

Exotic Plant Management
Denali National Park and Preserve
2007 Field Season
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Introduction

The 2007 summer field season marks the seventh year that invasive plants species have been inventoried in Alaska National Parks, and the fourth season that the Exotic Plant Management Team (EPMT) has mapped and selectively hand-treated invasive plant populations. The spatial data collected with the GPS units helps the National Parks Service (NPS) to monitor the spread of invasives over the long-term, to evaluate the efficacy of hand-treatment, and to further plan long-term control efforts.

Denali National Park and Preserve (DENA) has one of the highest visitation of all Alaskan Parks, which makes it uniquely susceptible to invasions by non-native plants. Firstly, the higher number of visitors translates into a higher potential for invasive seeds to be spread by foot or vehicle traffic. Secondly, high visitor volume means that anthropogenic disturbances (in which invasive species thrive), in the form of ongoing maintenance and new construction projects, are regularly created.

It is the goal of the DENA EPMT to monitor past sites of invasive plants, to hand-treat those populations deemed “more”¹ invasive, to monitor areas which might be susceptible to new invasive populations, and to prevent the establishment of new invasive populations through revegetation efforts of disturbed sites.

Methods

Invasive Plant Monitor and Control

EPMT members this field season monitored new anthropogenic disturbed sites and used last years GPS data (see Appendix A) to return to the sites of previous invasive plant populations (in the front country, along the Park Road, along the George Parks Highway by the Park entrance, and at Kantishna) to map invasive plant populations with Trimble Geo XT GPS units. These GPS units were loaded with custom data dictionaries, which allowed EPMT members to log specific attributes of each population.

Many invasive plants were easily recognized and identified by EPMT members with past invasive experience. Team members consulted the Alaska Plant Information Clearinghouse’s *Invasive Plants of Alaska*, Eric Hultén’s *Flora of Alaska and Neighboring Territories: A Manual of the Vascular Plants*, Verna Pratt’s *Wildflowers of Denali National Park*, and Denali staff botanists to identify any plants which were not immediately recognizable.

¹ A ranking of ≥ 50 , as noted at http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm

Whenever possible, invasive plant populations were controlled with manual treatment (pulled by hand). Because of time and labor restraints during the field season, plants deemed very invasive by AKEPEPIC were pulled first. This sometimes meant that invasives such as *Plantago major*, *Trifolium repens*, and *Taraxacum officinale* along certain portions of the park road were monitored, but left untreated.

Volunteers were utilized whenever they were available. An Americorps/TCCC crew spent three weeks in DENA pulling *Melilotus alba*, *Crepis tectorum*, and *Taraxacum officinale*, while the annual East End and West End Dandelion Deveg drew individual volunteers from across the United States to pull *Taraxacum officinale* along the Park Road, by the Visitors Center, and at Wonder Lake.

Restoration and Revegetation Efforts at DENA

DENA is the only Alaska National Park collecting native seeds in order to restore construction sites, and thus prevent invasive species from gaining footholds in disturbed areas. EPMT member Wendy Mahovlic organizes annual Need for Seed events for both the East and West end, which draw individual volunteers from across the state and country.

2007 marks the first season that seeds will be cleaned on-site, rather than taking them to the Plant Materials Center in Palmer, Alaska to be processed. Cleaned seeds are organized by species and collection location and stored in the onsite seed bank.

Results

Invasive plants of high priority:

***Crepis tectorum* (Narrowleaf Hawksbeard): 1,481 pounds pulled this season**

When mature, narrowleaf hawksbeard is a yellow composite flower atop a narrow, single stem and can produce up to 49,000 seed per plant (AKEPIC, 64). This plant is easy to pull by hand. However, *Crepis tectorum* populations are still incredibly difficult to control because it is challenging to see the narrow stems among other roadside vegetation unless the plant is flowering. Because of this, *Crepis tectorum* sites need to be hand-treated regularly – at least once a week.

It is important to note, also, that mechanical treatment is effective in the short-term only. Burn field populations that were weed-eaten last year responded by sprouting more robustly this year, and with an increased number of stems from each plant. Mechanical treatment appears to logarithmically increase the number of potential seeds in the long run. DENA EPMT members do NOT recommend mechanical treatment as an effective solution to controlling *Crepis tectorum* populations.

Re-treated sites this year included the sewage lagoon and burn field along the first mile of the Park Road, both sides of the Park Road from the entrance to the Visitors Center, inside the Visitors Center and in the bus parking lot, Riley Creek Campground, the road from the Riley Creek Mercantile towards the long-term parking lot and past the Post Office, along the pedestrian trail that starts across from Riley Creek Mercantile and winds

past the sewage lagoon, and at the Kantishna airstrip and horse corral. Additionally, there was a single *Crepis tectorum* stem treated in a new spot this year, at approximately mile 3.5 of the Park Road, on the north side of the road, just past the gravel section of the road.

Crepis tectorum has completely taken over the sewage lagoon and burn field site. EPMT members and the volunteer TCCC/Americorps crew invested 152 man-hours hand-pulling 1,301 pounds of *Crepis tectorum* from the sewage lagoon area in late-June and early-July. By mid-July, an observer was unable to tell that the site had ever been treated. There is a possibility that the DENA sewage lagoon will be reconstructed in the next few years. If that happens, EPMT member Wendy Mahovlic will recommend that that soil be burned and NOT re-used. Until that time, however, manual retreatment of the area seems to be a waste of time and resources.

Unless the sewage lagoon and burn field can be chemically treated (or burned?), we recommend that that area be left alone in the future so that EPMT members and volunteers can focus on completely eradicating less profuse *Crepis tectorum* populations in other areas of the park.

***Hieracium aurantiacum* (orange hawkweed): 0 pounds pulled**

An orange composite often planted as an ornamental, since no native Alaska plant blooms in a similar color.

EPMT members were concerned that seeds might be carried by flightseeing and/or air taxi aircrafts from the Talkeetna airstrip, where it grows rampantly, to the unimproved airstrips on the west fork of the Yentna river. Members spent two days completing a thorough survey of the area. One airstrip had been completely washed away by the river since last season. The remaining airstrip was deemed completely free of *Hieracium aurantiacum*, as well as of any other invasive species.

***Linaria vulgaris* (yellow toadflax)**

Is a distinctive looking plant with many narrow, alternate leaves along its single stem and yellow flowers in “dense, terminal clusters” (AKEPIC, 182). This highly invasive plant has only been found at two sites in DENA: along the railroad tracks in front of the railroad depot, and at the railroad tracks at the trailhead of the old Triple Lakes trail. (This site is most easily accessed now by taking following the new Triple Lakes trail to the railroad tracks and then following the tracks north).

Both populations were retreated and hand-pulled this year.

While AKEPIC notes that hand-pulling can effectively control small populations of *Linaria vulgaris* (184), members of DENA’s Long Term Ecological Monitoring team have commented that other National Parks refuse to hand-treat this plant because any portion of its root system left in the ground can resprout more vigorously than the original plant. These two stands should be monitored closely in coming seasons to note the effect of manual treatment on their population size.

***Melilotus alba/officinalis* (white and yellow sweetclover): 133 pounds**

This tall, aromatic clover is highly invasive (each plant may produce up to 35,000 seeds and seeds can remain viable in the soil for up to eight decades [AKEPIC, 103]) and already grows roadside along many miles of the George Parks Highway. Special attention is paid to eradicating this plant in Alaskan riparian habitats, in order to prevent this plant's spreading into the backcountry of National Parks via river systems. It is easily and effectively pulled by hand.

Inside of DENA boundaries, populations were retreated in the first 2 miles of the park road, along the railroad tracks from the depot to the park road, in a recently constructed propane field in C-Camp, and at the southeast corner of the Rock Creek automobile bridge by headquarters. There appeared to be more *Melilotus alba* in the area surrounding the intersection of the railroad tracks and the Park Road than there were in previous seasons.

Because *Melilotus alba* is so invasive, special care is given to keeping it out of DENA whenever possible. EPMT members have continued to monitor and treat populations several miles north and south of the Park Entrance along the George Parks Highway. Populations were retreated this year along either the side of the Highway from Glitter Gulch south to the entrance, at mile 232.5 (south of the Park entrance), and on the west side of the highway at the closest railroad crossing south of the Park entrance.

Hand treatment appears to be very effective in controlling *Melilotus alba*. The population underneath the "Kingfisher Creek" sign on the west side of the highway in Glitter Gulch took only about 6 man-hours to clear this season, as opposed to 32 last season. The population at mile 232.5 of the Parks Highway took an eight-person crew only 3 hours to eradicate this season, as opposed to 8 hours last season. Because of the long viability of the seed bank, however, hand treatment will need to be repeated annually for quite some time for these populations to be eradicated completely.

***Tripleurospermum perforata* (scentless false mayweed): 25 pounds**

A member of the Asteraceae family, this plant has white ray florets, yellow disk florets and leaves similar to, but more delicate than, exotic wild chamomile (AKEPIC, 58). *Tripleurospermum perforata* should be considered a DENA priority because it has the ability to grow in stands thick enough to stifle the growth of native seedlings (AKEPIC, 58).

Tripleurospermum perforata was retreated this season along the walking trail from the Park Road to the bus parking lot and along the railroad tracks from the railroad depot to the Park Road. There appeared to be more plants this season than last in the open areas south of the Park Road where the railroad tracks crossed the road.

***Vicia cracca* (bird vetch): 5 pounds**

This climbing plant has pinnate leaves typical of legumes, but can be distinguished from native species in DENA by its weak stem and its "well-developed" tendrils (AKEPIC, 107). *Vicia cracca* is particularly insidious for two reasons: 1) as a nitrogen-fixer, it

alters soil conditions (AKEPIC, 108), and 2) because its tendrils allow it to aggressively climb over nearby vegetation. *Vicia cracca* is being hand-controlled in DENA with moderate success; portions of the delicate root left in soil may resprout, so hand treatment is a labor-intensive task and treated areas should be rechecked regularly.

Stands of *Vicia cracca* at the Visitors Center airstrip and along the park road (on the south side of the road, 8 paces west of the WAC sign and 850 feet west of the WAC sign) were retreated this season, as was a single stem at the auto wash bay, which was present in 2004 but not in 2005 (Acosta, Wilson). None of these plants that were retreated had any flowers on them, even though newly-discovered populations elsewhere in the park did. Since these plants are infinitely more nondescript without their eye-catching blooms, it is important that, in the future, sites of previous infestations be tracked with GPS data.

Vicia cracca populations previously mapped in Kantishna at Fannie Quigley's cabin, at the C-Camp propane field, and by permanent housing apartment buildings were not present this season. These sites should be monitored next year to ensure that these populations do not return.

Two new populations were found this year: a stand of large, blooming plants in mound by Riley Creek Mercantile, and a stand of large, blooming plants along the railroad tracks north of the railroad depot. Both spots were controlled by EPMT members.

Invasive plants of lesser concern:

***Capsella bursa-pastoris* (shepherd's purse)** was monitored but not treated in Headquarters.

***Chenopodium album* (lambsquarters)** was monitored but not treated in Kantishna and in the sewage lagoon.

Hordeum jubatum was not controlled this year, given last year's discussion of its status of an exotic.

***Lupinus polyphyllus* (bigleaf lupine): 5 pounds**

Can be distinguished from the native lupines by its greater size and number of leaflets (10 or more on each palmate leaf).

One new stand of *Lupinus polyphyllus* was discovered and treated this season, west of the WAC sign. The population at the mile 7 pullout was neither monitored nor controlled, and should be checked next season.

***Phleum pratense* (common timothy)** was monitored and treated in Glitter Gulch. Populations previously noted in Kantishna and the frontcountry were not treated.

***Taraxacum officinale* (common dandelion): 605 pounds**

Continues to be the most pervasive and visible invasive in DENA. *Taraxacum officinale* is pervasive enough in the frontcountry of the park that EPMT members work to contain, rather than eradicate, it. (The one frontcountry exception to this strategy might be the Visitors Center, which is a new enough construction that some dedicated work there might prevent the new tundra mounds from being overcome by the plant in the future.)

Because *Taraxacum officinale* grows so profusely, it is an ideal plant population to utilize volunteer groups to control. Wendy Mahovlic organizes annual Dandelion Deveggs for both the East End and the West End, in attempts to monitor and control roadside populations of the plant beyond Savage River. TCCC/Americorps crews also pulled *Taraxacum officinale*.

Populations treated at Horseshoe Lake trail last year were not found this year.

EPMT member Wendy Mahovlic notes that she can definitely see that annual manual retreatment of *Taraxacum officinale* results in the population size shrinking from season to season.

***Trifolium repens*: (10 pounds)** grows all over the frontcountry, but is a lower priority than many of the other invasives in the area.

Previously monitored populations of ***Bromus inermis*, *Descurainia sophia*, *Erysimum cheiranthoides*, *Lappula squarrosa*, *Leucanthemum vulgare*, and *Ranunculus repens*** were not monitored because of time restraints and should be monitored next season.

Restoration and Revegetation Efforts at DENA

Volunteers this year spent 376 hours collecting native seeds. Particular attention was paid to gathering seeds that might be used for the green roofs and construction site of the soon-to-be-completed Eielson Visitors Center.

On Sept. 11 and 12, 2007 native seeds were planted in areas at the new Eielson Visitors Center by an EPMT member. Only one third of the leach field was planted with native grasses and *Hedysarum alpinum* due to the compact nature of the soil. The rock walls on the East end of the parking lot were planted with native grasses and wildflowers as was the rock wall in front of the interp sign near the main entrance. Specifics on which species were planted where can be found on the GPS data and on the Eielson map in the Reveg office. More native seed planting will need to be done in the Spring of 2008 when the construction is complete.

Table 1: Master List of Exotics found at DENA

Taxon	Common Name	Observed inside park?
<i>Brassica rapa</i>	field mustard	N
<i>Bromus inermis</i> ssp. <i>inermis</i>	smooth brome grass	Y
<i>Capsella bursa-pastoris</i>	shepherd's purse	Y
<i>Chenopodium album</i>	common lambsquarters	Y
<i>Crepis tectorum</i>	narrowleaf hawkbeard	Y
<i>Descurainia sophia</i>	flixweed	Y
<i>Elymus repens</i>	quackgrass	N
<i>Erysimum cheiranthoides</i>	wormseed mustard	Y
<i>Hordeum jubatum</i>	foxtail barley	Y
<i>Lappula squarrosa</i>	European stickseed	Y
<i>Lepidium densiflorum</i>	common pepperweed	Y
<i>Leucanthemum vulgare</i>	oxeye daisy	Y
<i>Linaria vulgaris</i>	yellow toadflax	Y
<i>Lupinus polyphyllus</i>	bigleaf lupine	Y
<i>Matricaria discoidea</i>	pineapple weed	Y
<i>Melilotus alba</i>	white sweetclover	Y
<i>Melilotus officinalis</i>	yellow sweetclover	Y
<i>Phleum pratense</i>	common timothy	Y
<i>Plantago major</i>	common plantain	Y
<i>Polygonum aviculare</i>	prostrate knotweed	Y
<i>Polygonum convolvulus</i>	black bindweed	N
<i>Polygonum cuspidatum</i>	Japanese knotweed	N
<i>Ranunculus repens</i>	creeping buttercup	Y
<i>Silene noctiflora</i>	night-blooming cockle	N
<i>Sonchus oleraceus</i>	annual sowthistle	Y
<i>Spergula arvensis</i>	corn spurry	N
<i>Stellaria media</i>	common chickweed	Y
<i>Taraxacum officinale</i> ssp. <i>officinale</i>	common dandelion	Y
<i>Trifolium hybridum</i>	alsike clover	Y
<i>Trifolium pratense</i>	red clover	Y
<i>Trifolium repens</i>	white clover	Y
<i>Tripleurospermum maritima</i>	false mayweed	N
<i>Tripleurospermum perforata</i>	scentless false mayweed	Y
<i>Triticum aestivum</i>	common wheat	Y
<i>Vicia cracca</i>	bird vetch	Y

Discussion

Volunteers provided DENA with an astonishing 1328 hours of labor this season. They are invaluable to the EPMT program and we are grateful for their help. Without their assistance there is no way EPMT members could possibly have pulled as many pounds of *Taraxacum officinale* or *Crepis tectorum*! It is important to consider, however, the point at which volunteer programs reach a point of diminishing returns – the moment when coordinating the logistics of large groups or motivating sluggish volunteers begins to take up time and energy that might more effectively be spent pulling weeds or collecting seeds.

It might be helpful to tweak volunteer schedules for next season so that TCCC crews were here for two weeks instead of three, or to arrange, if possible, for two separate crews to spend the same week at DENA simultaneously, so that EPMT members might utilize the same number of volunteer hours over a single week.

Additionally, because DENA is such a large park and the pioneer park in revegetation efforts, the EPMT could easily make use of a third team member. It could reasonably take the equivalent of a third person's full time effort to keep the *Crepis tectorum* along the Park Road under control, even if the population the sewage lagoon were not taken into account.

High priority tasks for 2008

- Revisit and retreat all known populations of *Linaria vulgaris*, *Melilotus alba*, *Tripleurospermum perforata*, and *Vicia cracca*
- Revisit sites of eradicated populations of *Vicia cracca* to ensure that they do not resprout.
- Survey Aramark housing area (Riverside) for potential invasives.
- Assist Wendy with restoration efforts at Eielson Visitors Center
- Continue ongoing dialogue with Kantishna private inholdings owners and landscapers in Glitter Gulch re: invasive control

Appendix A: Creating Background Files for the Trimble GeoXT

Convert Old Data (imp files) to Shapefiles:

Use GPS Pathfinder Office (GPO) to open old data imp files:

File → Open, Browse to old data. (ie. This year I went to:

W:\ARO\NaturalResources\EPMT\2007_DATA\2007_OUTGOING\Data_Files_2007\DENA\30_vicra_07.imp)

Double-click the EXPORT icon on the left toolbar.

The imp file you just open should be in the grey “Selected Files:” box.

Browse to the output folder where you want to store your shapefiles.

Choose an Export Setup: **Sample ESRI Shapefile Setup**

Create a map in ArcMap

Double-click on the ‘Add Data’ button (yellow diamond with a black cross in front of it) to browse to the shapefiles (.shp extension) you just created. Add that data.

Use the NPS Theme Manager to add whatever additional data you want included.

(I chose to add:

Trails – DENA,

Railroads (Local),

Roads (Local),

Buildings – DENA, and

OrthoImage True Color – DENA satellite images)

Export your map:

File → Export Map...

Browse to a folder where you’ve chosen to store these images.

Save as type: **TIFF (*.tif)**, I chose Resolution **600** dpi, and make sure that the ‘Write World File’ box is **checked**.

Convert the TIFF files to MrSID files:

Open ArcCatalog

Use the folder tree toolbar on the left-hand side to navigate to the TIFF image you just created.

Right-click on the file → Export → Raster to MrSID. A “Raster to MrSID” dialog box opens.

In the “Output raster” box (very bottom of the dialog box), browse to the folder where you would like these MrSID files stored. (IMPORTANT: there cannot be any spaces in this path, so putting them somewhere like “My Documents” will not work. You might have to drop them directly onto the :C or :D drive and just remember to delete them later.)

NOTE: MrSID files can NOT be dragged and dropped like normal files with Windows Explorer. If you want to move them around to keep them organized, you need to use the folder tree inside of **ArcCatalog** to drag and drop them.)

Transfer Background Files to the GPS Unit

Use the Data Transfer Utility in GPS Pathfinder Office to transfer your new background files to the GPS Unit.

Using background images with the GPS unit.

Open the ‘Map’ tab in Terrasync.

Under the ‘Layers’ drop-down, click on ‘Background Files...’ to choose the background file you want to view.

Under the ‘Layers’ drop-down, make sure that ‘Background’ is checked.

If you want to see your own position on the Map screen, make sure that a Rover file is open!

Works Cited

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