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Natural Resource Stewardship and Science

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

2013 Summary Report

Natural Resource Data Series NPS/WRST/NRDS—2014/674



ON THE COVER
Elodea surveys on Tebay Lakes
Photograph by: Morgan Gantz

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

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

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Contents

Page

Figures v

Tables vii

Abstract viii

Acknowledgments viii

Abbreviations ix

Introduction 1

Objectives 4

- Terrestrial Invasive Plants 4
- Aquatic Invasive Plants 4
- Restoration & Prevention 5
- Outreach, Education and Partnerships 6

Methods 7

- Inventory and Control Work 8
- Terrestrial Invasive Plants 8
- Aquatic Invasive Plants 9
- Restoration & Prevention 10
- Outreach, Education & Partnerships 11

Results 12

- Overview 12
- Big Volcanoes RZ 15
- Coastal-Icy Bay RZ 16
- McCarthy Front Country RZ 17
- Nabesna Front Country RZ 22

Contents (continued)

Page

St. Elias-Chugach Mountains RZ 26

Tetlin-Tanacross RZ 27

Upper Copper River Front Country 29

White River RZ 33

Bagley Icefield RZ 34

Areas outside WRST RZ's 34

Discussion and Recommendations 37

Inventory and Control Work 37

Terrestrial Invasive Plants *37*

Aquatic Invasive Plants *38*

Restoration & Prevention 38

Outreach, Education & Partnerships 39

Literature Cited 41

Appendix A: Prioritization Charts 45

Appendix B: Copper River Record - Canadian Waterweed 46

Appendix C: Copper River Record - Herbicide Press Release 49

Appendix D: Letter sent to Commercial Use Operators May 2013 50

Appendix E: List of Invasive Plant Species found in and around WRST 51

Figures

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

Figure 2. Native fireweed blooming by Ptarmigan Lake with Mt. Natazhat in the background. 2

Figure 3. The white sweetclover (*Melilotus alba*) infestation that EPMT targets for control at the intersection of the Nabesna Road and Tok Cutoff. 3

Figure 4. Aquatic Invasive Species Canadian Waterweed (*Elodea canadensis*). 4

Figure 5. SAGA crew youth sorting collected native seed for drying in Kennecott. 5

Figure 6. EPMT Reporting Zones (RZ) in Wrangell-St. Elias after Drazkowski et al. 2011. 7

Figure 7. Fraser, EPMT SCA, performing a walking inventory. 8

Figure 8. Tim, regional EPMT seasonal, surveying for invasive aquatics by packraft in Wrangell-St. Elias. 9

Figure 9 Before (left) and after (right) pictures of beds outside the restrooms at Copper Center headquarters. 10

Figure 10. David, EPMT technician, mapping seed collections in Kennecott as part of the Need for Seed event. 11

Figure 11. Copper Lake trail running through the boreal forest. 12

Figure 12. Big Volcanoes reporting zone in Wrangell-St.Elias. 15

Figure 13. Coastal-Icy Bay reporting zone in Wrangell-St.Elias. 16

Figure 14. McCarthy Front Country reporting zone in Wrangell-St.Elias. 17

Figure 15. Morgan, EPMT CLM, mapping infestations from her bike. 19

Figure 16. EPMT Staff, SAGA crew members, and volunteers at the first ever Kennecott Need for Seed. 20

Figure 17. Nabesna Front Country reporting zone in Wrangell-St. Elias. 22

Figure 18. David, WRST EPMT staff member, and a SAGA crew with pulled weeds at the Tok Cutoff. 24

Figure 19. Work on the Soda Lake ORV trail re-route. 25

Figures (continued)

Page

Figure 20. St. Elias-Chugach reporting zone in Wrangell-St. Elias. 26

Figure 21. Lower Tebay Lake surveyed for *Elodea* by WRST EPMT staff. 27

Figure 22. Tetlin-Tanacross reporting zone in Wrangell-St.Elias. 28

Figure 23. Horses on private property at Ptarmigan Lake. 29

Figure 24. Upper Copper River reporting zone in Wrangell-St. Elias..... 30

Figure 25. Fraser, EPMT SCA, with various YCC and SAGA crew members pose with the entrance sign and filled weed bags at park headquarters. 31

Figure 26. Gavin, YCC, with a fistful of blooming hawksbeard in the Glennallen Maintenance Yard. 32

Figure 27. White River reporting zone in Wrangell-St.Elias..... 33

Figure 28. Bagley Icefileld reporting zone in Wrangell-St.Elias..... 34

Figure 29. Part of the Whitesweet clover infestation at the Richardson/ Glenn Highway Junction in Glennallen prior to the Weed Smackdown. 35

Figure 30. Copper Basin Weed Warriors at the first ever Copper Basin Weed Smackdown pose with their 231lbs of white sweetclover. 36

Figure 31. Close up of narrowleaf hawksbeard. 37

Figure 32. The 2013 park EPMT headed out to do aquatic invasive surveys (Tim, Morgan, Fraser, and David). 38

Figure 33. David (left), EPMT technician, staffs an information booth with park interpretive staff at the Kenny Lake Fair..... 39

Figure 34. View from Dead Dog Hill rests area on the Nabesna Road. 40

Tables

Page

Table 1. Invasive plant management person hours for WRST EPMT staff, youth groups, & volunteers. 12

Table 2. Summary of WRST EPMT invasive plant management species acreage accomplishments. 13

Table 3. Infestation priorities for control work in the Nabesna Front Country RZ for 2013. 23

Table 4. Infestation priorities for control work in the McCarthy Front Country RZ for 2013. 18

Table 5. Seeds collected during the “Need for Seed” public native seed collection event held on August 12 – 16, 2013 within a 20 mile radius of the Kennecott Mines NHL. Some seeds listed here were donated by Mark Vail and collected in and around the McCarthy Road. 21

Abstract

This report describes the work performed by the Alaska Exotic Plant Management Team in Wrangell-St. Elias National Park and Preserve during the 2013 season. Three Alaska Exotic Plant Management Team members were stationed at Park Headquarters in Copper Center while working at various locations within the park and preserve. Work focused on invasive plant inventories and treatments park-wide, revegetation/ restoration efforts around park facilities and native seed collection in Kennicott Valley. Work was mapped using Trimble GeoXT units and was performed with the help of volunteers, a Southeast Alaska Guidance Association crew, Youth Conservation Corps interns, one Student Conservation Association intern, one Chicago Botanic Garden Conservation Land Management intern, and one seasonal biological technician for the National Park Service. Data was edited and analyzed using GPS Pathfinder Office and ArcGIS 10. A total of 128 bags totaling 2,182 pounds of manually pulled weeds were bagged and then taken to an incinerator in Anchorage to be burned. 9.17 acres of plants were treated in 2013 and a total of 1.37 acres were restored through re-vegetation efforts.

Acknowledgments

The Wrangell-St. Elias National Park and Preserve Exotic Plant Management Team members would like to extend a big thanks to all who helped us weed this year. First, thank you to the private landowners Urban Rahoi at Ptarmigan Lake and the Collins' Family at Long Lake for allowing us to conduct surveys on their airstrips. Also, thank you Erika French, Evan Platt and Gayle Gordon for volunteering with us this season. We also appreciate the Southeast Alaska Guidance Association crew members and Youth Conservation Corps interns for providing lots of continued effort to pull our largest and most persistent infestations. We would also like to recognize Mark Vail of McCarthy for his generous donation of native seeds to our newly established seed bank program and Trey Simmons of the NPS Central Alaskan Inventory & Monitoring Network for providing us with the *Didymo* data outlined in this report.

Abbreviations

AKNHP	Alaska Natural Heritage Program
CB-CWMA	Copper Basin Cooperative Weed Management Area
CLM	Chicago Botanic Garden's Conservation Land Management
DOT	Alaska Department of Transportation
EPMT	Exotic Plant Management Team
GPS	Global Positioning System
NHL	National Historic Landmark
NPS	National Park Service
ORV	Off-road vehicle
RZ	Reporting zone
SAGA	Southeast Alaska Guidance Association
SCA	Student Conservation Association
WMC	Wrangell Mountain Center
WRST	Wrangell-St. Elias National Park and Preserve
YCC	Youth Conservation Corps

Introduction

While invasive plants are mostly limited to areas of human disturbance in Alaska, several species have begun to infest undisturbed ecosystems (Carlson et al. 2008). The potential for these species to

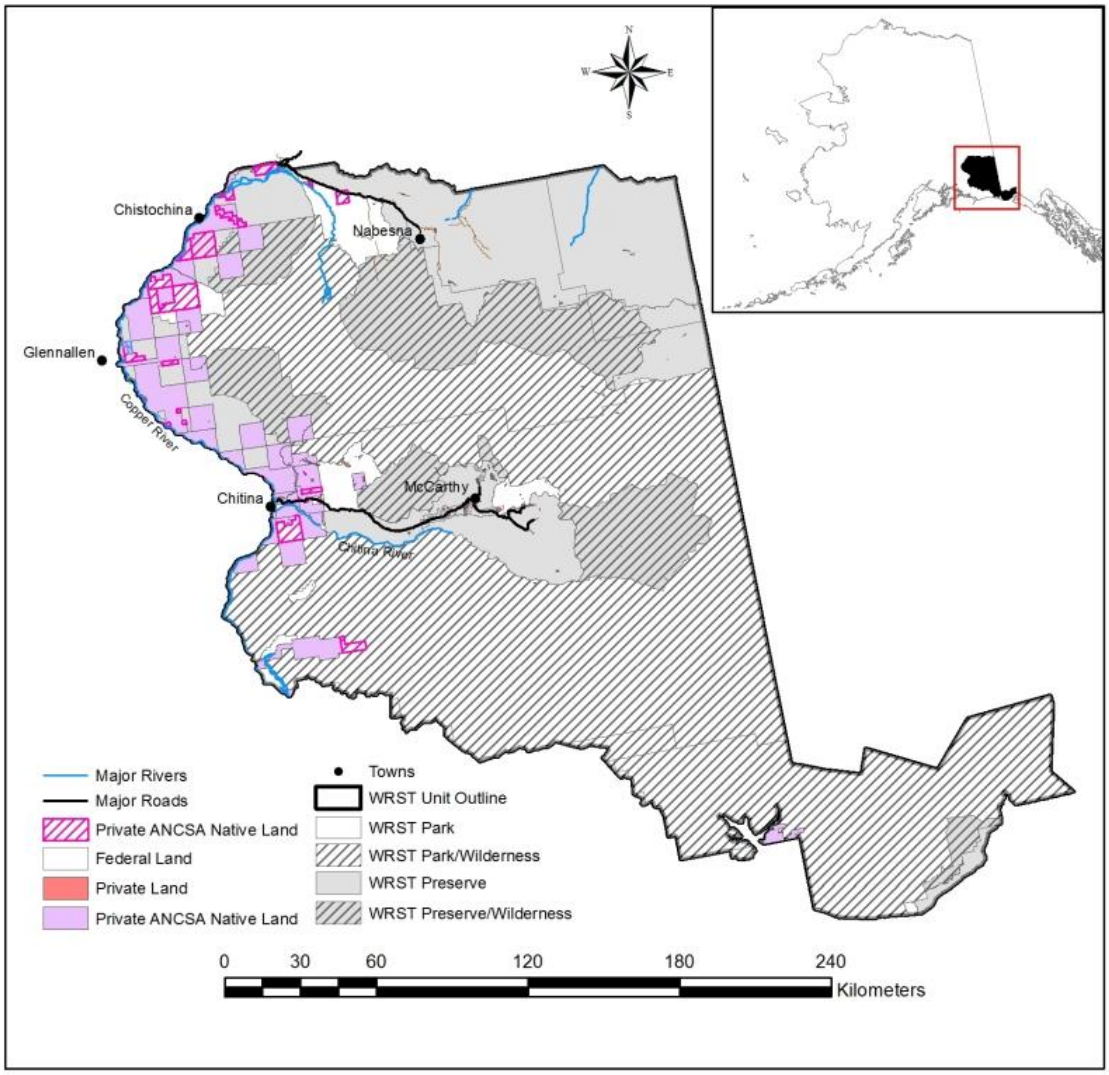


Figure 1. Map of Wrangell-St. Elias National Park and Preserve with inset of location within Alaska.

disperse via glacial river systems and potentially benefit from climatic change presents a real ecological threat to Alaska's wildlands (Spellman and Wurtz 2010). Climate change could play a direct role to the success of invasive species as they are better able to adjust the timing of their annual activities in regards to propagation than native species (Willis et al. 2010). As climate changes, invasive species impacts may alter in severity and direction, posing greater threats to natural ecosystems and biodiversity (YISC 2011). Invasive species management has become costly in Alaska, with an annual average of $5.8 million spent between 2007 and 2011 (Schwörer et al. 2012). As time passes impacts and management costs are increasing, in response to these threats the

National Park Service (NPS) Alaska Exotic Plant Management Team (EPMT) has adopted the management approach of early detection and rapid response to invasive plant infestations.

Wrangell-St. Elias National Park & Preserve (WRST) in Alaska is the largest U.S. national park. Encompassing 13.3 million acres, WRST is slightly bigger than Switzerland. The area includes “hard park,” managed like most other national parks and preserve lands that allow such activities as hunting and fishing. In conjunction with Kluane and Glacier Bay National Parks and Provincial Park Tatshenshini-Alsek in Canada, WRST is part of a World Heritage Site containing one of the largest protected ecosystems on the planet. In addition WRST contains the largest amount of designated Wilderness in the country (over 9 million acres) and the Kennecott Mines National Historic Landmark (NHL), the site of the richest copper mine in U.S. history. Two roads, eleven distinct off-road vehicle (ORV) trails, and 19 maintained backcountry landing strips (and numerous unmaintained landing sites) provide access to WRST, although the majority of park lands remain inaccessible to all but foot, river, and floatplane traffic (Figure 1).



Figure 2. Native fireweed blooming by Ptarmigan Lake with Mt. Natazhat in the background.

Existing roads, trails, rivers, float plane lakes and airstrips are the primary vectors for invasive plants in the park. Human disturbed areas, such as the patchwork of private and native corporation lands within the park that have been developed, logging areas, landing strips, abandoned homesteads, or camping and mining sites, offer a welcome home to invasive plants. The land status within WRST is

one of the most complex situations of any unit in the NPS with over 800,000 acres of private, state, Native Corporation, and university lands inside the park boundaries. Due to the Alaska Native Claims Settlement Act of 1971 and the Alaska National Interest Lands Conservation Act of 1980 the ownership of these lands has not been static. Lands within the WRST boundaries have been selected for conveyance to the state of Alaska, Native Villages, and Native Corporations. Until these lands have been surveyed and conveyed they are still considered park managed. Land conveyances began in 1971 and continue today. Likewise the park continues to buy and acquire lands from individuals who wish to sell. Access to non-federal lands across park lands via ORVs or aircraft, plus land uses such as commercial and residential development, logging, and mining add to the challenge of invasive species management.

Remote airstrips (Figure 2) are potential locations for introduction and dispersal of invasive plants onto park lands. WRST has 19 park-maintained remote airstrips, three state-maintained strips (May Creek, and two strips in McCarthy), several privately maintained strips, and perhaps 100 or more airstrips/landing spots that are not maintained but used regularly. There are at least six state-maintained airstrips adjacent to park lands from which visitors, residents, and staff members all access the interior of the park: Beaver Creek, Canada; Chistochina; Chitina; Gulkana; Tok; and Yakutat.



Figure 3. The white sweetclover (*Melilotus alba*) infestation that EPMT targets for control at the intersection of the Nabesna Road and Tok Cutoff.

Invasive plant species are a concern to resource managers because they threaten the genetic integrity of native flora through hybridization, can out-compete resident plant species for limited resources, can change the structure and function of ecosystems through alterations of geochemical and geophysical processes, and can impact fish and wildlife habitat (Vitousek et al. 1996, Gordon 1998). From 2000-2004 baseline surveys were conducted for invasive plants on Alaska NPS lands (Densmore et al. 2001, McKee 2003, Bauder and Heys 2004). The NPS established the Alaska EPMT in 2003 (McKee 2003) and WRST established a park based EPMT program in 2005 (Gilmore 2005). Since then the program has grown mostly through youth internship programs. The 2013 WRST EPMT field season crew consisted of three core members: one seasonal employee and two seasonal interns.

Objectives

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

Terrestrial Invasive Plants

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

Some of the most aggressive known infestations that are monitored and controlled every year in WRST are white sweetclover (Melilotus alba) at the intersection of the Nabesna Road and Tok Cutoff (Figure 3), oxeye daisy (Leucanthemum vulgare) in Kennecott, common tansy (Tanacetum vulgare) at the Glennallen park maintenance yard, and scentless false mayweed (Tripleurospermum inodorum) at the Betty Freed property, NPS seasonal park housing in Slana.



Figure 4. Aquatic Invasive Species Canadian Waterweed (*Elodea canadensis*).

Areas with high visibility, human activity, or probable pathways (areas likely to transfer invasive plants or seeds to other areas of the park) are also a priority. Annual monitoring and control efforts continue around WRST visitor centers in Slana, Copper Center, Chitina, McCarthy, and Kennecott Mines NHL. This year's survey efforts were focused on the McCarthy Road, backcountry airstrips, float plane lakes, and Kennecott Mines NHL.

Aquatic Invasive Plants

Climate change and invasive species pose serious threats to the structure and function of aquatic ecosystems worldwide (Parmesan and Yohe 2003). In August of 2010, the USDA Forest Health Protection program became aware of a substantial infestation of Canadian waterweed (*Elodea canadensis*) in the Fairbanks area (Wurtz and Lisuzzo 2010). Further research lead to the discovery that *Elodea* had been

previously documented in Cordova, a coastal town just outside park boundaries with lots of float plane traffic into WRST, but that information was not widely known. The Forest Service returned to the Cordova float plane lake and confirmed that there is an infestation.

One of the unique features of WRST is that it manages the famous Copper River salmon fishery (Demientieef 2002). *Elodea* has been documented to directly compete with Chinook salmon for breeding habitat (Mertz et al. 2008). It is estimated that *Elodea*, if left unmonitored and allowed to spread, would cost the state of Alaska $230,000 a year in future commercial salmon harvest revenues and over a million dollars a year in future sport fishing revenues (Wurtz and Lisuzzo 2010). Because of the importance of the Copper River salmon fishery, one of the more important fisheries in the state, the park is concerned about the introduction of this invasive and the effect it could pose on the health of the fishery in the Copper River Watershed. For this reason the EPMT is monitoring lakes with high float plane traffic for the occurrence of *Elodea.* In addition the need for public outreach and education on *Elodea* was recognized as a priority.

Didymo (Didymosphenia geminata) or "rock snot" is a diatomaceous algae that is considered to be native to cold, oligotrophic waters in the northern hemisphere. Didymo was present in Canada in the late 1800s, but did not begin to cause problems until the early 1990s (Spaulding and Elwell 2007). According to a 2011 update from AKNHP, 2007 was the first reported nuisance bloom in Alaska on the Brooks River (Bogan 2011). D. geminata is the only freshwater diatom to exhibit large scale invasive behavior and the ability to alter foodweb structure and hydraulics of streams and rivers (Spaulding and Elwell 2007). With climate change on the rise, Didymo has the potential threat to significantly impact stream ecosystem function if not properly monitored and managed. The key to curbing the spread of Didymo is educating fly fishermen in particular about cleaning their equipment and making sure to not use felt bottomed waders. In an effort to monitor the status of Didymo and ensure that aggressive invasive behavior does not occur in Alaska, several records of Didymo data collected by Trey Simmons were added to the following reporting zones in the WRST EPMT database: St. Elias/Chugach Mtns, Nabesna Front Country, Tetlin/Tanacross North Country, White River, Coastal/Icy Bay, and one additional record on Icy Bay Stream just outside the Park boundary.

Restoration & Prevention

Alaska NPS units are directed to restore sites with local seed sources and/or native vegetation (NPS 2010). NPS is directed to limit the impacts, such as introduction of exotic species, on natural systems by restoring areas disturbed by NPS activities such as construction.



Figure 5. SAGA crew youth sorting collected native seed for drying in Kennecott.

Restoration of native plants accelerates the recovery of the biological community function and physical components of these systems (NPS 2006). Thru Executive Order 13148, federal agencies are directed to promote environmentally sound landscaping practices and programs to reduce adverse impacts to the natural environment. Agencies are also expected to minimize adverse impacts of actions or projects on existing native plant communities by requiring on-site managers and contractors to ensure that practices which minimize impacts to natural habitat are followed during construction (Clinton 1994).

Outreach, Education and Partnerships

An objective of the Alaska EPMT is to inform employees, local residents, and park visitors about the threats and impacts caused by invasive plants and provide steps that individuals can take to minimize those impacts. For any management plan to be effective, the public must recognize the threats posed by nonnative plant species, change behavior that results in the spread of infestations, and provide support for management efforts (NPS 2006). Education is also vital to gain public, industry, and political support for prevention, control, and detection activities. As rural communities continue to grow and as introduction of new weeds become a greater threat, education will help rural communities avoid problems occurring in other parts of Alaska (AKDNR 2011). To build support for prevention programs, managers need to rigorously quantify the economic and ecological impacts of invasive species and clearly communicate this information to the public (YISC 2011). Partnerships with other landowners is critical as weeds do not recognize boundaries and often it is the invasive plants outside of park boundaries that are the reservoir for establishing populations within the park.

Methods

The 2013 WRST EPMT consisted of one Chicago Botanic Garden Conservation Land Management intern: Morgan Gantz, one Student Conservation Association intern: D. Fraser Watson, and one seasonal biological technician: David Krimmel. The 2013 EPMT staff members were stationed at the WRST Headquarters in Copper Center. Three different Southeast Alaska Guidance Association (SAGA) crews assisted the WRST EPMT for a total of three weeks and five Youth Conservation Corps (YCC) students assisted for three weeks.

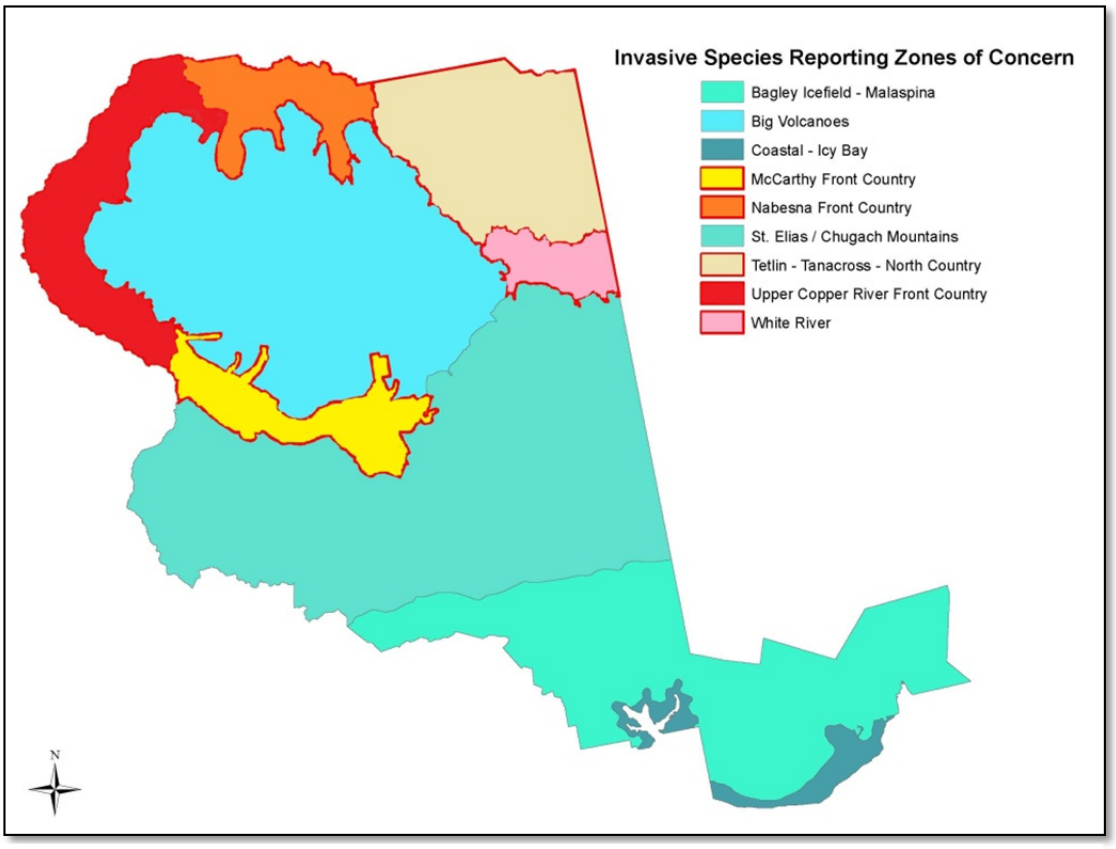


Figure 6. EPMT Reporting Zones (RZ) in Wrangell-St. Elias after Drazkowski et al. 2011.

Due to the park's large geographic range, reporting infestations or restorations at a meaningful scale has been a challenge. For reporting purposes WRST EPMT has adopted the eight reporting zones (RZ) that were developed and used for the 2011 WRST Natural Resource Condition Assessment (**Figure 6**, Drazkowksi et al. 2011).

All inventory, control, and restoration work is mapped using a Global Positioning System (GPS) Trimble GeoExplorer 2008 Series GeoXT. These units were used to record location and attribute information for geographic information system analysis. GPS units can achieve sub-meter horizontal accuracy and were equipped with a standard Alaska-specific data dictionary enabling both precise

mapping and standardized data collection. GPS data was post-processed and edited by field personnel using GPS Pathfinder Office, then transferred to the regional office for processing.

Weeds are primarily disposed of at an incinerator in Anchorage although occasionally they might be destroyed onsite at particularly remote locations due to the difficulty of transporting them back to headquarters.

Inventory and Control Work

Invasive plants were inventoried and monitored following the 2013 Alaska EPMT field protocol (Million et. al. 2013). Both areas with and without invasive plants were mapped with detail sufficient to analyze any changes to infestation size. The data were collected for incorporation into two databases: Alien Plant Control and Management Database – the nationwide NPS database for invasive plant data – and Alaska Exotic Plant Information Clearinghouse – a collaborative, web-based database for tracking invasive weed infestations in Alaska. Attributes are based on North American Weed Management Association standards and describe the size, density, and severity of the invasive plant infestation being mapped.

Terrestrial Invasive Plants

Infestations in the McCarthy Front Country RZ and Nabesna Front Country RZ were analyzed for prioritization utilizing the AKNHP species ranking and infestation occurrences (Appendix A). Category A represents high risk infestations with a relatively small amount therefore targeted by EPMT for eradication. Category B represents high risk infestations with a relatively large amount therefore targeted by EPMT for containment. Category C represents low risk infestations that are not widespread and are managed by the EPMT only as time allows.



Figure 7. Fraser, EPMT SCA, performing a walking inventory.

Areas of human development, frequent use, and likely vectors into the park were the main focus of invasive plant surveys. Walking and bicycle inventories were conducted along roadsides, trails, and at WRST Headquarters to identify previously unknown invasive plant infestations. Particular attention was paid to areas of obvious disturbance, such as gravel pits, pullouts, new culvert sites, airstrips, etc. If invasive species were found in numbers that could be controlled within a reasonable time frame, they were removed by hand. Control work was conducted using manual methods, including pulling, digging, cutting, and mowing. Weeds were then disposed of in clearly labeled plastic bags which were packed full and tied

tightly. These bags were stored in a connex container designated for weed storage until they could be taken to an incinerator in Anchorage at the end of the season.

On particularly aggressive or large infestations where hand pulling would be ineffective or too time consuming, herbicide is an effective tool in lowering seed production and eradicating invasive species. Herbicide within the park is used in accordance with the 2010 NPS herbicide Environmental Assessment's (EA) Finding of No Significant Impact (FONSI). In 2013, WRST, targeted only narrowleaf hawksbeard (*Crepis tectorum*) and common tansy (*Tanacetum vulgare)* with herbicide. The low toxicity level herbicide, Milestone, was used to control these species at a rate of 6 oz. per acre. A total of 0.79 oz. was sprayed to control 0.133 acres of plants. All herbicide applications were made by state of Alaska certified pesticide applicators using a precise, spot application method with calibrated backpack sprayers. The public was notified of treatments via press release (Appendix C). Best management practices are followed to ensure legal, safe, and responsible herbicide use (NPS 2010).



Figure 8. Tim, regional EPMT seasonal, surveying for invasive aquatics by packraft in Wrangell-St. Elias.

Aquatic Invasive Plants

Canadian Waterweed (*Elodea Canadensis*), was surveyed by EPMT using pack rafts and dip nets. This year was the 3rd year of monitoring lakes with high float plane traffic for *Elodea* (Lain 2012). Because of the quantity of lakes in WRST and the high cost of getting there (most are only accessible by float plane) the EPMT is trying to work up a rotational schedule whereby lakes with the highest probability of *Elodea* establishment are surveyed each year. In 2013 three lakes were surveyed: Tebay Lakes (St. Elias-Chugach Mountains RZ), Tanada Lake (Nabesna Front Country RZ), and Long Lake (McCarthy Front Country RZ). All of these lakes receive float plane traffic from Cordova, where known infestations of *Elodea* occur. It is important to note that all of the lakes targeted for surveys in 2013 are salmon spawning lakes.

To raise public awareness of this new threat to Alaskan waters, a newspaper article was published in the Copper River Record during June (Appendix B) and a letter was sent to commercial use operators who access WRST water bodies (Appendix C). Chicago Botanic Garden intern, Morgan Gantz, also wrote a blog entry regarding this aquatic invasive in Alaska. Continued education and outreach to floatplane users, commercial use operators, and concessionaires will be critical in keeping this weed out of the park waterways.

Restoration & Prevention

Since its inception, the EPMT at WRST has attempted minor restoration efforts around the new park headquarters at Copper Center which had many construction-disturbed areas (Gilmore 2005). Around 2010 the EPMT began working much more closely with the maintenance division in regards to both restoration and prevention (Lain et al 2011) and in 2011 the EPMT became more seriously involved in restoration planning (Lain 2012). Restoration areas were mapped similarly to inventory and control work.



Figure 9. Before (left) and after (right) pictures of beds outside the restrooms at Copper Center headquarters.

Restoration efforts at park headquarters have focused on delineating and restoring natural areas and planting grass in mowed areas as well as creating native plant beds for interpretive purposes (Lain and Terwilliger 2013). Efforts at Chitina have focused on re-establishing the historic lawn with grass seed and fertilizer and making sure it gets mowed regularly. Where the lawn was re-established, weed-free grass seed (Alaska Lawn Mix), was used and spread at a rate of 41 lbs. per 1,000 sq. feet. Both the 18-32-16 fertilizer and the lime were spread at a rate of 15 lbs. per 1,000 sq. feet. In Kennecott, restoration efforts were identified in the Kennecott Operations Plan (NPS 2013b) and involve collecting native seed for herbaceous re-vegetation around the NHL, planting grass in historic lawn sites and planting fast growing native shrubs (mainly willow and alder) in select areas for screening and stabilization purposes. In the Nabesna area restoration efforts have centered on current park projects such as the building of the Kendesnii Campground and the ORV trail re-routes (NPS 2011).

A key component to prevention has been ensuring that equipment is cleaned and sterilized (with a steam cleaner) prior to moving it to whatever portion of the park it is going to be used and re-cleaning it before moving it to another portion. The park is not only working on improving our own efforts in this regard but making it a part of contract language.

The park has also incorporated the salvaging of tundra mats as part of trail work in the park. This acts as both restoration and prevention. Tundra mats are removed from sections where trail is going to be installed and then used later on bare cut-banks or down slopes. This provides both an organic layer and a seed source for bare areas and reduces the ability for invasive plants to take root and the amount of time for natives to recolonize. The park has used this successfully on the new River Overlook trail at headquarters (Upper Copper River RZ), the Kendesnii Campground, and the ORV trail re-routes (both in the Nabesna Front Country RZ).



Figure 10. David, EPMT technician, mapping seed collections in Kennecott as part of the Need for Seed event.

Outreach, Education & Partnerships

WRST EPMT participated in 4 community events this season: the McCarthy 4th of July parade, the first ever Copper Valley Weed Smackdown, the Kenny Lake Fair and the first ever Need for Seed event in Kennecott. The crew set up a public education booth at both the McCarthy parade (Fugure 14) and the Kenny Lake Fair and connected with community members about the threat of invasive weeds in Alaska. The new Need for Seed public native seed collection event was also advertised at the McCarthy parade in an effort to recruit volunteers and educate the community on the importance of restoration with native wild seeds. The Weed Smackdown and the Need for Seed events were successful events that we expect will become regular annual events.

Two articles regarding invasive weeds, one on *Elodea* and the other on chemical treatment, were published in the Copper River Record in June to spread awareness to citizens within the valley (Appendix B). Letters to all commercial use operators, including float plane users, fishing guides and backcountry concessioners about *Elodea* were written and sent out early in the season in an effort to build awareness amongst the user groups who are most likely to come across this invasive aquatic (Appendix D). Morgan, the Chicago Botanic Garden's Conservation Land Management (CBG CLM) also contributed 4 blog entries to the CBG CLM blog (http://clminternship.org/blog/) as part of her internship.

The park EPMT has long been involved in the fledgling development of the Copper Basin Cooperative Weed Management Area (CB-CWMA). In 2013 the group became more official with the passing of a Memorandum of Understanding early this summer, with signatures currently being solicited from 13 public, private, and nonprofit parties in the region (CB-CWMA 2013) and the establishment of an email listserve hosted by the Copper River Watershed: copperbasininvasives@lists.copperriver.org. This year also marked the first year that the CB-CWMA

organized a public weed removal event, the Glennallen Weed Smackdown which focused on the removal of white sweetclover in Glennallen.

Results

Overview

It is important to note that this spring was unusually cool and wet in Wrangell-St. Elias. The snowpack continued to increase through the first two weeks of May; normally it starts to deteriorate in April. The Central Alaska Network Inventory and Monitoring Program (NPS 2013a) reported that May precipitation in Wrangell-St. Elias was an impressive 327% above normal. As a result, plant phenology was much delayed this year and it took a long time for both the ground and lakes to thaw this year. This made some of the planned control work difficult to implement. In addition, a late snow event at the end of May caused a landfall of migrating birds including thousands of seed eating Lapland larkspurs (*Calcarius lapponicus*) in the Copper Basin. It seems that these birds ate a lot of weed seed as several large, known infestations, were almost negligible this year especially around the park headquarters. In addition seed success rate from re-vegetation efforts were also lower than usual, which may be in part from the consumption of theses seeds by the very hungry larkspurs.



Figure 11. Copper Lake trail running through the boreal forest.

A total of 2,505 field hours were logged by WRST EPMT members and volunteers this season. The 2013 WRST EMPT crew spent a total of 1,009 person hours in the field, while the youth groups (Figure 7) and other volunteers added 1,496 hours (Table 1). At the end of the 2013 field season WRST had mapped a total of 295.26 acres finding 70.52 acres infested with invasive plants, most of which are located along road and trail corridors and in communities within the park (Table 2). When the Alaska EPMT program first started in WRST, the main focus was mapping infestations outside of the park to understand where the seed sources and pathways were located (Gilmore 2005). While the mapping of new infestations is still a key part of the program, the focus has now shifted to monitoring and treating known infestations within WRST boundaries (Terwilliger et al. 2010) and prevention of the spread of new infestations through park activities. This year a total of 9.17 acres of invasive plants were treated and the total canopy acres controlled was 0.4 while 1.37 acres were restored (Table 2).

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

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

*Hours for SCA's are a rough estimate

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

Most of the efforts of the EPMT focus on what is considered Front Country which includes the McCarthy, Nabesna, and Upper Copper River RZs. Other RZs have specific areas that are of concern or are inventoried and monitored opportunistically. The Coastal –Icy Bay & Bagley Icefield RZs get the least amount of attention as they are not very accessible for either staff or visitors.

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

Fiscal Year	Invasive GPS Data[1]													New Exotic Plant Spp
	NPS Managed Lands			Non-NPS Lands inside boundary			Non-NPS Lands outside boundary			Total Acreage			Acres Restored[3]	
	Acres Surveyed	Acres Infested[2]	Acres Treated	Acres Surveyed	Acres Infested	Acres Treated	Acres Surveyed	Acres Infested	Acres Treated	Acres Surveyed	Acres Infested	Acres Treated		
2003[A]	-	4.95	-	-	3.5	-	-	-	-	-	-	-	-	17
2004	2.46	2.46	0.18	10.03	0.10	0.02	5.03	0.60	0.13	17.52	3.16	0.33	-	1
2005[B]	0.71	0.71	0.17	1.20	1.20	0.24	7.69	1.89	0.41	9.60	3.80	0.82	-	1
2006	284.70	5.19	2.51	16.24	2.89	0.05	30.84	5.20	<0.01	331.78	13.28	2.56	-	9
2007	402.63	8.29	0.37	107.64	5.07	0.18	80.82	7.32	0.36	591.09	20.68	0.91	-	2
2008[C]	383.32	1.45	0.35	434.87	2.99	0.52	1,557.38	0.69	0.22	2,375.57	5.13	1.09	-	4
2009	131.53	20.24	8.43	86.60	21.70	1.90	64.50	9.70	8.70	282.63	51.64	19.03	-	3
2010	804.40	110.40	17.60	476.70	72.30	4.30	175.80	30.30	4.30	1,456.90	213.00	26.20	0.05	4
2011	49.43	24.43	8.48	13.98	4.91	3.01	0.00	0.00	0.00	63.40	29.33	11.49	0.31	1
2012	40.18	12.93	10.07	8.20	1.71	0.10	10.72	7.55	4.93	59.10	22.19	15.10	0.04	0
2013	142.65	20.61	1.92	37.90	0.09	0.00	114.71	49.82	7.251	295.26	70.52	9.17	**1.37**	0

Note: Foxtail barley acreage is included in this data.
1-All acreage was calculated using January 2010 NPS land status. Due to conveyances this may not have been the status at the time it was mapped. Land that has been selected for conveyances but was not yet conveyed by January 2010 are counted as NPS managed land.
2-Acres infested is calculated by acres mapped multiplied by the percent cover in areas greater than 0.5 acres. If under 0.5 acres, acreage mapped is counted as 100%.
3-2010 is the first year that restoration efforts were mapped & seed collections tracked.
A-Data was collected during the 2003 field season but is highly inaccurate/ imprecise. Number of exotic plant species includes all exotic/ non-native species known to occur in WRST prior to 2003.
B-Problems with GPS units resulted in low mapping acres.
C-WRST EPMT members drove and mapped the Richardson Highway and the Nabesna and McCarthy Roads looking for only for white sweetclover. This accounts for the unusually high number of survey acres.
D-Numbers do not count aquatic invasive acres surveyed.

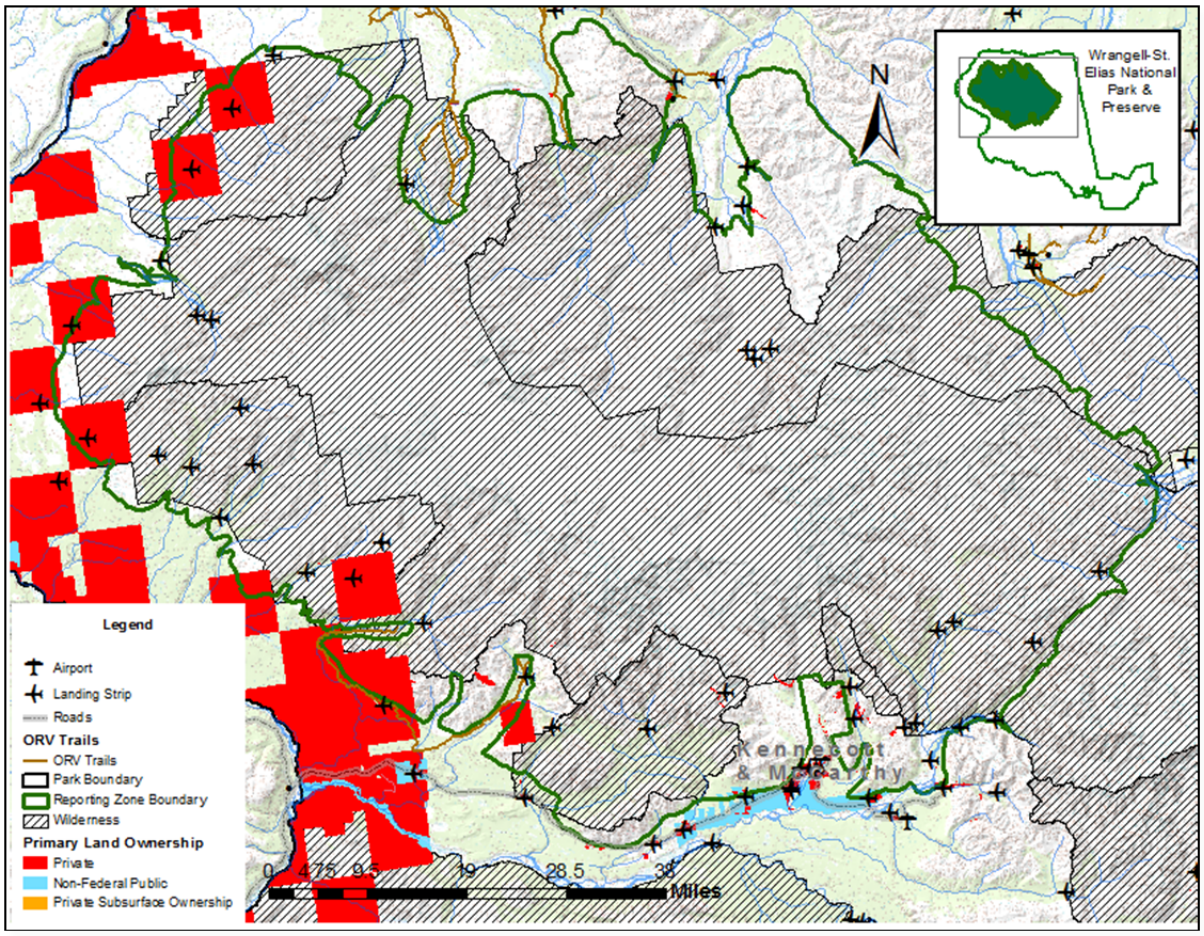


Figure 12. Big Volcanoes reporting zone in Wrangell-St.Elias.

Big Volcanoes RZ

The big volcanoes RZ (Figure 12) is dominated, as its name suggests by volcanic mountains and glaciers and occupies most of the central portion of the park and is predominately designated Wilderness. It is also a mix of hard park and preserve (not shown in **Figure 12** but can be seen in **Figure 1).** However, there are several sites that get high visitation mostly via plane and some off the McCarthy Road in this area.

This year the EPMT crew attempted to hike up to the Marvelous Mill site but due to difficult stream crossings did not make it all the way there. The trail up to the second creek crossing was surveyed and only common dandelion was found. This area has been of some concern since 2003 when a particularly large infestation of black bindweed was reported (274 plants) in an area that is otherwise fairly pristine (Loso 2005). In 2011 park ecologist Miranda Terwilliger revisited the site on a quick day trip and realized that it needed much more in-depth inventorying. In 2012 infestations of Kentucky bluegrass, common dandelion, mouse-ear chickweed, white and yellow clover, black bindweed, nettle, chickweed, shepherd's purse, flixweed, timothy grass, plantago, and pigweed were found and the crew manually pulled the higher ranking species that occurred on NPS lands (Lain et

al. 2012). It is assumed that the weed seeds came in with the horse stock kept by the previous landowner. The NPS will continue to work with the landowners to reduce or eradicate this infestation in the future.

This year, the Nizina airstrip was surveyed and no invasive weeds were found (Watson 2013). In 2010 foxtail barley was documented growing at various locations along the Nizina River, at both of the airstrips at the toe of the Nizina Glacier and at the Lakina River (Lain et al 2011). Infestations of common dandelion were inventoried at the Nizina public use cabin, along the lake on the Donoho Basin trail, at the Peavine airstrip, and at the Hidden Creek Valley trail (Lain et al 2011).

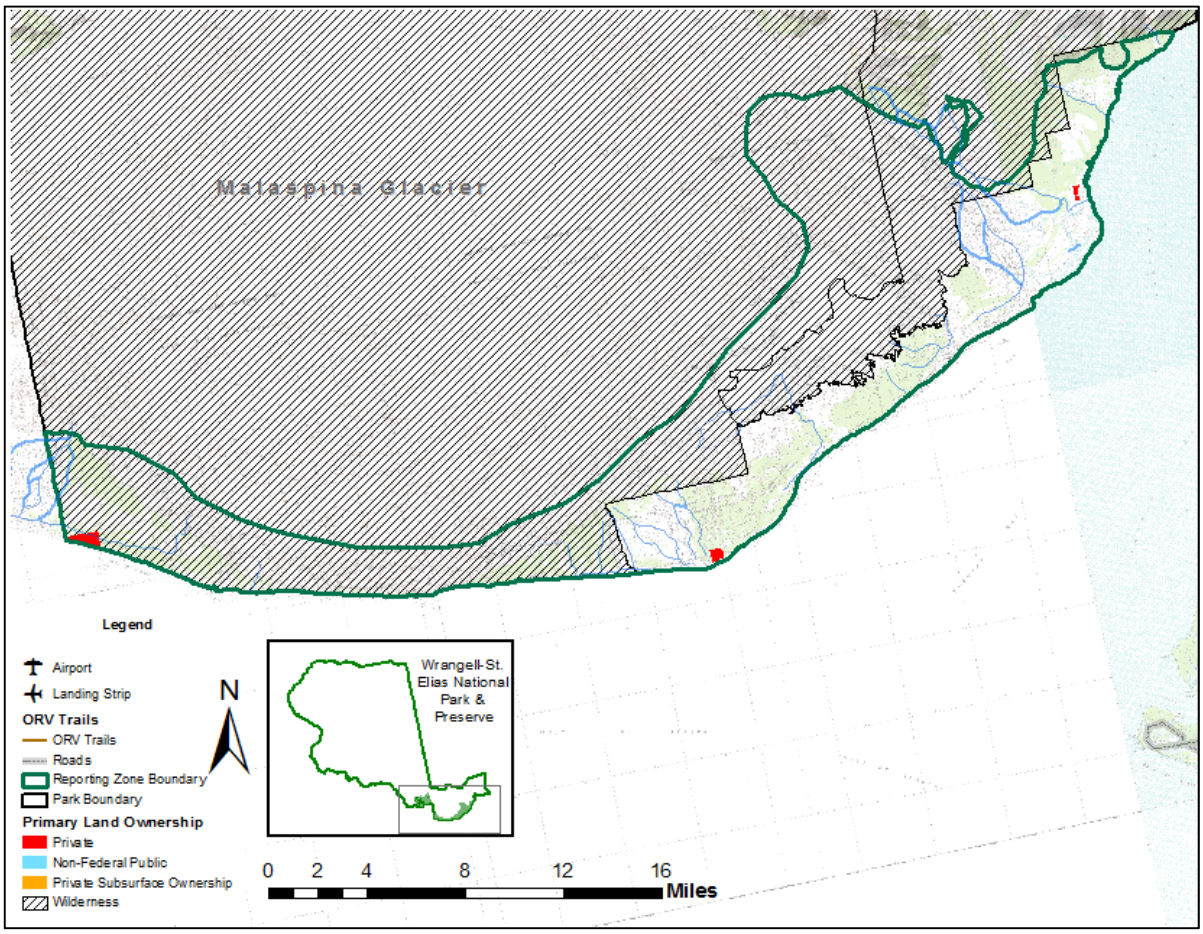


Figure 13. Coastal-Icy Bay reporting zone in Wrangell-St.Elias.

Coastal-Icy Bay RZ

No areas in this zone (Figure 13) have been surveyed since the 2009 field season. In 2009 the Esker Creek public use cabin was surveyed for terrestrial invasive species; no invasive species were found (Terwilliger et al. 2010). Access is a limiting factor for inventorying in this reporting zone.

Within this RZ we have two aquatic records from 2007 of *Didymo* (*Didymosphenia geminata*) at Galiano West Creek with 1 *Didymo* per 800 valves recorded and Icy Bay Stream with 5 *Didymo* per 800 . This area is of concern as it was predicted to receive quantities of marine-origin tsunami debris

from the 2011 Japanese tsunami (NOAA 2011). NOAA predicted a high likelihood of biofouling organisms being attached to this debris. Biofouling refers to the attached and associated free-living organism found on marine structures which have the potential to become invasive species on the North American coasts. This potential threat was underscored by the over 90 non-native living species, several of which are already known as high profile invasive species that were found on a dock that washed up in Oregon (OSU Hatfield Marine Science Center 2012).

McCarthy Front Country RZ

The McCarthy Front Country Reporting Zone (Figure 14) is a complex portion of the park and includes the Chitina Ranger station, Kennecott Mines NHL, the town of McCarthy, the entire McCarthy Road, and is a complex patchwork of private and federal lands as well as a mix of hard park and preserve (not shown in **Figure 14** but can be seen in **Figure 1**). The Chitina River dominates the RZ and several trails are located here. It is the most highly visited area in the park outside of the visitor center in Copper Center.

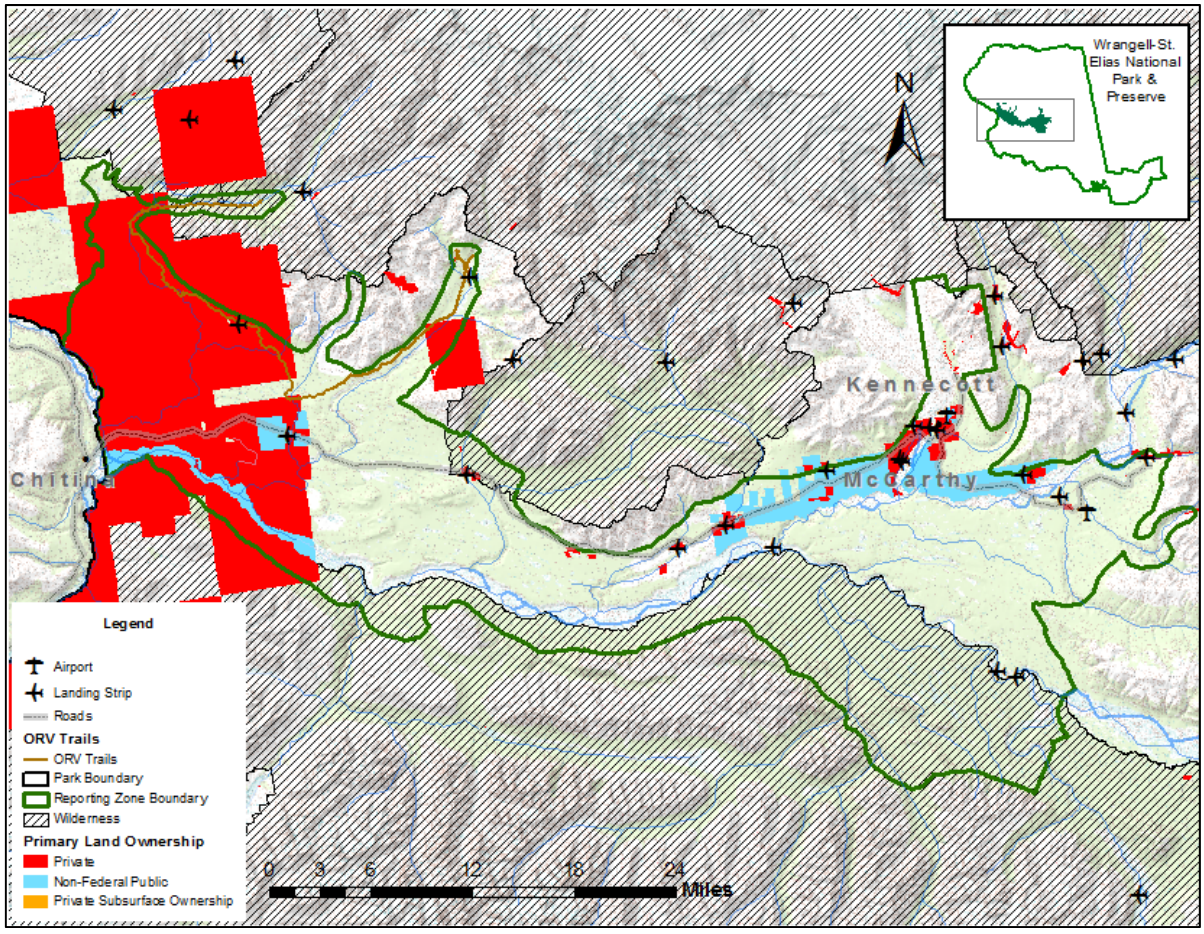


Figure 14. McCarthy Front Country reporting zone in Wrangell-St.Elias.

Table 3. Infestation priorities for control work in the McCarthy Front Country RZ for 2013.

Category	McCarthy Reporting Zone			
	Latin Name	Common Name	Acreage Impacted	2013 AKNHP Rank
A	*Caragana arborescens*	Siberian pea shrub	0.03	74
	Linaria vulgaris	yellow toadflax	0.01	69
	Melilotus alba	White sweetclover	0.000008	81
	Elymus repens	quackgrass	0.05	59
	Leucanthemum vulgare	oxeye daisy	0.61	61
	Galeopsis tetrahit	hempnettle	0.004	50
	Trifolium pratense	red clover	0.43	53
	Polygonum convolvulus	black bindweed	0.11	50
	Tripleurospermum inodorum	scentless false mayweed	0	48
	Rumex crispus	curly dock	0.82	48
B	*Phleum pratense*	common timothy	14.38	54
	Bromus inermis	smooth brome grass	2.44	62
	Vicia cracca	bird vetch	1.75	73
	Taraxacum officinale	common dandelion	309.33	58
	Crepis tectorum	narrowleaf hawksbeard	3.6	56
	Trifolium repens	white clover	40.16	59
	Trifolium hybridum	alsike clover	60.70	57
C	*Thlaspi arvense*	field pennycress	0.30	42
	Silene noctiflora	night-blooming cockle	0.08	42
	Veronica serpyllifolia	thymeleaf speedwell	0.15	36
	Senecio vulgaris	common groundsel	0.38	36
	Viola tricolor	johnny jumpup	0.00022	34
	Poa annua	Annual bluegrass	0.11	46
	Descurainia sophia	flixweed	0.68	41
Inventory Only	*Hordeum jubatum*	foxtail barley	68.63	63

Infestations in the McCarthy Front Country RZ were analyzed for prioritization utilizing the AKNHP species ranking and infestation occurrences (Table 4, Appendix A). Category A represents species infestations with an AKNHP ranking of forty-eight or higher with less than one acre previously mapped on Park lands within the reporting zone. These infestations are of high risk with a relatively small amount. Due to the limited field season in Alaska the infestations in Category A were not eradicated and should be targeted by EPMT for eradication in future years.

This season the WRST EPMT crew conducted a bicycle survey of the 60 miles of gravel McCarthy Road. The first bicycle surveys for roads within the park were conducted in 2010 for both the

Nabesna and McCarthy roads and since then it has been the goal of the EPMT to alternate bicycle surveys between these roads every year.

Common invasive plants observed along the first five miles of the McCarthy road were foxtail barley, common dandelion, narrowleaf hawksbeard and lambsquarter. After mile five, we noticed there was a new grass species established on the roadside. A photo point and voucher specimen was taken and sent into AKNHP for positive identification, we suspect it could be quackgrass (*Elymus repens*). Follow up on the identification should occur in 2014 and the site should be re-visited and fully mapped. Near mile six or seven there was a recent re-vegetation project along the roadside and lambsquarter was one of the first plants to sprout up from this area. Between mile thirty and fifty, many sections had been brush cut and bulldozed by the State of Alaska Department of Transportation to widen the road. There were also several sections of the road where fill had been imported. We suspect that this fill facilitated the transport of invasive species to each particular area as numerous lambsquarter plants were found growing in these locations. It should be noted that in past years the EPMT suspected an infestation of bird vetch (*Vicia cracca*) near Long Lake, but past vouchers positively identified by AKNHP indicate that it is *Vicia Americana*, a native plant rare to interior Alaska. This plant is very similar to its invasive relative and crews should be familiar with both before surveying the area. A pack raft survey for *Elodea canadensis* was also conducted just off of the McCarthy Road, on Long Lake, an important salmon spawning location. No *Elodea* was found. The EPMT once again manned an educational booth in McCarthy during the 4th of July celebrations.

The Kennecott Mines NHL, designated in 1998, is the focus of much of the WRST EPMT efforts in this reporting zone. The landmark encompasses the land, mineral, and associated holdings of the Kennecott Copper Mines in south-central Alaska and includes structures in the historic mill town (Figure 10). The NHL designation encompasses 7,700 acres of public and private lands (Gilbert et al. 2001). Since then the park has acquired or purchased additional lands and buildings. Copper mining operations in Kennecott occurred from 1901 to 1938 and were among the nation's richest (Gilbert et al. 2001). Stabilization work in the Kennecott Mines NHL is currently ongoing and is expected to take many years.



Figure 15. Morgan, EPMT CLM, mapping infestations from her bike.

Construction projects such as this disturb native vegetation and can contribute to invasive weed infestations. In addition, outside fill material that may be used could be a vector for spreading invasive weeds into the park. These areas will need attention in the future, both by pulling invasive

weeds and planting native species. The EPMT has been actively engaged in the planning efforts in the NHL through representation by the park ecologist, Miranda Terwilliger.

In an effort to identify possible transportation vectors for invasive weeds to enter the park, surveys were conducted at remote airstrip locations within this RZ. This year Jake's Bar, Chitina, both McCarthy airstrips and 2 private airstrips, located at Long Lake and the McCarthy Bed and Breakfast, were surveyed for invasive weeds. No invasive weeds were found at the backcountry strip of Jake's Bar. At the Chitina airport, the following weeds were inventoried: lambsquarter (*Chenopodium album*), narrowleaf hawksbeard (*Crepis tectorum*), common pepperweed (*Lepidium densiflorum*) and prostrate knotweed (*Polygonum aviculare*). Through conversation with Don Hofstetter from the Copper River Watershed Project, there is a known infestation of White Sweetclover near the Chitina airport; however no infestations were recorded on the active airstrip.

At both the original McCarthy airstrip (owned by John Adams) and the main state-owned McCarthy airport, the only invasive weeds found were alsike clover (*Trifolium hybridum*) and common dandelion. At the privately owned McCarthy B&B airstrip, located on the west side, before reaching the footbridge, the following invasive weeds were found: common dandelion (*Taraxacum officinale*), foxtail barley (*Hordeum jubatum*), common plantain (*Plantago major*), prostrate knotweed (*Polygonum aviculare*), pineapple weed (*Matricaria discoidea*), common pepperweed (*Lepidium densiflorum*) and shepherd's purse (*Capsella bursa-pastois*).

As part of the park's restoration effort in Kennecott the park kicked off the beginning of what they hope will be an ongoing effort to collect native seed in the Kennicott Valley this year. Intern, Morgan Gantz, CBG CLM, organized and lead a week long volunteer native seed collection event entitled "Need for Seed" within the surrounding area of the Kennecott Mines NHL. A seven person SAGA crew assisted during the week of August 12 – 16, 2013 with seed collecting as well as a volunteer from the local community. This event was modeled after the established seed collection event in Denali National Park, the only other Alaska NPS unit to organize such an event. The purpose of this event in WRST is to collect native seeds from the wild within a 20 mile radius of the Kennecott Mines NHL boundary to build a seed bank. Seeds collected will eventually be used for re-vegetation efforts within the NHL (Table 5).



Figure 16. EPMT Staff, SAGA crew members, and volunteers at the first ever Kennecott Need for Seed.

In 2011, 18 birch trees were planted along National Creek in August of 2011 within the Kennecott Mines NHL (Lain 2012). This site was re-visited in 2013 to monitor the success of the planting. Unfortunately, a few birch trees were detected but not in good condition. The trees were planted on a scree rock slope with no soil for the roots to become established. The site was very close to the edge of the creek and possible flooding could have washed out the young trees.

Table 4. Seeds collected during the "Need for Seed" public native seed collection event held on August 12 – 16, 2013 within a 20 mile radius of the Kennecott Mines NHL. Some seeds listed here were donated by Mark Vail and collected in and around the McCarthy Road.

Common Name	Scientific Name	Amount
Dryas	*Dryas Drummondii*	7 lg bags
Leafy Arnica	*Arnica alpina spp. Attenuata*	13.7 g
Large Leaf Avens	*Geum macrophyllum Willd*	117 g
Northern daisy fleabane	*Erigeron acris*	3 g
Alpine Arnica	*Arnica alpina spp. Angustifolia*	0.7 g
Larkspur/Monkshood	*Delphinium glaucum/Aconitum delphinifolium*	7.4 g
Tall Jacobs Ladder	*Polemonium acutiflorum*	20.4 g
Northern Goldenrod	*Solidago multiradiata*	11.4 g
Siberian Aster	*Aster sibiricus*	13 g
Eskimo Potato	*Hedysarum alpinum*	201.9 g
Alpine Arnica	*Arnica alpina ssp. Attenuata*	30.9 g
Geranium	*Geranium erianthum*	4 g
Columbine	*Aquilegia formosa*	19.3 g
Daisy Fleabane	*Erigeron acris*	3 g
Alpine Arnica	*Arnica alpina ssp. Angustifolia*	0.7 g
Lupine	*Lupinus arcticus*	108.7 g
Oxytrope	*Oxytropis Campestris*	7.5 g
Alpine milk vetch	*Astragalus alpinus L.*	5.3 g
wild Rose	*Rosa acicularis*	82 g
Grass of Parnassus	*Parnassia palustris*	3.4 g
Red Currant	*Ribes triste*	142 g
Pasque Flower	*Pulsatilla patens*	17.7 g
Black Current	*Ribes hudsonianum Richardson*	22.7 g
Forget me Not	*Myosotis alpestris ssp. Asiatica*	8.2 g
pale poppy	*Papaver alboroseum*	1.7 g
White violet	*Viola renifolia*	3.4 g

This year, the EPMT planted grass at mowed, maintained areas at the Chitina Ranger station and around the Silk Stocking cottages in Kennecott were seeded with a grass seed mixture obtained from Alaska Mill and Feed in Anchorage. Weed-free grass seed (Alaska Lawn Mix), was spread at a rate of 41 lbs. per 1,000 sq. feet. Both the 18-32-16 fertilizer and the lime were spread at a rate of 15 lbs. per 1,000 sq. feet.

Nabesna Front Country RZ

The Nabesna Front Country RZ (**Figure 17**) is also a complex area of the park with a patchwork of private and federal lands containing, among other things: the entirety of the Nabesna Road, the highest density of trails in the park, the Slana Ranger station, the traditional Batzulneatas fish camp, and the community of Slana. It too is a mix of hard park and preserve (not shown in **Figure 17** but can be seen in Figure 1).

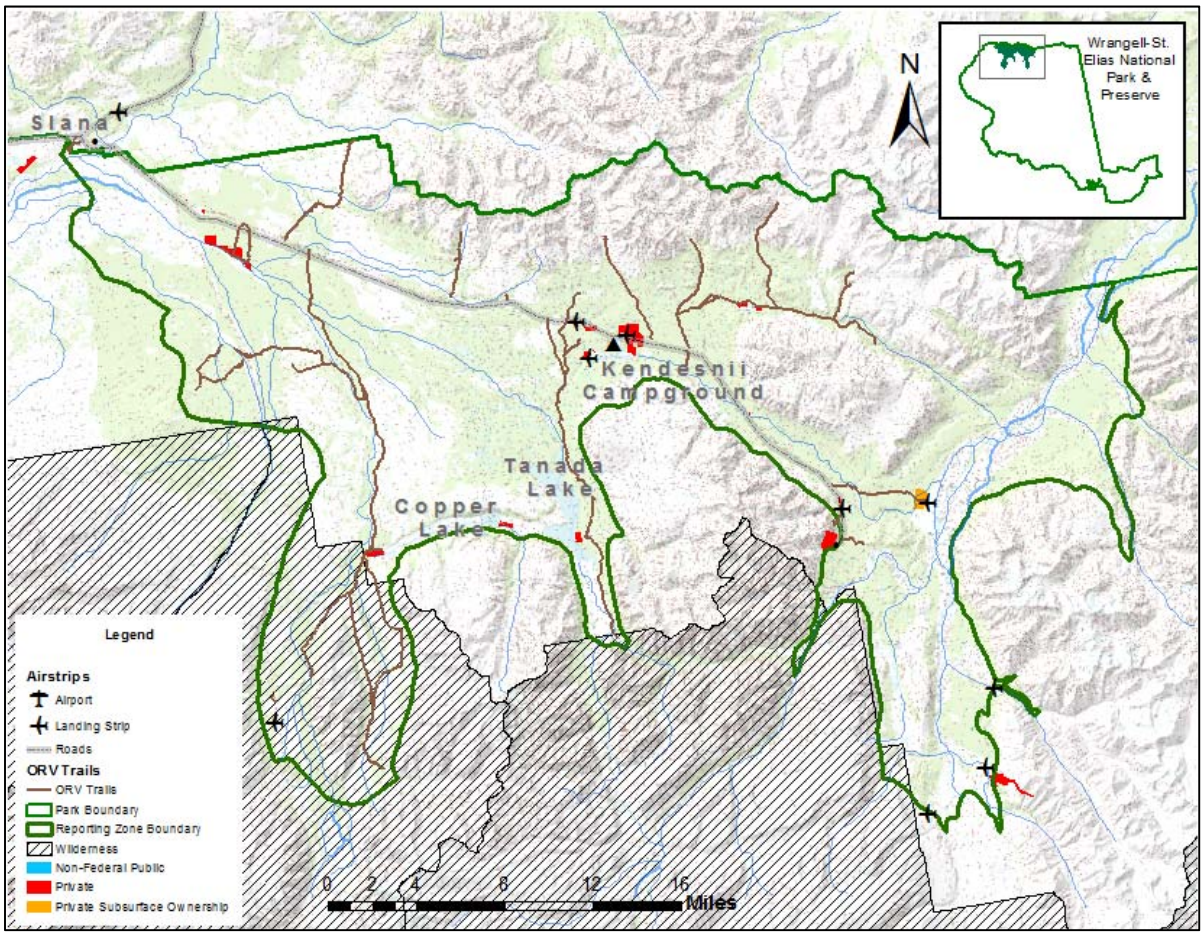


Figure 17. Nabesna Front Country reporting zone in Wrangell-St. Elias.

Infestations in the Nabesna Front Country RZ were prioritized utilizing the species AKNHP ranking and previously mapped infestation acreage (Table 3, Appendix A). Category A represents species infestations with an AKNHP ranking of fifty or higher with less than 0.05 previously mapped impacted acres on Park lands within the reporting zone. Two species were classified as Category A infestations: common timothy (Phleum pretense) and Narrowleaf hawksbeard (Crepis tectorum). According to the 2012 EPMT summary report, infestations of common timothy were mapped and pulled at two locations: one near the outhouse at the Slana Ranger Station, and another at about milepost 17.5 at the bottom of the hill that leads to the roadside way station (Lain and Terwilliger 2013). These two locations were re-visited in 2013 and it appears that control efforts in 2012 were successful because no common timothy was

found at either location. Previous years efforts to pull and eradicate Narrowleaf hawksbeard have been successful since no new infestations in this reporting zone were found.

Although the aquatic species, Canadian Waterweed (*Elodea canadensis),* has not yet been ranked for invasiveness in the state of Alaska, the park considers this a Category A species due to the threat it poses to Copper River salmon habitat and that it has been found in lakes adjacent to Park borders. This year, the WRST EPMT conducted pack raft surveys targeting *Elodea* on Tanada Lake, an important salmon spawning ground within this RZ. No *Elodea* was discovered.

Table 5. Infestation priorities for control work in the Nabesna Front Country RZ for 2013.

Category	Nabesna Reporting Zone			
	Latin Name	Common Name	Acreage Impacted	2013 AKNHP Rank
A	*Phleum pratense*	common timothy	0.000016	54
	Crepis tectorum	narrowleaf hawksbeard	0.04	56
B	*Melilotus alba*	white sweetclover	13.09	81
C	*Lappula squarrosa*	European stickseed	0.39	44
	Descurainia sophia	flixweed	0.002	41
	Capsella bursa-pastoris	shepherd's purse	0.00017	40
	Chenopodium album	common lambsquarter	0.13	37
	Lepidium densiflorum	common pepperweed	0.003	25

Two species were classified as Category B infestations: white sweet clover (*Melilotus alba*) and common dandelion (*Taraxacum officinale* ssp. *Officinale).*The two white sweet clover infestations are not on park lands but are in a vector location just outside of the Nabesna Front Country RZ and are considered a potential threat to park lands. Weeding was again performed on a large infestation of white sweetclover at the Tok cutoff and Nabesna Road intersection (**Figure 18**). This infestation has been intensively weeded since 2005. The EPMT 2012 Summary report indicates that the infestation was controlled for three days in mid-July and for three days in August by the WRST EPMT and SAGA crews. We were scheduled to pull this infestation two times in 2013, early in the season during June and then again late in the season during August. However, due to the unusually cold and late spring plant phenology took longer to get started and no weeds were growing at this location in late June. For this reason the Tok-cutoff infestation was only manually controlled for three days in August by the WRST EPMT and SAGA crews. Even though EPMT waited until August to pull, 85% of the white sweetclover was comparatively small (3-4 inches in height) and not flowering. The 15% that were of normal size and had flowers were targeted as higher priority and eradicated. White sweetclover was pulled on both sides of the Tok Cutoff to the west of the intersection, as well as on

the west slope of the Nabesna Road immediately prior to the intersection. The total area of white sweet clover pulled at the junction of the Tok Cutoff and the Nabesna Road was 1.24 acres.

In 2012, the smaller infestation consisting of forty two white sweetclover plants was inventoried and manually treated by staff near the gravel pit at mile one on the Nabesna Road (Lain and Terwilliger 2013), in 2011 there were thirty three plants at this site (Lain 2012) and in 2010 there were only nine (Lain et al 2011). Control efforts at this location appear to be successful as no white sweetclover was found at the gravel pit during 2013.



Figure 18. David, WRST EPMT staff member, and a SAGA crew with pulled weeds at the Tok Cutoff.

Due to time restraints and infestation locations, common dandelion was not targeted for containment treatments although it is widespread along the Nabesna road.

Category C represents species infestations with an AKNHP ranking of fifty or less with less than 0.5 previously mapped infested acres. Five species were classified as Category C infestations: European stickseed (Lappula squarrosa), lambsquarter (Chenopodium album), shepherd's purse (Capsella bursa-pastoris), flixweed (*Descurainia sophia*), and common pepperweed (Lepidium densiflorum).

In this category, in 2012 the WRST EPMT crew surveyed and pulled the scentless false mayweed and common dandelion at the Betty Freed property. The Betty Freed property is a park owned home (NPS 2001) used for seasonal housing. This year the Freed property was surveyed and the following weeds were mapped: foxtail barley (Hordeum jubatum), pineapple weed (Matricaria discoidea), shepherds purse (Capsella bursa-pastoris), lambsquarters (Chenopodium album), prostrate knotweed (Polygonum aviculare) and plantain (Plantago major). A voucher of what was believed to be common eyebright (Euphrasia nemorosa), was sent in for positive identification by the AKNHP, and was determined to be the native arctic eyebright (Euphrasia subartica). Routine mowing occurs at the Freed property, potentially spreading invasive plants around the yard. To combat invasion, Alaska grass seed mix obtained from Alaska Mill and Feed in Anchorage was laid in the mowed area and mapped as restoration polygons. Weed-free grass seed (Alaska Lawn Mix), was spread at a rate of 41 lbs. per 1,000 sq. feet. Both the 18-32-16 fertilizer and the lime were spread at a rate of 15 lbs. per 1,000 sq. feet. Next year it will be important to check back on the Betty Freed Property for both restoration success rates from the grass seed and also for any new infestations near the back of the property.

Late this season construction work was underway with the placement of a new aboveground septic system building that was put in behind the common area and a gravel road leading back to the building. Much of the land behind the house was ripped up and bare soil was exposed.

There are two species the park considers native but worth monitoring: the aquatic diatomaceous algal species *Didymo* (*Didymosphenia geminata*) and foxtail barley (*Hordeum jubatum*). Whether or not foxtail barley is native to Alaska has been hotly debated; the park's earliest known collection is from 1962 and it is widely spread along the Nabesna Road in this RZ. Rock snot, on the other hand, is considered native but has recently been seen to be acting invasively in Alaska due to warming waters. For now the park does inventory these species when found but does not control them.

In 2012, *Didymo* (*Didymosphenia geminata*) or data collected by the Central Alaskan Inventory and Monitoring Network was added to the WRST EMPT database with 3 records occurring in this RZ. Sampling first occurred in the fall of 2006 at Rock Creek, which resulted in finding 8 *Didymo* per 800 valves. Rock Creek has been sampled 1-2 times per year every year since 2006, *Didymo* was only found in the Fall 2006 sample. In the fall of 2008, Chalk Creek was sampled and reported only 1 *Didymo* per 800 valves. Chalk Creek has been sampled 2-3 times per year every year since 2008, and again *Didymo* was only found in the Fall 2008 sample. Lastly, a potential bloom was noted in August 2011 at Mile 27 of the Nabesna Road but the identification was not confirmed.



Figure 19. Work on the Soda Lake ORV trail re-route.

The park has been undertaking extensive work on the Off-road vehicle (ORV) trails in the Nabesna RZ subsequent to the record of decision on an environment impact statement related to these trails (NPS 2011). The EPMT has been working with the maintenance division on using best practices to avoid the spread of invasive weeds during this work including thoroughly cleaning vehicles and tools before taking them into the backcountry, salvaging native tundra mats to use for local revegation on cut-banks and slopes, and locating weed free gravel sources. The EPMT will also continue to monitor these trails post construction to identify and control any plants that may have come in inadvertently. This year the EPMT assisted with the pre-work evaluation of Trail Creek trail and verified that there were no invasive plants prior to beginning work (Gantz 2013).

St. Elias-Chugach Mountains RZ

The Chugach Mountains feature predominately in this RZ (Figure 20) and most of it is in hard park and in designated Wilderness. Exceptions to this include Tebay Lakes, the lower Bremner River and a portion near McCarthy/ Kennecott NHL. Private and Native corporation lands as well as the Bremner Historic Mining District can be found here as well.

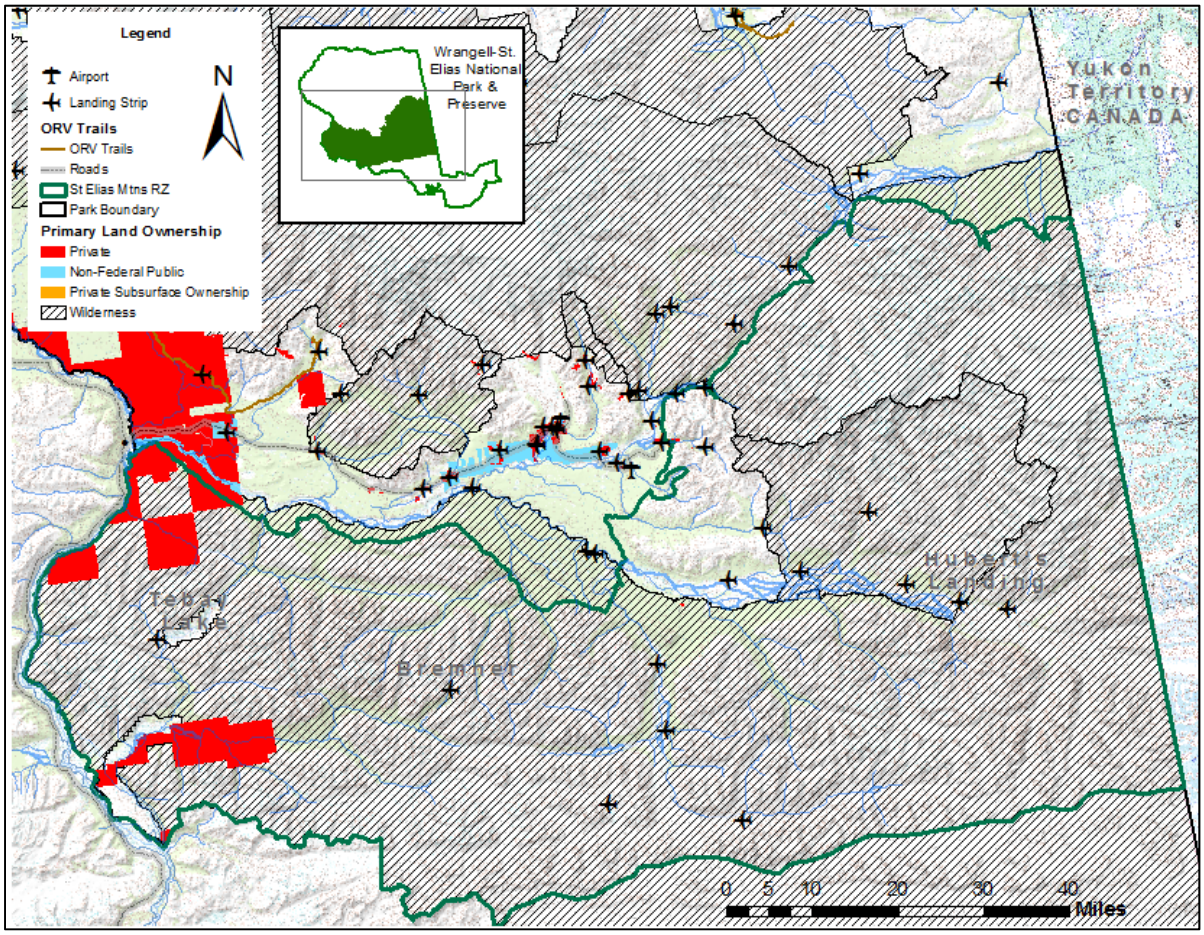


Figure 20. St. Elias-Chugach reporting zone in Wrangell-St. Elias.

This year the WRST EPMT crew and regional data manager, Tim Federal, conducted aquatic surveys via pack raft of Tebay Lakes located within this RZ. Tebay Lakes are very popular for guided fishing arriving via floatplane from Cordova. Cordova is one of the places with confirmed populations of *Elodea*. A float plane dropped off the crew on the lower lake and they portaged to the middle and upper lakes to conduct *Elodea* surveys. In all three lakes, no *Elodea* was found. Because of the high number of commercial float planes that fly into lakes in this RZ from Cordova we recommend that the EPMT continue to survey lakes in the area for *Elodea.*

The other aquatic of concern, *Didymo* (*Didymosphenia geminata*) has been recorded in two areas in this RZ. In 2007, Willow Creek was sampled in 2007 and 13 *Didymo* per 800 valves were found. In 2009, a Tana tributary was sampled and 1 *Didymo* per 800 valves were found.



Figure 21. Lower Tebay Lake surveyed for *Elodea* by WRST EPMT staff.

This year Hubert's landing airstrip was inventoried and no invasive species were found. Currently, the only terrestrial invasive species reported in this zone by WRST EPMT is foxtail barley found along a sand bar on the lower Copper River in 2011(Lain 2012). In addition staff re-visited the Bremner Historic District (White 2000) to check some reports of suspected invasive plants. No invasive plants were found around the historic mining camp or airstrip.

Tetlin-Tanacross RZ

This RZ (**Figure 22**) lies completely within the preserve and has small scattered private lands. Notably it does contain non-federal subsurface ownership, particularly within the Gold Hill Historic (and active) Mining District. The Chisana Historic District contains a still active community and is a popular base for other park activities in the area.

This year the WRST EPMT crew surveyed two remote airstrips within this RZ, the Chicken strip and the privately owned Ptarmigan Lake airstrip. Other than a suspected infestation of Kentucky bluegrass at the end of the strip, no invasive weeds were found at the Chicken Strip (Krimmel and Gantz 2013). A voucher was taken of the suspected bluegrass and sent into AKNHP for positive identification.

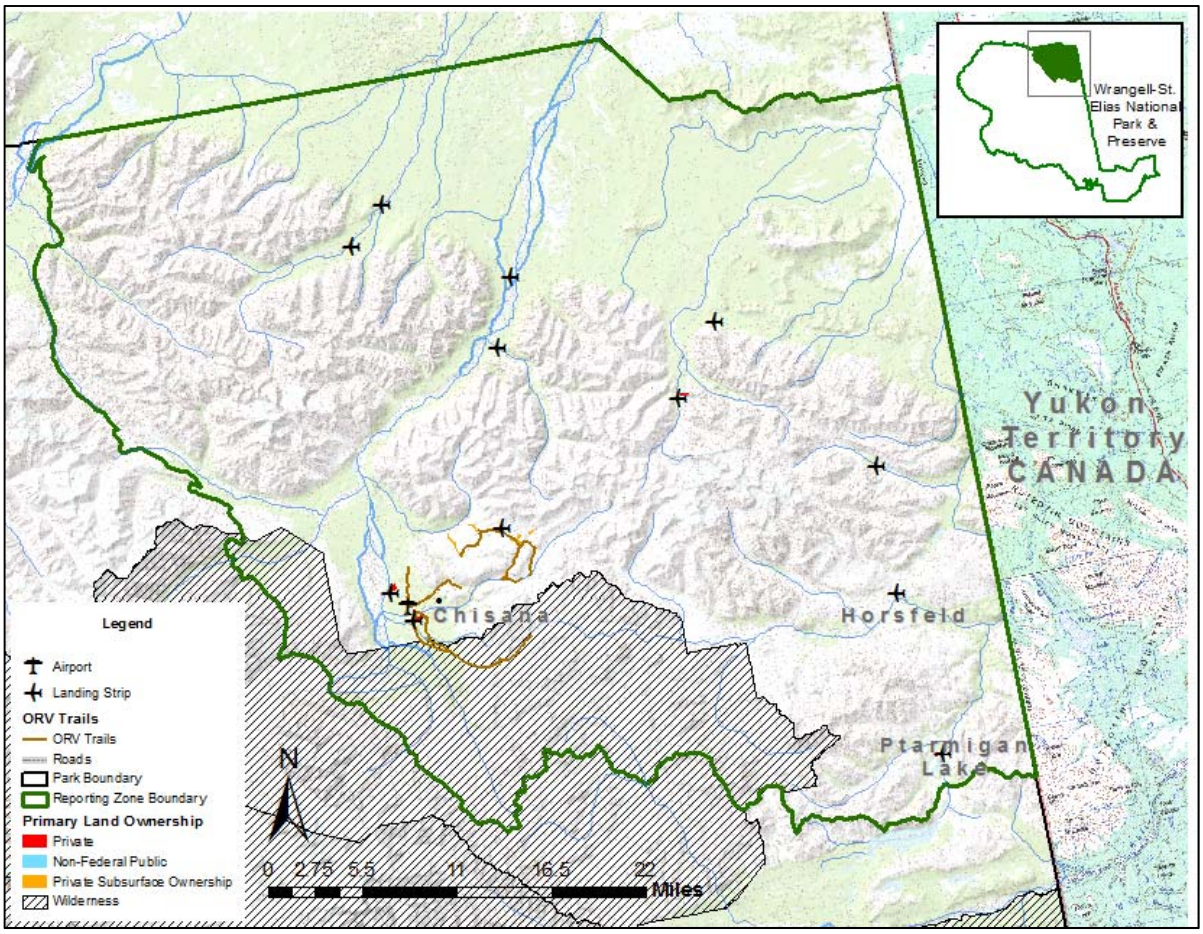


Figure 22. Tetlin-Tanacross reporting zone in Wrangell-St.Elias.

Ptarmigan Lake airstrip, owed by Urban Rahoi, was first surveyed in the late fall of 2009 and only Foxtail barley (*Hordeum jubatum*) and Common chickweed (*Stellaria media*) were discovered (Terwilliger et al. 2010). When revisited in 2013, the airstrip and surrounding private property were inventoried and numerous additional invasive plant species were discovered (Krimmel and Gantz 2013). The active airstrip itself was mainly infested with large amounts of foxtail barley and small patches of prostrate knotweed and chickweed. In addition to foxtail barley, knotweed and chickweed the following plants were inventoried: Perennial Pepperweed (*Lepidium latifolium*), Pineapple Weed (*Matricaria discoidea*), Prostrate Knotweed (*Polygonum aviculare*), Lambquarter (*Chenopodium album*), and Narrowleaf Hawksbeard (*Crepis tectorum*).

Control work at Ptarmigan Lake consisted of 5 bags of pulled weeds weighing a total of 160 lbs. A volunteer, nephew of the caretakers, assisted us with one day of pulling. The weeds were disposed by burning them in an enclosed incinerator. If control work is to be done again in the future at this site, more time and people may be required to adequately assess and treat the airstrip.



Figure 23. Horses on private property at Ptarmigan Lake.

It is important to note that this property has 7 domesticated free-range horses that frequently roam throughout the park. It appeared that many of the common weeds that were found on the property originated from horses transporting them. The location where horse feces were piled up near the stable was completely infested with weeds.

We have some aquatic data for *Didymo* (*Didymosphenia geminata*) in this RZ with 4 records added to the EPMT database in 2012 According to notes, there was a recorded bloom at both Beaver Creek and Ptarmigan Creek in 2006 measuring 48 *Didymo* per 800 valves and 49 *Didymo* per 800 valves respectively. In 2008 Beaver Creek and Bryan Creek were re-sampled with Beaver Creek measuring only 5 *Didymo* per 800 valves, while Bryan Creek measured at 87 *Didymo* per 800 valves. Ptarmigan and Rock Lakes should be considered for future *Elodea* surveys as they get quite a bit of float plane traffic.

Upper Copper River Front Country

Within this RZ (Figure 24), 41% of the land is owned by Native corporations (NPS PDS 2009). For reporting purposes the park headquarters and park properties in Glennallen are included in this RZ although technically they are not in the park. Most of this RZ is inaccessible by road and is in preserve.

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

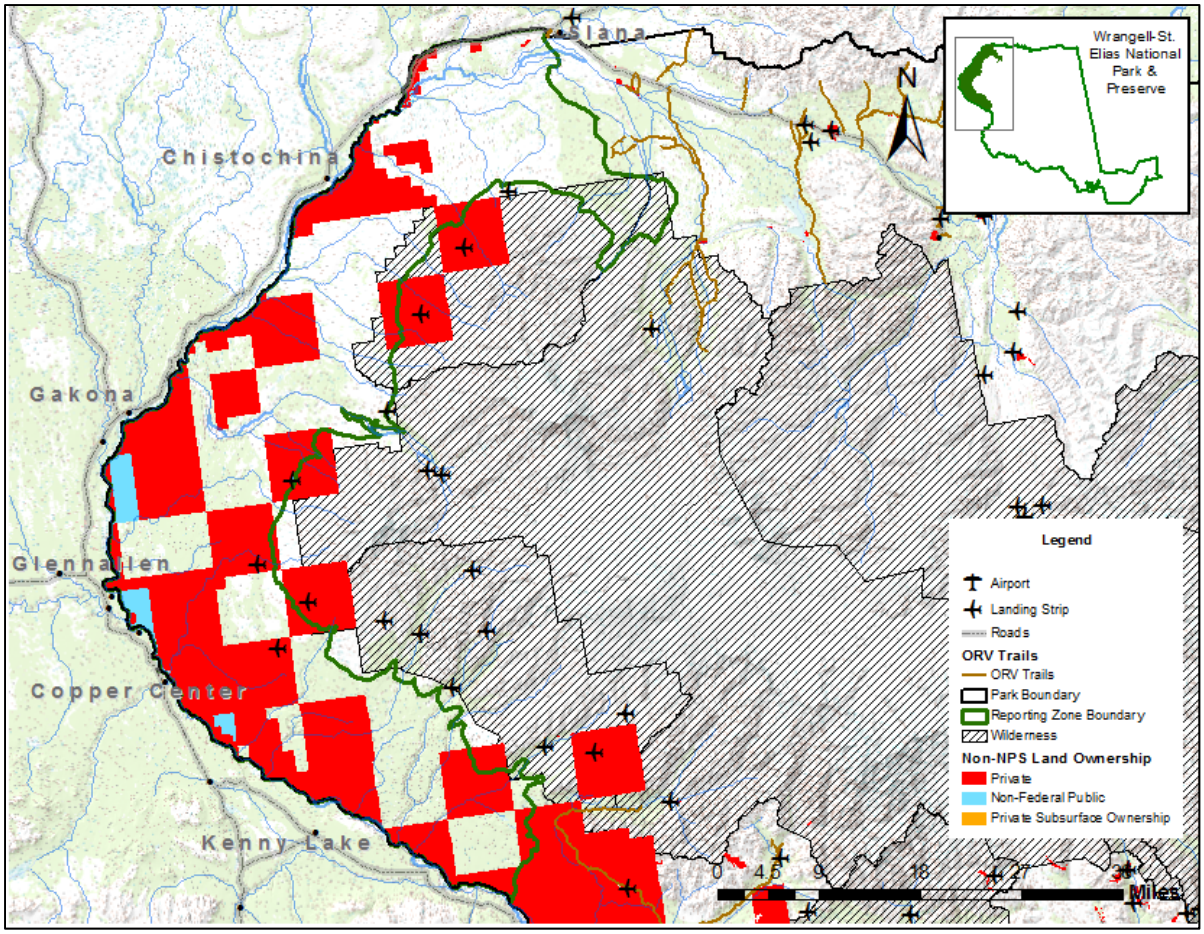


Figure 24. Upper Copper River reporting zone in Wrangell-St. Elias.

In 2013, chemical and manual methods were used to control infestations around WRST Headquarters. A seven person SAGA crew and a four person YCC crew spent two days at the end of June and one day in early August manually controlling known weed infestations around WRST Copper Center Headquarters and adjacent employee housing. The area around WRST's welcome sign was intensively weeded several times this season by WRST EPMT staff and the front area was planted with 12 native rose bushes. This year the maintenance staff removed the log edging in the area and the EPMT successfully lobbied for boulders to be installed to prevent the plantings from being scraped away by winter snow plows. Twenty seven seedling birch trees were also planted behind the sign. Common dandelion, narrowleaf hawksbeard, and foxtail barley were mapped and removed. The WRST EPMT and YCC crews continued the re-vegetation efforts around the Visitor Center that began in 2011.

In other areas around WRST Headquarters, there were continual efforts throughout the season to map and treat narrowleaf hawksbeard, foxtail barley and common dandelion. This year, an aggressive infestation of narrowleaf hawksbeard near the entrance to the Park Headquarters in Copper Center was chemically treated by EPMT Alaska Region Liaison Chris Overbaugh. On September 7, 2013, 0.19 oz. of Milestone concentrate was used to make 1 gallon of mix (with water) to treat a 0.0333

acre infestation of *Crepis tectorum*. This particular infestation showed up after fire wise thinning was conducted at the headquarters and likely came from the nearby highway (Barnes, personal communication 2012). The SAGA and YCC crews pulled infestations at the Visitor Center, theater, exhibit building, resource buildings, behind the administrative building, around the visitor's parking lot, and at the junction of the administration and visitor center driveways. The area behind the administrative building is overrun with lambsquarter, narrowleaf hawksbeard, prostrate knotweed, clovers (*Trifolium spp.*), pineapple weed, common plantain, common dandelion, and foxtail barley. This infestation is from a septic tank replacement in 2008 which was covered with weed-infested topsoil and has resulted in a bumper crop of invasive weeds (Gilmore and Harper 2008). This area is a potential seed source for other areas around headquarters (Terwilliger et al. 2010). In the past this area has been continually mowed by the maintenance staff to prevent the infestations going to seed as invasive weeds continue to sprout despite ongoing control efforts. However, for the third consecutive year, due to herbicide treatments in 2011 and intensive manual pulling, the area was considered controlled enough to allow the native grasses and forbs to grow without mowing.



Figure 25. Fraser, EPMT SCA, with various YCC and SAGA crew members pose with the entrance sign and filled weed bags at park headquarters.

In 2011, the EPMT and Interpretive staff turned to restoration as a means of combating invasive plants, improving visitor flow, facilitating better use of space, and screening of parking areas (Lain 2012). This season the WRST EPMT continued restoration efforts around park headquarters in Copper Center begun in 2011. In late June, the WRST EPMT, SAGA, and YCC crews worked on the visitor complex restoration efforts. The crews also planted the native plants beds that are used by Rangers to interpret native vegetation to park visitors with the following native shrubs: rose (*Rosa acicularis*), Labrador tea (*Ledum palustris*), high bush cranberry (*Viburnum eduleI)*, shrubby cinquefoil (*Potentilla fruiticosa*), and dwarf dogwood (*Cornus Canadensis*). Native vegetation mats were saved by a maintenance SAGA crew during the construction of the bluff trail at Park headquarters in Copper Center for the second consecutive year. This year, the salvaged tundra mats were used in the native plant beds to create a better soil base and as a seed source for native plants. In addition, 125 birch trees were planted this year in the natural vegetation areas immediately surrounding the WRST visitor center. The EPMT staff also assisted the Interpretive staff with

planting the historically accurate non-invasive, non-native plants, blue delphiniums (*Delphinium grandiflora*) and rhubarb (*Rheum rhabarbarum*) in controlled areas around signs. These species were both planted throughout the park by miners and help the interpreters tell that story.

Native seeds that were planted in 2012 (Lain and Terwilliger 2013) had mixed success. It seems that while a late winter storm at the end of May created a landfall of rapacious, seed eating birds which reduced the overall weed population at headquarters dramatically and also ate quantities of native seed that was transplanted. Surprisingly, the Purple reedgrass (*Calamagrostis purpurascens)* which had been collected some time before the visitor center was established was still viable. Trees and shrubs planted in 2011 and 2012 have varying success rates but some are establishing themselves nicely. Overall, revegetation efforts do seem to be helping reduce the invasive weed problem at headquarters.



Figure 26. Gavin, YCC, with a fistful of blooming hawksbeard in the Glennallen Maintenance Yard.

The joint WRST/BLM maintenance yard in Glennallen stores equipment that is transported and used within park boundaries by park staff and is heavily infested with invasive weeds. Common tansy (*Tanacetum vulgare*) and narrowleaf hawksbeard (*Crepis tectorum*) are the most predominant species of concern in the yard. Common tansy (*Tanacetum vulgare*) is prevalent in the maintenance area and has yet to be documented within the park. The origin of this infestation is not known as it does not occur elsewhere in the Copper River Basin. The WRST EPMT members have attempted to control it through hand pulling since 2009. It is difficult to effectively control manually as it can reproduce by seed and vegetatively via an extensive rhizomatous system. The location of this infestation makes it a high priority as it could easily spread into the park or BLM lands through the movement of equipment.

On particularly aggressive or large infestations where hand pulling would be ineffective or too time consuming, herbicide is an effective tool in lowering seed production and eradicating invasive species. Use of herbicide was approved by the environmental compliance by both agencies in 2012. Herbicide was used for the second consecutive year to manage a particularly aggressive infestation of common tansy and narrow-leaf hawksbeard at the Glennallen maintenance yard. On September 7, 2013, regional EPMT Liaison, Chris Overbaugh, applied Milestone herbicide at a rate of 6 oz. per acre to infestations of narrowleaf hawksbeard and common tansy within the maintenance yard. A total of 0.79 oz. of Milestone concentrate was used in 4 gallons of water (mix) and sprayed on 0.133 acres of plants. 99.5 % of the infestation was narrowleaf hawksbeard and 0.5 % common tansy. The

outcome of this treatment should be monitored in 2014 and adaptive management strategies will be used to develop future treatment plans.

Herbicide was also used at the Copper Center Park Headquarters on a large infestation of narrow-leaf hawksbeard along the driveway entrance to the Visitor's Center that sprang up after fire wise treatment of the grounds. All herbicide applications were made by state of Alaska certified pesticide applicators using a precise, spot application method with calibrated backpack sprayers. A wide range of best management practices are followed to ensure legal, safe, and responsible herbicide use (NPS 2010).

White River RZ

This RZ (Figure 27) contains both park and preserve **(**not shown in **Figure 27** but can be seen in **Figure 1**) and has contains designated Wilderness. The White River RZ, is part of the Yukon river drainage, not the Copper. An established trail from Beaver Creek, Canada and Chisana is used to bring horses in for concessioners runs through this RZ.

As of 2013, the WRST EPMT has not collected any terrestrial data from the White River reporting zones. However, domestic horses graze in the White River RZ and the park hopes to inventory it for invasive plants in the future. We do have one record on the aquatic *Didymo* (*Didymosphenia*

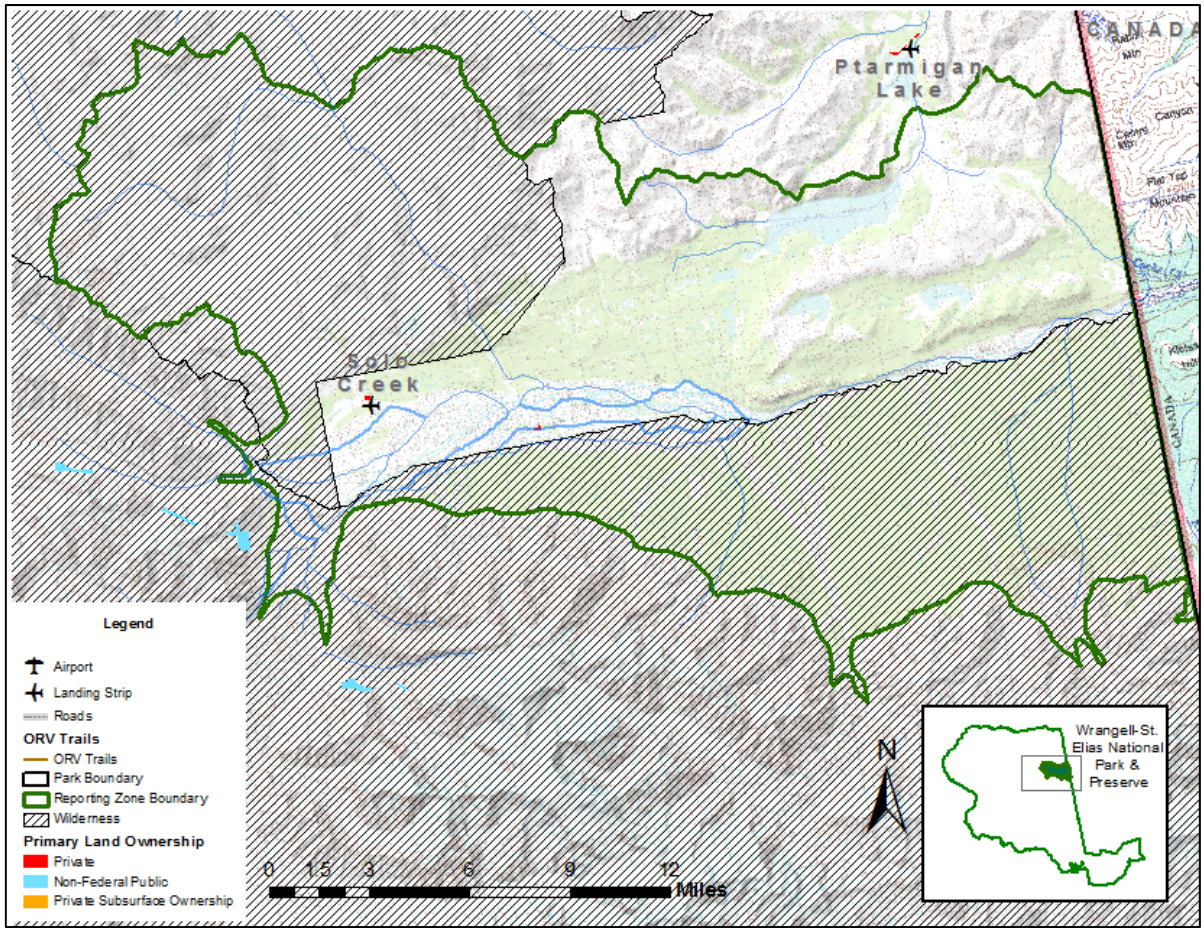


Figure 27. White River reporting zone in Wrangell-St.Elias.

geminata) occurring at the Rock Lake outflow in 2006 in the White River RZ, and 49 *Didymo* per 800 valves were found.

Bagley Icefield RZ

Most of this RZ (Figure 28) is made up of formidable ice formations including the Bagley Icefield and the Malaspina and Hubbard glaciers and has very little vegetation. As of 2013, the WRST EPMT has not collected any terrestrial data from the Bagley Icefield RZ and does not consider it to currently be an area of high concern.

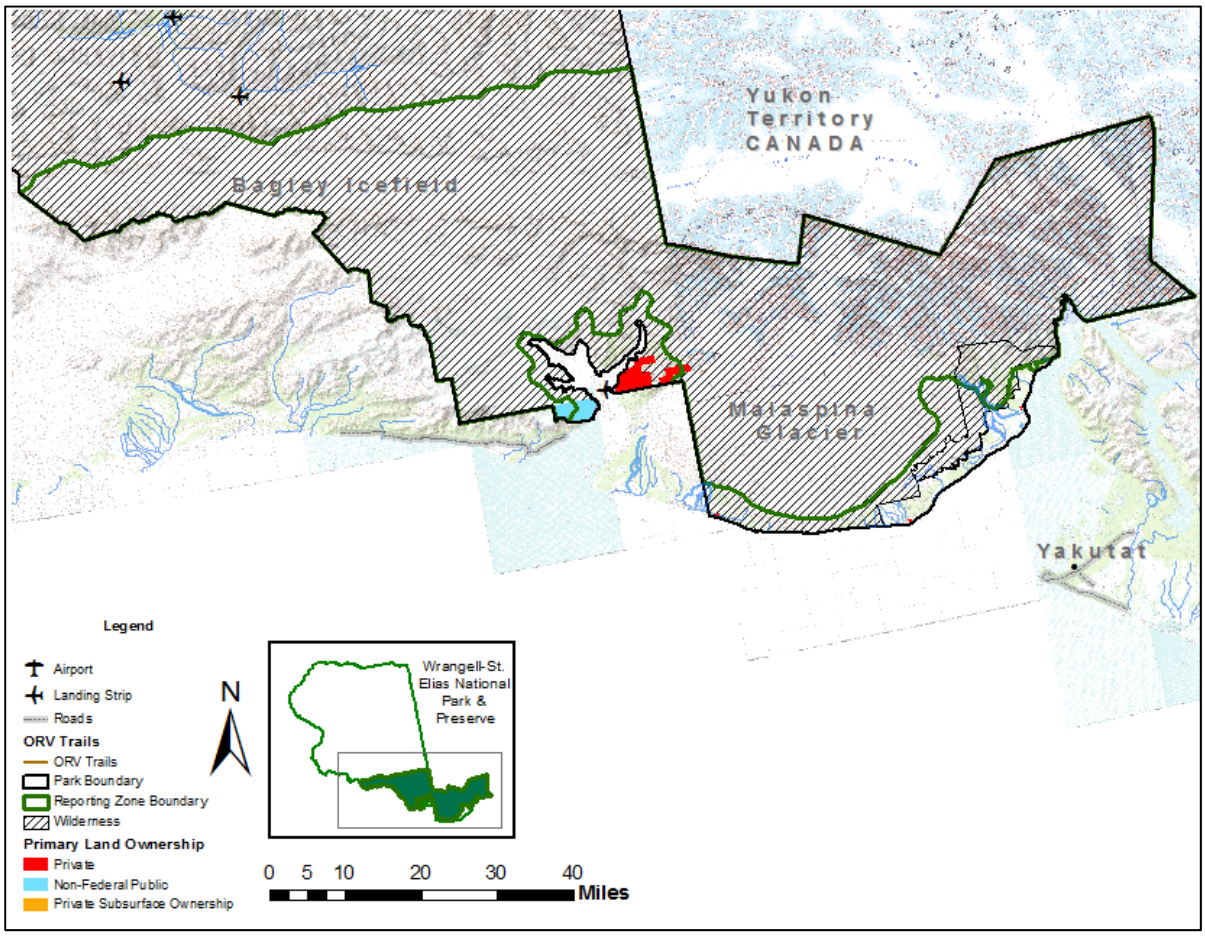


Figure 28. Bagley Icefileld reporting zone in Wrangell-St.Elias.

Areas outside WRST RZ's

Although most of the park's EPMT efforts are focused on lands within the park boundaries the park considers it important to target transportation vectors outside of park boundaries and collaborate with the Copper Basin Cooperative Weed Management Area (CB-CWMA) in inventorying, monitoring, and outreach events (CB-CWMA 2013).

This year the park EPMT conducted car based highway surveys in 2013 along the Glenn, Edgerton and sections of the Richardson Highways. Priority species of concern for inventory along these highways were high ranking threatening species such as white and yellow sweetclover and narrowleaf hawksbeard. The total number of miles of infestations mapped along the Glenn Highway was 20 miles of white and yellow sweet clover from Palmer to mile 100. The total area of infestations mapped along the Old Edgerton and Edgerton Highways was 0.5 acres of white sweet clover and narrowleaf hawksbeard.



Figure 29. Part of the Whitesweet clover infestation at the Richardson/ Glenn Highway Junction in Glennallen prior to the Weed Smackdown.

White sweetclover was also inventoried and manually controlled by WRST EPMT and SAGA crews was outside of the Park at the intersection of the Richardson highway and Tok Cutoff road for the first time. The total area of white sweet clover pulled at the junction of the Tok Cutoff and the Richardson Highway was 0.2 acres. Other weeds found here include narrowleaf hawksbeard (*Crepis tectorum*), lambsquarter (*Chenopodium album*) and plantain (*Plantago major*). About a half of a day was spent weeding here. Due to high traffic and close proximity for access into the park, it may be effective to concentrate control efforts on white sweetclover here in the future since plant growth is not as dense as the infestation occurring at the Nabesna Road and Tok cutoff intersection.

The park collaborated with partners from CB-CWMA in coordinating the first ever annual Weed Smackdown in Glennallen, Alaska on August 10. Key partners involved with the event include Ahtna, Inc., BLM, Copper River Watershed Project, Native Village of Kluti-Kaah, Wrangell Institute for Science and the Environment; the focus species was White Sweetclover (*Melilotus alba)* (**Figure 29**). The park mapped the infestations along the Glenn Highway within the Glennallen corridor and mapped the manual control work of the volunteers. We also contributed safety vests, highway signs, gloves, bags, and weed diggers as well as paid for the incineration of the weeds bagged at the event. The pull was concentrated at the junction of the Glenn (HWY 1) and the Richardson (Hwy 4) highways where many travelers pass through. The Smackdown drew 9 participants who helped to bag 231 lbs. of white Sweetclover (*Melilotus alba*) from approximately 0.62 acres in the course of 5 hours. While this may seem like a small number given the broad community support for the CB-CWMA, the per capita participation was 0.2% which is double that of larger towns like Fairbanks. The CB-CWMA hopes to make this an annual event especially given the large infestations of white sweetclover and yellow hawksbeard (*Crepis tectorum)* in Glennallen and the recent road construction there. They are also looking to create other events in other Basin communities in the future. Next year we hope to plan the event earlier before the white sweetclover begins to go to seed and when there are less conflicting events.

In addition, members of the Copper Country Alliance had a Kenny Lake community weed pull in the gravel pit behind the Kenny Lake School where they also focused on white sweetclover. This year marks the first year since 2005 that community weeds pulls have taken place in the Basin (Gilmore 2005).



Figure 30. Copper Basin Weed Warriors at the first ever Copper Basin Weed Smackdown pose with their 231lbs of white sweetclover.

Late this summer, the park ecologist took a voucher of a plant that was growing in the Silver Springs Subdivision in Copper Center. This plant has been identified by botanists at the NPS and AKNHP as *Kochia scoparia* L., an invasive plant originally from Asia. To our knowledge, this collection represents the first record of this species in Alaska. The origin of the seed is suspected to either be migrating birds or sunflower seed sold as birdfeed. Next summer it will be important to look for and eradicate any *Kochia* species in the area as we can still stop this plant from invading Alaska.

Discussion and Recommendations

Inventory and Control Work

In past seasons, the WRST EPMT has focused on mapping invasive weeds and then utilizing manual control methods where feasible. Although inventory and control work is essential to a successful invasive species program, the WRST EPMT should petition park managers to increase prevention as a park wide goal as part of their strategic plan for managing invasive species. Establishing strong prevention measures such as quarantine and inspection of common vectors of invasive plants is less expensive than the resulting resource losses and the costs of management and control. Prevention is the most critical aspect of invasive plant management (AKDNR 2011). Prevention should include education, risk analysis, and pathway management. It is key that WRST EPMT members comment on projects that would increase the spread of invasives through the compliance process.

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

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



Figure 31. Close up of narrowleaf hawksbeard.

Terrestrial Invasive Plants

Specific inventory goals for the 2014 season include: a comprehensive bicycle survey of the Nabesna road (taking consideration for previously mapped infestations and for DOT construction sites), recently reconstructed ORV trails in the Nabesna RZ, pullouts, and unmapped airstrips and trails. The EPMT should also attempt, once again, to map the entire trail to Marvelous Mill. A goal of the EPMT is to map all park maintained trails and airstrips and to be able to rotationally visit these on a regular basis since they cannot all be visited in one year. The EPMT has also been asked to assist with creating a comprehensive GIS map of white/yellow sweetclover within the Copper Basin for the CB-CWMA once all data has been processed through AKEPIC. This map will be useful for coordination of community weed pull events and establishing treatment priority infestations.

Specific treatments utilizing infestation prioritization should continue throughout the park. A long term treatment and re-vegetation plan for Kennecott Mines NHL should be a priority, as this area is under extensive renovations. With the permission of the landowner, it would be worthwhile to spend a longer time controlling invasive plants at the Ptarmigan Lake airstrip.

To reduce the possible introduction of invasive plants from outside or the spread of existing invasive plants within the park through park activities, NPS should implement best management practices for all ground-disturbing operations. To minimize invasive plant colonization, restoration and re-vegetation efforts should be increasingly included in project proposals and implemented utilizing native seedlings, native transplants, native cuttings, salvaged mats, bioengineering techniques with native plants, and native seeds. The EPMT needs to work closely with the maintenance division regarding activities on the ORV trails in the Nabesna RZ and the Kennecott Mines NHL in the McCarthy RZ. Early in the season the EPMT needs to work with the maintenance division to set up an existing vehicle wash plant at the maintenance yard for cleaning vehicles, including ORVs that go into the park to minimize weed spread.

Aquatic Invasive Plants

Elodea continues to be a threat to the park as its spread outside the boundaries increases. The EPMT should continue to conduct aquatic surveys via packraft on highly trafficked lakes and important salmon spawning lakes. Ideally, we would set up a rotational system where highly susceptible lakes would be on a rotational inventory as detection is key to our ability to respond. Certain lakes outside of the park, which are commonly used to fly people into the park, should also be considered for survey. For 2014 target lakes might include: Hanagita, Copper, Iceberg, Ptarmigan, and Tolsona Lakes. If *Elodea* were found it would certainly rise to the top of the EPMT's list of concerns.



Figure 32. The 2013 park EPMT headed out to do aquatic invasive surveys (Tim, Morgan, Fraser, and David).

Restoration & Prevention

Restoration efforts should continue at WRST Headquarters. The WRST EPMT should follow the approved detailed plan for the area which includes proposed areas for native re-vegetation, suggested planted species with type (seed, transplant, cutting) and amount per area. The WRST EPMT should work with the maintenance staff to arrange watering schedules for newly re-vegetated areas. WRST EMPT 2014 crew should monitor the re-vegetated areas around headquarters including the areas

seeded with grass, planted with birch trees and the native seed beds planted during 2013. Likewise, the crew should re-visit the Chitina ranger station, Silk Stocking Cottage lawns in Kennecott, and the Betty Freed property in Slana to monitor success of grass seed spread in 2013. Likely, these areas will need another application of grass seed, fertilizer, and lime.

Restoration efforts at the Kennecott Mines NHL town site with native seeds and historically non-native garden plants with non-invasive, historically accurate plants should continue as outlined in the Kennecott Mines NHL Operations Plan (NPS 2013b). To take on the greater need for native restoration in the area, the WRST EPMT should develop a restoration protocol for collecting and cleaning native seeds for future use. The WRST EPMT should continue working on the Need for Seed plan and work on recruiting more volunteers for seed collecting in the Kennicott Valley.

The maintenance staff has purchased a vehicle decontamination station that the EPMT staff should help set up early in the field season. This should help reduce the spread of the invasive seeds at the maintenance yard to other parts of the park by vehicles and equipment. This will be particularly important with several large trail projects that are scheduled to start in 2014.

Outreach, Education & Partnerships

Key elements for success in controlling invasive plants are education and community involvement. The WRST EPMT staff should continue to work with other park staff and finalize an invasive plant policy. Presentations should continue to be given to seasonal staff. Informal training should be provided to interpreters who interact with the public as well as seasonal staff from other divisions, who are sometimes directed to do weeding around visitor centers. This will provide these staff with an understanding of the importance of the EPMT goals and allow them to contribute to the WRST EPMT effort. Staff members who are directed to complete supplemental weeding or mowing for control should be aware of the WRST EPMT's mapping and reporting requirements so their work is properly documented.



Figure 33. David (right), EPMT technician, staffs an information booth with park interpretive staff at the Kenny Lake Fair.

In past years, WRST EPMT technicians put together field flip books for each ranger station highlighting the "top ten" invasive species for each area as. This year they also provided phenology calendars containing what had been recorded in the past and space for the interpretive staff to add phenology data for 2013. The EPMT staff maintained one at headquarters. These calendars were then collected at the end of the year and entered into a phenology log, providing valuable data used to plan the timing of mechanical and chemical

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

One of the most important aspects of community education is the active involvement of local residents. The Copper Valley Invasive Plants Workgroup remains in existence and is currently working to finalize the official charter for the Copper Basin Cooperative Weed Management Area. WRST is an active and supportive member of this group. This year the first annual Copper Basin weed Smackdown was organized by members of the CB-CWMA. Although nine members attended, more effort should be made to recruit more volunteers from the local community. The event date should be set on a weekend and not on opening day of hunting. Consideration of possibly extending the weed pull for a longer time period to include plants seeding out at different times should occur. Follow up discussions also mentioned planning several different events in different locations throughout the Copper Basin and implementing some sort of localized challenge as an incentive to pull the most weeds. This may help to recruit more community members and volunteers throughout the different regions of the Copper Basin. Efforts should continue to be made to strengthen the CB-CWMA group and involve more community members.

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



Figure 34. View from Dead Dog Hill rests area on the Nabesna Road.

Literature Cited

Alaska Department of Natural Resources (AKDNR). 2011. Strategic Plan for Invasive Weeds and Agricultural Pest Management and Prevention. Plant Materials Center, Palmer, Alaska.

Bauder, P., and J. Heys. 2004. Exotic plant management at Wrangell-St. Elias National Park & Preserve: 2004 Field season report. National Park Service Unpublished Report, Wrangell-St. Elias National Park and Preserve, Copper Center, Alaska.

Barnes, Jennifer. 2012. Regional Fire Ecologist, communicated August 6, 2012.

Bogan, D. 2011. *Didymosphenia geminata* in Alaska, 2011 update. Alaska Natural Heritage Program, University of Alaska Anchorage.

Carlson, M. L., I. V. Lapina, M. Shephard, J. S. Conn, R. Densmore, P. Spencer, J. Heys, J. Riley, and J. Nielsen. 2008. Invasiveness ranking system for non-native plants of Alaska. USDA Forest Service, R10, R10-TP-143. Anchorage, Alaska.

Copper Basin – Cooperative Weed Management Area (CB-CWMA). 2013. Collaborative Memorandum of Understanding for the Copper Basin Cooperative Weed Management Area DRAFT (March 22).

Clinton, B. 1994. Presidential memorandum: environmentally and economically beneficial practices on federal landscaped grounds. The White House. Washington, D.C.

Demientieef, M. 2002. Federal Subsistence Board Letter of Delegation of Authority for Management of the Copper River Fishery to the Superintendent of Wrangell-St. Elias National Park & Preserve. May 8, 2002.

Densmore, R. V., P. C. McKee, and C. Roland. 2001. Exotic plants in Alaskan National Park units. U.S. Geological Survey Unpublished Report, Anchorage, Alaska.

Drazkowski, B., K. J. Stark, M. R. Komp, G. Bernatz, D. Brown, C. Richtman, C. Lee, A. Robertson, and K. Slifka. 2011. Wrangell-St. Elias National Park and Preserve natural resource condition assessment. Natural Resource Report NPS/NRSS/WRD/NRR—2011/406. National Park Service, Fort Collins, Colorado.

Gantz, M.E. 2013. Vegetation Assessment for Trail Creek ORV Trail. National Park Service Unpublished Compliance Report, Wrangell-St. Elias National Park and Preserve, Copper Center, Alaska.

Gilbert, C., P. White, and A. Worthington. 2001. Cultural landscape report: Kennecott Mill town. National Park Service Report D-75. Anchorage, Alaska.

Gilmore, L. 2005. Exotic plant management in Wrangell-St. Elias National Park and Preserve: 2005 Field season report. National Park Service Unpublished Report, Wrangell-St. Elias National Park and Preserve, Copper Center, Alaska.

Gilmore, L. 2006. Exotic plant management in Wrangell-St. Elias National Park and Preserve: 2006 Field season report. National Park Service Unpublished Report, Wrangell-St. Elias National Park and Preserve, Copper Center, Alaska.

Gilmore, L., and T. Harper. 2008. Exotic plant management in Wrangell-St. Elias National Park and Preserve: 2008 Field season report. National Park Service Unpublished Report, Wrangell-St. Elias National Park and Preserve, Copper Center, Alaska.

Gordon, D. R. 1998. Effects of invasive, non-indigenous plant species on ecosystem processes: Lessons from Florida. Ecological Applications 8(4):975-989.

Krimmel, D. J., Gantz, M. E. 2013. Summary of Exotic Plants reported at Ptarmigan Lake and Chicken Airstrips. National Park Service Unpublished Compliance Report, Wrangell-St. Elias National Park and Preserve, Copper Center, Alaska.

Lain, A. M. 2012. Invasive plant management in Wrangell-St. Elias National Park & Preserve: 2011 summary report. Natural Resource Data Series NPS/WRST/NRDS—2012/ 230 . National Park Service, Fort Collins, Colorado.

Lain, A.M., and M. L. N. Terwilliger. 2013. Invasive plant management in Wrangell-St. Elias National Park & Preserve: 2012 summary report. Natural Resource Data Series NPS/WRST/NRDS – 2013/433. National Park Service, Fort Collins, Colorado.

Lain, A. M., N. M. Liette, and M. L. N. Terwilliger. 2011. Invasive plant management for Wrangell-St. Elias National Park & Preserve: 2010 Summary report. Natural Resource Data Series NPS/WRST/NRDS—2011/128. National Park Service, Fort Collins, Colorado.

Lain, A.M., T.W. Federal, M.L.N. Terwilliger, and D. S. Rosenkrans. 2012. Summary of Exotic Plants Reported on Tract 28-114a: Marvelous Mill Site. Unpublished Compliance Report, Wrangell-St. Elias National Park and Preserve, Copper Center, Alaska.

Loso, M. G. 2005. McCarthy Creek Forest Resource Inventory. National Park Service Resource Report NPS/AR/NRTR-2005-52, Anchorage, AK.

McKee, C. 2003. Exotic plants in Alaska National Parks: 2003 field season report. U.S. Geological Survey Unpublished Report, Anchorage, Alaska.

Mertz, J.E., Smith, J.R., Workman, M.L., Setka J.D., and B. Mulchaey. 2008. Aquatic Macrophyte Encroachment in Chinook Salmon Spawning Beds: Lessons Learned from Gravel Enhancement Monitoring in the Lower Mokelumne River, California. North American Journal of Fisheries Management. 28: 1568-1577

Million, B., Rapp, W., Federal, T., Lain, A. and C. Overbaugh. 2013. Alaska Exotic Plant Management Team 2013 field protocol. National Park Service Unpublished Report, Anchorage, Alaska.

National Oceanogaphic Atmospheric Administration (NOAA). 2011. Modeled Movement of the Marine Debris Generated by the March 2011 Japan Tsunami.

National Park Service (NPS). 2001. Donated Property Along the Nabesna Road: Finding of No Significant Impact. National Park Service, Anchorage, Alaska. Signed January 5, 2001.

NPS. 2006. Management Policies 2006. National Park Service, Washington, D.C.

NPS. 2009. Permanent Dataset (PDS). 2009. LandStatusAKR.gdb, Primary Land Ownership. NPS GIS Team. Anchorage, AK.

NPS. 2010. Alaska region invasive plant management plan: Finding of no significant impact. National Park Service, Anchorage, Alaska. Signed March 2, 2010.

NPS. 2011. Nabesna Off-Road Vehicle Management Plan and Environmental Impact Statement: Record of Decision. National Park Service, Anchorage, Alaska. Signed January 14, 2011.

NPS. 2013a. Central Alaska Network Inventory and Monitoring Program: Wrangell-St. Elias Spring 2013 Weather Summary. National Park Service, Anchorage, Alaska.

NPS. 2013b. The Kennecott Mines National Historic Landmark Maintenance, Restoration, and Operations Plan: Finding Of No Significant Impact. Wrangell-St. Elias National Park and Preserve, Copper Center, Alaska. Signed Nov 29, 2014.

Oregon State University (OSU) Hatfield Marine Science Center. Blog: Biota on Japanese Tsunami Marine Debris. Accessed February 5, 2013.

Parmesan C., and G. Yohe. 2003. A globally coherent fingerprint of climate change impacts across natural systems. Nature 421:37–42.

Schwörer, T., R. Federer and H. Ferren. 2012. Managing invasive species: How much do we spend? Institute of Social and Economic Research, University of Alaska Anchorage

Spaulding, S.A., and Elwell, L., 2007, Increase in nuisance blooms and geographic expansion of the freshwater diatom *Didymosphenia geminata*: U.S. Geological Survey Open-File Report 2007-1425, 38 p.

Spellman, B. T., and T. L. Wurtz. 2010. Invasive sweetclover (*Melilotus alba*) impacts native seedling recruitment along floodplains of interior Alaska. Biological Invasions. Published online: January 6, 2011.

Terwilliger, M. N., J. M. Donohue, L. M. Gilmore, T. E. Harper, and K. M. Laushman. 2010. 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. National Park Service, Fort Collins, Colorado.

Vitousek, P. M., C. M. D'Antonio, L. L. Loope, and R. Westbrooks. 1996. Biological invasions as global environmental change. American Scientist 84: 468-478.

Watson, D. F. 2013. Invasive Plant Species Assessment of Lakina/Nizina Airstrip. National Park Service Unpublished Compliance Report, Wrangell-St. Elias National Park and Preserve, Copper Center, Alaska.

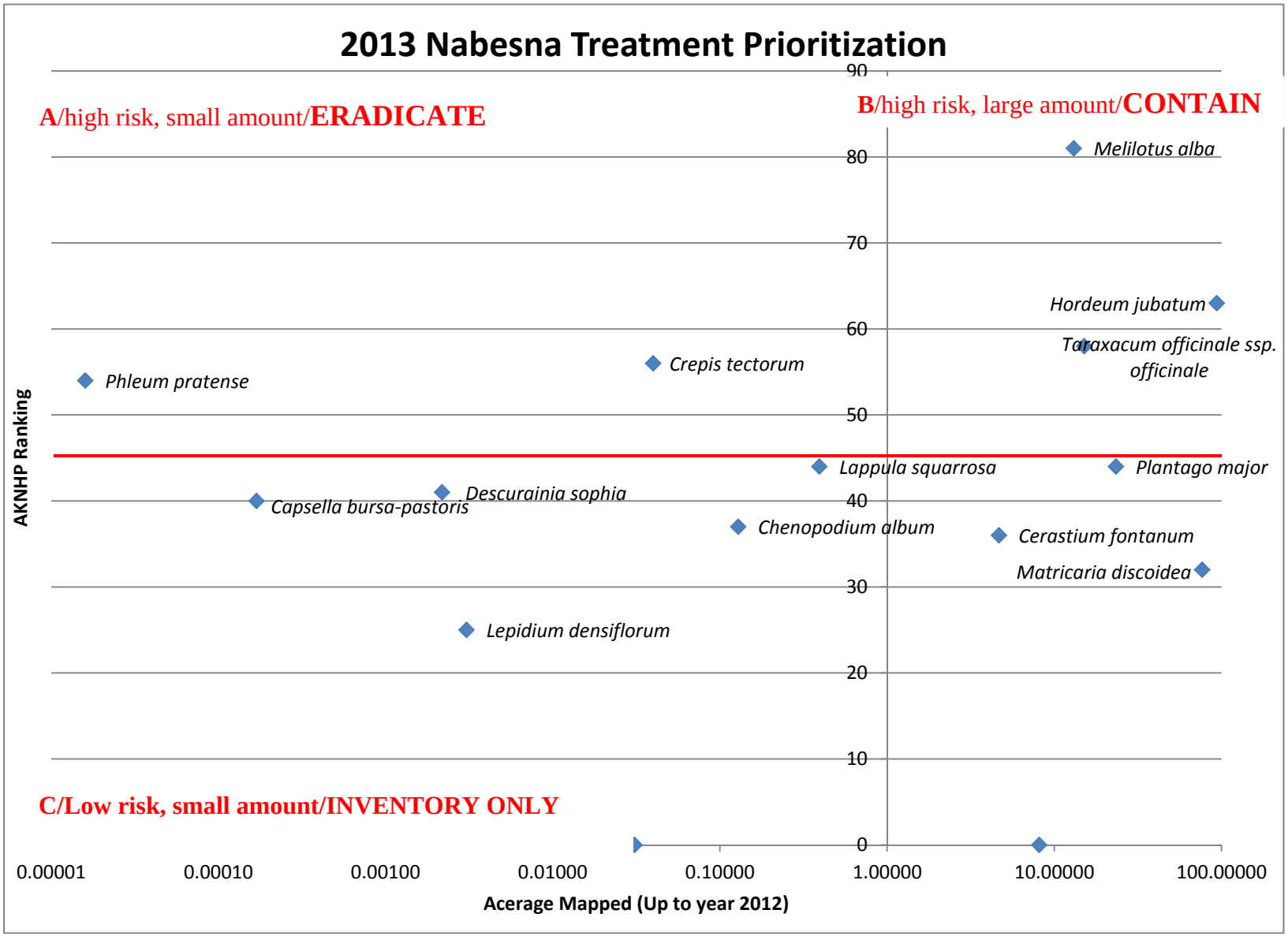
White, P. J. 2000. Cultural Landscape Report: Bremner Historic District, Wrangell-St. Elias National Park and Preserve, Alaska. National Park Service, NPS D-70, Anchorage, Alaska.

Willis, C. G., B. R. Ruhfel, R. B. Primack, A. J. Miller-Rushing, J. B. Losos, and C. C. Davis. 2010. Favorable climate change response explains non-native species' success in Thoreau's woods. PLoS ONE. 5 (1): e8878.

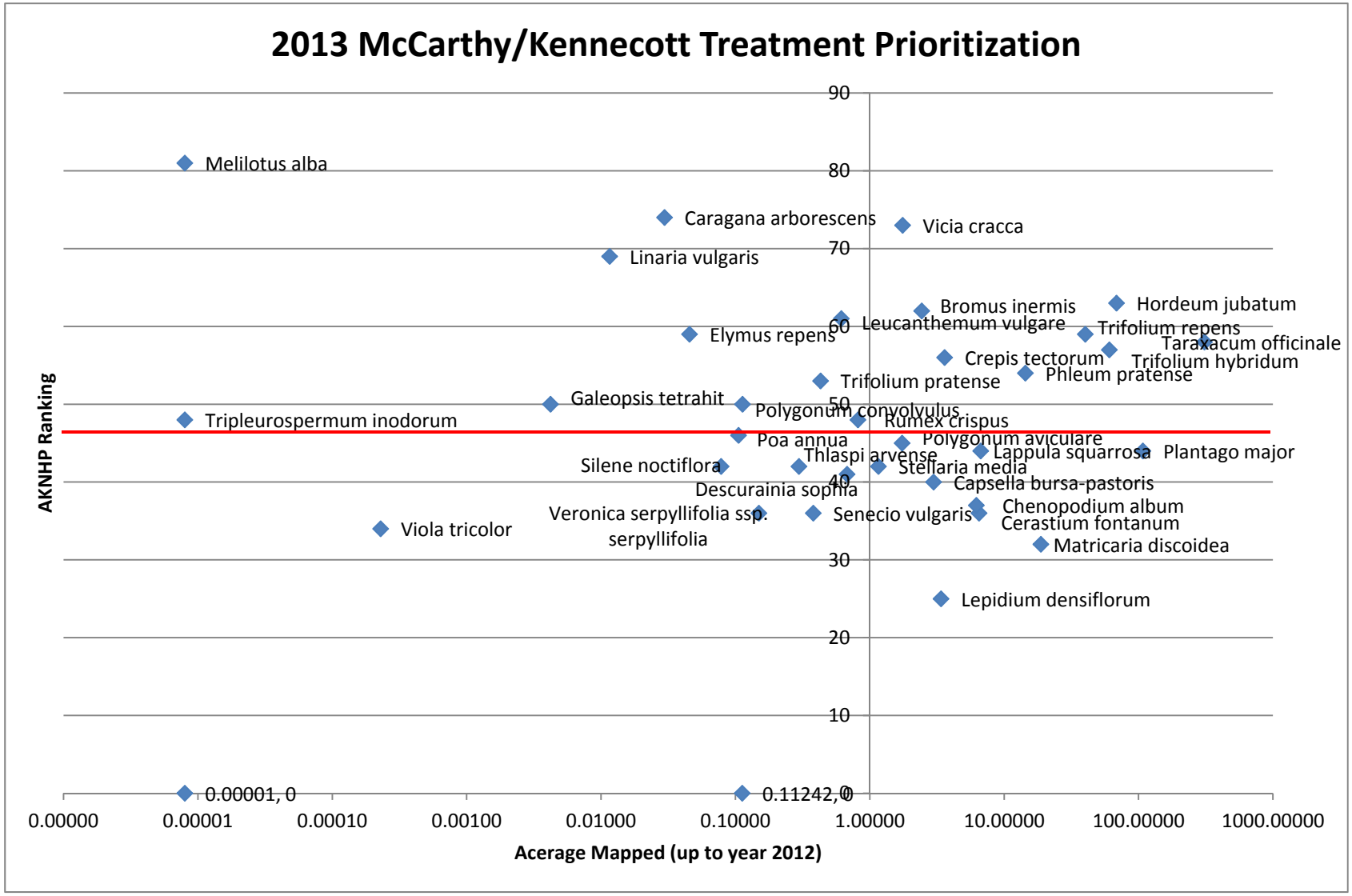
Wurtz, T., and N. Lisuzzo. 2010. The cost of no action: What would not doing anything about the infestation in the Fairbanks area cost Alaska? Fairbanks Elodea Informational Meeting, Fairbanks, Alaska, December 2010.

Yukon Invasive Species Council (YISC). 2011. The effect of climate change on invasive species and their potential impacts in Whitehorse. Whitehorse, Yukon, Canada.

Appendix A: Prioritization Charts



Appendix B: Copper River Record - Canadian Waterweed



Canadian waterweed: a threat to Alaska waters

NPS News Release, Copper Center--Elodea canadensis, a.k.a. Canadian Waterweed, is not a familiar name in Alaska, but unfortunately, it might be one to reckon with. The first documented encounter with this invasive aquatic plant took place in 2010 in Fairbanks. It has since been making itself cozy in the waters of Alaska, including invasions at Eyak Lake in Cordova and in 3 float-plane lakes around Anchorage…and now Stormy Lake on the Kenai Peninsula. This is the first aquatic freshwater invasive plant species that has been confirmed in Alaska.



NPS courtesy graphic

Elodea canadensis, a.k.a. Canadian Waterweed, an invasive freshwater plant, could damage recreation and salmon habitat if it takes hold in Alaska

As with most invasive plant species, Elodea was brought over for decoration. Its bright green leaves, hearty stem, and long roots make it an attractive specimen for aquariums. U.S. Forest Service ecologist, Trish Wurtz said, "It's almost guaranteed," that someone dumped it into the Chena slough from an aquarium sometime in the past 10 years. Wurtz observed, "A bunch of red clay balls" (commonly found in aquaria) in the silt underneath a bridge in the slough.

Elodea reproduces asexually from plant parts. In the fall, leafy stalks detach from a parent plant, float away, root, and start new plants. The smallest fragments overwinters, wait patiently until it thaws, and float downstream until it finds a suitable place for it to grow. Elodea prefers slow moving water with thick sediment. Once it has settled into a spot, Elodea grows rapidly where it accumulates into a tangled mass.



Photo courtesy of Aquatic Solutions UK

When Elodea gets out of control - massive Elodea removal effort in the UK

What does this mean for Alaskans? Like many invasive species, Elodea knows no boundaries. Once as canoeing, or fishing make sure to remove and wash all mud, plant material, sediment, and water from equipment before and after engaging in your water activities. The strongest tool in our invasion toolbox for aquatic invaders, however, is prevention – keeping Elodea out of our ponds and waterways before it becomes a problem.

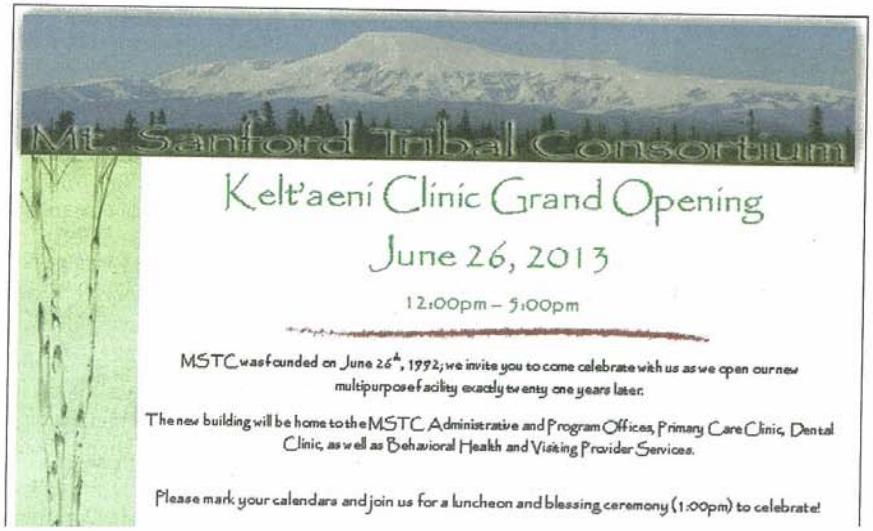
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can easily cling to rudders and floats, as well as boat propellers, only to be deposited at the next water body. Elodea can reduce water flow and water quality, out-compete native aquatic plants, lower property values, make waters unusable for recreation and degrade fish spawning habitats. On a grander scale, Elodea can make a huge impact on two large Alaskan industries: sport fishing and commercial salmon harvesting. According to estimates by the Alaska Department of Fish and Game, Elodea could make a dent of $350,000 loss per year for both these industries combined.

You may be asking yourself, "How can I prevent Elodea from spreading further into Alaskan waters?" If involved in water activities such as boating, footwear with non-absorbent soles. Since felt waders have been identified as a mechanism for moving aquatic invasive species, the Alaska Board of Fisheries voted to prohibit their use in freshwaters of Alaska. Please also dispose properly of your aquatic plants and animals. Remember that plenty of animals and plants can survive Alaskan waters. If you do encounter Elodea make sure to take a photograph, sample, and the location you found it at. Please report observations to the Copper Basin Cooperative Weed Management Area (CB-CWMA) at copperbasininvasives@lists.copperriver.org or the Exotic Plant Management Team at Wrangell-St. Elias National Park & Preserve at (907) 822-7232, Miranda_Terwilliger@nps.gov.

MOUNTAIN VIEW
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Winter Hours
Every Day
10am
to 8pm

Appendix C: Copper River Record - Herbicide Press Release

Holy Family Catholic Church
Rev. Frank Reitter
Mass: 10:00 a.m. Sundays
All are welcome at His house.
822-3442 Aurora Drive

Mt Drum Lutheran Church
Through God and together all things are possible!
Mount Drum Lutheran Church
Silver Springs Loop
Copper Center Tel: 822-5115
Join us on Sunday for:
• Worship Celebration 11:00 AM
• Sunday School (all ages) 10:00 AM

The Pregnancy Center
Pregnant? We care and want to help.
Stop by and see us!
All information is strictly confidential and all services are free.
In Glennallen across from the Post Office - in the Family Life Building

2013 NPS herbicide treatments target exotic invasive plants

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

Invasive species display rapid growth, spread with little or no human assistance, and are expensive to remove and difficult to control once established. These species are a concern because they can out-compete native species for limited resources and can change the structure and function of ecosystems.

Establishment of invasive species can also result in loss of habitat and food sources for native insects, birds, fish, and other wildlife.

The Exotic Plant Management Team at WRST has been documenting and managing invasive plants for the past several years.

The following are the proposed treatments for 2013:

Narrowleaf Hawksbeard at the Park Headquarters in Copper Center. This infestation has been manually controlled since 2007 with no decrease in the infestation size or density. The area was treated in 2010, 2011 and 2012 and is scheduled to be treated in early June. The proposed herbicide is Milestone.

Common Tansy at the Maintenance Yard, Glennallen. This infestation was first discovered in 2009 and has been manually controlled for three years. It is difficult to effectively control in this manner as it can reproduce by seed and vegetatively via an extensive underground root system.

The location of this infestation makes it a high priority as it could easily spread into the park through the movement of equipment. This area was treated with herbicide in 2012 and is scheduled to be treated in late August/early September. The proposed herbicide is Milestone.

All proposed applications will be made by State of Alaska certified pesticide applicators using a precise, spot application method with calibrated backpack sprayers.

Herbicide application is dependent on the target plant's growth stage and the weather. Applications will only be made when weather conditions are appropriate.

For additional information please contact Miranda Terwilliger, Ecologist, at 907-822-7232.

Appendix D: Letter sent to Commercial Use Operators May 2013

United States Department of the Interior

NATIONAL PARK SERVICE

Wrangell-St. Elias National Park & Preserve
Mile 106.8 Richardson Hwy. P.O. Box 439
Copper Center, AK 99573-0439
907 822 5234; Fax 907 822 7216
http://www.nps.gov/wrst

N50/ A7217

Elodea Threatens Alaska Fisheries and Aquatic Resources
05/15/2013

Dear Park Commercial Use Operator-

Until recently, Alaska has been considered free of invasive aquatic plants that greatly impact freshwater resources in other areas of the world where they are not native. The discovery of *Elodea* in Chena Slough in Fairbanks in 2010 drew attention to an established population in Eyak Lake and led to the discovery of *Elodea* in other waterbodies. Since then, it has been documented in several additional water bodies in Fairbanks, Anchorage, and the Cordova region.

Amy Larsen, an aquatic ecologist for the National Park Service in Fairbanks, explains that *Elodea* can fill up slow-moving waterways and lakes, making fishing or boating virtually impossible. It could also alter stream flow, which could impact spawning salmon in the Chena River or Arctic grayling in Chena Slough, she said.

Elodea can hitch-hike on floatplanes, boats, and water-sporting equipment. Help keep Alaska's waters valuable. Please inspect and clean your equipment before entering/exiting a lake. If you think you have seen *Elodea*, take a sample or photograph, and note location. You can report suspected infestations to:

Miranda Terwilliger, Ecologist
Wrangell-St Elias National Park & Preserve
Phone 907/822.7232 | Fax 907/822.7216
Email miranda_terwilliger@nps.gov

Eric Veach, Chief of Resources
Wrangell-St Elias National Park & Preserve
Phone 907/822.7212 | Fax 907/822.7216
Email eric_veach@nps.gov

Thank you for taking the time to learn about your role in reducing the threat of *Elodea* to Alaskan fisheries and aquatic resources.

Sincerely,

R. Obernesser

Rick Obernesser
Superintendent

Appendix E: List of Invasive Plant Species found in and around WRST

This table lists the invasive plant species documented within Wrangell-St. Elias National Park and Preserve and adjacent lands sorted by their 2013 AKEPIC invasiveness ranking. This table does not include some of the species that are still being confirmed from the 2013 season. Plants where there are no vouchers should be targeted for collecting in future years. Species with a AKEPIC ranking over 50 are considered the highest priority for inventory and control by the EPMT.

Invasive Plant Species Detected within park boundaries		2013 AKEPIC Rank	Number of known vouchers	Found in Following Reporting Zones
Latin Name	Common Name			
Arabis glabra	tower rockcress	unranked	0	
Erysimum cheiranthoides	wormseed mustard	unranked	2	
Kochia scoparia	kochia	unranked		**NOT ON PARKLANDS.** Silver Springs subdivision, Copper Center - 2013 voucher with ALA. First documentation in Alaska to NPS and AKNHP knowledge.
Lupinus polyphyllus	big leaf lupine	unranked		**NOT ON PARKLANDS.** Yakutat
Papaver somniferum	opium poppy	unranked	0	
Rheum rhabarbarum	rhubarb	unranked	0	Nabesna
Melilotus alba	white sweetclover	81	1	
Caragana arborescens	Siberian peashrub	74	1	McCarthy
Vicia cracca	bird vetch	73	1	McCarthy
Linaria vulgaris	yellow toadflax	69	1	McCarthy RZ
Melilotus officinalis	yellow sweetclover	69	0	
Medicago sativa	alfalfa	64/59	1	
Hordeum jubatum	foxtail barley	63	3	Note: WRST considers this species a native and only inventories it. It was first found in 1962.
Bromus inermis	smooth brome grass	62	1	
Leucanthemum vulgare	oxeye daisy	61	0	McCarthy
Tanacetum vulgare	common tansy	60	1	Glennallen Maint. Yard
Elymus repens	quakgrass	59	0	
Trifolium repens	white clover	59	0	
Taraxacum officinale ssp. *officinale*	common dandelion	58	0	
Trifolium hybridum	alsike clover	57	1	
Crepis tectorum	narrowleaf hawksbeard	56	1	
Phleum pratense	common timothy	54	2	
Trifolium pratense	red clover	53	0	
Lolium perenne	perrenial ryegrass	52	0	
Poa pratensis ssp. *Pratensis*	Kentucky bluegrass	52	1	

Invasive Plant Species Detected within park boundaries		2013 AKEPIC Rank	Number of known vouchers	Found in Following Reporting Zones
Latin Name	Common Name			
Digitalis pupurea	purple foxglove	51		McCarthy
Galeopsis tetrahit	hempnettle	50	2	McCarthy RZ
Polygonum convolvulus	black bindweed	50	0	Big Volcanoes
Medicago lupulina	black medic	48		**NOT ON PARKLANDS.** Glennallen
Rumex crispus	Curly Dock	48	0	
Tripleurospermum perforatum	scentless false mayweed	48	0	
Amaranthus retroflexus	pigweed	45	0	Park HQ
Polygonum aviculare	prostrate knotweed	45	3	
Lappula squarrosa	European stickseed	44	4	Nabesna
Plantago major	common plantain	44	1	
Silene latifolia	bladder campion	42	0	
Silene noctiflora	night-blooming cockle	42	0	
Stellaria media	common chickweed	42	1	
Thlapsi arvense	field pennycress	42	1	
Descurainia sophia	flixweed	41	0	
Capsella bursa-pastoris	shepherd's purse	40	1	
Papaver nudicaule	Icelandic poppy	39	1	Nabesna
Chenopodium album	common lambsquarter	37	1	
Cerastium fontanum ssp. *vulgare*	mouse ear chickweed	36	0	McCarthy
Senecio vulgaris	common groundsel	36	1	
Silene vulgaris	bladder campion	36		
Veronica serpyllifolia		36	2	
Matricaria discoidea	pineapple weed	32	0	
Lepidium densiflorum	common pepperweed	25	1	