Exotic Plants in Alaskan National Park Units

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Introduction

We conducted a preliminary study of and made recommendations concerning exotic vascular plants in Alaskan National Park units. The National Park Service defines exotic species as those occurring in a given place as a result of actions of humans. Study objectives included assembling and reporting existing information on exotic plant species, and performing field surveys in five high priority parks. This report focuses on plants we actually located and identified in or near the five parks surveyed during the 2000-2001 field seasons. We provide information for each taxon on life history, location and size of populations within each park, significance of impact, and feasibility of control or management.

Study Area

We selected five parks, and specific areas within those parks, for survey for this study. Our selections were based on information from park resource personnel, existing data, and logistical concerns. In Denali National Park and Preserve (DENA), we surveyed the park road, park facilities and campgrounds, selected trails, privately owned lodges in Kantishna, and horse trails around Kantishna. In addition, Carl Roland checked for exotic plants on his native plant surveys in remote areas. In Wrangell-St. Elias National Park and Preserve (WRST), we surveyed the construction site of the new visitor center and the nearby gravel pit, the road from Chitina to McCarthy, the campground near McCarthy, the road from McCarthy to Kennicott, and selected areas around the Kennecott Mine. We also surveyed the Nabesna Road to mile 32, where the road became impassable for our vehicle. In Kenai Fjords National Park (KEFJ), we surveyed the Exit Glacier Road, campground, parking area, and trails. In Sitka National Historical Park (SITK), we surveyed most of the park but concentrated on the visitor use areas, seashore, banks of Indian River, and the terrestrial perimeter of the park. In Katmai National Park and Preserve (KATM), we surveyed the Brooks Camp facilities, hiking trails out of the Brooks Camp, and disturbed areas around Grovsner Lodge, Kulik Lodge, and Katmai Lodge. We had already surveyed the Valley of 10,000 Smokes Road and the Three Forks Overlook area in 1997.

Methods

Lists of exotic plants known or expected to occur in the five surveyed parks were prepared prior to fieldwork. To prepare the lists, we obtained vascular plant lists from the parks and from the species lists compiled for each park by the Alaska Natural Heritage Program. Lists of exotic plants occurring in Alaska were obtained from Hulten (1968) and Kartesz and Meacham (1999).

Plants were identified in the field as native, exotic, or unknown. For each exotic or unknown plant, an estimate of population size, habitat description, and GPS location were recorded. Population size was classified as <5, 5-10, 11-20, 21-30, 31-40, 41-50, or >50. Representative specimens of unknown plants and exotic plants were photographed on site and collected. The University of Alaska herbarium staff verified plant identifications. We mounted and labeled specimens according to University of Alaska Museum standards. Curated specimens are currently in the herbarium database and collection.

A database was prepared in Excel Microsoft 2000. The database also includes some exotic taxa which we found near but not in the parks we surveyed. We included them in the database to alert park resource managers to their presence near parks. Data fields for each location of a plant or group of plants include scientific name based on the Integrated Taxonomic Information System (ITIS) (2001), synonyms used by the University of Alaska Museum herbarium, National Park Service unit, latitude, longitude, elevation, plant population size, and notes on habitat and location.

We prepared a summary report for most exotic taxa. Each report summarized information important to resource management personnel in Alaskan parks. References for more detailed information were cited. Reports have a short, nontechnical description of the plant that emphasizes characteristics easily identified

in the field, and most reports have a color photo of the plant. This is followed by a summary of available information on ecology and life history, which includes general information on the source, current distribution, and threats posed by the exotic plant, as well as information specific to Alaska. The last section addresses the distribution and management of the exotic plant in Alaskan parks, with, where needed, information for individual parks in which the exotic plant occurs.

The summary report is followed by the exotic species ranking system developed by Hiebert and Stubbendieck (1993). The criteria in this ranking system provide a relative measure of the significance of impact and feasibility of control or management. Each exotic taxon was ranked separately for each park in which it occurs. The entire species ranking form is included for each exotic taxon because much of our data on distribution and ecology are presented in this ranking form. In some cases, other investigators had previously collected an exotic species in a park, but we were not able to find any plants during our survey. In these cases, we list the plant in the species summary ranking form as "previously collected" but do not go through the ranking system, which requires knowledge of current plant population status. We also indicate on the species summary ranking form if an especially troublesome species is not in the park but close to the boundary.

General Results Summary

Compared to NPS units in the rest of the United States, the Alaskan National Park Service units are relatively pristine in terms of exotic plants (Westbrooks 1998). Most of the exotic plant taxa we found were confined to areas that had been recently or repeatedly disturbed by humans (Table 1). There are, however, several exceptions. Two herbs, *Melilotus alba* (white sweet clover) and *Polygonum cuspidatum* (Japanese knotweed), have invaded naturally open riparian areas elsewhere in Alaska, but are still confined to human disturbances in the Alaskan NPS units that we surveyed. One herb, *Vicia cracca* (bird vetch), not only invades stands of native shrubs and tree saplings, but also climbs and spreads over native plants. This plant spreads slowly and is not yet a problem in Alaskan NPS units, but is a threat to many parks. One exotic tree, *Sorbus aucuparia* (European mountain ash), has invaded native plant communities in SITK.

Several factors have protected Alaskan parks so far. The first protecting factor is climate, particularly the interacting effects of past and current climates. Past climates have produced a flora low in diversity but adapted to a wide range of ecological conditions. Many of our shrubs and herbs are already circumpolar or circumboreal in distribution. Most exotic taxa are not adapted to the current climate, particularly low soil temperatures and/or permafrost, in interior, northwest, or northern Alaska. The most vulnerable Alaskan parks are those with a more moderate maritime climate.

The second protecting factor is that Alaskan park unit ecosystem components and processes are relatively undisturbed. Alaskan parks have all the pieces, including key predators, herbivores, and a relatively natural wildfire regime (partially suppressed for only about 60 years). Ecosystems in NPS units in other states, by comparison, have been altered by livestock grazing, wildfire suppression, altered hydrology, and other factors that ease the entry of invasive species.

The third factor is that most Alaskan NPS park units are large enough to include all the ecosystem pieces, and are surrounded by undeveloped lands. In comparison, most NPS park units in other states are islands in a sea of altered ecosystems with many invasive exotic plants. This effect can be seen in SITK.

In spite of these protective factors, the threat to Alaskan park units from exotic plants is increasing. New exotic plants are appearing, and some of those already present are spreading rapidly.

Table 1. Exotic plant taxa growing in or near DENA, KATM, KEFJ, SITK, and WRST.

Species	Common name
Annuals/biannuals present only for 2-3 years after disturbance.	
Capsella bursa-pastoris (L.) Medik.	shepherd=s purse
Chenopodium album L.	lambsquarters
Descurainia sophia (L.) Webb	herb sophia
Lepidium densiflorum Schrad.	common pepperweed
Matricaria discoidea DC.	pineapple weed
Polygonum aviculare L.	prostrate knotweed
Annuals/biannuals which persist and spread in disturbed areas	
Crepis tectorum L.	narrowleaf hawksbeard
Lappula squarrosa (Retz.) Dumort.	European stickseed
Melilotus officinalis (L.) Lam.	yellow sweetclover
Perennials which persist in disturbed areas but usually do not spread in Alaska	
Bromus inermis Leyss.	smooth brome
Festuca rubra L.	red fescue
Phleum pratense L.	timothy
Perennials which persist and spread in disturbed areas	
Digitalis purpurea L.	purple foxglove
Elymus repens (L.) Gould	quackgrass
Leucanthemum vulgare Lam.	oxeye-daisy
Linaria vulgaris P. Mill.	butter and eggs
Lupinus polyphyllus Lindl.	bigleaf lupine
Plantago major L.	common plantain
Ranunculus repens L.	creeping buttercup
Rumex acetosella L.	common sheep sorrel
Rumex obtusifolius L.	bitter dock
Taraxacum officinale G.H. Weber	common dandelion
Trifolium hybridum L.	alsike clover
Trifolium pratense L.	red clover
Trifolium repens L.	white clover
Annual/biannuals and perennials which invade natural areas	
Melilotus albus Medik.	white sweet-clover
Polygonum cuspidatum Sieb. & Zucc.	Japanese knotweed
Sorbus aucuparia L.	European mountain ash
Vicia cracca L.	bird vetch

There are several reasons:

- X Climate change. A warming trend is expanding the potential range for exotic taxa, particularly in interior, northern, and western Alaska.
- X Introduction of new exotic plants. Some are introduced accidentally; others are introduced for horticulture or agriculture. Examples of the invasive exotics introduced for horticulture include the recent planting of *Polygonum cuspidatum* as an ornamental in Anchorage.
- X Introduction of cold-adapted cultivars of existing exotic plants. For example, a cold-adapted cultivar of *Melilotus alba* was seeded along the Parks Highway north of DENA about 10 years ago. Seeds were brought into DENA on car tires, and populations of this conspicuous exotic established along the first mile of the Park Road.
- X Some exotic plant species may have shifted from the Alag phase@ to the Alog phase@ of proliferation and spread. These terms refer to a common pattern in terrestrial plant invasions, where a slow rate of range occupation is followed by a rapid acceleration of the rate of spread (Mack et al. 2000). The Alag phase@ may be overcome when the population size and distribution increases to a critical point and natural selection produces plants adapted to the new environment (Crooks and Soule 1999).
- X Increases in construction disturbance and visitor use.

General Recommendations

We focus on recommendations for inventory and monitoring of exotic plants and for resource management practices to control the invasion and spread of exotic plants. Eradication methods are addressed in the individual species abstracts.

Inventory and monitoring

Our study of exotic plants should be the beginning of a continuing and expanded survey and monitoring program for Alaskan NPS units. All park units should be surveyed for exotic plants, and a monitoring program developed. We emphasize that surveys and monitoring cannot be confined to the park itself, but should include disturbed areas near the park. At this time, Alaskan NPS units have an extraordinary opportunity to detect, track, and eradicate exotic plants when they first invade a park, or during the Alag phase@ when eradication is still relatively easy. This window of opportunity should not be missed. Our recommendations include: (1) continuing participation in interagency programs to identify and control exotic plants and to keep current on the statewide status of new and existing exotic plants, and (2) region-wide training and development of inventory and monitoring programs for exotic plants.

We need more information that allows NPS to predict where a species might spread. For example recent work on *Sapium sebiferum* (Chinese tallow) used field studies and a computer model to predict the potential range of this invasive exotic (Pattison et al. 2001). We also need to learn, within a specific area, what factors control the establishment and growth of an exotic plant. Examples of this type of research were conducted to determine the effects of soil and moisture regime on the spread and growth of *Sapium sebiferum* in three wildlife refuges (Barrileaux and Grace 2000), the effects of vegetation type and anthropogenic disturbance on distribution of exotic plants in a national park (Larson et al. 2001), and the effects of adjacent plant communities and soils on invasion of roadsides by exotic plants (Safford and Harrison 2001). For Alaskan NPS units, we need information on the potential range of exotic plants, including (1) those already in Alaska and capable of invading natural areas, such as *Polygonum cuspidatum*, *Melilotus alba*, and *Centaurea biebersteinii* (spotted knapweed), and (2) serious invaders such *Lythrum salicaria* L. (purple loosestrife) which are not yet in Alaska but are spreading northward.

Management

The first management objective is to prevent exotics from entering the parks. Education is a vital tool. NPS personnel living within the park, park concessionaires, and inholders need education about the threat of exotic plants and the specific exotic plants that may spread from ornamental plantings and imported topsoil into the park.

Routine resource management practices that effectively control target exotic species are very important. The most basic practice is minimizing disturbance to reduce habitat suitable for exotic plants. Then, when disturbance does occur, construction and revegetation practices that reduce the number and vigor of exotic plants are needed.

Fill source control. Fill for construction must be from sources free of exotic plants. Fill sources should be checked and approved by NPS personnel. Actual fill extraction should be monitored. A severe infestation of an invasive exotic plant occurred in one western NPS unit when an unsupervised contractor took fill from the wrong site.

Topsoil source control. Imported topsoil is often contaminated with exotic plants. For example, topsoil from Anchorage that was used for landscaping around the Sealife Center in Seward apparently introduced two exotic plants that have the potential to invade KEFJ. When topsoil from within a park is used, it is also important to ensure that the source was not full of exotic plants, and that the topsoil is not stored in an area close to many wind-dispersed exotic plants, such as *Taraxacum officinale* (common dandelion).

Fertilizer use. Inappropriate fertilizer use can encourage the growth of exotic plants. Broadcasting a standard, quick-release nitrogen/phosphorous/potassium (NPK) fertilizer is almost always a bad idea. The nitrogen stimulates the growth of fast-growing exotic plants, but leaches out of the soil before slower-growing native plants can utilize it. Slow-release NPK fertilizer does not promote exotics when it is buried at the base of transplants and cuttings (for details, see Densmore et al. 2000). In the past, we have broadcast slow-release NPK fertilizer when we seeded native plants, and have recommended this procedure (Densmore et al. 2000). Recent research in Great Britain and Minnesota, however, has shown that addition of fertilizer with potassium greatly increases the number of *Taraxacum officinale* plants present in grasslands and lawns (Tilman et al. 1999). *Taraxacum officinale* is a poor competitor for potassium and/or has a higher requirement for potassium. The amount of potassium available to plants growing in most mineral soils, including those in Alaska, is adequate to support native plant communities (Pearcy et al. 1989), and added potassium may tip the balance toward *T. officinale*.

We need research to test whether the amount of potassium we have added with slow-release fertilizers was sufficient to stimulate *T. officinale*. In DENA, qualitative observations indicate that *T. officinale* grows well with or without fertilizer. Until we have more data, we suggest avoiding fertilizer or using a slow-release fertilizer with little or no potassium.

Assisted revegetation. Disturbed areas likely to be invaded by exotic plants should be revegetated. For example, in DENA, the area around the park entrance and headquarters has many exotic plants, particularly *T. officinale*. When the first mile of the Park Road was upgraded, some disturbed sites were planted sparsely with native plants but most of the area was left to revegetate naturally. After five years, 83% of the area left to revegetate naturally was still bare mineral soil, and an average of 36 *T. officinale* plants per m^2 had invaded (Densmore et al. 2000). Other sites were seeded with a mix of native legumes and wheatgrasses, from seed sources in the park. After five years, 40% of this area was still bare ground, and an average of 0.5 *T. officinale* plants per m^2 had invaded. Because there was still bare soil available for colonization by exotic plants, we conclude that the native plants in the seed mix partly inhibited *T. officinale* by resource competition. Another revegetation method that effectively excluded exotic plants was salvaging and transplanting blocks of native vegetation with shrubs and small trees on disturbed areas. After five years, these areas had no exotic plants.

A problem still remains on road shoulders and other areas with continuous human disturbance where nnative plants are not providing cover. In DENA, road shoulders are providing a habitat in which the

recently introduced exotic *Crepis tectorum* (narrowleaf hawksbeard) is spreading along the park road. We recommend seeding the low-growing native grass *Poa alpina* and searching for additional suitable native species (Densmore et al 2000). Resource management personnel in Glacier National Park are facing similar problems with road shoulders, and are also considering using *P. alpina* and other low-growing species (Asebrook and Brenneman 1999).

Results Summary and Recommendations by Park

Denali National Park and Preserve

In DENA, most exotic plants were the common species of recent and/or continuing human disturbances, including *Matricaria discoidea* (pineapple weed), *Capsella bursa-pastoris* (shepherd=s purse), *Chenopodium album* (lambsquarters), and *Polygonum aviculare* (prostrate knotweed). There were exotics that present a more serious problem. This area has been repeatedly invaded by a cold-hardy cultivar of *Melilotus alba* that was seeded on Parks Highway roadsides north of the park entrance. This cultivar is probably continuously introduced on vehicle tires, and is capable of expanding along the Park Road. A monitoring and eradication plan for this plant has been in place for several years and needs continuing support and training. Another exotic, *Crepis tectorum*, has invaded and spread rapidly during the last four years. DENA began to eradicate *C. tectorum* in 2000 and followed up in 2001. *Taraxacum officinale* was the only species that had spread along the Park Road beyond the developed areas at the east and west ends of the road. The native subspecies, *Taraxacum officinale* ssp. *ceratophorum*, was also common, in mixed populations with the exotic subspecies. However, these stands have been reduced with an excellent monitoring and eradication program, illustrating what can be done when the problem is recognized and addressed.

Additionally, some 2000 funding was used to facilitate surveys, in conjunction with the plant inventory program, of natural disturbances such as talus slopes and wetlands for exotics. Exotic plants had not spread to these areas.

Katmai National Park and Preserve

We found only a few exotic taxa in KATM, but these were common around areas with continuous human use. *Taraxacum officinale*, *Matricaria discoidea*, *Capsella bursa-pastoris* and lawn grasses (primarily *Poa pratensis*) were found around Brooks Camp and lodges on other lakes, and *M. discoidea* was present near the falls viewing platform and occasionally along the road to the Valley of 10,000 Smokes. The Valley of 10,000 Smokes Road should be resurveyed following recent construction, and regular monitoring is needed. Some eradication may be useful. *Matricaria discoidea* should be removed from the viewing platform area before it spreads to any more trampled bank areas along the Brooks River, and an eradication program for common dandelion at Brooks Camp would be relatively easy and would prevent a large expansion of the population into new construction areas.

Kenai Fjords National Park

In KEFJ, several exotic weeds, including *Matricaria discoidea, Taraxacum officinale,* and *Trifolium repens* (white clover) were found around the ranger station and parking lot, and *T. officinale* was scattered along trails, but exotic plants were not found on glacial moraine, outwash, or riparian gravel bars. Common dandelion was the only abundant exotic plant along Exit Glacier Road roadsides within the park, but the remainder of Exit Glacier Road was bordered by *Medicago sativa* (alfalfa), *Melilotus officinalis* (yellow sweetclover), *Trifolium pratense* (red clover), *Leucanthemum vulgare* (oxeye daisy), and *Crepis tectorum*. *Linaria vulgaris* (butter and eggs) was already growing along Exit Glacier Road inside the park. These exotic plants are likely to invade or spread further into the park, particularly if new disturbed areas

are created by construction projects. Many of these taxa are easily controlled if removed when the first plants establish, but are difficult to eradicate when populations are larger. *Linaria vulgaris*, for example, now has only a few plants established along the road within the park. KEFJ is also threatened by several invasive exotic taxa that are present in Seward. The most serious threat is *Vicia cracca*, which is well established around the Alaska Sealife Center. It was apparently introduced with topsoil imported from the Anchorage area for landscaping. A large population of *Tripleurospermum perforata* (scentless false mayweed) has also established in the same soil. This species has spread rapidly around Anchorage. A small amount of regular monitoring and eradication would protect the park.

Sitka Historical Park

SITK is bordered by the city of Sitka and is continuously susceptible to invasion from many exotic plant taxa that thrive in the mild climate. *Sorbus aucuparia* trees have invaded native plant communities. Many other exotic plants were present but were confined to lawns and forest edges adjacent to lawns and other disturbed open visitor use areas. *Polygonum cuspidatum*, an invasive, noxious subshrub, has invaded the park from seed from nearby ornamental and naturalized plants, but is monitored and controlled. This small park needs regular monitoring and eradication projects.

Wrangell-St Elias National Park and Preserve

In WRST, only a few taxa of exotic plants were found along the Nabesna Road, but these were relatively common, including *Matricaria discoidea, Erysimum cheiranthoides* (wormseed wallflower), and *Taraxacum officinale*. The native subspecies, *Taraxacum officinale* ssp. *ceratophorum*, was also common, in mixed populations with the exotic subspecies. The exotic taxa present are not a threat to undisturbed vegetation, but the Nabesna Road should be monitored every 3-5 years.

The road from Chitina to McCarthy had extensive populations of exotic *Taraxacum officinale, Trifolium hybridum* (alsike clover), and *T. repens*, and recently planted *Bromus inermis* (smooth brome) and *Festuca rubra* (red fescue). The main threat to this area is planned road construction, which would increase the opportunities for existing and new exotic plants to invade roadsides and spread into the park. Careful preconstruction revegetation planning and monitoring during and after construction would reduce this threat.

The Kennecott Mine area had the usual exotics of inhabited areas that have or have had gardens, lawns, and livestock; including many exotic *T. officinalis plants*, many stands of several exotic *Trifolium* species, *Elymus repens* (quackgrass), *Capsella bursa-pastoris, Matricaria discoidea*, and a large seed bank of exotic agricultural weeds which would germinate if the soil were disturbed. The wagon trail and hiking trails had only a few exotic *T. officinalis*. The worst area for potentially invasive exotic plants was around the building that was recently been restored as the NPS visitor center for the mine. This area has been recently planted with *B. inermis, F. rubra*, other grasses, and *Leucanthemum vulgare*. The *L. vulgare* was abundant, vigorous, spreading, and conspicuously alien. This plant should be removed before it spreads along trails, roads, and natural disturbances.

Summary Reports and Species Ranking

***Bromus inermis* Leyss. Smooth brome**

Fig. 1. *Bromus inermis* on cut slope of Park Road near entrance, DENA.

Fig. 2. Each *Bromus* leaf has a W-shaped crease.

Description

Bromus inermis is a rhizomatous, sod-forming grass, in Alaska up to 1 m in height but often shorter. Leaves have a AW@ shaped crease on the leave blade. The exotic subspecies *Bromus inermis* ssp. *inermis* and the native subspecies *Bromus inermis* ssp. *pumpellianus* (Scribn.) Wagnon both occur in Alaska. We found, however, that in park units the exotic subspecies was confined to roadsides and other disturbed areas where it had been sown, while the native grass was generally found in natural habitats.

Ecology and Life History

Bromus inermis is a perennial that reproduces from seed and spreads by rhizomes to form a dense sod. *Bromus inermis* ssp. *inermis* was introduced from Eurasia as a forage crop as early as 1875 (Sather 1987; Royer and Dickinson 1999). It is now a weed of cultivated and disturbed areas throughout the northern hemisphere. In Alaska, exotic *Bromus inermis* has been widely planted as a pasture and forage crop, and as a revegetation grass along roadsides and along the Trans-Alaska Pipeline System corridor from Valdez to Coldfoot (variety AManchar@) (Alyeska Pipeline Service Company 1975). This grass has survived on the pipeline corridor for up to 25 years (McKendrick 2001). We did not observed this plant in undisturbed plant communities, and McKendrick (2001) found that it had not spread from the pipeline corridor into adjacent undisturbed vegetation. It is listed as an invader of natural areas by NPS (Plant Conservation Association 2001). *Bromis inermis* is not considered highly invasive, but once established, it is very persistent in natural areas and native prairies, where the dense sod appears to exclude other species (Sather 1987; Wilson and Stubbendieck 2000). Growth, however, is poor on organic soils or in shade (Sather 1987). In DENA, our long-term observations indicated that *B. inermis* planted on an old road right-of-way delayed natural succession by 10-20 years, but once shrubs and tree saplings grew sufficiently to provide shade, *B. inermis* declined and eventually disappeared.

Distribution and Management in Park Units

In DENA, *Bromus inermis* was planted in the late 1960's and early 1970's on roadsides and disturbed areas associated with the construction of the Parks Highway and the upgrading of a portion of the Park Road. On rocky, well-drained roadside areas and gravel pits, the grass did not establish or died out. However, we found patches persisting in favorable spots along the Parks Highway and as far along the Park Road as the abandoned Teklanika gravel pit. These patches of *B. inermis* were not spreading from seed and were generally declining, so eradication is not a priority. *Bromus inermis* had, however, been spread to new disturbed areas when soil containing *B. inermis* rhizomes was redistributed with heavy equipment. In WRST, *B. inermis* had been seeded on the roadsides of the Chitina-McCarthy Road, with large, conspicuous stands on recently constructed cut-slopes; stands were also present on private property along the road. Again, eradication is not a priority, but additional seeding may not be recommended.

If control or eradication is desired, detailed recommendations for using mowing, fire, and herbicides are available (Sather 1987; Wilson and Stubbendieck 2000). Hand or mechanical weeding tends to leave some rhizomes, but can be effective if repeated on small populations.

Species Ranking Summary Form for *Bromus inermis*

Park Unit	Significance of Impact: Current Level of Impact	Significance of Impact: Innate Ability to Become a Pest	Significance of Impact: Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	20	21	41	54	Low
KATM	pc[a]	-[b]	-	-	-
KEFJ	np[c]	-	-	-	-
SITK	np	-	-	-	-
WRST	20	21	41	54	Low

[a]Previously collected in this park unit.
[b]No data.
[c]Not yet collected in this park unit.

Species Ranking Form for *Bromus inermis*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
2				2

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
5				5

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
2				2

3. Effect on natural processes and character
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
7				7

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
2				2

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
2				2

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
20				20

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5				5

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
1				1

   3. Vegetative reproduction
      a. no vegetative reproduction 0
      b. vegetative reproduction rate maintains population 1
      c. vegetative reproduction rate results in moderate increase in population size 3
      d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
3				3

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5				5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3				3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
0				0

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0				0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
3				3

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
1				1

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
21				21

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)

a. several; widespread and dense 1
b. intermediate number; patchy 3
c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
1				1

2. Areal extent of populations

a. > 50 1
b. 11-50 ha 2
c. 5-10 3
d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
3				3

B. Ease of Control

1. Seed banks

a. seeds remain viable in the soil for at least 3 years 0
b. seeds remain viable in the soil for 2-3 years 5
c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
15				15

2. Vegetative regeneration

a. any plant part is a viable propagule 0
b. sprouts from roots or stumps 5
c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
5				5

3. Level of effort required

a. repeated chemical or mechanical control measures required 1
b. one or two chemical or mechanical treatments required 5
c. can be controlled with one chemical treatment 10
d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
5				5

4. Abundance and proximity of propagules near park

a. many sources of propagules near park 0
b. few sources of propagules near park, but these are readily dispersed 5
c. few sources of propagules near park, but these are not readily dispersed 10
d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
10				10

C. Side Effects of Chemical/Mechanical Control Measures

1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
5				5

D. Effectiveness of Community Management

1. the following options are not effective 0

2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10				10

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
54				54

***Capsella bursa-pastoris* (L.) Medik. Shepherd=s purse**

Fig. 3 *Capsella bursa-pastoris* in campground near McCarthy, WRST.

Description

Capsella bursa-pastoris (L.) Medik. has a rosette of basal leaves 3-20 cm long, and a thin, branching taproot. The flowering stem is 10-50 cm high and has alternate leaves. The white flowers are small, with petals 2-4 mm long. The seedpods are 4-8 mm long and are heart-shaped. This shape is unusual and makes it easy to identify the plants in the field. The size of the plant and the number of seeds produced varies greatly, from tiny plants on dry and/or nutrient-poor soil to large, branched plants on more favorable sites.

Ecology and Life History

Capsella bursa-pastoris was introduced from Europe and first reported in North America prior to 1672 (Royer and Dickinson 1999). It is now a weed of cultivated and disturbed areas throughout the northern hemisphere, occurring even in the high arctic Canadian islands (Kartez and Mecham 1999). We did not observe this plant in undisturbed plant communities, and but it is listed as an invader of natural areas by NPS (Plant Conservation Association 2001).

This species reproduces from seed dispersed to a disturbed site or from buried seed. Buried seeds have been shown to remain viable for at least 35 years (Baskin and Baskin 1998). Therefore, plants may appear on sites that have been redisturbed several decades after the last human disturbance. The plant can grow as an annual, germinating in the spring, producing seeds, and dying at the end of the growing season, or as a winter annual, germinating later in the growing season, overwintering as a rosette of leaves, producing seeds the following growing season, and dying at the end of the growing season.

Distribution and Management in Park Units

Capsella bursa-pastoris is a short-lived colonizer of disturbed areas and will be present for only 2-5 years unless the site is repeatedly disturbed. Plants may appear in any park unit when an area is disturbed by construction or trampling, especially if the area has a history of previous human use. It does not spread along highway shoulders. The plants are relatively inconspicuous and the aesthetic impacts are usually minimal. The plants are easily pulled up by hand, although several weedings may be necessary to eliminate plants germinating from buried seeds.

Species Ranking Summary Form for *Capsella bursa-pastoris*

Park Unit	Significance of Impact: Current Level of Impact	Significance of Impact: Innate Ability to Become a Pest	Significance of Impact: Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	-8	21	13	60	Low
KATM	-8	21	13	60	Low
KEFJ	np[a]	-[b]	-	-	-
SITK	pc[c]	-	-	-	-
WRST	-8	21	13	60	Low

[a]Not yet collected in this park unit.
[b]No data.
[c]Previously collected in this park unit.

Species Ranking Form for *Capsella bursa-pastoris*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
-10	-10			-10

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
1	1			1

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1	1			1

3. Effect on natural processes and character
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0	0			0

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0	0			0

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
0	0			0

Total Possible 50

Total by park	DENA	KATM	KEFJ	SITK	WRST
	-8	-8			-8

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5	5			5

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
3	3			3

   3. Vegetative reproduction
      a. no vegetative reproduction 0
      b. vegetative reproduction rate maintains population 1
      c. vegetative reproduction rate results in moderate increase in population size 3
      d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
0	0			0

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5	5			5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3	3			3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5	5			5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0	0			0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
0	0			0

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
0	0			0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
21	21			21

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)

a. several; widespread and dense 1
b. intermediate number; patchy 3
c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
5	5			5

2. Areal extent of populations

a. > 50 1
b. 11-50 ha 2
c. 5-10 3
d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5	5			5

B. Ease of Control

1. Seed banks

a. seeds remain viable in the soil for at least 3 years 0
b. seeds remain viable in the soil for 2-3 years 5
c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
0	0			0

2. Vegetative regeneration

a. any plant part is a viable propagule 0
b. sprouts from roots or stumps 5
c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
10	10			10

3. Level of effort required

a. repeated chemical or mechanical control measures required 1
b. one or two chemical or mechanical treatments required 5
c. can be controlled with one chemical treatment 10
d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
15	15			15

4. Abundance and proximity of propagules near park

a. many sources of propagules near park 0
b. few sources of propagules near park, but these are readily dispersed 5
c. few sources of propagules near park, but these are not readily dispersed 10
d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
0	0			0

C. Side Effects of Chemical/Mechanical Control Measures

1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
15	15			15

D. Effectiveness of Community Management

1. the following options are not effective 0

20

2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10	10			10

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0	0			0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
60	60			60

***Chenopodium album* L. Lambsquarters**

Figure 3. Mixed group of *Chenopodium album* and *Matricaria discoidea* growing at DENA headquarters.

Description

Chenopodium album grows 10-60 cm high. The plant appears bluish-green and more or less mealy-white. Flowers are small (3 mm) and without petals. The size of the plant and the number of seeds produced varies greatly, from tiny plants on dry and/or nutrient-poor soil to large, branched plants on more favorable sites.

Ecology and Life History

Chenopodium album was introduced from Europe, but some varieties have been classified as native to North America, including Alaska (Kartez and Mecham 1999). *Chenopodium album* is a cosmopolitan weed of cultivated and recently disturbed areas (Royer and Dickinson 1999). We did not observe this plant in undisturbed plant communities, but it is listed as an invader of natural areas in other climates (Plant Conservation Association 2001).

This species reproduces from seed dispersed to a disturbed site or from buried seed. Seeds require light for germination, and buried seeds can remain viable for possibly as long as 1700 years (Baskin and Baskin 1998). Therefore, plants may appear on sites that have been redisturbed several decades after the last human disturbance. The plant grows as an annual, germinating in the spring, producing seeds, and dying at the end of the growing season.

Distribution and Management in Park Units

Chenopodium album is a short-lived colonizer of disturbed areas and will be present for only 1-3 years unless the site is repeatedly disturbed. Plants may appear in any park unit when an area is disturbed by construction or trampling, especially if the area has a history of previous human use. It does not spread along highway shoulders. The plants can make a site look weedy if they are large and abundant, but the aesthetic impacts are usually minor. The plants are easily pulled up by hand, although several weedings may be necessary to eliminate plants germinating from buried seeds.

Species Ranking Summary Form for *Chenopodium album*

	Significance of Impact				
Park Unit	Current Level of Impact	Innate Ability to Become a Pest	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	-6	22	16	60	Low
KATM	np[a]	-[b]	-	-	-
KEFJ	np	-	-	-	-
SITK	pc[c]	-	-	-	-
WRST	-6	22	16	60	Low

[a]Not yet collected in this park unit.
[b]No data.
[c]Previously collected in this park unit.

Species Ranking Form for *Chenopodium album*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
-10				-10

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
1				1

b. areal extent of populations
(1) <5 ha 1
(2) 5-10 ha 2
(3) 11-50 ha 3
(4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1				1

3. Effect on natural processes and character
a. plant species having little or no effect 0
b. delays establishment of native species in disturbed sites up to 10 years 3
c. long-term (more than 10 years) modification or retardation of succession 7
d. invades and modifies existing native communities 10
e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0				0

4. Significance of threat to park resources
a. threat to secondary resources negligible 0
b. threat to areas' secondary (successional) resources 2
c. endangerment to areas' secondary (successional) resources 4
d. threat to areas' primary resources 8
e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0				0

5. Level of visual impact to an ecologist
a. little or no visual impact on landscape 0
b. minor visual impact on natural landscape 2
c. significant visual impact on natural landscape 4
d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
2				2

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
-6				-6

B. Innate Ability of Species to Become a Pest
1. Ability to complete reproductive cycle in area of concern
a. not observed to complete reproductive cycle 0
b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5				5

2. Mode of reproduction
a. reproduces almost entirely by vegetative means 1
b. reproduces only by seeds 3
c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
3				3

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
0				0

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5				5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3				3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5				5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0				0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
0				0

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
1				1

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
22				22

II. Feasibility of Control or Management
   A. Abundance Within Park

1. Number of populations (stands)
   a. several; widespread and dense 1
   b. intermediate number; patchy 3
   c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
5				5

2. Areal extent of populations
   a. > 50 1
   b. 11-50 ha 2
   c. 5-10 3
   d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5				5

B. Ease of Control
1. Seed banks
   a. seeds remain viable in the soil for at least 3 years 0
   b. seeds remain viable in the soil for 2-3 years 5
   c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
0				0

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
10				10

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
15				15

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
0				0

C. Side Effects of Chemical/Mechanical Control Measures
1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
15				15

D. Effectiveness of Community Management
1. the following options are not effective 0
2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed

burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10				10

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
60				60

***Crepis tectorum* L. Narrowleaf hawksbeard**

Fig. 5. *Crepis tectorum* along Park Road, DENA.

Description

Crepis tectorum grows 20-50 cm tall, and has a rosette of basal leaves and alternate leaves on the flowering stem. The leaves are 10-15 cm long, getting smaller toward the top of the plant. The flowering stem branches with a single flower on each branch. The bright yellow flowers are similar to dandelions in appearance and size. The seed heads look like small dandelion seed heads, with a white pappus on each seed.

Ecology and Life History

Crepis tectorum was introduced from Europe and Asia, and was first reported in Canada in 1877 (Royer and Dickinson 1999). It is now a weed of cultivated and disturbed areas throughout the northern

United States and Canada, but we did not observe this plant in undisturbed plant communities, and it is generally not regarded as an invader of natural areas (Plant Conservation Association 2001). The plant appears to be adapted to northern climates, but its potential range in Alaska is unknown. Hulten (1968) mapped it to the Arctic Ocean in Europe, but not in Siberia.

This species reproduces from seed dispersed to a disturbed site. Seeds are described as nondormant and more seeds germinate in light than dark (Baskin and Baskin 1998). There is no information as to whether dormant seeds buried in the soil will germinate when the soil is disturbed. The plant can grow as an annual, germinating in the spring, producing seeds, and dying at the end of the growing season, or as a winter annual, germinating later in the growing season, overwintering as a rosette of leaves, producing seeds the following growing season, and dying at the end of the growing season.

Distribution and Management in Park Units

Crepis tectorum is a short-lived colonizer of disturbed areas but is likely to reseed as long as open soil and full sunlight are available. The plants thrive and spread along roadsides. Aesthetic impacts are significant because the plants are showy and conspicuous when in flower. The plants are easily pulled up by hand, although several weedings may be necessary to eliminate plants overlooked when they were in the small rosette stage. Yearly monitoring is important as this plant appears to be spreading rapidly in Alaska and it is likely to be reintroduced after it is eradicated. *Crepis tectorum* was first noticed in DENA in 1995 or 1996. By 2000 the plant population had grown to more 200 plants, which were then weeded by hand. In 2001, more plants were present, probably from plants overlooked in the rosette stage. In KEFJ, we did not observe *Crepis tectorum* along Exit Glacier Road in 2000, but in 2001 we found a small population on a recently disturbed roadside at mile 4 on Exit Glacier Road. This plant was also present around Glenallen and has been previously collected in WRST.

Species Ranking Summary Form for *Crepis tectorum*

	Significance of Impact				
Park Unit	Current Level of Impact	Innate Ability to Become a Pest	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	11	21	32	65	High
KATM	np[a]	-[b]	-	-	-
KEFJ	np[c]	-	.-	.-	High[d]
SITK	np	-	-	-	-
WRST	pc[e]	-	-	-	-

[a]Not yet collected in this park unit.
[b]No data.
[c]Found outside park boundaries but may invade park.
[d]Monitoring needed to prevent invasion.
[e]Previously collected in this park unit.

Species Ranking Form for *Crepis tectorum*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
1				

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
5				

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1				

    3. Effect on natural processes and character
      a. plant species having little or no effect 0
      b. delays establishment of native species in disturbed sites up to 10 years 3
      c. long-term (more than 10 years) modification or retardation of succession 7
      d. invades and modifies existing native communities 10
      e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0				

4. Significance of threat to park resources
      a. threat to secondary resources negligible 0
      b. threat to areas' secondary (successional) resources 2
      c. endangerment to areas' secondary (successional) resources 4
      d. threat to areas' primary resources 8
      e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0				

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA KATM KEFJ SITK WRST
4

Total Possible 50
Total by park

DENA KATM KEFJ SITK WRST
11

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA KATM KEFJ SITK WRST
5

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA KATM KEFJ SITK WRST
3

   3. Vegetative reproduction
      a. no vegetative reproduction 0
      b. vegetative reproduction rate maintains population 1
      c. vegetative reproduction rate results in moderate increase in population size 3
      d. vegetative reproduction rate results in rapid increase in population size 5

DENA KATM KEFJ SITK WRST
0

   4. Frequency of sexual reproduction for mature plant
      a. almost never reproduces sexually in area 0
      b. once every five or more years 1
      c. every other year 3
      d. one or more times a year 5

DENA KATM KEFJ SITK WRST
5

   5. Number of seeds per plant
      a. few (0-10) 1
      b. moderate (11-1,000) 3
      c. many-seeded (>1,000) 5

DENA KATM KEFJ SITK WRST
3

   6. Dispersal ability
      a. little potential for long-distance dispersal 0
      b. great potential for long-distance dispersal 5

DENA KATM KEFJ SITK WRST
5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0				

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
0				

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
0				

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
21				

II. Feasibility of Control or Management
   A. Abundance Within Park
      1. Number of populations (stands)
         a. several; widespread and dense 1
         b. intermediate number; patchy 3
         c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
3				

      2. Areal extent of populations
         a. > 50 1
         b. 11-50 ha 2
         c. 5-10 3
         d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5				

   B. Ease of Control
      1. Seed banks
         a. seeds remain viable in the soil for at least 3 years 0
         b. seeds remain viable in the soil for 2-3 years 5
         c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
15				

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA KATM KEFJ SITK WRST
10

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA KATM KEFJ SITK WRST
15

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA KATM KEFJ SITK WRST
0

C. Side Effects of Chemical/Mechanical Control Measures
   1. control measures will cause major impacts to community 0
   2. control measures will cause moderate impacts to community 5
   3. control measures will have little or no impact on community 15

DENA KATM KEFJ SITK WRST
15

D. Effectiveness of Community Management
   1. the following options are not effective 0
   2. cultural techniques (burning, flooding) can be used to control target species 5
   3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA KATM KEFJ SITK WRST
10

E. Biological Control
   1. biological control not feasible (not practical possible, or probable) 0
   2. potential may exist for biological control 5
   3. biological control feasible 10

DENA KATM KEFJ SITK WRST
0

Total Possible 100

Total by park

DENA KATM KEFJ SITK WRST
65

***Descurainia sophia* (L.) Webb Herb-sophia**

Fig. 6. *Descurainia sophia* growing near Nabesna Road, WRST.

Description

Descurainia sophia is an herb with a rosette of leaves and leafy flowering stalks up to 1 m tall. The plant appears grayish-green due to star-shaped hairs on the stems and leaves. The leaves are finely divided. Flowers are small (3 mm) and yellow, and seed pods are long (15-30 mm) and narrow (1 m). *Descurainia sophia* is very similar to the native *D. sophoides*, which is common in disturbed areas. Unfortunately, the best way to tell the two species apart is to look at the hairs with a magnifying lens. *Descurainia sophia* has star-shaped hairs, and *D. sophoides* has glandular hairs.

Ecology and Life History

Descurainia sophia was introduced from Europe in the 1800's and is now a weed of cultivated and recently disturbed areas throughout the northern hemisphere (Royer and Dickinson 1999). We did not observe this plant in undisturbed plant communities, but it is listed as an invader of natural areas in other climates (Plant Conservation Association 2001).

This species reproduces from seed dispersed to a disturbed site and possibly from buried seed, and germination is stimulated by light (Baskin and Baskin 1998). The plant usually grows as a winter annual, germinating during in the growing season, overwintering as a rosette of leaves, producing seeds the

following growing season, and dying at the end of the growing season.

Distribution and Management in Park Units

Descurainia sophia is a short-lived colonizer of disturbed areas and is for only 1-3 years unless the site is repeatedly disturbed. Plants may appear in any park unit when an area is disturbed by construction or trampling, and can persist on roadsides. The plants can make a site look weedy if they are large and abundant. The aesthetic impacts, however, are minor, in part because the plants are similar to common native plants. *Descurainia sophia* has very little impact on park resources and can generally be ignored. If eradication is desired, the plants are easily pulled up by hand.

Species Ranking Summary Form for *Descurainia sophia*

	Significance of Impact				
Park Unit	Current Level of Impact	Innate Ability to Become a Pest	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	-8	22	14	60	Low
KATM	np[a]	-[b]	-	-	-
KEFJ	np	-	-	-	-
SITK	np	-	-	-	-
WRST	-8	22	14	60	Low

[a]Not yet collected in this park unit.
[b]No data.

Species Ranking Form for *Descurainia sophia*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
-10				-10

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
1				1

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3

(4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1				1

3. Effect on natural processes and character
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0				0

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0				0

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
-8				-8

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5				5

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
3				3

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
0				0

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5				5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3				3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5				5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0				0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
0				0

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
1				1

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
22				22

II. Feasibility of Control or Management
   A. Abundance Within Park

1. Number of populations (stands)
   a. several; widespread and dense 1
   b. intermediate number; patchy 3
   c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
5				5

2. Areal extent of populations
   a. > 50 1
   b. 11-50 ha 2
   c. 5-10 3
   d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5				5

B. Ease of Control
1. Seed banks
   a. seeds remain viable in the soil for at least 3 years 0
   b. seeds remain viable in the soil for 2-3 years 5
   c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
0				0

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
10				10

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
15				15

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
0				0

C. Side Effects of Chemical/Mechanical Control Measures
1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
15				15

D. Effectiveness of Community Management
1. the following options are not effective 0
2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed

burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10				10

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
60				60

***Elymus repens* L. (Gould) Quackgrass**

Fig. 7. *Elymus repens* (showing rhizome system) growing in Kennecott, WRST.

Description

Elymus repens is similar in appearance to the native Alaskan species of *Elymus* (wheatgrass). *Elymus repens*, however, has a creeping network of yellowish white rhizomes that produce shoots, while the native species of *Elymus* do not have rhizomes and grow in clumps.

Ecology and Life History

Elymus repens was introduced from Europe as a contaminant in hay or straw, and was first reported in North America in 1672 (Royer and Dickinson 1999). It is now distributed throughout Canada and most of the United States, and occurs even in Greenland (Karteaz and Meachem 1999). It is a serious threat in crops and gardens, and is classified as a noxious weed in Alaska, nine other states, and Canada. We did not observe this plant in undisturbed plant communities, but it is listed as an invader of natural areas in other climates (Plant Conservation Association 2001).

This species reproduces from seed dispersed to a disturbed site, and germination is reduced by shade or burial (Baskin and Baskin 1998). The plant grows as a perennial, and spreads with an extensive network of rhizomes with fibrous roots at each rhizome node. Under ideal conditions, a plant may spread up to 3 m per year and produce 200 new shoots (Royer and Dickinson 1999).

Distribution and Management in Park Units

Elymus repens is a colonizer of disturbed areas and can persist even when shaded by trees and shrubs. Plants in park units are associated with lawns and gardens. In DENA, the only spot where we found *E. repens* was near a gardening area at park headquarters. We also carefully surveyed all the revegetation plantings of native *Elymus* in DENA and did not find any *E. repens* which had contaminated the seed mixes and established. In WRST, *E. repens* was common only in Kennecott. The aesthetic impacts are minor as it is difficult to distinguish *E. repens* from native *Elymus* plants. Small populations of *E. repens*, such as those in DENA, can be eradicated by digging up the plants and rhizomes. Larger populations may be controlled by mowing. The most important management tool is monitoring to keep the plant out of lawns and gardens within NPS units.

Species Ranking Summary Form for *Elymus repens*

	Significance of Impact				
Park Unit	Current Level of Impact	Innate Ability to Become a Pest	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	3	30	33	50	Low
KATM	np[a]	-[b]	-	-	-
KEFJ	np[c]	-		-	Low[d]
SITK	np	-	-	-	-
WRST	3	30	33	50	Low

[a]Not yet collected in this park unit.
[b]No data.
[c]Found outside park boundaries but may invade park.
[d]Monitoring needed to prevent invasion.

Species Ranking Form for *Elymus repens*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
1				1

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
1				1

b. areal extent of populations
(1) <5 ha 1
(2) 5-10 ha 2
(3) 11-50 ha 3
(4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1				1

3. Effect on natural processes and character
a. plant species having little or no effect 0
b. delays establishment of native species in disturbed sites up to 10 years 3
c. long-term (more than 10 years) modification or retardation of succession 7
d. invades and modifies existing native communities 10
e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0				0

4. Significance of threat to park resources
a. threat to secondary resources negligible 0
b. threat to areas' secondary (successional) resources 2
c. endangerment to areas' secondary (successional) resources 4
d. threat to areas' primary resources 8
e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0				0

5. Level of visual impact to an ecologist
a. little or no visual impact on landscape 0
b. minor visual impact on natural landscape 2
c. significant visual impact on natural landscape 4
d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
3				3

B. Innate Ability of Species to Become a Pest
1. Ability to complete reproductive cycle in area of concern
a. not observed to complete reproductive cycle 0
b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5				5

2. Mode of reproduction
a. reproduces almost entirely by vegetative means 1
b. reproduces only by seeds 3
c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
5				5

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
3				3

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5				5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3				3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5				5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0				0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
3				3

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
1				1

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
30				30

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)

a. several; widespread and dense 1
b. intermediate number; patchy 3
c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
5				5

2. Areal extent of populations

a. > 50 1
b. 11-50 ha 2
c. 5-10 3
d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5				5

B. Ease of Control

1. Seed banks

a. seeds remain viable in the soil for at least 3 years 0
b. seeds remain viable in the soil for 2-3 years 5
c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
15				15

2. Vegetative regeneration

a. any plant part is a viable propagule 0
b. sprouts from roots or stumps 5
c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
5				5

3. Level of effort required

a. repeated chemical or mechanical control measures required 1
b. one or two chemical or mechanical treatments required 5
c. can be controlled with one chemical treatment 10
d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
5				5

4. Abundance and proximity of propagules near park

a. many sources of propagules near park 0
b. few sources of propagules near park, but these are readily dispersed 5
c. few sources of propagules near park, but these are not readily dispersed 10
d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
10				10

C. Side Effects of Chemical/Mechanical Control Measures

1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
5				5

D. Effectiveness of Community Management

1. the following options are not effective 0

2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10				10

E. Biological Control
1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
50				50

***Festuca rubra* L. Red Fescue**

Fig. 8. *Festuca rubra* growing behind NPS building at WRST.

Description

Festuca rubra has numerous narrow leaves, and forms loose tufts or sod, often with short rhizomes. The culms (flowering stems) and flower spikelets are usually reddish in color. Each flower has a sharp point (awn) on the lemma, which distinguishes *F. rubra* from species of *Poa* (blugrass) that are often planted with it.

Ecology and Life History

Festuca rubra is native to Alaska and occurs throughout the northern hemisphere (Hulten 1968; Karteaz and Meachem 1999). European varieties have been widely introduced to North America but are difficult to distinquish from North American plants (Cody 1996; Kucera 1998). *Festuca rubra* varieties are widely planted in Alaska for forage, turf, and revegetation. Two commercially available varieties, "Boreal" and "Arctared", have been widely used for revegetation in Alaska (McKendrik 2001). "Boreal" is a variety selected in Canada, and "Arctared" is a variety selected in Alaska (probably from the Palmer area). These *F. rubra* varieties have persisted for 20 years on the Trans-Alaska Pipeline System route from Valdez to Prudhoe Bay (McKendrik 2001). McKendrik (2001) also found that the planted *F. rubra* had not spread into adjacent undisturbed areas at any of this sample sites. It is listed, however, as an invader of natural areas in other climates (Plant Conservation Association 2001).

Festuca rubra is a perennial that reproduces from seed and spreads from rhizomes.

Distribution and Management in Park Units

Exotic varieties of *Festuca rubra* have been seeded and persist in DENA, KEFJ, SITK, WRST, and possibly in KATM lawn areas. We have not conducted a complete historical search to determine the exact areas in each park where exotic *F. rubra* was seeded for lawns and revegetation. Because it is difficult to distinguish exotic and native *F. rubra* without this information, we do not have enough data for the species ranking form. This exotic grass would be difficult to eradicate, and although persistent, it does not appear to spread.

***Lappula squarrosa* (Retz.) Dumort. European stickseed**

Fig. 9 *Lappula squarrosa*, growing in Glenallen.

Description

Lappula squarrosa grows 20-40 cm tall, and has a rosette of basal leaves and alternate leaves on the many-branched flowering stem. The leaves are 2-10 cm long, getting smaller toward the top of the plant. The blue flowers look like forget-me-not flowers (they are related) but are smaller, about 3 mm across. The brown nutlets have two rows of hooked prickles which stick to clothing and animal fur.

Ecology and Life History

Lappula squarrosa was introduced from the eastern Mediterranean region of Europe and first reported in eastern North America prior to 1698 (Royer and Dickinson 1999). It is now a weed of roadsides, disturbed areas, and overgrazed pastures throughout the northern hemisphere (Hulten 1968; Kartez and Mecham 1999). We did not observe this plant in undisturbed plant communities, and it is not listed as an invader of natural areas (Plant Conservation Association 2001).

This species reproduces from seed dispersed to a disturbed site or from buried seed. Buried seeds may remain viable for up to five years (Royer and Dickinson 1999). The hooked prickles attach readily and firmly to fur and clothing and thus are easily dispersed for long distances. The plant can grow as an annual, germinating in the spring, producing seeds, and dying at the end of the growing season, or as a winter annual, germinating later in the growing season, overwintering as a rosette of leaves, producing seeds the

following growing season, and dying at the end of the growing season.

Distribution and Management in Park Units

Lappula squarrosa is a short-lived colonizer of disturbed areas, but can persist on repeatedly disturbed sites. It can spread along highway shoulders. The plants are moderately conspicuous and the seeds are a nuisance to visitors. Visitors are very likely to remove seeds from their clothes in campgrounds where the plant can spread rapidly. Plant populations in DENA and WRST are now small and this species can be monitored and eradicated. The plants are easily pulled up by hand, although several weedings may be necessary to eliminate plants germinating from buried seeds. This species, however, may be reintroduced because it is common around the Glenallen area and has also been reported in Healy. Plants could appear on roadsides and other disturbed areas in other park units if seeds arrive stuck to visitors or animals.

Species Ranking Summary Form for *Lappula squarrosa*

	Significance of Impact				
Park Unit	Current Level of Impact	Innate Ability to Become a Pest	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	-8	21	13	65	High
KATM	np[a]	-[b]	-	-	-
KEFJ	np	-	-	-	-
SITK	np	-	-	-	-
WRST	-8	21	13	60	High

[a]Not yet collected in this park unit.
[b]No data.

Species Ranking Form for *Lappula squarrosa*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
-10				-10

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
1				1

      b. areal extent of populations
        (1) <5 ha 1

(2) 5-10 ha 2
(3) 11-50 ha 3
(4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1				1

3. Effect on natural processes and character
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0				0

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0				0

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
-8				-8

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5				5

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
3				3

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
0				0

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5				5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3				3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5				5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0				0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
0				0

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impct in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 50

Total by park	DENA	KATM	KEFJ	SITK	WRST
	21				21

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)

a. several; widespread and dense 1
b. intermediate number; patchy 3
c. few; scattered 5

	DENA	KATM	KEFJ	SITK	WRST
	5				5

2. Areal extent of populations

a. > 50 1
b. 11-50 ha 2
c. 5-10 3
d. < 5ha 5

	DENA	KATM	KEFJ	SITK	WRST
	5				5

B. Ease of Control

1. Seed banks

a. seeds remain viable in the soil for at least 3 years 0
b. seeds remain viable in the soil for 2-3 years 5
c. seeds viable in the soil for 1 year or less 15

	DENA	KATM	KEFJ	SITK	WRST
	0				0

2. Vegetative regeneration

a. any plant part is a viable propagule 0
b. sprouts from roots or stumps 5
c. no resprouting following removal of aboveground growth 10

	DENA	KATM	KEFJ	SITK	WRST
	10				10

3. Level of effort required

a. repeated chemical or mechanical control measures required 1
b. one or two chemical or mechanical treatments required 5
c. can be controlled with one chemical treatment 10
d. effective control can be achieved with mechanical treatment 15

	DENA	KATM	KEFJ	SITK	WRST
	15				15

4. Abundance and proximity of propagules near park

a. many sources of propagules near park 0
b. few sources of propagules near park, but these are readily dispersed 5
c. few sources of propagules near park, but these are not readily dispersed 10
d. no sources of propagules are in dose proximity 15

	DENA	KATM	KEFJ	SITK	WRST
	0				0

C. Side Effects of Chemical/Mechanical Control Measures

1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
15				15

D. Effectiveness of Community Management

1. the following options are not effective 0
2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10				10

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
60				60

***Lepidium densiflorum* Schrad. Common pepperweed**

Fig. 10. *Lepidium densiflorum* in NPS campground area near McCarthy, WRST.

Description

Lepidium densiflorum has a basal rosette of toothed leaves 3-10 cm long and 2-3 cm wide, and a thin, short taproot. The flowering stem usually has numerous branches and is 10-50 cm high with alternate leaves. The flowers are small and inconspicuous. The seed pods are 2-3 mm long, with 9-15 pods produced for every 1 cm of flowering stems. The high density of pods gives the plant a distinctive appearance that facilitates field identification.

Ecology and Life History

Lepidium densiflorum is native to North America, but has spread as a contaminant in seed and feed (Kartez and Mecham 1999, Royer and Dickinson 1999). Hulten (1968) regards the plant as introduced to Alaska beyond its native range, and Cody (1996) considers the plant native but possibly a recent introduction into the Yukon Territory. It possible that the plant is native to Alaska and was simply rare before human disturbance greatly expanded the available habitat, and it is also likely that the current gene pool of this plant includes genes from populations introduced from further south. It is now a weed of cultivated and disturbed areas throughout the northern hemisphere, but we did not observe this plant in undisturbed plant communities, and it is not listed as an invader of natural areas (Plant Conservation Association 2001).

This species reproduces from seed dispersed to a disturbed site or from buried seed (Baskin and

Baskin 1998). Therefore, plants may appear on sites which have been redisturbed after previous disturbance. The plant can grow as an annual, germinating in the spring, producing seeds, and dying at the end of the growing season, or as a winter annual, germinating later in the growing season, overwintering as a rosette of leaves, producing seeds the following growing season, and dying at the end of the growing season.

Distribution and Management in Park Units

Lepidium densiflorum is a short-lived colonizer of disturbed areas and is likely to be present for only 2-5 years unless the site is repeatedly disturbed. Plants may appear in any park unit when an area is disturbed by construction or trampling, especially if the area has a history of previous human use. The plants look Aweedy@ but the aesthetic impacts are usually minor. The plants are easily pulled up by hand, although several weedings may be necessary to eliminate plants germinating from buried seeds.

Species Ranking Summary Form for *Lepedium densiflorum*

	Significance of Impact				
Park Unit	Current Level of Impact	Innate Ability to Become a Pest	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	-8	21	13	65	Low
KATM	np[a]	-[b]	-	-	-
KEFJ	np	-	-	-	-
SITK	np	-	-	-	-
WRST	-8	21	13	65	Low

[a]Not yet collected in this park unit.
[b]No data.

Species Ranking Form for *Lepidium densiflorum*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
-10				-10

2. Abundance
   a. number of populations (stands)
      (1) few; scattered (<5) 1
      (2) intermediate number; patchy (6-10) 3
      (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
1				1

   b. areal extent of populations
      (1) <5 ha 1
      (2) 5-10 ha 2
      (3) 11-50 ha 3
      (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1				1

3. Effect on natural processes and character
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0				0

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0				0

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
-8				-8

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5				5

2. Mode of reproduction
   a. reproduces almost entirely by vegetative means 1
   b. reproduces only by seeds 3
   c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
3				3

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
0				0

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5				5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3				3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5				5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0				0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
0				0

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
21				21

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)
   a. several; widespread and dense 1
   b. intermediate number; patchy 3
   c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
5				5

2. Areal extent of populations
   a. > 50 1
   b. 11-50 ha 2
   c. 5-10 3
   d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5				5

B. Ease of Control

1. Seed banks
   a. seeds remain viable in the soil for at least 3 years 0
   b. seeds remain viable in the soil for 2-3 years 5
   c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
0				0

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
10				10

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
15				15

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
5				5

C. Side Effects of Chemical/Mechanical Control Measures
   1. control measures will cause major impacts to community 0
   2. control measures will cause moderate impacts to community 5
   3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
15				15

D. Effectiveness of Community Management
   1. the following options are not effective 0
   2. cultural techniques (burning, flooding) can be used to control target species 5
   3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10				10

E. Biological Control
   1. biological control not feasible (not practical possible, or probable) 0
   2. potential may exist for biological control 5
   3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0				0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
65				65

***Leucanthemum vulgare* Lam. Oxeye-daisy**

Fig. 11. *Leucanthemum vulgare* growing behind NPS building in Kennecott.

Field Identification

Leucanthemum vulgare has a daisy-type flower with white ray petals and a yellow center. Both basal and stem leaves have wavy to lobed margins.

Ecology and Life History

Leucanthemum vulgare was introduced from Europe as a garden plant (Royer and Dickinson 1999). It is now a weed of disturbed areas and pastures throughout North America (Hulten 1968; Royer and Dickinson 1999), and is listed as noxious weed in six states (Kartez and Mecham 1999). Unfortunately, this species is popular as a garden ornamental in Alaska, has been sown along roadsides as a Awildflower@, and is present in some commercial Awildflower@ seed mixes. This plant appears to be spreading and very persistent in disturbed areas in Alaska. We did not observe this plant in undisturbed plant communities, but it is listed as an invader of natural areas in other climates (Plant Conservation Association 2001).

This species reproduces from seed dispersed to a disturbed site, and also spreads from creeping rhizomes. General germination requirements are known but no information is available on the role of buried seed (Baskin and Baskin 1998). The plant is a perennial, and each plant can produce many seeds each year.

Distribution and Management in Park Units

Leucanthemum vulgare is a persistent colonizer of disturbed areas. The plants present a significant visual impact in the park landscape. Plants may invade disturbed areas in any park unit if seed sources are nearby, and can persist in areas with continuing disturbance or where open soil remains and other species do not shade it out. The plant has a shallow root system and can be removed with pulling or cultivation.

However, the area should be checked to see if any new plants have sprouted from any leftover rhizomes. It is very important to keep this plant from being planted as an ornamental around park housing and other structures, and to discourage concessionaires and inholders from planting it. An education program would be very helpful-most people are simply unaware that some ornamentals are a threat to park resources.

Species Ranking Summary Form for *Leucanthemum vulgare*

	Significance of Impact				
Park Unit	Current Level of Impact (0-50)	Innate Ability to Become a Pest (0-50)	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	8	33	41	65	High
KATM	np[a]	-[b]	-	-	-
KEFJ	np[c]	-		-	High[d]
SITK	8	33	41	65	High
WRST	8	33	41	65	High

[a]Not yet collected in this park unit.
[b]No data.
[c]Found outside park boundaries but may invade park.
[d]Monitoring program urgent.

Species Ranking Form for *Leucanthemum vulgare*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
1			1	1

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
1			1	1

b. areal extent of populations
   (1) <5 ha 1
   (2) 5-10 ha 2
   (3) 11-50 ha 3
   (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1			1	1

3. Effect on natural processes and character
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0			0	0

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0			0	0

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
5			5	5

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
8			8	8

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5			5	5

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
5			5	5

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
3			3	3

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5			5	5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3			3	3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5			5	5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
3			3	3

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
3			3	3

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
1			1	1

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
33			33	33

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)

a. several; widespread and dense 1
b. intermediate number; patchy 3
c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
5			5	5

2. Areal extent of populations

a. > 50 1
b. 11-50 ha 2
c. 5-10 3
d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5			5	5

B. Ease of Control

1. Seed banks

a. seeds remain viable in the soil for at least 3 years 0
b. seeds remain viable in the soil for 2-3 years 5
c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
15			15	15

2. Vegetative regeneration

a. any plant part is a viable propagule 0
b. sprouts from roots or stumps 5
c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
5			5	5

3. Level of effort required

a. repeated chemical or mechanical control measures required 1
b. one or two chemical or mechanical treatments required 5
c. can be controlled with one chemical treatment 10
d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
5			5	5

4. Abundance and proximity of propagules near park

a. many sources of propagules near park 0
b. few sources of propagules near park, but these are readily dispersed 5
c. few sources of propagules near park, but these are not readily dispersed 10
d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
5			5	5

C. Side Effects of Chemical/Mechanical Control Measures

1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
15			15	15

D. Effectiveness of Community Management

1. the following options are not effective 0
2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10			10	10

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0			0	0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
65			65	65

***Linaria vulgaris* P. Mill. Butter and eggs**

Fig. 12. *Linaria vulgaris* growing with *Leucanthemum vulgare* in a weedy area in Anchorage.

Field Identification

Linaria vulgaris resembles a small snapdragon, but with a spur on each flower. The showy yellow flowers occur in dense terminal clusters. The stems have numerous narrow alternate leaves.

Ecology and Life History

Linaria vulgaris was introduced from Europe as a ornamental by early colonial gardeners (Carpenter and Murray 1998). It is now a weed of roadsides, disturbed areas, rangeland, and no-till and minimum-till agricultural areas (Hulten 1968; Royer and Dickinson 1999). *Linaria vulgaris* is listed under the State of Alaska Regulations, 11 AAC 34.020 Plant Health and Quarantine, as a restricted noxious weed with a maximum allowable tolerance of 1 seed/lb contaminating commercial seed, and is listed as a noxious weed in seven other states (Kartez and Mecham 1999). This plant appears to be spreading and very persistent in disturbed areas in Alaska. We did not observe this plant in undisturbed plant communities, but it is listed as an invader of natural areas outside Alaska (Plant Conservation Association 2001).

This species reproduces from seed dispersed to a disturbed site, and also forms extensive clones from creeping rhizomes. General germination requirements are known but no information is available on the role of buried seed (Baskin and Baskin 1998). The plant is a perennial, and each plant can produce thousands of seeds each year.

Distribution and Management in Park Units

Plants may invade in any park unit when an area is disturbed by construction or trampling, and can persist in areas with continuing disturbance or where open soil remains and other species do not shade it out. *Linaria vulgaris* is a persistent colonizer of disturbed areas, and can spread along highway shoulders. The plants present a significant visual impact in the park landscape. Plant populations are now small and this species can be monitored and eradicated. The plants can be pulled up by hand but several weedings may be necessary to eliminate plants resprouting from rhizomes. It is very important to eliminate this exotic before it forms extensive clones. Once large clones are formed and thousands of seeds are being dispersed, control will be very difficult.

Species Ranking Summary Form for *Linaria vulgaris*

	Significance of Impact				
Park Unit	Current Level of Impact (0-50)	Innate Ability to Become a Pest (0-50)	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	pc[a]	-	-	-	-
KATM	np[b]	-[c]	-	-	-
KEFJ	7	31	38	50	High
SITK	np	-	-	-	-
WRST	7	31	38	50	High

[a]Previously collected in this park unit.
[b]Not yet collected in this park unit.
[c]No data.

Species Ranking Form for *Linaria vulgaris*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
		1		1

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
		1		1

b. areal extent of populations
(1) <5 ha 1
(2) 5-10 ha 2
(3) 11-50 ha 3
(4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
		1		1

3. Effect on natural processes and character
a. plant species having little or no effect 0
b. delays establishment of native species in disturbed sites up to 10 years 3
c. long-term (more than 10 years) modification or retardation of succession 7
d. invades and modifies existing native communities 10
e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
		0		0

4. Significance of threat to park resources
a. threat to secondary resources negligible 0
b. threat to areas' secondary (successional) resources 2
c. endangerment to areas' secondary (successional) resources 4
d. threat to areas' primary resources 8
e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
		0		0

5. Level of visual impact to an ecologist
a. little or no visual impact on landscape 0
b. minor visual impact on natural landscape 2
c. significant visual impact on natural landscape 4
d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
		4		4

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
		7		7

B. Innate Ability of Species to Become a Pest
1. Ability to complete reproductive cycle in area of concern
a. not observed to complete reproductive cycle 0
b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
		5		5

2. Mode of reproduction
a. reproduces almost entirely by vegetative means 1
b. reproduces only by seeds 3
c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
		3		3

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
		5		5

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
		5		5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
		5		5

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
		5		5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
		0		0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
		3		3

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
		0		0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
		31		31

II. Feasibility of Control or Management
   A. Abundance Within Park

1. Number of populations (stands)
   a. several; widespread and dense 1
   b. intermediate number; patchy 3
   c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
		5		5

2. Areal extent of populations
   a. > 50 1
   b. 11-50 ha 2
   c. 5-10 3
   d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
		5		5

B. Ease of Control
1. Seed banks
   a. seeds remain viable in the soil for at least 3 years 0
   b. seeds remain viable in the soil for 2-3 years 5
   c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
		0		0

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
		5		5

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
		5		5

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
		5		5

C. Side Effects of Chemical/Mechanical Control Measures
1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
		15		15

D. Effectiveness of Community Management
1. the following options are not effective 0
2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed

burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
		10		10

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
		0		0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
		50		50

***Lupinus polyphyllus* Lindl. Bigleaf lupine**

Fig. 13. *Lupinus polyphyllus* growing in lightly disturbed tundra near lodge near Kantishna in DENA.

Field Identification

Lupinus polyphyllus resembles lupines native to Alaska, but has more than 10 leaflets per leaf, while the native lupines have less than 10 leaflets on all leaves.

Ecology and Life History

Lupinus polyphyllus is native to the Rocky Mountains and the Pacific Northwest. It has been widely seeded on roadsides in southcentral Alaska and planted elsewhere as an ornamental. It is now a weed of roadsides and disturbed areas (Hulten 1968). This plant appears to be spreading and very persistent in disturbed areas in Alaska. We did not observe this plant in undisturbed plant communities, and it is not listed as an invader of natural areas elsewhere (Plant Conservation Association 2001).

This species is a perennial that reproduces from seed dispersed to a disturbed site, and also forms extensive clones from creeping rhizomes. Seeds of wild *Lupinus* species are dormant and can persist for many years as buried seed (Baskin and Baskin 1998). *Lupinus polyphyllus* in Alaska, however, is from commercial seed that has probably been selected for the ability to germinate more quickly and uniformly than the wild seed.

Distribution and Management in Park Units

The *Lupinus polyphyllus* in DENA has been growing for some years at a private lodge near Wonder Lake. At this elevation, the plants do not appear to reproduce from seed, but have successfully maintained one or more populations by spreading by rhizomes. *Lupinus polyphyllus* has been present in disturbed areas in Seward for many years and apparently produces seed, but has not spread into KEFJ. This species is most likely to be introduced into NPS units as an ornamental, as most gardeners and landscapers believe this species is a native lupine. The plants can be eradicated when the populations are small by digging up the plants and rhizomes, but several weedings may be necessary to eliminate plants resprouting from rhizomes. It is very important to eliminate this exotic before it forms extensive clones.

Species Ranking Summary Form for *Lupinus polyphyllus*

Park Unit	Significance of Impact: Current Level of Impact (0-50)	Significance of Impact: Innate Ability to Become a Pest (0-50)	Significance of Impact: Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	12	11	23	55	Low
KATM	np[a]	-[b]	-	-	-
KEFJ	np[c]	-	-	-	Low[d]
SITK	np	-	-	-	-
WRST	np	-	-	-	-

[a]Not yet collected in this park unit.
[b]No data.
[c]Found outside park but may invade park.
[d]Needs monitoring.

Species Ranking Form for *Lupinus polyphyllus*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
1				

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
1				

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1				

3. Effect on natural processes and character,
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
3				

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
2				

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
4				

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
12				

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
0				

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
1				

   3. Vegetative reproduction
      a. no vegetative reproduction 0
      b. vegetative reproduction rate maintains population 1
      c. vegetative reproduction rate results in moderate increase in population size 3
      d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
3				

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
0				

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
1				

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
0				

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
3				

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
3				

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
0				

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
11				

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)
   a. several; widespread and dense 1
   b. intermediate number; patchy 3
   c. few; scattered 5

DENA KATM KEFJ SITK WRST
5

2. Areal extent of populations
   a. > 50 1
   b. 11-50 ha 2
   c. 5-10 3
   d. < 5ha 5

DENA KATM KEFJ SITK WRST
5

B. Ease of Control

1. Seed banks
   a. seeds remain viable in the soil for at least 3 years 0
   b. seeds remain viable in the soil for 2-3 years 5
   c. seeds viable in the soil for 1 year or less 15

DENA KATM KEFJ SITK WRST
0

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA KATM KEFJ SITK WRST
5

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA KATM KEFJ SITK WRST
5

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA KATM KEFJ SITK WRST
10

C. Side Effects of Chemical/Mechanical Control Measures

1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA KATM KEFJ SITK WRST
15

D. Effectiveness of Community Management

1. the following options are not effective 0
2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10				

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0				

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
55				

***Matricaria discoidea* DC. Pineapple weed**

Fig. 14. *Matricaria discoidea* on the side of Nabesna Road, WRST.

Description

Matricaria discoidea has one to many leafy stems 5-40 cm tall. The leaves are finely divided. The greenish-yellowish flowers are arranged in a cone-shaped head 5-10 mm across, which looks like a tiny pineapple. The whole plant has a strong odor when crushed. The size of the plant and the number of seeds produced varies greatly, from tiny plants on dry and/or nutrient-poor soil to large, branched plants on more favorable sites.

Ecology and Life History

Matricaria discoidea was introduced into North America and is now a weed of roadsides and other disturbed areas throughout the northern hemisphere, where it can grow well on compacted soils. In Alaska, this plant is found in most places where humans are (Hulten 1968). The Dena=ina (also called Tanaina) Athabaskans of Southcentral Alaska have many medicinal uses for this plant, and their names for this plant are of Russian origin (Kari 1991). *Matricaria discoidea* probably was brought to Alaska by the Russians as a medicinal herb, and it probably traveled throughout Alaska with Native Alaskans, by design or accident. We did not observe this plant in undisturbed plant communities, but it is listed as an invader for a few natural areas elsewhere (Plant Conservation Association 2001).

We have found no information on germination in this species, but information on closely related species indicates that this species reproduces both from seed dispersed to a disturbed site and from buried seed (Baskin and Baskin 1998). Therefore, plants may appear on sites that have been redisturbed several decades after the last human disturbance. The plant grows as an annual, germinating in the spring, producing seeds, and dying at the end of the growing season.

Distribution and Management in Park Units

Matricaria discoidea is an annual but readily reseeds in disturbed areas if not overgrown by other

vegetation. The plants look Aweedy@ but are relatively inconspicuous, and the aesthetic impacts are usually minor. This species has been living, spreading, and thriving with humans in Alaska for a long time, and plants may appear in any park unit when an area is disturbed by construction or trampling, especially if the area has a history of previous human use. Therefore, while it may be feasible to remove small populations from sensitive areas such as small disturbances in wilderness areas, this species is likely to reinvade disturbed areas that are frequently used by humans. The plants are easy to pull up by hand, although several weedings may be necessary to eliminate plants germinating from buried seeds. Hand weeding, however, may be inefficient and ineffective where there are large, dense populations of small plants.

Species Ranking Summary Form for *Matricaria discoidea*

	Significance of Impact				
Park Unit	Current Level of Impact	Innate Ability to Become a Pest	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	-4	21	17	46	Low
KATM	-4	21	17	46	Low
KEFJ	-4	21	17	60	Low
SITK	pc[a]	-	-	-	-
WRST	-4	21	17	46	Low

[a]Previously collected in this park unit.

Species Ranking Form for *Matricaria discoidea*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
-10	-10	-10		-10

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5		5

b. areal extent of populations
(1) <5 ha 1
(2) 5-10 ha 2
(3) 11-50 ha 3
(4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1	1	1		1

3. Effect on natural processes and character
a. plant species having little or no effect 0
b. delays establishment of native species in disturbed sites up to 10 years 3
c. long-term (more than 10 years) modification or retardation of succession 7
d. invades and modifies existing native communities 10
e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0	0	0		0

4. Significance of threat to park resources
a. threat to secondary resources negligible 0
b. threat to areas' secondary (successional) resources 2
c. endangerment to areas' secondary (successional) resources 4
d. threat to areas' primary resources 8
e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0	0	0		0

5. Level of visual impact to an ecologist
a. little or no visual impact on landscape 0
b. minor visual impact on natural landscape 2
c. significant visual impact on natural landscape 4
d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
0	0	0		0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
-4	-4	-4		-4

B. Innate Ability of Species to Become a Pest
1. Ability to complete reproductive cycle in area of concern
a. not observed to complete reproductive cycle 0
b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5		5

2. Mode of reproduction
a. reproduces almost entirely by vegetative means 1
b. reproduces only by seeds 3
c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
3	3	3		3

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
0	0	0		0

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5		5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3	3	3		3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5		5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0	0	0		0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
0	0	0		0

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
0	0	0		0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
21	21	21		21

II. Feasibility of Control or Management
   A. Abundance Within Park

1. Number of populations (stands)
   a. several; widespread and dense 1
   b. intermediate number; patchy 3
   c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
1	1	5		1

2. Areal extent of populations
   a. > 50 1
   b. 11-50 ha 2
   c. 5-10 3
   d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5		5

B. Ease of Control
1. Seed banks
   a. seeds remain viable in the soil for at least 3 years 0
   b. seeds remain viable in the soil for 2-3 years 5
   c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
0	0	0		0

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
10	10	10		10

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
5	5	15		5

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
0	0	0		0

C. Side Effects of Chemical/Mechanical Control Measures
1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
15	15	15		15

D. Effectiveness of Community Management
1. the following options are not effective 0
2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed

burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10	10	10		10

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0	0	0		0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
46	46	60		46

***Melilotus alba* Medikus White sweetclover**
***Melilotus officinalis* (L.) Lam. Yellow sweetclover**

Fig. 15. *Melilotus alba* along Park Road near railroad crossing, DENA.

Fig. 16. *Melilotus officinalis* with other planted legumes along Exit Glacier Road, just outside entrance to KEFJ.

Note: *Melilotus alba* and *M. officinalis* are closely related and similar in appearance, ecology, life history, and management. They differ, however, in their distribution in and threat to the park units. Therefore, the text covers both species but the species ranking form is separate for each species.

Description

Melilotus alba and *M. officinalis* have the typical Athree-leaf clover@ trifoliate leaves on erect stalks which, in Alaska, are usually not taller than 1.5 m. The fragrant white flowers of *M. alba* are 4-6 mm long and are clustered in racemes with 40-100 flowers; the fragrant yellow flowers of *M. officinalis* are slightly larger and are clustered in racemes with 20-60 flowers.

Ecology and Life History

Melilotus alba and *M. officinalis* are native from the Mediterranean area through central Europe to Tibet, and were introduced to North America as a forage crop in the 1600's (Eckardt 1987; Royer and Dickinson 1999). They are now distributed throughout the northern hemisphere and have spread from cultivation to be common weeds of roadsides and disturbed areas. We did not observe these plants in undisturbed plant communities in the parks we were surveyed, or outside KEFJ on gravel bars along the Resurrection River adjacent to areas along Exit Glacier Road which had been planted with *M. officinalis* and other exotic legumes. *Melilotus alba*, however, has invaded gravel bars along the Stikine River in the Stikine-LeConte Wilderness (Stensvold 2000), is considered an invasive plant with established infestations in Alaska (University of Alaska 2001). Both *Melilotus sp.* are listed as invaders of natural areas in other regions (Eckardt 1987; Plant Conservation Association 2001).

These species reproduce from seed dispersed to a disturbed site or from buried seed. Buried seeds can remain viable for up to 81 years (Royer and Dickinson 1999). Therefore, plants may appear on sites which have been redisturbed after previous disturbance. The plants are annuals or biennials and can persist in open areas. The size of the plant populations can vary considerably from year to year, depending on how many buried seeds germinate and how many plants overwinter successfully. *Melilotus sp.* grow best on calcareous soils and can grow on alkaline soils (Turkington et al. 1978, cited in Eckardt 1987), and therefore are more likely to invade gravel fill or natural gravel bars which have a higher pH than undisturbed soils with an intact organic layer.

Distribution and Management in Park Units

The *Melilotus alba* in DENA is a cold-hardy cultivar which was seeded on Parks Highway roadsides north of the park entrance and has repeatedly invaded the park. This plant first appeared near the park entrance on the incoming traffic side of the road, indicating that is was, and probably continues to be, introduced on vehicle tires. It is probably capable of expanding along the Park Road, although we have not observed this plant on roadsides above treeline outside the park. *Melilotis alba* can persist in disturbed areas if not overgrown by other vegetation. The aesthetic impacts are major because many visitors recognize the flowering plants as exotics. The plants are fairly easy to pull up by hand, although several weedings may be necessary to eliminate plants germinating from buried seeds. Handweeding has effectively reduced populations of *Melilotus alba* on gravel bars along the Stikine River in the Stikine-LeConte Wilderness (Stensvold 2000). *Melilotus alba* and *M. officinalis* are managed in natural areas outside Alaska by prescribed burns or hand weeding (Eckardt 1987).

Species Ranking Summary Form for *Melilotus alba*

Park Unit	Significance of Impact: Current Level of Impact (0-50)	Significance of Impact: Innate Ability to Become a Pest (0-50)	Significance of Impact: Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	14	36	50	65	High
KATM	np[a]	-[b]	-	-	-
KEFJ	np	-	-	-	-
SITK	np	-	-	-	-
WRST	np	-	-	-	-

[a]Not yet collected in this park unit.
[b]No data.

Species Ranking Form for *Melilotus alba*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
1				

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
5				

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1				

3. Effect on natural processes and character
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0				

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
2				

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
5				

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
14				

B. Innate Ability of Species to Become a Pest
1. Ability to complete reproductive cycle in area of concern
   a. not observed to complete reproductive cycle 0
   b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5				

2. Mode of reproduction
   a. reproduces almost entirely by vegetative means 1
   b. reproduces only by seeds 3
   c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
3				

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
0				

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5				

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
5				

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5				

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0				

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
3				

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
10				

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
36				

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)

a. several; widespread and dense 1
b. intermediate number; patchy 3
c. few; scattered 5

DENA KATM KEFJ SITK WRST
5

2. Areal extent of populations

a. > 50 1
b. 11-50 ha 2
c. 5-10 3
d. < 5ha 5

DENA KATM KEFJ SITK WRST
5

B. Ease of Control

1. Seed banks

a. seeds remain viable in the soil for at least 3 years 0
b. seeds remain viable in the soil for 2-3 years 5
c. seeds viable in the soil for 1 year or less 15

DENA KATM KEFJ SITK WRST
0

2. Vegetative regeneration

a. any plant part is a viable propagule 0
b. sprouts from roots or stumps 5
c. no resprouting following removal of aboveground growth 10

DENA KATM KEFJ SITK WRST
10

3. Level of effort required

a. repeated chemical or mechanical control measures required 1
b. one or two chemical or mechanical treatments required 5
c. can be controlled with one chemical treatment 10
d. effective control can be achieved with mechanical treatment 15

DENA KATM KEFJ SITK WRST
15

4. Abundance and proximity of propagules near park

a. many sources of propagules near park 0
b. few sources of propagules near park, but these are readily dispersed 5
c. few sources of propagules near park, but these are not readily dispersed 10
d. no sources of propagules are in dose proximity 15

DENA KATM KEFJ SITK WRST
0

C. Side Effects of Chemical/Mechanical Control Measures

1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA KATM KEFJ SITK WRST
15

D. Effectiveness of Community Management

1. the following options are not effective 0

2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA KATM KEFJ SITK WRST
10

E. Biological Control
1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA KATM KEFJ SITK WRST
0

Total Possible 100
Total by park

DENA KATM KEFJ SITK WRST
60

Species Ranking Summary Form for *Melilotus officinalis*

Park Unit	Significance of Impact: Current Level of Impact (0-50)	Significance of Impact: Innate Ability to Become a Pest (0-50)	Significance of Impact: Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	np[a]	-[b]	- -	-	-
KATM	np	-	-	-	-
KEFJ	np[c]	-	.-	-	High[d]
SITK	np	-	-	-	-
WRST	8	36	44	41	High

[a]Not yet collected in this park unit.
[b]No data.
[c]Found outside park but likely to invade park.
[d]Monitoring very important.

Species Ranking Form for *Melilotus officinalis*

I. Significance of Impact
A. Current Level of Impact
1. Distribution relative to disturbance regime
a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
b. found in sites disturbed within the last 10 years 1
c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
d. found in late-successional sites disturbed 51-100 years BP 5
e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA KATM KEFJ SITK WRST
1

2. Abundance
   a. number of populations (stands)
      (1) few; scattered (<5) 1
      (2) intermediate number; patchy (6-10) 3
      (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
				1

   b. areal extent of populations
      (1) <5 ha 1
      (2) 5-10 ha 2
      (3) 11-50 ha 3
      (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
				1

3. Effect on natural processes and character
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
				0

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
				2

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
				5

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
				8

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
				5

2. Mode of reproduction
   a. reproduces almost entirely by vegetative means 1
   b. reproduces only by seeds 3
   c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
				3

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
				0

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
				5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
				5

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
				5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
				0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
				3

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
				10

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
				36

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)
   a. several; widespread and dense 1
   b. intermediate number; patchy 3
   c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
				5

2. Areal extent of populations
   a. > 50 1
   b. 11-50 ha 2
   c. 5-10 3
   d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
				5

B. Ease of Control

1. Seed banks
   a. seeds remain viable in the soil for at least 3 years 0
   b. seeds remain viable in the soil for 2-3 years 5
   c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
				0

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
				5

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
				1

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
				0

C. Side Effects of Chemical/Mechanical Control Measures
   1. control measures will cause major impacts to community 0
   2. control measures will cause moderate impacts to community 5
   3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
				15

D. Effectiveness of Community Management
   1. the following options are not effective 0
   2. cultural techniques (burning, flooding) can be used to control target species 5
   3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
				10

E. Biological Control
   1. biological control not feasible (not practical possible, or probable) 0
   2. potential may exist for biological control 5
   3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
				0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
				41

***Plantago major* L. Common plantain**

Fig. 17. *Plantago major* on Exit Glacier Trail, near ranger station, KEFJ.

Description

Plantago major has a basal rosette of oval leaves 5-20 cm long and a short thick rootstalk with fibrous roots. Flowers are arranged in dense spikes up to 25 cm long on leafless stalks. The flowers are small and inconspicuous.

Ecology and Life History

Plantago major is distributed throughout the northern hemisphere. Hulten (1968) divides Alaskan plants into two varieties: one native to Alaska (var. *Pilgeri*) and one (var. *major*) introduced from Europe; Hitchcock and Cronquist (1973) also recognize a native and an introduced variety. Kartez and Mecham (1999), however, regard the varieties as invalid and simply consider the plant native to North America. This plant travels with humans (who have also greatly expanded the available habitat) and it is also likely that the current Alaskan gene pool of this plant includes genes from populations from many areas. It is now a weed of roadsides and cultivated and disturbed areas, but we did not observe this plant in undisturbed plant communities. However, NPS has listed *P. major* as an invader of some natural areas (Plant Conservation Association 2001).

This species reproduces from seed dispersed to a disturbed site or from buried seed. Buried seeds can remain viable for up to 40 years (Baskin and Baskin 1998). Therefore, plants may appear on sites that have been redisturbed after previous disturbance. The plant is a perennial and can persist in open areas without competition from taller plants. It is quite resistant to trampling.

Distribution and Management in Park Units

Plantago major is a perennial and can persist in disturbed areas if not overgrown by other vegetation.

Plants may appear in any park unit when an area is disturbed by construction or trampling, especially if the area has a history of previous human use. The plants look Aweedy@ but the aesthetic impacts are usually minor. The plants are fairly easy to pull up by hand, although several weedings may be necessary to eliminate plants germinating from buried seeds.

Species Ranking Summary Form for *Plantago major*

Park Unit	Significance of Impact: Current Level of Impact	Significance of Impact: Innate Ability to Become a Pest	Significance of Impact: Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	7	24	31	38	Low
KATM	3	24	27	40	Low
KEFJ	3	24	27	40	Low
SITK	3	24	27	40	Low
WRST	7	24	31	38	Low

Species Ranking Form for *Plantago major*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
1	1	1	1	1

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
5	1	1	1	5

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1	1	1	1	1

    3. Effect on natural processes and character
      a. plant species having little or no effect 0
      b. delays establishment of native species in disturbed sites up to 10 years 3
      c. long-term (more than 10 years) modification or retardation of succession 7

d. invades and modifies existing native communities 10
e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
7	3	3	3	7

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5	5	5

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
3	3	3	3	3

   3. Vegetative reproduction
      a. no vegetative reproduction 0
      b. vegetative reproduction rate maintains population 1
      c. vegetative reproduction rate results in moderate increase in population size 3
      d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5	5	5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3	3	3	3	3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5	5	5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
3	3	3	3	3

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
24	24	24	24	24

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)

a. several; widespread and dense 1
b. intermediate number; patchy 3
c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
3	5	5	5	3

2. Areal extent of populations

a. > 50 1
b. 11-50 ha 2
c. 5-10 3
d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5	5	5

B. Ease of Control

1. Seed banks

a. seeds remain viable in the soil for at least 3 years 0
b. seeds remain viable in the soil for 2-3 years 5
c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

2. Vegetative regeneration

a. any plant part is a viable propagule 0
b. sprouts from roots or stumps 5
c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
5	5	5	5	5

3. Level of effort required

a. repeated chemical or mechanical control measures required 1
b. one or two chemical or mechanical treatments required 5
c. can be controlled with one chemical treatment 10
d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

4. Abundance and proximity of propagules near park

a. many sources of propagules near park 0
b. few sources of propagules near park, but these are readily dispersed 5
c. few sources of propagules near park, but these are not readily dispersed 10
d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

C. Side Effects of Chemical/Mechanical Control Measures

1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
15	15	15	15	15

D. Effectiveness of Community Management

1. the following options are not effective 0

2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10	10	10	10	10

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
38	40	40	40	38

***Polygonum aviculare* L. Prostrate knotweed**

Fig. 18. *Polygonum aviculare* growing in gravel along trail in Anchorage.

Description

Polygonum aviculare is prostrate, mat-like plant with long, spreading branches, small leaves, and tiny flowers in the axils of the leaves.

Ecology and Life History

Polygonum aviculare was introduced from Europe and is now a weed of cultivated and disturbed areas throughout the northern hemisphere (Hulten 1968). We did not observe this plant in undisturbed plant communities, but it is listed as an invader of natural areas elsewhere (Plant Conservation Association 2001).

Polygonum aviculare is an annual that reproduces from seed dispersed to a disturbed site or from buried seed. Buried seeds have been shown to remain viable for at least 16 years (Baskin and Baskin 1998). Therefore, plants may appear on sites that have been redisturbed several decades after the last human disturbance. The plant can grows as an annual, germinating in the spring, producing seeds, and dying at the end of the growing season.

Distribution and Management in Park Units

Polygonum aviculare is a short-lived colonizer of disturbed areas and is present for only 2-5 years unless the site is repeatedly disturbed. Plants may appear in any park unit when an area is disturbed by

construction or trampling, especially if the area has a history of previous human use. It does not spread along highway shoulders. The plants are relatively inconspicuous and the aesthetic impacts are usually minimal. The plants are easily pulled up by hand, although several weedings may be necessary to eliminate plants germinating from buried seeds.

Species Ranking Summary Form for *Polygonum aviculare*

	Significance of Impact				
Park Unit	Current Level of Impact	Innate Ability to Become a Pest	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	-8	21	13	60	Low
KATM	-8	21	13	60	Low
KEFJ	np[a]	-[b]	-	-	-
SITK	np	-	-	-	-
WRST	-8	21	13	60	Low

[a]Not yet collected in this park unit.
[b]No data.

Species Ranking Form for *Polygonum aviculare*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
-10	-10			-10

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
1	1			1

b. areal extent of populations
(1) <5 ha 1
(2) 5-10 ha 2
(3) 11-50 ha 3
(4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1	1			1

3. Effect on natural processes and character
a. plant species having little or no effect 0
b. delays establishment of native species in disturbed sites up to 10 years 3
c. long-term (more than 10 years) modification or retardation of succession 7
d. invades and modifies existing native communities 10
e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0	0			0

4. Significance of threat to park resources
a. threat to secondary resources negligible 0
b. threat to areas' secondary (successional) resources 2
c. endangerment to areas' secondary (successional) resources 4
d. threat to areas' primary resources 8
e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0	0			0

5. Level of visual impact to an ecologist
a. little or no visual impact on landscape 0
b. minor visual impact on natural landscape 2
c. significant visual impact on natural landscape 4
d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
0	0			0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
-8	-8			-8

B. Innate Ability of Species to Become a Pest
1. Ability to complete reproductive cycle in area of concern
a. not observed to complete reproductive cycle 0
b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5	5			5

2. Mode of reproduction
a. reproduces almost entirely by vegetative means 1
b. reproduces only by seeds 3
c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
3	3			3

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
0	0			0

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5	5			5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3	3			3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5	5			5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0	0			0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
0	0			0

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
0	0			0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
21	21			21

II. Feasibility of Control or Management
   A. Abundance Within Park

1. Number of populations (stands)
   a. several; widespread and dense 1
   b. intermediate number; patchy 3
   c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
5	5			5

2. Areal extent of populations
   a. > 50 1
   b. 11-50 ha 2
   c. 5-10 3
   d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5	5			5

B. Ease of Control
1. Seed banks
   a. seeds remain viable in the soil for at least 3 years 0
   b. seeds remain viable in the soil for 2-3 years 5
   c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
0	0			0

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
10	10			10

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
15	15			15

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
0	0			0

C. Side Effects of Chemical/Mechanical Control Measures
1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
15	15			15

D. Effectiveness of Community Management
1. the following options are not effective 0
2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed

burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10	10			10

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0	0			0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
60	60			60

***Polygonum cuspidatum* Sieb. & Zucc. Japanese knotweed**

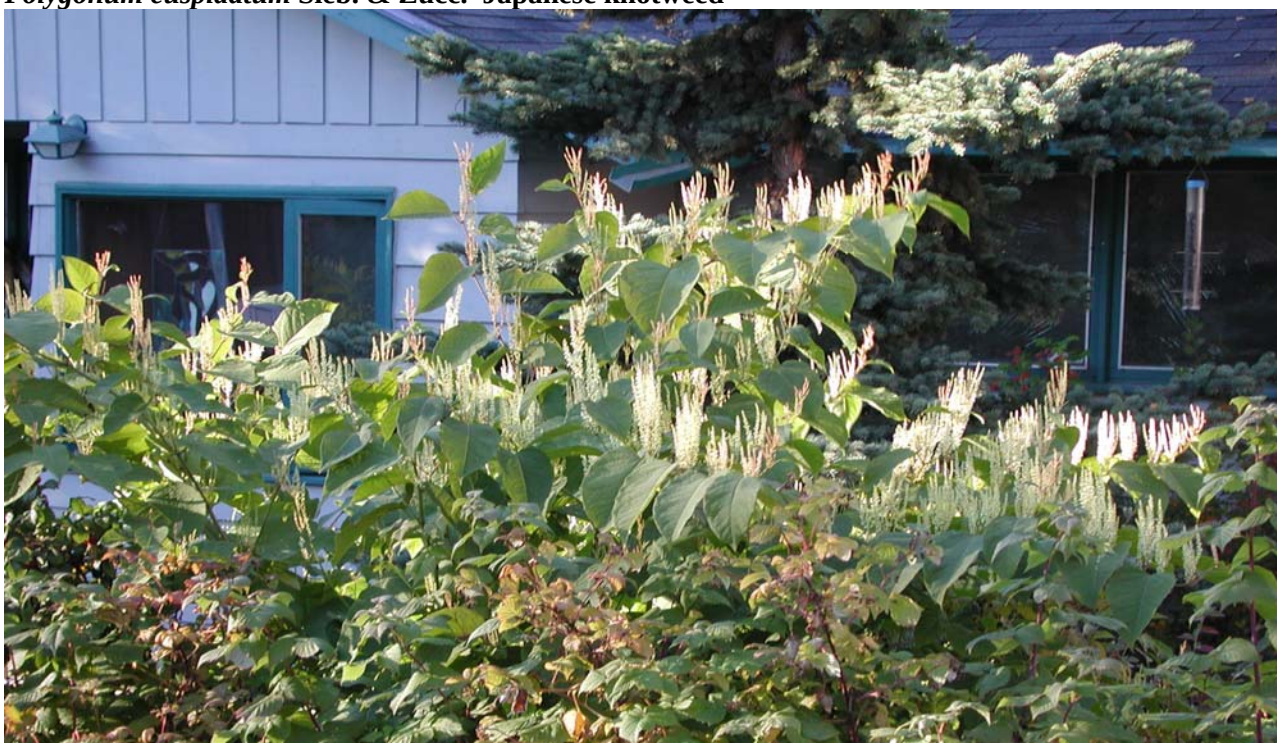

Fig. 19. Flowering *Polygonum cuspidatum* growing in a yard in Anchorage. The vigorous growth at this latitude suggests that the plant could invade KEFJ and KATM.

Description

Polygonum cuspidatum is easy to recognize and difficult to overlook. The plant is an perennial herb with hollow, bamboo-like stems which grow 1-3 m tall. The heart-shaped leaves are large (5-15 cm long, 5-12 cm broad) with a pointed tip. Sprays of small, white flowers are borne along the stem. The plant has an extensive rhizome system.

Ecology and Life History

Polygonum cuspidatum is native to eastern Asia. It was first introduced from Japan to the United Kingdom as an ornamental, and from there to North America in the late 1800's (Seiger 1991). It is now a serious invasive plant in Europe, the United Kingdom, at least 42 states in the United States (including Alaska), and most Canadian provinces (Japanese Knotweed Alliance 2001). It is particularly common in maritime areas of North America, and is regulated as a noxious weed in Washington, Oregon, California, and North Carolina (Haber 1999; Kartesz and Meacham 1999). In Alaska, it is considered an invasive plant with established infestations, including Baranof Island in Tongass National Forest (Stensvold 2000; University of Alaska 2001), and is listed as an invader of natural areas in other regions (Seiger 1991; Plant Conservation Association 2001).

Polygonum cuspidatum does not appear to be a threat in undisturbed forest and other low light areas, but is likely to expand its range in open habitats. Once established, it forms large, almost pure stands which are extremely persistent and difficult to eradicate, and which exclude natural regeneration of native plants. (Seiger 1991). It is a very serious threat in riparian areas, where it can rapidly colonize open areas of streambanks and gravel bars, survive severe floods, and prevent the natural succession of native herbs, shrubs, and trees (Remaley 2001). In the Pacific Northwest, streambanks infested with *P. cuspidatum* are barren in the spring, since the plant is just sprouting its herbaceous stems from the rootstock at the time

when native willows, alders, and poplars would be contributing insects and organic debris (catkins, bud scales) to the stream ecosystem. This reduces the food supply of juvenile salmon at a critical time.

Polygonum cuspidatum flowers in August and September, and seeds are produced in a few weeks. Seiger (1991) states that seeds do not appear to be a significant mode of reproduction where the species has been introduced. We observed, however, that the *P. cuspidatum* in STIK appears to have established from seed. *Polygonum cuspidatum* spreads primarily through an extensive system of rhizomes up to 20 m long. Plants sprout from rhizome pieces washed downstream or in soil transported by humans. Plants grow slowly but steadily in low nutrient habitats and rapidly in high nutrient habitats. *Polygonum cuspidatum* grows best in unshaded, moist habitats.

Distribution and Management in Park Units

Polygonum cuspidatum has been planted as an ornamental in Southeast Alaska and in Anchorage. It has invaded SITK, but the park monitors it and keeps it under control by clipping. Because the plant does well in Anchorage, it may be capable of invading Glacier Bay National Park (GLBA), and coastal areas of WRST, KEFJ, and KATM. Control of this plant requires an effort by both government agencies and private groups to educate gardeners not to plant *Polygonum cuspidatum*. NPS personnel should check communities near GBLA, WRST, and KEFJ to determine whether local gardeners have the plant. Stensvold (2000, personal communication) has been testing methods to eradicate the plant on Baranof Island and should be contacted for up-to-date information. Single plants can be entirely dug up, but it is difficult to get all the rhizomes and the digging causes further disturbance (Seiger 1991). Small stands, as in SITK, and sometimes large stands, can be controlled by repeated cutting. Repeated applications of herbicides, with or without cutting, may be required on large, well-established stands. A great deal of information is available for *P. cuspidatum* in the references we have cited in this summary, and these should be consulted for more detailed information on ecology and eradication, especially the use of herbicides.

Species Ranking Summary Form for *Polygonum cuspidatum*

	Significance of Impact				
Park Unit	Current Level of Impact (0-50)	Innate Ability to Become a Pest (0-50)	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	np[a]	-[b]	-	-	-
KATM	np	-	-	-	-
KEFJ	np	-	-	-	-
SITK	19	43	62	56	High
WRST	np	-	-	-	-

[a]Not yet collected in this park unit.
[b]No data.

Species Ranking Form for *Polygonum cuspidatum*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
			1	

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
			5	

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
			1	

    3. Effect on natural processes and character
      a. plant species having little or no effect 0
      b. delays establishment of native species in disturbed sites up to 10 years 3
      c. long-term (more than 10 years) modification or retardation of succession 7
      d. invades and modifies existing native communities 10
      e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
			3	

4. Significance of threat to park resources
      a. threat to secondary resources negligible 0
      b. threat to areas' secondary (successional) resources 2
      c. endangerment to areas' secondary (successional) resources 4
      d. threat to areas' primary resources 8
      e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
			4	

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA KATM KEFJ SITK WRST
5

Total Possible 50
Total by park DENA KATM KEFJ SITK WRST
19

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA KATM KEFJ SITK WRST
5

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA KATM KEFJ SITK WRST
5

   3. Vegetative reproduction
      a. no vegetative reproduction 0
      b. vegetative reproduction rate maintains population 1
      c. vegetative reproduction rate results in moderate increase in population size 3
      d. vegetative reproduction rate results in rapid increase in population size 5

DENA KATM KEFJ SITK WRST
5

   4. Frequency of sexual reproduction for mature plant
      a. almost never reproduces sexually in area 0
      b. once every five or more years 1
      c. every other year 3
      d. one or more times a year 5

DENA KATM KEFJ SITK WRST
5

   5. Number of seeds per plant
      a. few (0-10) 1
      b. moderate (11-1,000) 3
      c. many-seeded (>1,000) 5

DENA KATM KEFJ SITK WRST
5

   6. Dispersal ability
      a. little potential for long-distance dispersal 0
      b. great potential for long-distance dispersal 5

DENA KATM KEFJ SITK WRST
5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
			3	

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
			5	

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
			5	

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
			43	

II. Feasibility of Control or Management
   A. Abundance Within Park
      1. Number of populations (stands)
         a. several; widespread and dense 1
         b. intermediate number; patchy 3
         c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
			5	

      2. Areal extent of populations
         a. > 50 1
         b. 11-50 ha 2
         c. 5-10 3
         d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
			5	

   B. Ease of Control
      1. Seed banks
         a. seeds remain viable in the soil for at least 3 years 0
         b. seeds remain viable in the soil for 2-3 years 5
         c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
			15	

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
			0	

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
			1	

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
			0	

C. Side Effects of Chemical/Mechanical Control Measures
   1. control measures will cause major impacts to community 0
   2. control measures will cause moderate impacts to community 5
   3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
			15	

D. Effectiveness of Community Management
   1. the following options are not effective 0
   2. cultural techniques (burning, flooding) can be used to control target species 5
   3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
			10	

E. Biological Control
   1. biological control not feasible (not practical possible, or probable) 0
   2. potential may exist for biological control 5
   3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
			5	

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
			56	

***Ranunculus repens* L. Creeping Buttercup**

Fig. 20. *Ranunculus repens* growing in laws grass at SITK.

Description

Ranunculus repens is a small trailing herb with creeping branches which root at the nodes. The leaves are trifoliate, and each leaflet is deeply three-lobed and toothed. The flowers are the familiar "buttercup", with large, bright yellow petals.

Ecology and Life History

Ranunculus repens was introduced from Europe and is now a weed of disturbed places, pastures, and lawns throughout the northern hemisphere and (Hulten 1968; Kartesz and Meacham 1999). We did not find this plant outside of lawns and adjacent visitor use areas, but it is listed as an invader of natural areas in other regions (Plant Conservation Association 2001).

Ranunculus repens is a perennial that spreads from seeds and rooted branches. It persists in fairly moist, open areas, and appears to grow well in lawns of the Pacific coastal area of Alaska. .

Distribution and Management in Park Units

We found *Ranunculus repens* in the lawn areas within SITK and in lawns in Seward, but not inside KEFJ. The plants are conspicuous, but we have found them only in association with exotic lawn grasses. As long as the plants remain confined to these areas, eradication is probably not important. If eradication is necessary, all of the rooted branches must be tracked down and removed.

Species Ranking Summary Form for *Ranunculus repens*

Park Unit	Significance of Impact: Current Level of Impact (0-50)	Significance of Impact: Innate Ability to Become a Pest (0-50)	Significance of Impact: Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	np[a]	-[b]	-	-	-
KATM	np	-	-	-	-
KEFJ	np[c]	-	.-	-	
SITK	1	33	34	67	Low
WRST	np	-	-	-	-

[a]Not yet collected in this park unit.
[b]No data.
[c]Found outside park boundaries but may invade park.

Species Ranking Form for *Ranunculus repens*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
			-10	

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
			5	

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
			2	

3. Effect on natural processes and character
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
			0	

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
			0	

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
			4	

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
			1	

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
			5	

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
			5	

   3. Vegetative reproduction
      a. no vegetative reproduction 0
      b. vegetative reproduction rate maintains population 1
      c. vegetative reproduction rate results in moderate increase in population size 3
      d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
			3	

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
			5	

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
			3	

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
			5	

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
			3	

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
			3	

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
			1	

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
			33	

II. Feasibility of Control or Management
   A. Abundance Within Park
      1. Number of populations (stands)
         a. several; widespread and dense 1
         b. intermediate number; patchy 3
         c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
			3	

2. Areal extent of populations
   a. > 50 1
   b. 11-50 ha 2
   c. 5-10 3
   d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
			5	

B. Ease of Control
1. Seed banks
   a. seeds remain viable in the soil for at least 3 years 0
   b. seeds remain viable in the soil for 2-3 years 5
   c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
			5	

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
			0	

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
			5	

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
			0	

C. Side Effects of Chemical/Mechanical Control Measures
1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
			15	

D. Effectiveness of Community Management
1. the following options are not effective 0
2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
			10	

E. Biological Control

1. biological control not feasible (not practical possible, or probable)	0
2. potential may exist for biological control	5
3. biological control feasible	10

	DENA	KATM	KEFJ	SITK	WRST
				0	

Total Possible	100

Total by park	DENA	KATM	KEFJ	SITK	WRST
				43	

***Rumex acetosella* L. Common sheep sorrel**

No photo available.

Description

Rumex acetosella is a small herb 15-30 cm tall. The distinctive leaves are shaped like an arrowhead with lobes projecting from the base. Tiny, inconspicuous flowers are borne in leafless panicles.

Ecology and Life History

Rumex acetosella was introduced from Europe and is now a weed of disturbed places, pastures, and lawns throughout the northern hemisphere and is regulated as a noxious weed in two states (Hulten 1968; Kartesz and Meacham 1999). We did not find this plant in undisturbed areas, but it is listed as an invader of natural areas in other regions (Plant Conservation Association 2001).

Rumex acetosella is a perennial that spreads from seeds and rhizomes. It persists in moist areas where there is little competition from other plants.

Distribution and Management in Park Units

We found *Rumex acetosella* in KEFJ and SITK, but the plant has a coastal distribution (Hulten 1968) and may also appear in GBLA, WRST, and KATM. The plants are inconspicuous and usually do not persist when shaded out by other vegetation. Eradication is probably not important, but if desired it is necessary to dig up the rhizomes.

Species Ranking Summary Form for *Rumex acetosella*

	Significance of Impact				
Park Unit	Current Level of Impact (0-50)	Innate Ability to Become a Pest (0-50)	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	np[a]	-[b]	-	-	-
KATM	np	-	-	-	-
KEFJ	-8	27	19	70	Low
SITK	-8	27	19	70	Low
WRST	np	-	-	-	-

[a]Not yet collected in this park unit.
[b]No data.

Species Ranking Form for *Rumex acetosella*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
		-10	-10	

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
		1	1	

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
		1	1	

    3. Effect on natural processes and character
      a. plant species having little or no effect 0
      b. delays establishment of native species in disturbed sites up to 10 years 3
      c. long-term (more than 10 years) modification or retardation of succession 7
      d. invades and modifies existing native communities 10
      e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
		0	0	

4. Significance of threat to park resources
      a. threat to secondary resources negligible 0
      b. threat to areas' secondary (successional) resources 2
      c. endangerment to areas' secondary (successional) resources 4
      d. threat to areas' primary resources 8
      e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
		0	0	

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
		0	0	

Total Possible 50

Total by park	DENA	KATM	KEFJ	SITK	WRST
			-8	-8	

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
		5	5	

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
		5	5	

   3. Vegetative reproduction
      a. no vegetative reproduction 0
      b. vegetative reproduction rate maintains population 1
      c. vegetative reproduction rate results in moderate increase in population size 3
      d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
		3	3	

   4. Frequency of sexual reproduction for mature plant
      a. almost never reproduces sexually in area 0
      b. once every five or more years 1
      c. every other year 3
      d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
		5	5	

   5. Number of seeds per plant
      a. few (0-10) 1
      b. moderate (11-1,000) 3
      c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
		3	3	

   6. Dispersal ability
      a. little potential for long-distance dispersal 0
      b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
		5	5	

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
		0	0	

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
		0	0	

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
		1	1	

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
		27	27	

II. Feasibility of Control or Management
   A. Abundance Within Park
      1. Number of populations (stands)
         a. several; widespread and dense 1
         b. intermediate number; patchy 3
         c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
		5	5	

      2. Areal extent of populations
         a. > 50 1
         b. 11-50 ha 2
         c. 5-10 3
         d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
		5	5	

   B. Ease of Control
      1. Seed banks
         a. seeds remain viable in the soil for at least 3 years 0
         b. seeds remain viable in the soil for 2-3 years 5
         c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
		15	15	

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
		5	5	

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
		15	15	

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
		0	0	

C. Side Effects of Chemical/Mechanical Control Measures
   1. control measures will cause major impacts to community 0
   2. control measures will cause moderate impacts to community 5
   3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
		15	15	

D. Effectiveness of Community Management
   1. the following options are not effective 0
   2. cultural techniques (burning, flooding) can be used to control target species 5
   3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
		10	10	

E. Biological Control
   1. biological control not feasible (not practical possible, or probable) 0
   2. potential may exist for biological control 5
   3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
		0	0	

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
		70	70	

***Taraxacum officinale* G.H. Weber Common dandelion**

Fig. 21. The exotic *Taraxcum officinale* ssp. *officinale* growing at DENA headquarters.

Fig. 22. The native *Taraxacum officinale* ssp. *ceratophorum* growing at DENA headquarters.

Fig. 23. The "horns" on the bracts under the flower heads of the native *Taraxacum officinale* ssp. *ceratophorum*.

Field Identification

Taraxacum officinale has a basal rosette of toothed leaves, leafless hollow flower stalks, yellow Apowder puff@ shaped flower heads, and a taproot. The whole plant has a milky white juice. There is also a native dandelion, *T. officinale* ssp. *ceratophorum* (Ledeb.) Schinz ex Thellung, which also colonizes disturbed areas and commonly grows in mixed populations with the exotic subspecies, *T. officinale* ssp. *officinale*, in DENA and WRST. The two subspecies are easy to tell apart with a little practice-the native subspecies has conspicuous Ahorns@ on the bracts under the flower head, and the overall appearance of the plant and flowers will appear quite different with just a little field experience.

Ecology and Life History

Taraxacum officinale was introduced from Europe and Asia, and is now a serious weed of lawns, pastures, roadsides, disturbed areas, and no-till and minimum-till agricultural areas throughout North America (Hulten 1968; Royer and Dickinson 1999). We did not observe exotic *T. offincinale* in undisturbed plant communities; all *Taraxacum* plants we found in undisturbed vegetation were native species. We have not observed *T. officinale* establishing on any site where the organic layer is undisturbed, nor have we observed it persisting after it is shaded out by shrubs and saplings in the process of natural succession. Tilman et al. (1999) have shown that *T. officinale* requires relatively high levels of potassium in the soil. Potassium levels are generally highest on unweathered soils, and most Alaskan soils have adequate potassium for good growth of this species. The exotic *T. offincinale* is listed as an invader of natural areas (Plant Conservation Association 2001).

This species reproduces from seed dispersed to a disturbed site, and can also resprout from the root or root segments. General germination requirements are known but no information is available on the role of buried seed (Baskin and Baskin 1998). The plant is a perennial, and each plant can produce hundreds of seeds each year, which are wind-dispersed for long distances.

Distribution and Management in Park Units

Taraxacum officinale is a persistent colonizer of disturbed areas, and can spread along highway shoulders. Plants may invade in any park unit when an area is disturbed by construction or trampling, and can persist in areas with continuing disturbance or where open soil remains and other species do not shade it out. The plants present a significant visual impact in the park landscape. DENA has an active management program for *T. officinale.* Established plant populations have been eradicated or at least reduced in sensitive areas where populations are relatively small. The plants must have the taproot severed beneath the root crown, and this is hard work. The second management tool is seeding a mixture of native legumes and wheatgrass on areas disturbed by construction. These native plant communities greatly reduced the number of *T. offincinalis* seedlings that established, and reduced growth of those that did establish (Densmore et al. 2000). It is very important to eliminate this exotic before it forms large populations. Once large populations develop and thousands of seeds are being dispersed, control is very difficult. A small-scale monitoring and eradication program would control populations on KEFJ Exit Glacier trails and along trails in KATM.

Species Ranking Summary Form for *Taraxacum officinale*

Park Unit	Significance of Impact: Current Level of Impact	Significance of Impact: Innate Ability to Become a Pest	Significance of Impact: Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	12	24	36	42	Moderate
KATM	9	24	33	44	Low
KEFJ	12	24	36	44	Moderate
SITK	12	24	36	44	Low
WRST	12	24	36	42	Low

Species Ranking Form for *Taraxacum officinale*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
1	1	1	1	1

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
5	3	5	5	5

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1	1	1	1	1

3. Effect on natural processes and character
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5	5	5

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
12	12	12	12	12

B. Innate Ability of Species to Become a Pest
1. Ability to complete reproductive cycle in area of concern
   a. not observed to complete reproductive cycle 0
   b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5	5	5

2. Mode of reproduction
   a. reproduces almost entirely by vegetative means 1
   b. reproduces only by seeds 3
   c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
3	3	3	3	3

3. Vegetative reproduction
   a. no vegetative reproduction 0
   b. vegetative reproduction rate maintains population 1
   c. vegetative reproduction rate results in moderate increase in population size 3
   d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5	5	5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3	3	3	3	3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5	5	5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
3	3	3	3	3

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
24	24	24	24	24

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)

a. several; widespread and dense 1
b. intermediate number; patchy 3
c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
1	3	3	3	1

2. Areal extent of populations

a. > 50 1
b. 11-50 ha 2
c. 5-10 3
d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5	5	5	5	5

B. Ease of Control

1. Seed banks

a. seeds remain viable in the soil for at least 3 years 0
b. seeds remain viable in the soil for 2-3 years 5
c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
15	15	15	15	15

2. Vegetative regeneration

a. any plant part is a viable propagule 0
b. sprouts from roots or stumps 5
c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
5	5	5	5	5

3. Level of effort required

a. repeated chemical or mechanical control measures required 1
b. one or two chemical or mechanical treatments required 5
c. can be controlled with one chemical treatment 10
d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
1	1	1	1	1

4. Abundance and proximity of propagules near park

a. many sources of propagules near park 0
b. few sources of propagules near park, but these are readily dispersed 5
c. few sources of propagules near park, but these are not readily dispersed 10
d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

C. Side Effects of Chemical/Mechanical Control Measures

1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
15	15	15	15	15

D. Effectiveness of Community Management

1. the following options are not effective 0

2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

E. Biological Control

1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0	0	0	0	0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
42	44	44	44	42

***Trifolium hybridum* L. Alsike clover**
***Trifolium pratense* L. Red clover**
***Trifolium repens* L. White clover**

Fig. 24. *Trifolium hybridum* and *T. pratense* in Kennecott, WRST.

Fig. 25. *Trifolium repens* near park hotel, DENA.

Note: *Trifolium hybridum, T. pratense* and *T. repens* are similar in appearance, ecology, life history, and management, and the text covers all three species. *Trifolium pratense* differs from the other two species in its distribution and threat to the park units and has a separate species ranking form. *Trifolium hybridum* and

T. repens are difficult to distinguish in the field without examining the rooting structure of each plant, and many areas contain both species. Therefore, we have combined the *T. hybridum* and *T. repens* in one species abstract.

Field Identification

Trifolium hybridum, T. pratense, and *T. repens* are typical Aclovers@ with alternate leaves with three leaflets. *Trifolium pratense* is distinguished from the other two species by its pink flowers in larger terminal clusters and the light-colored V-shape on each leaf. *Trifolium hybridum* and *T. repens* both have white to pinkish white flowers in terminal clusters and similar leaves. One way to tell these two species apart is to examine the stems and roots-*T. repens* has creeping stems which root at the nodes; *T. hybridum* has erect stems which do not produce roots at the nodes. These two species can be confused because *T. hybridum* are often prostrate, not erect, in areas exposed to trampling or vehicle traffic; and *T. repens* may have more erect stems when growing in the shade.

Ecology and Life History

Trifolium hybridum, T. pratense and *T. repens* were introduced from Europe and Asia, and are now serious weeds of lawns, roadsides, and disturbed areas (Hulten 1968; Royer and Dickinson 1999). *Trifolium hybridum* and *T. pratense* have been planted for forage in Alaska (Laughlin et al. 1986), and *T. hybridum* and *T. repens* have been widely planted for lawns and revegetation on roadsides and other disturbed areas. We have not observed any of the *Trifolium sp.* in undisturbed plant communities, but we have noticed that *T. hybridum* and *T. repens* persist in disturbed areas even when overtopped and shaded by native successional species. NPS lists these three *Trifolium sp.* as invaders of natural areas elsewhere (Plant Conservation Association 2001).

Trifolium hybridum, T. pratense and *T. repens* are perennials that reproduce from seed dispersed to a disturbed site or from buried seed. At least some of the seeds produced each year are physically dormant (also referred to as Ahard seeded@) (Baskin and Baskin 1998). The seeds do not germinate until the seed coat is sufficiently broken down (by decay or abrasion) to admit water. *Trifolium repens* also spreads vegetatively.

Distribution and Management in Park Units

Trifolium hybridum and *T. repens* in DENA, KEFJ, and SITK were mostly confined to lawns and adjacent areas. In WRST, *Trifolium hybridum* and *T. repens* were abundant along much of the length of the Chitina-McCarthy Road where they apparently were seeded. They have also spread from private property along the road, and *Trifolium hybridum* was grown in the Kenny Lake area as a forage crop (Laughlin et al. 1986). It would be virtually impossible to eradicate these species from the road or from Kennicott. Reconstruction of the road will decrease, but not eradicate these species. The priority in all parks is to keep *Trifolium hybridum* and *T. repens* from establishing on trails and other backcountry disturbances.

Trifolium pratense is not as well adapted to Alaskan climates and plants escaped from cultivation are only occasional. We hand-weeded a patch of about 12 plants in Denali several years ago and *T. pratense* has not reappeared.

Species Ranking Summary Form for *Trifolium hybridum* and *T. repens*

Park Unit	Significance of Impact: Current Level of Impact (0-50)	Significance of Impact: Innate Ability to Become a Pest (0-50)	Significance of Impact: Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	9	31	40	39	Low
KATM	pc[a]	-[b]	-	-	-
KEFJ	9	31	40	39	Low
SITK	9	31	40	39	Low
WRST	10	31	41	37	Low

[a]Previously collected in this park unit.
[b]No data.

Species Ranking Form for *Trifolium hybridum* and *T. repens*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
1		1	1	1

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
5		5	5	5

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
1		1	1	2

3. Effect on natural processes and character
   a. plant species having little or no effect 0
   b. delays establishment of native species in disturbed sites up to 10 years 3
   c. long-term (more than 10 years) modification or retardation of succession 7
   d. invades and modifies existing native communities 10
   e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
0		0	0	0

4. Significance of threat to park resources
   a. threat to secondary resources negligible 0
   b. threat to areas' secondary (successional) resources 2
   c. endangerment to areas' secondary (successional) resources 4
   d. threat to areas' primary resources 8
   e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
0		0	0	0

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA	KATM	KEFJ	SITK	WRST
2		2	2	2

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
9		9	9	10

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA	KATM	KEFJ	SITK	WRST
5		5	5	5

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA	KATM	KEFJ	SITK	WRST
5		5	5	5

   3. Vegetative reproduction
      a. no vegetative reproduction 0
      b. vegetative reproduction rate maintains population 1
      c. vegetative reproduction rate results in moderate increase in population size 3
      d. vegetative reproduction rate results in rapid increase in population size 5

DENA	KATM	KEFJ	SITK	WRST
1		1	1	1

4. Frequency of sexual reproduction for mature plant
   a. almost never reproduces sexually in area 0
   b. once every five or more years 1
   c. every other year 3
   d. one or more times a year 5

DENA	KATM	KEFJ	SITK	WRST
5		5	5	5

5. Number of seeds per plant
   a. few (0-10) 1
   b. moderate (11-1,000) 3
   c. many-seeded (>1,000) 5

DENA	KATM	KEFJ	SITK	WRST
3		3	3	3

6. Dispersal ability
   a. little potential for long-distance dispersal 0
   b. great potential for long-distance dispersal 5

DENA	KATM	KEFJ	SITK	WRST
5		5	5	5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
3		3	3	3

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
3		3	3	3

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
1		1	1	1

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
31		31	31	31

II. Feasibility of Control or Management

A. Abundance Within Park

1. Number of populations (stands)

a. several; widespread and dense 1
b. intermediate number; patchy 3
c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
3		3	3	3

2. Areal extent of populations

a. > 50 1
b. 11-50 ha 2
c. 5-10 3
d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
5		5	5	3

B. Ease of Control

1. Seed banks

a. seeds remain viable in the soil for at least 3 years 0
b. seeds remain viable in the soil for 2-3 years 5
c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
0		0	0	0

2. Vegetative regeneration

a. any plant part is a viable propagule 0
b. sprouts from roots or stumps 5
c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
5		5	5	5

3. Level of effort required

a. repeated chemical or mechanical control measures required 1
b. one or two chemical or mechanical treatments required 5
c. can be controlled with one chemical treatment 10
d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
1		1	1	1

4. Abundance and proximity of propagules near park

a. many sources of propagules near park 0
b. few sources of propagules near park, but these are readily dispersed 5
c. few sources of propagules near park, but these are not readily dispersed 10
d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
0		0	0	0

C. Side Effects of Chemical/Mechanical Control Measures

1. control measures will cause major impacts to community 0
2. control measures will cause moderate impacts to community 5
3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
15		15	15	15

D. Effectiveness of Community Management

1. the following options are not effective 0

2. cultural techniques (burning, flooding) can be used to control target species 5
3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
10		10	10	10

E. Biological Control
1. biological control not feasible (not practical possible, or probable) 0
2. potential may exist for biological control 5
3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
0		0	0	0

Total Possible 100

Total by park

DENA	KATM	KEFJ	SITK	WRST
39		39	39	37

Species Ranking Summary Form for *Trifolium pratense*

Park Unit	Significance of Impact: Current Level of Impact (0-50)	Significance of Impact: Innate Ability to Become a Pest (0-50)	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENA	pc[a]	-[b]	-	-	-
KATM	np[c]	-	-	-	-
KEFJ	np[d]	-	-	-	Low[e]
SITK	np	-	-	-	-
WRST	7	28	35	60	Low

[a]Previously collected in this park unit.
[b]No data.
[c]Not yet collected in this park
[d]Found outside park but may invade park.
[e]Should be monitored.

Species Ranking Form for *Trifolium pratense*

I. Significance of Impact
  A. Current Level of Impact
    1. Distribution relative to disturbance regime
      a. found only within sites disturbed within the last 3 years or sites regularly disturbed -10
      b. found in sites disturbed within the last 10 years 1
      c. found in midsuccessional sites disturbed 11-50 years before present (BP) 2
      d. found in late-successional sites disturbed 51-100 years BP 5
      e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA	KATM	KEFJ	SITK	WRST
				1

    2. Abundance
      a. number of populations (stands)
        (1) few; scattered (<5) 1
        (2) intermediate number; patchy (6-10) 3
        (3) several; widespread and dense (>10) 5

DENA	KATM	KEFJ	SITK	WRST
				1

      b. areal extent of populations
        (1) <5 ha 1
        (2) 5-10 ha 2
        (3) 11-50 ha 3
        (4) >50 ha 5

DENA	KATM	KEFJ	SITK	WRST
				1

    3. Effect on natural processes and character
      a. plant species having little or no effect 0
      b. delays establishment of native species in disturbed sites up to 10 years 3
      c. long-term (more than 10 years) modification or retardation of succession 7
      d. invades and modifies existing native communities 10
      e. invades and replaces native communities 15

DENA	KATM	KEFJ	SITK	WRST
				0

    4. Significance of threat to park resources
      a. threat to secondary resources negligible 0
      b. threat to areas' secondary (successional) resources 2
      c. endangerment to areas' secondary (successional) resources 4
      d. threat to areas' primary resources 8
      e. endangerment to areas' primary resources 10

DENA	KATM	KEFJ	SITK	WRST
				0

5. Level of visual impact to an ecologist
   a. little or no visual impact on landscape 0
   b. minor visual impact on natural landscape 2
   c. significant visual impact on natural landscape 4
   d. major visual impact on natural landscape 5

DENA KATM KEFJ SITK WRST
4

Total Possible 50
Total by park

DENA KATM KEFJ SITK WRST
7

B. Innate Ability of Species to Become a Pest
   1. Ability to complete reproductive cycle in area of concern
      a. not observed to complete reproductive cycle 0
      b. observed to complete reproductive cycle 5

DENA KATM KEFJ SITK WRST
5

   2. Mode of reproduction
      a. reproduces almost entirely by vegetative means 1
      b. reproduces only by seeds 3
      c. reproduces vegetatively and by seed 5

DENA KATM KEFJ SITK WRST
3

   3. Vegetative reproduction
      a. no vegetative reproduction 0
      b. vegetative reproduction rate maintains population 1
      c. vegetative reproduction rate results in moderate increase in population size 3
      d. vegetative reproduction rate results in rapid increase in population size 5

DENA KATM KEFJ SITK WRST
0

   4. Frequency of sexual reproduction for mature plant
      a. almost never reproduces sexually in area 0
      b. once every five or more years 1
      c. every other year 3
      d. one or more times a year 5

DENA KATM KEFJ SITK WRST
5

   5. Number of seeds per plant
      a. few (0-10) 1
      b. moderate (11-1,000) 3
      c. many-seeded (>1,000) 5

DENA KATM KEFJ SITK WRST
3

   6. Dispersal ability
      a. little potential for long-distance dispersal 0
      b. great potential for long-distance dispersal 5

DENA KATM KEFJ SITK WRST
5

7. Germination requirements
   a. requires open soil and disturbance to germinate 0
   b. can germinate in vegetated areas but in a narrow range or in special conditions 3
   c. can germinate in existing vegetation in a wide range of conditions 5

DENA	KATM	KEFJ	SITK	WRST
				3

8. Competitive ability
   a. poor competitor for limiting factors 0
   b. moderately competitive for limiting factors 3
   c. highly competitive for limiting factors 5

DENA	KATM	KEFJ	SITK	WRST
				3

9. Known level of impact in natural areas
   a. not known to cause impacts in any other natural area 0
   b. known to cause impacts in natural areas, but in other habitats and climate zones 1
   c. known to cause low impact in natural areas in similar habitats and climate zones 3
   d. known to cause moderate impact in natural areas in similar habitats and climate zones 5
   e. known to cause high impact in natural areas in similar habitats and climate zones 10

DENA	KATM	KEFJ	SITK	WRST
				1

Total Possible 50

Total by park

DENA	KATM	KEFJ	SITK	WRST
				28

II. Feasibility of Control or Management
   A. Abundance Within Park
      1. Number of populations (stands)
         a. several; widespread and dense 1
         b. intermediate number; patchy 3
         c. few; scattered 5

DENA	KATM	KEFJ	SITK	WRST
				5

      2. Areal extent of populations
         a. > 50 1
         b. 11-50 ha 2
         c. 5-10 3
         d. < 5ha 5

DENA	KATM	KEFJ	SITK	WRST
				5

   B. Ease of Control
      1. Seed banks
         a. seeds remain viable in the soil for at least 3 years 0
         b. seeds remain viable in the soil for 2-3 years 5
         c. seeds viable in the soil for 1 year or less 15

DENA	KATM	KEFJ	SITK	WRST
				0

2. Vegetative regeneration
   a. any plant part is a viable propagule 0
   b. sprouts from roots or stumps 5
   c. no resprouting following removal of aboveground growth 10

DENA	KATM	KEFJ	SITK	WRST
				5

3. Level of effort required
   a. repeated chemical or mechanical control measures required 1
   b. one or two chemical or mechanical treatments required 5
   c. can be controlled with one chemical treatment 10
   d. effective control can be achieved with mechanical treatment 15

DENA	KATM	KEFJ	SITK	WRST
				15

4. Abundance and proximity of propagules near park
   a. many sources of propagules near park 0
   b. few sources of propagules near park, but these are readily dispersed 5
   c. few sources of propagules near park, but these are not readily dispersed 10
   d. no sources of propagules are in dose proximity 15

DENA	KATM	KEFJ	SITK	WRST
				5

C. Side Effects of Chemical/Mechanical Control Measures
   1. control measures will cause major impacts to community 0
   2. control measures will cause moderate impacts to community 5
   3. control measures will have little or no impact on community 15

DENA	KATM	KEFJ	SITK	WRST
				15

D. Effectiveness of Community Management
   1. the following options are not effective 0
   2. cultural techniques (burning, flooding) can be used to control target species 5
   3. routine management of community or restoration or preservation practices (e.g., prescribed burning, flooding, controlled disturbance) effectively controls target species 10

DENA	KATM	KEFJ	SITK	WRST
				10

E. Biological Control
   1. biological control not feasible (not practical possible, or probable) 0
   2. potential may exist for biological control 5
   3. biological control feasible 10

DENA	KATM	KEFJ	SITK	WRST
				0

Total Possible 100

Total by park	DENA	KATM	KEFJ	SITK	WRST
					60

Vicia cracca L. **Purple-White Tufted Vetch**

Fig. 26. *Vicia cracca* growing in landscaped areas around the Sealife Center in Seward.

Field Identification

Vicia cracca is a climbing plant with weak stems. Each leaf has 8-10 pairs of leaflets and tendrils at the end of the leaf. The bluish-violet, fragrant flowers are borne in one-sided, many-flowered racemes. *Vicia nigricans* ssp. *gigantea* (Hook.) Lassetter & Gunn. is a native legume of Southeast Alaska and the Pacific Northwest. This species is similar to *Vicia cracca* but more robust, with strong stems. So far, the range of the two species in Alaska does not overlap.

E**cology and Life History**

Vicia cracca was introduced from Europe and has naturalized to become a weed of roadsides and disturbed areas (Hulten 1968; Karteaz and Meacham 1999). In Alaska, *Vicia cracca* was introduced as a forage crop in Fairbanks and Palmer, and has spread relatively slowly from these centers. This species is listed as a noxious weed in Alaska with established infestations (University of Alaska 2000). *Vicia cracca* usually establishes in disturbed areas, including those with well-developed vegetation. The plants overgrow herbaceous vegetation and climb "kudzu-style" up and over shrubs such as alder and willow. We have also observed *V. cracca* growing in open mature deciduous forest near Fairbanks, and it is listed as an invader of natural areas elsewhere (Plant Conservation Association 2001).

Vicia cracca is a perennial that reproduces from seed dispersed to a disturbed site or from buried seed. Seeds are large and not easily dispersed, but can spread more easily when tendrils and vine branches with seed pods cling to vectors, are broken off the plant, and carried to a new location. At least some of the

seeds produced each year are physically dormant (also referred to as Ahard-seeded@) (Baskin and Baskin 1998). The seeds do not germinate until the seed coat is sufficiently broken down (by decay or abrasion) to admit water.

Distribution and Management in Park Units

Vicia cracca was previously collected in DENA along Riley Creek near the Nenana River, but we did not locate any plants in our survey. We also found *V. cracca* growing vigorously in the landscaped area around the Seward Sealife Center. It was apparently accidentally introduced with topsoil that was imported from Anchorage for landscaping. *Vicia cracca* may spread into KEFJ. This species is very difficult to eradicate once established, and is a serious ecological and aesthetic threat to the parks. MONITORING FOR AND IMMEDIATELY ERADICATING THIS SPECIES IS A VERY HIGH PRIORITY.

Literature Cited

Alyeska Pipeline Service Company. 1975. Revegetation report RV-001.3.

Asebrook, J. M. and B.S. Brenneman. 1999. 1999 revegetation monitoring report: Glacier National Park. 57 pp.

Barrilleaux, T. C. and J. B. Grace. 2000. Growth and invasive potential of *Sapium sebiferum* (Euphorbiaceae) within the coastal prairie region: the effects of soil and moisture regime. American Journal of Botany 87: 1099-1106.

Baskin, C. C. and J. M. Baskin. 1998. Seeds: ecology, biogeography, and evolution of dormancy and germination. Academic Press, San Diego. 666 pp.

Carpenter, A. and T. Murray. 1998. The Nature Conservancy element stewardship abstract for *Linaria genistifolia* and *Linaria vulgaris*. http://www.tnc.org

Cody, W. J. 1996. Flora of the Yukon Territory. NRC Research Press, Ottawa, Ontario, Canada. 643 pp.

Crooks, J. A. and M. E. Soule. 1999. Causes and consequences of lag times in the population explosions of invasive alien species. Abstract, 1999 Annual Meeting of the Society of Conservation Biology.

Densmore, R. V., M. E. Vander Meer, and N. G. Dunkle. 2000. Native plant revegetation manual for Denali National Park. Information and Technology Report USGS/BRD/ITR-2000-0006. 42 pp.

Eckardt, N. 1987. The Nature Conservancy element stewardship abstract for *Melilotus alba, Melilotus officinalis.* http://www.tnc.org

Haber, E. 1999. Invasive exotic plants of Canada fact sheet no. 12, Japanese knotweed. http://infoweb.magi.com

Hiebert, R. D. and J. Stubbendieck. 1993. Handbook for ranking exotic plants for management and control. U.S. National Park Service Natural Resources Report NPS/NRMWRO/NRR-93/08.

Hulten, E. 1968. Flora of Alaska and neighboring territories. Stanford University Press, Stanford, California. 1008 pp.

Integrated Taxonomic Information System. 2001. http://www.itis.usda.gov

Japanese Knotweed Alliance. 2001. http//cabi.org/BIOSCIENCE/japanese_knotweed_alliance.htm

Kari, P. R. 1991. Tanaina plantlore, Denaina k=et=una. Alaska Natural History Association. 206 pp.

Kartesz, J. T. and C. A. Meacham. 1999. Synthesis of the North American flora. CD-ROM Version 1.0. North Carolina Botanical Garden.

Kucera, C. L. 1998. The grasses of Missouri. University of Missouri Press. 305 pp.

Larson, D. L., P. J. Anderson, W. Newton. 2001. Alien plant invasion in mixed-grass prairie: effects of vegetation type and anthropogenic disturbance. Ecological Applications 11: 128-141.

Laughlin, W. M., G. R. Smith, and M. A. Peters. 1986. Effect of phosphorous and potassium on alsike clover. Agroborealis 18: 20-23.

Mack, R. N., D. Simberloff, W. M. Lonsdale, H. Evans, M. Clout, and F. Bazzaz. 2000. Biotic invasions: causes, epidemiology, global consequences and control. Ecological Society of America, Issues in Ecology No. 5.

McKendrick, J. D. 2001. Inventory of grasses along the Trans-Alaska Pipeline-1999. Agroborealis 33:4-20.

Pattison, R., R. Mack, and R. Black. 2001. Predicting potential distribution of a plant invader: integrating field studies and climate matching approaches. Abstract, Ecologist Society of America 2001 Annual Meeting.

Pearcy, R. W., J. R. Ehleringer, H. A. Mooney, and P. W. Rundel, eds. 1989. Plant physiological ecology, field methods and instrumentation. Chapman and Hall, New York. 457 pp.

Plant Conservation Alliance Alien Plant Working Group. Updated 8/4/01. Alien plant invaders of natural areas by scientific name. http://www.nps.gov

Remaley, T. 2001. Plant Conservation Alliance Alien Plant Working Group - Japanese Knotweed (*Polygonum cuspidatum*). http://www.nps.gov

Royer, F. and R. Dickinson. 1999. Weeds of the northern U.S. and Canada. University of Alberta Press,

Edmonton, Alberta, Canada. 434 pp.
Safford, H. D. and S. P. Harrison. 2001. Grazing and substrate interact to affect native vs. exotic diversity in roadside grasslands. Ecological Applications 11: 1112-1122.
Sather, N. 1987. The Nature Conservancy element stewardship abstract for *Bromis inermis*. http://www.tnc.org
Seiger, L. 1991. The Nature Conservancy element stewardship abstract for *Polygonum cuspidatum*. http://www.tnc.org
Stensvold, M. 2000. Noxious weed surveys and projects conducted on the Tongass National Forest 1997-2000. Technical report on file, Tongass National Forest. 2 pp.
Tilman, E. A., D. Tilman, M. J. Crawley, and A. E. Johnston. 1999. Biological weed control via nutrient competition: potassium limitation of dandelions. Ecological Applications 9: 103-111.
University of Alaska Cooperative Extension Service, Tanana District. 2000. Alaska=s noxious and invasive plants. Updated list, on file.
Westbrooks, R. G. 1998. Invasive plants: changing the landscape of America: fact book. Federal Interagency Committee for the Management of Noxious and Exotic Weeds, Washington D.C. 109 pp.
Willson, G. D. and J. Stubbendieck. 2000. A provisional model for smooth brome management in degraded tallgrass prairie. Ecological Restoration 18:34-38.