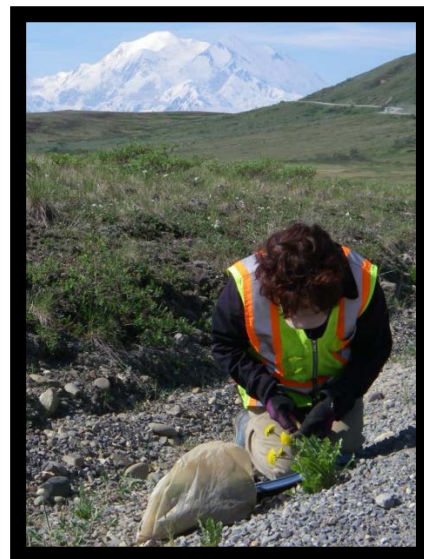




Invasive and Exotic Plant Management in Denali National Park and Preserve

2013 Summary Report

Natural Resource Data Series NPS/DENA/NRDS—2014/639



ON THE COVER

Clockwise from top left: Southeast Alaska Guidance Association crew member Amber Jones collecting native arnica seeds; Southeast Alaska Guidance Association Field Specialist Matthew Frintner pulling yellow toadflax; June Southeast Alaska Guidance Association crew members and leaders pose at Sable Pass for a group photo; Denali Vegetation Technician Wendy Mahovlic digging invasive dandelions near Stony Dome. Photographs by Wendy Mahovlic and Shannon Apgar-Kurtz

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Fort Collins, Colorado

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado, publishes a range of reports that address natural resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

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

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

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

In 2013 the Exotic Plant Management Team (EPMT) had a dual focus in Denali National Park and Preserve: to collect accurate data about the exotic plants in the park and to treat existing infestations. This was done using Global Positioning Systems to map the locations of the infestation and manual treatment of invasive plants, or in a few cases, the use of chemical treatment. Invasive plants are prioritized in part by the Alaska Natural Heritage Program's invasive plant ranking system and phenology. Higher ranking plants may be pulled later in the season because a lower ranking plant goes to seed first. There has been a considerable attempt to manage and reduce the size and number of infestations of invasive plants over the ten years the EPMT has existed in Denali. This year 1,417 pounds (4.89 acres) of invasive plants were pulled, 66 pounds of un-cleaned native seeds were collected, and 0.35 were re-vegetated using native seed with volunteers donating 1480 hours for the entire 2013 summer. This was accomplished with dedication from: a Student Conservation Association (SCA) intern, three Southeast Alaska Guidance Association (SAGA) crews, and six individuals. This year also marked the first year of using Windows Live Photo Gallery to organize photos and to eliminate the need for storing duplicates.

Acknowledgements

This author would like to thank the hard work and dedication of many people who helped to make this a successful season for native plants and Denali's Exotic Plant Management Team; Wendy Mahovlic whose dedication and guidance have been invaluable; Tim Federal and Joel Cusick for their technical support; Carl Roland for his overall supervision; the Denali National Park and Preserve's Dogsled Kennel and Trail Crew for their dedication in preventing invasive plants from spreading; the Denali National Park and Preserve's Maintenance Division for being a great partner in revegetating construction sites.

The author would like to acknowledge and thank the three SAGA crews who provided the necessary hands needed to control invasive plants and collect native seeds and other dedicated volunteers who help make this program a success.

Abbreviations

AKDOT- Alaska Department of Transportation

AKNHP- Alaska Natural Heritage Program

AKRR- Alaska Railroad

BIC- Backcountry Information Center

CLA – Concession Land Assessment

DENA- Denali National Park and Preserve

DVC- Denali Visitor Center

EPMT- Exotic Plant Management Team

GPS-Global Positioning System

HQ- Denali Headquarters

MSLC – Murie Science and Learning Center

NPS- National Park Service

SAGA- Southeast Alaska Guidance Association

SCA- Student Conservation Association

WWTP- Waste Water Treatment Plant

WAC- Wilderness Access Center

WLPG- Windows Live Photo Gallery

Introduction

Denali National Park and Preserve (henceforth Denali) contains more than six million acres of unspoiled wilderness and it is the Exotic Plant Management Team's (EPMT) goal to help keep this untamed land pristine by preventing invasive plants from taking hold in the park. For the past ten years, it has been the EPMT's goal to prevent the current 28 invasive species from spreading further into Denali. This goal is helped by Denali's relatively isolated location, a harsh climate, and limited means of transportation into the park which have kept invasive plants, with the exception of dandelions, limited to the front country. With the addition of manual and chemical treatment Denali's EPMT has been slowly but steadily working to control invasive plants and thereby helping to restore natural habitat in disturbed areas. The reduction of invasive species is also aided by collecting seeds from native plants and planting them in new construction sites.

Collecting data via Global Positioning System (GPS) allows the EPMT to monitor infestations and track progress year-to-year. These data have allowed the EPMT to show a reduction in the number of invasive plants accomplished by manual treatment and the areas which are still infested. In very few cases it has been necessary to chemically treat species that manual treatment has failed to eliminate. Overall reduction of invasive plants has been aided by restricting the use of imported soil in construction projects, ensuring construction equipment is free of mud and dirt where invasive plant seeds can harbor, and collecting native seeds for revegetation of construction areas. This favors native plants growth while inhibiting invasive plants.

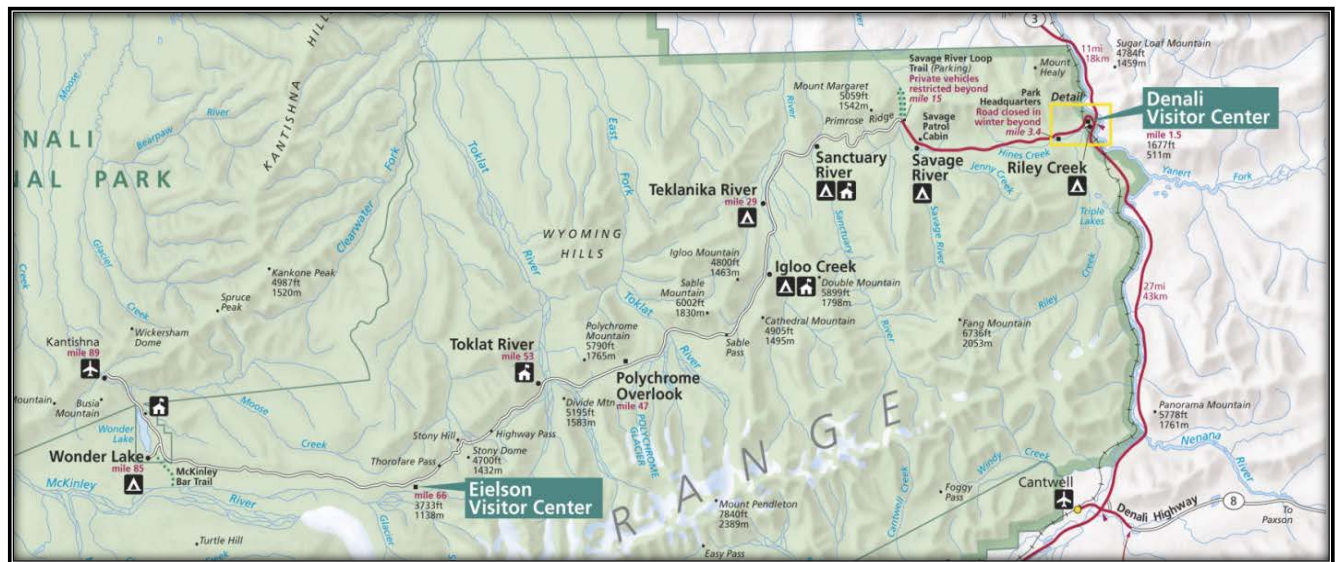


Figure 1. Map of the road through Denali.

Most invasive plants grow within the first three miles of the park road due to the high volume of vehicular and foot traffic and construction disturbance. As visitors walk and drive this part of the park road it is easy for invasive plants to become established and be carried further into the park. This is why it is essential for invasive plants already growing here to be monitored and treated every year. Manually treating these plants in the front country also creates a perfect opportunity to talk to

visitors walking in this area about invasive populations; why it's important to manage them and how they can help prevent the spread of exotic species in Denali and in their home state.

Invasive plants growing outside park boundaries along the George Parks Highway are also monitored and in many cases manually treated. This is done from mile 231 through 239 (the entrance to the Denali is at mile 237) to prevent these plants from spreading into Denali. Chemical treatment is only used within the park boundaries.

Methods

Site Selection

The Denali EPMT staff uses the Alaska Natural Heritage Program's (AKNHP) invasive ranking system to prioritize which invasive plants have the potential to become the biggest problems. With their ranking as a guide and GPS data collected over the past ten years the EPMT determines which species to monitor and where they are growing. Most of the EPMT's efforts are concentrated on the first three miles of the park road due to the high volume of traffic and the potential for contamination further into the park. This section of road sees traffic from visitor service operations, personal vehicles, and buses. A portion of these buses drive into the park along the road corridor and can carry invasive seeds further into Denali.

The EPMT uses the Early Detection, Rapid Response approach to find, treat, and monitor invasive plants in the park and along the Park's Highway near the entrance to Denali. The EPMT monitors along the George Parks Highway due to the high potential of any invasive plants growing alongside the highway to spread into Denali. By monitoring this area, invasive plants can be detected and treated rapidly before they have a chance to take hold and spread into the park. All invasive populations in Denali or along the George Parks Highway are mapped regardless of treatment. This is done using a Trimble GeoXT (GPS) with TerraSync, GIS software.

Manual treatment

The majority of invasive species are manually treated. Typically this means kneeling down and using a dandelion digger to dig the plant out by the root. This is done before a plant has the chance to go to seed. As mentioned above, the best time to stop an infestation is before it can spread. This is unrealistic for some species such as narrowleaf hawksbeard or plantain which have already established themselves in several areas within the first three miles of the park road. Thus, the most effective way to treat is to dig each plant out year after year. All of the pulled invasive plants are stored in marked large sturdy plastic bags until winter when they can be burned.



Figure 2. Digging dandelions along park road near Wonder Lake

Chemical Treatment

The more rapid the response to an infestation of invasive plants, the easier it is to contain and eliminate the threat. By monitoring and treating known infestations, others are more likely to be detected and can be properly treated. For invasive plants that fail to respond to manual treatment, chemical treatment is an option. Chemical treatment, or herbicide, is only used for a very small number of infestations. This year these areas included the treatment of: dandelions behind a newly

revegetated site at the C-Camp fuel tanks, pineapple weed and lambsquarter at the kennel's future weed free compost area, and bird vetch at the entrance to the power plant. The power plant entrance had the most prolific infestation of bird vetch in Denali and was sprayed with the herbicide Milestone in July of 2012. It was treated again on July 8, 2013, due to a few plants (22 stems) reappearing. Milestone was again used at a rate of 6 oz. per acre. The other 5 populations of bird vetch that were sprayed in 2012 have been "undetected" in 2013. These populations should be monitored in the future:

1. Mound by the Mercantile Bus Stop – 6 stems
2. 30' west of the Riley Creek/Wilderness Access sign (mile .75 Park Rd.) – along old roadside trail – 3 stems.
3. NE corner of the Denali airstrip – 3 stems
4. NE corner of the Denali airstrip – 8 stems. These 2 populations are 6' from each other.
5. Along the sidewalk that leads to the front door of the Power Plant (mile 1.45 Park Rd.) – 3 sets of bird vetch all with 1 or 2 stems each.

Another factor in determining when to manually or chemically treat is based on the phenology of the plant is. For chemical treatment, if using Milestone, it is best to treat the plant before it flowers. For manual treatment it is critical to pull plants before they go to seed. Dandelions (*Taraxacum officinale*) are the EPMT's main focus in June because they bloom sooner and therefore go to seed before a higher priority invasive such as Narrowleaf hawksbeard (*Crepis tectorum*) or Bird vetch (*Vicia cracca*). As soon as the latter two start to bloom they become the main focus due to their small numbers and its ability to spread.

All the data collected over the season is submitted to the EPMT at the National Park Service (NPS) Alaska Regional Office. They collect data from every NPS EPMT for the Alaska Region and is included in the Government Performance and Results Act (GPRA) reporting (Ring, 2012).

Results

Overview

This year the EPMT divided its time between the following projects and targeted more individual species listed below. A total of 1417 pounds (4.89 acres) were manually removed, mainly inside Denali’s boundaries but also along the George Parks Highway from mile 231 through 239.

Table 1. Summary of treatment results from 2004-2013.

Year	EPMT Personnel		Volunteer Crews		Total Person Field Hours	Invasive GPS Data NPS Lands(non-NPS lands)		
	# pers.	Field Hours	# pers.	Field hours		Species Acres Surveyed	Species Acres Infested*	Acres Treated
2004	1	39	1	25	64	2.553 (6.557)	0.934 (6.557)	0.450 (0.035)
2005	1	224	8	544	768	16.713 (2.321)	12.877 (1.531)	3.261 (0.186)
2006	1	454	8	679	1,133	750.313 ¹ (2.958)	16.866 (0.349)	10.211 (0.121)
2007	2 ²	743	16	1,173	1,916	805.951 ¹ (7.826)	11.329 (0.301)	8.368 (0.289)
2008	2 ²	626	10	454	1,080	741.687 ¹ (11.982)	12.750 (7.968)	11.051 (0.649)
2009	2 ²	571	5	385	956	749.459 ¹ (4.210)	20.437 (0.317)	11.370 (0.317)
2010	3 ³	1,893	16	2,560	4,453	159.034 (35.245)	16.766 (2.616)	14.125 (2.586)
2011	3 ⁴	764	3	143	907	290.592 (23.395)	29.348 (7.228)	10.290 (2.010)
2012	2 ²	478	35	912	1390	61.872 (6.397)	19.108 (2.366)	10.519
2013	2 ²	500	27	980	1480	118.85 (8.3)	5.783 (1.189)	4.56 (0.461)

* 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% cover.

1-This acreage includes the actual road surface of the Denali Park Road.

2-Includes one SCA intern

3-Includes two SCA interns

4-Includes one SCA intern and one international SCA intern

Dandelion Removal

As part of an ongoing control effort two weeks in June are dedicated to dandelion removal. Common dandelion (*Taraxacum officinale*) is the most prolific invasive species in the park and is most recognizable. It looks similar to the native horned dandelion (*Taraxacum ceratophorum*) and while both grow in disturbed areas, common dandelions far outnumber their native counterpart. While it would take a herculean effort to rid the park entirely of common dandelion, keeping them from working their way beyond the Savage River checkpoint (where traffic is greatly restricted) at mile 15 is entirely possible given the continuance of dandelion removal efforts.

East



Figure 3. SAGA crew members digging dandelions alongside park road.

The first week of dandelion Deveg, June 10th through the 14th, was spent with six Southeast Alaska Guidance Association (SAGA) youth crew members and their two crew leaders. When dividing the park road, the East Fork Cabin (mile 43 park road) is approximately half way. From mile 43 on the park road to mile 16, the SAGA crew helped to pull 237 lbs. of dandelions and volunteered 288 hours. Much of this was accomplished by walking the park road with multiple people on each side looking for dandelions and identifying each one as the common dandelion before digging the taproot out. The campgrounds at Igloo, Teklanika, and Sanctuary and the gravel pit at Teklanika were also thoroughly

searched.

West

The following week, June 17th through the 21st, the EMPT staff along with a personal volunteer, started at mile 72 on the park road and eradicated dandelions to the end of the road at mile 92 by pulling 55 lbs. of dandelions. With the exception of the Eielson Visitor Center (mile 66), there weren't any dandelions detected from mile 43 to mile 72 along the park road. It should be noted that while the overall number of dandelions are diminishing beyond mile 72, there are several private lodges in Kantishna, and at least two of these lodges, the Kantishna Roadhouse and the Denali Backcountry Lodge have the common dandelion growing on their respective property. Due to lack of time and personnel, the Kantishna airstrip was not manually treated this season so this area should be closely monitored in the future to prevent the spread of dandelions. This year found an absence of dandelions on the road from the Wonder Lake campground to the new water tank site. This is likely due to the construction taking place last year and this year.

Invasive sweep

During the week of July 15th through the 19th three SAGA crew members along with their three crew leaders joined in on purging the first three miles of the park road and the surrounding area of some of the most invasive plants. The surrounding areas included mile 231.95 and 238 of the George Parks Highway. Over four days 692 lbs. of invasive plants were removed and 248 hours of volunteer time donated. The vast majority of the 692 lbs. consisted of foxtail barley, plantain, and dandelions that were removed from the C-Camp Shaffer Building area. The SAGA crew also collected seeds from Frigid Arnica (*Arnica frigida*), Alpine Arnica (*Arnica alpine ssp. angustifolia*), and Arctic Lupine (*Lupinus arcticus*) for later revegetation projects.

Table 2. Target species for treatment.

Latin Name	Common Name	AKEPIC Rank	Location*	Acres Infested	Acres Treated
<i>Crepis tectorum</i>	Narrowleaf hawksbeard	56	F, HC, PH, PK, TD	0.845	0.845
<i>Galeopsis bifida</i>	Splitlip hempnettle	50	HC	0.001	0.001
<i>Hieracium umbellatum</i>	Narrowleaf hawkweed	51	PH	0.027	0.027
<i>Hordeum jubatum</i>	Foxtail barley	63	F, PH, PK, TD	1.58	1.38
<i>Linaria vulgaris</i>	Yellow toadflax	69	TD	0.008	0.008
<i>Melilotus alba</i>	White sweetclover	81	F, PH, TD	0.118	0.118
<i>Melilotus officinalis</i>	Yellow sweetclover	69	PK	0.003	0.003
<i>Plantago major</i>	Common plantain	44	F, FQ, HC, PK, PH, TD	0.839	0.6
<i>Silene noctiflora</i>	Night flowering silene	42	HC	0	0
<i>Taraxacum officinale ssp. Officinale</i>	Common dandelion	58	F, FQ, HC, PH, PK, TD	3.26	1.7
<i>Trifolium spp.</i>	Alsike, red and white clover	57, 53, 59	F, HC, PH, PK	0.19	0.003
<i>Tripleurospermum inodorum</i>	Scentless chamomile	48		0.001	0.001
<i>Vicia cracca</i>	Bird vetch	73	F, PH, PK, TD	0.34	0.31

* F = front country, FQ=Fannie Quigley's Cabin, HC=Kantishna horse corral, PH = George Parks Highway (AK Route 3), PK = park road, and TD = train depot.



Figure 4. Siberian pea shrub

Siberian pea shrub (*Caragana arborescens*)

With an AKNHP invasive ranking of 74, the only Siberian pea shrub plant in the park was in front of the Wilderness Access Center and was removed in 2010. It has not been observed since but the area should be checked once a season to make sure it is not growing back. While looking for the landscapers at the McKinley Chalet Resort, three shrubs were observed growing in a landscaped area. One of the landscapers and maintenance workers were informed of its invasiveness but since it's on private property the EPMT cannot treat it. It is important to talk

to the landscapers every year to keep them aware of the issue because employee turnover rate is high. Siberian pea shrub was found in the following areas:

1. McKinley Chalet Resort (mile 239 George Parks Highway)
2. Wilderness Access Center (mile .75 park road)

Narrowleaf hawksbeard (*Crepis tectorum*)

Narrowleaf hawksbeard is a high priority even though the AKNHP invasive ranking is 56. It was brought in through contaminated soil used for the Waste Water Treatment Plant (WWTP) sometime before 1999 and started to spread from there. In 2009 the narrowleaf hawksbeard growing in the



Figure 5. Narrowleaf hawksbeard

WWTP was treated with herbicide and in 2010 the area adjacent to WWTP was treated and it was a success. (Evans & Knapick, 2010). The area it has currently spread into is relatively small and it is responding well to manual treatment. Narrowleaf hawksbeard can be found in the following areas:

1. Kantishna Horse Corral (mile 90.9 park road)
2. Park road from Post Office road (mile .25 park road) to the Wilderness Access Center (mile .70 park road)
3. Waste Water Treatment Plant (mile .25 park road)
4. Waste Water Treatment outflow pipe (mile 237.25 George Parks Highway)
5. Just north of the park entrance (mile 237.15 George Parks Highway)
6. Bus driver personal parking lot (mile 1.5 park road)
7. Bus parking lot (mile 1.5 park road)
8. Aramark Employee Dining Room (EDR) (mile 1.25 park road)
9. Murie Science and Learning Center (MSLC) revegetation area (mile 1.25 park road)

Starting in late June narrowleaf hawksbeard sweeps are conducted once a week at the sites listed above. The plants have narrow stems making them tricky to spot from above unless they are blooming or in seed, especially if they are growing amongst other vegetation. Checking these areas once a week increases the likelihood of catching narrowleaf hawksbeard before it has a chance to go to seed. It has yet to be found in an undisturbed area. This highlights the importance of checking all newly revegetated areas and the continued monitoring of previous revegetation sites.

Splitlip hempnettle (*Galeopsis bifida*)

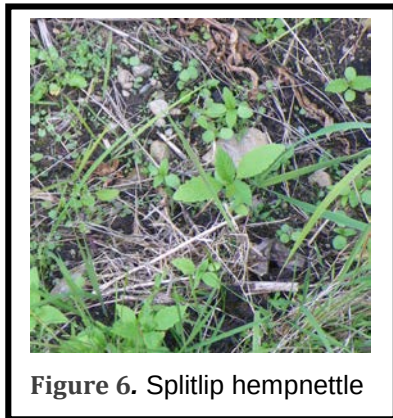


Figure 6. Splitlip hempnettle

Splitlip hempnettle can only be found at the old Kantishna Horse Corral and was likely brought in when there were horses. It has an AKNHP invasive ranking of 50. Due to the small area affected, it has been vigorously dug up every year and its population is diminishing. According to Kantishna locals, it has been growing in the area for years. (Ring, 2012) It should still be dug up when pulling invasive plants in the Kantishna area. It has been observed in the following area:

1. Kantishna Horse Corral (mile 90.9 park road)

Narrowleaf Hawkweed (*Hieracium umbellatum*)

Narrowleaf hawkweed has an AKNHP invasive ranking of 51 and has not been found within the boundaries of Denali. However, it has been found near the McKinley Village at mile 231.95 on the George Parks Highway and was manually treated with the help of a SAGA crew in attempt to keep it from spreading into Denali.

1. Mile 231.95 George Parks Highway

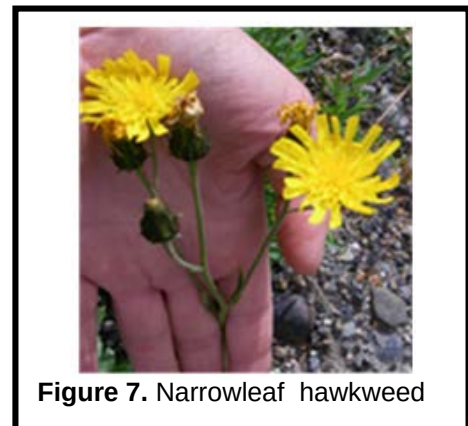


Figure 7. Narrowleaf hawkweed

Foxtail barley (*Hordeum jubatum*)



Figure 8. Foxtail barley

While the nativity of foxtail barley is subject to debate, its invasive tendencies are not. The AKNHP has given it a ranking of 63 and left untreated it spreads quickly in disturbed areas. While it is not the highest priority, it has the potential to become a bigger problem. It is very dangerous to animals if they inhale or swallow the awns because they can become lodged in their mouths and noses. Foxtail barley has been observed growing in the following areas:

1. C-Camp (mile 3 park road)

2. Park road from Post Office road (mile .25 park road) to the Wilderness Access Center (mile .70 park road)
3. Shaffer Building (mile 3 park road)
4. Waste Water Treatment outflow pipe (mile 237.25 George Parks Highway)
5. Kennel road (mile 3.4 park road)
6. The Alaska Railroad Depot (mile 1.4 park road)
7. Concession Land Assessment Building (CLA) (mile 1.5 park road)
8. Mile 238 George Parks Highway

It appears to be creeping further along the park road and growing in recent revegetation areas. Several hundred pounds were pulled from C-Camp and the Shaffer Building area which was recently revegetated in the summer of 2012. Foxtail barley was also pulled from the recently revegetated road leading to the dog sled kennel. A few foxtail barley plants were also observed along the ridge of the Triple Lakes Trail and at the old airstrip site at Savage Campground but were not manually treated.

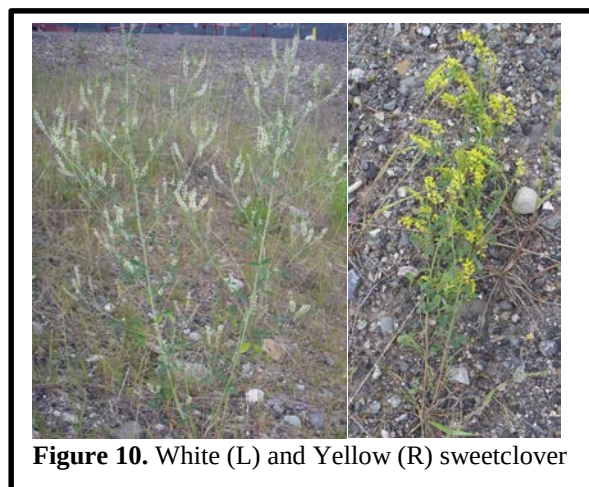
Yellow toadflax (*Linaria vulgaris*)



AKNHP has given yellow toadflax an invasive ranking of 69. It was carried in by an Alaska Railroad (AKRR) train and only found in the middle of the tracks at the Denali depot. It has proven hard to manually treat due to its rhizomatous root structure. This year it was in part manually treated by the EMPT with the help of SAGA and later chemically treated by the AKRR.

1. The Alaska Railroad Depot (mile 1.4 park road)

White and yellow sweetclover (*Melilotus alba* and *Melilotus officinalis*)



With an AKNHP invasive ranking of 81, white sweetclover is ranked higher than its cousin yellow sweetclover who has an invasive ranking 69. One white sweetclover plant was found behind the fuel tanks at C-Camp and one was pulled by a park employee at the Shaffer building before the EPMT could map it. Both yellow and white sweetclover were found between mile 238 and 239 Parks Highway. This area is of particular concern because it is heavily trafficked by visitors who then come into Denali. It has been observed in the following areas:

1. C-Camp fuel tanks (mile 3 park road)
2. Shaffer building (mile 3 park road)

3. Glitter Gulch mile 238 to mile 239 George Parks Highway
4. Waste Water Treatment outflow pipe (mile 237.25 George Parks Highway)
5. Just north of the park entrance (mile 237.15 George Parks Highway)

Common plantain (*Plantago major*)

With an AKNHP ranking of 44 the common plantain is a low priority. It is only targeted in recent revegetated areas and only mapped when a higher priority species is mapped. Common plantain likes to grow in disturbed areas. It has been observed in the following areas:

1. C-Camp (mile 3 park road)
2. Shaffer Building (mile 3 park road)
3. Kennels road (mile 3.4 park road)
4. Concession Land Assessment Building (mile 1.5 park road)
5. Park road from Post Office road (mile .25 park road) to the Wilderness Access Center (mile .70 park road)
6. Waste Water Treatment Plant (mile .25 park road)
7. Waste Water Treatment outflow pipe (mile 237.25 George Parks Highway)
8. Bus driver personal parking lot (mile 1.5 park road)
9. Bus parking lot (mile 1.5 park road)
10. Aramark Employee Dining Room (EDR) (mile 1.25 park road)
11. Murie Science and Learning Center revegetation area (mile 1.25 park road)
12. Train depot (mile 1.4 park road)
13. Wonder Lake Ranger Station (mile 86 park road)
14. Wonder Lake Campground (mile 84.5 park road)
15. Kantishna Horse Corral (mile 90.9 park road)
16. Fannie Quigley Cabin (mile 92.1 park road)



Figure 11. Common plantain

Night flowering silene (*Silene noctiflora*)

This year, night flowering silene was not detected at the Kantishna horse corral, located near splitlip hempnettle where both have been pulled in years past. This area should continue to be monitored to make sure night flowering saline does not come back. It has an AKNHP invasive ranking of 42.

1. Kantishna Horse Corral (mile 90.9 park road)



Figure 12. Night flowering silene

Common dandelion (*Taraxacum officinale*)

Common dandelion has an AKNHP ranking of 58 and is the most prolific invasive plant in Denali



Figure 13. Wendy Mahovlic digging the common dandelion in Kantishna

and easily the most recognizable. Because it is so common elsewhere it is easily brought into the park on vehicles, shoes and gear. Once established and allowed to go to seed, it spreads quickly in disturbed areas. Within Denali the most prolific area dandelions grow in is the most trafficked area, the first three miles of the park road. Unlike every other invasive plant in the park, dandelions have spread past the Savage River check station and along the park road. It has been observed in the following areas:

1. Park road from mile 1 through 43
2. Eielson Visitor Center (mile 66 park road)
3. Park road from mile 72 through 92.4
4. Fannie Quigley Cabin (mile 92.1 park road)
5. C-Camp (mile 3 park road)
6. Shaffer Building (mile 3 park road)
7. Kennels road (mile 3.4 park road)
8. Concession Land Assessment Building (mile 1.5 park road)
9. Waste Water Treatment Plant Outflow pipe (mile 237.25 Parks Highway)

White, Alsike, red clover (*Trifolium repens*, *T. hybridum*, and *T. pretense*)

White, Alsike and red clovers have an AKNHP invasive ranking of 59, 27, and 53 respectively. White clover is most prevalent near the mercantile (mile .42 park road) and is being monitored and not manually treated due to a lack of help and higher priority invasive plants. Six plants were pulled from the Waste Water Treatment outflow pipe revegetation area in an attempt to prevent it from spreading. It has been observed in the following areas:

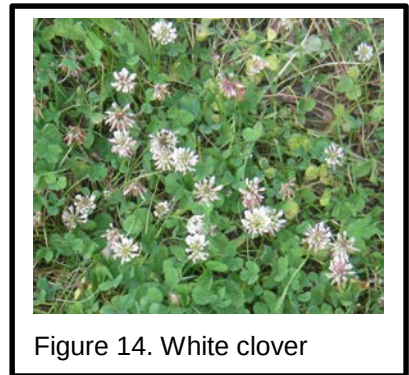


Figure 14. White clover

1. Park road in certain areas miles 1-15
2. C-Camp (mile 3 park road)
3. Mercantile (mile .4 park road)
4. Waste Water Treatment outflow pipe (mile 237.25 George Parks Highway)
5. Alaska Railroad Depot (mile 1.4 park road)
6. Denali Visitor Center Parking Lot (mile 1.5 park road)

Scentless chamomile (*Tripleurospermum inodorum*)

Scentless chamomile was not detected this year and may be considered a success story. With an AKNHP ranking of 48, it was found in 2005 (Acosta, 2005) at the Alaska Railroad Depot. The infestation diminished over the past eight years with a notable exception in 2009 (Bryne, 2009). The depot should continue to be monitored because the train's ability to transport invasive plants into Denali.

1. Alaska Railroad Depot (mile 1.4 park road)

Bird vetch (*Vicia cracca* ssp. *cracca*)



Figure 16. Bird vetch

Bird vetch has an AKNHP ranking

of 73 and is one of Denali's EPMT's highest priorities. Its rhizomatous root structure makes it especially hard to manually treat. It also poses a bigger threat than most other invasive plants because a little tendril on the end of the leaves grasps on to other plants and shades them. Due to these factors in 2012 the herbicide, Milestone was sprayed on the infestations in Denali and again in 2013 (Ring, 2012). Herbicide was sprayed on these populations of bird vetch in July, 2012: 2 populations at the NE corner

of Denali airstrip, near the bus stop at the mercantile, 30 feet west of Wilderness Access Center sign along old roadside trail, near the door to the power plant, and at the entrance to the power plant. Bird vetch is responding very well to herbicide. There weren't any plants detected at Fannie Quigley's cabin after digging them up in 2011. Infestations outside of the park on State land are manually treated due to a lack of permission from the State of Alaska for chemical treatment. Bird vetch can be found in the following areas:

1. Mile 231.90 George Parks Highway
2. State pullout at mile 238 George Parks Highway
3. Old campground site at mile 240 George Parks Highway
4. Entrance to the power plant (mile 1.47 park road)
5. McKinley Chalet Resort (mile 238 George Parks Highway)

The worst infestation of bird vetch is in a landscaped area in front of the McKinley Chalet Resort. The EPMT has notified the landscaping and maintenance departments there but has not treated it because it is on private property. It is important to talk to the landscapers every year due to the high employee turnover rate at the resort. There are two different areas at the Chalet where it is taking over and should still be monitored. Both of these areas are in front of the Chalet near the Parks Highway in the landscaped shrubs. EPMT has mapped both locations.



Figure 15. Scentless chamomile

Need for Seed

The Need for Seed is an annual volunteer effort in which native seeds are collected for future revegetation purposes. This year, the east end effort was from August 12 – August 16 and included 6 SAGA volunteers who spent 252 hours collecting 45 pounds of uncleaned seed. The west end session was August 19 – August 24 and 21 pounds of uncleaned seeds were collected with the assistance of 3 volunteers who spent 144 hours collecting as well as planting native seeds. All of the seeds were ripe and ready to collect during that time period. During the west end session, Culler's Creek (Mile 50 Park Rd. – Porcupine Forest) was revegetated by planting native seeds. Seeds used were: *Leymus innovatus*, *Oxytropis campestris*, and *Hedysarum mackenzii*. Mag Amp fertilizer was used.

The east end collection areas were:

- The Nenana River – just east of the Nenana River bridge (south end) mile 237.35 – across the river from ERA helicopters. This is a very good spot to collect *Oxytropis campestris* and *Leymus innovatus*.
- Along Riley Creek at the far end of the overflow parking area – lots of *Hedysarum alpinum* plants.
- The areas surrounding the RV parking area at the Denali Visitor Center (DVC) – this area was reveged in 2007 and is a wonderful source for *Elymus sp.* seeds.
- The old Mile 4 roadbed which was revegetated in 2009 and is an excellent place to collect *Oxytropis campestris* and *Elymus sp.*
- Mile 240 and 236 Parks Highway are great spots for *Hedysarum mackenzii*.

The west end collection areas were:

- Toklat rest area and the old gravel pit across the road – this area was revegetated in 2007 and is a good source for *Oxytropis campestris*, *Elymus sp.*, and *Leymus innovatus*.
- Along the Park Rd. just west of Toklat rest area – great source for *Hedysarum alpinum*, *Leymus innovatus*, *Elymus sp.*, and *Delphinium glaucum*.
- Mile 62 – across from Stony pull-out – a fantastic source for *Arnica lessingii*.
- Mile 85 and the Wonder Lake Campground Rd. – *Elymus sp.* plants are plentiful here.
- McKinley River Bar – *Hedysarum alpinum* seeds are profuse.

Outreach and Education

Outreach and education continues to be an integral part of Denali's EPMT's approach. It is in the park's best interest to educate visitors and employees on how they can help to prevent the spread of invasive plants. Last year a fact sheet was published about Denali's invasive plants and is a great resource for visitors and employees alike.

Many want to know what is being pulled and why, which creates a perfect opportunity to inform them on what the EPMT does and how they can help. Forming a good partnership with the maintenance, trails, visitor services and interpretation departments is also a key goal.

Maintenance is a great resource because their projects create a need for revegetation sites. A continued close partnership is important to know when and where revegetation projects will be needed so native seeds can be collected. Each maintenance employee can watch for invasive plants, if they know what they are looking for. That is why the Revegetation Technician did a Power Point presentation – "Denali Deveg and Reveg" during the monthly Maintenance meeting in June.

While the vast majority of trail work doesn't need vegetation, the trail crew members can also look for invasive plants. There are few established trails in Denali and most are in the front country. These trails are very popular with visitors looking for an established trail to hike, increasing the risk of invasive seeds finding their way onto these trails. During the trail crew's training in May, the Revegetation Technician educated the crew on Denali's invasive plants so they can watch for exotic species.

Interpretation and visitor services have the most contact with visitors. A few sentences given at a ranger program or hike is one of the best ways for visitors to be informed about invasive plants. Having a fact sheet out at the visitor center information area and the backcountry information center to inform visitors might also prove helpful in trying to spread the word. To facilitate this further, the Revegetation Technician presented a Power Point about Denali's invasive plants at the Interpretation department's monthly meeting in July.

For the EPMT, narrowleaf hawksbeard sweeps are one of the few opportunities to have some face to face time with visitors. Acknowledging visitors as they walk by increases the likelihood an EPMT member will be asked what she is pulling and why. Having a few sentences on what is invasive and why it's important can be crucial to visitor exposure. Also if visitors see the problem firsthand they are more likely to give invasive plants a second thought.

Recommendations

The following are recommendations for the upcoming 2014 field season.

- Coordinate with the Alaska Department of Transportation about treating invasive plants along the George Parks Highway with herbicide. Especially about chemically treating the infestations of bird vetch at miles 231.90 and the pullout at mile 238.
- Ask the AKRR when they spray herbicide on the tracks at the Denali depot.
- Monitor toadflax at the AKRR.
- Ask the bus drivers if they will give a very brief talk about invasive plants in Denali: which plants are invasive, what to look for, and how to prevent their spread.
- Talk to the landscapers at each of the lodges in Kantishna about controlling dandelions on their property.
- Gather the landscapers and maintenance crews at the hotels in Glitter Gulch for a discussion on invasive plants and how they can help.
- Find out who owns the airstrip at Kantishna and inquire about the possibility of spraying herbicide to control the dandelions.
- Sponsor a volunteer weed pull with visitors and/or employees.
- Create a fact sheet or pamphlet about which invasive plants are edible or can be used for medicinal purposes and how to prepare them.
- Monitor the east side of mile 232.25 of the George Parks Highway for tall white sweetclover, which up until an AKDOT project two years had been found there.
- Monitor the newly revegetated areas - Kennels Road, Shaffer Building, CLA Building, and the Outflow pipe area at Mile 237.25 Parks Highway for foxtail barley, dandelions, plantain, tall white sweetclover, and narrowleaf hawksbeard.
- Monitor the road from the Wonder Lake campground to the new water tank site for dandelions.
- Continue to walk the highway from mile 238 through 239 and look for tall white and yellow sweetclover and other invasive plants as this is an area with heavy car and foot traffic.
- Monitor the areas where bird vetch was found and treated with herbicide: the NE corner of the Denali airstrip, near the bus stop at the mercantile, 30 feet west of Wilderness Access Center sign along old roadside trail, near the door to the power plant, and at the entrance to the power plant.

Windows Live Photo Gallery

This year Denali's EPMT implemented Windows Live Photo Gallery (WLPG) in an attempt to manage photos. All photos from this year and many from past years were added and organized. This was done by "tagging" photos in WLPG. Tagging refers to imbedding a word or phrase in the photo which is used to identify it. For example in the EPMT's WLPG a picture of a common dandelion will be tagged with the common name, the Latin name, the word "plant", and the word "invasive". Before the project was started a system for organization had to be mapped out by the EPMT staff. In order to keep it simple seven categories were chosen: location, event, plant name, whether the plant is invasive or native, if a Trimble (GPS unit) is in the photo, what organization a person belongs to (or volunteer), and a generic tag (i.e. location, plant, animal, landscape). Each photo will end up with multiple tags for example, a photo of a SAGA crew member digging a common dandelion at mile 17 of the park road will have the tags: mile 17 (location), SAGA (organization), invasive, common dandelion, plant, dandelion deveg east (event). The key to organizing photos this way is consistency.

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Appendix 1 Invasive Plant Policy of Denali National Park

September 2008

Topsoil Transportation

- Top priority – no invasive plants or seeds contained within the topsoil.
- Can transport topsoil from the west end of the park to the east end of the park as most invasives are at the east end. Not recommended to transport topsoil from the east end to the west end. There are exceptions to this as there are some invasive plants at the west end. An example is the horse corral in Kantishna. There are several invasive plants in that area that are not seen anywhere else in the park.
- No mileage limitation.
- Important to make sure that the surrounding area where the topsoil is taken from is free of invasive plants and seeds.
- Saving topsoil from the disturbed site to put back when the project needs it is a good policy – if feasible.

Revegetation of Disturbed Land

- Disturbed land in the park must be revegetated with native species from within a 20 mile radius of where the disturbance is.
- Revegetation may occur with native tundra mats, native transplants, native seedlings, native cuttings, bioengineering techniques with native plants, and native seeds.
- Instructions on how to revegetate using the materials above are found in the —Native Plant Revegetation Manual for Denali National Park and Preserve by Roseann V. Densmore.
- Revegetation with native species must occur to keep the ecosystem intact.
- One of the most important procedures before using any of the revegetation methods is scarifying the soil. Soil compaction is the cause for most of the unsuccessful revegetation projects (luckily, there aren't many of those!!!!).
- Fertilizer is not used in the Front Country front country projects as it makes the invasives grow as much or more than the native plants or seeds.
- Fertilizer was used at the Primrose turn-around (mile 17) with no detrimental effects.

- After the native tundra mats or native plants are planted it is ESSENTIAL to water, water, and water – especially if it is a dry summer.
- Saving tundra mats and transplants before the site is disturbed is good policy if they are free of invasive plants – if feasible. The tundra mats at Eielson were saved for three years on pallets and are doing marvelously after being transplanted in May and June of 2008.

Seed Collection and Range of Use

- Seeds are collected, cleaned, and planted by hand thereby making them very precious.
- Seed needs for a project can take up to several seasons to collect, so prompt communication with the revegetation technician about any maintenance projects that need seeds is vital to the success of native seed planting. Joe D. informed the revegetation technician six years before the new Denali Visitor Center needed seeding. That was a sufficient amount of time to be able to collect all the seeds needed for such a large project.
- When planting the native seeds, annual rye is used in the mix. This provides almost instant greening of an area and helps diminish the possibilities of invasives taking hold. Native seeds can take up to three or four seasons to become established and invasives can invade in one season. Annual rye is also used to stabilize slopes.

Equipment Inspection for Use within the Park

- Construction companies that are going to be using their equipment within the park boundaries need to have it pressure washed and inspected before bringing it in the park. Hopefully, this will diminish the spread of invasive plants within the park. This includes species that have already taken hold in parts of the park (common dandelion) and others that have not arrived here but are in Anchorage and Fairbanks or the lower 48.
- When inspecting equipment, one looks in all the nooks and crannies of the rig, looking for clumps of dirt, mud, or gravel that might be harboring invasive seeds which range in size from smaller than a pinhead to several inches. Inspecting the tires or treads is also very important as seeds can hitch-hike on the rubber or metal as well as the axils. The parts of the equipment that are closest to the ground are most likely the areas that will transport the invasive seeds, but the entire piece of equipment needs to be inspected.
- If the equipment does not meet the standards of the inspector, the piece must be taken to be pressure washed again and re-inspected.

Gravel and Borrow Pit Inspections

- Any pit that is outside the park and is used to store or extract soil, gravel, or any other material to or from the park needs to be inspected. This is to insure that the equipment going to/from the pit stays invasive free (as it has already been inspected) and the material in the pit that is coming to the park is invasive free.
- When inspecting a pit, one looks for invasives not only in the pit, but on the road entering the pit and all areas surrounding it. If any invasives exist, it depends on the species of invasive as to what happens next. If the invasive is of the variety in which the seeds can stay viable for up to 80 years (such as *Melilotus alba* or *M. officinalis*), then the pit will fail inspection. If the seeds are not that variety, the invasives can be pulled by the inspector (if there are not that many) or the owner of the pit should pull them and the pit can be inspected again.