



Invasive and Exotic Species Management for Wrangell-St. Elias National Park and Preserve

2009 Summary Report

Natural Resource Data Series NPS/WRST/NRDS—2010/023



ON THE COVER

(from top left moving clockwise): EPMT technician Tamara Harper and volunteers monitor the Jumbo Mine trail for invasive dandelions; CLM intern Joe Donohue monitors the McCarthy road; SCA interns Katie Laushman weeds the Bonanza Mine trail; CLM intern Joe Donohue and SCA volunteer Jesse Amo keep the Bonanza Mine trail weed free; EPMT technician Lil Gilmore and SCA Katie Laushman weeding the Chitina airport.
Photographs by: 2009 Alaska EPMT WRST staff

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The Natural Resource Data Series is intended for timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner. 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	vii
Abbreviations	viii
Abstract	ix
Acknowledgments.....	x
Introduction.....	1
Objectives	2
Methods.....	3
Results.....	4
Overview.....	4
Nabesna/Slana Area.....	8
Headquarters/Copper Center Area.....	10
Chitina Area.....	13
McCarthy/ Kennecott Area.....	14
Yakutat Area.....	18
Remote Sites	18
Restoration Efforts	21
Outreach and Education.....	21
Discussion	22
Invasive Plant Species	22
Restoration Efforts and Future Weeding	25
Outreach and Education.....	26
Fauna of Concern.....	27

Literature Cited	30
Appendix I. Invasive Plant Synopses.....	35
Appendix II. Park Facilities and Weeding Efforts.....	41
Appendix III. Vouchers Collected In 2009.....	43
Appendix IV. Copper River Record Newspaper Article	45
Appendix V. Conservation Land Management Intern Blog	47

Figures

	Page
Figure 1. Invasive common dandelion growing along the Root Glacier trail.	1
Figure 2. Location of Wrangell-St. Elias National Park and Preserve.	2
Figure 3. Oxeye daisies grow amongst the native fireweed (<i>Epilobium angustifolium</i>).	3
Figure 4. EPMT technician Lil Gilmore and CLM intern Joe Donohue begin an inventory of white sweetclover in Chitina.	4
Figure 5. Bags of weeds waiting to be burned.	5
Figure 6. View of Nabesna Road heading east.	8
Figure 7. Trail off the Nabesna Road.	9
Figure 8. The native dandelions can be identified by the non-curved back involucral bracts at the flower base.	10
Figure 9. Weeds growing on disturbed ground around the park headquarters at Copper Center.	10
Figure 10. The SAGA crew, hard at work, weeds around Park headquarters in Copper Center.	12
Figure 11. The Chitina Ranger Station.	13
Figure 12. EPMT members monitor the Jumbo Mine trail for invasive species.	14
Figure 13. EPMT Technician Tamara Harper weeds lambsquarters on Silk Stocking Row in Kennecott.	15
Figure 14. CLM Joe Donohue and SCA Jesse Amo keep Bonanza Mine trail weed free.	16
Figure 15. McCarthy footbridge looking west with disturbed ground on either side.	17
Figure 16. Ecologist Miranda Terwilliger and CLM Joe Donohue identify grasses.	18
Figure 17. SCA Katie Laushman about to begin survey of the remote Skolai Pass airstrip.	18
Figure 18. Ecologist Miranda Terwilliger trying to get a GPS signal while surveying the lower Copper River.	19
Figure 19. Boreal Forest trail behind the Copper Center visitor’s center.	21

Figure 20. EMPT members at their invasive weed information booth at the McCarthy 4 th of July celebrations.	22
Figure 21. Foxtail barley is found among the native dwarf fireweed on the banks of the Copper River.	23
Figure 22. The weedy airstrip at Ptarmigan Lake.	24
Figure 23. EPMT members weed lambsquarters from a gravel pit in McCarthy to prevent its spread into the Kennecott valley.	24
Figure 24. Silk Stocking Road needs native plant restoration now that building restoration is completed.	25
Figure 25. EPMT technician Tamara Harper speaks with the public about invasive weeds at the McCarthy 4 th of July celebrations.	26
Figure 26. An interpretive park ranger giving a talk in Kennecott.	27
Figure 27. A European black slug (<i>A. ater</i>) on a trail in Yakutat.	28
Figure 28. The 2009 Chakina fire burns through a forest full of spruce bark beetle killed trees.	29
Figure 29. A lone white sweetclover plant made its way onto the McCarthy Road.	37

Tables

	Page
Table 1. Summary of Wrangell-St. Elias National Park & Preserve Exotic Plant Management.	6
Table 2. Summary of invasive plant species detected in Wrangell-St. Elias.	7
Table 3. Infestations Considered Eradicated in 2009.	9
Table 4. List of Maintained Trails and Invasive Weed Efforts.	11
Table 5. List of Landing Strips and Airports and Weeding Efforts.	20

Abbreviations

ADF&G	Alaska Department of Fish and Game
AKEPIC	Alaska Exotic Plants Information Clearinghouse
AKNHP	Alaska Natural Heritage Program
APCAM	Alien Plant Control and Management Database
BLM	U.S. Bureau of Land Management
CBG	Chicago Botanic Gardens
CLM	Chicago Botanic Gardens' Conservation Land Management Intern
CNIPM	Committee for Noxious and Invasive Plant Management
CRNA	Copper River Native Association
DNR	Alaska Division of Natural Resources
EPMT	Exotic Plant Management Team
GIS	Geographic Information Systems
GPS	Geographic Positioning System
KWG	Kennicott Wilderness Guides
NPS	U.S. National Park Service
SAGA	Southeast Alaska Guidance Association
SEAG	St. Elias Alpine Guides
SCA	Student Conservation Association
TCCC	Tribal Civilian Community Corp
USGS	U.S. Geological Survey
WMC	Wrangell Mountain Center
WRST	Wrangell-St. Elias National Park and Preserve
YCC	Youth Conservation Corp
YPP	Young Professionals Program

Abstract

This report describes the work performed by the Exotic Plant Management Team (EPMT) at Wrangell-St. Elias National Park and Preserve (WRST) during the 2009 season. Four EPMT members were stationed at three locations in the park: Copper Center, Slana, and McCarthy-Kennecott. Invasive plant inventories and weeding occurred around these three locations, along the McCarthy and Nabesna Roads, along the Copper River, at other locations in the Copper Basin, and at seven backcountry destinations within the park. Invasive plant populations were mapped using GeoXT Trimble units and manual weeding was performed with the help of volunteers, a Southeast Alaska Guidance Association (SAGA) crew, and seasonal National Park Service (NPS) employees. Data was edited and analyzed using Pathfinder Office and ArcGIS. A total of 187 bags were filled with pulled weeds, an increase of over a hundred bags from 2008. Weed bags were burned in the gravel pit south of the Administration Building at WRST Headquarters. Three new eradications were recorded this year. Total canopy acres controlled (0.151) were slightly larger than in 2008 (0.1), while gross park acres treated increased to 7.205 acres in 2009, from 1 acre in 2008. A total of 215.4 park acres and 60.2 acres of non-park lands were surveyed in 2009. These results indicate that the expansion of the WRST EPMT program to include two workers stationed in McCarthy-Kennecott and one in Slana is having positive effects on the program. As of the end of the 2009 field season WRST has documented 261.6 acres of invasive weeds on park land.

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 them weed this year including volunteers Molly Cromwell, Bob Griffis, and Hannah Rowland; the Southeast Alaska Guidance Association (SAGA) crew; Student Conservation Association (SCA) interns Jesse Amo and Johanna Jackson; Youth Conservation Corps (YCC) interns Zack Absher and Keaton Shepherd; as well as seasonal NPS employees Tiffany Helkenn, Heidi Peters, and Vanessa Wilcox-Healey. A special thank you goes to volunteer Jim Hannah and NPS Chitina district ranger Pete Dalton for their coordination of rafting trips on the Copper River. We would also like to thank the maintenance trail crew for disposing of our pulled weeds. In addition we have a special thank you to Molly McCormick, fisheries biologist, for keeping her own little corner at headquarters weeded.

Introduction

Alaska does not strike most people as a place where exotic plants would be of great concern, due to its climate, latitude, and relative isolation. While exotic plants are mostly limited in distribution to areas of human disturbance, there are indications that they are quickly spreading and that several species may be able to colonize native ecosystems. The potential for these species to disperse via glacial river systems and benefit from climatic warming presents a very real ecological threat to Alaska's vast wilderness. Unlike the rest of the country, Alaska still has the chance to prevent the arrival of exotic plants in most areas of the state. To accomplish this goal, the Alaska Exotic Plant Management Team (EPMT) has adopted the approach of early detection and rapid response to exotic plant infestations.

Wrangell-St. Elias National Park & Preserve (WRST) is the largest U.S. National Park encompassing 13 million acres (a bit bigger than Switzerland). In conjunction with Kluane National Park and Provincial Park Tatshenshini-Alsek in Canada, and Glacier Bay National Park & Preserve in the U.S. it forms a World Heritage Site containing one of the largest protected ecosystems on the planet. Two roads, numerous off-road vehicle trails, and 16 maintained backcountry landing strips provide access to the Park/Preserve but the majority of it remains inaccessible to all but foot traffic.



Figure 1. Invasive common dandelion growing along the Root Glacier trail.

Existing roads, trails, and airstrips are the primary vectors for invasive plants in the park. Human disturbed areas such as landing strips and abandoned home and mining sites offer a welcome home to invasive plants. In-holders in the Park/Preserve grow non-native plants for food and ornamental value, and sometimes these plants escape cultivation and move onto public lands. Although the majority of these escapees lack the characteristics that define an invasive plant, a few are true menaces, outcompeting

native vegetation. Some of these in-holders graze pack animals that survive the winter via supplemental feed flown in from park borderlands. Weed free forage is not widely available and these animals spread weeds through their feces as they wander freely on park lands. These weeds take advantage of non-human disturbances, such as changing streambeds, de-glaciation, mudslides, and other natural events and there are likely pockets of weeds that go undiscovered in the vast lands that are Wrangell-St. Elias.

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. From 2000-2004 baseline surveys were conducted for exotic plants on Alaska National Park Service (NPS) lands (Densmore et al 2001, McKee 2003, Bauder and Heys 2004). The NPS established the Alaska EPMT in 2003 and WRST first obtained funding for a seasonal specific to the EPMT

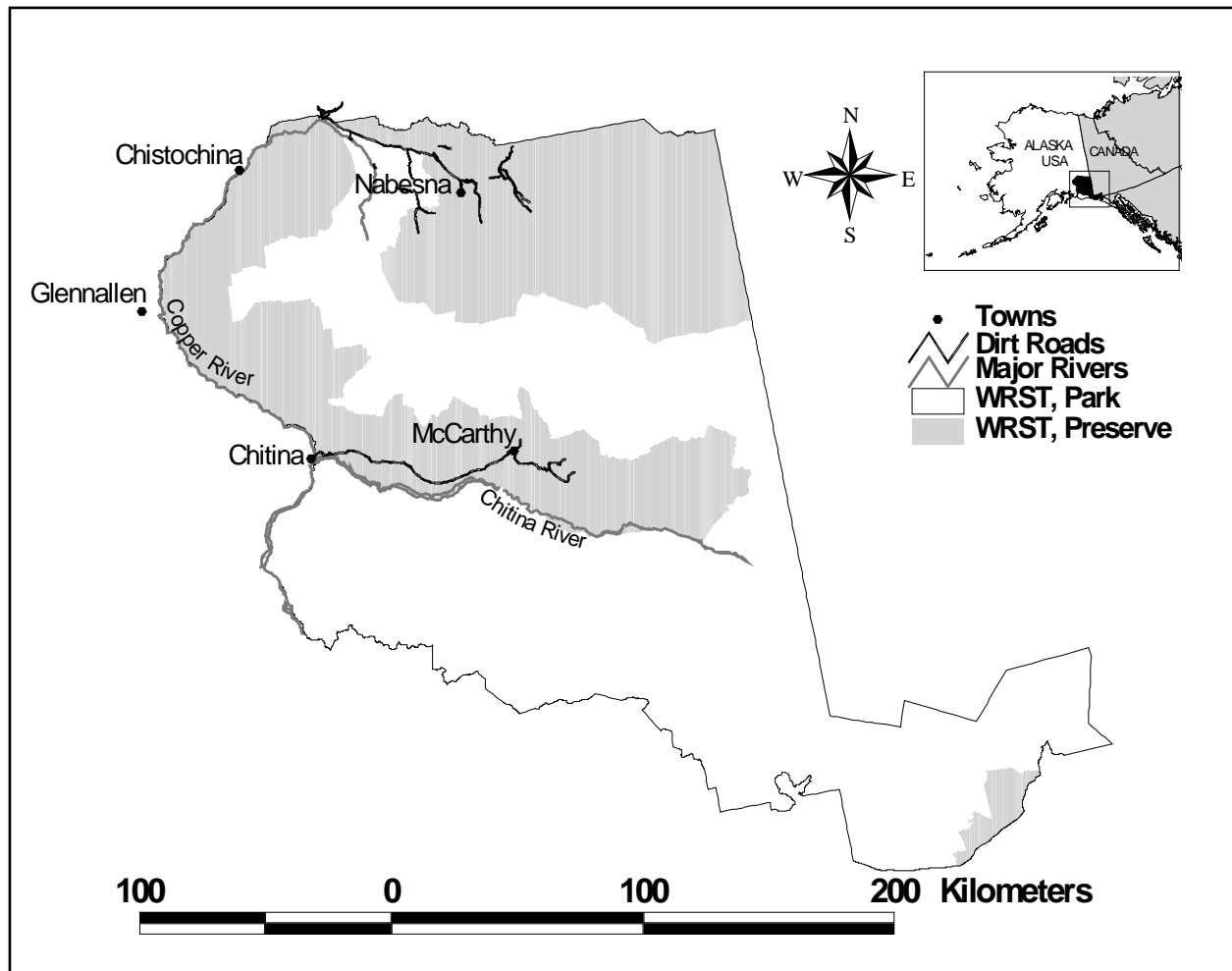


Figure 2. Location of Wrangell-St. Elias National Park and Preserve.

program in 2005 (Gilmore 2005). Since then the program has grown, mostly through youth internship programs (Table 1, Gilmore 2006, Gilmore and Goldsmith 2007, Gilmore and Harper 2008). As of 2009 there were four full time summer members of the WRST EPMT program stationed in various communities in the park. The outreach afforded by having employees stationed in communities is invaluable. It can help “demystify” the concept of invasive plant control for locals, removing it from the joke category of “What, you’re wasting my tax money pulling the sweetclover! It smells so good!” to a deeper understanding of the damage invasive plants can cause to a known and loved landscape. Without help from local residents, there can be little expectation that eradication or containment of invasive plants is possible.

Objectives

The primary objectives of the EPMT are to a) monitor known infestations of exotic weeds, b) contain, control and, where possible, eradicate known populations, and c) to inventory areas with known human disturbance where exotic plants are likely to appear. Control work, i.e. weeding, is prioritized using the weed rank of plants from the Alaska Invasive Ranking System (Carlson et al 2008). Ranking is an indication of invasiveness. Species with a higher rank are considered more

aggressive than weeds with a lower rank and are usually considered a higher priority for treatment. Small infestations of weeds that can easily be pulled are also of a high priority. Large infestations of low ranked weeds are of the lowest priority for control but are still mapped and monitored. If time allows crews will perform control work on these populations as well.

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 and the Slana Road and near the Chitina airport, oxeye daisy (*Leucanthemum vulgare*) in Kennecott, and scentless false mayweed (*Tripleurospermum perforatum*) at the Betty Freed property (named after its former owner who bequeathed it to NPS) for seasonal park housing in Slana.

Areas with high visibility or high human activity are also a priority. Annual monitoring and control efforts continue around the five WRST visitor centers in Slana, Copper Center, Chitina, Kennecott, and Yakutat, at various information kiosks, campgrounds, trailheads, and highly used airstrips. While not yet complete, efforts are being organized for comprehensive inventories of high use trails, public use cabin sites, remote airstrips, in-holder access routes and properties, grazed allotments, wilderness routes, and river corridors.



Figure 3. Oxeye daisies grow amongst the native fireweed (*Epilobium angustifolium*).

Methods

Invasive plants were inventoried and monitored following the 2009 Alaska Exotic Plant Management Team Protocol (Rapp 2009). Both areas infested with and free of invasive plants were mapped with detail sufficient to analyze any changes to infestation size. The data were collected for entry into two distinct databases: Alien Plant Control and Management Database (APCAM) - the nationwide NPS database for invasive plant data - and Alaska Exotic Plant Information Clearinghouse (AKEPIC) - a collaborative, web-based database for tracking invasive weed infestations in Alaska. Attributes are based on North American Weed Management Association standards (2002) and describe the size, diversity, and severity of the invasive plant infestation being mapped, as well as to satisfy database requirements.

Field methods were used to survey lands for invasive plants by opportunistic sampling, focusing on areas of human development and frequent use as reported by park staff. If invasive species were found in sufficiently low numbers, they were removed by hand. Trimble mapping grade, global positioning system (GPS) units, including GeoXT, were used to record location and attribute information for GIS analysis. GPS units can achieve sub-meter horizontal accuracy and were equipped with a standard Alaska-specific data dictionary, developed by Jeff Heys, former EPMT Liaison, and Whitney Rapp, EPMT Data Manager, 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 export to GIS format.

Walking or slow driving inventories were conducted along roadsides, on trails, and at Park 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, etc. Vouchers of unidentified plants were collected, pressed, labeled and sent to the Alaska Natural Heritage Program (AKNHP) in Anchorage for identification over the winter.

Control work was conducted using manual methods, including pulling, digging, and cutting to remove weeds. Weeds were then disposed of in marked plastic bags which were packed full and tied tightly. These bags were stored in a contained area until they could be burned at the end of the season by the WRST maintenance department.

The 2009 WRST EPMT consisted of two seasonal Biological Technicians: Lil Gilmore (with support from the region) and Tamara Harper (on Centennial funding), and two interns: Joe Donohue, with the Conservation and Land Management Program from the Chicago Botanic Garden (CLM), and Katie Laushman, with the Student Conservation Association (SCA). Lil Gilmore was stationed at headquarters in Copper Center. Tamara Harper and Joe Donohue were stationed in McCarthy/ Kennecott. Katie Laushman was stationed at Slana. There were two weeks of work from the Southeast Alaska Guidance Association (SAGA) crew of 10 students with 4 supervisors



Figure 4. EPMT technician Lil Gilmore and CLM intern Joe Donohue begin an inventory of white sweetclover in Chitina.

Results

Overview

As of the end of 2009 field season WRST has 261.5 acres infested with invasive plants most of which are located along road and trail corridors and in communities within the park. In WRST a total of 1,648 field hours were logged by EPMT workers or volunteers this season. The WRST EPMT crew spent a total of 948 person hours in the field, while the SAGA crew contributed 580 person hours, and other volunteers added 117 person hours. This is a 3 fold increase in time spent on weeds, both by dedicated crew members and volunteers (Table 1). When the EPMT program first started in WRST the main focus was on the mapping of the infestations (Gilmore 2005). While mapping new infestations is still a key part of the program the focus has now shifted to monitoring and treating known infestations (Table 1). This year the number of treatment acres have dramatically increased while new infestation surveys and known infestation monitoring continued.

A total of 7.2 acres of invasive plants were treated this season, a significant increase from 1 acre treated in 2008. Total canopy acres controlled (0.2) were slightly larger than in 2008 (0.1). A total of 215.4 park acres and 60.2 acres of non-park lands were surveyed in 2009. As of the end of the 2009 field season WRST has documented 261.6 acres of invasive weeds on park land. The four EPMT workers, a ten-person SAGA crew, and six volunteers filled 187 bags with



Figure 5. Bags of weeds waiting to be burned.

pulled weeds over the course of the season. Nine vouchers were collected in the 2009 season and sent to AKNHP for identification verification (APPENDIX II. VOUCHERS COLLECTED IN 2009). The results of these will be returned sometime prior to next field season.

This year the crew documented one new species of invasive plant within the park, mouse-ear chickweed (*Cerastium fontanum ssp. vulgare*), and one just outside of park boundaries, bigleaf lupine (*Lupinus polyphyllus*). Mouse-ear chickweed was found for the first time at several locations in the McCarthy-Kennecott area.

Specifically, it was found along the main road in Kennecott, along the road from Kennecott to McCarthy, and among several other invasive plants at the NPS apartments on Silk Stocking Row. Bigleaf lupine was found in the Yakutat area but not within the park itself. This brings the total number of known non-native plants in WRST to 37 (Table 2). This year the crew also documented the presence of invasive fauna.

Four new large (>1 acre) infestations were discovered this season. One, containing 11 species of invasive plants (common lambsquarter- the most prevalent, common dandelion, prostrate knotweed, all three species of clover, pineapple weed, flixweed, common chickweed, mouse-eared chickweed, and oxeye daisy), was found at the Silk Stocking Row apartments in Kennecott. The area was recently disturbed during the construction and remodeling of the cottages. Topsoil and gravel were scraped from around the buildings, leaving exposed ground and piles of dirt and rocks where weeds are now thriving. A second large infestation was found behind the Administration building at the Copper Center headquarters, where a septic tank was recently installed and weedy soil brought in. The third infestation was of common tansy throughout the upper maintenance yard in Glennallen along the perimeter of the fence line. An extensive infestation of foxtail barley (*Hordeum jubatum*), mouse ear chickweed, and pineapple weed (*Matricaria discoidea*) was identified at the private in-holder landing strip Ptarmigan Lake. This airstrip contains a horse corral where non weed-free certified feed is flown in. This seems to be the most likely source for the infestations in this remote area.

The crew also found new, small infestations of white sweetclover for the first time at Headquarters and on the McCarthy Road at mile 13. White sweetclover is the highest AKEPIC ranked invasive plant in WRST and as such these infestations warrant some concern. White sweetclover is a rapidly spreading invasive plant that can become quickly established in an area (AKEPIC 2006). Care should be taken to monitor and re-treat these areas next year to prevent establishment of white sweetclover at these locations.

Table 1. Summary of Wrangell-St. Elias National Park & Preserve Exotic Plant Management.

Year	EPMT Personnel		Youth Groups			Other Volunteers		Total Person Field Hours	Invasive GPS Data NPS Lands(non-NPS lands)			New Spp.	Bags Collected	Plant Vouchers
	# pers.	Field Hours	Group(s) Involved	# pers.	Total hours	# pers.	Total hours		Acres Surveyed	Acres Infested*	Acres Treated			
2001	-	-	none	-	-	-	-	-	-	-	-	17	-	13
2002	-	-	none	-	-	-	-	-	-	-	-	-	-	9
2003	-	-	none	-	-	-	-	-	*1	73.93 (-)	0.1	2	-	3
2004	-	-	none	-	-	-	-	-	12.5 (5.0)	84.4 (5.0)	0.2	3	-	15
2005	1	240	Community pull, DNR Forestry Intern Program	14	49	-	-	289	1.9 (7.7) ²	86.3 (12.7) ²	-. ²	6	96	39
2006	1	260	SAGA, DNR Forestry Intern Program, AmeriCorps TCCC ³	7	125.5	2	870	1,256	300.0 (22.4)	97.1 (24.0)	2.8	5	-	232
2007	2 ⁴	303	AmeriCorps TCCC ³	18	576	2	107.75	987	507.6 (64.63)	163.6 (49.3)	0.4	3	20	34
2008	2	315	SAGA, YPP ⁵	14	98	7	148.75	562	822.1 (1,531.5) ⁶	172.8 (50.5)	4.5	1	99	10
2009	4 ⁷	948	SAGA	10	580	6	117	1,645	215.4 (60.2)	261.6 (87.7)	7.2	3	187	9

* Acres infested is calculated by acres mapped times the percent cover in areas greater than 5 acres. If under 5 acres, acreage mapped is counted as 100%.

1-Data was collected but is highly inaccurate

2-Problems with GPS units resulted in low mapping acres in 2005

3-Tribal Civilian Community Corp

4-Includes a CLM intern

5-Youth Professionals Program

6-EPMT drove and mapped the Richardson Highway and the Nabesna and McCarthy Roads looking for white sweetclover only. This accounts for the unusually high acreage.

7-Includes one CLM and one SCA intern

Table 2. Summary of invasive plant species detected in Wrangell-St. Elias.

Season	#	New Invasive Plant Species Detected		AKEPIC Rank
		Latin Name	Common Name	
2001	17	<i>Bromus inermis</i>	smooth brome grass	62
		<i>Capsella bursa-pastoris</i>	shepherd's purse	40
		<i>Chenopodium album</i>	common lambsquarter	37
		<i>Descurainia sophia</i>	flixweed	41
		<i>Elymus repens</i>	quackgrass	59
		<i>Lappula squarrosa</i>	European stickseed	44
		<i>Lepidium densiflorum</i>	common pepperweed	25
		<i>Leucanthemum vulgare</i>	oxeye daisy	61
		<i>Linaria vulgaris</i>	yellow toadflax	61
		<i>Matricaria discoidea</i>	pineapple weed	32
		<i>Melilotus officinalis</i> ¹	yellow sweetclover	69
		<i>Plantago major</i>	common plantain	44
		<i>Polygonum aviculare</i>	prostrate knotweed	45
		<i>Taraxacum officinale</i> ssp. <i>officinale</i>	common dandelion	58
		<i>Trifolium hybridum</i>	alsike clover	57
		<i>Trifolium pratense</i>	red clover	53
		<i>Trifolium repens</i>	white clover	59
2002	-	none	none	-
2003	2	<i>Crepis tectorum</i>	narrowleaf hawksbeard	54
		<i>Melilotus alba</i> ¹	white sweetclover	81
2004	3	<i>Lolium perenne</i>	perennial ryegrass	41
		<i>Phleum pratense</i>	common timothy	54
		<i>Thlaspi arvense</i>	field pennycress	(blank)
2005	7	<i>Amaranthus retroflexus</i>	redroot pigweed	(blank)
		<i>Caragana arborescens</i>	Siberian peashrub	66
		<i>Galeopsis tetrahit</i>	hempnettle	40
		<i>Polygonum convolvulus</i>	black bindweed	(blank)
		<i>Silene noctiflora</i>	night-blooming cockle	42
		<i>Tripleurospermum perforatum</i>	scentless false mayweed	48
2006	4	<i>Vicia cracca</i>	bird vetch	73
		<i>Arabis glabra</i>	tower rockcress	(blank)
		<i>Erysimum cheiranthoides</i>	wormseed mustard	(blank)
		<i>Hordeum jubatum</i> ²	foxtail barley	63
2007	3	<i>Silene latifolia</i>	bladder campion	42
		<i>Papaver somniferum</i>	opium poppy	(blank)
		<i>Stellaria media</i>	common chickweed	42
2008	1	<i>Tanacetum vulgare</i>	common tansy	57
		<i>Rheum rhabarbarum</i>	rhubarb	(blank)
2009	1	<i>Cerastium fontanum</i> ssp. <i>vulgare</i>	mouse ear chickweed	36
TOTAL	38			

1-Melilotus officinalis and M. alba are now considered to be the same species.

2-Hordeum jubatum has, until recently, been considered a non-native. However as of 2010 it is being considered as a native to Alaska (AKEPIC) but may still be controlled in certain areas due to the impacts on domestic animals.

Eight infestations were considered eradicated in 2009 (Table 3) since they have not been seen for a minimum of one season. One year may be an insufficient length of time to judge eradication, so these populations should be monitored again in 2010. A complete synopsis of the status of invasive plants by species can be found in the appendix (APPENDIX I. INVASIVE PLANT SYNOPSES).

Nabesna/Slana Area

In the Nabesna District nine of the fourteen trails off the Nabesna Road were surveyed in 2009 (Table 4), with help from Katie Laushman, the SCA intern stationed at Slana Ranger Station.

Caribou Creek Trail, Suslota Lake Trail, the trail to the Viking Lodge, and the first portion of Lost Creek Trail were inventoried and no invasive plants were documented. The trail to the fish weir and the Batzulnetas village was also mapped with no invasive plants documented except for a small patch of common dandelions which was discovered near the old village buildings at the end of the trail. The patch was not pulled due to conflict with annual culture camps at the site, but it should be monitored and weeded next year. With help from volunteers Bob Griffis and



Figure 6. View of Nabesna Road heading east.

Molly Cromwell, the Skookum Volcano Trail, Reeves Field Trail, and the trail to Rambler Mine at the end of Nabesna Road were inventoried with no invasive plants documented. In 2007 and 2008, the Slana Fishwheel trail had been monitored and white sweetclover was discovered, however, monitoring this year revealed no invasive plants (Gilmore and Goldsmith 2007, Gilmore and Harper 2008). This trail should be monitored again in 2010 since one year may be insufficient to judge an infestation properly eradicated.

Weeding was performed on the known infestation of white sweetclover at the Tok cut-off and around operational facilities. The intensive weeding of the white sweetclover infestation at the junction of the Tok Cut-Off and Nabesna Road during the past five years (Gilmore 2005, 2006, Gilmore and Goldsmith 2007, Gilmore and Harper 2008) is making a noticeable difference. In some areas the native vegetation is beginning to reappear. This year the infestation was controlled with the help of a 10 person SAGA crew and interns Joe Donohue and Katie Laushman. White sweetclover was pulled on the north side of the highway, as well as on the slopes on the West and East side of the Nabesna Road. The crew spent 3 days pulling all flowering plants in early July. Volunteers Bob Griffis and Molly Cromwell also helped control white sweetclover in mid-June, spending about nine hours each pulling non-flowering plants in smaller sections on the West and East sides of the road.

Table 3. Infestations Considered Eradicated in 2009.

Last Seen	Species		Rank	Location
	Latin Name	Common Name		
2004 ¹	<i>Crepis tectorum</i>	narrowleaf hawksbeard	54	mile 31, Nabesna Road
2006	<i>Crepis tectorum</i>	narrowleaf hawksbeard	54	unused gravel pit at mile 11, Nabesna Road
2006	<i>Descurainia sophia</i>	flixweed	41	Little Jack Creek Bridge.
2007	<i>Lappula squarrosa</i>	European stickseed	44	mile 17.9 Nabesna Road, in front of vault toilet at Dead Dog Hill rest area
2007 ²	<i>Vicia cracca</i>	bird vetch	73	Gakona Lodge
2008	<i>Chenopodium album</i>	common lambsquarter	37	McCarthy airstrip
2008	<i>Matricaria discoidea</i>	pineapple weed	32	Rowcon gravel pit near McCarthy airstrip
2008	<i>Thlaspi arvense</i>	field pennycress	(blank)	island between footbridges over Kennecott River

1 -Several creeks run across the road between mileposts 29 & 35. They shift channels frequently and may have moved the plants.

2 -This is probably due to mowing of the grounds by new owners rather than a true eradication.



Figure 7. Trail off the Nabesna Road.

Control efforts were performed at Dead Dog Hill and Rock Lake rest along the Nabesna Road. All three have had documented invasive weeds. The SAGA crew helped control some foxtail barley on the Nabesna Road in pullouts at Dead Dog Hill and Rock Lake. Much of the roadside contains foxtail barley, as well as patches of common dandelion, but the majority of the plants were not mapped or pulled. In 2006, areas of foxtail barley on the Nabesna Road past mile 30 were mapped, but a complete inventory of foxtail barley on the Nabesna Road would be helpful in future years. Foxtail barley was also mapped and pulled around the Slana Ranger Station, bunkhouse, garage, and cabanas.

Four other known infestations of invasive plants on the Nabesna Road were monitored this year: scentless false mayweed at the Betty Freed property at Mile 2.4; narrowleaf hawksbeard in an unused gravel pit around Mile 11; European stickseed (*Lappula squarrosa*) on Dead Dog Hill; and common dandelion near Long Lake.

Originally a private home, the Betty Freed property was donated to WRST in 2001 and is used for seasonal NPS housing for employees working on the Nabesna Road or in the backcountry. Despite five years of weeding and two treatments this year, scentless false mayweed is not decreasing here. Because it is a long season plant and new plants emerge all summer, it is in a continual bloom/seed cycle, making it difficult to eradicate without weeding it at least weekly. One other population has been identified on the Nabesna Road growing at a grave or memorial site at Mile 2, which will not be weeded given the nature of the site.

Remnants of a vegetable garden and other domestic plants remain on the Freed property, including 18 rhubarb (*Rheum rhabarbarum*) plants. As discussed in the 2007 Seasonal Report for Glacier Bay (Rapp 2008), rhubarb is not presently listed as an invasive but is an extremely long-lived plant in Alaska that is worth watching.

Narrowleaf hawksbeard in the gravel pit near mile 11 and European stickseed found on Dead Dog Hill both appear eradicated. Neither population has been found since 2006 (Gilmore and Goldsmith 2007, Gilmore and Harper 2008).

Most of the dandelions found on the Nabesna Road are horned dandelions (*Taraxacum ceratophorum*), the native species. The site near Long Lake is one of the few locations where common dandelions have been inventoried in Slana in past seasons. Despite weeding in 2008 (Gilmore and Harper 2008), a few common dandelion plants were monitored and weeded here in 2009.



Figure 8. The native dandelions can be identified by the non-curved back involucre bracts at the flower base.

Headquarters/Copper Center Area

WRST moved its Headquarters to its current location in Copper Center in 2002. The surrounding area was left largely untouched during construction. The native aspen (*Populus tremuloides*), black and white spruce (*Picea mariana* and *P. glauca*) and other vegetation make an impressive backdrop. However, building sites were cleared of all vegetation and weedy



Figure 9. Weeds growing on disturbed ground around the park headquarters at Copper Center.

topsoil was spread, leading to an unkempt landscape. Narrowleaf hawksbeard, common dandelions, and foxtail barley dominate the invasive populations established around Headquarters, while the grounds also have large numbers of lambsquarters (*Chenopodium album*), and European stickseed plants. Attempts have been made to improve the landscaping, but it has not yet been a job priority and little change has occurred so far. However, lambsquarters that grew thickly in the small “woodland” area in front of the Visitor’s Center in 2008 (Gilmore and Harper 2008) was not found this year, and is considered eradicated.

Table 4. List of Maintained Trails and Invasive Weed Efforts.

Name	What	Ownership	Year*	Invasives?
Batzulnetas & Fish Wier	Trail	Nabesna Rd m. 8.5	2009	none
Bonanza Mine	Trail	Kennecott	2009	
Chititu Camp	Trail	May Creek	2009	<i>Taraxacum officinale</i>
Crystalline Hills	Trail	McCarthy Rd m.34.7		
Dan Creek	Trail	May Creek	2009	<i>Taraxacum officinale</i>
Dixie Pass	Trail	McCarthy Rd m.14.5		
Donoho Basin	Trail	Kennecott	2009	
Erie Mine	Trail	Kennecott		
Jumbo + Bonanza	Trail	Kennecott	2009	<i>Taraxacum officinale</i> , <i>Trifolium hybridum</i> , <i>others</i>
Jumbo Mine	Trail	Kennecott	2009	<i>Taraxacum officinale</i>
Long Lake	Trail	McCarthy Rd m.45.2	2009	potentially <i>Vicia cracca</i>
Long Lake	Trail	Nabesna Rd m.22.9	2009	potentially <i>Vicia cracca</i>
Nugget Creek	Trail	McCarthy Rd m.14.5		
Old Wagon Road	Trail	McCarthy -Kennecott		
Public Use Cabin	Trail	May Creek	2009	<i>Taraxacum officinale</i>
Rambler Mine	Trail	Nabesna Rd m.42	2009	none
Root Glacier ³	Trail	Kennecott	2009*	<i>Taraxacum officinale</i>
Skookum Volcano	Trail	Nabesna Rd m.36.2	2009	none
Strelna Lake	Trail	McCarthy Rd m.10		
Viking Lodge	Trail	Nabesna Rd m.21.8	2009	none
West Glacier Trail	Trail	McCarthy	2009	<i>Taraxacum officinale</i> , potential <i>L. perenne</i>
Young Creek	Trail	May Creek	2009	<i>Taraxacum officinale</i>
Big Grayling Lake	Trail (ATV)	Nabesna Rd m. 30.8		
Caribou Creek	Trail (ATV)	Nabesna Rd m.19.2	2009	none
Copper Lake	Trail (ATV)	Nabesna Rd m.12.2		
Kennecott Glacier Toe	Trail (ATV)	McCarthy	2009	<i>Taraxacum officinale</i> , potential <i>L. perenne</i>
Lost Creek ²	Trail (ATV)	Nabesna Rd m.30.8	2009*	
Reeve's Field	Trail (ATV)	Nabesna Rd m.40.2	2009	none
Soda Creek	Trail (ATV)	Nabesna Rd m.31.8		
Suslota Lake	Trail (ATV)	Nabesna Rd m.11	2009	none
Tanada Lake	Trail (ATV)	Nabesna Rd m.24		
Trail Creek	Trail (ATV)	Nabesna Rd m.29		

* - Year indicates the last year that this facility was visited by the EPMT crew

1 – *M. alba* was found in 2007 and 2008 (Gilmore and Goldsmith 2007, Gilmore and Harper 2008)

2 – only the beginning portion of this trail was mapped

3 –weeded to Amazon Creek

The Visitor Center entrance sign area was intensively weeded three times this season: by Lil Gilmore, several non-EPMT seasonal employees, and the SAGA crew aided by SCA Katie Laushman. Perennial rye grass (*Lolium perenne*), common dandelions, narrowleaf hawksbeard, and foxtail barley plants were monitored and removed. The SAGA crew also removed a dead spruce tree and bushes from the area and weeded along the entrance driveway. Although the sign area looks barren now, seed collected this fall will be spread and next season it should be more attractive.

In other areas around Headquarters narrowleaf hawksbeard, foxtail barley and common dandelions were mapped and pulled several times by seasonal employees and once by the SAGA crew. The main focus was on the grounds around the Ahtna Museum, Visitor's Center, theater, exhibit building, and comfort station. The SAGA crew also mapped and pulled narrowleaf hawksbeard, foxtail barley and common dandelions behind the Administration building, around the visitor's parking lot, and at the junction of the administration and public driveways. The area behind the Administration building is especially weedy, and is overrun with lambsquarters, narrowleaf hawksbeard, prostrate knotweed (*Polygonum aviculare*), clovers (*Trifolium spp.*), pineapple weed, common plantain (*Plantago major*), common dandelion, and foxtail barley. This is from a 2008 the septic tank replacement which was covered with weedy topsoil and has resulted in a bumper crop of invasive weeds. This area is not in view of the public visitor but is on full display for park employees and other official visitors and could act as a seed source for other areas around Headquarters.



Figure 10. The SAGA crew, hard at work, weeds around Park headquarters in Copper Center.

A permanent NPS employee, Molly McCormick, has made it her own personal mission to keep the area around the Marc Building free of invasive weeds. For the last three years, she has weeded common dandelions, narrowleaf hawksbeard, and foxtail barley throughout the summer. As a consequence the yard around this building is almost without invasive plants.

In the gravel pit just south of Park Headquarters, narrowleaf hawksbeard, common dandelion, foxtail barley, and a small infestation of white sweetclover were monitored and weeded by the SAGA crew and SCA intern. This is the first year white sweetclover has been found at Headquarters. In addition to plants in the gravel pit, a small patch was discovered, inventoried and weeded at the junction of the administration and public driveways, and both patches were treated twice, once by the SAGA crew and later by the biological technician. The plants had not yet gone to seed so they may not become a consistent problem. White sweetclover in the gravel pit could be the result of burning weed bags there, while the origin of the other population is unknown. However, on the Richardson Highway across from the entrance to the park, a population of white sweetclover has been monitored and weeded on an annual basis. The infestation generally fluctuates in size and the 2009 season saw a larger than normal infestation.

Many plants were too small to pull efficiently and an increase in flowering plants is expected in 2010.

The grounds behind the seasonal housing buildings, located on a rise at the edge of the gravel pit, have large numbers of narrowleaf hawksbeard, common dandelions, foxtail barley, and minor amounts of clover, all of which were mapped. The remaining area surrounding the buildings is only sparsely weedy.

In the Glennallen maintenance yard, the SAGA crew spent a day mapping and weeding narrowleaf hawksbeard, common dandelions, foxtail barley, and common tansy. The SAGA crew worked for four days at Headquarters and provided a positive source of manpower for the EPMT program, collecting about 20 bags of weeds from the headquarters area.

In 2006, an EPMT worker at WRST began monitoring the extent of white sweetclover throughout the Copper Basin (Gilmore 2006). Although this area is not in the park, it was considered important to have documentation of the explosive growth of the plant in this area. This season most white sweetclover populations growing on the Glenn and the Richardson Highways, and the side roads throughout the Copper Basin were not mapped. Unless another agency steps in, the EPMT program should continue to monitor roadsides in the Copper Basin every two or three years for white sweetclover. A small patch of bird vetch (*Vicia cracca*) at the gravel pit near mile 126 of the Richardson Highway was monitored. No other bird vetch was monitored this season in the Copper Basin.

Chitina Area



Figure 11. The Chitina Ranger Station.

Chitina is outside of the Park but WRST maintains a ranger and comfort station in the summer there and all road traffic to Kennecott travels through Chitina so close monitoring of the area is vital. Foxtail barley was reported growing around the Chitina Ranger Station but when it was inventoried by the EPMT crew it had just been mowed and was no longer evident.

Another important location in Chitina is the Airport which is monitored due to the fact that most planes using this airport are traveling to and from remote locations in the park. Weed seed could easily hop a ride aboard one of these planes or its passengers

and it is easier to weed the airport then to monitor where the planes go. A large patch of white sweetclover growing along the Edgerton Highway near the road to the Chitina Airport was monitored and weeded by the EPMT in 2009. Large amounts of white sweetclover were inventoried and weeded near the One-Stop store in Chitina. This is the first season white sweetclover has been documented in Chitina.

A population of possible bird vetch exists between mileposts 44-46, near Long Lake, along both sides of the McCarthy Road. The area, which is in the roadway and on private property, was inventoried and samples were taken for identification. The plant was determined to be American vetch (*Vicia americana*), a native species. If bird vetch is identified here in the future, the landowner should be contacted for permission to remove.

In 2006, Danny Rosenkrans, of the WRST Lands and Special Uses Department, reported a wide swath of possible bird vetch growing on the South side of the Lakina River along a permitted landowner access route. In mid-September of 2009, this population was monitored and vouchers collected approximately 150 feet south of the Lakina River, but attempts to gather GPS were unsuccessful. The vouchers collected were identified by Mary Beth Cook, a former botanist for WRST, as a native *Oxytropis* species. Because this field work was performed late in the season, the full extent of the population may not have been visible and this area should be monitored again in July or August of 2010 to ensure that it is the native species.

For the first time, a single white sweetclover plant was found on the McCarthy Road, at mile 13. The plant was mapped and pulled, and a road scan revealed no other white sweetclover populations. The road continues to have sporadic infestations of flixweed (*Descurainia sophia*), foxtail barley, clovers, and common dandelions.

The population of oxeye daisy discovered in 2007 (Gilmore and Goldsmith 2007) at Mile 10.9 was not monitored or weeded, but the technician noted few plants during a visual inspection late in the season. No new populations were found this season.

McCarthy/ Kennecott Area

In the McCarthy District all of the trails leading out of Kennecott were at least partially evaluated, mapped and weeded (Table 4) as were the Jumbo Creek and Donoho Basin Campsites. The most predominant invasive plant along the trails was common dandelion. For the first year the historic wagon trail from Kennecott to McCarthy and the Kennicott Historic Cemetery were inventoried. Despite guided horse tours on the road no invasives were documented. Oxeye daisy remains the highest priority in the Kennecott town site. For the sixth consecutive year, the main infestation on the slope behind the Jurick building was treated. All flowering plants were pulled, as well as many rosettes, but surrounding vegetation makes complete removal difficult. Treatments occurred earlier in the season and more often this year, and all flowering plants were removed before going to seed. Fewer flowering plants were found than in 2008 (Gilmore and Harper 2008), indicating the effectiveness of yearly weeding treatments.



Figure 12. EPMT members monitor the Jumbo Mine trail for invasive species.

Three other populations of oxeye daisy on private properties were controlled this summer. The grounds behind Kennicott Wilderness Guides (KWG) were retreated for the third year in a row, with all plants removed (Gilmore and Goldsmith 2007, Gilmore and Harper 2008). Two distinct areas were treated, one within KWG's community garden and the other on the outside. Oxeye daisies on private property on Silk Stocking Row were treated for the second year, with fewer plants this season. A small, new infestation was pulled around the NPS cottages on Silk Stocking Row. The Kennicott Glacier Lodge continues to have a large garden of oxeye daisies, which provides a continual seed source for the area. The owners have been contacted and are attached to their daisies. They could perhaps be convinced to replace them with a similar species that is less invasive if one could be found.



Figure 13. EPMT Technician Tamara Harper weeds lambsquarters on Silk Stocking Row in Kennecott.

Work was performed for the first time on several species growing around the NPS seasonal employee cottages on Silk Stocking Row, an area recently disturbed by construction and remodeling of the cottages. Topsoil and gravel was scraped from around the buildings, leaving exposed ground and piles of dirt and rocks where weeds are thriving. Lambsquarters is the most prevalent alongside common dandelion, prostrate knotweed, black bindweed (*Polygonum convolvulus*), various clovers, pineapple weed, flixweed, common chickweed (*Stellaria media*), mouse-ear chickweed, and oxeye daisy. This area will need attention in

the future, both by pulling exotics and planting native species, since the disturbed ground is perfect for continual growth of invasive plants.

Trails leading into the park are prime vectors for the dispersal of invasive plants further into WRST lands, due to foot and vehicle traffic. This year, the Root Glacier Trail was monitored and weeded to Amazon Creek. Fewer common dandelion infestations were found this year than last, but rosettes continued to sprout all season in several areas, leading to multiple re-treatments throughout the summer. The section of trail leading to the glacier was inventoried, with a few common dandelions found. The Jumbo Creek campground was inventoried this year and most campsites were clean, but one site covered with common dandelions was weeded several times.

Common dandelion populations were monitored and retreated on the Bonanza Mine Trail. Infestations occur sporadically all along the trail, and are more prevalent at lower elevations. The trail was thoroughly weeded from the top to below the tree line with the help of several SCA volunteers. Below this elevation, the trail becomes highly infested with common dandelions, clovers and other weeds. The Jumbo Mine Trail cuts off from the Bonanza Mine Trail and is not as heavily infested with common dandelions. Individual dandelions were found above the tree line on the Jumbo Mine Trail in several places and were removed. Two stretches of the Jumbo Mine Trail, near the Bonanza Creek crossing, have large common dandelion infestations growing under thick alders (*Alnus rubra*) and among tall grasses. These areas were documented but not treated. Common dandelions were also pulled where the Jumbo Mine Trail breaks off from the

Bonanza Mine Trail however trail brushing was underway when these areas were monitored, making it difficult to conduct a thorough search.

The foot path/ATV trail leading from the Wagon Road leading out of McCarthy to the toe of the Kennecott Glacier was monitored this year, and has some scattered dandelions, but they have not moved any farther out into the park based on previous year's data. The high-use areas at the glacier toe, specifically around the NPS burn pile and near the abandoned truck, remain clean, except for one possible perennial rye grass population, which was gathered for identification. The west glacier trail, starting at the NPS McCarthy Road Information Station and leading to the west side of the Kennecott Glacier, was inventoried this year. The first portion, newly rerouted through the spruce forest, was free of invasive plants, although difficult to map with GPS due to canopy cover. Once the trail leaves the spruce forest there is a dense infestation of common dandelions, which were mapped.



Figure 14. CLM Joe Donohue and SCA Jesse Amo keep Bonanza Mine trail weed free.

Other areas in Kennecott which were weeded and/or inventoried include: common dandelions on Silk Stocking trail; mouse-ear chickweed on Main Street; and the historic cemetery, where no invasive plants were documented.

McCarthy town site has several species of invasive weeds, many on private property and along roadways with the potential to move into parkland. Control efforts occurred with consent of property owners. Yellow toadflax (*Linaria vulgaris*), night-blooming cockle (*Silene noctiflora*), narrowleaf hawksbeard, Siberian peashrub (*Caragana arborescens*), and split-lip hempnettle (*Galeopsis tetrahit*) were retreated in various locations in downtown McCarthy. Most infestations were comparable in size to last year (Gilmore and Harper 2008), with the exception of split-lip hempnettle, which was nearly eradicated. Field pennycress was found for the first time at the Wrangell Mountains Center's (WMC) garden. All plants were inventoried and completely removed. Common dandelions and clovers are abundant throughout McCarthy and were not controlled this season.

Invasive plants on the west side of McCarthy (on the road accessible side of the footbridge) were also monitored and controlled. Previously identified populations (Gilmore and Goldsmith 2007, Gilmore and Harper 2008) of yellow toadflax, narrowleaf hawksbeard, and foxtail barley were retreated several times this season and a new population of narrowleaf hawksbeard was found and pulled at the end of the McCarthy Road, near the west footbridge. Common dandelions were pulled at the NPS seasonal housing complex. Narrowleaf hawksbeard and European stickseed continue to grow at the horse corral on Kennecott Lodge and Hostel land and were retreated regularly. Common timothy (*Phleum pretense*) inventoried here last year (Gilmore and Harper 2008) was not apparent for most of this season, due to horse grazing all summer. After the horses left in late August, though, common timothy sprouted and the perimeter was mapped.



Figure 15. McCarthy footbridge looking west with disturbed ground on either side.

Down the road in the St. Elias Alpine Guides' (SEAG) parking lot, a large infestation of European stickseed was inventoried and treated. European stickseed was also retreated on the island between the Kennecott River footbridges. One field pennycress plant pulled from the island last year (Gilmore and Harper 2008) was not found this year, and is considered eradicated.

The McCarthy airstrip was monitored and retreated twice this season. Many common dandelions were pulled during both treatments, but unlike in 2008 (Gilmore and Harper 2008) very few flixweed and foxtail barley were found and no lambsquarters was found. The taxiways, which were infested with common dandelions, were inventoried and weeded for the first time this year. The road into the airstrip was inventoried and is infested with common

dandelion and various clovers. The old airstrip, on the south side of McCarthy Creek, was also inventoried, with common dandelion and clovers being the most prevalent invasive plants

Several roads in the McCarthy area, both new and previously existing, were inventoried this year as a baseline for future monitoring. A new subdivision road was put in last year near the airport and the initial inventory documented no invasive weeds. A subdivision road north of the McCarthy Road and on the west side of McCarthy was inventoried and common dandelions and flixweed were pulled. Common dandelions and foxtail barley were pulled on roads to the McCarthy vehicle bridge on both sides of the Kennecott River. The road from Kennecott to McCarthy and continuing to the NPS McCarthy Road Information Station was mapped and inventoried. It has sporadic infestations of common dandelion, clovers, mouse-ear chickweed, and foxtail barley.

Trails leading out of the McCarthy area were inventoried and weeded. The trails on either side of McCarthy Creek connecting to the vehicle bridge across McCarthy Creek were inventoried and weeded. Both had scattered common dandelions that were pulled.

Two privately-owned gravel pits (owned by the Rowland family), one in the airport subdivision and one on the west side of McCarthy, were monitored and weeded three times this season. The daughter of the family, Hannah, volunteered alongside the WRST EPMT crew. These pits are the gravel and dirt source for many projects in the valley and along the McCarthy road, having the potential to spread invasive weeds if they become infested. The gravel pit near the McCarthy airstrip is primarily clean, except for small clovers and a few scattered common dandelions, which were pulled during each treatment. The gravel pit on the west side of McCarthy has more invasive plants, including common dandelions, lambsquarters, smooth brome (*Bromus inermis*) and small clovers, which were pulled during each monitor. Regular monitoring and weeding has been successful in controlling invasive plants in these pits so far.

Yakutat Area

For the first time ever EPMT surveys were performed in coastal portions of the park. No invasive species were found on park lands. However, bigleaf lupine and European black slug (*Arion ater*) were found in the nearby town of Yakutat and may very well have spread to park lands. There is also some evidence that reed canary grass (*Phalaris arundinacea*) may be in the area and that chytrid fungus (*Batrachochytrium dendrobatidis*) may be affecting local wood frog (*Rana sylvatica*) and western toad (*Bufo boreas boreas*) populations. Chytrid fungus has been found to have devastating effects on amphibian populations worldwide (Reeves 2008). The EPMT crew was not in the area long enough to exhaustively explore the presence of non-natives. Invasive species documented in Yakutat were not treated as they occur outside of park boundaries.



Figure 16. Ecologist Miranda Terwilliger and CLM Joe Donohue identify grasses.

Remote Sites

Donoho Basin, across the Root Glacier from Kennecott, is a popular backcountry destination for visitors and use has been increasing over the past few years. This area was inventoried for the first time this summer. No invasive plants were found in the lower campsite area, or along the trail leading to the upper lake. So far the area remains clean but with its popularity future monitoring will be important.



Figure 17. SCA Katie Laushman about to begin survey of the remote Skolai Pass airstrip.

Remote airstrips are potential locations for introduction and dispersal of invasive plants into the park. Within the park boundary there are 20 park maintained remote airstrips (Table 5), four state maintained strips (Chisana, May Creek, and two strips in McCarthy), several privately maintained strips, and perhaps 100 or more that are not maintained but used regularly. There are at least six state maintained airstrips adjacent to the greater park boundary from which visitors, residents, and staffs all access the interior of the park (Beaver Creek, Canada; Chistochina; Chitina; Gulkana; Tok; Yakutat). In 2009 the EPMT crew surveyed three state maintained airstrips: May Creek, Chisana, and McCarthy

(details about the later two can be found in the Chitina and McCarthy sections). Large infestations of common dandelion were documented on the May Creek airstrip, around the main May Creek cabin, and on local trails leading to the public use cabin, Dan Creek, Young Creek, and Chititu camp. A small amount of foxtail barley was mapped and pulled around the May Creek main cabin, but the common dandelion infestation there was only mapped, since it was too thick to control with manual pulling. Only one off the remote park maintained airstrips, Skolai Pass, was surveyed this year and no invasives were documented. Over the history of the WRST

EPMT only eight of the 20 park maintained airstrips have been surveyed: one in 2008 (Gilmore and Harper 2008) six in 2006 (Gilmore 2006) (Table 5). This season the WRST EPMT opportunistically surveyed the remote, non-maintained airstrip Wolverine where no invasive plants were documented. In the fall there was an opportunity to fly out to a privately maintained airstrip at Ptarmigan Lake with an active horse coral located adjacent. Despite the lateness of the season an extensive infestation of foxtail barley, common chickweed, and pineapple weed was documented.

The EPMT crew participated in 3 rafting trips in order to survey for invasive plants. Two trips were conducted on the lower Copper River between Chitina and Cordova (June 8-11 and July 14-19) and one trip was conducted on the upper Copper River from the Slana confluence to just above Chistochina (August 6-8). The lower Copper River is bordered by park lands to the east and Chugach National Forest and native allotment lands to the west. The upper Copper River has park lands to the south and east with BLM lands to the north.

This was a very dry, hot summer and the river waters were steadily high throughout the summer. The latter two trips were conducted while the water was extremely high which flooded much of the landing places usually available. To date all river inventory work has been performed opportunistically by joining other NPS divisions on their patrols of the area. Since the main objective of these trips is usually something other than inventorying for invasive weeds, the data collected from these areas should not be considered comprehensive. To really get a sense of the invasive weeds in the area one would have to stick very close to the shore and spend more time walking. Areas which were inventoried were usually where the rafts stopped for meals, camping, at trail heads, campsite evaluations, and for law enforcement stops. Otherwise there are large swaths of river that were missed entirely. However, even though these rafting trips create a sporadic inventory they are helpful in monitoring the spread of invasive plants along one of the main vectors in the park: river corridors.



Figure 18. Ecologist Miranda Terwilliger trying to get a GPS signal while surveying the lower Copper River.

On the June Lower Copper River trip no invasive plants were documented although it was early in the year and plants may not have fully emerged. Camping areas surveyed included a beach on the east side of the Copper River, north of the Cirque creek confluence, and a site on the east side of the Copper River, just south of the Wernicke River confluence. In 2008, a separate site close to this Wernicke River camping area was inventoried and no invasive plants were documented (Gilmore and Harper 2008). A hiking trail heading due east of the 2009 Wernicke River camping area was inventoried with no invasive plants found, although it was not digitally recorded as GPS did not work under the dense canopy cover. Due to the high water, different locations were surveyed during the July float of this section. Several foxtail barley infestations were found along sand bars including several patches slightly south and across the river from Cleave Creek (to the east and south) and north of the Peninsula. Foxtail barley was also mapped and pulled along the banks on the Upper Copper River trip in August near the confluence with the Indian River. There is some speculation that the river corridors serve as a main vector of spread for the foxtail barley in the area.

Table 5. List of Landing Strips and Airports and Weeding Efforts.

Name	What	Ownership	Year*	Invasives?
Ampitheatre Creek	Landing Strip	Park	2006	<i>Hordeum jubatum</i>
Baultoff	Landing Strip	Park		
Beaver Creek	Airport	Canada		
Black Mountain	Landing Strip	Park		
Bremner	Landing Strip	Park		
Chelle Lake	Landing Strip	Park	2006	none
Chisiana	Airport	State	2009	none
Chistochina	Airport	State		
Chitina	Landing Strip	State	2009	<i>Melilotus alba</i>
Chitina/ Nzina Confluence	Landing Strip	Park	2006	none
Doubtful Creek	Landing Strip	Park	2006	none
Glacier Creek	Landing Strip	Park	2006	<i>Taraxacum officinale</i>
Gulkana	Airport	State	2009	
Huberts	Landing Strip	Park		
Jakes Bar 1	Landing Strip	Park		
Jakes Bar 2	Landing Strip	Park		
May Creek	Landing Strip	Park	2009	<i>Taraxacum officinale</i>
McCarthy #2	Airport	State	2009	<i>Taraxacum officinale</i> , <i>Descurainia sophia</i> , <i>Hordeum jubatum</i>
Nizina/ Chitina	Landing Strip	Park		
Nugget Creek	Landing Strip	Park		
Peavine	Landing Strip	Park	2006	<i>Hordeum jubatum</i> , <i>Taraxacum officinale</i>
Pennisula	Landing Strip	Park		
Sanford 1	Landing Strip	Park		
Sanford 2	Landing Strip	Park		
Skolai Pass	Landing Strip	Park	2009	none
Solo Creek	Landing Strip	Park		
Tana River	Landing Strip	Park	2008	none
Tok	Airport	State		

* - Year indicates the last year that this facility was visited by the EPMT crew

Restoration Efforts



Figure 19. Boreal Forest trail behind the Copper Center visitor's center.

WRST is unusual in that Park Headquarters are located outside the actual park, and many visitors only see this area around Headquarters. In 2006, three white spruce trees (*Picea glauca*), several rose bushes (*Rosa acicularis*), and several soapberry bushes (*Shepherdia canadensis*) were planted in the sign circle at Headquarters. Only two white spruce trees, six rose bushes, and one soapberry bush have survived the last three winters and still appear healthy. Efforts to seed or transplant flowers in 2006 were largely unsuccessful. Lupine (*Lupinus* *nootkatensis*) has since disappeared, but a few beautiful Jacob's ladder (*Polemonium*

pulcherrimum), Rocky Mountain goldenrod (*Solidago multiradiata*), and alpine sweet vetch (*Hedysarum alpinum*) have survived. In an attempt to keep the weeds at bay, annual ryegrass (*Lolium multiflorum*) was also seeded in 2006, but the seed was evidently mislabeled and proved to be perennial ryegrass as the area was overrun with large, straggling clumps of dead grass. Improving the appearance of the grounds through additional restoration efforts, especially by using native Alaskan plants, would insure that visitors remember their time at WRST positively. Also, maintaining a weed-free environment at Headquarters is an important step in preventing the spread of invasive plants into nearby park lands.

In late August and early September 2009, seeds were collected from eight native plant species for restoration efforts in the future: anemone (*Anemone multifida*), pussytoes (*Antennaria* *ssp.*), aster (*Aster sibericus*), fireweed (*Epilobium angustifolium*), pumpkin berry (*Geocaulon livedum*), arctic lupine (*Lupinus arcticus*), rattlebox (*Rhinanthus minor*), and goldenrod (*Solidago* *ssp.*). The seeds were dried and, except for lupine and pumpkin berry, will be stored over the winter. Lupine and pumpkin berry were seeded in the sign circle at the end of September, while other species will be sowed in the spring.

Outreach and Education

The EPMT team spends a portion of each season educating the public about the economic and ecological costs of invasive weeds. Many people remain unaware of the impacts invasive weeds have and in particular, are unaware that they are a problem in Alaska. Over the summer it is not uncommon for visitors to approach team members and ask them "Why are you picking all of the pretty flowers?" or "What, you're wasting my tax money pulling the sweetclover! It smells so good!" The EPMT sees education as an important part of keeping invasive weeds from spreading. An informed public can help slow the spread of weeds and support programs dealing with them. Every year team members participate in several outreach events and spend time with volunteer youth groups.

Education sometimes starts at home and with this in mind the regional EPMT recruited members to post an article each day during National Invasive Weeds Awareness Week on the internal NPS

Alaska intranet. Lil Gilmore of WRST was one of the participants. She also created flip booklets of the most common invasive weeds found at Copper Center for other NPS staff to use when they participating in weeding. As part of educating park staff Lil began a draft invasive plant policy for the park which would be used to help educate staff from other divisions on how they can help prevent the spread of invasive weeds within the park. This draft is the beginning of a dialog about park policies regarding things such as movement of topsoil, gravel source for infill, cleaning vehicles between uses in different areas with different levels of invasive problems, etc. Lil also wrote an article for the local newspaper, the Copper River Record (APPENDIX II. VOUCHERS COLLECTED IN 2009) and as part of his internship Joe Donohue posted a piece on the CLM blog regarding his work with the program (APPENDIX III. COPPER RIVER RECORD NEWSPAPER ARTICLE) and put together a power point on his experience and Katie Laushman wrote a report for the work she did with the program for college credit.

Team members Tamara Harper and Katie Laushman created an “Invasive Weeds of the Kennecott-McCarthy Area” display booth for the 4th of July celebration in McCarthy to share information with the local public and visitors alike. They staffed the booth and talked with people about how to identify invasive plants growing in the Kennecott-McCarthy area and how to control them. The booth included pressed examples of several exotic weed species, and brochures and pamphlets with helpful information for identifying the plants.

Team members sometimes also field more direct questions from local residents with specific inquiries. Lil Gilmore responded to a request from a resident in Kennecott for advice and recommendations for what native plants to plant on her property. She was especially interested in preventing the spread of invasive species or non-native plants on her property by replacing the local vegetation where it had been impacted by the construction of her home.

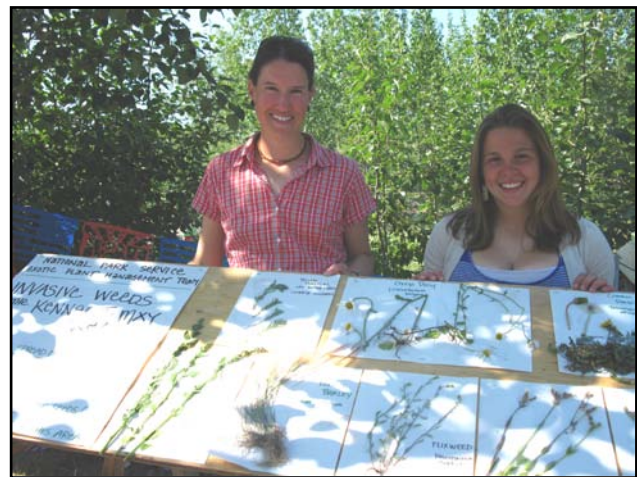


Figure 20. EMPT members at their invasive weed information booth at the McCarthy 4th of July celebrations.

Discussion

Invasive Plant Species

In the past the WRST EPMT has focused on mapping not only the park but the road corridors surrounding the park in order to better understand where the invasive plants seed sources were and where the threats were greatest for the park (Gilmore and Harper 2008). With the data collected there is now a fairly good understanding of the distribution of invasive plants along the Edgerton, Glenn, and Richardson highways and Tok Cut-off adjacent to the park. At this point the park does not see a reason to continue large scale mapping and treating outside of park land as it is not within our jurisdiction. The Gulkana and Chitina airports will continue to be a priority as they have substantial infestations and many flights originate there which end in the park and could serve as vectors. Likewise, the junction of the Tok cut-off with the Richardson Highway is

a prime seed source for weeds on the Nabesna road and the EPMT will continue to try and treat this area.



Figure 21. Foxtail barley is found among the native dwarf fireweed on the banks of the Copper River.

Other areas that are not within the park proper but that will continue to be mapped and treated include the Chitina, Copper Center, Slana, and Yakutat ranger stations. These ranger stations are often the main view of the park that many visitors get. Specific mapping goals for the 2010 season should include: comprehensive bicycle surveys of the Nabesna and McCarthy Roads, the road between McCarthy and Kennecott, backcountry trails that are accessible from these roads, campgrounds and pullouts, park maintained and concessionaire airstrips, and where possible, remote in-holder properties. A particular focus should be to map invasive weeds on properties where in-holders or concessionaires have horse stock. Most of these animals are fed non weed-free certified forage from outside of the park for at least part of the year and it is not known how this is affecting the native ecosystems. The extensive weed infestations found at Ptarmigan Lake this year indicates that there may be several species entering the heart of the park in this fashion.

The McCarthy Road has not been thoroughly surveyed although much of the section from the Gilahina Bridge at mile 29 to the Collins Homestead at mile 45 was walked in 2007 (Gilmore and Goldsmith 2007). An intensive “plant scan” method, concentrated on white sweetclover, was conducted using vehicles from mile 50 to mile 59 of the McCarthy Road and portions of the Nabesna road during the 2008 season (Gilmore and Harper 2008). To date the road between Kennecott and McCarthy has not been surveyed. It would be useful to have a comprehensive survey of both roads using either bicycles or ATV’s. These are the primary access points for invasive weeds and a baseline inventory would help us target problem populations. Along the McCarthy road at Long Lake a determination of the species of *Vicia* needs to be determined. If it turns out that this is the invasive bird vetch the EPMT needs to cooperate with the landowner to remove it.

Nine of the sixteen trails off the Nabesna Road were surveyed in 2009 as were two of the rest areas, the fish weir, and the Batzulnetas Village (Table 4). The remaining trails, and the rest of the Tanada Lake trail, need to be surveyed. Of the four trails off the McCarthy Road only the trailheads have been mapped (Gilmore and Harper 2008). Mapping these should be a high priority in 2010. The Old Wagon Road between McCarthy and Kennecott was mapped for the first time this year. The park permitted a concessionaire to give horseback rides along this trail and as the horses are fed imported feed (no weed-free certified forage is currently available within the state of Alaska) it needs to be monitored at least once a year. Trails leaving from Kennecott are fairly well mapped. Efforts here should focus on starting at the most remote location where weeds have been found and weeding back towards Kennecott. In the Donoho

Basin the campgrounds and full trail need to be inventoried as does the area which was burned in 2007 (Gilmore and Goldsmith 2007).

Twelve park service maintained airstrips remain un-surveyed (Table 4). If possible these should be surveyed in conjunction with the maintenance division's planned service schedule. The Chistochina, Gulkana, Chitina, and McCarthy airports need to be monitored and treated regularly. The May Creek airstrip has a large infestation which would benefit from a SAGA crew if they could be brought out to it. Privately owned airstrips as well as those used by concessionaires need to be inventoried and treated where landowner agreement can be reached.



Figure 22. The weedy airstrip at Ptarmigan Lake.

Ptarmigan Lake and Ultima Thule are both covered with foxtail barley. Infestations of foxtail barley on private lands adjacent to river corridors should also be inventoried and treated after seeking landowner permission. An example would be the campground next to the footbridge in McCarthy.

Within Kennecott and McCarthy the WRST EPMT needs to continue to monitor and control oxeye daisy, yellow toadflax, European stickseed, field pennycress, and narrowleaf hawksbeard infestations. The relatively new Nizina River airstrip and subdivision in McCarthy needs to be



Figure 23. EPMT members weed lambsquarters from a gravel pit in McCarthy to prevent its spread into the Kennecott valley.

inventoried. It will also be useful to continue to monitor and control weeds at the Rowcon gravel pits in cooperation with a Rowland family member, since they have the potential to spread invasives. The Rowland family is interested in trying to certify their gravel pits as weed free and as they are one of the few gravel sources available in the Kennecott/ McCarthy area the EPMT and WRST needs to support them in this endeavor. In Nabesna particular attention should be paid to the trail to the fish weir and the scentless false mayweed at the Betty Freed property. The park will also want to monitor the 56,000acre Chakina burn for invasive weed presence. Luckily the fire is fairly remote which may preclude invasive weeds from getting established.

Areas that could use the assistance of larger work crews if available include: a) the area around headquarters in Copper Center including the nearby gravel pit and the seasonal housing there; b)

the tansy at the Glennallen maintenance yard; c) the white sweetclover at the junction of the Tok cut-off and the Richardson highway; d) the airstrip at May Creek; e) control large high-priority infestations of common dandelions, foxtail barley, and clovers in McCarthy and Kennecott; f) the Chitina airport area; and g) large infestations identified on private land within the park.

Since there is no longer a botanist at WRST, it would be very helpful to have a place or person able to identify vouchers during the season. Having an authoritative identification within a couple weeks would allow control of potential invasive populations during the same season they are found, instead of waiting until next year.

If the WRST EPMT program expands to include more backcountry inventorying, more reliable Trimble units or a Trimble with a hurricane antenna would be useful for gathering GPS data under dense canopy cover. The current handheld Trimble units often proved inadequate in situations with trails surrounded by trees.

If repeated years of manual treatment do not have a significant effect on dense populations of invasive plants, such as common dandelions, white sweetclover, foxtail barley, tansy and clover species, a gentle herbicide may be necessary to control these populations. The herbicide should only be utilized in dense monoculture populations, where it can be applied directly to the target plant and only during periods of dry weather, in order to avoid damage to surrounding native plants. Herbicides are a very controversial issue in the communities in the park and extensive public education should be initiated before using them.

It would be preferable to inventory and weed common tansy no earlier than mid August in the future. Tansy is a very long season plant by Alaskan standards. New plants were still coming up until almost September. June was too early to do the initial inventory and resulted in many plants being missed. Its bloom season is very long, making it possible to delay weeding. The infestation began blooming in late July this year and was just beginning to set seed in early September. Because the maintenance yard has both early season and late season plants, it should be weeded twice each summer.

Restoration Efforts and Future Weeding

Restoration efforts should be continued at Headquarters, and new restoration plans should be drawn up for areas of large invasive plant infestations, such as the NPS apartments on Silk Stocking Road in Kennecott, and the gravel pit behind the Administration building at Headquarters. The areas surrounding Headquarters buildings should be re-weeded and reseeded each year until native plants are re-established. In addition, a plan needs to be put into place to re-seed Kennecott proper with native seeds once the massive reconstruction effort there slows down or comes to an end otherwise the acres of disturbed ground will be a haven for invasive weeds. The sign circle by the entrance of the Copper Center visitor's center is the first impression many visitors have of WRST, and many stop to have their picture taken in



Figure 24. Silk Stocking Road needs native plant restoration now that building restoration is completed.

front of the sign. The area is weedy and not particularly attractive or inviting. Laying a gravel path would provide a dry, clean walkway and help preserve the plants. Planting more native shrubs and perhaps native trees behind the sign would be attractive and eventually reduce weeding time. Planting a mixture of low-growing grass and native flowers and shrubs would be easy to maintain and would make the area around the flag and Visitor Center more appealing. The vegetation should be as attractive as the sign and provide a hint of the beauty of the Park/Preserve. Currently, one of the main hurdles to these objectives is the lack of a steady watering source to see the plantings through dry spells.

In order to take on the greater need for restoration, the WRST EPMT needs to focus on developing a restoration protocol for collecting and cleaning native seeds for future use. WRST currently lacks the equipment necessary to clean and store large amounts of seed or starter plants in the spring. As restoration work continues to upgrade, it may become necessary to invest in equipment and storage space

Outreach and Education



Figure 25. EPMT technician Tamara Harper speaks with the public about invasive weeds at the McCarthy 4th of July celebrations.

Key elements for success in controlling invasive plants are education and community involvement. At WRST this involvement needs to start with park staff that may be unaware given the relative weed free nature of most of the parks in the Alaska region. EPMT staff needs to continue to work with other divisions and finalize an invasive plant policy for the park so that park staff is not contributing to the spread of invasive weeds nor creating fertile ground for them to become established. It is important that the EPMT staff work closely with the maintenance division in particular to achieve this goal. Presentations should be given to seasonal staff and some very informal training needs to occur 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, so that they are contributing to the EPMT effort and understand its importance. In addition, staff members who are directed to complete supplemental weeding would be aware of the EPMT's mapping and reporting requirements so their work is properly documented. This last summer EPMT technician Lil Gilmore put together an excellent pamphlet for these other staff members to use around the visitor centers. Much of this staff is unfamiliar with plant identification and it is important that they pull invasives and not native plants. This next year the staff should create more of these localized flip books for other divisions to use. The EPMT staff needs to work more closely with the interpretive division so that they can include information about invasive plants in their ranger talks at the visitor centers, at the Princess Lodge, on cruise ships, at youth camps, and teacher-ranger-teacher programs.

Radio and newspaper interviews help bring the problem to public attention. The summer craft and agricultural fairs are good venues for educational displays. Next year the EPMT will try to

have booths at the McCarthy and Glennallen 4th of July celebrations, the Copper Center Fireweed Festival (late July), the Kenny Lake Fair (mid-August), and the Fair Weather Days in Yakutat (late August). Handouts about exotic plants, especially the easily carried booklet, Selected Invasive Plants of Alaska, should be widely distributed, while site specific booklets should be created for invasive plants found at Copper Center, McCarthy-Kennecott, and Slana. Libraries, laundromats, post offices, local visitor centers, and hotels throughout the Copper Basin are also good locations to display information.

Possibly the most important aspect of community education is the involvement of residents. At this time, there is no organization in the Basin responsible for area-wide education and weeding. If the Copper Valley Invasive Plants Workgroup remains in existence and is able to secure funding for a coordinator, it would be a positive step toward involving community members. Recently the Copper Basin Soil and Water District has advertised a position for an exotic weeds coordinator in Glennallen and the Copper River Native Association (CRNA) has plans to hire local YPP students to weed invasives within the Basin for the summer of 2010. The WRST EPMT staff should work with these groups and share data that they have collected throughout the Copper Basin. The EPMT also needs to coordinate with the Yakutat area; residents there were not sure whether the European black slugs (*Arion ater*) were native or not. There was also some confusion about Banana slugs (*Ariolimax columbianus*) which are also not native to Yakutat but are further south. A slug round up with an education theme would be a good way to alert the community of the threats of this invasive.

The team of two EPMT workers in McCarthy-Kennecott worked very well for the summer 2009 season. Two people work more efficiently and safely together in bear country. Having employees working full time in McCarthy increases both the amount of work done in the area and the potential to involve local residents in this work. Local residents helped with control work this season and were



Figure 26. An interpretive park ranger giving a talk in Kennecott.

instrumental in notifying the NPS personnel of new infestations. Cooperating with locals in control work helps educate the public and encourages local residents to cooperate in a community-wide effort. Education and public involvement could be increased with more outreach, such as talks, work groups and partnering with other organizations that have an interest in the invasive species issue, such as the Wrangell Mountains Center (WMC). It is important that the EPMT maintain informal partnership with the WMC and work with them on educational programs and public outreach. Talk with WMC college program students before they go on their backcountry field trip to enlist their help with backcountry invasive plant monitoring.

Fauna of Concern

Invasive plants are not the only species of concern in Wrangell-St. Elias National Park and Preserve. There are additional threats of invasive or exotic insects, diseases, diatoms, mollusks,

fish, birds, and mammals and there are some native species which over the past decade have started to act invasive and completely changing the ecosystems they inhabit.

Existing exotic terrestrial animal species in Wrangell-St. Elias include the plains bison (*Bison bison bison*) which was introduced for game by Alaska Department of Fish & Game (ADF&G) before the park was founded in 1962 (ADF&G 1980). At present the bison populations have been stable or declining due to lack of habitat. To date the park has not managed bison. However, the 58,000 acre Chakina fire which burned in 2009 may open up substantial habitat for the bison which may cause their populations to increase. A larger population may affect what plant species return to the area and could potentially impact wildlife populations. In addition there is some concern that these populations would be a direct impediment if the state of Alaska introduced wood bison (*Bison bison athabasca*) both due to concerns of inter-breeding (genetic dilution) as well as the risk of disease (primarily brucellosis, ADF&G 2007).



Figure 27. A European black slug (*A. ater*) on a trail in Yakutat.

The European black slug (*Arion ater*) was identified in the Yakutat area outside the park boundary in 2009. This mollusk is omnivorous and will eat itself if all other food sources are not available and because it is hermaphroditic it can fertilize itself if needed. They appear to have been introduced through gardening material and appear capable of overwintering. It is unknown if these slugs escape the borders of town and move into sensitive environments such as estuaries and marshes (Schrader & Hennon 2005).

A variety of native fish species have been introduced into a few lakes across the park that were naturally non-fishbearing. To our knowledge, fish introductions have not resulted in range extensions of species.

Suspected, but not confirmed, invasive species include the chytrid fungus (*Batrachochytrium dendrobatidis*) which may be affecting local frog populations. Local knowledge of declining western toad (*Bufo boreas boreas*) populations as well as documentation from similar areas of sharp declines,

amphibian die-offs and malformations (Reeves 2008) suggest that the chytrid fungus is present in the Yakutat area. To date no study has been undertaken to confirm this although the local reports on the absence of a once nuisance species is suspicious. Another suspected but not confirmed species is lake trout (*Salvelinus namaycush*) which were reportedly planted in Chelle Lake and other lakes near the Tana River by local guides to improve sport fishing.

Invasive species which have not arrived yet but which are of particular concern include the European green crab (*Carcinus maenas*), Atlantic salmon (*Salmo salar*), and the white-nosed syndrome fungus (*Geomyces destructans*). Recent habitat mapping by ADF&G indicates that Riou Bay may be ideal habitat for the invasive green crab (Harney 2007). Atlantic salmon are suspected to be in the waters of Glacier Bay National Park just south of WRST (SEAN 2008) and they have also been documented near the mouth of the Copper River. White-nosed syndrome fungus is not yet documented in Alaska but very little is known about bats (primarily *Myotis*

lucifigus) and their hibernation habits in the park but WRST caves are at prime temperatures for the syndrome to thrive. WRST caves made headlines in the National Speleological Society newsletter in 2008 (NSS 2008) around the same time that Caves in the eastern United States were being closed due to white-nosed syndrome and it is likely that more cavers will be recreating in park caves.

There are also a few native species which of late, have begun to act like invasive species. One of these, the spruce bark beetle (*Dendroctonus rufipennis*), became a documented cause of concern in 1990s when they killed large swaths of spruce trees in the park (Allen et al. 2006). The beetle is limited in the far north by heat (Holsten et al. 1985) and it is thought that climate change, and the lack of long periods of severe cold, is the cause of the current proliferation of the beetles (Barber et al. 1997). From 2000 to 2003, bark beetle-caused tree mortality in forests of the western U.S. increased from 1.6 to 4 million ha (4 to 10 million acres), representing the largest annual increase in recorded history (WFLC 2009). The large outbreaks of spruce bark beetle are dramatically changing the habitat for many species by changing the habitat and available food sources as well as changing the fire regime by increasing the fuels available (WFLC 2009). The interactions between fire and insect outbreak events are expected to create new positive feedbacks for further warming (IPCC 2007; Goetz et al. 2007; Running 2008, ACCAP 2009).



Figure 28. The 2009 Chakina fire burns through a forest full of spruce bark beetle killed trees.

A species of diatom, known as rock snot or didymo (*Didymosphenia geminata*) is usually considered to be native to Alaska, although it is usually found in low abundance, but is now being recognized as acting invasive in its native range given its ability to create mats that dominate stream beds nearly completely (Spalding and Elwell 2007). In the past, *D. geminata* was generally considered to be an indicator of oligotrophic or pristine conditions in boreal streams and there is some thought that its invasive character may be due to a genetic variant, or a response to anthropogenic alteration of the environment (Simmons 2009). In 2006 mats of didymo were noted at 3 lake outlet streams and Rock Creek during a pilot study for an inventory and monitoring network stream study (Simmons 2009). Whether or not this is of major concern is yet to be determined however it is known that *D. geminata* is also spread via human vectors such as waders and boat bottoms and it should be monitored.

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Appendix I. Invasive Plant Synopses

This section describes populations of invasive plants found at WRST that are ranked 48 or above according to the Alaska Natural Heritage Program invasiveness scale (complete information on scale is available at <http://akweeds.uaa.alaska.edu>). Also, European stickseed has been given a synopsis because this species appears to be increasing around McCarthy. Plants are listed alphabetically by Latin name.

***Bromus inermis* (Smooth Brome Grass, rank 62)**

Smooth brome exists in the gravel pit on the west side of McCarthy, and in downtown McCarthy, at the Donoho Avenue site. Both infestations are too thick for manual control, and their perimeters were mapped. In past years, smooth brome was monitored along McCarthy Creek and from mile 50-60 on the McCarthy Road (Gilmore and Harper 2007). Neither location was monitored this year.

***Caragana arborescens* (Siberian pea shrub, rank 66)**

This species has been found in only one location in the Kennecott Valley: on private property in McCarthy growing as a privacy hedge. The owner is aware of its invasive status and is cooperating fully by removing seedlings that spread from the main plants. The area was monitored this year and many small plants surrounding the bushes and across the street were removed.

***Crepis tectorum* (Narrowleaf hawksbeard, rank 54)**

Narrowleaf hawksbeard is abundant in the southern and central areas of the Copper Basin. It is evident at Park Headquarters, and along all roadsides, in gravel pits, and parking areas. Sometimes only a few plants are noticeable but often it is growing thickly. No efforts have been made to treat it on non-Park lands.

The McCarthy and Nabesna Roads are not yet heavily infested. Although populations were reported in 2004 (Bauder and Heys 2004) and 2006 (Gilmore 2006) on the Nabesna Road, narrowleaf hawksbeard has not been found anywhere on it since 2006 (Gilmore and Goldsmith 2007, Gilmore and Harper 2008). On the McCarthy Road, narrowleaf hawksbeard was monitored in 2009 and weeded as it continues to grow at mile 59.

Narrowleaf hawksbeard remains a high priority in the McCarthy area. Control efforts continued on the three known populations: the former horse corral in downtown McCarthy, the horse corral on the land of Kennecott River Lodge and Hostel, and the driveway into NPS west side seasonal housing. One new population was found west of the Syren parking lot on the McCarthy Road. The sites monitored and retreated this year are essentially the same size or smaller than last year, and they are on private property and roadways only. Continual weeding and monitoring for new infestations will be critical to keep narrowleaf hawksbeard out of parkland. Narrowleaf hawksbeard has not yet been found in Kennecott.

***Elymus repens* (Quackgrass, rank 59)**

In the past, quackgrass has been recorded in McCarthy, but it was not found in 2009. Not much attention has been paid to this species in recent years, but more attention should be paid to it in the future, since it has been recorded in the park in the past.

Hordeum jubatum (Foxtail barley, rank 63)

Foxtail barley is, as of 2010, no longer considered an invasive species in Alaska. As a result groups like AKEPIC will no longer be tracking it. However, WRST has been tracking this species since 2005 (Gilmore 2005) and it seems to mainly occur where there has been significant human or horse caused disturbance.

Thick stands of foxtail barley grow along the Nabesna Road. A lengthy, labor-intensive effort will be needed to control this growth, but it should be a priority in upcoming seasons. In the McCarthy-Kennecott area, this species is widespread and beyond eradication by hand-pulling. Therefore, only certain high-priority areas were given time and effort this season. It was retreated on NPS land at the west side housing facility where it was growing on the road and had the potential to spread via passing vehicles. A few plants found on the McCarthy airstrip were removed, although far fewer were found than last year. Plants along various roads in the McCarthy area were pulled. It continues to be pervasive on private property at the end of the McCarthy Road, near the west footbridge. Should the NPS acquire this property in the future, it would be an opportunity to eradicate the population at this location. In addition foxtail barley was found in large quantities at the Ptarmigan Lake in-holding. This land owner owns and keeps horses both on his lands and park lands. Further investigation of the spread of this plant from horses would be useful.

Lappula squarrosa (European stickseed, rank 44)

In 2006, two European stickseed plants were inventoried and weeded at the Dead Dog Hill Rest Area on the Nabesna Road (Gilmore 2006). Two plants were weeded in the same location 2007 (Gilmore and Goldsmith 2007), but no plants were found in 2009.

Pulling continued on previously identified populations: at the horse corral on Kennecott River Lodge and Hostel land, at the end of the airstrip near McCarthy church (between the two footbridges), and at the NPS McCarthy Road Information Station. A new large infestation, at the St. Elias Alpine Guides parking lot on the McCarthy road, was removed. European stickseed was found more often than last season, mostly along roads. The sticky seeds lend themselves to easy transport and this species appears to be increasing around McCarthy.

Leucanthemum vulgare (Oxeye daisy, rank 61)

The population of oxeye daisy discovered in 2007 (Gilmore and Goldsmith 2007) at mile 10.9 on the McCarthy Road was not monitored or weeded this season. It should be monitored during coming seasons and the owner asked for permission to weed.

Oxeye daisy is the highest-ranked invasive weed in Kennecott. The population on park property on the slope behind the Jurick building has decreased in size and density over the past few years. This year all flowering plants were pulled before going to seed and many rosettes were removed. Native raspberry and fireweed continue to increase as oxeye daisies are removed. With the exception of Kennicott Glacier Lodge, all known populations of oxeye daisy on private property in Kennecott are being treated and have decreased in size. A new, small population at the Wrangell Mountains Center garden in McCarthy was also pulled.

Linaria vulgaris (Yellow toadflax, rank 61)

No new infestations were found this year and there are no known plants on park lands. Three yellow toadflax populations in the McCarthy area were monitored and retreated this season: at the end of John Adam's airstrip in west McCarthy, at the former horse corral in downtown McCarthy, and in the garden bed under the Wrangell Mountains Center events sign in McCarthy. All plants were removed as rosettes before flowering. Eradication of these populations is possible with continued attention.

Lupinus polyphyllus (Bigleaf lupine, rank 55)

Big leaf lupine was found near park boundaries in the coastal community of Yakutat. At this point it has not been identified as being in the park but surveys of the area are incomplete.

Medicago lupulina (Black medic, rank 59)

Black medic was found to be growing alongside the Gakona lodge on the Tok Cut-off in 2006 (Gilmore 2006) in a mowed area and was observed on a highway scan in 2007 (location was not recorded) for white sweetclover (Gilmore and Goldsmith 2007). It has not been observed within the park boundaries.

Melilotus alba (White sweetclover, rank 81)

In Slana, white sweetclover remains a high priority. The area around the junction of the Tok Cut-Off and Nabesna Road should be closely monitored as plants will need to be pulled for many years.

In 2007 (Gilmore and Goldsmith 2007), during a routine monitoring of the Slana Fishwheel Trail, white sweetclover was found for the first time since 2004 (Bauder and Heys 2004). Plants were found in the same location in 2008 (Gilmore and Harper 2008), but no plants were found here during the 2009 season. This trail should be monitored and, when necessary, weeded once or twice a season.

White sweetclover populations growing on the Glenn and the Richardson Highways and side roads throughout the Copper Basin were not mapped this year. In 2009, white sweetclover growing at mile 28 on the Edgerton Highway was monitored and weeded by the EPMT crew. They also weeded two patches growing in Chitina at the One-Stop Grocery. Unless another agency steps in, the EPMT program should consider monitoring the roadsides in the Copper Basin for the white sweetclover every two or three years.



Figure 29. A lone white sweetclover plant made its way onto the McCarthy Road.

Monitoring and weeding white sweetclover at mile 106.8 of the Richardson Highway, across from Headquarters, should be continued. Many small plants were observed and weeded in the fall of the 2009 season, and there may be a large stand of flowering plants in 2010.

For the first time, one plant was found in 2009 on the McCarthy Road at mile 13. The plant was removed, but it had already gone to seed, so the area should be monitored next year. The surrounding area was searched, and no other plants found. Since white sweetclover has become established in Chitina, the McCarthy Road should be scanned periodically in subsequent growing seasons.

The 2009 season was the first year that white sweetclover has been found at Headquarters. In addition to the plants in the gravel pit, a small patch was discovered near the gate to the Visitor Center. Both were inventoried and treated. The white sweetclover in the gravel pit was probably the result of burning weed bags there, while the origin of the other is unknown. Both areas were treated twice, once by the SAGA group and later by the biological technician. The plants had not yet seeded so they may not become an established problem.

Melilotus officinalis (Yellow sweetclover, rank 69)

Yellow sweetclover was found in Glennallen in front of old Petrolane building when surveying roads for white sweetclover in 2007 (Gilmore and Goldsmith 2007). As it is far from park lands it has not been monitored since.

Phleum pratense (Common timothy, rank 54)

Common timothy still exists at the horse corral on Kennecott Lodge and Hostel land, even though it was not visible for most of the summer due to horse grazing. However, in late August 2009 when the horses left common timothy re-sprouted and the perimeter was mapped.

Tanacetum vulgare (Common tansy, rank 57)

Common tansy has only been found in the maintenance yard in Glennallen (which is rented from the Glennallen BLM Field Office), where it was weeded by the SAGA crew in 2009. No one quite knows the origin although abandoned weed bags are suspect.

Taraxacum officinale ssp. officinale (Common dandelion, rank 58)

The common dandelion is pervasive in all areas covered by this report. At Park Headquarters, dandelions grow thickly along the drive to the Visitor's Center and more sparsely in other areas. The drive should be weeded at least once per season.

The common dandelion is so widespread in the McCarthy-Kennecott area that it is generally beyond control by manual methods. Consequently, only specific locations of concern can be monitored and managed with the resources currently available. These high-priority areas include roads, trails, airstrips and gravel pits that may facilitate spreading dandelions out of town centers and into relatively weed-free park land.

Control efforts in 2009 in the Kennecott area focused on the trails into the park. The Root Glacier, Bonanza Mine and Jumbo Mine Trails were each monitored and treated this season. The Root Glacier Trail was treated several times, since new dandelion rosettes sprouted all summer. The Bonanza Mine Trail was thoroughly weeded from the top of the trail to below tree line. At this point, the weed density becomes too high to make a difference with limited manpower. The Jumbo Mine Trail is the least infested trail out of Kennecott, and work was done above the tree line and where the Jumbo Mine Trail splits from the Bonanza Mine Trail. Two stretches of the Jumbo Mine Trail, near where it crosses Bonanza Creek, have large plants

growing and were mapped. Pulling can contain the number of weeds on trails and prevent common dandelions from becoming established further into the park. However, with the Kennecott town site heavily infested and serving as a constant seed source, the trails will require maintenance every summer.

In McCarthy, dandelion monitoring and control work focused on the airstrip, trails, roads, and gravel pits, because of their potential to spread invasive plants into the park. Trails along McCarthy Creek and around the Kennecott Glacier, roads coming from town, the McCarthy airstrip, and the Rowcon gravel pits were all high priority areas.

***Trifolium hybridum* (Alsike clover, rank 57)**

***Trifolium pratense* (Red clover, rank 53)**

***Trifolium repens* (White clover, rank 59)**

Clovers are found in all areas covered in this report, although not as common as the common dandelion. Infestations have been mapped in Kennecott, McCarthy, and May Creek. They have been observed in Slana, Headquarters, and along the highways in the Copper Basin but not officially documented. Of the three, red clover seems to be the least abundant. More effort should be spent on mapping their extent next year, since they were not a priority this year.

***Tripleurospermum perforatum* (Scentless false mayweed, rank 48)**

Scentless false mayweed was monitored and weeded at the Betty Freed property on the Nabesna Road during the 2005, 2006, 2007, 2008, and 2009 field seasons (Gilmore 2005 and 2006, Gilmore and Goldsmith 2007, Gilmore and Harper 2008). It appears to be slowly increasing, possibly due to the fact that the property is being used more. In 2008, it was found near a grave or memorial site at mile 2 on the Nabesna Road (Gilmore and Harper 2008). It had obviously been planted and tended. Due to the nature of the site, no inventory or weeding will be done.

***Vicia cracca* (Bird vetch, rank 73)**

The bird vetch at mile 2.25 on the Edgerton Highway was visually monitored. It appears to be spreading more rapidly than in past years. In 2007, a possible population of bird vetch was discovered between Mileposts 126-127 on the Richardson Highway (Gilmore and Goldsmith 2007). The voucher collected at this location has never been positively identified. It is a comparatively small stand, approximately four meters long and one meter wide. It was monitored again in 2009. All three locations are outside the boundary of the park.

The reported population of bird vetch growing south of the Lakina River was monitored in mid-September this year. Vouchers collected were identified as *Oxytropis* *ssp.*, a native plant, but this population should be monitored again in July or early August 2010. Bird vetch may not have been visible this year due to the lateness of the field work.

Appendix II. Park Facilities and Weeding Efforts

Name	What	Location/ Ownership	Year*	Invasives?
Esker Creek	Cabin	Yakutat	2009	none
Copper Lake	Campsite	Nabesna Rd m.12.2		
Jumbo Creek	Campsite	Kennecott	2009	<i>Taraxacum officinale</i>
Kettle Lake	Campsite	Nabesna Rd m.16.6		
Rufus Creek	Campsite	Nabesna Rd m.6.1		
Twin Lakes	Campsite	Nabesna Rd m.27.8		
Kennicott Historic Cemetery	Cemetery	Kennecott	2009	none
Betty Freed Housing	Operations	Nabesna Rd	2009	<i>Rheum rhabarbarum</i> , <i>Tripleurospermum perforatum</i>
Glennallen Housing	Operations	Glennallen		
HQ Gravel Pit & Housing	Operations	Copper Center	2009	<i>Hordeum jubatum</i> , <i>Taraxacum officinale</i>
Maintenance Yard	Operations	Glennallen	2009	<i>Crepis tectorum</i> , <i>Hordeum jubatum</i> , <i>Tanacetum vulgare</i> , <i>Taraxacum officinale</i>
May Creek Cabins	Operations	May Creek	2009	<i>Taraxacum officinale</i> , <i>Hordeum jubatum</i>
Silk Stocking NPS Housing	Operations	Kennecott	2009	<i>Cerastium fontanum</i> , <i>Leucanthemum vulgare</i> , <i>Matricaria discoidea</i> , <i>Polygonum aviculare</i> , <i>Polygonum convolvulus</i> , <i>Stellaria media</i> , <i>Taraxacum officinale</i> , <i>Trifolium ssp.</i>
Slana Ranger House	Operations	Slana		
Slana Ranger Station & Facilities	Operations	Nabesna Rd	2009	
West Side Housing	Operations	McCarthy	2009	
Yakutat Ranger Station	Operations	Yakutat	2009	<i>Arion ater</i>
Gilahina Trestle	Pullout	McCarthy Rd m.29		
Kuskulana Bridge	Pullout	McCarthy Rd m.17		
McCarthy Overlook	Pullout	McCarthy Rd m.57.5		
NPS Information Station	Pullout	McCarthy Rd m.59		
Chitina	Ranger Station	Chitina		
Dead Dog Hill	Rest Area	Nabesna Rd m.17.8	2009	<i>Hordeum jubatum</i>
Jack Creek	Rest Area	Nabesna Rd m.35.3	2006	<i>Descurainia sophia</i>
Rock Lake	Rest Area	Nabesna Rd m.21.8	2009	<i>Hordeum jubatum</i>
Footbridge to McCarthy	Road	McCarthy	2009	<i>Taraxacum officinale</i>
Tok-Cutoff Junction	Road	Cut-off Junction		
Batzulnetas Village	Village	Nabesna Rd m. 8.5	2009	<i>Taraxacum officinale</i>
Long Lake Fish Weir ¹	Weir	McCarthy Rd m.22.9	2009	eradicated <i>Melilotus alba</i>
Slana Fish Weir	Weir	Nabesna Rd m.8.5		

¹ *Melilotus alba* was found in 2007 & 2008

Appendix III. Vouchers Collected In 2009

Voucher Number: Description or best guess at species.

mxy001: possible perennial rye grass (*Lolium perenne* ssp. *multiflorum*, rank 41) collected near NPS burn pit at toe of Kennecott Glacier.

mxy002: bunch grass collected from Rowcon gravel pit in west McCarthy.

mxy003: possible bird vetch collected from trail South of Lakina River. Identified as *Oxytropis* ssp. by former botanist for WRST, Mary Beth Cook.

mxy004: possible white sweetclover found at Rowcon gravel pit.

mxy005: possible potentilla collected from McCarthy.

mxy 006: unknown from McCarthy WRST Maintenance Yard.

mxy 007: possible chickweed collected from McCarthy.

mxy 008: possible bird vetch found at Long Lake on McCarthy Road.

mxy 009: unknown mustard found at NPS Silk Stocking Row apartments

Appendix IV. Copper River Record Newspaper Article

10 November 19, 2009



COPPER RIVER RECORD

Invasive Plants Push Out Locals

By Lil Gilmore

Did you wonder this summer what that person was doing walking along the roadside carrying the odd looking yellow calculator?

The "calculator" was actually a GPS unit and he or she was one of several National Park Service employees scouring Wrangell-St. Elias National Park and Preserve and the Copper Basin for invasive plants.

To qualify for the dubious title of "invasive," a plant must be non-native to the ecosystem it is threatening. It must also be likely to cause economic or environmental harm.

Invasive plants have characteristics that allow them to "outcompete" the native vegetation. They grow quickly, mature early, and spread

seeds that can survive a long time. Some invasive species may be able to hybridize or cross-pollinate with local plants, which compromises the genetic makeup of native species.

Many invasives destroy a habitat by hoarding the available water and nutrients. In other words, an invasive plant is tough enough to take over the neighborhood. They are the bullyboys of the plant community.

The Exotic Plant Management Team (EPMT) employed by the National Park Service do most of their work in the Park/Preserve, but sometimes work on roadsides throughout the Basin, attempting to keep invasive species from moving into the Park. Park employees will not remove any plant, invasive or not, from private property

unless given permission by the owner.

There are plenty of non-native plants that pose no threat to the ecosystem – annuals like your cabbages and petunias, or perennial plants that do not spread and compete aggressively on their own.

White sweetclover (*Melilotus alba*) is the most visible invasive plant moving into the Copper Basin. It has rapidly taken over large stretches of our roadsides. Its tall pale blooms and overpowering sweet smell make it very noticeable. Despite the efforts of several agencies and concerned residents, the plant is continuing to spread. White sweetclover is also widespread around the state.

Narrow-leaf hawksbeard (*Crepis tectorum*) is another very noticeable invasive plant. It seemed to come from nowhere four or five years ago and now is literally everywhere. It looks slightly like a scrawny dandelion and is remarkable for its persistence. Pull it out one day and it is back a couple of days later.

Bird vetch (*Vicia cracca*) is not yet a serious presence in the Basin but it is potentially very damaging. Its purple blossoms are quite beautiful tangled with bright pink fireweed flowers. But its smothering ways are less attractive to the plants it buries, including the willow browse moose need for survival.

There are many more invasive plants in Wrangell-St. Elias National Park and Preserve and around the Copper Basin,



Doug Vollman

Narrow-leaf Hawksbeard, an invasive plant with dandelion-looking blooms, is appearing in newly graveled areas around Copper Basin. It can invade hayfields, but is commonly found on disturbed ground along the roads.

all of them threatening the ecosystem to a greater or lesser extent. A few of the more aggressive include dandelions (*Taraxacum officinale*), butter and eggs (*Linaria vulgaris*), oxeye daisies (*Leucanthemum vulgare*), common tansy (*Tanacetum vulgare*), foxtail (*Hordeum jubatum*), and Siberian pea shrub (*Caragana arborescens*).

What can you do to help stop the spread of these unwanted plants?

Research the plants you seed or transplant.

Buy only certified weed-free hay, mulch, and topsoil.

Pull that dandelion before it goes to seed.

Weed your garden and lawn before plants go to seed.

Burn your pulled weeds, and if you can't burn them right away, store in plastic bag with the top tied.

Make sure you, your gear, your pet, and your vehicle are weed-free before going camping.

Join weed pulls in your community.

Report invasive plants to Wrangell-St. Elias National Park and Preserve at 822-7232.

If you do not have a way to dispose of weeds properly, you may ask the Ecologist

(822-7232) at Wrangell-St. Elias for bags and return to the park for disposal.

Many people wonder we should go to so effort to get rid of weeds. "Ordinary" are not a concern; on invasive species need removed. One reason bother with these invasives for every stretch of side swallowed by sweet or another invasive species is an equal number of the wildflowers that dazzle eyes each summer are lost.

And when a habitat degraded by invasive it will not support the plants that provide for many creatures, including eventually us.

If you would like to more about the consequences of invasive plants for the land and animals and plants Copper Basin, the following sites are interesting informative: Alaska Native Heritage Program at [akweeds.uaa.alaska.edu](http://www.akweeds.uaa.alaska.edu); CNIPM at <http://www.cnipm.org>; and a dandelion book compiled by the staff at Glacier Bay National Park at http://www.nps.gov/natres/EPMT/Reland_dandelion_cookbook.pdf



Lil Gilmore photo

This patch of white sweetclover on the Edgerton Highway near the Chitina Airport is one of many growing along the roadsides in the Copper Basin.

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Appendix V. Conservation Land Management Intern Blog

[“Up to the Land of the Midnight Sun...”](http://clminternship.org/blog/?p=540) (Web Address: <http://clminternship.org/blog/?p=540>)

Posted September 22, 2009



Rafting the Copper River and keeping an eye out for invasive plants and amazing sights along the way.

For the past 3 months, my CLM internship has placed me in Alaska, specifically Wrangell-St. Elias National Park, our largest national park and a land of superlatives within this gigantic land. As a member of the Exotic Plants Management Team (EPMT) for Wrangell-St. Elias National Park, it has been my duty, along with the 4 other EPMT workers in the park, to identify, prioritize and weed populations of invasive plants throughout this 13.2 million acre park (about 2.6 million acres per person!). Luckily, Alaska is somewhat ahead of the invasive species curve, compared to the majority of places in the lower 48, and the immensity of this park lends a few perks to my job. For example, it is unreasonable to survey large swaths of the park from headquarters on foot, so this summer I have had the opportunity to tag along on a 5 day raft trip, multiple day hiking trips, and multiple flights into the backcountry, all while inventorying for invasive plant species and learning the native plants and animals throughout this park's many ecosystems. When we find a population of invasive plants, we use Trimble GPS units to take GPS coordinates, describe the population, and, when manpower allows, weed it. The most common invasive plants encountered this summer have been oxeye daisy (*Leucanthemum vulgare*), narrowleaf hawksbeard (*Crepis tectorum*), white sweetclover (*Melilotus alba*), lambsquarters (*Chenopodium album*), foxtail barley (*Hordeum jubatum*), and the common dandelion (*Taraxacum officinale*). Not all of these species are actively weeded by the park's EMPT program, particularly the common dandelion, but it is still important to monitor all invasive species populations to determine their potential to negatively affect these nearly pristine Alaskan ecosystems.



Inventorying for invasive plants on the Jumbo Mine Trail among the blooming fireweed (*Epilobium angustifolium*)

The immensity of Wrangell-St. Elias National Park makes it inaccessible to most visitors, and because invasive species usually arrive in new areas with the help of humans, we have focused on inventorying and weeding more highly visited areas, including backcountry destinations, airplane landing strips, campsites, trails into the park, and town centers. Wrangell-St. Elias National Park differs from many other parks in the US because there are private inholders within the park. In fact, there's an entire town located in the center of the park—McCarthy, Alaska—which is where I have been stationed this summer. Before arriving, I was told that the 'nearest' grocery store to McCarthy is a 7-8 hour drive away, comparable to the drive from my home in Ohio to Chicago—and just for some groceries! The reality has been a bit easier (a general store in town does stock a limited and expensive selection of food), but the people of McCarthy definitely live a different way of life from the majority of Americans. For the past three and a half months I have lived in McCarthy and traveled around the park, but during the remaining month and a half of my internship, I will be stationed at Copper Center, on the western edge of the park, since McCarthy is shutting down now that tourist season is over.



Porphyry mountain in fall, bordering McCarthy

Thus, my internship has challenged me not only in learning the plants, animals and processes of new ecosystems (boreal forest, alpine tundra, glaciers, and temperate rainforest!), hiking for days to inventory invasive species populations, and honing my GPS/GIS and report writing skills, but it has also challenged my way of life. In McCarthy, many people live out life from a different time: when homes were heated by wood stove, water was hauled from nearby creeks, and people lived off the land. Cell phones and television hardly exist here, internet is slower than dialup,

and mail comes only twice a week. Yet it has been extremely rewarding to see this way of life, experience some of it, learn about these Alaskan ecosystems, and realize that real wilderness still does exist in this world, an exciting thought for someone who grew up in the Midwest.



Kennecott, an abandoned mining town four miles from McCarthy, overlooking the Root Glacier moraine and bordering mountains

-Joe Donohue, Wrangell-St. Elias National Park, Alaska

~ by clmintern on September 22, 2009.
