American Weed Management Association standards and describe the size, density, and severity of the invasive plant infestation being mapped. Re-vegetation efforts were similarly mapped.

Surveying and mapping were conducted with a Trimble GeoExplorer 2008 Series GeoXT Global Positioning System (GPS). These units were used to record location and attribute information for geographic information system analysis. GPS units can achieve sub-meter horizontal accuracy and were equipped with a standard Alaska-specific data dictionary enabling both precise mapping and standardized data collection. GPS data was post-processed and edited by field personnel using GPS Pathfinder Office, then transferred to the regional office for processing.

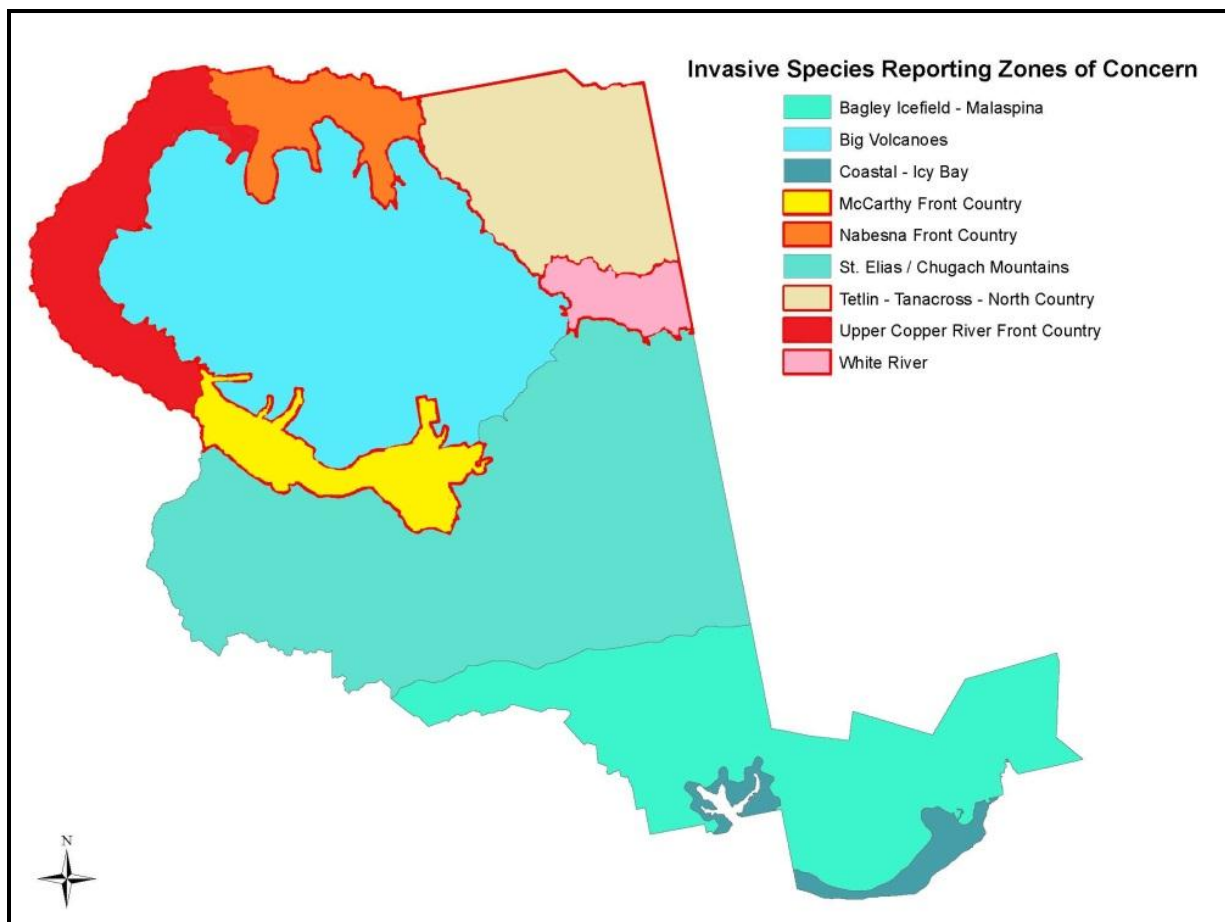


Figure 4. Reporting zones for invasive plant management with high priority zones outlined in red.



Due to the park's large geographic range, reporting infestations at a meaningful scale has been a challenge. For reporting purposes WRST EPMT has adopted the same eight reporting zones (RZ) that were developed and used for the 2011 WRST Natural Resource Condition Assessment (Figure 2, 2011 Drazkowski et al.).



Figure 5. The Trimble GPS.

Infestations in the McCarthy Front Country reporting zone and Nabesna Front Country reporting zone were analyzed for prioritization utilizing the AKNHP species ranking and infestation occurrences (Appendix B). The data analysis was completed this season by EPMT term AnnMarie Lain. Category A represents high risk infestations with a relatively small amount therefore targeted by EPMT for eradication. Category B represents high risk infestations with a relatively large amount therefore targeted by EPMT for containment. Category C represents low risk infestations with a relatively small amount therefore managed by the EPMT only as time allows.

Areas of human development, frequent use, and weed pathways were the main focus of invasive plant surveys. Walking inventories were conducted along roadsides, trails, and at WRST Headquarters to identify previously unknown invasive plant infestations. Particular attention was paid to areas of obvious disturbance, such as gravel pits, pullouts, new culvert sites, airstrips, etc.

If invasive species were found in numbers that could be controlled within a reasonable time frame, they were removed by hand. Control work was conducted using manual methods, including pulling, digging, and cutting. Weeds were then disposed of in clearly labeled plastic bags which were packed full and tied tightly. These bags were stored in a connex container designated for weed storage until they could be taken to an incinerator at the end of the season.

Herbicide was used to manage a particularly aggressive infestation of common tansy at the Glennallen maintenance yard. All herbicide applications were made by state of Alaska certified pesticide applicators using a precise, spot application method with calibrated backpack sprayers. A wide range of best management practices are followed to ensure legal, safe, and responsible herbicide use (NPS 2010).

Prevention methods this year focused on pressure washing vehicles and equipment in the Glennallen maintenance yard before transport to a work site within the park. The EPMT worked closely with the maintenance division towards this end.

The 2012 WRST EPMT consisted of one term biological technician: AnnMarie Lain, and two interns with the Student Conservation Association (SCA): Maria Vasquez and Kevin Storey. The 2012 EPMT staff members were stationed at the WRST Headquarters in Copper Center. Three different Southeast Alaska Guidance Association (SAGA) crews assisted the WRST EPMT for a total of five weeks and three Youth Conservation Corps (YCC) students assisted for two weeks.



## Results

### Overview

A total of 1,790 field hours were logged by WRST EPMT members and volunteers this season. The 2012 WRST EMPT crew spent a total of 302 person hours in the field, while the youth groups and other volunteers added 1,488 hours (Table 1).

Table 1. Invasive plant management person hours for WRST EPMT staff, youth groups, & volunteers.

Year	EPMT Personnel				Youth Groups			Other Volunteers		Total Person Field Hours
	Hires	S C A	C L M	Field Hours	Group(s) Involved	Persons	total hours	Persons	total hours	
2005	1	0	0	240	Community weed pull, DNR Forestry Intern Program	14	49	0	0	289
2006	1	0	0	260	SAGA, DNR Forestry Intern Program, TCCC	7	126	2	870	1,256
2007	1	0	1	303	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

\*Hours for SCA's are a rough estimate

Acronyms: SCA – Student Conservation Association, CLM – Chicago Land Management program, DNR – Department of Natural Resources, TCCC – Tribal Civilian Community Corps, YPP – Youth Professionals Program, SAGA – Southwest Alaska Guidance Association, YCC – Youth Conservation Crews

At the end of the 2012 field season WRST had mapped a total of 59 acres finding 22 acres infested with invasive plants, most of which are located along road and trail corridors and in communities within the park (Table 2). When the Alaska EPMT program first started in WRST, the main focus was mapping infestations outside of the park to understand where the seed sources and pathways were located (Gilmore 2005). While the mapping of new infestations is still a key part of the program, the focus has now shifted to monitoring and treating known infestations within WRST boundaries (Terwilliger et al. 2010) and prevention of the spread of new infestations through park activities. This year a total of 15 acres of invasive plants were treated this season and the total canopy acres controlled was 0.4 while 0.4 acres were restored (Table 2).

One voucher was collected, pressed, labeled and was sent to the Alaska Natural Heritage Program (AKNHP) in Anchorage where it was verified to be Bird Vetch (*Vicia cracca*). This specimen, pulled from mile 177 of the Glenn highway, at the east side of the gate to the Ahtna Gas Drilling site near Tolsona will be curated into the park herbarium collection. This specimen was collected by the Copper River Watershed.

Table 2. Summary of WRST EPMT invasive plant management species acreage accomplishments.

Fiscal Year	Invasive GPS Data <sup>1</sup>													New Exotic Plant Spp
	NPS Managed Lands			Non-NPS Lands inside boundary			Non-NPS Lands outside boundary			Total Acreage			Acres Restored <sup>3</sup>	
	Acres Surveyed	Acres Infested <sup>2</sup>	Acres Treated	Acres Surveyed	Acres Infested	Acres Treated	Acres Surveyed	Acres Infested	Acres Treated	Acres Surveyed	Acres Infested	Acres Treated		
2003 <sup>A</sup>	-	4.95	-	-	3.5	-	-	-	-	-	-	-	-	17
2004	2.46	2.46	0.18	10.03	0.10	0.02	5.03	0.60	0.13	17.52	3.16	0.33	-	1
2005 <sup>B</sup>	0.71	0.71	0.17	1.20	1.20	0.24	7.69	1.89	0.41	9.60	3.80	0.82	-	1
2006	284.70	5.19	2.51	16.24	2.89	0.05	30.84	5.20	<0.01	331.78	13.28	2.56	-	9
2007	402.63	8.29	0.37	107.64	5.07	0.18	80.82	7.32	0.36	591.09	20.68	0.91	-	2
2008 <sup>C</sup>	383.32	1.45	0.35	434.87	2.99	0.52	1,557.38	0.69	0.22	2,375.57	5.13	1.09	-	4
2009	131.53	20.24	8.43	86.60	21.70	1.90	64.50	9.70	8.70	282.63	51.64	19.03	-	3
2010	804.40	110.40	17.60	476.70	72.30	4.30	175.80	30.30	4.30	1,456.90	213.00	26.20	0.05	4
2011	49.43	24.43	8.48	13.98	4.91	3.01	0.00	0.00	0.00	63.40	29.33	11.49	0.31	1
2012	40.18	12.93	10.07	8.20	1.71	0.10	10.72	7.55	4.93	59.10	22.19	15.10	0.04	0

Note: Foxtail barley acreage is included in this data.

1-All acreage was calculated using January 2010 NPS land status. 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 January 2010 are counted as NPS managed land.

2-Acres infested is calculated by acres mapped multiplied by the percent cover in areas greater than 0.5 acres. If under 0.5 acres, acreage mapped is counted as 100%.

3-2010 is the first year that restoration efforts were mapped & seed collections tracked.

A-Data was collected during the 2003 field season but is highly inaccurate/ imprecise. Number of exotic plant species includes all exotic/ non-native species known to occur in WRST prior to 2003.

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

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

## Nabesna Front Country RZ

Infestations in the Nabesna Front Country RZ were analyzed for prioritization utilizing the species AKNHP ranking and infestation occurrences (Table 3, Appendix B).

Table 3. Infestation priorities for the Nabesna Front Country RZ for 2012.

Category	Nabesna Reporting Zone			
	Latin Name	Common Name	Occurrences	2012 AKEPIC Rank
A	<i>Phleum pratense</i>	common timothy	2	58
	<i>Crepis tectorum</i>	narrowleaf hawksbeard	8	56
B	<i>Melilotus alba</i>	white sweetclover	85	81
	<i>Hordeum jubatum</i>	foxtail barley	272	63
	<i>Taraxacum officinale</i>	common dandelion	57	58
C	<i>Tripleurospermum inodorum</i>	scentless false mayweed	14	48
	<i>Lappula squarrosa</i>	European stickseed	6	44
	<i>Descurainia sophia</i>	flixweed	5	41
	<i>Capsella bursa-pastoris</i>	shepherd's purse	1	40
	<i>Chenopodium album</i>	common lambsquarter	6	37
	<i>Lepidium densiflorum</i>	common pepperweed	1	28
	<i>Papaver nudicaule</i>	Icelandic poppy	3	0
	<i>Rheum rhabarbarum</i>	rhubarb	6	0

Category A represents species infestations with an AKNHP ranking of fifty or higher with less than twenty five documented occurrences on park lands within the reporting zone. Two species were classified as Category A infestations: common timothy (*Phleum pratense*) and Narrowleaf hawksbeard (*Crepis tectorum*).

Previously documented infestations of common timothy were mapped and pulled at two locations: one near the outhouse at the Slana Ranger Station, and another at about mile point 17.5 at the bottom of the hill that leads to the roadside way station. Five previously documented infestations of Narrowleaf hawksbeard were re-visited and mapped. Not one infestation site had any plants to pull. This leads us to believe that previous years efforts to pull and eradicate Narrowleaf hawksbeard have been successful. No new infestations of common timothy or Narrowleaf hawksbeard were recorded in this reporting zone during the field season.

Three species were classified as Category B infestations: white sweet clover (*Melilotus alba*), common dandelion (*Taraxacum officinale* ssp. *officinale*), and foxtail barley (*Hordeum jubatum*). The two white sweet clover infestations are not on park lands but are in a vector location just outside of the Nabesna Front Country RZ and are considered a potential threat to park lands. Due to time restraints and infestation locations, common dandelion and foxtail barley were not targeted for containment treatments. Both species are already wide-spread along the Nabesna road within the park.

Weeding was performed on a large infestation of white sweetclover at the Tok and Nabesna Roads, otherwise known as the Tok Cutoff (Figure 4). This infestation has been intensively weeded since 2005. This year the infestation was controlled for three days in mid-July and for three days in August by the WRST EPMT and SAGA crews. White sweetclover was pulled on the north side of the highway, and on the slopes on the west and east side of the Nabesna Road.



Figure 6. WRST EPMT staff and SAGA crew pulling white sweetclover at the Tok Cutoff.

The smaller infestation consisting of forty two white sweetclover plants was inventoried and manually treated by staff near the gravel pit at mile one on the Nabesna Road, in 2011 there were thirty three plants at this site and in 2010 there were only nine.

Category C represents species infestations with an AKNHP ranking of fifty or less with less than twenty five documented occurrences. Six species were classified as Category C infestations: European stickseed (*Lappula squarrosa*), lambsquarter (*Chenopodium album*), shepherd's purse (*Capsella bursa-pastoris*), flixweed (*Descurainia sophia*), scentless false mayweed (*Tripleurospermum inodorum*), and common pepperweed (*Lepidium densiflorum*).

The WRST EPMT crew surveyed and pulled the scentless false mayweed and common dandelion at the Betty Freed property. The Betty Freed property is a park owned home (NPS 2001) used for seasonal housing.

### **McCarthy Front Country RZ**

The Kennecott Mines NHL, designated in 1998, is the focus of much of the WRST EPMT efforts in this reporting zone. The landmark encompasses the land, mineral, and associated holdings of the Kennecott Copper Mines in south-central Alaska and includes structures in the historic mill town (Figure 5). The NHL designation encompasses 7,700 acres of public and private lands (Gilbert et al. 2001). Since then the park has acquired or purchased additional lands and buildings. Copper mining operations in Kennecott occurred from 1901 to 1938 and were among the nation's richest (Gilbert et al. 2001).

The NPS and the local community are engaged in an ongoing planning effort to identify buildings that will be stabilized or rehabilitated and the NPS is currently in the process of revising their operations plan for the NHL. Stabilization work in the Kennecott Mines NHL is expected to take many years. These construction projects disturb native vegetation and can contribute to invasive weed infestations. In addition, outside fill material that may be used could be a vector for spreading invasive weeds into the park. These areas will need attention in the



Figure 7. The main mill site in Kennecott NHL.

future, both by pulling invasive weeds and planting native species. The EPMT has been actively engaged in the planning efforts in the NHL through representation by the park ecologist, Miranda Terwilliger. In 2012 EPMT term AnnMarie Lain attended several NHL planning meetings and made suggestions to facilitate and include invasive plant management in the Kennecott Operations Plan.

#### Infestations in the McCarthy

Front Country RZ were analyzed for prioritization utilizing the

AKNHP species ranking and infestation occurrences (Table 4, Appendix B). Category A represents species infestations with an AKNHP ranking of forty-eight or higher with less than twenty documented occurrences on Park lands within the reporting zone. These infestations are of high risk with a relatively small amount, due to limited time and personal the infestations in Category A were not eradicated and should be targeted by EPMT for eradication in 2013. In Category B, oxeye daisy remains one of the larger infestations that the EPMT dedicates yearly work to.

On August 14<sup>th</sup>, 2012 regional EPMT seasonal Tim Federal accompanied a five person SAGA crew to begin a containment treatment on infestations at May Creek. May Creek was first visited by the EPMT in 2003 (McKee 2003), and again in 2009 and 2010 (Terwilliger et al 2010, Lain 2011). This area is a very important backcountry operations center, so any priority weeds in the vicinity pose concern due to it being used as a staging area for operations occurring deep in the backcountry.

The crew spent a total of 4 hours manually treating the areas around the main cabin facilities at May Creek. Infestations of foxtail barley, common dandelion, alsike clover, red clover, white clover, common pepperweed, and flixweed were targeted for this containment treatment. The crew spent another 4 hours treating common dandelion and alsike clover at the Cook Cabin which is approximately one mile down trail from the main cabin facilities.

Table 4. Infestation priorities for the McCarthy Front Country RZ for 2012.

Category	McCarthy Reporting Zone			
	Latin Name	Common Name	occurrences	2012 AKEPIC Rank
<b>A</b>	<i>Caragana arborescens</i>	Siberian peashrub	9	70
	<i>Linaria vulgaris</i>	yellow toadflax	14	69
	<i>Bromus inermis</i>	smooth brome grass	9	62
	<i>Elymus repens</i>	quackgrass	7	59
	<i>Phleum pratense</i>	common timothy	8	54
	<i>Galeopsis tetrahit</i>	hempnettle	2	50
	<i>Trifolium pratense</i>	red clover	15	53
	<i>Polygonum convolvulus</i>	black bindweed	5	50
	<i>Tripleurospermum inodorum</i>	scentless false mayweed	1	48
	<i>Rumex crispus</i>	curly dock	1	48
<b>B</b>	<i>Hordeum jubatum</i>	foxtail barley	140	63
	<i>Leucanthemum vulgare</i>	oxeye daisy	86	61
	<i>Taraxacum officinale</i>	common dandelion	1060	58
	<i>Crepis tectorum</i>	narrowleaf hawksbeard	71	56
	<i>Trifolium repens</i>	white clover	138	59
	<i>Trifolium hybridum</i>	alsike clover	143	57
<b>C</b>	<i>Polygonum aviculare</i>	prostrate knotweed	16	45
	<i>Thlaspi arvense</i>	field pennycress	6	42
	<i>Stellaria media</i>	common chickweed	8	42
	<i>Silene noctiflora</i>	night-blooming cockle	10	42
	<i>Veronica serpyllifolia</i>	thymeleaf speedwell	1	36
	<i>Cerastium fontanum</i>	mouse ear chickweed	19	36
	<i>Senecio vulgaris</i>	common groundsel	6	36
	<i>Viola tricolor</i>	johnny jumpup	1	34
	<i>Lepidium densiflorum</i>	common pepperweed	10	28
	<i>Papaver somniferum</i>	opium poppy	1	0
	<i>Arabis glabra</i>	tower rockcress	1	0
	<i>Erysimum cheiranthoides</i>	wormseed mustard	1	0
	<i>Papaver nudicaule</i>	Icelandic poppy	2	0

The May Creek Public Use Cabin was also manually treated for common dandelion. The footpath leading to the Chititu Creek was inventoried with no invasive plant species found. A large patch of common dandelion was found growing along the banks of the Chititu Creek. The crew spent an entire day pulling the dandelion infestations at the public use cabin and along the creek.



On the last day of their trip, the crew pulled infestations of common dandelion, alsike clover, foxtail barley, and common chickweed at the field adjacent to the weather station and at Gagnon's Cabin.

### Upper Copper River Front Country

WRST moved its headquarters to its current location in Copper Center in 2002. This location, although situated on the outskirts of the Upper Copper River reporting zone, is relevant to park managers as a potential pathway for dispersal of invasive plant seeds. The native aspen (*Populus tremuloides*), black and white spruce (*Picea mariana* and *P. glauca*) and other vegetation make an impressive backdrop. Unfortunately, building sites were cleared of all vegetation and weed infested topsoil was spread. Narrowleaf hawksbeard (*Crepis tectorum*), common dandelion, and foxtail barley are heavily established infestations around WRST Headquarters. The area also has smaller infestations of lambsquarter, European stickseed, and white sweetclover. White sweetclover has the highest invasiveness rank of any invasive plant in WRST and as such these infestations warrant some concern. The WRST EPMT monitored and treated these areas to prevent further establishments of white sweetclover at these locations. The once abundant pigweed (*Amaranthus retroflexus*) that posed such a problem the first four years after moving to the new site seems to have all but disappeared (Gilmore 2006).

In 2012, mechanical and manual methods were used to control infestations around WRST Headquarters. The maintenance staff has cooperated with the WRST EPMT by mowing and bagging invasive plant infestations upon request. An eight person SAGA crew spent two days at the end of June and four days in early July manually controlling known weed infestations around WRST Copper Center Headquarters and employee housing. Four YCC interns controlled weeds in conjunction with the SAGA crew at WRST



Figure 8. SCA, YCC, and SAGA youth pose at headquarters.

Headquarters for four days. The planting area around WRST's welcome sign was intensively weeded several times this season by WRST EPMT staff. Common dandelion, narrowleaf hawksbeard, alsike clover (*Trifolium hybridum*), and foxtail barley were mapped and removed. The WRST EPMT, YCC, and SAGA crews continued the re-vegetation efforts around the Visitor Center that began in 2011 (Lain 2012). This and other restoration projects are discussed further below in the Restoration Efforts section.

In other areas around WRST Headquarters there were continual efforts throughout the season to map and pull narrowleaf hawksbeard, foxtail barley and common dandelion. The SAGA and YCC crews pulled infestations at the Visitor Center, theater, exhibit building, resource buildings,

behind the administrative building, around the visitor's parking lot, and at the junction of the administration and visitor center driveways. The area behind the administrative building is overrun with lambsquarter, narrowleaf hawksbeard, prostrate knotweed, clovers (*Trifolium spp.*), pineapple weed, common plantain, common dandelion, and foxtail barley. This infestation is from a septic tank replacement in 2008 which was covered with weed-infested topsoil and has resulted in a bumper crop of invasive weeds (Gilmore and Harper 2008). This area is a potential seed source for other areas around headquarters (Terwilliger et al. 2010). In the past, this area has been continually mowed by the maintenance staff to prevent the infestations going to seed as invasive weeds continue to sprout despite ongoing control efforts. However, this year, due to herbicide treatments in 2011 and intensive manual pulling the area was considered controlled enough to allow the native grasses and forbs to grow without mowing.



Figure 9. Fire Fuel Reduction at Copper Center Headquarters.

In 2011 the NPS Eastern Area Fire group conducted a fire fuel reduction plan around the Copper Center headquarters and administrative facilities. In late 2012 the regional fire ecologist, Jennifer Barnes (personal communication), reported the growth of hawksbeard within the forest adjacent to the access road from the highway. The staff did not have time to investigate the report for this year but it should be a high priority for the next field season. It

is likely that the hawksbeard came in from seed sources along the

Richardson highway and took advantage of the newly disturbed area.

The WRST maintenance yard in Glennallen stores equipment that is transported and used within park boundaries by park staff. The maintenance yard is jointly owned by the NPS and BLM. As a result, all control activities had to pass scrutiny of the environmental compliance for both agencies. Common tansy (*Tanacetum vulgare*) is prevalent in the maintenance area and has yet to be documented within the park. The origin of this infestation is not known as it does not occur elsewhere in the Copper River Basin. The WRST EPMT members have attempted to control it through hand pulling since 2009. It is difficult to effectively control manually as it can reproduce by seed and vegetatively via an extensive rhizomatous system. The location of this infestation makes it a high priority as it could easily spread into the park or BLM lands through the movement of equipment. Regional EPMT Technician, Tim Federal, applied a low toxicity level herbicide, called Milestone VM, on the common tansy infestation around the Glennallen maintenance yard on August 28<sup>th</sup> of this season. The treatment area was approximately 0.39 acres. The outcome of this treatment should be monitored in 2013 and adaptive management strategies will be used to develop future treatment plans.



This year, the EPMT, in cooperation with the maintenance staff, implemented decontamination procedures for vehicles used on the Nabesna Road ORV trails. All vehicles were required to undergo a high-pressure, hot water spray before being hauled to the work site from the Glennallen maintenance yard. Hopefully this will help reduce the spread of the invasive seeds at the maintenance yard to other parts of the park. The maintenance staff has purchased a vehicle decontamination station that the EPMT staff should help set up early next field season.

### **Tetlin-Tanacross-North Country RZ**

No areas in this zone were surveyed in the 2012 field season. In 2011, one remote airstrip was surveyed in conjunction with a concessioner site visit in this RZ. The WRST EPMT crew did not find any invasive species on the Snag Creek airstrip. They did find infestations of foxtail barley, mouse-ear chickweed, common plantain, and pineapple weed at a park owned cabin within the area. A large infestation of a potentially invasive grass was found at the same site (Lain and Terwilliger 2011). Although WRST EPMT members were unable to control the infestations this season, efforts should be made to revisit the site in 2013. The NPS Snag Creek Guide Area assessment can be obtained by contacting Mark Keogh, NPS Concession Specialist.

### **White River and Bagley Icefield RZ**

As of 2012, the WRST EPMT has not collected any data from the White River or Bagley Icefield reporting zones. However, domestic horses graze in the White River RZ and the park hopes to inventory it for invasive plants in the future. In contrast the Bagley Icefield is mostly ice and glaciers and is not currently an area of high concern.

### **Big Volcanoes RZ**

This year the NPS property around the Marvelous Mill and Spokane Airstrip was surveyed and controlled by WRST Lands Manager Danny Rosenkrans, Regional EPMT seasonal Tim Federal, and SCA Kevin Storey (Lain et al. 2012). The adjacent private lands were also surveyed with the landowner's permission. This area has been of some concern since 2003 when a particularly large infestation of black bindweed was reported (274 plants) in an area that is otherwise fairly pristine (Loso 2005). In 2011

park ecologist Miranda Terwilliger revisited the site on a quick day trip and realized that it needed much more in-depth inventorying. In 2012 infestations of Kentucky bluegrass, common dandelion, mouse-ear chickweed, white and yellow clover, black bindweed, nettle, chickweed, shepherd's purse, flixweed, timothy grass, plantago, and pigweed were found (Lain et al. 2012). It is assumed that the weed seeds came in with the horse stock kept by the previous landowner.

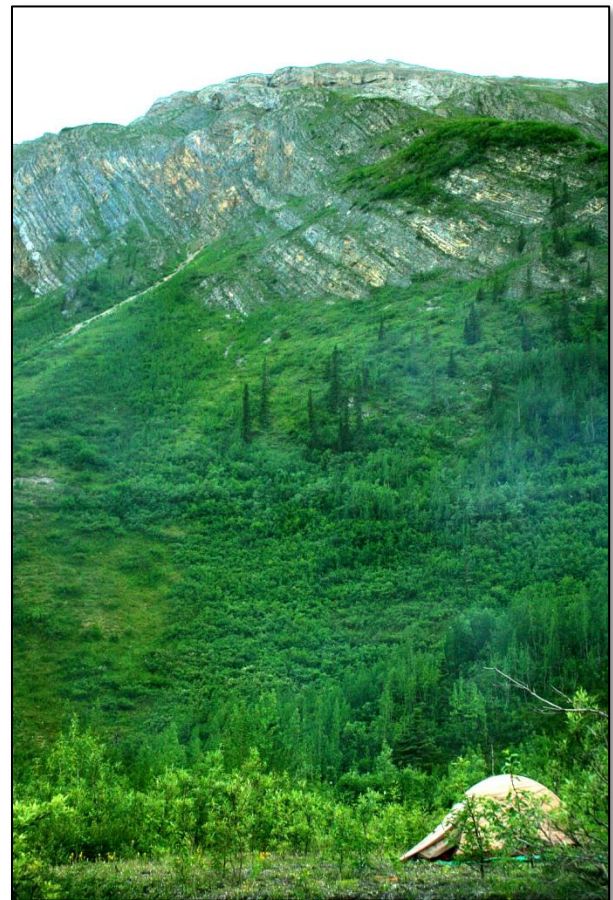


Figure 10. EPMT camp at Spokane Airstrip.

Tim and Kevin manually pulled the higher ranked species on NPS managed lands over a four day period. A report is being provided to the landowners. The NPS would like to work with the landowners to reduce or eradicate this infestation in the future.

No other areas in this zone were surveyed in the 2012 field season. In 2010 foxtail barley was documented growing at various locations along the Nizina River, at both of the airstrips at the toe of the Nizina Glacier and at the Lakina River (Lain et al 2011). Infestations of common dandelion were inventoried at the Nizina public use cabin, along the lake on the Donoho Basin trail, at the Peavine airstrip, and at the Hidden Creek Valley trail (Lain et al 2011).

### **Coastal-Icy Bay RZ**

No areas in this zone were surveyed in the 2012 field season. In 2009 a WRST EPMT intern and the park ecologist, Miranda Terwilliger, surveyed the Esker Creek public use cabin for invasive species; no invasive species were found (Terwilliger et al. 2010). Access is a limiting factor for inventorying in this reporting zone.

### **St. Elias-Chugach Mountains RZ**

No areas in this zone were surveyed in the 2012 field season. As of 2011 the only invasive species reported in this zone by WRST EPMT is foxtail barley (Lain 2012). One area that is of concern is the Bremner Historic District which was last visited cursorily by the WRST EPMT in 2010 (Lain et al. 2011). Given the high historical disturbance (White 2000), the current high visitation, and the vague reports that suggest invasive species may be present, the EPMT feels that this area is a high priority for inventory.

### **Restoration**

Where infestations larger than 0.1 acre are controlled, Alaska NPS units are directed to restore the site with local seed sources and/or native vegetation (NPS 2010). NPS is directed to limit the

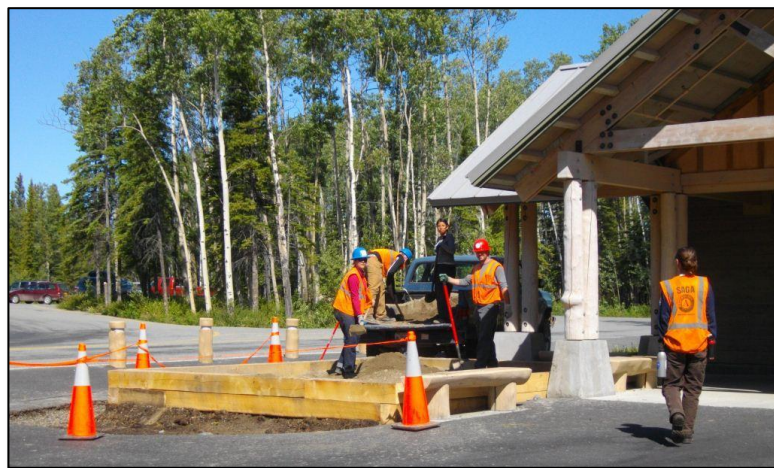


Figure 11. SAGA and SCA crew members building native plant beds in front of the Copper Center Visitor Center.

impacts, such as introduction of exotic species, on natural systems by restoring areas disturbed by NPS activities such as hazard tree removal or construction.

Restoration of native plants accelerates the recovery of the biological community function and physical components of these systems (NPS 2006). Thru Executive Order 13148, federal agencies are directed to promote environmentally sound landscaping practices and programs to reduce adverse impacts to the natural environment. Agencies are also expected to minimize adverse



impacts of actions or projects on existing native plant communities by requiring on-site managers and contractors to ensure that practices which minimize impacts to natural habitat are followed during construction (Clinton 1994).



Figure 12. Map of park Copper Center Visitor Center complex re-vegetation plan.

Prior to 2011, re-vegetation projects within WRST had been confined to the vegetation around the welcome sign at the Copper Center complex (Gilmore and Goldsmith 2007). In 2011, the EPMT and Interpretive staff turned to restoration as a means of combating invasive plants,

improving visitor flow, facilitating better use of space, and screening of parking areas (Lain 2012).

This season, under the direction of the park ecologist, Miranda Terwilliger, the WRST EPMT continued restoration efforts around park headquarters in Copper Center begun in 2011. This project was submitted for public comment through the NPS Planning, Environment & Public Comment website; a decision making tool for park planners that fosters conservation-based consultation, cooperation, and communication. For three days in late June and five days in early July the WRST EPMT, SAGA, and YCC crews worked on the visitor complex restoration efforts.

The crews also created native plants beds that will be planted in 2013 and used by Rangers to interpret native vegetation to park visitors. Re-vegetation efforts will continue in 2013.

In 2011, members of the WRST resource, maintenance, and interpretation staff delineated areas around headquarters as natural vegetation (trees & shrubs), natural shrub, or mowed grass (Figure 13. Map of park Copper Center Visitor Center complex re-vegetation plan.). A four-foot buffer zone of mowed grass was kept on either side of all established trails. The re-vegetation area for mowed grass is approximately 1.3 acres or 56,628 sq. feet. Due to time and weather constraints, only half of the designated mowed grass areas were re-seeded this year. The EPMT



Figure 13. AnnMarie Lain spreading the word about invasive plants at the Kenny Lake Fair.

and SAGA crews dug up existing shrubs and plants in the grass areas and replanted the plants in designated natural vegetation areas. The two most prevalent native plants saved were Northern yellow oxytrope (*Oxytropis campestris*) and arctic lupine (*Lupinus arcticus*). Native plants and tundra mats from a nearby trail and amphitheater project were removed by a maintenance SCA crew and re-planted in the native plant areas.

EMPT member Kevin Storey then rototilled the areas to be reseeded with grass to loosen up the compacted soil. After consultation with the Alaska Plant Materials Center, it was decided to add fertilizer and lime to the seed mix. Weed-free grass seed, Alaska Lawn Mix, was spread at a rate of 41 lbs. per 1,000 sq. feet. Both the 18-32-16 fertilizer and the lime were spread at a rate of 15 lbs. per 1,000 sq. feet. Edging was installed and used to delineate the spaces between mowed areas and natural areas. The reseeded areas were marked off-limits until the grass grew sufficiently to tolerate trampling. Once the grass began to grow the areas were mowed regularly by the maintenance staff. Preliminary results show that the reseeded grass areas have very few weeds.

In late fall, the park ecologist, Miranda Terwilliger, re-seeded the designated native areas in Copper Center with native seeds that had been collected by the EPMT team in the area over the past few years. The primary species were Purple reedgrass (*Calamagrostis purpurascens*), Pasque flower (*Pulsatilla patens*), and Northern yellow oxytrope. Seeding these plants before the winter will allow the seeds to experience the normal freezing and thawing cycle many of them require to germinate (Densmore et al. 2000).

For the first year, tundra mats were salvaged by maintenance crews at the direction of the park ecologist and EPMT staff and used for re-vegetation purposes. Native vegetation mats were saved by a maintenance SAGA crew during the construction of trails at the Twin Lakes/Kendesnii Campground and used to re-vegetate other disturbed areas in the campground particularly around culverts. Trail crews saved tundra mats along the Soda Lake Trail re-route and used them to cover bare banks and erodible areas uncovered by the trail. This was the first successful implementation of salvaging native tundra mats for re-vegetation purposes on a large scale in WRST.

### **Outreach and Education**

An objective of the Alaska EPMT is 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 nonnative plant species, change behavior that results in the spread of infestations, and provide support for management efforts (NPS 2006). Education is also vital to gain public, industry, and political support for prevention, control, and detection activities. As rural communities continue to grow and as introduction of new weeds become a greater threat, education will help rural communities avoid problems occurring in other parts of Alaska (AKDNR 2011). To build support for prevention programs, managers need to rigorously quantify the economic and ecological impacts of invasive species and clearly communicate this information to the public (YISC 2011).

Due to limited staff, the EPMT did not participate in the usual outreach booths at the McCarthy 4<sup>th</sup> of July or the Kenny Lake Fair. It is hoped that the team can re-engage in these next year. In June, WRST EPMT term AnnMarie Lain wrote and published an article in the Copper River record about non-invasive gardening practices (Appendix C) and letters to float plane users and fishing guides about *Elodea* are being drafted to be sent out next spring.



## Discussion and Recommendations

### Inventory and Control Work

In past seasons, the WRST EPMT has focused on mapping invasive weeds and utilizing manual control methods where feasible. Although inventory and control work is essential, the WRST EPMT should encourage park managers to make prevention a priority as part of the strategic plan for managing invasive species.

Establishing strong prevention measures such as quarantine and inspection of common invasive plant vectors is less expensive than the resulting resource losses and the costs of management and control. Prevention is the most critical aspect of invasive plant management (AKDNR 2011). Prevention should include education, risk analysis, and pathway management. It is key that WRST EPMT members comment on projects that would increase the spread of invasives through the compliance

process.



Figure 14. EPMT staff pulling white-sweet clover.

WRST EPMT should rigorously identify pathways by which invasive species move into the park and cooperate with other departments in WRST to mitigate infestation risks and establish standard operating procedures and policies where needed.

Specific mapping goals for the 2013 season should include: a comprehensive bicycle survey of the McCarthy road (taking consideration for previously mapped infestations and for DOT construction sites), backcountry trails that have not been mapped or that have high priority infestations, newly constructed or repaired trails, hazard fuel treatment areas, campgrounds, pullouts, and unmapped airstrips. Since it has been 3 years it is also time to map the highways surrounding the park from a vehicle for white sweet clover and hawksbeard. The latter in particular seems to be increasing on the Copper Basin roadways.

An important part of the WRST EPMT's inventory effort is to insure that the park herbariums contain vouchers of identified invasive weeds found in the park. It is important to coordinate with the park's curator to share information on invasive specimens collected from other projects. This will reduce collecting multiple vouchers of the same specimen and will help identify areas of known infestations that are documented in the park by other collectors.

In August of 2010, the USDA Forest Health Protection program became aware of a substantial infestation of Canadian waterweed (*Elodea nuttalli*) in the Fairbanks area (Wurtz and Lisuzzo



Figure 16. Float planes can spread invasive water plants inadvertently.

waterweed, if left unmonitored and allowed to spread, would cost the state of Alaska \$230,000 a year in future commercial salmon harvest revenues and over a million dollars a year in future sport fishing revenues (Wurtz and Lisuzzo 2010). Education and outreach to floatplane users, commercial use operators, and concessionaires will be critical in keeping this weed out of the park waterways.

Specific treatments should continue at WRST Headquarters and the Chitina, Copper Center, Kennecott Mines NHL, and Slana ranger stations. A long term treatment and re-vegetation plan for Kennecott Mines NHL should be a priority, as this area is under extensive renovation. To reduce the possible introduction of invasive plants from outside or the spread of existing invasive plants within the NHL, NPS should implement best management practices for all ground-disturbing operations. To minimize invasive plant colonization's, restoration and re-vegetation efforts should be increasingly included in project proposals and implemented utilizing native seedlings, native transplants, native cuttings, salvaged mats, bioengineering techniques with

2010). Canadian waterweed directly competes with Chinook salmon for breeding habitat (Mertz et al. 2008). 2011 was the first year that the WRST EPMT inventoried for aquatic invasive species (Lain 2012). Slow moving rivers and lakes that are accessed by float planes should be monitored for aquatic invasive species due to the planes ability to inadvertently spread infestations. Several lakes in the park are visited by float planes that start in waters known to have Canadian waterweed infestations. It is estimated that Canadian

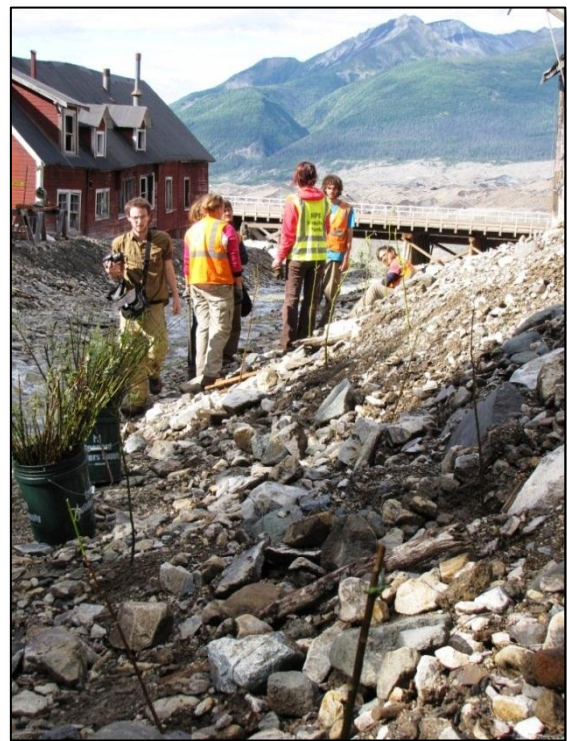


Figure 15. EMPT staff and SAGA re-vegetating National Creek in Kennecott Mines NHL.



native plants, and native seeds.

## Restoration

Restoration efforts should continue at WRST Headquarters (Figure 10). The WRST EPMT should follow the approved detailed plan for the area which includes proposed areas for native re-vegetation, suggested planted species with type (seed, transplant, cutting) and amount per area. The WRST EPMT should work with the maintenance staff to arrange for watering schedules for newly re-vegetated areas.

The WRST EPMT is also considering a plan to submit to park managers to seed the Kennecott Mines NHL town site with native seeds and potentially historically non-native garden plants with non-invasive, historically accurate plants. The Kennecott Mines NHL should include the same details listed for the WRST Headquarters re-vegetation plan. Likewise, there is a proposal to re-seed the lawn in front of the Chitina ranger station in 2013 to reduce the weed population and improve aesthetics.

To take on the greater need for restoration, the park EPMT should develop a restoration protocol for collecting and cleaning native seeds for future use. The EPMT program now has the equipment necessary to clean and store large amounts of seed. The team is currently working on a plan to start a volunteer seed collecting program in the Kennicott Valley.

## Outreach and Education

Key elements for success in controlling invasive plants are education and community involvement. The park EPMT should continue to work with other park staff and finalize an invasive plant policy. Presentations should continue to be given to seasonal staff. Informal training should be provided both for interpreters who interact with the public as well as seasonal staff from other divisions, who are sometimes directed to do weeding around visitor centers. This will provide these staff with an understanding of the importance of the EPMT goals and allow



Figure 17. Invasive Plant outreach in McCarthy.

them to contribute to the EPMT effort. In addition, staff members who are directed to complete supplemental weeding or mowing for control should be aware of the EPMT's mapping and reporting requirements so their work is properly documented.

As in past years, in 2012 park EPMT technicians put together field flip books for each ranger station highlighting the "top ten" species for each area and invasive species phenology logs. Next year, the EPMT staff should make a greater effort to both record phenology



themselves and to encourage other divisions in WRST to use the phenology logs as the information collected is valuable to gauge the timing of mechanical and chemical treatments. In addition, the park should consider having phenology recorded directly into a wider program such as the National Phenology network that would increase the ease of data sharing. Setting up joint EPMT and Interpretation staff meetings to evaluate the weed phenology at each ranger station would be particularly helpful due to the turnover of rangers. Future park EPMT staff should also work closely with the interpretive division to include information about invasive plants in their ranger talks at the visitor centers, Princess Lodge, youth camps, and at teacher-ranger-teacher programs.

One of the most important aspects of community education is the active involvement of local residents. The Copper Valley Invasive Plants Workgroup is currently working to finalize the official charter for the Copper Basin Cooperative Weed Management Area. WRST is an active and supportive member of this group. Efforts should be made to strengthen this group and involve more community members.

Due to travel constraints, the park EPMT should coordinate with the Yakutat area NPS staff. Yakutat is accessible to park staff mainly by driving to Anchorage and then flying to the Yakutat airport via commercial airline. It is expensive and difficult to inventory and monitor this portion of the park without a dedicated Yakutat crew who is stationed there seasonally. It would be valuable to have more information on invasive species in this part of the park, but it was logistically not possible to work there in 2010-12.

Education and public involvement could be increased with more talks, work groups and partnering with other organizations that have an interest in the invasive species issue, such as the Wrangell Mountains Center (WMC) and Wrangell Institute for Science and Environment (WISE). It is important that the park EPMT maintain informal partnership with these local groups and work with them on educational programs and public outreach. The park EPMT should talk with WMC students and backcountry rangers before they go on their backcountry field trip to enlist their help with backcountry invasive plant monitoring.

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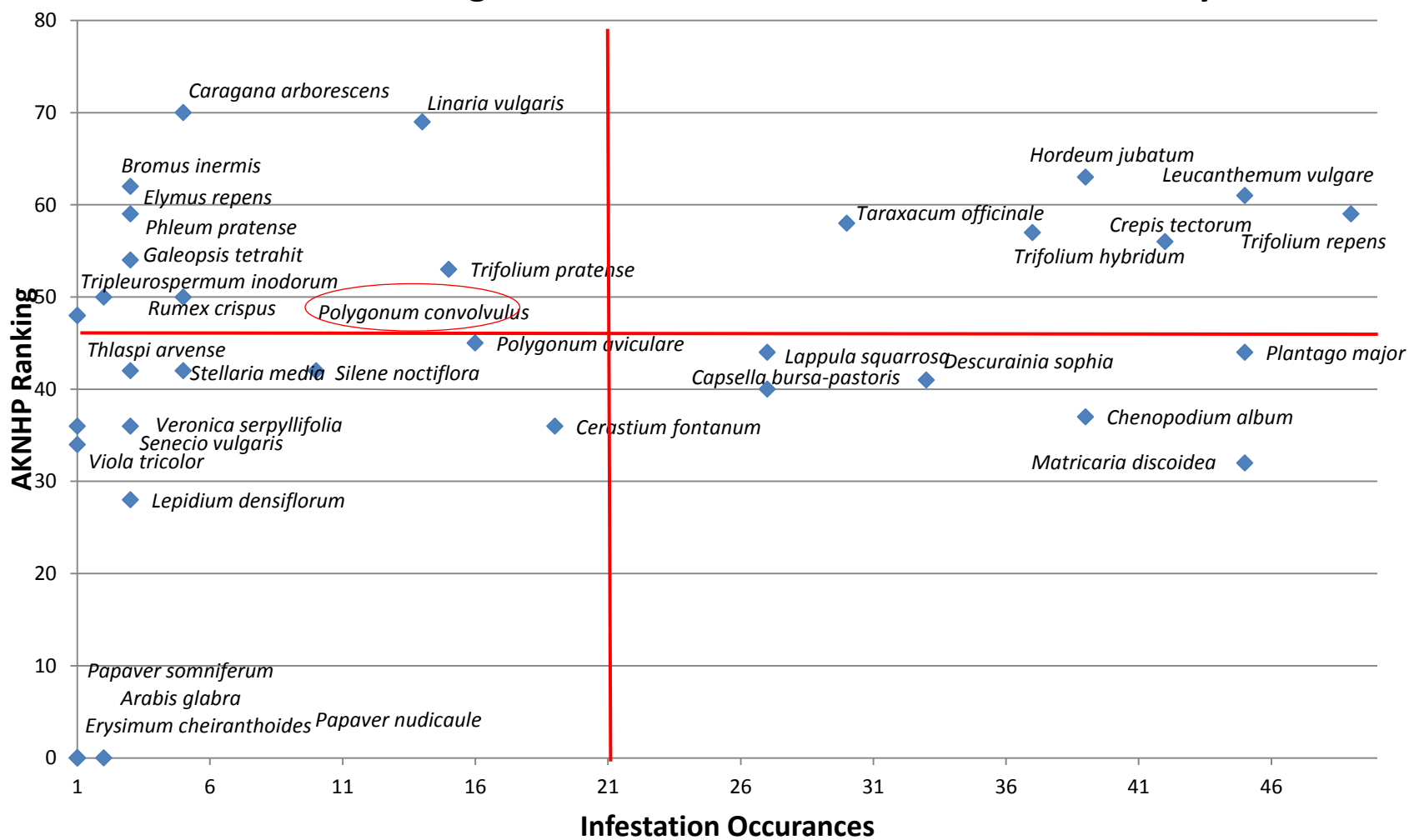
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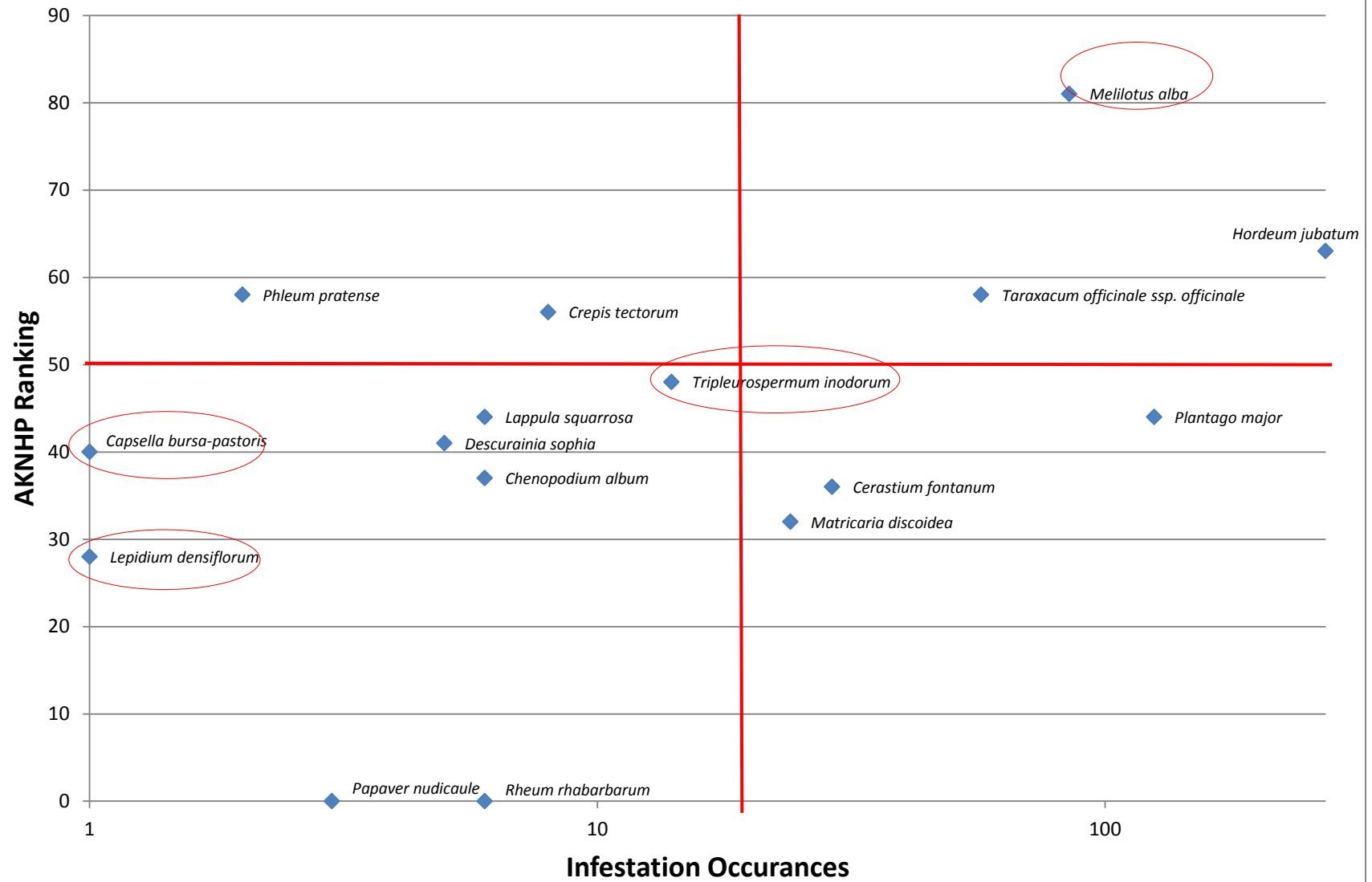
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## Appendix B: Prioritization Charts

### Prioritizing 2012 Treatments - Kennecott and McCarthy



## Prioritizing Nabesna 2012 Treatments



## Appendix C: Copper River Record May 2012

 COPPER RIVER RECORD

### Practice non-invasive gardening

By ANNIE LAIN,  
NPS-COPPER CENTER

This is the time of year that I start to get excited about my garden. I've earmarked the seed catalogues, brushed up on my square-foot-gardening techniques and reviewed my planting journal from last year. My next step before purchasing any seed is to review the voluntary codes of conduct for gardeners. Human actions are the primary means of invasive species introductions. As gardeners, I believe we are a collective force that can be part of the solution. This is a list of five things that you can do to prevent the spread of plants that threaten wild areas by displacing native vegetation and destroying wildlife habitat.

- Purchase only non-invasive species when you acquire plants. What's invasive to Alaska? Call (907) 822-7283 to request your very own, complimentary invasive-free

gardening publication.

- Remove invasive species from your land and replace them with non-invasive species suited to your site and needs. Check out the Alaska Department of Natural Resources and Alaska Native Plant Society to find native plant sources and helpful publications.
- Just say No! Do not trade plants with other gardeners if you know they are species with invasive characteristics.
- Request that botanical gardens and local nurseries promote, display and sell only non-invasive seeds and plants. Help educate your community and other gardeners in your area by suggesting alternative plant options that are less likely to escape cultivation.
- Be a Leader! Organize and participate in neighborhood work groups to remove invasive plant species.

Like many of you, I value my wilderness lifestyle in Alaska. Taking these small steps to insure that your actions don't inadvertently spread problematic plants and threaten natural areas will help to protect and keep your Alaska wild.