National Park Service
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Natural Resource Stewardship and Science

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

2017 Summary Report

Natural Resource Report NPS/WRST/ NRR—2018/1596

ON THIS PAGE
Mt. Drum overlooking Chelle Lake
Photograph by Jason Waddington

ON THE COVER
From top row, left to right: Jason Waddington with eDNA samples at Braye Lakes, Peter Frank mapping at Braye Lakes, *Tanacetum vulgare* in the Glennallen maintenance yard, EPMT and volunteers at the Copper Basin Invasive Weed Smackdown, Christine DeVries mapping near Chelle Lake, *Papaver somniferum* found on the McCarthy Road, Christine DeVries and Kate Lusby surveying on Sculpin Lake.
Photographs by Jason Waddington, Peter Frank, and Christine DeVries

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

2017 Summary Report

Natural Resource Report NPS/WRST/NRR—2018/1596

Kate Lusby and Jason Waddington

National Park Service
Wrangell-St. Elias National Park and Preserve
Mile 106.8 Richardson Hwy P.O. Box 439
Copper Center, AK 99573

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

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Abstract

This report summarizes work conducted by the Exotic Plant Management Team (EPMT) in Wrangell-St. Elias National Park and Preserve (WRST) during the 2017 field season. This summer marked the thirteenth consecutive year WRST staff have inventoried and controlled invasive plants in the park, preserve and adjoining gateway communities. The 2017 the WRST EPMT crew consisted of two National Park Service (NPS) Biological Science Technicians and two Student Conservation Association (SCA) interns stationed at Park Headquarters in Copper Center. Field work was focused on the following objectives: Monitor and control known infestations; survey for and document new infestations; and prevent the spread of invasive species through NPS activities. A total of 216.6 acres were surveyed by EPMT staff during the 2017 field season, of which a total of 6.8 acres were found to be infested. Of the 6.8 infested acres, a total of 5.6 acres were treated by manual and chemical control. In total, 17 invasive species were documented by the WRST EPMT in 2017. Throughout the season, seed from 11 native plant species was collected with a combined weight of 63.2 pounds.

Acknowledgments

The authors would like to thank all of the individuals who have dedicated their time and energy to make the 2017 Wrangell-St. Elias National Park and Preserve Exotic Plant Management Team's season a success. A special thanks to Peter Frank, for his knowledge of park flora, leadership, and technical skills; Christine DeVries for her passion for botany and attention to detail in the field; and Chris Overbaugh for his overall expertise and assistance in all aspects of the EPMT program. We would also like to recognize all the partners involved in the Copper Basin Community Weed Management Area for their assistance in monitoring and controlling infestations in the park's gateway communities.

The authors would also like to acknowledge those who so generously volunteered their time to benefit the EPMT this summer; the Student Conservation Association interns who helped our control and seed collection efforts; Youth Conservation Corps interns who assisted with Elodea surveys; and to all the community volunteers who gave their time and effort to helping with the Copper Basin Weed Smackdown.

Acronyms

AK-DOT Alaska Department of Transportation
AKEPIC Alaska Exotic Plants Information Clearinghouse
AKNHP Alaska Natural Heritage Program
BLM Bureau of Land Management
CB-CWMA Copper Basin Collective Weed Management Area
CRWP Copper River Watershed Project
EA Environmental Assessment
EPMT Exotic Plant Management Team
FONSI Finding of No Significant Impact
NHL National Historic Landmark
NISIMS National Invasive Species Information Management System
NPS National Park Service
ORV Off-Road Vehicle
RZ Reporting Zone
SCA Student Conservation Association
WRST Wrangell-St. Elias National Park and Preserve
WISE Wrangell Institute for Science and Environment
WMC Wrangell Mountain Center
YCC Youth Conservation Corps

Introduction

Historically, Alaska has been less affected by invasive plant species than the rest of the United States; however, in recent decades, invasive plant species in Alaska have become established in human-altered landscapes and are now threatening undisturbed ecosystems and their processes (Nawrocki et al 2011). Invasive species alter ecosystems through: hybridization and competition with native flora, altered geophysical and nutrient dynamics, and impacted fish and wildlife habitat (Vitousek et al. 1996, Gordon 1998). Increased human activity in Alaska's wildlands will likely promote establishment of non-native plant species (Nawrocki et al 2011). To respond to these threats to Alaska's ecosystems, the Exotic Plant Management Team (EPMT) uses an early detection and rapid response management strategy for invasive plant infestations in and around Wrangell-St. Elias National Park and Preserve (WRST).

Access points and areas of human activity in WRST serve as vectors for invasive plant introduction. The park can be accessed through the McCarthy and Nabesna roads, multiple off-road vehicle (ORV) and hiking trails, backcountry landing strips, and floatplane lakes. The land status within WRST is complex; there are areas of private, state, Native Corporation, and university lands within park boundaries. Many of these in-holdings harbor invasive plants species which have the potential to spread onto public lands. Additionally, boat and floatplane traffic into the park creates a need to survey for aquatic invasive species in addition to terrestrial surveys. Early detection of invasive species through surveys is essential for managing infestations effectively.

The Alaska EPMT was established by the NPS in 2003 to combat the increasing spread of invasive plants into the state's national parks (McKee 2003). Since its founding, it has provided invasive plant management to all of Alaska's 16 national parks. The EPMT program at WRST was first established in 2005 (Gilmore 2005) and has since operated under the following objectives: a) to monitor known infestations of invasive plants; b) to contain, control and where possible eradicate these infestations; c) to inventory areas with known human disturbance where invasive plants are likely to appear; d) where possible, prevent the further spread of invasive species in and around WRST. Over the past twelve years, the WRST EPMT has inventoried and treated invasive plant populations in and around the park and worked with community partners to address spread of invasive species in the Copper Basin.

The following report details work conducted by the WRST EPMT during the 2017 field season and provides recommendations for future invasive plant management in WRST.

Methods

Fieldwork at WRST was conducted between June 5th and September 8th, 2017. The core members of the 2017 WRST EPMT were; Peter Frank, NPS GS-7 EPMT field crew lead, Christine DeVries, NPS GS-5 Biological Science Technician, Kate Lusby, SCA intern, and Jason Waddington, SCA intern. One five-person SCA crew worked a total of 200 person hours assisting the WRST EPMT with manual control efforts. One two-person YCC crew worked a total of 32 person hours assisting with *Elodea canadensis* surveys. A second five-person SCA crew worked a total of 400 person hours over the course of two weeks assisting with native seed collection.

Defining Reporting Zones

To facilitate reporting efforts, the park and its environs have been divided into nine reporting zones (RZ) (Figure 1) based on the 2011 WRST Natural Resource Condition Assessment (Drazkowski et al. 2011). Given the size of this park, these divisions allow for more meaningful and focused reporting. Therefore, the results in this report are structured around these RZs. This report only addresses the RZs that were visited in 2017.

Figure 1. Map of the Reporting Zones used in Wrangell-St. Elias National Park and Preserve

Data Collection and Analysis

Methods of mapping, data collection and post-processing followed the 2017 Alaska EPMT field and office protocols (Overbaugh et al. 2017a, b). All inventory, control, and restoration work were mapped using two Trimble GeoExplorer 2008 Series GeoXT data loggers, both equipped with a standardized Alaska EPMT data dictionary. These units were used to record both spatial and attribute data for geographic information system (GIS) analysis. GPS data were differentially corrected and edited by field personnel using Trimble GPS Pathfinder Office 5.85. Post-processed GPS data were sent to the Alaska Regional office every two weeks to be converted into GIS data and entered into two geodatabases: the National Park Service's National Invasive Species Information Management System (NISIMS) and the Alaska Natural Heritage Program's Alaska Exotic Plant Information

Clearinghouse (AKEPIC). GIS data were used to calculate the number of acres surveyed, infested and treated during the 2017 field season. Acres surveyed represents the total area mapped. Acres infested represents the area of a mapped infestation multiplied by the percent cover of invasive plants in that mapped area. Acres treated represents the area of a mapped infestation multiplied by the percent cover of invasive plants in that mapped area and by the percent of the infestation treated. These acreage numbers are used in reporting by the Alaska EPMT and will be used throughout this report.

Prioritizing Fieldwork

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

Inventory and Monitoring

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

Inventories for aquatic invasive species, specifically *Elodea*, focused on water bodies known to receive heavy float plane traffic from infested areas such as Cordova or Anchorage. Water bodies that support spawning habitat for salmon were given the highest priority. Inventories were conducted by paddling the perimeter of the lake in an inflatable raft or canoe and visually surveying the littoral zone. Unknown plants were retrieved with a double-headed rake and identified in the boat. In 2017, EPMT staff surveyed aquatic plants in a total of 8 lakes.

Control Work

Under direction of NPS Management Policies Section 4.4.4 (2006), high priority is given to managing invasive species which have or could have a substantial impact on park resources and that can reasonably be expected to be successfully controlled. Lower priority is given to invasive species that have limited impact on park resources or that cannot be successfully controlled. The WRST EPMT expands upon these national standards by assessing additional variables (Table 1) to further refine the prioritization of control work. One of these variables, the invasiveness rank (as defined by Carlson et al. 2008), is used to understand the intensity of invasiveness of each species in relation to one another. Higher values indicate higher invasiveness capability in Alaska.

Table 1. Variables used to prioritize invasive plant management.

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

Infestations given top priority for control in 2017 included: white sweetclover (*Melilotus albus*) at the intersection of the Nabesna Road and Tok Cutoff, narrowleaf hawksbeard (*Crepis tectorum*), common tansy (*Tanacetum vulgare*) and yellow toadflax (*Linaria vulgaris*) at the park maintenance yard in Glennallen, oxeye daisy (*Leucanthemum vulgare*) in Kennecott, and narrowleaf hawksbeard and white sweetclover at the Kuskulana gravel pit (McCarthy road, mile 17).

Control Methods

Chemical control methods, specifically herbicide applications, were the primary means of invasive plant control employed by the 2017 WRST EPMT. All chemical controls were done in accordance with the 2010 NPS herbicide Environmental Assessment's (EA) Finding of No Significant Impact (FONSI) (NPS 2010). Chemical herbicides have been employed in WRST since 2011 to control high priority infestations around the park. In 2017, EPMT staff conducted herbicide applications in the Alaska Department of Transportation (AK-DOT) right-of-way at the intersection of the Nabesna Road and Tok cutoff. These applications were done in partnership with the Copper River Watershed Project (CRWP) and followed the procedures laid out by the AK-DOT Integrated Vegetation Management Plan (Coffey 2016). The herbicide Milestone, a broadleaf specific herbicide containing the active ingredient aminopyralid, was used for all treatments in 2017. All herbicide operations were performed by crew members who had received training and earned certification as State of Alaska Licensed Pesticide Applicators.

For small infestations, follow up treatments and areas where chemical control was not feasible, the 2017 WRST EPMT used manual control methods, such as hand pulling or digging. All invasive plant material removed through manual control was bagged and weighed using a hanging scale. All plant material removed was deposited at the Copper Basin Sanitary landfill.

Restoration and Prevention

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

Restoration and prevention efforts within the park have focused on ongoing construction projects and trail maintenance (NPS 2011). In Kennecott, restoration efforts were identified in the Kennecott Operations Plan (NPS 2013) and involved collecting seed for herbaceous re-vegetation around the Kennecott National Historic Landmark (NHL). For the rest of the park, restoration and prevention efforts have focused on ongoing construction projects and continuing trail maintenance. In 2017 these efforts were focused around the Copper Lake Trail and included native seed collection and planting. Prevention efforts have been focused on monitoring and controlling non-natives found in material storage and extraction sites, such as the Glennallen Maintenance Yard and Kuskulana gravel pit.

The WRST EPMT manages the park's seed bank, that provides native plant material for park restoration and outreach projects. Seed collection is done in the late summer and fall, and focuses on early successional species or species which are prevalent in the area. Seed cleaning and preparation is done by Park Service staff, depending on the type of seed and the available work force. Seed needing further processing with specialized equipment, such as grasses, will be processed by the Alaska Plant Material Center in Palmer. Seeds are stored at the park headquarters in Copper Center in freezer kept at 0°F, to prolong viability.

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

Results

2017 Field Season Summary

In 2017, the WRST EPMT and volunteers spent a total of 2,459 hours in the field surveying for, mapping, and controlling invasive plant species. Through these efforts, 216.6 acres in and around the park and preserve were surveyed and mapped. These surveys resulted in the documentation of 17 invasive plant species covering 6.8 acres. The WRST EPMT treated a total of 5.6 infested acres in 2017 resulting in 3,088 lb. of plant material physically removed, and applied 86.34 gallons of mixed herbicide solution containing 15.68 fl. oz. of Milestone concentrate.

Ten SCA volunteers worked a total of 600 hours on invasive plant removal and seed collection projects. A total of 20 volunteers assisted with various projects during the season working a total of 195 hours.

Upper Copper River Front Country RZ

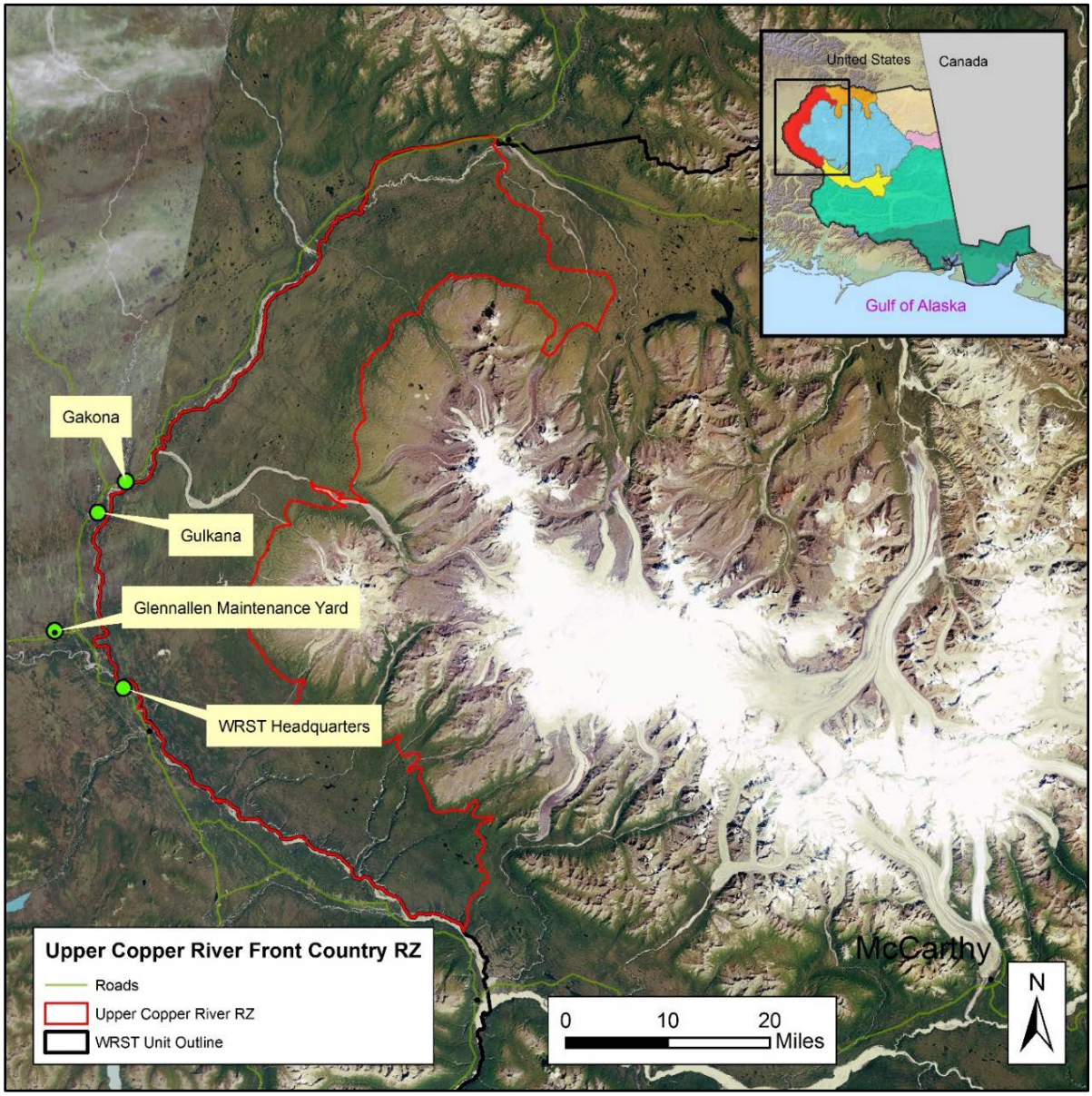

Figure 2. Map of Upper Copper River Front Country RZ

Glennallen Maintenance Yard

There are a variety of invasive plant species found in the Glennallen maintenance yard. During the 2017 season, the focus of chemical and manual treatments were on narrowleaf hawksbeard (*Crepis tectorum*) and common tansy (*Tanacetum vulgare*). There were three rounds of chemical treatment on the narrowleaf hawksbeard that occurred in June, August, and September. The common tansy received two rounds of chemical treatment, in June and September. All of the chemical treatments were supplemented throughout the season by multiple manual treatments focused on flowering

plants. A total of 413.2 square ft. were infested and treated using of 0.33 gallons of mixed herbicide containing 0.062 fl. oz. of Milestone concentrate for the 2017 season.

WRST Headquarters

Three areas within WRST headquarters were treated in 2017: seasonal housing, the gravel pit adjacent to seasonal housing, and headquarters campus. There are multiple invasive species that grow around headquarters, but the majority of chemical and manual treatments were focused on narrowleaf hawksbeard for all three areas. Additionally, a small patch of 4 white sweetclover (*Melilotus albus*) individuals were chemically treated in the gravel pit outside of the EPMT conex.

In the seasonal housing area and the gravel pit, narrowleaf hawksbeard was chemically treated and supplemented by manual treatment of flowering plants. For the two areas, a total of 0.23 infested acres were treated using 8.5 gallons of mixed herbicide containing 1.45 fl. oz. of Milestone concentrate. In the area around headquarters campus, flowering narrowleaf hawksbeard was manually treated.

Gakona and Gulkana

Manual treatments of white sweetclover were performed in the communities of Gakona and Gulkana (Figure 3). White sweetclover grows along the roadways in these areas, in close proximity to rivers and creeks that feed into the Copper River. In mid-July, four EPMT personnel, a five-person SCA crew, and two Copper River Watershed Project (CRWP) personnel, conducted manual treatments along the Gulkana River, within the Gulkana Village, at Bear Creek, and roadsides along the Tok Cutoff in Gakona. A total of 1.68 acres were manually treated, with 1,249 lb. of white sweetclover removed. The details for the Gakona treatment can be found in the Community Weed Pull section, as it was treated during a community event.

Figure 3. EPMT personnel removing white sweetclover in Gakona.

Chelle Lake

Chelle Lake is located near the base of Mt. Drum and can be accessed via a backcountry airstrip. It has been a popular destination in previous years due to its vicinity to the mountain and the presence of a public use cabin. In 2017, two WRST EPMT personnel surveyed the area between the cabin and the nearby airstrip. No invasive plants were found.

Glenn Highway

At the end of July, CRWP personnel reported finding bird vetch (*Vicia cracca*) along the Glenn Highway just outside of Glennallen. Two EPMT personnel went to the area to determine the extent of the infestation (Figure 4). Multiple large patches were observed and mapped on the north side of the highway between mile 185 and mile 177. The total size of the infestations is 0.85 acres. The infestations were in full flower. It is suspected that this population of bird vetch was introduced from fill used to build an access road to the Ahtna natural gas drilling site at mile 177 of the Glenn Highway. The population was originally documented in 2012 and the new infestations documented in 2017 are believed to have spread during DOT mowing operations.

Figure 4. EPMT crew lead mapping bird vetch along the Glenn Highway.

McCarthy Front Country RZ

McCarthy Road

The McCarthy Road is one of two roads that provides access into the park (Figure 5). It is a 60-mile unpaved road that begins in Chitina and ends in McCarthy. The road has been surveyed biennially since 2007 (excluding 2011). During the last week of July, three EPMT personnel surveyed the road on bicycles. The goal for the 2017 survey was to map and manually treat three of the higher priority plants in the park; white sweetclover, narrowleaf hawksbeard, and oxeye daisy (*Leucanthemum vulgare*), while also mapping and manually treating any species that were previously undetected.

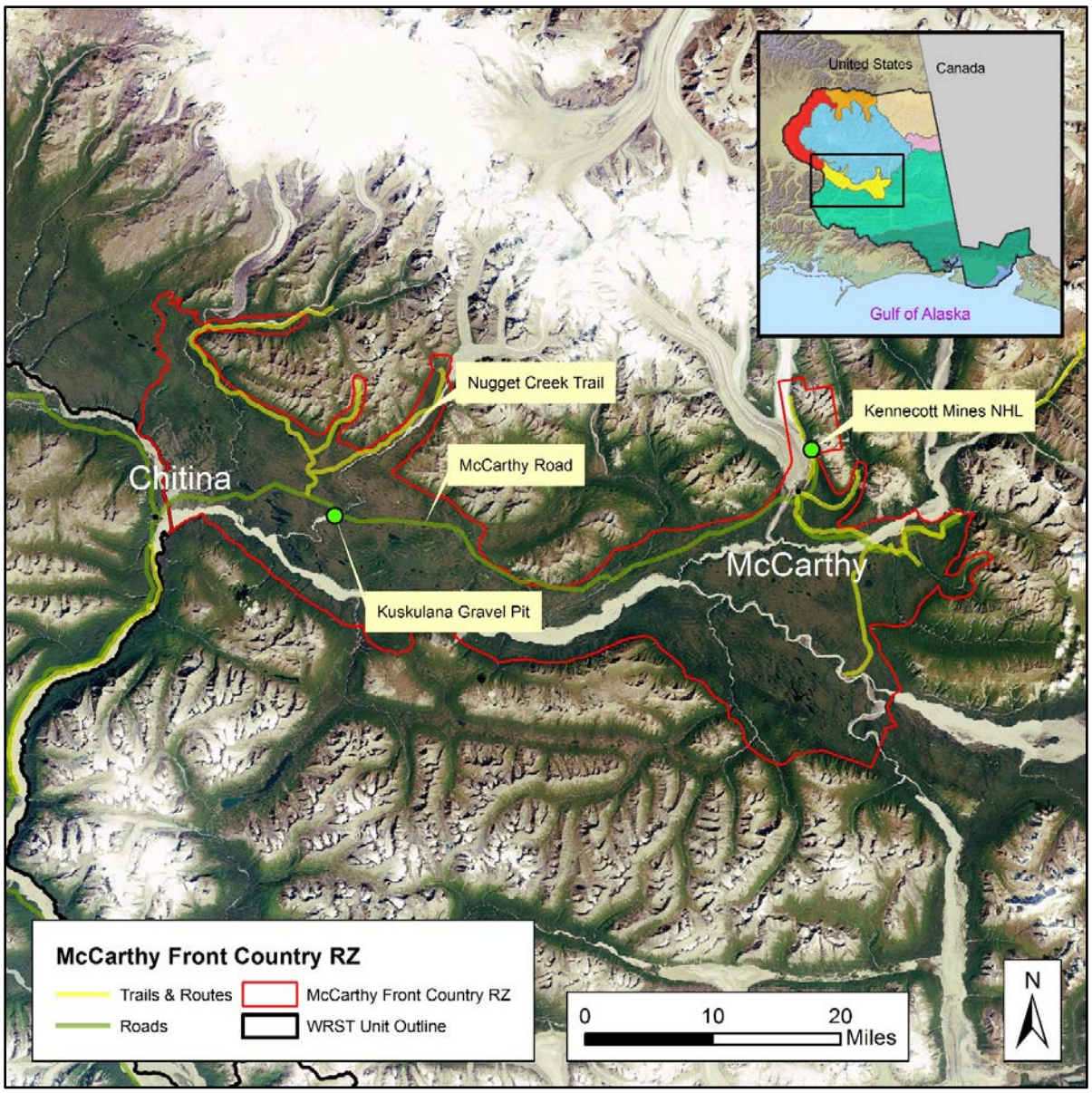

Figure 5. Map of McCarthy Front Country RZ

<u>Mile 0 – Mile 15</u>

On the first day of the survey, the crew mapped and manually treated a small patch of white sweetclover at mile 7 and patches of narrowleaf hawksbeard near miles 5.5, 6.5 and 15 (Figure 6). Some of the patches of narrowleaf hawksbeard were far too dense with rosettes to be treated, but all plants that were bolting and flowering were removed from those infestations. Near mile 11, an unusual ornamental poppy was discovered by the crew. They mapped it and chose to collect it at a later date in order to properly identify the plant. After the road survey was completed, the poppy was collected and taken back to the office, and identified as *Papaver somniferum*, an ornamental plant commonly called peony poppy.

Figure 6. EPMT members surveying for invasive plant species along the McCarthy Road

Mile 15 – Mile 29

On the second day of the survey, the crew biked from mile 15-17 with no invasive species found. They stopped at the Kuskulana gravel pit, located at mile 17 on the McCarthy Road, and manually treated white sweetclover and narrowleaf hawksbeard. The Kuskulana gravel pit was been treated both chemically and manually during the 2017 season. A patch of narrowleaf hawksbeard was mapped and manually treated at mile 27. At mile 28, two flowering individuals of white sweetclover were mapped and manually treated. All other areas of this section of road were free of high priority species.

Mile 29 – Mile 45

Multiple patches of narrowleaf hawksbeard were found in this section of road, at miles 38.5, 40, and 44. All populations were mapped and manually treated. No other high priority species were observed on this section of the road.

Mile 45 – Mile 60

While surveying the last section of the road, the crew discovered a patch of yellow toadflax (*Linaria vulgaris*) on the north side of the road at mile 53.5. There were four flowering stems present, along with a few skeletons from the previous growing season. The infestation was mapped and manually

removed. Narrowleaf hawksbeard was also mapped and manually treated in this section of the road, at miles 45, 48.5, 49, and 53.5.

Kuskulana Gravel Pit

The Kuskulana gravel pit is located on the south side of the McCarthy Road at mile 17 (Figure 5). The gravel pit is managed by DOT and is not a public use area, however, it is adjacent to a park wayside and receives heavy traffic from visitors and RV campers. White sweetclover, yellow sweetclover (*Melilotus officinalis*), and narrowleaf hawksbeard were present in the gravel pit. There is a high dispersal potential for these plants as DOT actively uses the gravel pit. In 2017, the WRST EPMT completed the first chemical treatments on the site and continued manual control efforts as well.

The gravel pit was mapped and chemically treated three times throughout the 2017 season, in early June, July, and August. White sweetclover and yellow sweetclover were primarily concentrated near the entrance of the gravel pit, while narrowleaf hawksbeard was spread throughout the pit. The infested area in the gravel pit totalled 0.16 acres. The first chemical treatment in early June required 3.02 gallons of mixed herbicide containing 0.51 fl. oz. of Milestone concentrate. The second treatment in the beginning of July required 2 gallons of mixed herbicide containing 0.34 fl. oz. of Milestone concentrate, and the third and final chemical treatment in early August required 0.74 gallons of mixed herbicide containing 0.13 fl. oz. of Milestone concentrate. Prior to applying herbicide, all flowering plants were manually treated, and control efforts were supplemented by an additional manual treatment of the gravel pit during the McCarthy Road survey.

Nugget Creek Trail

The Nugget Creek Trail is a 15 mile trail that can be accessed from the Kotsina Road at mile 14.5 of the McCarthy Road. At the end of the trail there is a popular public use cabin, which attracts hikers, bicyclists, and ORV users. The last half of the trail (mile 6 - mile 15) was surveyed in 2014 via ORV, but was unable to be finished due to technical difficulties with the vehicle. In 2017, two EMPT personnel completed the unfinished survey and surveyed mile 1 - mile 6 of the trail via bicycles.

The crew mapped all invasive species encountered along the trail. Common dandelion (*Taraxacum officinale* ssp. *officinale*), white clover (*Trifloium repens*), and common plantain (*Plantago major*) were found during the survey. All three species were found in small individual populations, but were extensively scattered along most of the trail.

Kennecott Mines National Historic Landmark

The Kennecott Mines National Historic Landmark (NHL) is located approximately 4 miles outside of McCarthy. In 2017, the WRST EMPT crew continued control efforts on oxeye daisy located on park lands on the hillside southwest of the Kennicott Glacier Lodge. This location has been manually treated each year since 2004 (excluding 2005 and 2012). The site was manually treated twice during the 2017 season, in June and August. Oxeye daisy is difficult to control, given it is highly rhizomatous, making multiple treatments necessary each year. Many rosettes were pulled in June, and larger, flowering plants were removed in August.

During the 2016 season, the WRST EPMT crew revegetated the gravel slope beneath the General Manager's office in Kennecott. During the first site visit in June 2017, the EPMT crew observed prostrate knotweed (*Polygonum aviculare*), shepherd's purse (*Capsella bursa-pastoris*), and lamb's quarters (*Chenopodium album*) growing in the revegetated area. The crew manually treated the infestation, and discovered the same species growing in the Kennecott gravel pit, likely the source of the infestation. The gravel slope received a second manual treatment by EPMT personnel in August.

St. Elias/Chugach Mountains RZ

Bremner Historic Mining District

Bremner Historic Mining District features a public use cabin, buildings left from the once active gold mine, and multiple social trails (Figure 7). Guiding companies in the McCarthy area frequently use the landing strip located at the site to pick up and drop off park visitors. This area provides access into the backcountry of the park, and had not been surveyed since 2010. In June 2017, two EPMT personnel surveyed the landing strip, social trails, and around the buildings in the area. No invasive plants were found.

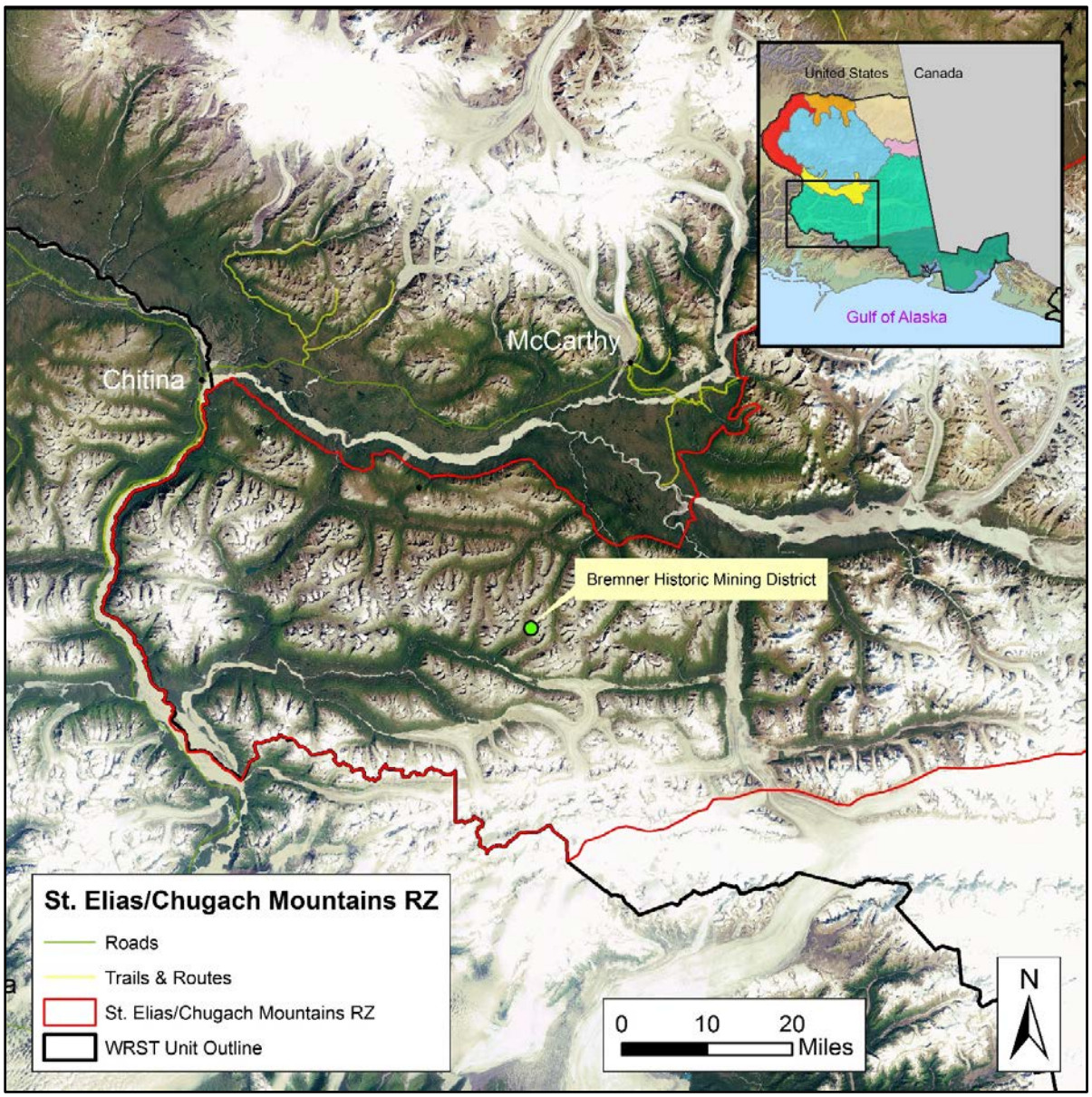

Figure 7. Map of St. Elias/Chugach Mountains RZ

Nabesna Front Country RZ

Skookum Volcano Trail

The Skookum Volcano Trail (Figure 8) is a popular hiking trail located at mile 36.8 of the Nabesna road and was most recently surveyed in 2014. In 2017 the first 1.25 miles were surveyed. No invasive plants were found.

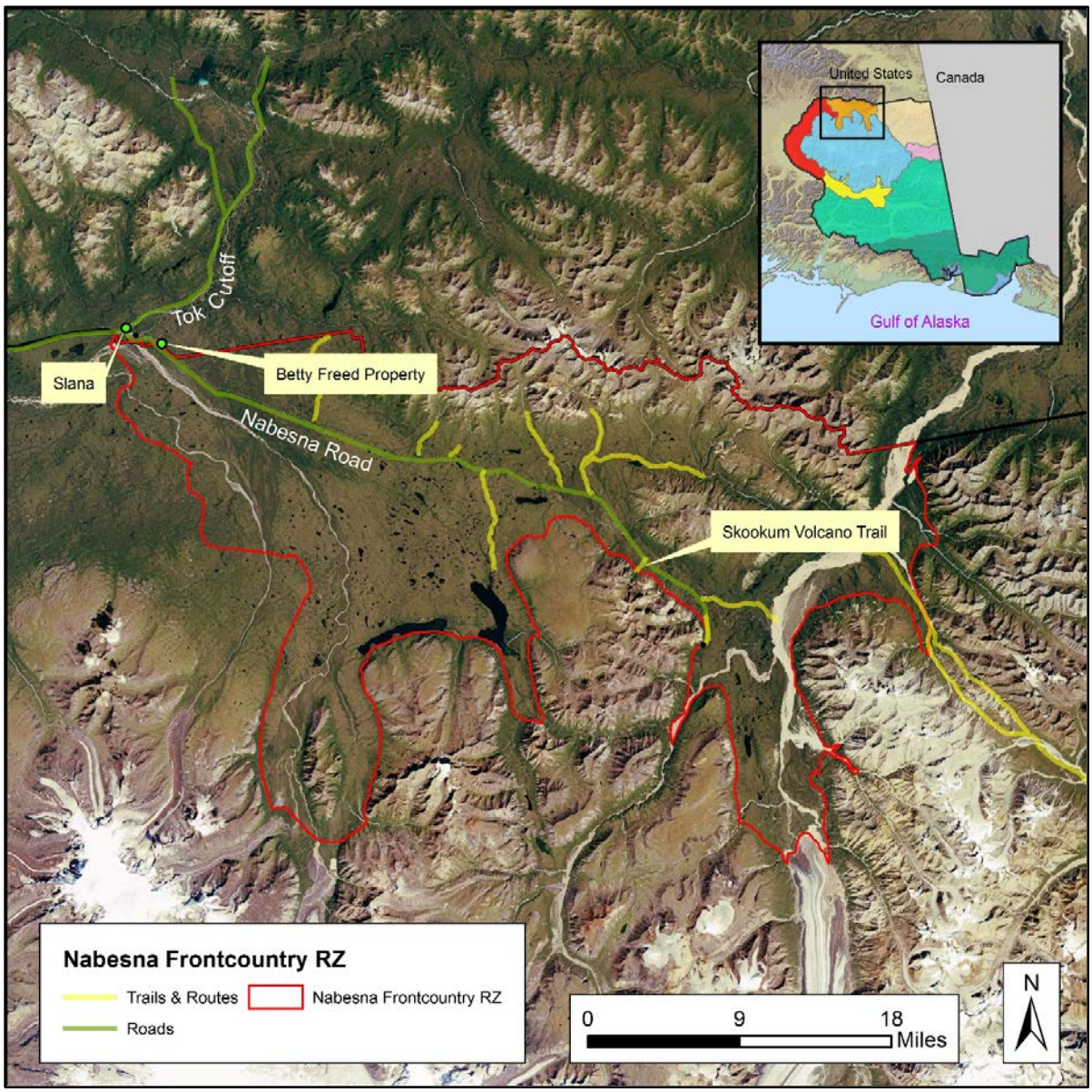

Figure 8. Map of Nabesna Front Country RZ

Slana

Control work has been performed since 2005 on a large infestation of white sweetclover at the intersection of the Tok Cutoff and the Nabesna Road, just outside the park. White sweetclover receives an invasiveness rank of 81 out of 100 according to Alaska Natural Heritage Program's (AKNHP) invasiveness ranking system (Carlson et al 2008). Due to its high invasiveness rank and the potential for this infestation to spread into the park via the Nabesna road, this has become a consistent management priority for the WRST EPMT over the past twelve years. Before permits to apply herbicide at this site were obtained from AK-DOT all treatments were performed manually. Herbicide treatments were first applied at this site in 2016. In 2017, the WRST EPMT continued herbicide treatments at the site.

The initial herbicide treatment in June involved four WRST EPMT members, one Alaska Regional EPMT member, and one volunteer. Two of the WRST EPMT members were unable to spray due to permitting restrictions and so acted as spotters and pulled any flowering plants. Over the course of three days, a total of 0.68 infested acres were treated using 20 gallons of mixed herbicide containing 4.12 fl. oz. of Milestone concentrate.

The site received a follow-up manual treatment in July performed by four WRST EPMT members and a six-person SCA crew. Control effort was focused on plants that were larger than seedlings to prevent any plants from going to seed before the herbicide treatment planned for August. A total of 57 lbs. of white sweetclover were pulled during this treatment.

The final re-treatment occurred in August. This herbicide treatment involved four WRST EPMT members and one Alaska Regional EPMT member. Again, due to permitting restrictions, two WRST EPMT members acted as spotters and pulled any flowering plants. Over the course of three days, a total of 1.5 infested acres were treated using 49.5 gallons of mixed herbicide containing 8.95 fl. oz. of Milestone concentrate.

Betty Freed Property

The Betty Freed Property is the location of WRST employee housing in Slana. Crews often stay here before heading further into the park on the Nabesna Road. The property also sees a significant amount of vehicle traffic from WRST maintenance staff. The high amount of traffic through this area makes it a possible source of invasive species that could spread into the park.

In June 2017, two WRST EPMT members applied 0.26 gallons of mixed herbicide containing 0.05 fl. oz. of Milestone concentrate to a total of 304.9 sq. ft. at the Betty Freed Property. Plants treated included prostrate knotweed, common plantain, narrowleaf hawksbeard, common dandelion, lamb's quarters, and false mayweed (*Tripleurospermum inodurum*).

Tetlin – Tanacross – North Country RZ

Braye Lake and Horsfeld Lodge

Braye Lake is in the Northeast corner of WRST (Figure 9). It is a popular location for visitors due to its proximity to the nearby Horsfeld Lodge which offers horseback guiding services to tourists and hunters. The lodge often free-ranges its horses in the surrounding area. The area immediately surrounding Horsfeld Lodge was most recently surveyed in 2014 and multiple invasive plant species were found. The horses are potential vectors for these plants to spread elsewhere in the park.

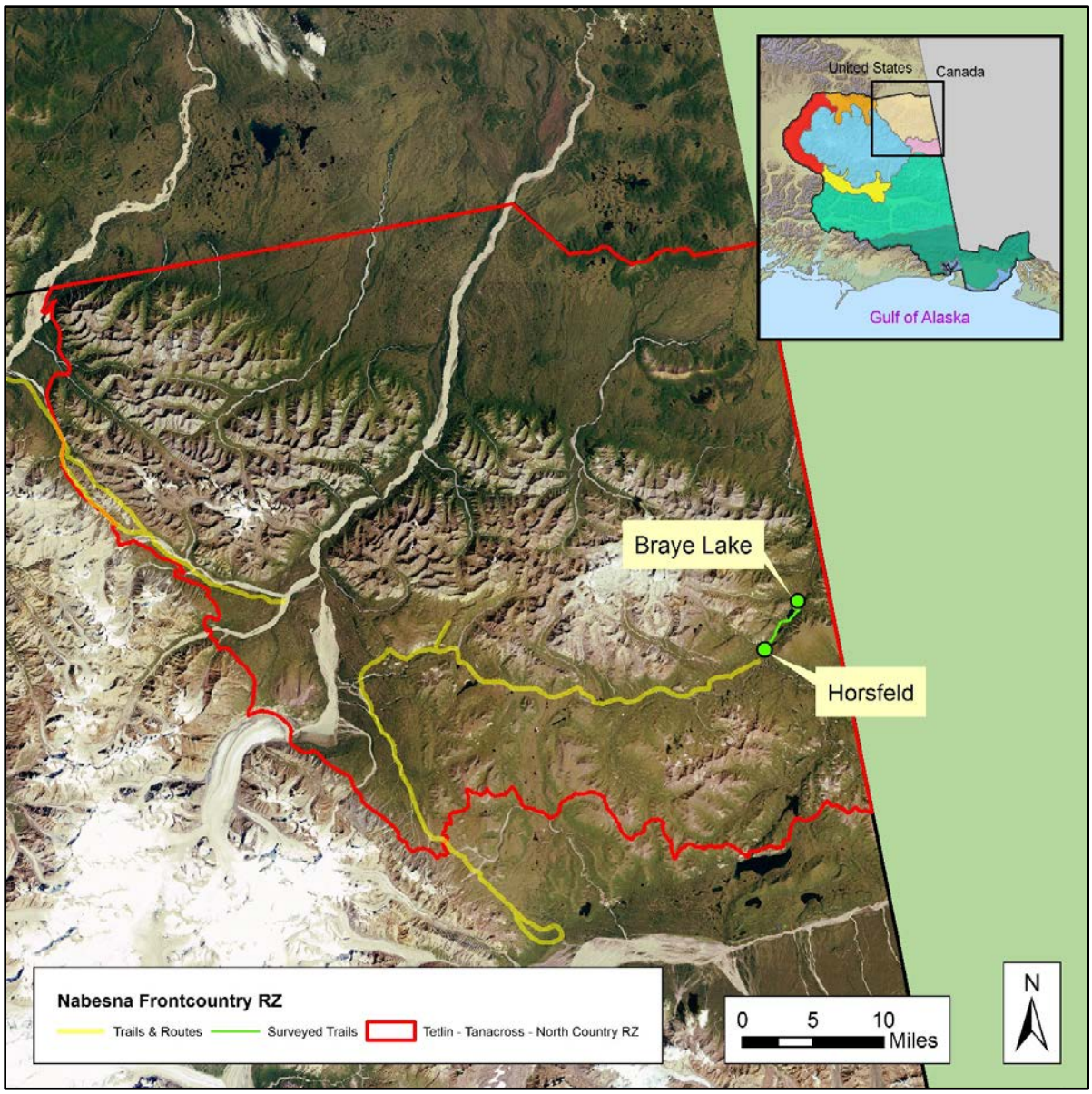

Figure 9. Map of Tetlin-Tanacross-North Country RZ

In 2017, two WRST EPMT personnel surveyed approximately five miles of horse and snow machine trails between Braye Lake and Horsfeld Lodge as well as the trails on the North end of Braye Lake. No invasive plants were found. The two WRST EPMT personnel also surveyed the area around the Horsfeld corral, looking specifically for narrowleaf hawksbeard and black bindweed which were found here for the first time in 2014. Neither species were detected.

Elodea Surveys

In summer 2017, the WRST EPMT crew surveyed eight lakes for non-native aquatic plants species including: Sculpin Lake, Braye Lakes, Chelle Lake, Sanford Lake, Long Lake, Moose Lake, Hanagita Lake, and Dadina Lake (Figure 10). Of these, five required flights into the remote backcountry. Although the surveys were to document any aquatic invasive plants detected, the target

species was *Elodea canadensis*. Elodea was not found during any of the surveys, but for further lab analysis, 4 environmental DNA (eDNA) samples were taken at each lake surveyed for a total of 32 samples (Figure 11). A total of 45.5 miles of lake perimeter was surveyed during these trips. On Hanagita and Dadina lakes, EPMT personnel performed point-intercept surveys in addition to the shoreline surveys.

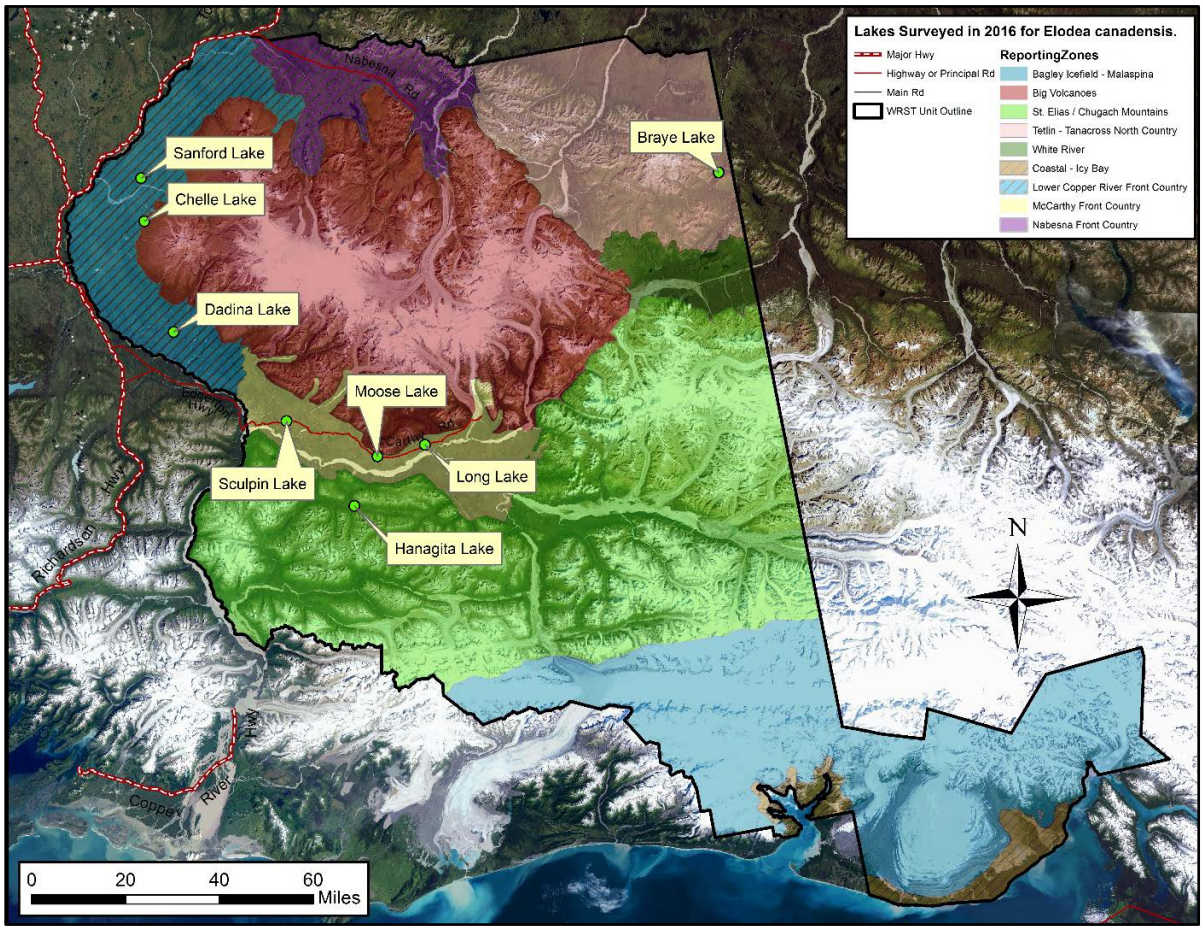

Figure 10. Map of aquatic plant surveys

Figure 11. EPMT members prepare eDNA samples taken from Sculpin Lake.

Lakes were surveyed with an inflatable canoe and a hard-sided canoe. In addition to surveys for invasive plants, inventories of native plant species were conducted. A total of 27 native aquatic plant species were documented and 60 herbarium vouchers collected from the surveyed lakes. The majority of the identified species were submersed aquatic vegetation, although additional species such as shoreline plants, floating leaved rooted plants, free floating plants, macroscopic algae, and aquatic mosses were also collected.

Education, Outreach, and Community Partnerships

Information Booths

In 2017 the WRST EPMT set up an information booth at two community events – the Fourth of July celebration in McCarthy and the annual Kenny Lake Fair. The booth featured a poster with information on invasive plants in Alaska, primarily those found in WRST and the Copper Basin. Many local residents and a few visitors to the area were very interested in learning about invasive plants. Overall, the booth was very well received and helped to facilitate conversations within the community about invasive plants.

Wrangell Institute for Science & Environment Geology Camp

The WRST EPMT partnered with the Wrangell Mountains Center (WMC) and the Wrangell Institute for Science & Environment (WISE) to host an educational program and a seed collection event for a middle school geology camp (Figure 12). Two WRST EPMT members led a group of seven students to the toe of the Kennicott glacier where they gave a presentation on glacial succession and native plants. The students learned how to identify and collect seeds from Eskimo potato (*Hedysarum alpinum*) and yellow oxytrope (*Oxytropis campestris*). The WRST EPMT members then took the students to the NPS campground in McCarthy where the group collected seed from the previously mentioned plants.

Figure 12. EPMT members educate students about glacial succession and native plants in McCarthy

Community Weed Pull Event

In July 2017, the WRST EPMT participated as a member of the Copper Basin Cooperative Weed Management Area (CB-CWMA) in the 5th annual Copper Basin Invasive Weed Smackdown. This year the event was located in Gakona and control efforts were focused on the large patches of white sweetclover on both sides of the road adjacent to the Gakona River. 19 volunteers attended the event, including volunteers from NPS and Bureau of Land Management (BLM), community members, and a six person SCA crew. A total of 1.2 acres of infested area were treated and 1,839 lbs. of white sweetclover were pulled.

Restoration and Seed Collection

Seed Collection

In 2017 the WRST EPMT focused seed collection efforts to two main locations – McCarthy/Kennecott and the Copper Lake trail in Nabesna. Seed collection occurred during the last week of August in McCarthy and Kennecott and during the first week of September on the Copper Lake trail. In both locations, the WRST EPMT was aided by a five person SCA crew.

Collection efforts in the McCarthy/Kennecott area primarily took place in the NPS campground in McCarthy and on the Jumbo Mine trail in Kennecott. Here, seed was collected from a variety of grasses and wildflowers with the focus being on grasses, particularly bluejoint reedgrass (*Calamagrostis canadensis*), and cow parsnip (*Heracleum maximum*). On the Copper Lake trail, the majority of the time was spent collecting seed from bluejoint reedgrass with a small amount of time spent collecting from slough grass (*Beckmannia syzigachne*).

In 2017, including seed collected during the Geology camp with WMC and WISE, 63.2 lbs. of seed were collected from 11 different plant species.

Table 2. Weights of seed collected in 2017

Scientific Name	Common Name	Seed Weight (g)
Aquilegia formosa	Western columbine	33.5
Acontium delphinifolium	Monkshood	1.0
Beckmannia syzigachne	Slough grass	131.5
Bromus cilatus	Fringed brome	1,582.1
Calamagrostis canadensis	Bluejoint reedgrass	19,996.1
Elymus trachycaulus	Slender wheatgrass	1,061.7
Geum macrophyllum	Largeleaf avens	379.6
Hedysarum maximum	Eskimo potato	1,510.1
Heracleum maximum	Cow parsnip	2,757.1
Oxytropis campestris	Yellow oxytrope	925.8
Potentilla mulifida	Staghorn cinquefoil	278.9

Restoration on Copper Lake Trail

The Copper Lake trail is a heavily used ORV trail used by subsistence hunters and fisherman accessing Copper Lake and the Black Mountains beyond the end of the trail. During the summer of 2017, WRST trail crews performed improvements to the Copper Lake trail and made new trail cuts. To decommission the old section of trail, two WRST EPMT personnel performed revegetation work at mile 9 of the Copper Lake trail where the old and new trails intersect. The soil on the old trail was loosened with hand tools and bluejoint reedgrass seed, collected on the Copper Lake trail in 2016, was spread on the first 35 meters of the old trail section.

Recommendations

Inventory and Surveys

The biennial bicycle survey of the Nabesna Road should be continued in 2018. The Nabesna Road provides access to front country and backcountry areas of the park and is used frequently by both hunters and park visitors. Known infestations and any previously undetected infestations should be mapped and manually treated to prevent further spread.

The infestation of bird vetch that was discovered growing along the Glenn Highway in 2017 should continue to be monitored in 2018. Contact should be made with DOT to see if chemical control is possible in this site.

EPMT member surveying along the Skookum Volcano Trail.

Backcountry airstrips, public use cabins, and park trails should receive continued monitoring in the future. Multiple airstrips and public use cabins should be monitored each summer, and sites should be scheduled on a yearly rotation to maintain that each site is visited every other year, every three years, or every five years. Many of these sites are currently free of invasive species, but these areas are popular with park visitors and potential infestations could be found early with continued surveying. Trails should be monitored according to which road survey is occurring during the season. The Nabesna Road is scheduled to be surveyed in 2018; all trails that begin along that road should be surveyed as well. For the 2019 season, the McCarthy Road and its accompanying trails should be surveyed.

During the 2016 season, EPMT staff surveyed the hangar at Yakutat and discovered Canada thistle (*Cirsium arvense*) and reed canarygrass (*Phalaris arundinaceae*). Given this location's proximity to the Coastal-Icy Bay RZ, EPMT staff should continue monitoring at this site. Coordinating with WRST Visitor and Resource Protection (VRP) staff on monitoring and control of these species in this area is highly suggested, as travel to Yakutat is costly.

Elodea Surveys

The Elodea protocol for the 2017 season was a success. The methods outlined in this protocol should continue to be utilized for future field seasons. The WRST EPMT was able to collect consistent data from all of lakes surveyed. The crew was able to document native vegetation, water depth, water visibility, and weather conditions. This information will contribute to future efforts and provide data about the composition of aquatic vegetation in Alaska's lakes.

EPMT member surveying for aquatic plant species at Hanagita Lake.

Lakes with high rates of float plane traffic and those that provide salmon spawning habitat should be considered for baseline and repeat surveys. Lakes to survey in 2018 inside the park include Tebay Lake, Long Lake, Grizzly Lake, and Jack Lake. Lakes located outside the park that should be surveyed include Lake Louise and Cross Winds Lake. EPMT staff should coordinate with fisheries staff for lake monitoring.

Control Work

Manual Control

To determine the efficacy of manual treatments, surveying and monitoring of control sites should be continued. In Kennecott NHL, the oxeye daisy that grows on the slope beneath the Kennicott Glacier Lodge and the species found on the slope beneath the General Manager's Office should continue to receive manual treatments. Ideally, these sites would be controlled early in the season in June, and again in August.

Other sites that should continue to be manually controlled are the Glennallen maintenance yard, Copper Center HQ, and the Slana site at the junction of Nabesna Road and Tok Cutoff. These three sites have been and should continue to be chemically treated, but manual control should be used in conjunction to remove any flowering plants missed during chemical treatments.

Chemical Control

In 2017, the WRST EPMT continued chemical control at four sites, and carried out treatments at one new site, the Kuskulana gravel pit. Herbicide use began in WRST in 2011 and has proved to be an effective and efficient method for controlling infestations when applied properly and at the optimum time in the life cycle of the plant. Where possible, chemical treatments should be utilized in concert with manual treatments to obtain the best results.

Chemical treatments should continue at the Glennallen maintenance yard, the Slana site, Kuskulana gravel pit, Betty Freed property, and Copper Center HQ. All of these sites have a high rate of traffic from vehicles, park staff, and visitors that then travel within park boundaries. Ideally, these sites should receive multiple treatments throughout the season, supplemented by manual treatments to remove flowering plants.

Nugget Creek Trail should be considered for chemical control treatments. Manual control of the infestations along this trail would be too time intensive and likely much less effective than chemical treatments. The use of an ORV during chemical control would be essential to completing the treatments in a timely manner.

Education, Outreach, and Partnerships

Community outreach and education events are important for the prevention and control of invasive plants. Education and outreach events were successful in 2017, the WRST EPMT should continue these efforts in 2018. EPMT should continue hosting the informational booth at the 4th of July parade in McCarthy and at the Kenny Lake Fair. Both events provide a good opportunity to communicate with local landowners and community members about invasive plants in the Copper River Basin.

The EMPT should continue to partner with WISE and WMC for their summer events. In 2017, EPMT taught a lesson at the Geology Camp to local youth. In past years, EPMT has partnered with these organizations at a “Need for Seed” event. Partnerships with these organizations should continue for 2018.

The community weed pull event, the “Copper River Basin Invasive Weed Smackdown,” often held in Glennallen or Gakona should continue in 2018. EPMT partners with members of the CB-CWMA for this event. The event brings awareness to community members about the infestation severity of white sweetclover in the Copper River Basin. Given that the event is one-day only, a large group of volunteers is what makes this event successful. Advertising the event in local businesses through flyers and on the radio is helpful in recruiting volunteers.

To facilitate public education about native plants, the EPMT should install a native plant garden at Kennecott NHL. Kennecott NHL attracts a large number of the park’s visitors, and has the potential to be a highly effective platform for educating visitors about native and invasive plants. To make the garden a success, EPMT staff should partner with Kennecott NHL Interpretation staff or VRP staff to coordinate location and planting of the garden. Seed from the SCA-aided seed collections should be utilized for the garden. EPMT staff should create signs and informational posters to display information about the importance of native plants and the negative impacts of invasive plants.

Restoration and Seed Collection

Restoration and revegetation sites from 2017 and other previous years should continue to be monitored for success and for potential infestations of invasive plants. Revegetation sites on the Copper Lake Trail should be monitored for success, and revegetation work should be done on the trail cuts that were decommissioned during the 2017 season. In Kennecott, success of the restoration on the slope beneath the General Manager's Office should continue to be monitored as invasive species were discovered and treated there during 2017.

Annual seed collection aided by SCA or YCC crews should continue in Nabesna. 2017 was a highly successful year, as a large amount of bluejoint reedgrass seed was collected, among other species. Seed collection should be focused on species that are successful in revegetation applications. Monitoring restoration sites will be helpful in determining which species should be collected in future years.

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Appendix A: Aquatic Vegetation Documented in 2017 Elodea Surveys

Scientific Name	Common Name	Braye Lake	Chelle Lake	Dadina Lake	Hanagita Lake	Long Lake	Moose Lake	Sanford Lake	Sculpin Lake
Calliergon cordifolium	Heart-leaved spearmoss	-	-	-	X	-	-	-	-
Callitriche hermaphroditica	Northernwater-starwort	-	-	-	X	-	-	-	-
Ceratophyllum demerson	Coon's tail	-	-	-	X	X	-	-	-
Chara spp.	Muskwort	X	X	X	-	X	-	-	-
Fontinalis spp.	Common Water Moss	X	X	-	-	X	-	-	-
Hippuris vulgaris	Common mare's tail	X	-	-	-	X	X	-	-
Isoetes maritima	Maritime quillwort	-	-	X	-	-	-	-	-
Myriophyllum sibiricum	Siberian water milfoil	X	-	-	X	X	X	-	-
Nitella spp.	Brittlewort	-	-	-	X	-	-	-	-
Nuphar lutea	Yellow pond-lily	-	-	X	-	-	-	-	X
Potamogeton epihydrus	Ribbon-leaf pondweed	-	X	-	-	-	-	-	-
Potamogeton friesii	Frie's pondweed	-	-	-	-	X	X	-	-
Potamogeton gramineus	Grass-leaved pondweed	-	-	X	-	-	-	X	-
Potamogeton natans	Floating-leaved pondweed	-	-	-	-	-	-	-	-
Potmogeton praelongus	Whitestem pondweed	X	X	X	X	X	-	X	-
Potamogeton pusillus	Small pondweed	-	-	-	X	-	-	-	X
Potamogeon richardsonii	Richardson's pondweed	-	X	X	X	X	X	X	X
Potamogeton robbinsii	Robbin's pondweed	-	-	-	-	-	-	-	-
Potamogeton zosteriformis	Flatstem pondweed	-	-	-	X	-	-	-	-
Ranunculus trichophyllus	White water crowfoot	X	-	-	X	-	-	-	-
Schoenoplectus subterminalis	Water bulrush	-	X	-	-	-	-	-	-
Sparganium hyperboreum	Northern bur reed	-	-	X	-	X	-	X	-
Stuckenia filiformis	Fineleaf pondweed	-	X	-	X	X	X	-	-
Stuckenia pectinata	Sago pondweed	-	X	-	X	-	-	X	-

Appendix A (continued): Aquatic Vegetation Documented in 2017 Elodea Surveys

Scientific Name	Common Name	Braye Lake	Chelle Lake	Dadina Lake	Hanagita Lake	Long Lake	Moose Lake	Sanford Lake	Sculpin Lake
Stuckenia vaginata	Sheathed pondweed	-	-	-	-	-	X	-	-
Subularia aquatica	Water awlwort	X	-	-	-	-	-	-	-
Utricularia macrorhiza	Common bladderwort	-	X	-	-	-	-	X	-

Appendix B: Presence of Non-native Plants in WRST Reporting Zones 2017

Scientific Name	Common Name	AKEPIC Rating	Upper Copper River	McCarthy Front Country	Nabesna Front Country	St. Elias/ Chugach Mountains	Tetlin-Tanacross-North Country
Capsella bursa-pastoris	Shepherd's purse	40	-	X	-	-	-
Chenopodium album	Lamb's quarters	37	X	X	X	-	-
Crepis tectorum	Narrowleaf hawksbeard	56	X	X	X	-	-
Fallopia convolvulus	Black bindweed	50	-	X	-	-	-
Leucanthemum vulgare	Oxeye daisy	61	-	X	-	-	-
Linaria vulgaris	Yellow toadflax	69	X	X	-	-	-
Medicago lupulina	Yellow alfalfa	64	X	-	-	-	-
Melilotus albus	White sweetclover	81	X	X	X	-	-
Papaver somniferum	Peony poppy	N/A	-	X	-	-	-
Plantago major	Common plantain	44	-	X	X	-	-
Polygonum aviculare	Prostrate knotweed	45	-	X	X	-	-
Prunus padus	European bird cherry	74	-	X	-	-	-
Tanacetum vulgare	Common tansy	60	X	-	-	-	-
Tarxacum officinale ssp. *officinale*	Common dandelion	58	X	X	X	-	-
Trifolium repens	White clover	59	-	X	-	-	-
Tripleurospermum inodorum	False mayweed	48	-	-	X	-	-
Vicia cracca	Bird vetch	73	X	-	-	-	-

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

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National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525