

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 b	ut 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 distur	bed 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 inva	de 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 m² 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 m² 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.

10 Species Ranking Summary Form for *Bromus inermis*

	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	20	21	41	54	Low
KATM	pc^{a}	b	-	-	-
KEFJ	np ^c	-	-	-	-
SITK	np	-	-	-	-
WRST	20	21	41	54	Low

^aPreviously collected in this park unit.

^bNo data.

^cNot 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.	a. found only within sites disturbed within the last 3 years or sites regularly disturbed						
	b.	5. found in sites disturbed within the last 10 years						
	c.	found in midsuccessional sites disturbed 11-50 y	years befo	ore present (BP)		2		
	d.	found in late-successional sites disturbed 51-100) years B	P		5		
	e.	found in high-quality natural areas with no know	vn major	disturbance for	100 year	s 10		
			DENA	KATM KEFJ	SITK	WRST		
			2			2		
2.	Ab	undance						
	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

3

5

WRST

2

DENA KATM KEFJ SITK

- (1) <5 ha (2) 5-10 ha
 - (3) 11-50 ha
 - (4) >50 ha

					11
	3.	a. b. c.	ect on natural processes and character plant species having little or no effect delays establishment of native species in disturbe long-term (more than 10 years) modification or r invades and modifies existing native communitie invades and replaces native communities	etardation of succession s DENA KATM KEFJ SIT	
	4	а.	· · · · · · · · · · · · · · · · · · ·	7	7
	4.	S1g a. b. c.	nificance of threat to park resources threat to secondary resources negligible threat to areas' secondary (successional) resource endangerment to areas' secondary (successional)		0 2 4
		d.	threat to areas' primary resources		8
		e.	endangerment to areas' primary resources		10
				DENA KATM KEFJ SIT	K WRST
	_	÷		2	2
	5.		vel of visual impact to an ecologist		0
		a. b.	little or no visual impact on landscape minor visual impact on natural landscape		$0 \\ 2$
		о. с.	significant visual impact on natural landscape		4
		d.	major visual impact on natural landscape		5
			5 1 1	DENA KATM KEFJ SIT	
				2	2
Total P					50
Total b	y pa	ırk		DENA KATM KEFJ SIT 20	<u>K WRST</u> 20
B.	Inr	nate .	Ability of Species to Become a Pest	20	20
	1.		ility to complete reproductive cycle in area of con	cern	
		a.	not observed to complete reproductive cycle		0
		b.	observed to complete reproductive cycle		5
				DENA KATM KEFJ SIT	
	2	NЛ	de ef verve du ction	5	5
	2.		ode of reproduction reproduces almost entirely by vegetative means		1
		a. b.	reproduces annost entirely by vegetative means reproduces only by seeds		3
		с.	reproduces vegetatively and by seed		5
				DENA KATM KEFJ SIT	K WRST
				1	1
	3.	Ve	getative reproduction		
		a.	no vegetative reproduction		0
		b.	vegetative reproduction rate maintains population		1
		c. d	vegetative reproduction rate results in moderate i vegetative reproduction rate results in rapid incre		3 5
		u.	vegetative reproduction rate results in rapid mere	DENA KATM KEFJ SIT	
				3	3
				-	÷

	4.	Fre	equency 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
				<u>DENA KATM KEFJ SITK</u>	K WRST
				5	5
	5.	Νť	umber 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	K WRST
				3	3
	6.	Di	spersal 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.	Ge	ermination requirements		
		a.	requires open soil and disturbance to germinate		0
		b.	can germinate in vegetated areas but in a narro	÷ .	3
		c.	can germinate in existing vegetation in a wide	-	5
				DENA KATM KEFJ SITK	
				0	0
	8.	Co	ompetitive 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	
				3	3
	9.	Kr	nown level of impact in natural areas		_
		a.	not known to cause impacts in any other natura		0
		b.	known to cause impacts in natural areas, but in		
		c.	known to cause low impact in natural areas in		
		d.	known to cause moderate impact in natural are		
		e.	known to cause high impact in natural areas in		
				DENA KATM KEFJ SITK	
_				1	1
	tal Possi				50
To	tal by pa	ırk		DENA KATM KEFJ SITK	
				21	21

II. Fe	asibi	lity of Control or Management		13
		undance Within Park		
	1.	Number of populations (stands)		
		a. several; widespread and dense		
		b. intermediate number; patchy		
		c. few; scattered		
			DENA KATM KEFJ SI	TK WRS
			1	1
	2.	Areal extent of populations		
		a. > 50		
		b. 11-50 ha		
		c. 5-10		
		d. < 5ha	DENIA KATMIKEEL CI	
				TK WRS
D	Ec	se of Control	3	3
D.	בа:			
	1.	a. seeds remain viable in the soil for at least 3 yea	rs	
		b. seeds remain viable in the soil for 2-3 years	13	
		c. seeds viable in the soil for 1 year or less		
			DENA KATM KEFJ SI	TK WRS
			15	15
	2.	Vegetative regeneration		-
		a. any plant part is a viable propagule		
		b. sprouts from roots or stumps		
		c. no resprouting following removal of abovegrou	and growth	
				TK WRS
	_		5	5
	3.	Level of effort required		
		a. repeated chemical or mechanical control measu		
		b. one or two chemical or mechanical treatments r	required	
		c. can be controlled with one chemical treatmentd. effective control can be achieved with mechanic	aal twaatmaant	
		d. effective control can be achieved with mechanic		TK WRS
			DENA KATM KEFJ SI 5	~
	4.	Abundance and proximity of propagules near park	5	5
		a. many sources of propagules near park		
		b. few sources of propagules near park, but these a	are readily dispersed	
		c. few sources of propagules near park, but these a		
		d. no sources of propagules are in dose proximity	,F	
			DENA KATM KEFJ SI	TK WRS
			10	10
C.	Sic	e Effects of Chemical/Mechanical Control Measures		
	1.	control measures will cause major impacts to comm	-	
	2.	control measures will cause moderate impacts to co	-	
	3.	control measures will have little or no impact on co	-	
				TK WRS
			5	5
P		ectiveness of Community Management	5	5

2.	cultural techniques (burning, flooding) can be used t	to control target species		5
3.	routine management of community or restoration or	preservation practices (e	.g., prese	cribed
	burning, flooding, controlled disturbance) effectively	y controls target species		10
		DENA KATM KEFJ	SITK	WRST
		10		10
E. Bi	ological Control			
1.	biological control not feasible (not practical possible	e, or probable)		0
2.	potential may exist for biological control	•		5
3.	biological control feasible			10
	-	DENA KATM KEFJ	SITK	WRST
		0		0
Total Poss	ible			100
Total by pa	ark	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.

16 Species Ranking Summary Form for Capsella bursa-pastoris

	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	pc^{c}	-	-	-	-
WRST	-8	21	13	60	Low

^aNot yet collected in this park unit.

^bNo data.

^cPreviously 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

	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
 e. found in high-quality natural areas with no known major disturbance for 100 years 10

	e. Toulie in high quality natural areas with no know	vii illujõi	distaiounee ioi	100 year	5 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

					17	
3.	Effect on natural processes and char a. plant species having little or no b. delays establishment of native s c. long-term (more than 10 years) d. invades and modifies existing n	effect pecies in disturbed s modification or reta				0 3 7 10
	e. invades and replaces native com	nmunities <u>D</u>		KATM KEFJ	SITK	15 <u>WRST</u>
4.	Significance of threat to park resour a. threat to secondary resources ne b. threat to areas' secondary (succe c. endangerment to areas' secondar d. threat to areas' primary resource	ces gligible essional) resources ry (successional) res	0 sources	0 s		0 0 2 4 8
	e. endangerment to areas' primary	resources		KATM KEFJ	SITK	10 WRST
5.	Level of visual impact to an ecologi a. little or no visual impact on land b. minor visual impact on natural l c. significant visual impact on natural d. major visual impact on natural l	st Iscape andscape ural landscape	0	0		0 0 2 4 5
		<u>D</u>	<u>ENA</u> 0	KATM KEFJ 0	SITK	WRST 0
Total Poss Total by p			<u>)ENA</u> -8	KATM KEFJ -8	SITK	50 <u>WRST</u> -8
B. In 1.	ate Ability of Species to Become a PAbility to complete reproductive cyaa. not observed to complete reproductiveb. observed to complete reproductive	est cle in area of concer luctive cycle ive cycle <u>D</u>	'n	-0 <u>KATM KEFJ</u> 5	SITK	0 5 <u>WRST</u>
2.	Mode of reproductiona. reproduces almost entirely by veb. reproduces only by seedsc. reproduces vegetatively and by	egetative means seed	-	5 KATM KEFJ	SITK	5 1 3 5 <u>WRST</u>
3.	Vegetative reproduction a. no vegetative reproduction b. vegetative reproduction rate ma c. vegetative reproduction rate rest d. vegetative reproduction rate rest	intains population ults in moderate incr ults in rapid increase <u>D</u>	e in po		ze <u>SITK</u>	3 0 1 3 5 WRST 0

	4.	Fre	equency 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.	Nu	mber 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.	Di	spersal 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.	Ge	rmination requirements				
		a.	requires open soil and disturbance to germinate				0
		b.	can germinate in vegetated areas but in a narrow	range or	in special cond	itions	3
		c.	can germinate in existing vegetation in a wide ra	ange of co	onditions		5
				DENA	KATM KEFJ	SITK	WRST
				0	0		0
	8.	Co	mpetitive 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.	Kn	own 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 o	other habi	tats and climate	zones	1
		c.	known to cause low impact in natural areas in si	milar hab	itats and climat	e zones	3
		d.	known to cause moderate impact in natural areas	s in simila	ar habitats and c	limate z	ones 5
		e.	known to cause high impact in natural areas in s	imilar ha	bitats and clima	te zones	10
				DENA	KATM KEFJ	SITK	WRST
				0	0		0
Total	Possi	ble					50
Total	by pa	ırk		DENA	KATM KEFJ	SITK	WRST
	_			21	21		21

		lity of Control or Management				
	Ab	undance Within Park				
	1.	Number of populations (stands)				
		a. several; widespread and dense				1
		b. intermediate number; patchy				3
		c. few; scattered	DENI		a mu	5
				<u>KATM KEFJ</u>	SITK	WRST
	2		5	5		5
	2.	Areal extent of populations 50				1
		a. > 50 b. 11-50 ha				1
		c. 5-10				2 3
		d. < 5ha				5
			DENA	KATM KEFJ	SITK	WRST
			5	5		5
B.	Eas	se of Control	ç	C		U U
	1.	Seed banks				
		a. seeds remain viable in the soil for at least 3 yea	rs			0
		b. seeds remain viable in the soil for 2-3 years				5
		c. seeds viable in the soil for 1 year or less				1.
				KATM KEFJ	SITK	WRST
			0	0		0
	2.	Vegetative regeneration				0
		a. any plant part is a viable propagule				0
		b. sprouts from roots or stumps	nd anowith			5
		c. no resprouting following removal of abovegrou	-	KATM KEFJ	SITK	10 WRST
			10	10	SIIK	<u>10</u>
	3.	Level of effort required	10	10		10
	0.	a. repeated chemical or mechanical control measu	res require	d		1
		b. one or two chemical or mechanical treatments r				5
		c. can be controlled with one chemical treatment				10
		d. effective control can be achieved with mechanie	cal treatment	nt		15
				KATM KEFJ	SITK	WRST
			15	15		15
	4.	Abundance and proximity of propagules near park				~
		a. many sources of propagules near park		1:		0
		b. few sources of propagules near park, but these a				5
		c. few sources of propagules near park, but these ad. no sources of propagules are in dose proximity	are not read	iny dispersed		1(1:
		d. no sources of propagules are in dose proximity	DENA	KATM KEFJ	SITK	WRST
			$\frac{DLIVA}{0}$	0	SIIK	0
С	Sid	le Effects of Chemical/Mechanical Control Measures	0	0		0
0.		control measures will cause major impacts to comm				0
		control measures will cause major impacts to comm	•			5
		control measures will have little or no impact on co	-			15
		r	-	KATM KEFJ	SITK	WRST
			15	15		15
D	Fff	fectiveness of Community Management				
D.						

2	Ω
4	υ

	2. cultural techniques (burning, flooding) can be used t	to control	target species		5
	3. routine management of community or restoration or	preservat	tion practices (e.	g., presc	cribed
	burning, flooding, controlled disturbance) effectivel	y controls	s target species		10
		DENA	KATM KEFJ	SITK	WRST
		10	10		10
E. 1	Biological Control				
	1. biological control not feasible (not practical possible	e, or prob	able)		0
	2. potential may exist for biological control	•			5
	3. biological control feasible				10
		DENA	KATM KEFJ	SITK	WRST
		0	0		0
Total Po	ossible				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 mealywhite. 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.

	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

Species Ranking Summary Form for Chenopodium album

^aNot yet collected in this park unit.

^bNo data.

^cPreviously collected in this park unit.

Species Ranking Form for Chenopodium album

- I. Sigr
 - A.

	a.	found only within sites disturbed within the last 3	3 years o	r sites regularly	disturbe	d -10			
	b.	b. found in sites disturbed within the last 10 years							
	c.	found in midsuccessional sites disturbed 11-50 years	ears befo	ore present (BP)		2			
	d.	found in late-successional sites disturbed 51-100	years Bl	P		5			
	e.	found in high-quality natural areas with no knows	n major	disturbance for	100 years	s 10			
			DENA	KATM KEFJ	SITK	WRST			
			-10			-10			
2.	Ab	oundance							
	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			

nificance of Impact	
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	

		b.	areal extent of populations (1) <5 ha				1
			(2) 5-10 ha(3) 11-50 ha				2 3
			(4) >50 ha				5
				<u>DENA</u> 1	KATM KEFJ	SITK	WRST 1
	3.	Eff	ect on natural processes and character	1			1
		a.	plant species having little or no effect				0
		b.	delays establishment of native species in disturbe long-term (more than 10 years) modification or r				3 7
		c. d.	invades and modifies existing native communitie		Sil of succession		10
		e.	invades and replaces native communities				15
				-	KATM KEFJ	SITK	WRST
	4.	Sio	nificance of threat to park resources	0			0
	т.	a.	threat to secondary resources negligible				0
		b.	threat to areas' secondary (successional) resource				2
		c.	endangerment to areas' secondary (successional) threat to areas' primary resources	resource	es		4 8
		d. e.	endangerment to areas' primary resources				8 10
			······································	DENA	KATM KEFJ	SITK	WRST
	~	T		0			0
	5.	Lev a.	vel of visual impact to an ecologist 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	DENIA		OTTV	5 WDST
				2	KATM KEFJ	SITK	WRST 2
Total P	ossił	ole		-			50
Total by	y pa	rk			KATM KEFJ	SITK	WRST
В	Inn	ate	Ability of Species to Become a Pest	-6			-6
D.			ility to complete reproductive cycle in area of con	cern			
		a.	not observed to complete reproductive cycle				0
		b.	observed to complete reproductive cycle	DENIA		OTTV	5 WDST
				<u>DENA</u> 5	KATM KEFJ	<u>511K</u>	<u>WRST</u> 5
	2.	Mo	ode of reproduction	-			-
		a.	reproduces almost entirely by vegetative means				1
		b.	reproduces only by seeds reproduces vegetatively and by seed				3 5
		υ.	reproduces vegetatively and by seed	<u>DE</u> NA	KATM KEFJ	SITK	WRST
				3			3

24							
	3.	Ve	getative reproduction				
		a.	no vegetative reproduction				0
		b.	vegetative reproduction rate maintains populatio	m			1
			vegetative reproduction rate results in moderate		in population air	70	3
		С.				Le	
		d.	vegetative reproduction rate results in rapid incre			amu	5
				-	KATM KEFJ	SITK	WRST
				0			0
	4.	Fre	equency 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	In The Kerg	5111	5
	5	Nu	umber of goods per plant	5			5
	5.		umber of seeds per plant				1
		a.	few (0-10)				1
		b.	moderate (11-1,000)				3
		c.	many-seeded (>1,000)				5
					KATM KEFJ	SITK	WRST
				3			3
	6.	Di	spersal 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.	Ge	ermination requirements	U			U
	<i>.</i> .	a.	requires open soil and disturbance to germinate				0
		b.	can germinate in vegetated areas but in a narrow	range or	in special cond	itions	3
				-	-	nions	5
		c.	can germinate in existing vegetation in a wide ra	-		OTTI	-
					KATM KEFJ	SITK	WRST
	0	~		0			0
	8.	Co	ompetitive 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.	Kn	nown 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 c		itats and climate	zones	1
		с.	known to cause low impact in natural areas in sit				3
			*				
		d.	known to cause moderate impact in natural areas				
		e.	known to cause high impact in natural areas in si				10 WDCT
				DENA	KATM KEFJ	SITK	WRST
				1			1
Total 1							50
Total l	by pa	ırk		DENA	KATM KEFJ	SITK	WRST
				22			22
II. Fe	asibi	lity	of Control or Management				
		-	ance Within Park				

			25	5
	 Number of populations (stands) several; widespread and dense intermediate number; patchy 			1 3 5
	c. few; scattered	DENA KATM KEFJ 5	SITK	5 <u>WRST</u> 5
	 2. Areal extent of populations a. > 50 b. 11-50 ha 	5		1 2
	c. 5-10 d. < 5ha	<u>DENA KATM KEFJ</u> 5	SITK	3 5 <u>WRST</u> 5
В.	Ease of Control			
	 Seed banks seeds remain viable in the soil for at least 3 yea seeds remain viable in the soil for 2-3 years seeds viable in the soil for 1 year or less 			0 5 15
		DENA KATM KEFJ 0	SITK	WRST
	 Vegetative regeneration any plant part is a viable propagule 	0		0 0
	b. sprouts from roots or stumpsc. no resprouting following removal of abovegrou	nd growth <u>DENA KATM KEFJ</u> 10	SITK	5 10 <u>WRST</u> 10
	 Level of effort required repeated chemical or mechanical control measures one or two chemical or mechanical treatments responses can be controlled with one chemical treatment effective control can be achieved with mechanical 	equired	SITK	1 5 10 15 <u>WRST</u> 15
	 4. Abundance and proximity of propagules near park a. many sources of propagules near park b. few sources of propagules near park, but these a c. few sources of propagules near park, but these a d. no sources of propagules are in dose proximity 	are readily dispersed	SITK	0 5 10 15
C.	 Side Effects of Chemical/Mechanical Control Measures 1. control measures will cause major impacts to comm 2. control measures will cause moderate impacts to co 3. control measures will have little or no impact on co 	uunity mmunity	SITK	0 0 5 15 WRST
D.	Effectiveness of Community Management 1. the following options are not effective 2. cultural techniques (burning, flooding) can be used 3. routine management of community or restoration of	15 to control target species		15 0 5

burning, flooding, controlled disturbance) effectively	y controls target species		10
	DENA KATM KEFJ	SITK	WRST
	10		10
E. Biological Control			
1. biological control not feasible (not practical possible	e, 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.

	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	-	-	8
KEFJ	np ^c	-			High ^d
SITK	np	-	-	-	-
WRST	pc ^e	-	-	-	-

Species Ranking Summary Form for Crepis tectorum

^aNot yet collected in this park unit.

^bNo data.

^cFound outside park boundaries but may invade park.

^dMonitoring needed to prevent invasion.

^ePreviously collected in this park unit.

Species Ranking Form for *Crepis tectorum*

Significance of Impact I.

- 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 found in high-quality natural areas with no known major disturbance for 100 years 10 e.

		C.	Tound in high-quality natural areas with no known	5		•	
				DENA	KATM KEFJ	SITK	WRST
				1			
	2.	Ab	undance				
		a.	number of populations (stands)				
			(1) few; scattered (<5)				1
			(2) intermediate number; patchy (6-10)				3
			(2) interinted the number, patenty (6 10)(3) several; widespread and dense (>10)				5
			•	DENA	KATM KEFJ	SITK	WRST
			-	<u>5</u>	KAIWI KLIJ	SIIK	WIGI
		h	anal autom of nonviotions	5			
		b.	areal extent of populations				1
			(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.	Eff	fect on natural processes and character				
		a.	plant species having little or no effect				0
		b.	delays establishment of native species in disturbed	l sites u	p to 10 years		3
		c.	long-term (more than 10 years) modification or ret	tardatio	n 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.	Signifi	cano	e of threat to park resources	0			
	Siginii	a.	threat to secondary resources negligible				0
		b.	threat to areas' secondary (successional) resources				2
					G		
		с.	endangerment to areas' secondary (successional) re	esource	5		4
		d.	threat to areas' primary resources				8
		e.	endangerment to areas' primary resources	DENI		amu	10
			-		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
				4
		d. major visual impact on natural landscape		5
			DENA KATM KEFJ SITK	WRST
			4	
Total P	ossi	ble		50
Total b	v na	nrk	DENA KATM KEFJ SITK	WRST
1 otar o	JPC		11	
п	T.e.	Ability of Sussian to Dessure a Dest	11	
D.		hate Ability of Species to Become a Pest		
	1.		icern	
		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	c .	
	2.			1
				1
		b. reproduces only by seeds		3
		c. reproduces vegetatively and by seed		5
			DENA KATM KEFJ SITK	WRST
			3	
	3.	Vegetative reproduction		
		e		
		a no vegetative reproduction		0
		a. no vegetative reproduction	n	0
		b. vegetative reproduction rate maintains populatio		1
		b. vegetative reproduction rate maintains populatioc. vegetative reproduction rate results in moderate	increase in population size	1 3
		b. vegetative reproduction rate maintains populatio	increase in population size ease in population size	1 3 5
		b. vegetative reproduction rate maintains populatioc. vegetative reproduction rate results in moderate	increase in population size ease in population size	1 3
		b. vegetative reproduction rate maintains populatioc. vegetative reproduction rate results in moderate	increase in population size ease in population size	1 3 5
	4.	 b. vegetative reproduction rate maintains populatio c. vegetative reproduction rate results in moderate d. vegetative reproduction rate results in rapid increase 	increase in population size ease in population size DENA KATM KEFJ SITK	1 3 5
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant 	increase in population size ease in population size DENA KATM KEFJ SITK	1 3 5 <u>WRST</u>
	4.	 b. vegetative reproduction rate maintains populatio c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area 	increase in population size ease in population size DENA KATM KEFJ SITK	1 3 5 <u>WRST</u> 0
	4.	 b. vegetative reproduction rate maintains populatio c. vegetative reproduction rate results in moderate if d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years 	increase in population size ease in population size DENA KATM KEFJ SITK	1 3 5 <u>WRST</u> 0 1
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years c. every other year 	increase in population size ease in population size DENA KATM KEFJ SITK	1 3 5 <u>WRST</u> 0 1 3
	4.	 b. vegetative reproduction rate maintains populatio c. vegetative reproduction rate results in moderate if d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0	1 3 5 <u>WRST</u> 0 1 3 5
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years c. every other year 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0	1 3 5 <u>WRST</u> 0 1 3
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years c. every other year 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0	1 3 5 <u>WRST</u> 0 1 3 5
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years c. every other year 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u>	1 3 5 <u>WRST</u> 0 1 3 5
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years c. every other year d. one or more times a year 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u>	1 3 5 WRST 0 1 3 5 WRST
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u>	1 3 5 <u>WRST</u> 0 1 3 5 <u>WRST</u> 1
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u>	1 3 5 <u>WRST</u> 0 1 3 5 <u>WRST</u> 1 3
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u> 5	1 3 5 WRST 0 1 3 5 WRST 1 3 5
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u> 5	1 3 5 <u>WRST</u> 0 1 3 5 <u>WRST</u> 1 3
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) c. many-seeded (>1,000) 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u> 5	1 3 5 WRST 0 1 3 5 WRST 1 3 5
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) c. many-seeded (>1,000) Dispersal ability	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u> 5	1 3 5 WRST 0 1 3 5 WRST 1 3 5
	5.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) c. many-seeded (>1,000) 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u> 5	1 3 5 WRST 0 1 3 5 WRST 1 3 5
	5.	 b. vegetative reproduction rate maintains populatio c. vegetative reproduction rate results in moderate if d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) c. many-seeded (>1,000) Dispersal ability a. little potential for long-distance dispersal 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u> 5	1 3 5 WRST 0 1 3 5 WRST 1 3 5 WRST
	5.	 b. vegetative reproduction rate maintains populatio c. vegetative reproduction rate results in moderate if d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) c. many-seeded (>1,000) Dispersal ability a. little potential for long-distance dispersal 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u> <u>3</u>	1 3 5 WRST 0 1 3 5 WRST 1 3 5 WRST 0 5
	5.	 b. vegetative reproduction rate maintains populatio c. vegetative reproduction rate results in moderate if d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) c. many-seeded (>1,000) Dispersal ability a. little potential for long-distance dispersal 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u> 0 <u>DENA KATM KEFJ SITK</u> <u>3</u>	1 3 5 WRST 0 1 3 5 WRST 1 3 5 WRST 0

-		31
7.	Germination requirements	0
	a. requires open soil and disturbance to germinate	range or in special conditions 0
	b. can germinate in vegetated areas but in a narrow	o i
	c. can germinate in existing vegetation in a wide rar	DENA KATM KEFJ SITK WRST
		0
8.	Competitive ability	0
0.	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 a	
	b. known to cause impacts in natural areas, but in ot	
	c. known to cause low impact in natural areas in sin	
	d. known to cause moderate impact in natural areas	
	e. known to cause high impact in natural areas in sin	
		DENA KATM KEFJ SITK WRST
		0
Total Possi	hle	50
Total by pa		DENA KATM KEFJ SITK WRST
rotar by pa	IK	21
II. Feasibi	lity of Control or Management	
	undance Within Park	
	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 DENIA KATM KEEL SITK WOST
		DENA KATM KEFJ SITK WRST 5
R Fac	se of Control	5
D. La.	Seed banks	
1.	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

54			
	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	f aboveground growth	10
		DENA KATM KEFJ SITK	WRST
		10	
	2. Level of effort required		
	a. repeated chemical or mechanical co	ntrol measures required	1
	b. one or two chemical or mechanical	-	5
	c. can be controlled with one chemical		10
	d. effective control can be achieved wi	th mechanical treatment	15
		DENA KATM KEFJ SITK	WRST
		15	
	Abundance and proximity of propagules	s near park	
	a. many sources of propagules near pa	-	0
	b. few sources of propagules near park		5
	c. few sources of propagules near park		10
	d. no sources of propagules are in dose	• •	15
		DENA KATM KEFJ SITK	WRST
		0	
C.	Side Effects of Chemical/Mechanical Control	ol Measures	
	. control measures will cause major impa	ets to community	0
	2. control measures will cause moderate in		5
	control measures will have little or no ir		15
		DENA KATM KEFJ SITK	WRST
		15	
D. 1	Effectiveness of Community Management		
	. the following options are not effective		0
	2. cultural techniques (burning, flooding) of	can be used to control target species	5
		estoration or preservation practices (e.g., presc	ribed
	burning, flooding, controlled disturbanc		10
		DENA KATM KEFJ SITK	WRST
		10	
E. 1	Biological Control		
	. biological control not feasible (not pract		0
	2. potential may exist for biological control	1	5
	 biological control feasible 		10
		DENA KATM KEFJ SITK	WRST
		0	
Total Po			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.

	Significance of	f 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

Species Ranking Summary Form for Descurainia sophia

^aNot yet collected in this park unit. ^bNo data.

Species Ranking Form for Descurainia sophia

- I. Significance of Impact
 - A. Current Level of Impact
 - 1. Distribution relative to disturbance regime

1.	DIS	stribution 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 WR	ST
		-10 -10	
2.	Ab	bundance	
	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 WR	ST
		1 1	
	b.	areal extent of populations	
		(1) <5 ha	1
		(2) 5-10 ha	2
		(3) 11-50 ha	3

						35	_
			(4) > 50 ha	DENA	KATM KEFJ	SITK	5 WRST
				1		51111	1
	3.	Eff	fect on natural processes and character				
		a.	plant species having little or no effect				0
		b.	delays establishment of native species in disturbe				3
		c.	long-term (more than 10 years) modification or r		n of succession		7
		d.	invades and modifies existing native communitie	es			10
		e.	invades and replaces native communities	DENIA		OTT I	15
				-	KATM KEFJ	SITK	WRST
	4.	Si.	mificance of threat to park resources	0			0
	4.	a.	nificance of threat to park resources threat to secondary resources negligible				0
		b.	threat to areas' secondary (successional) resource	2.5			2
		с.	endangerment to areas' secondary (successional)		s		<u>-</u> 4
			threat to areas' primary resources				8
		e.	endangerment to areas' primary resources				10
				DENA	KATM KEFJ	SITK	WRST
				0			0
	5.	Le	vel 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 5
		d.	major visual impact on natural landscape	DENA	KATM KEFJ	SITK	WRST
				$\frac{DLIVA}{0}$	KAIWI KLIJ	SIIK	0
Total P	ossi	ble		0			50
	Total by park			DENA	KATM KEFJ	SITK	WRST
	1			-8			-8
В.	Inn	ate	Ability of Species to Become a Pest				
	1.	Ab	ility to complete reproductive cycle in area of con	ncern			
		a.	not observed to complete reproductive cycle				0
		b.	observed to complete reproductive cycle				5
					KATM KEFJ	SITK	WRST
	2	N.	1. Commente d'au	5			5
	۷.		ode of reproduction reproduces almost entirely by vegetative means				1
		a. b.	reproduces annost entrery by vegetative means reproduces only by seeds				3
		b. с.	reproduces vegetatively and by seed				5
		с.	reproduces vegetatively and by seed	DENA	KATM KEFJ	SITK	WRST
				3		~~~~	3

30							
	3.	Ve	getative reproduction				
		a.	no vegetative reproduction				0
		b.	vegetative reproduction rate maintains populatio	n			1
		c.	vegetative reproduction rate results in moderate		in population siz	ze	3
		d.	vegetative reproduction rate results in rapid incre				5
		u.	vegetative reproduction rate results in rapid mere		KATM KEFJ	SITK	WRST
				$\frac{DLIAA}{0}$	KAIWI KLIJ	SIIK	0
	4	En/	aguanay of sayual rangeduction for mature plant	0			0
	4.		equency of sexual reproduction for mature plant				0
		a.	1 5				0
		b.	once every five or more years				1
		c.	every other year				3
		d.	one or more times a year				5
					KATM KEFJ	SITK	WRST
				5			5
	5.	Nu	imber 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.	Di	spersal ability				
		a.	little potential for long-distance dispersal				0
		b.	great potential for long-distance dispersal				5
			8	DENA	KATM KEFJ	SITK	WRST
				5			5
	7.	Ge	ermination requirements	-			-
		a.	requires open soil and disturbance to germinate				0
		b.	can germinate in vegetated areas but in a narrow	range or	in special condi	itions	3
		с.	can germinate in existing vegetation in a wide ra	-	-	nions	5
		с.		-	KATM KEFJ	SITK	WRST
				$\frac{D B H H}{0}$	In The Kerg	5111	0
	8.	Co	ompetitive ability	U			0
	0.	a.	poor competitor for limiting factors				0
		b.	moderately competitive for limiting factors				
			highly competitive for limiting factors				3 5
		c.	linging competitive for minung factors	DENIA	VATM VEEL	CITV	
				_	KATM KEFJ	SITK	WRST
	0	V.	and lovel of immediation activity and another	0			0
	9.		nown level of impact in natural areas				0
		a.	not known to cause impacts in any other natural				0
		b.	known to cause impacts in natural areas, but in c				1
		c.	known to cause low impact in natural areas in sin				3
		d.	known to cause moderate impact in natural areas				
		e.	known to cause high impact in natural areas in si				10
				DENA	KATM KEFJ	SITK	WRST
				1			1
Total							50
Total	by pa	ırk		DENA	KATM KEFJ	SITK	WRST
				22			22
II. Fe	easib	ility	of Control or Management				
A	. At	ound	ance Within Park				

			37	7
	 Number of populations (stands) a. several; widespread and dense b. intermediate number; patchy c. few; scattered 			1 3 5
		DENA KATM KEFJ	SITK	WRST
	 2. Areal extent of populations a. > 50 b. 11-50 ha c. 5-10 	5		5 1 2 3
	d. < 5ha	DENA KATM KEFJ 5	SITK	5 <u>WRST</u> 5
В.	Ease of Control			
	 Seed banks seeds remain viable in the soil for at least 3 yea seeds remain viable in the soil for 2-3 years seeds viable in the soil for 1 year or less 	urs <u>DENA KATM KEFJ</u> 0	SITK	0 5 15 <u>WRST</u> 0
	2. Vegetative regeneration	0		0
	a. any plant part is a viable propaguleb. sprouts from roots or stumpsc. no resprouting following removal of abovegrouting	and growth <u>DENA KATM KEFJ</u>	SITK	0 5 10 WRST
		10		10
	 Level of effort required repeated chemical or mechanical control measu one or two chemical or mechanical treatments can be controlled with one chemical treatment effective control can be achieved with mechanical 	required	SITK	1 5 10 15 <u>WRST</u> 15
	4. Abundance and proximity of propagules near park			
	a. many sources of propagules near parkb. few sources of propagules near park, but thesec. few sources of propagules near park, but thesed. no sources of propagules are in dose proximity	are not readily dispersed		0 5 10 15
	I I G	DENA KATM KEFJ	SITK	WRST
C.	Side Effects of Chemical/Mechanical Control Measures1. control measures will cause major impacts to comm2. control measures will cause moderate impacts to compare the state of the state o	nunity		0 0 5
	3. control measures will have little or no impact on co	ommunity	~~~~~	15
_		<u>DENA KATM KEFJ</u> 15	SITK	<u>WRST</u> 15
D.	 Effectiveness of Community Management the following options are not effective cultural techniques (burning, flooding) can be used routine management of community or restoration option 	÷ .	.g., presc	0 5 cribed

burning, flooding, controlled disturbance) effectively	y controls target species		10
	DENA KATM KEFJ	SITK	WRST
	10		10
E. Biological Control			
1. biological control not feasible (not practical possible	e, 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.

	Significance of	f 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

Species Ranking Summary Form for Elymus repens

^aNot yet collected in this park unit.

^bNo data.

^cFound outside park boundaries but may invade park.

^dMonitoring 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

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				
	DENA KATM KEFJ SITK W	/RST			
	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 W	/RST			
	1	1			

$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
$\begin{array}{c c c c c c c c c c c c c c c c c c c $
$\begin{array}{c c c c c c c c c c c c c c c c c c c $
113. Effect on natural processes and character0a. plant species having little or no effect0b. delays establishment of native species in disturbed sites up to 10 years3c. long-term (more than 10 years) modification or retardation of succession7d. invades and modifies existing native communities10e. invades and replaces native communities10e. invades and replaces native communities15DENA KATM KEFJ SITK WRST004. Significance of threat to park resources2a. threat to secondary resources negligible0b. threat to areas' secondary (successional) resources2c. endangerment to areas' secondary (successional) resources8e. endangerment to areas' primary resources10DENA KATM KEFJ SITK WRST0005. Level of visual impact to an ecologist0a. little or no visual impact on natural landscape2c. significant visual impact on natural landscape2c. significant visual impact on natural landscape50DENA KATM KEFJ SITK WRST000Total Possible50Total Possible50DENA KATM KEFJ SITK WRST33333B. Innate Ability of Species to Become a Pest31. Ability to complete reproductive cycle in area of concern50
a. plant species having little or no effect0b. delays establishment of native species in disturbed sites up to 10 years3c. long-term (more than 10 years) modification or retardation of succession7d. invades and modifies existing native communities10e. invades and replaces native communities15DENA KATM KEFJ SITK WRST 0004. Significance of threat to park resources2a. threat to secondary resources negligible0b. threat to areas' secondary (successional) resources2c. endangerment to areas' secondary (successional) resources4d. threat to areas' primary resources8e. endangerment to areas' primary resources10DENA KATM KEFJSITKWRST005. Level of visual impact to an ecologist0a. little or no visual impact on natural landscape2c. significant visual impact on natural landscape50DENA KATM KEFJSITKWRST005. Level of visual impact on natural landscape50DENA KATM KEFJSITKWRST007007008. major visual impact on natural landscape50DENA KATM KEFJSITKWRST007007005DENA KATM KEFJSITK00700700700
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 $\frac{DENA \ KATM \ KEFJ \ SITK \ WRST}{0} 0$ 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 $\frac{DENA \ KATM \ KEFJ \ SITK \ WRST}{0} 0$ 5. Level of visual impact to an ecologist a. little or no visual impact on natural landscape 2 c. significant visual impact on natural landscape 5 $\frac{DENA \ KATM \ KEFJ \ SITK \ WRST}{0} 0$ Total Possible 50 Total Possible 50 DENA \ KATM \ KEFJ \ SITK \ WRST 3 B. Innate Ability of Species to Become a Pest 1. Ability to complete reproductive cycle in area of concern
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 $\frac{DENA \ KATM \ KEFJ \ SITK \ WRST}{0} 0$ 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 $\frac{DENA \ KATM \ KEFJ \ SITK \ WRST}{0} 0$ 5. Level of visual impact to an ecologist a. little or no visual impact on natural landscape 2 c. significant visual impact on natural landscape 4 d. major visual impact on natural landscape 5 $\frac{DENA \ KATM \ KEFJ \ SITK \ WRST}{0} 0$ Total Possible 50 Total Possible 50 B. Innate Ability of Species to Become a Pest 1. Ability to complete reproductive cycle in area of concern
d. invades and modifies existing native communities10e. invades and replaces native communities15 $DENA \ KATM \ KEFJ \ SITK \ WRST \ 0 \ 0$ 4. Significance of threat to park resources0a. threat to secondary resources negligible0b. threat to areas' secondary (successional) resources2c. endangerment to areas' secondary (successional) resources4d. threat to areas' primary resources8e. endangerment to areas' primary resources10DENA \ KATM \ KEFJ \ SITK \ WRST \ 0 \ 005. Level of visual impact to an ecologist0a. little or no visual impact on natural landscape0b. minor visual impact on natural landscape2c. significant visual impact on natural landscape5DENA \ KATM \ KEFJ \ SITK \ WRST \ 0 \ 0Total Possible50Total Possible50B. Innate Ability of Species to Become a Pest31. Ability to complete reproductive cycle in area of concern
e. invades and replaces native communities 15 DENA KATM KEFJ SITK WRST 0 $04. Significance of threat to park resourcesa. threat to secondary resources negligible 0b. threat to areas' secondary (successional) resources 2c. endangerment to areas' secondary (successional) resources 4d. threat to areas' primary resources 10DENA KATM KEFJ SITK WRST0$ $05. Level of visual impact to an ecologista. little or no visual impact on natural landscapeb. minor visual impact on natural landscapec. significant visual impact on natural landscaped. major visual impact on natural landscapefor tal Possible 50Total Possible 50Total by park DENA KATM KEFJ SITK WRST3$ $3B. Innate Ability of Species to Become a Pest1. Ability to complete reproductive cycle in area of concern$
DENA KATM KEFJSITKWRST 0004. Significance of threat to park resources a. threat to secondary resources negligible0b. threat to areas' secondary (successional) resources2c. endangerment to areas' secondary (successional) resources4d. threat to areas' primary resources8e. endangerment to areas' primary resources10DENA KATM KEFJSITKWRST005. Level of visual impact to an ecologist a. little or no visual impact on natural landscape b. minor visual impact on natural landscape c. significant visual impact on natural landscape d. major visual impact on natural landscape d. major visual impact on sutural landscape d. major visual impact on sutural landscape d. major visual impact on natural landscape d. major visual impact on sutural landscape d. major visual impact on natural landscape d. major visual impact on sutural landscape d. major visual impact on natural landscape d. major visual impact on sutural landscape d. major visual impact on natural landscape d. major visual impa
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
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 0 a. little or no visual impact on landscape 0 b. minor visual impact on natural landscape 2 c. significant visual impact on natural landscape 5 DENA KATM KEFJ SITK WRST 0 0 0 Total Possible 50 50 Total by park DENA KATM KEFJ SITK WRST 3 3 3 B. Innate Ability of Species to Become a Pest 3 3 1. Ability to complete reproductive cycle in area of concern 3 3
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 5 DENA KATM KEFJ SITK WRST 0 0 Total Possible 50 Total by park 55 B. Innate Ability of Species to Become a Pest 1. Ability to complete reproductive cycle in area of concern
c. endangerment to areas' secondary (successional) resources 4 d. threat to areas' primary resources 10 <u>DENA_KATM_KEFJ_SITK_WRST</u> 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 5 <u>DENA_KATM_KEFJ_SITK_WRST</u> 0 0 Total Possible 50 Total Possible 50 B. Innate Ability of Species to Become a Pest 1. Ability to complete reproductive cycle in area of concern
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e. endangerment to areas' primary resources 10 10 10 10 10 10 10 10 10 10
DENA KATM KEFJ SITK WRST 0 0 5. Level of visual impact to an ecologist 0 a. little or no visual impact on landscape 0 b. minor visual impact on natural landscape 2 c. significant visual impact on natural landscape 2 d. major visual impact on natural landscape 5 DENA KATM KEFJ SITK WRST 0 0 0 Total Possible 50 50 Total by park DENA KATM KEFJ SITK WRST 3 3 3 B. Innate Ability of Species to Become a Pest 3 3 1. Ability to complete reproductive cycle in area of concern 50
0 0 5. Level of visual impact to an ecologist 0 a. little or no visual impact on landscape 0 b. minor visual impact on natural landscape 0 c. significant visual impact on natural landscape 2 d. major visual impact on natural landscape 5 DENA KATM KEFJ SITK 0 0 Total Possible 50 Total by park 50 B. Innate Ability of Species to Become a Pest 3 1. Ability to complete reproductive cycle in area of concern 3
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 Total Possible 50 Total by park 50 B. Innate Ability of Species to Become a Pest 1. Ability to complete reproductive cycle in area of concern
b. minor visual impact on natural landscape c. significant visual impact on natural landscape d. major visual impact on natural landscape Total Possible Total Possible Total by park B. Innate Ability of Species to Become a Pest 1. Ability to complete reproductive cycle in area of concern b. minor visual impact on natural landscape DENA KATM KEFJ SITK WRST 3 2 2 2 4 3 DENA KATM KEFJ SITK WRST 3 3 2 2 2 3 2 3 2 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3
c. significant visual impact on natural landscape d. major visual impact on natural landscape 5 DENA KATM KEFJ SITK WRST 0 Total Possible Total by park B. Innate Ability of Species to Become a Pest 1. Ability to complete reproductive cycle in area of concern
d. major visual impact on natural landscape 5 DENA KATM KEFJ SITK 0 0 Total Possible 50 Total by park DENA KATM KEFJ 8. Innate Ability of Species to Become a Pest 3 1. Ability to complete reproductive cycle in area of concern 3
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 3 3 1. Ability to complete reproductive cycle in area of concern 50
0 0 Total Possible 50 Total by park DENA KATM KEFJ SITK WRST 3 3 3 B. Innate Ability of Species to Become a Pest 3 3 1. Ability to complete reproductive cycle in area of concern 50
Total Possible 50 Total by park DENA KATM KEFJ SITK WRST 3 3 3 B. Innate Ability of Species to Become a Pest 3 3 1. Ability to complete reproductive cycle in area of concern 50
DENA KATM KEFJ SITK WRST 3 3 B. Innate Ability of Species to Become a Pest 3 1. Ability to complete reproductive cycle in area of concern
3 3 B. Innate Ability of Species to Become a Pest 3 1. Ability to complete reproductive cycle in area of concern 3
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 <u>DENA KATM KEFJ SITK WRST</u>
<u>DENA KATM KEFJ SITK WRST</u> 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

42			
3.	Vegetative reproduction		
	a. no vegetative reproduction		0
	b. vegetative reproduction rate maintains population	on	1
	c. vegetative reproduction rate results in moderate	increase in population size	3
	d. vegetative reproduction rate results in rapid incr		5
		DENA KATM KEFJ SITK	
		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	DENIA VATM VEEL SITV	5 WDST
		DENA KATM KEFJ SITK	WRST 5
5.	Number of goods per plant	5	3
5.	Number of seeds per plant a. few (0-10)		1
	b. moderate (11-1,000)		1 3
	c. many-seeded (>1,000)		5
	e. many sected (>1,000)	DENA KATM KEFJ SITK	
		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	
		5	5
7.	Germination requirements		
	a. requires open soil and disturbance to germinate		0
	b. can germinate in vegetated areas but in a narrow	÷ .	3
	c. can germinate in existing vegetation in a wide r	-	5
		DENA KATM KEFJ SITK	
o	Compatitive shility	0	0
8.	Competitive ability a. poor competitor for limiting factors		0
	a. poor competitor for limiting factorsb. moderately competitive for limiting factors		03
	c. highly competitive for limiting factors		3 5
	e. Inginy competitive for minting factors	DENA KATM KEFJ SITK	
		3	3
9.	Known level of impact in natural areas	2	5
	a. not known to cause impacts in any other natural	l area	0
	b. known to cause impacts in natural areas, but in		1
	c. known to cause low impact in natural areas in si		3
	d. known to cause moderate impact in natural area	is in similar habitats and climate	zones 5
	e. known to cause high impact in natural areas in s	similar habitats and climate zone	
		DENA KATM KEFJ SITK	WRST
		1	1
Total Possi			50
Total by pa	rk	DENA KATM KEFJ SITK	
		30	30

II Ea	sibility of Control on Monogoment		43
	usibility of Control or Management Abundance Within Park		
11.	1. Number of populations (stands)		
	a. several; widespread and dense		1
	b. intermediate number; patchy		3
	c. few; scattered		5
		DENA KATM KEFJ SIT	<u>'K WRST</u>
		5	5
	2. Areal extent of populations		
	a. > 50		1
	b. 11-50 hac. 5-10		23
	c. 5-10 d. < 5ha		5
	u. < sha	DENA KATM KEFJ SIT	
		5	5
B.	Ease of Control	-	2
	1. Seed banks		
	a. seeds remain viable in the soil for at least 3 years	S	C
	b. seeds remain viable in the soil for 2-3 years		5
	c. seeds viable in the soil for 1 year or less		1:
		DENA KATM KEFJ SIT	
	2. Vegetative regeneration	15	15
	 Vegetative regeneration any plant part is a viable propagule 		C
	b. sprouts from roots or stumps		5
	c. no resprouting following removal of abovegroun	nd growth	10
		DENA KATM KEFJ SIT	
		5	5
	3. Level of effort required		
	a. repeated chemical or mechanical control measure		1
	b. one or two chemical or mechanical treatments re	equired	5
	c. can be controlled with one chemical treatmentd. effective control can be achieved with mechanical	al traatmant	10 1:
	d. effective control can be achieved with mechanica	DENA KATM KEFJ SIT	
		5	<u>K WK51</u> 5
	4. Abundance and proximity of propagules near park	-	2
	a. many sources of propagules near park		0
	b. few sources of propagules near park, but these ar	re readily dispersed	5
	c. few sources of propagules near park, but these an	re not readily dispersed	10
	d. no sources of propagules are in dose proximity		1:
		DENA KATM KEFJ SIT	
~		10	10
C.	Side Effects of Chemical/Mechanical Control Measures	unity.	0
	1. control measures will cause major impacts to commu	-	0 5
	 control measures will cause moderate impacts to con control measures will have little or no impact on con 	-	1:
	5. control measures will have nucle of no impact off con	DENA KATM KEFJ SIT	
		<u>5</u>	<u>K WK51</u> 5
		5	5
D.	Effectiveness of Community Management	5	5

4	4

2.	cultural techniques (burning, flooding) can be used t	o control target species		5
3.	routine management of community or restoration or	preservation practices (e.	.g., prese	cribed
	burning, flooding, controlled disturbance) effectively	y controls target species		10
		DENA KATM KEFJ	SITK	WRST
		10		10
E. Bi	ological Control			
1.	biological control not feasible (not practical possible	e, or probable)		0
2.	potential may exist for biological control	_		5
3.	biological control feasible			10
		DENA KATM KEFJ	SITK	WRST
		0		0
Total Poss	ible			100
Total by pa	ark	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 distinguish 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.

	Significance of Impact				
Park Unit	Current Level of Impact	Innate Ability to Become a Pest	Total (0-100)	Feasibility of Control (0-100)	Urgency
DENIA	0	21	10	65	TT: 1
DENA	-8	21	13	65	High
KATM	np ^a	b	-	-	-
KEFJ	np	-	-	-	-
SITK	np	-	-	-	-
WRST	-8	21	13	60	High

Species Ranking Summary Form for Lappula squarrosa

^aNot yet collected in this park unit. ^bNo data.

Species Ranking Form for Lappula squarrosa

I. Significance of Impact

- A. Current Level of Impact
 - 1. Distribution relative to disturbance regime

b. found in sites disturbed within the	sturbed 11-50 years before present (BP)	1 2
	•	2
c. found in midsuccessional sites dis	sturbed 51-100 years BP	
d. found in late-successional sites di		5
e. found in high-quality natural area	s 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		3
(3) several; widespread and dense	e (>10)	5
	DENA KATM KEFJ SITK	WRST
	1	1
b. areal extent of populations		
(1) < 5 ha		1

				49	
		(2) 5-10 ha			2
		(3) 11-50 ha			3
		(4) > 50 ha		017717	5
			DENA KATM KEFJ	SITK	WRST
2	БĤ	Seat on matural management and allowed an	1		1
3.		fect on natural processes and character			0
	a. b.	plant species having little or no effect delays establishment of native species in disturbe	ad sites up to 10 years		0 3
	о. с.	long-term (more than 10 years) modification or r	1 V		3 7
	с. d.	invades and modifies existing native communitie			10
	е.	invades and replaces native communities			10
	с.	invades and replaces harve communities	DENA KATM KEFJ	SITK	WRST
			0		0
4.	Sig	gnificance of threat to park resources			
	a.	threat to secondary resources negligible			0
	b.	threat to areas' secondary (successional) resource	es		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.		vel of visual impact to an ecologist			0
	a.	1 1			0
	b.	1 1			2
	С.	significant visual impact on natural landscape			4
	d.	major visual impact on natural landscape	DENIA VATM VEEL	OITV	5 WDST
			DENA KATM KEFJ 0	SITK	<u>WRST</u> 0
Total Poss	ihle		0		50
Total by p			DENA KATM KEFJ	SITK	WRST
rotar by p	uik		-8	5111	-8
B. In	nate	Ability of Species to Become a Pest	0		0
1.		ility to complete reproductive cycle in area of con	cern		
	a.	not observed to complete reproductive cycle			0
	b.	observed to complete reproductive cycle			5
			DENA KATM KEFJ	SITK	WRST
			5		5
2.	Mo	ode 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	on	1
	c. vegetative reproduction rate results in moderate	increase in population size	3
	d. vegetative reproduction rate results in rapid incr	ease 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
C	Discourse 1 shiliter	3	3
6.	Dispersal ability		0
	a. little potential for long-distance dispersalb. great potential for long-distance dispersal		0 5
	b. great potential for long-distance dispersal	DENA KATM KEFJ SITK	WRST
		5	5
7.	Germination requirements	5	5
7.	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 ra		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 o	other habitats and climate zones	1
	c. known to cause low impact in natural areas in si		3
	d. known to cause moderate impact in natural area		
	e. known to cause high impet in natural areas in sin		10
		DENA KATM KEFJ SITK	WRST
		0	0

			51	
Total Possible		DENIA VATM VEEL	CITIZ	50 WDST
Total by park		DENA KATM KEFJ 21	SITK	<u>WRST</u> 21
II. Feasibility	II. Feasibility of Control or Management			21
	A. Abundance Within Park			
1. Nu	mber of populations (stands)			
a.	several; widespread and dense			1
b.	intermediate number; patchy			3
с.	few; scattered		armer	5
		DENA KATM KEFJ	SITK	WRST
$2 \wedge m$	al attent of populations	5		5
2. Are a.	eal extent of populations > 50			1
a. b.	11-50 ha			2
с.	5-10			3
	< 5ha			5
		DENA KATM KEFJ	SITK	WRST
		5		5
B. Ease of				
1. See	ed banks			0
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 15
с.	seeds viable in the soil for 1 year or less	DENA KATM KEFJ	SITK	WRST
		0	SIIK	0
2. Ve	getative regeneration	0		0
a.	any plant part is a viable propagule			0
b.	sprouts from roots or stumps			5
с.	no resprouting following removal of aboveground	d growth		10
		DENA KATM KEFJ	SITK	WRST
2 1		10		10
	vel of effort required	a magning d		1
a. b	repeated chemical or mechanical control measure one or two chemical or mechanical treatments red			1 5
0. C.	can be controlled with one chemical treatment	quireu		10
e. d.	effective control can be achieved with mechanica	l treatment		15
		DENA KATM KEFJ	SITK	WRST
		15		15
4. Ab	undance and proximity of propagules near park			
a.	many sources of propagules near park			0
b.	few sources of propagules near park, but these are			5
c.	few sources of propagules near park, but these are	e not readily dispersed		10
d.	no sources of propagules are in dose proximity	DENA KATM KEFJ	SITK	15 WRST
		0	SIIK	$\frac{WKSI}{0}$
		v		U

C.				0
	1. control measures will cause major impacts to commu	•		0
	2. control measures will cause moderate impacts to com			5
	3. control measures will have little or no impact on com	munity		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 p	U	σ nreso	ribed
	burning, flooding, controlled disturbance) effectively		6., prese	10
	burning, nooding, controlled disturbance) effectively	DENA KATM KEFJ	SITV	-
			SITK	<u>WRST</u>
Б		10		10
E.	e			_
	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 F	Possible			100
	by park	DENA KATM KEFJ	SITK	WRST
100010	- France	<u>60</u>	~	60
		00		00

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.

	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

Species Ranking Summary Form for Lepedium densiflorum

^aNot yet collected in this park unit. ^bNo data.

Species Ranking Form for Lepidium densiflorum

I. Significance of Impact

- A. Current Level of Impact
 - 1. Distribution relative to disturbance regime

ć	a.	found only within sites disturbed within the last 3 years or sites regularly disturbed	-10
1	э.	found in sites disturbed within the last 10 years	1
(с.	found in midsuccessional sites disturbed 11-50 years before present (BP)	2
(1.	found in late-successional sites disturbed 51-100 years BP	5
6	e.	found in high-quality natural areas with no known major disturbance for 100 years	10
		DENA KATM KEFJ SITK	WRST
		-10	-10

			55
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 S	SITK WRST
		1	1
	b. areal extent of populations		
	(1) < 5 ha		1
	(2) 5-10 ha		2 3
	(3) 11-50 ha (4) > 50 ha		3 5
	(4) >50 ha	DENA KATM KEEL S	SITK WRST
		DENA KATM KEFJ S 1	<u>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 </u>
3.	Effect on natural processes and character	1	1
5.			0
	a. plant species having little or no effectb. delays establishment of native species in disturb	ed sites up to 10 years	3
	c. long-term (more than 10 years) modification or	- ·	5 7
	d. invades and modifies existing native communiti		10
	e. invades and replaces native communities		15
		DENA KATM KEFJ S	SITK WRST
		0	0
4.	Significance of threat to park resources		
	a. threat to secondary resources negligible		0
	b. threat to areas' secondary (successional) resourc	es	2
	c. endangerment to areas' secondary (successional)	resources	4
	d. threat to areas' primary resources		8
	e. endangerment to areas' primary resources		10
			SITK WRST
_		0	0
5.	Level of visual impact to an ecologist		0
	a. little or no visual impact on landscape		0
	b. minor visual impact on natural landscape		2 4
	c. significant visual impact on natural landscaped. major visual impact on natural landscape		4 5
	u. major visual impact on natural fandscape	DENA KATM KEFJ S	SITK WRST
		0	0
Total Possi	ble	0	50
Total by pa		DENA KATM KEFJ S	SITK WRST
		-8	-8
B. Inn	ate Ability of Species to Become a Pest		
1.	Ability to complete reproductive cycle in area of con	ncern	
	a. not observed to complete reproductive cycle		0
	b. observed to complete reproductive cycle		5
		DENA KATM KEFJ S	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				0
	a. no vegetative reproduction				0
	b. vegetative reproduction rate maintains populationc. vegetative reproduction rate results in moderate in		in population siz		1 3
	d. vegetative reproduction rate results in moderate re				5
	al regetative reproduction fate results in rapid mere		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 yeard. one or more times a year				3 5
	u. one of more times a year	DENA	KATM KEFJ	SITK	WRST
		5		51111	5
5.	Number of seeds per plant				
	a. few (0-10)				1
	b. moderate (11-1,000)				3
	c. many-seeded (>1,000)	DENIA	VATM VEEL	OITV	5 WDST
		<u>DENA</u> 3	KATM KEFJ	SITK	WRST 3
6.	Dispersal ability	5			5
	a. little potential for long-distance dispersal				0
	b. great potential for long-distance dispersal				5
			KATM KEFJ	SITK	WRST
_		5			5
7.	Germination requirements				0
	a. requires open soil and disturbance to germinateb. can germinate in vegetated areas but in a narrow	range or	in special condi	tions	0 3
	c. can germinate in existing vegetation in a wide ra			tions	5
		-	KATM KEFJ	SITK	WRST
		0			0
8.	Competitive ability				_
	a. poor competitor for limiting factors				0
	b. moderately competitive for limiting factorsc. highly competitive for limiting factors				3 5
	c. Inginy competitive for minung factors	DENA	KATM KEFJ	SITK	WRST
		$\frac{DLIVA}{0}$	IN THE INDI J	5111	$\frac{0}{0}$

0	77			57	
9.	Kn	own level of impact in natural areas			0
	a.	not known to cause impacts in any other natural a			0
	b.	known to cause impacts in natural areas, but in ot			1
	c.	known to cause low impact in natural areas in sin	nilar habitats and climate	zones	3
	d.	known to cause moderate impact in natural areas	in similar habitats and cl	imate zo	ones 5
	e.	known to cause high impact in natural areas in sin	nilar habitats and climate	e zones	10
			DENA KATM KEFJ	SITK	WRST
			0		0
Total Possi	ible		-		50
Total by pa			DENA KATM KEFJ	SITK	WRST
rotur og pr	ann		21	5111	21
II Feasib	ility	of Control or Management	21		21
		ance Within Park			
		umber of populations (stands)			
1.		several; widespread and dense			1
	а. ь	intermediate number; patchy			
	b.	few; scattered			3 5
	c.	lew, scatteled	DENIA VATM VEEL	SITK	
			DENA KATM KEFJ 5	SIIK	WRST 5
2	۸	and autout of a couldtion of	3		3
۷.		eal extent of populations > 50			1
	a.				1
		11-50 ha			2
	С.	5-10			3
	a.	< 5ha			5
			DENA KATM KEFJ	SITK	WRST
			5		5
		f Control			
1.	See	ed 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.	Ve	getative regeneration			
	a.	any plant part is a viable propagule			0
	b.	sprouts from roots or stumps			5
	c.	no resprouting following removal of aboveground	d growth		10
			DENA KATM KEFJ	SITK	WRST
			10		10
3.		vel of effort required			
	a.	repeated chemical or mechanical control measure	s required		1
		one or two chemical or mechanical treatments rec			5
	c.	can be controlled with one chemical treatment			10
	d.	effective control can be achieved with mechanica	l treatment		15
			DENA KATM KEFJ	SITK	WRST
			15		15

	4. A	Abundance and proximity of propagules near park	
	a	a. many sources of propagules near park	0
	b	b. few sources of propagules near park, but these are readily dispersed	5
	c	e. few sources of propagules near park, but these are not readily dispersed	10
	d	1. no sources of propagules are in dose proximity	15
		DENA KATM KEFJ SITK V	VRST
		5	5
C.	Side 1	Effects of Chemical/Mechanical Control Measures	
		control measures will cause major impacts to community	0
	2. c	control measures will cause moderate impacts to community	5
	3. c	control measures will have little or no impact on community	15
		<u>DENA KATM KEFJ SITK V</u>	VRST
		15	15
D.	Effec	ctiveness of Community Management	
	1. tł	he following options are not effective	0
	2. c	cultural techniques (burning, flooding) can be used to control target species	5
	3. ro	outine management of community or restoration or preservation practices (e.g., prescril	bed
	b	purning, flooding, controlled disturbance) effectively controls target species	10
		<u>DENA KATM KEFJ SITK V</u>	VRST
		10	10
E.	Biolo	ogical Control	
	1. b	biological control not feasible (not practical possible, or probable)	0
	2. p	potential may exist for biological control	5
	3. b	biological control feasible	10
		<u>DENA KATM KEFJ SITK V</u>	VRST
		0	0
Total F	Possible	e	100
Total b	oy park	DENA KATM KEFJ SITK V	VRST
		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.

	Significance of In	npact			
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

Species Ranking Summary Form for Leucanthemum vulgare

^aNot yet collected in this park unit.

^bNo data.

^cFound outside park boundaries but may invade park.

^dMonitoring 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	ithin the last 3 years or sites regularly disturbed	-10
----	-----------------------------------	---	-----

1

2

5

- b. found in sites disturbed within the last 10 years
- c. found in midsuccessional sites disturbed 11-50 years before present (BP)
- d. found in late-successional sites disturbed 51-100 years BP
- 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

		here and and afferent of a second discuss			61	
		 b. areal extent of populations (1) <5 ha (2) 5-10 ha (3) 11-50 ha (4) >50 ha 				1 2 3 5
			<u>DENA</u> 1	KATM KEFJ	SITK 1	WRST 1
	3.	Effect on natural processes and character a. plant species having little or no effect b. delays establishment of native species in disturb c. long-term (more than 10 years) modification or d. invades and modifies existing native communities	oed sites up retardation		1	1 0 3 7 10 15
		-		KATM KEFJ	SITK	WRST
	4.	Significance of threat to park resources a. threat to secondary resources negligible b. threat to areas' secondary (successional) resource	0		0	0 0 2
		 c. endangerment to areas' secondary (successionar) resources d. threat to areas' primary resources e. endangerment to areas' primary resources 		s		2 4 8 10
		e. endurgerment to areas primary resources	DENA 0	KATM KEFJ	SITK 0	WRST 0
	5.	 Level of visual impact to an ecologist a. little or no visual impact on landscape b. minor visual impact on natural landscape c. significant visual impact on natural landscape d. major visual impact on natural landscape 	0		0	0 2 4 5
				KATM KEFJ	SITK	WRST
otal P otal b			5 DFNA	KATM KEFJ	5 SITK	5 50 WRST
iui 0	y pu		8		8	8
B.	Inn 1.	hate Ability of Species to Become a PestAbility to complete reproductive cycle in area of coa. not observed to complete reproductive cycleb. observed to complete reproductive cycle				0 5
	-		DENA 5	KATM KEFJ	<u>SITK</u> 5	WRST 5
	2.	Mode of reproductiona. reproduces almost entirely by vegetative meansb. reproduces only by seedsc. reproduces vegetatively and by seed				1 3 5
		c. reproduces vegetatively and by seed	DENA 5	KATM KEFJ	SITK 5	WRST 5

Total Total

02	-						
	3.	Ve	getative reproduction				
		a.	no vegetative reproduction				0
		b.	vegetative reproduction rate maintains population	n			1
		c.	vegetative reproduction rate results in moderate	increase	in population siz	ze	3
		d.	vegetative reproduction rate results in rapid increased				5
				DENA	KATM KEFJ	SITK	WRST
				3		3	3
	4.	Fre	equency of sexual reproduction for mature plant				
		a.	almost never reproduces sexually in area				0
		b.	once every five or more years				1
		с.	every other year				3
		d.	one or more times a year	DENIA	VATM VEEL	CITIZ	5 WDST
				-	KATM KEFJ	SITK	WRST
	5	NI	mbon of coods non mlont	5		5	5
	5.		mber of seeds per plant few (0-10)				1
		a. b.	moderate (11-1,000)				3
			many-seeded (>1,000)				5
		c.	many-seeded (>1,000)	DENA	KATM KEFJ	SITK	WRST
				3		3	3
	6.	Dis	spersal 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.		rmination requirements				
			requires open soil and disturbance to germinate				0
		b.	can germinate in vegetated areas but in a narrow	-	-	itions	3
		c.	can germinate in existing vegetation in a wide ra	-		amu	5
					KATM KEFJ	SITK	WRST
	0	C	num stitiste altilitet	3		3	3
	8.		mpetitive ability				0
		a. h	poor competitor for limiting factors moderately competitive for limiting factors				0
		b. с.	highly competitive for limiting factors				3 5
		U.	inging competitive for minting factors	DENA	KATM KEFJ	SITK	WRST
				3		3	3
	9.	Kn	own level of impact in natural areas	5		5	5
	2.	a.	not known to cause impacts in any other natural	area			0
		b.	known to cause impacts in natural areas, but in o		tats and climate	zones	1
		c.	known to cause low impact in natural areas in sin				3
		d.	known to cause moderate impact in natural areas				ones 5
		e.	known to cause high impact in natural areas in si				10
				DENA	KATM KEFJ	SITK	WRST
				1		1	1
	otal Possi						50
T	otal by pa	ırk			KATM KEFJ	SITK	WRST
				33		33	33

II. Fea	sibility of Control or Management		63	3
	Abundance Within Park			
	1. Number of populations (stands)			
	a. several; widespread and dense			1
	b. intermediate number; patchy			3
	c. few; scattered		0 mu	5
		DENA KATM KEFJ	SITK	WRST
	2. Areal extent of populations	5	5	5
	a. > 50			1
	b. 11-50 ha			
	c. 5-10			2 3
	d. < 5ha			5
		DENA KATM KEFJ	SITK	WRST
		5	5	5
В.	Ease of Control			
	1. Seed banks			0
	a. seeds remain viable in the soil for at least 3 year	rs		0
	b. seeds remain viable in the soil for 2-3 yearsc. seeds viable in the soil for 1 year or less			5 15
	c. seeds viable in the soil for 1 year or less	DENA KATM KEFJ	SITK	WRST
		15	15	15
	2. Vegetative regeneration	10	10	10
	a. any plant part is a viable propagule			0
	b. sprouts from roots or stumps			5
	c. no resprouting following removal of abovegrou	nd growth		10
		DENA KATM KEFJ	SITK	WRST
		5	5	5
	3. Level of effort required	• •		1
	a. repeated chemical or mechanical control measu	_		1 5
	b. one or two chemical or mechanical treatments rc. can be controlled with one chemical treatment	equiled		10
	d. effective control can be achieved with mechanic	cal 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 a			5
	c. few sources of propagules near park, but these a	are not readily dispersed		10
	d. no sources of propagules are in dose proximity		~~~~	15
		DENA KATM KEFJ	SITK	WRST
C	Side Effects of Chemical Machanical Control Macaure	5	5	5
U.	Side Effects of Chemical/Mechanical Control Measures 1. control measures will cause major impacts to comm			0
				0 5
	7 Control measures will cause moderate impacts to co	1111101111 y		5
	 control measures will cause moderate impacts to co control measures will have little or no impact on co 			15
	 control measures will cause moderate impacts to co control measures will have little or no impact on co 		SITK	15 WRST

64							
	D.	Eff	ectiveness of Community Management				
		1.	the following options are not effective				0
		2.	cultural techniques (burning, flooding) can be used to	o control	target species		5
		3.	routine management of community or restoration or p	preservat	tion practices (e.	g., presc	ribed
			burning, flooding, controlled disturbance) effectively	controls	s target species		10
				DENA	KATM KEFJ	SITK	WRST
				10		10	10
	E.	Bic	logical Control				
		1.	biological control not feasible (not practical possible,	or proba	able)		0
		2.	potential may exist for biological control				5
		3.	biological control feasible				10
				DENA	KATM KEFJ	SITK	WRST
				0		0	0
To	al P	ossi	ble				100
To	al b	y pa	rk	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.

	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	

Species Ranking Summary Form for Linaria vulgaris

^aPreviously collected in this park unit. ^bNot yet collected in this park unit.

Not yet conected in this par

[°]No data.

Species Ranking Form for Linaria vulgaris

- I. Significance of Impact
 - A. Current Level of Impact
 - 1. Distribution relative to disturbance regime

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	0
	DENA KATM KEFJ SITK WRS	Т
	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 WRS	Т
	1 1	_

			67	,
	 b. areal extent of populations (1) <5 ha (2) 5-10 ha (3) 11-50 ha (4) > 50 ha 			1 2 3
	(4) >50 ha	DENA KATM KEFJ 1	SITK	5 <u>WRST</u> 1
	Effect on natural processes and character a. plant species having little or no effect b. delays establishment of native species in disturbe c. long-term (more than 10 years) modification or r d. invades and modifies existing native communitie e. invades and replaces native communities	ed sites up to 10 years etardation of succession		0 3 7 10 15
	1	DENA KATM KEFJ	SITK	WRST
	 Significance of threat to park resources a. threat to secondary resources negligible b. threat to areas' secondary (successional) resource c. endangerment to areas' secondary (successional) d. threat to areas' primary resources e. endangerment to areas' primary resources 			$ \begin{array}{c} 0 \\ 2 \\ 4 \\ 8 \\ 10 \end{array} $
	e. endangerment to areas primary resources	DENA KATM KEFJ	SITK	WRST
	 Level of visual impact to an ecologist a. little or no visual impact on landscape b. minor visual impact on natural landscape c. significant visual impact on natural landscape d. major visual impact on natural landscape 	0 DENA KATM KEFJ	SITK	0 2 4 5 WRST
Total Possib		4		4
Total by par		DENA KATM KEFJ 7	SITK	50 <u>WRST</u> 7
1.	Ate Ability of Species to Become a Pest Ability to complete reproductive cycle in area of con a. not observed to complete reproductive cycle b. observed to complete reproductive cycle	cern DENA KATM KEFJ	SITK	0 5 WRST
	Mode of reproductiona. reproduces almost entirely by vegetative meansb. reproduces only by seedsc. reproduces vegetatively and by seed	5		5 1 3 5
		DENA KATM KEFJ 3	SITK	WRST 3

00	3.	Vegetative	reproduction	1							
			setative reprod							(0
		b. vegeta	tive reproduc	tion rate main	tains population	n					1
					ts in moderate i		in popula	tion siz	ze	,	3
		-	-		ts in rapid incre					-	5
		C				-	KATM	KEFJ	SITK	WRST	[
								5		5	
	4.		-	production for	-						
				luces sexually	in area					(0
			very five or n	nore years							1
		-	other year								3
		d. one or	more times a	ı year							5
						DENA	KATM		SITK	WRS7	-
	_							5		5	
	5.		f seeds per pla	ant							
		a. few (0-									1
			ate (11-1,000	,							3
		c. many-s	seeded (>1,00	00)							5
						DENA	KATM		SITK	WRST	-
	_	.						5		5	
	6.	Dispersal a									~
				ong-distance d							0
		b. great p	otential for lo	ong-distance o	lispersal	DEMA		VEEL	017717		5
						DENA	KATM		SITK	WRST	-
	-	a						5		5	
	7.		on requiremen		•						~
					e to germinate						0
		-		-	but in a narrow	-	-		tions		3
		c. can ge	rminate in ex	isting vegetat	ion in a wide ra	-			OTTV		5
						DENA	KATM		SITK	WRST	-
	0	a	1 .1.					0		0	
	8.	Competitiv	-	1 6 .							0
		-	-	limiting facto							0
			• •	itive for limiti	•						3
		c. highly	competitive	for limiting fa	ctors	DENIA		VEEL	OTTIZ		5
						DENA	KATM		SITK	WRST	<u>-</u>
	0	17 1	1 6	• , 1				3		3	
	9.		-	in natural area							0
				·	y other natural			.1			0
					l areas, but in o						1
				·	tural areas in sin						3
					in natural areas						5
		e. known	to cause high	n impact in na	tural areas in si						0
						DENA	KATM		SITK	WRST	-
Tatal I		1.						0		0	0
Total F						DENIA	<u> </u>	VEET	CITV	5(WDS7	
Total b	у ра	K				DENA	KATM		SITK	WRS7	-
II Ea	ooih:	ity of Cont	rol or Monor	amont				31		31	
		indance Wi	rol or Manage	ement							
A.	AC	muance w1	unn Park								

A. Abundance Within Park

	1				69)
	1	Number of populations (stands) a. several; widespread and dense b. intermediate number; patchy c. few; scattered				1 3 5
			DENA	KATM KEFJ	SITK	WRST
	1	Areal extent of populations a. > 50 b. 11-50 ha c. 5-10 d. < 5ha		5		5 1 2 3 5
			DENA	<u>KATM KEFJ</u> 5	SITK	<u>WRST</u> 5
B.	1.	e of Control Seed banks a. seeds remain viable in the soil for at least 3 years b. seeds remain viable in the soil for 2-3 years c. seeds viable in the soil for 1 year or less		J		0 5 15
			<u>DENA</u>	KATM KEFJ	SITK	WRST
	1	Vegetative regeneration a. any plant part is a viable propagule b. sprouts from roots or stumps c. no resprouting following removal of aboveground	1 growth	0		0 0 5 10
		c. no resprouting following felloval of aboveground	-	KATM KEFJ	SITK	WRST
	1	Level of effort required a. repeated chemical or mechanical control measure b. one or two chemical or mechanical treatments req c. can be controlled with one chemical treatment d. effective control can be achieved with mechanical	s require juired l treatme	5 ed ent <u>KATM KEFJ</u>	SITK	5 1 5 10 15 WRST
	1	Abundance and proximity of propagules near park		5		5
	1	 a. many sources of propagules near park b. few sources of propagules near park, but these are c. few sources of propagules near park, but these are d. no sources of propagules are in dose proximity 	e not rea		SITK	0 5 10 15 <u>WRST</u> 5
C.	1. 2.	Effects of Chemical/Mechanical Control Measures control measures will cause major impacts to commun control measures will cause moderate impacts to com- control measures will have little or no impact on comm	munity munity	<u>KATM KEFJ</u> 15	SITK	0 5 15 <u>WRST</u> 15
D.	1. 2.	ctiveness of Community Management the following options are not effective cultural techniques (burning, flooding) can be used to routine management of community or restoration or p		target species	g., presc	0 5

burning, flooding, controlled disturbance) effectively	controls	s target species		10
	DENA	KATM KEFJ	SITK	WRST
		10		10
E. Biological Control				
1. biological control not feasible (not practical possible,	, or prob	able)		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.

72 Species Ranking Summary Form for Lupinus polyphyllus

	Significance of In	npact			
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	12	11	23	55	Low
KATM	np^{a}	_b	-	-	-
KEFJ	np ^c	-	-	-	Low ^d
SITK	np	-	-	-	-
WRST	np	-	-	-	-

^aNot yet collected in this park unit.

^bNo data.

^cFound outside park but may invade park.

^dNeeds 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)
 - d. found in late-successional sites disturbed 51-100 years BP
 - e. found in high-quality natural areas with no known major disturbance for 100 years 10

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

1

2

5

1 3

5

DENA KATM KEFJ SITK WRST

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

					73	3
		Eff a. b. c. d. e.	ect on natural processes and character, plant species having little or no effect delays establishment of native species in disturbe long-term (more than 10 years) modification or r invades and modifies existing native communitie invades and replaces native communities	etardation of succession	SITK	0 3 7 10 15 WRST
				DENA KATM KEFJ 3	SIIK	WKSI
		Sig a. b. c.	nificance of threat to park resources threat to secondary resources negligible threat to areas' secondary (successional) resource endangerment to areas' secondary (successional)			0 2 4
		d. e.	threat to areas' primary resources endangerment to areas' primary resources	resources		8 10
				DENA KATM KEFJ 2	SITK	WRST
		Lev a. b.	vel of visual impact to an ecologist little or no visual impact on landscape minor visual impact on natural landscape			0 2
		c. d.	significant visual impact on natural landscape major visual impact on natural landscape	DENA KATM KEFJ	SITK	4 5 <u>WRST</u>
Total Po	accil	مام		4		50
Total by				DENA KATM KEFJ 12	SITK	WRST
B.	1.		Ability of Species to Become a Pest ility to complete reproductive cycle in area of con- not observed to complete reproductive cycle observed to complete reproductive cycle	cern		05
		υ.	observed to complete reproductive cycle	DENA KATM KEFJ 0	SITK	WRST
		Mo a. b. c.	de of reproduction reproduces almost entirely by vegetative means reproduces only by seeds reproduces vegetatively and by seed			1 3 5
		C.	reproduces vegetatively and by seed	DENA KATM KEFJ	SITK	WRST
		Veg a. b.	getative reproduction no vegetative reproduction vegetative reproduction rate maintains population			0 1
		c.	vegetative reproduction rate results in moderate i		ze	3
		u.	vegetative reproduction rate results in rapid incre	DENA KATM KEFJ 3	SITK	WRST

4.		equency of sexual reproduction for mature plant		0
	a.	almost never reproduces sexually in area		0
	b.	once every five or more years		1
		every other year		3
	a.	one or more times a year	DENIA VATM VEEL CITV	5 WDST
			<u>DENA KATM KEFJ SITK</u> 0	WRST
5.	Nu	mber 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
<i>.</i>	Б.	1 1 11	1	
6.		spersal ability		0
	a.	little potential for long-distance dispersal		0
	b.	great potential for long-distance dispersal	DENIA VATM VEEL CITV	5 WDST
			DENA KATM KEFJ SITK 0	WRST
7	G	mination requirements	0	
7.		rmination requirements requires open soil and disturbance to germinate		0
	a. b.	can germinate in vegetated areas but in a narrow		03
	о. с.	can germinate in existing vegetation in a wide i	č	5
	υ.	can germinate in existing vegetation in a wide i	DENA KATM KEFJ SITK	WRST
			3	
8.	Co	mpetitive ability	C .	
	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.	Kn	own level of impact in natural areas		
	a.	not known to cause impacts in any other natura	l 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 s		3
	d.	known to cause moderate impact in natural area		
	e.	known to cause high impact in natural areas in		10
			DENA KATM KEFJ SITK	WRST
			0	
Total Possi				50
Total by pa	ark		DENA KATM KEFJ SITK	WRST
			11	

		75	
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 5
d. < 5ha			5
	DENA KATM KEFJ 5	SITK	WRST
B. Ease of Control	-		
1. Seed banks			
a. seeds remain viable in the soil for at least 3 years	3		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
e. seeds viable in the son for 1 year of less	DENA KATM KEFJ	SITK	WRST
	0	5111	
2. Vegetative regeneration	0		
a. any plant part is a viable propagule			0
b. sprouts from roots or stumps			5
c. no resprouting following removal of abovegroun	d growth		10
c. no resprouting following removal of abovegroun	DENA KATM KEFJ	SITK	WRST
	<u>DENA KAIM KEIJ</u> 5	SIIK	WKSI
3. Level of effort required	5		
	as required		1
a. repeated chemical or mechanical control measureb. one or two chemical or mechanical treatments repeated on the second seco			5
	quiled		-
	altraatmant		10 15
d. effective control can be achieved with mechanica		OITIZ	-
	DENA KATM KEFJ	SITK	WRST
	5		
4. Abundance and proximity of propagules near park			0
a. many sources of propagules near park			0
b. few sources of propagules near park, but these ar			5
c. few sources of propagules near park, but these ar	e 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 commu	-		0
2. control measures will cause moderate impacts to com	-		5
3. control measures will have little or no impact on com	nmunity		15
	DENA KATM KEFJ	SITK	WRST
	15		

1. the following options are not effective () ;
2 $(1 + 1)$	ī
2. cultural techniques (burning, flooding) can be used to control target species	
3. routine management of community or restoration or preservation practices (e.g., prescribed	
burning, flooding, controlled disturbance) effectively controls target species 1	0
DENA KATM KEFJ SITK WRST	
10	
E. Biological Control	
1. biological control not feasible (not practical possible, or probable))
2. potential may exist for biological control	;
3. biological control feasible	0
DENA KATM KEFJ SITK WRST	I
0	•
Total Possible 10	0
Total by park DENA KATM KEFJ SITK WRST	I
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.

	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

Species Ranking Summary Form for Matricaria discoidea

^aPreviously 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 o	r sites re	gularly	disturbe	d -10
	b.	found in sites disturbed within the last 10 years	•				1
	c.	found in midsuccessional sites disturbed 11-50 y	ears befo	ore prese	nt (BP)		2
	d.	found in late-successional sites disturbed 51-100	years B	P			5
	e.	found in high-quality natural areas with no know	n major	disturba	nce for	100 year	s 10
			DENA	KATM	KEFJ	SIŤK	WRST
			-10	-10	-10		-10
2.	Ab	undance					
	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

						79)
	b.	areal extent of populations					1
		(1) <5 ha (2) 5-10 ha					1 2
		(2) $5-10$ ha (3) $11-50$ ha					3
		(4) >50 ha					5
			DENA	KATM	KEFJ	SITK	WRST
2			1	1	1		1
3.		fect on natural processes and character plant species having little or no effect					0
	a. b.	delays establishment of native species in disturbe	ed sites u	n to 10 v	ears		03
	с.	long-term (more than 10 years) modification or r					7
	d.	invades and modifies existing native communitie					10
	e.	invades and replaces native communities					15
			-	KATM		SITK	WRST
4.	Sic	gnificance of threat to park resources	0	0	0		0
4.	a.	threat to secondary resources negligible					0
	ц. b.	threat to areas' secondary (successional) resource	es				2
	c.	endangerment to areas' secondary (successional)		S			4
	d.	threat to areas' primary resources					8
	e.	endangerment to areas' primary resources	DEMA			OTT I	10
			DENA 0	KATM 0	<u>KEFJ</u> 0	SITK	WRST 0
5.	Le	vel of visual impact to an ecologist	0	0	0		0
5.	a.						0
	b.	minor visual impact on natural landscape					2 4
	c.	significant visual impact on natural landscape					4
	d.	major visual impact on natural landscape	DENIA		VEEL	OTTR	5
			<u>DENA</u> 0	KATM 0	<u>KEFJ</u> 0	SITK	WRST 0
Total Poss	ible		0	0	0		50
Total by p			DENA	KATM	KEFJ	SITK	WRST
			-4	-4	-4		-4
B. In		Ability of Species to Become a Pest					
1.		bility to complete reproductive cycle in area of con	cern				0
	a. b.	not observed to complete reproductive cycle observed to complete reproductive cycle					0 5
	υ.	observed to complete reproductive cycle	DENA	KATM	KEFI	SITK	
			5	5	5		5
2.	Mo	ode of reproduction					
	a.	1 550					1
		reproduces only by seeds					3
	c.	reproduces vegetatively and by seed	DENA	KATM	KEEI	SITK	5 WRST
			<u>DENA</u> 3	<u> </u>	<u>KEFJ</u> 3	SIIK	3
			5	2	2		2

80								
	3.	Ve	getative reproduction					
		a.	no vegetative reproduction					0
		b.	vegetative reproduction rate maintains populatio	n				1
		c.	vegetative reproduction rate results in moderate	increase	in popula	ation siz	ze	3
		d.	vegetative reproduction rate results in rapid increased	ease in po	opulation	n size		5
				-	KATM		SITK	WRST
				0	0	0		0
	4.	Fre	equency 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
			2	DENA	KATM	KEFJ	SITK	WRST
				5	5	5		5
	5.	Nu	umber 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.	Di	spersal 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.	Ge	rmination requirements					
			requires open soil and disturbance to germinate					0
		b.	can germinate in vegetated areas but in a narrow	range or	in speci	al cond	itions	3
		c.	can germinate in existing vegetation in a wide ra	nge of co	onditions	5		5
				DENA	KATM	KEFJ	SITK	WRST
				0	0	0		0
	8.	Co	mpetitive 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.	Kn	own 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 o	ther habi	tats and	climate	zones	1
		c.	known to cause low impact in natural areas in sin	milar hab	itats and	l climate	e zones	3
		d.	known to cause moderate impact in natural areas	s in simila	ar habita	ts and c	limate z	ones 5
		e.	known to cause high impact in natural areas in si	imilar hal	bitats and	d climat	te zones	10
				DENA	KATM	KEFJ	SITK	WRST
				0	0	0		0
Total I	Possi	ble						50
Total b	ру ра	ırk		DENA	KATM	KEFJ	SITK	WRST
				21	21	21		21
II. Fe	asibi	lity	of Control or Management					
A.	Ab	und	ance Within Park					

A. Abundance Within Park

			81	l
	 Number of populations (stands) several; widespread and dense intermediate number; patchy 			1 3
	c. few; scattered	DENA KATM	<u>KEFJ SITK</u> 5	5 <u>WRST</u> 1
	 Areal extent of populations a. > 50 b. 11-50 ha 	1 1	5	1
	c. $5-10$ d. $< 5ha$			2 3 5
		DENA KATM	<u>KEFJ SITK</u> 5	WRST 5
В.	Ease of Control 1. Seed banks			
	a. seeds remain viable in the soil for at least 3 yearb. seeds remain viable in the soil for 2-3 yearsc. seeds viable in the soil for 1 year or less	rs		0 5 15
		DENA KATM	<u>KEFJ SITK</u> 0	WRST 0
	2. Vegetative regenerationa. any plant part is a viable propaguleb. sprouts from roots or stumps		-	0 5
	c. no resprouting following removal of abovegrou	nd growth <u>DENA KATM</u> 10 10	<u>KEFJ SITK</u> 10	10 <u>WRST</u> 10
	 3. Level of effort required a. repeated chemical or mechanical control measu b. one or two chemical or mechanical treatments r c. can be controlled with one chemical treatment 	-		1 5 10
	d. effective control can be achieved with mechanic	DENA KATM		15 <u>WRST</u>
	4. Abundance and proximity of propagules near parka. many sources of propagules near park	5 5	15	5
	 a. many sources of propagules near park b. few sources of propagules near park, but these a c. few sources of propagules near park, but these a d. no sources of propagules are in dose proximity 			0 5 10 15
		DENA KATM	<u>KEFJ SITK</u> 0	WRST 0
C.	Side Effects of Chemical/Mechanical Control Measures1. control measures will cause major impacts to comm2. control measures will cause moderate impacts to co	s nunity mmunity	0	0 5
	3. control measures will have little or no impact on con	mmunity <u>DENA KATM 15</u> 15 15	<u>KEFJ SITK</u> 15	15 <u>WRST</u> 15
D.	Effectiveness of Community Management1. the following options are not effective2. cultural techniques (burning, flooding) can be used3. routine management of community or restoration or			0 5 cribed
		_	—	

burning, flooding, controlled disturbance) effectively	controls	s target s	pecies		10
	DENA	KATM	KEFJ	SITK	WRST
	10	10	10		10
E. Biological Control					
1. biological control not feasible (not practical possible	, or prob	able)			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

	Significance of In	npact			
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	14	36	50	65	High
KATM	np ^a	_b	-	-	-
KEFJ	np	-	-	-	-
SITK	np	-	-	-	-
WRST	np	-	-	-	-

^aNot yet collected in this park unit. ^bNo 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
- e. found in high-quality natural areas with no known major disturbance for 100 years 10 <u>DENA KATM KEFJ SITK WRST</u> 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			

00			
	3.	Effect on natural processes and character	
		a. plant species having little or no effect	0
		b. delays establishment of native species in dist	curbed sites up to 10 years 3
		c. long-term (more than 10 years) modification	· ·
		d. invades and modifies existing native commu	
		e. invades and replaces native communities	15
		1	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) reso	urces 2
		c. endangerment to areas' secondary (successio	
		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 landscap	
		d. major visual impact on natural landscape	5
		5 1 1	DENA KATM KEFJ SITK WRST
			5
Total P	ossi	ble	50
Total b	y pa	rk	DENA KATM KEFJ SITK WRST
	-		14
В.	Inr	ate 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 mea	ans 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 popul	
		c. vegetative reproduction rate results in moder	
		d. vegetative reproduction rate results in rapid	
			DENA KATM KEFJ SITK WRST
			0

				87	
4.	Frequency of sexual reproduction for mature planta. almost never reproduces sexually in areab. once every five or more yearsc. every other yeard. one or more times a year	DENA	KATM KEFJ	SITK	0 1 3 5 WRST
		5	KATWI KLI J	SIIK	<u> </u>
5.	Number of seeds per plant a. few (0-10) b. moderate (11-1,000) c. many-seeded (>1,000)	DENA 5	KATM KEFJ	SITK	1 3 5 WRST
6.	Dispersal ability	5			
	a. little potential for long-distance dispersalb. great potential for long-distance dispersal	DENA	KATM KEFJ	SITK	0 5 WRST
		$\frac{DENA}{5}$	KATWI KLI'J	SIIK	WKSI
7.	Germination requirementsa. requires open soil and disturbance to germinateb. can germinate in vegetated areas but in a narrowc. can germinate in existing vegetation in a wide rational structure	inge of co		itions <u>SITK</u>	0 3 5 WRST
8.	Competitive abilitya. poor competitor for limiting factorsb. moderately competitive for limiting factorsc. highly competitive for limiting factors	DENA 3	KATM KEFJ	SITK	0 3 5 WRST
9.	 Known level of impact in natural areas a. not known to cause impacts in any other natural b. known to cause impacts in natural areas, but in o c. known to cause low impact in natural areas in sit d. known to cause moderate impact in natural areas e. known to cause high impact in natural areas in sit 	area other habi milar hab s in simila imilar hal	itats and climate ar habitats and c	e zones limate zo	0 1 3 ones 5 10 WRST
l Possil l by pa			KATM KEFJ	SITK	50 <u>WRST</u>

Total Total

88

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

л.						
	1. N	Number of populations (stands)				
	а	. several; widespread and dense				1
	t	b. intermediate number; patchy				3
		e. few; scattered				5
	-		DFNA	KATM KEFJ	SITK	WRST
			5		DIIK	WIRD I
	2	vest sutset of a secolations	5			
		Areal extent of populations				1
		n. >50				1
	-	o. 11-50 ha				2
	С	e. 5-10				3
	Ċ	l. < 5ha				5
			DENA	KATM KEFJ	SITK	WRST
			5			
в	Ease	of Control	-			
Ъ.		Seed banks				
						0
		. seeds remain viable in the soil for at least 3 years	5			0
		b. seeds remain viable in the soil for 2-3 years				5
	С	e. seeds viable in the soil for 1 year or less				15
				KATM KEFJ	SITK	WRST
			0			
	2. V	Vegetative regeneration				
	а	any plant part is a viable propagule				0
	b	b. sprouts from roots or stumps				5
		. no resprouting following removal of abovegroun	d growth	1		10
		. no resprouding rono and rono ar or upo regroun	-	KATM KEFJ	SITK	WRST
			10		DIIK	WR01
	2 т	and of offert required	10			
		evel of effort required		1		1
		. repeated chemical or mechanical control measure	-	ea		1
	ť	o. one or two chemical or mechanical treatments re	quired			5
	C	c. can be controlled with one chemical treatment				10
	C	I. effective control can be achieved with mechanica	al treatm	ent		15
			DENA	KATM KEFJ	SITK	WRST
			15			
	4. <i>A</i>	Abundance and proximity of propagules near park				
		. many sources of propagules near park				0
		b. few sources of propagules near park, but these ar	e readily	dispersed		5
			•	1		10
			e not rea	uny unspensed		
	C	l. no sources of propagules are in dose proximity	DENIA		OTT	15
			DENA	KATM KEFJ	SITK	WRST
			0			
C.	Side	Effects of Chemical/Mechanical Control Measures				
	1. c	control measures will cause major impacts to commu	inity			0
	2. c	control measures will cause moderate impacts to con	nmunity			5
		control measures will have little or no impact on con	-			15
			-	KATM KEFJ	SITK	WRST
			15		~~	
D	Effec	rtiveness of Community Management	15			

- D. Effectiveness of Community Management1. the following options are not effective

				89)
2.	cultural techniques (burning, flooding) can be used t	o control	target species		5
3.	routine management of community or restoration or			g., presc	cribed
	burning, flooding, controlled disturbance) effectively	y controls	s target species		10
		DENA	KATM KEFJ	SITK	WRST
		10			
E. Bi	ological 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
	C C	DENA	KATM KEFJ	SITK	WRST
		0			
Total Poss	ible				100
Total by pa	ark	DENA	KATM KEFJ	SITK	WRST
		60			

Species Ranking Summary Form for Melilotus officinalis

	Significance of In	npact			
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 ^c	-		-	High ^d
SITK	np	-	-	-	-
WRST	8	36	44	41	High

^aNot yet collected in this park unit.

^bNo data.

^cFound outside park but likely to invade park.

^dMonitoring 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
 - c. found in midsuccessional sites disturbed 11-50 years before present (BP)
 - d. found in late-successional sites disturbed 51-100 years BP
 - e. found in high-quality natural areas with no known major disturbance for 100 years 10

DENA KATM KEFJ SITK WRST

1

1

2

2.	Abundance			
2.	a. number of populations (stands)			
	(1) few; scattered (<5)			1
	(2) intermediate number; patchy (6-10)			3
	(3) several; widespread and dense (>10)			5
	(3) several, widespread and dense (>10)	DENA KATM KEFJ	SITK	WRST
				1
	b. areal extent of populations			1
	(1) $<$ 5 ha			1
	(1) (2)			
	(3) 11-50 ha			2 3 5
	(4) >50 ha			5
	(1) > 50 ht	DENA KATM KEFJ	SITK	WRST
				1
3.	Effect on natural processes and character			1
	a. plant species having little or no effect			0
	b. delays establishment of native species in disturb	bed sites up to 10 years		3
	c. long-term (more than 10 years) modification or			7
	d. invades and modifies existing native communiti			10
	e. invades and replaces native communities			15
	······································	DENA KATM KEFJ	SITK	WRST
				0
4. Signifi	cance of threat to park resources			
C	a. threat to secondary resources negligible			0
	b. threat to areas' secondary (successional) resourc	es		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 Possi			~ ~ ~ ~ ~	50
Total by pa	urk	DENA KATM KEFJ	SITK	WRST
D I				8
	hate Ability of Species to Become a Pest			
1.	Ability to complete reproductive cycle in area of con	ncern		0
	a. not observed to complete reproductive cycle			0
	b. observed to complete reproductive cycle	DENIA VATNA VEDI	CITU/	5 WDST
		DENA KATM KEFJ	SITK	WRST
				5

2	Mada of some dustion		91	
2.	Mode of reproductiona. reproduces almost entirely by vegetative meansb. reproduces only by seedsc. reproduces vegetatively and by seed			1 3 5
		DENA KATM KEFJ	SITK	WRST
3.	 Vegetative reproduction a. no vegetative reproduction b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate d. vegetative reproduction rate results in rapid increase 	increase in population siz		3 0 1 3 5 <u>WRST</u> 0
4.	Frequency of sexual reproduction for mature planta. almost never reproduces sexually in areab. once every five or more yearsc. every other yeard. one or more times a year	DENA KATM KEFJ	SITK	0 1 3 5 WRST
_			<u> </u>	5
5.	Number of seeds per plant a. few (0-10) b. moderate (11-1,000) c. many-seeded (>1,000)	DENA KATM KEFJ	SITK	1 3 5 <u>WRST</u> 5
6.	Dispersal abilitya. little potential for long-distance dispersalb. great potential for long-distance dispersal	DENA KATM KEFJ	SITK	0 5 WRST
7.	Germination requirementsa. requires open soil and disturbance to germinateb. can germinate in vegetated areas but in a narrowc. can germinate in existing vegetation in a wide ratio		tions SITK	5 0 3 5 <u>WRST</u> 0
8.	Competitive abilitya. poor competitor for limiting factorsb. moderately competitive for limiting factorsc. highly competitive for limiting factors	DENA KATM KEFJ	SITK	0 3 5 <u>WRST</u> 3

n	2
9	4

92							
	9.	Kn	own level of impact in natural areas				
		a.	not known to cause impacts in any other natural a	irea			0
		b.	known to cause impacts in natural areas, but in ot		tats and climate	zones	1
		с.	known to cause low impact in natural areas in sin				3
		с. d.	known to cause moderate impact in natural areas				
							10
		e.	known to cause high impact in natural areas in sin				
				DENA	KATM KEFJ	SITK	WRST
							10
Total P							50
Total b	y pa	rk		DENA	KATM KEFJ	SITK	WRST
							36
II. Fea	isibi	lity	of Control or Management				
A.	Ab	und	ance Within Park				
	1.	Nu	mber 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.	Ar	eal extent of populations				U
	2.		> 50				1
			11-50 ha				2
			5-10				3
		с.					5
		d.		DENIA		OITIZ	-
				DENA	KATM KEFJ	SITK	WRST
р	г						5
В.			f Control				
	1.	See	ed banks				
		a.	5				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.	Ve	getative regeneration				
			any plant part is a viable propagule				0
		b.	sprouts from roots or stumps				5
		c.	no resprouting following removal of aboveground	1 growth	1		10
				•	KATM KEFJ	SITK	WRST
							5
	3.	Ιe	vel of effort required				5
	5.			a roquir	ad		1
		a. h	repeated chemical or mechanical control measure		Ju		1
			one or two chemical or mechanical treatments rec	lanea			5
		с.	can be controlled with one chemical treatment	1 4	1		10
		d.	effective control can be achieved with mechanica			010017	15
				DENA	KATM KEFJ	SITK	WRST

						93	
	4.	Ab	undance and proximity of propagules near park				
		a.	many sources of propagules near park				0
		b.	few sources of propagules near park, but these ar	•	·		5
		c.	few sources of propagules near park, but these ar	e not rea	dily dispersed		10
		d.	no sources of propagules are in dose proximity				15
				DENA	KATM KEFJ	SITK	WRST
~	~						0
C.			ffects of Chemical/Mechanical Control Measures				
			ntrol measures will cause major impacts to commu				0
			ntrol measures will cause moderate impacts to com				5
	3.	cor	ntrol measures will have little or no impact on com	•			15
				<u>DENA</u>	KATM KEFJ	SITK	WRST
D							15
D.			veness of Community Management				0
			following options are not effective	. 1	, , ·		0
			tural techniques (burning, flooding) can be used to				5
	3.		tine management of community or restoration or p		· ·	g., presc	
		bui	rning, flooding, controlled disturbance) effectively			OTTV	10 WDST
				DENA	KATM KEFJ	SITK	WRST 10
E.	Bio	logi	ical Control				10
E.	1.	-	logical control not feasible (not practical possible,	or prob	able)		0
	1. 2.		cential may exist for biological control	or prob	abic)		5
	2. 3.		logical control feasible				10
	5.	010		DFNA	KATM KEFJ	SITK	WRST
						DIIK	0
Total P	Possil	ble					100
Total b				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.

	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	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 Summary Form for Plantago major

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

- b. found in sites disturbed within the last 10 years
- c. found in midsuccessional sites disturbed 11-50 years before present (BP)
- d. found in late-successional sites disturbed 51-100 years BP
- 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	KEEI	SITK	WRST
		5	1	1	1	5
	b. areal extent of populations	0	1	1	1	0
	(1) <5 ha					1
	(1) $<$ 10 ha (2) 5-10 ha					1
						2
	(3) 11-50 ha					3
	(4) > 50 ha	DENI			amu	C
		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 disturb	ed sites u	p to 10 y	vears		3
	c. long-term (more than 10 years) modification or	retardatio	on of suce	cession		7

2

96								
		d.	invades and modifies existing native communities invades and replaces native communities	S				10 15
		e.	invades and replaces native communities	DENA	KATM	KEFI	SITK	WRST
				$\frac{DDIMI}{0}$	0	0	0	0
	4.	Sig	gnificance of threat to park resources					
		a.	threat to secondary resources negligible					0
		b.	threat to areas' secondary (successional) resource					2
		с. d	endangerment to areas' secondary (successional) : threat to areas' primary resources	resource	S			4 8
		d. e.	endangerment to areas' primary resources					8 10
		U.	endungerment to areas primary resources	DENA	KATM	KEFJ	SITK	WRST
				0	0	0	0	0
	5.	Le	vel of visual impact to an ecologist					
		a.	little or no visual impact on landscape					0
		b.	minor visual impact on natural landscape					2
		c. d.	significant visual impact on natural landscape major visual impact on natural landscape					4 5
		u.	major visual impact on natural landscape	DENA	KATM	KEFI	SITK	WRST
				0	0	0	0	0
Total P	ossi	ible						50
Total b	y pa	ark		DENA	KATM		SITK	WRST
P				7	3	3	3	7
В.			Ability of Species to Become a Pest bility to complete reproductive cycle in area of cond	orn				
	1.	a.	not observed to complete reproductive cycle in area of cond not observed to complete reproductive cycle					0
		b.	observed to complete reproductive cycle					5
			I I I I I I I I I I I I I I I I I I I	DENA	KATM	KEFJ	SITK	WRST
				5	5	5	5	5
	2.	Mo	ode of reproduction					
		а. ь	reproduces almost entirely by vegetative means					1
		b. с.	reproduces only by seeds reproduces vegetatively and by seed					3 5
		U.	reproduces vegetatively and by seed	DENA	KATM	KEFJ	SITK	WRST
				3	3	3	3	3
	3.	Ve	getative reproduction					
		a.	no vegetative reproduction					0
		b.	vegetative reproduction rate maintains population					1
		c. d.	vegetative reproduction rate results in moderate in vegetative reproduction rate results in rapid incre-				<u>ze</u>	35
		u.	vegetative reproduction rate results in rapid life	-	KATM		SITK	WRST
				0	0	0	0	0

					97	1
4.	Frequency of sexual reproduction for mature planta. almost never reproduces sexually in areab. once every five or more yearsc. every other yeard. one or more times a year					0 1 3 5
		DENA	KATM		SITK	WRST
5.	Number of seeds per plant	5	5	5	5	5
5.	a. few (0-10)					1
	b. moderate (11-1,000)					3
	c. many-seeded (>1,000)	DENIA	KATM	VEEI	SITK	5 WRST
		<u>DENA</u> 3	<u> </u>	<u>KEFJ</u>	3	<u> </u>
6.	Dispersal ability	-	-	-	-	-
	a. little potential for long-distance dispersal					0
	b. great potential for long-distance dispersal	DENIA	VATM	VEEI	SITV	5 WDST
		<u>DENA</u> 5	KATM 5	<u>KEFJ</u> 5	<u>SITK</u> 5	WRST 5
7.	Germination requirements	5	5	5	5	5
	a. requires open soil and disturbance to germinate					0
	b. can germinate in vegetated areas but in a narrow				itions	3
	c. can germinate in existing vegetation in a wide ra	-			CITU.	5
		<u>DENA</u> 0	KATM 0	<u>KEFJ</u> 0	<u>SITK</u> 0	WRST 0
8.	Competitive ability	0	0	0	0	0
	a. poor competitor for limiting factors					0
	b. moderately competitive for limiting factors					3
	c. highly competitive for limiting factors	5511			armer	5
		DENA 3	KATM 3	<u>KEFJ</u> 3	<u>SITK</u>	WRST 3
9.	Known level of impact in natural areas	3	3	3	3	3
).	a. not known to cause impacts in any other natural	area				0
	b. known to cause impacts in natural areas, but in o		tats and	climate	zones	1
	c. known to cause low impact in natural areas in sin					3
	d. known to cause moderate impact in natural areas					
	e. known to cause high impact in natural areas in si					10
			KATM		SITK	WRST
Possi	hle	0	0	0	0	0 50
by pa		DENA	KATM	KEFJ	SITK	WRST
2 F -		24	24	24	24	24

Total Total

98

- II. Feasibility of Control or Management
 - Α.

	Feasibility of Control or Management							
А.	Ab	undance Within Park						
	1.	Number of populations (stands)						
		a. several; widespread and dense					1	
		b. intermediate number; patchy					3	
		c. few; scattered					5	
			DENA	KATM	KEFI	SITK	WRST	
			3	5	5	5	3	
	2.	Areal extent of populations	5	5	5	5	5	
	2.	a. > 50					1	
		b. 11-50 ha					2	
		c. 5-10					3	
		d. < 5ha					5	
		u. < Jila	DENIA		VEEL	SITV		
			DENA 5	KATM 5	<u>KEFJ</u> 5	<u>SITK</u>	WRST	
п	г		3	3	3	5	5	
В.		se of Control						
	1.	Seed banks					0	
		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	
			-	KATM		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	d growth	l			10	
			DENA	KATM	KEFJ	SITK	WRST	
			5	5	5	5	5	
	3.	Level of effort required						
		a. repeated chemical or mechanical control measure	s require	ed			1	
		b. one or two chemical or mechanical treatments rec	quired				5	
	 c. can be controlled with one chemical treatment d. effective control can be achieved with mechanical treatment 						10	
							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	e readily	disperse	ed		5	
		c. few sources of propagales near park, but these are	•	-			10	
		d. no sources of propagules are in dose proximity	e not rea	any ang	,eisea		15	
		a. The sources of propugates are in dose proximity	DFNA	KATM	KFFI	SITK	WRST	
			$\frac{DLIA}{0}$	0	0	0	0	
С	Sid	le Effects of Chemical/Mechanical Control Measures	0	U	v	0	U	
С.	1. control measures will cause major impacts to community 0							
	2.	control measures will have little energy impacts to com	intuinty				5	

3. control measures will have little or no impact on community

- DENA KATM KEFJ SITK WRST 15 15 15 15 D. Effectiveness of Community Management 1. the following options are not effective
 - 0

15

					99)
2.	cultural techniques (burning, flooding) can be used t	o control	target sp	pecies		5
3.	routine management of community or restoration or preservation practices (e.g., prescrib					cribed
	burning, flooding, controlled disturbance) effectively	, controls	s target s	pecies		10
		DENA	KATM	KEFJ	SITK	WRST
		10	10	10	10	10
E. Bie	ological Control					
1.	biological control not feasible (not practical possible	, or prob	able)			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 pa	urk	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.

	Significance of Impact					
Park Unit	Current Level of Impact	Innate Ability to Become a Pest	TotalFeasibility of Control(0-100)(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	

Species Ranking Summary Form for Polygonum aviculare

^aNot yet collected in this park unit.

^bNo 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
 - c. found in midsuccessional sites disturbed 11-50 years before present (BP)
 - d. found in late-successional sites disturbed 51-100 years BP
 - 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

1

2

102						
	ł	b. areal extent of populations				
		(1) <5 ha				1
		(1) (2) ha (2) 5-10 ha				2
		(3) 11-50 ha				3
		(4) > 50 ha				5
			DENA	KATM KEFJ	SITK	WRST
			1	1		1
	3. I	Effect on natural processes and character				
		a. plant species having little or no effect				0
		 b. delays establishment of native species in disturbe 	d sitas u	\mathbf{r} to 10 years		3
		· · ·				3 7
		. long-term (more than 10 years) modification or r		on of succession		
	(I. invades and modifies existing native communitie	s			10
	e	e. invades and replaces native communities				15
			DENA	KATM KEFJ	SITK	WRST
			0	0		0
	4. 5	Significance of threat to park resources				
		. threat to secondary resources negligible				0
		b. threat to areas' secondary (successional) resource	e.			2
		•	resource	28		4
		l. threat to areas' primary resources				8
	e	e. endangerment to areas' primary resources				10
			DENA	KATM KEFJ	SITK	WRST
			0	0		0
	5. I	Level of visual impact to an ecologist				
	8	a. little or no visual impact on landscape				0
	ł	b. minor visual impact on natural landscape				2
		e. significant visual impact on natural landscape				4
		l. major visual impact on natural landscape				5
	,	i. major visual impact on natural fandscape	DENIA	VATM VEEL	OTTV	-
				KATM KEFJ	SITK	WRST
			0	0		0
Total Po						50
Total by	y parl	Σ.	DENA	KATM KEFJ	SITK	WRST
			-8	-8		-8
В.	Inna	te Ability of Species to Become a Pest				
		Ability to complete reproductive cycle in area of con-	cern			
		a. not observed to complete reproductive cycle				0
						5
	l	b. observed to complete reproductive cycle	DENIA		OTTIZ	
			-	KATM KEFJ	SIIK	WRST
			5	5		5
	2. 1	Mode of reproduction				
	6	n. reproduces almost entirely by vegetative means				1
	ł	b. reproduces only by seeds				3
		e. reproduces vegetatively and by seed				5
		1	DENA	KATM KEFJ	SITK	WRST
			3	3	5111	3
			5	5		5

				103	;
3.	Vegetative reproduction				
	a. no vegetative reproduction				0
	b. vegetative reproduction rate maintains popula				1
	c. vegetative reproduction rate results in modera			ze	3
	d. vegetative reproduction rate results in rapid in			~~~~	5
			KATM KEFJ	SITK	WRST
4		0	0		0
4.	Frequency of sexual reproduction for mature plan	t			0
	a. almost never reproduces sexually in area				0
	b. once every five or more years				1
	c. every other yeard. one or more times a year				3 5
	u. one of more times a year	DENA	KATM KEFJ	SITK	WRST
		5	5	SIIK	5
5.	Number of seeds per plant	5	5		5
	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
			KATM KEFJ	SITK	WRST
7		5	5		5
7.	Germination requirements	to			0
	a. requires open soil and disturbance to germinab. can germinate in vegetated areas but in a narr		in special condi	itions	0 3
	c. can germinate in existing vegetation in a wide				5
	e. can germinate in existing vegetation in a wrat		KATM KEFJ	SITK	WRST
		$\frac{D B R R R}{0}$	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 natu				0
	b. known to cause impacts in natural areas, but i				1
	c. known to cause low impact in natural areas in				3
	d. known to cause moderate impact in natural ar				
	e. known to cause high impact in natural areas in				10 WPST
		$\frac{\text{DENA}}{0}$	KATM KEFJ 0	SITK	<u>WRST</u> 0
Total Possi	ble	U	U		50
Total by pa		DENA	KATM KEFJ	SITK	WRST
roun oy pu		$\frac{DLIM}{21}$	21	~11IX	21
II. Feasibi	ity 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
				KATM KEFJ	SITK	<u>WRST</u>
	2.	A real extent of populations	5	5		5
	Ζ.	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
В.		se of Control				
	1.	Seed banks				0
		a. seeds remain viable in the soil for at least 3 yearsb. seeds remain viable in the soil for 2-3 years	•			0 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	1			5
		c. no resprouting following removal of abovegroun	-	I KATM KEFJ	SITK	10 WRST
			10	10	SIIK	<u>10</u>
	3.	Level of effort required	10	10		10
		a. repeated chemical or mechanical control measure	es requir	ed		1
		b. one or two chemical or mechanical treatments re-				5
		c. can be controlled with one chemical treatment	_			10
		d. effective control can be achieved with mechanica			OTTR	15 WDGT
			<u>DENA</u> 15	KATM KEFJ 15	SITK	<u>WRST</u> 15
	4.	Abundance and proximity of propagules near park	15	15		15
	ч.	a. many sources of propagules near park				0
		b. few sources of propagules near park, but these ar	e readily	dispersed		5
		c. few sources of propagules near park, but these ar	e not rea	dily dispersed		10
		d. no sources of propagules are in dose proximity				15
					SITK	
C	C :-	a Effects of Chamical Machanical Control Macaura	0	0		0
C.	510 1.	le Effects of Chemical/Mechanical Control Measures control measures will cause major impacts to commu	nity			0
	2.	control measures will cause major impacts to commu	•			5
		control measures will have little or no impact on com	-			15
		L. L	-	KATM KEFJ	SITK	WRST
			15	15		15
D.		ectiveness of Community Management				_
	1.	the following options are not effective		, , ·		0
	2.	cultural techniques (burning, flooding) can be used to			a	5 vribad
	3.	routine management of community or restoration or p	Jieserval	non practices (e.	g., prese	mea

burning, flooding, controlled disturbance) effectively controls target species 10 $\begin{array}{cccccccccccccccccccccccccccccccccccc$			105	
Image: Image in the image is the image i	burning, flooding, controlled disturbance) effectively control	ols target species		10
E. Biological Control 0 1. biological control not feasible (not practical possible, or probable)02. potential may exist for biological control53. biological control feasible10DENA KATM KEFJ SITK WRST00Total Possible100	DEN	A KATM KEFJ	SITK	WRST
1.biological control not feasible (not practical possible, or probable)02.potential may exist for biological control53.biological control feasible10DENA KATM KEFJ SITK WRST 0000Total Possible	10	10		10
2. potential may exist for biological control53. biological control feasible10DENA KATM KEFJSITK00Total Possible100	E. Biological Control			
2. potential may exist for biological control53. biological control feasible10DENA KATM KEFJSITK00Total Possible100	1. biological control not feasible (not practical possible, or pro	bable)		0
3. biological control feasible10 $DENA KATM KEFJ SITK WRST$ 000Total Possible100				5
DENA KATM KEFJSITKWRST000Total Possible100				10
Total Possible 100		A KATM KEFJ	SITK	WRST
	0	0		0
Total by park <u>DENA KATM KEFJ SITK WRST</u>	Total Possible			100
	Total by park DEN	A KATM KEFJ	SITK	WRST
60 60 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.

	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	-	-	-	-	

Species Ranking Summary Form for Polygonum cuspidatum

^aNot yet collected in this park unit.

^bNo data.

108 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 WRST SITK KATM KEFJ 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 WRST SITK 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 invades and replaces native communities e. 15 SITK WRST DENA KATM KEFJ 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 WRST DENA KATM KEFJ SITK 4

	_	-			109)
	5.	a. b. c.	vel of visual impact to an ecologist little or no visual impact on landscape minor visual impact on natural landscape significant visual impact on natural landscape			0 2 4
		d.	major visual impact on natural landscape	DENA KATM KEFJ	<u>SITK</u>	5 WRST
Total Po Total by				DENA KATM KEFJ	SITK	50 WRST
В	Inn	ate	Ability of Species to Become a Pest		19	
	1.		ility to complete reproductive cycle in area of con-	cern		
		a. b.	not observed to complete reproductive cycle observed to complete reproductive cycle			0 5
				DENA KATM KEFJ	SITK	WRST
	า	Ма	ada of reproduction		5	
	2.	a.	ode of reproduction reproduces almost entirely by vegetative means			1
			reproduces only by seeds			3
		c.	reproduces vegetatively and by seed			5
				DENA KATM KEFJ	SITK	WRST
	3.	Ve	getative reproduction		5	
	5.		no vegetative reproduction			0
		b.	vegetative reproduction rate maintains population	1		1
		c.	vegetative reproduction rate results in moderate i		ze	3
		d.	vegetative reproduction rate results in rapid incre			5
				DENA KATM KEFJ	SITK	WRST
	4	Fre	equency of sexual reproduction for mature plant		5	
	т.	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	<u>SITK</u> 5	WRST
	5.	Nu	mber of seeds per plant		5	
		a.	few (0-10)			1
		b.	moderate (11-1,000)			3
		c.	many-seeded (>1,000)			5
				DENA KATM KEFJ	<u>SITK</u> 5	WRST
	6.	Dis	spersal ability		5	
		a.	little potential for long-distance dispersal			0
		b.	great potential for long-distance dispersal			5
				DENA KATM KEFJ	SITK	WRST
					5	

110				
7.	1			
	a. requires open soil and disturbance to germinate			0
	b. can germinate in vegetated areas but in a narrow		ditions	3
	c. can germinate in existing vegetation in a wide rar	-		5
		DENA KATM KEFJ	SITK 3	WRST
8.	Competitive ability		3	
0.	a. poor competitor for limiting factors			0
	b. moderately competitive for limiting factors			3
	c. highly competitive for limiting factors			5
	8 5 1	DENA KATM KEFJ	SITK	WRST
			5	
9.	Known level of impact in natural areas			
	a. not known to cause impacts in any other natural a	area		0
	b. known to cause impacts in natural areas, but in ot			1
	c. known to cause low impact in natural areas in sin			3
	d. known to cause moderate impact in natural areas			
	e. known to cause high impact in natural areas in sin			
		DENA KATM KEFJ		WRST
Total Poss	iblo		5	50
Total by p		DENA KATM KEF	SITK	WRST
rotar by p	ark	DENA KATWI KEU	43	WK51
II. Feasib	ility of Control or Management		45	
	oundance 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		WRST
			5	
2.	Areal extent of populations			1
	a. > 50			1
	b. 11-50 ha c. 5-10			2
	c. 5-10 d. < 5ha			3 5
	u. < Sha	DENA KATM KEFJ	SITK	WRST
			5	
B. Ea	use of Control		÷	
1.				
	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		WRST
			15	

2	x y , ,• ,•		111	
2.				0
	a. any plant part is a viable propaguleb. sprouts from roots or stumps			0 5
	 c. no resprouting following removal of aboveground grow 	wth		10
		VA KATM KEFJ	SITK	WRST
			0	<u> </u>
3.	Level of effort required		-	
	a. repeated chemical or mechanical control measures requ	uired		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 trea			15
	DEN	NA KATM KEFJ	SITK	WRST
4			1	
4.	Abundance and proximity of propagules near park			0
	a. many sources of propagules near parkb. few sources of propagules near park, but these are read	lily disported		0 5
	c. few sources of propagules near park, but these are not			10
	 d. no sources of propagules are in dose proximity 	readily dispersed		10
		IA KATM KEFJ	SITK	WRST
			0	
C. Si	de Effects of Chemical/Mechanical Control Measures			
1.	control measures will cause major impacts to community			0
	control measures will cause moderate impacts to communi			5
3.	control measures will have little or no impact on communi-			15
	DEN	NA KATM KEFJ	SITK	WRST
			15	
	ffectiveness of Community Management			0
1.	8 1	rol target analies		0 5
2. 3.			a prese	
5.	burning, flooding, controlled disturbance) effectively contr		g., prese	10
		VA KATM KEFJ	SITK	WRST
			10	
E. B	iological Control			
1.	biological control not feasible (not practical possible, or pr	obable)		0
2.	potential may exist for biological control			5
3.	8			10
	DEN	NA KATM KEFJ	SITK	WRST
Table	9.1.		5	100
Total Poss			CITIZ	100 WDST
Total by p	ark <u>DEN</u>	NA 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

	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 ^c	-		-		
SITK	Î	33	34	67	Low	
WRST	np	-	-	-	-	

^aNot yet collected in this park unit.

^bNo data.

^cFound 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 (1) < 5 ha (2) 5-10 ha 2 (3) 11-50 ha 3 (4) >50 ha 5 DENA KATM KEFJ SITK WRST 2

114				
	3.	Effect on natural processes and character		
		a. plant species having little or no effect		0
		b. delays establishment of native species in disturbe	ed sites up to 10 years	3
		c. long-term (more than 10 years) modification or r	- ·	7
		d. invades and modifies existing native communitie		10
		e. invades and replaces native communities		15
		, i i i i i i i i i i i i i i i i i i i	DENA KATM KEFJ SIT	TK WRST
			0	
4. Sig	nific	ance of threat to park resources	Ŭ	
		a. threat to secondary resources negligible		0
		b. threat to areas' secondary (successional) resource	^S	2
		c. endangerment to areas' secondary (successional)		- 4
		d. threat to areas' primary resources	resources	8
		e. endangerment to areas' primary resources		10
		e. champerment to areas primary resources	DENA KATM KEFJ SIT	TK WRST
			<u>DEIWI KATIWI KELI J</u>	
	5.	Level of visual impact to an ecologist	0	
		a. little or no visual impact to an ecologist		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
		a. major visual impact on natural landscape	DENA KATM KEFJ SIT	-
			4	
Total Po	ossih	le		50
Total by			DENA KATM KEFJ SIT	
rotar oʻj	pui		1	
B.	Inna	te Ability of Species to Become a Pest	-	
2.		Ability to complete reproductive cycle in area of con	cern	
		a. not observed to complete reproductive cycle		0
		b. observed to complete reproductive cycle		5
		······································	DENA KATM KEFJ SIT	TK 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 SIT	TK WRST
			5	
	3.	Vegetative reproduction		
		a. no vegetative reproduction		0
		b. vegetative reproduction rate maintains population	n	1
		c. vegetative reproduction rate results in moderate i		3
		d. vegetative reproduction rate results in rapid incre		5
			DENA KATM KEFJ SIT	TK WRST
			3	

			115	
4.	Frequency of sexual reproduction for mature planta. almost never reproduces sexually in areab. once every five or more yearsc. every other year			0 1 3
	d. one or more times a year	DENA KATM KEFJ	SITK 5	5 WRST
5.	Number of seeds per plant a. few (0-10) b. moderate (11-1,000)			1 3
	c. many-seeded (>1,000)	DENA KATM KEFJ	SITK 3	5 WRST
6.	Dispersal abilitya. little potential for long-distance dispersalb. great potential for long-distance dispersal			0 5
		DENA KATM KEFJ	<u>SITK</u> 5	WRST
7.	Germination requirementsa. requires open soil and disturbance to germinateb. can germinate in vegetated areas but in a narrowc. can germinate in existing vegetation in a wide ra		tions SITK	0 3 5 WRST
8.	Competitive ability		3	
	a. poor competitor for limiting factorsb. moderately competitive for limiting factorsc. highly competitive for limiting factors	DENA KATM KEFJ	SITK	0 3 5 WRST
9.	Known level of impact in natural areas		3	
	 a. not known to cause impacts in any other natural a b. known to cause impacts in natural areas, but in o c. known to cause low impact in natural areas in sir d. known to cause moderate impact in natural areas e. known to cause high impact in natural areas in sir 	ther habitats and climate nilar habitats and climate in similar habitats and cl	e zones limate zo e zones <u>SITK</u>	0 1 3 ones 5 10 <u>WRST</u>
Total Possil Total by pa		DENA KATM KEFJ	1 <u>SITK</u> 33	50 WRST
A. Ab	lity of Control or Managementundance Within ParkNumber of populations (stands)a. several; widespread and dense			1
	b. intermediate number; patchyc. few; scattered	<u>DENA KATM KEFJ</u>	<u>SITK</u> 3	3 5 <u>WRST</u>

0	•					
	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
			<u>2 21 (1 1</u>		5	11101
R	Fa	se of Control			5	
D.	1.	Seed banks				
	1.					0
		a. seeds remain viable in the soil for at least 3 years	5			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 abovegroun	d growth			10
		e. no resprouting rono and removal of abovegroun	•	KATM KEFJ	SITK	WRST
			DLIM		0	WIGI
	2	Lovel of affort required			0	
	3.	Level of effort required	•	.1		1
		a. repeated chemical or mechanical control measure		ed		1
		b. one or two chemical or mechanical treatments re	quired			5
		c. can be controlled with one chemical treatment				10
		d. effective control can be achieved with mechanica	al treatme	ent		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 ar	e readily	dispersed		5
		c. few sources of propagules near park, but these ar	-	-		10
		d. no sources of propagules are in dose proximity		uny unspensed		10
		d. no sources of propagules are in dose proximity	DENA	KATM KEFJ	SITK	WRST
			DENA	KAIM KEFJ		WINDI
C	c :-	a Effects of Chemical/Machanical Control Machan			0	
U.		le Effects of Chemical/Mechanical Control Measures	•			0
	1.	control measures will cause major impacts to commu	-			0
	2.	control measures will cause moderate impacts to con	-			5
	3.	control measures will have little or no impact on com	nmunity			15
			DENA	KATM KEFJ	SITK	WRST
					15	
D.	Eff	ectiveness of Community Management				
	1.	the following options are not effective				0
	2.	cultural techniques (burning, flooding) can be used to	o control	target species		5
	2. 3.	routine management of community or restoration or			a nree	-
	5.	burning, flooding, controlled disturbance) effectively			s., prese	
		ourning, noounig, controlled disturbance) effectively			CITT/	10 WDST
			DENA	KATM KEFJ		WRST
					10	

			117	
E. Biological Control1. biological control not feasible (not practical possible,	or proba	able)		0
2. potential may exist for biological control	I I I I	,		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 1	Ranking	Summary 1	Form for	Rumex	acetosella	

	Significance of In	npact			
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	-	-	-	-

^aNot yet collected in this park unit. ^bNo 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
 b. found in sites disturbed within the last 10 years
 c. found in midsuccessional sites disturbed 11-50 years before present (BP)
 d. found in late-successional sites disturbed 51-100 years BP
 e. found in high-quality natural areas with no known major disturbance for 100 years

	e.	found in high-quality natural areas with no know	n major disturbance for	100 year	s 10
			DENA KATM KEFJ	SITK	WRST
			-10	-10	
	2. A	bundance			
	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
		、 <i>/</i>	DENA KATM KEFJ	SITK	WRST
			1	1	
	3. E	ffect on natural processes and character			
	a.	plant species having little or no effect			0
	b	delays establishment of native species in disturbe	ed sites up to 10 years		3
	c.	long-term (more than 10 years) modification or r	etardation of succession	l	7
	d				10
	e.				15
		-	DENA KATM KEFJ	SITK	WRST
			0	0	
4.	Significar	ce of threat to park resources			
	a.	threat to secondary resources negligible			0
	b	threat to areas' secondary (successional) resource	es		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	

120					
	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
					4
		c. significant visual impact on natural landscape			
		d. major visual impact on natural landscape			5
			DENA KATM KEFJ	SITK	WRST
			0	0	
Total I	Possi	ble			50
Total b			DENA KATM KEFJ	SITK	WRST
Totart	by pe	lik	<u>-8</u>	-8	WKSI
р	Ŧ		-8	-8	
В.		ate Ability of Species to Become a Pest			
	1.		cern		
		a. not observed to complete reproductive cycle			0
		b. observed to complete reproductive cycle			5
		r r r	DENA KATM KEFJ	SITK	WRST
			<u>DERVICING INFINE INFI</u>	5	WIG1
	2		3	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
			<u>DERVE INTERV</u> 5	5	
	2	Venetation normalization	5	5	
	3.	Vegetative reproduction			0
		a. no vegetative reproduction			0
		b. vegetative reproduction rate maintains population	n		1
		c. vegetative reproduction rate results in moderate i	ncrease in population siz	ze	3
		d. vegetative reproduction rate results in rapid incre	ase in population size		5
		5 I I I I I I I I I I I I I I I I I I I	DENA KATM KEFJ	SITK	WRST
			<u>DEMAR INTERIO</u> 3	3	WIG1
			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
		a. one of more ames a year	DENA KATM KEFJ	SITK	WRST
				5	WIND I
	_		5	3	
	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
			<u>DENA KATM KELJ</u> 3	3	11101
	6	Dismonral skility	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	
			-		

				121	
7.	Germination requirements				
	a. requires open soil and disturbance to germinate				0
	b. can germinate in vegetated areas but in a narrow n			tions	3
	c. can germinate in existing vegetation in a wide ran				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 a				0
	b. known to cause impacts in natural areas, but in ot				1
	c. known to cause low impact in natural areas in sim				3
	d. known to cause moderate impact in natural areas				
	e. known to cause high impact in natural areas in sir				10
		DENA	KATM KEFJ	SITK	WRST
			1	1	
Total Possi					50
Total by pa	rk	DENA	KATM KEFJ	SITK	WRST
			27	27	
	lity of Control or Management				
	undance 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			armer	5
		DENA	KATM KEFJ	SITK	WRST
			5	5	
	se of Control				
1.					0
	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	DEMA		OTT IZ	15 WDGT
		DENA	KATM KEFJ	SITK	WRST
			15	15	

122					
	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	1 growth		10
		e. no resproading following felloval of aboveground	DENA KATM KEFJ	SITK	WRST
			<u>DENA KATM KEI5</u> 5	<u>511K</u>	WIGI
	2	Loval of affort required	5	5	
	3.	1			1
		a. repeated chemical or mechanical control measure			1
		b. one or two chemical or mechanical treatments rec	luirea		5
		c. can be controlled with one chemical treatment	1		10
		d. effective control can be achieved with mechanica		~~~~~	15
			DENA KATM KEFJ	SITK	WRST
			15	15	
	4.				
		a. many sources of propagules near park			0
		b. few sources of propagules near park, but these are			5
		c. few sources of propagules near park, but these are	e not readily dispersed		10
		d. no sources of propagules are in dose proximity			15
			DENA KATM KEFJ	SITK	WRST
			0	0	
C.	Sic	de Effects of Chemical/Mechanical Control Measures			
	1.	control measures will cause major impacts to commun	nity		0
		control measures will cause moderate impacts to com			5
		control measures will have little or no impact on com			15
			DENA KATM KEFJ	SITK	WRST
			15	15	
D.	Ef	fectiveness of Community Management			
		the following options are not effective			0
		cultural techniques (burning, flooding) can be used to	control target species		5
		routine management of community or restoration or p		.g., preso	
	0.	burning, flooding, controlled disturbance) effectively			10
		burning, nooding, controlled disturbulee) encenvery	DENA KATM KEFJ	SITK	WRST
			<u>10</u>	10	<u> </u>
E.	Bi	ological Control	10	10	
L.	1.		or probable)		0
	2.	potential may exist for biological control			5
	2. 3.				10
	5.	biological control feasible	DENIA VATM VEEL	OTTV	
			DENA KATM KEFJ	SITK	WRST
T. (1 T)	11.1.	0	0	100
Total F				OTT I	100
Total b	by pa	ark	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. officinalis* 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

	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	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 y	ears befo	ore prese	nt (BP)		2	
	d.	found in late-successional sites disturbed 51-100		-	. ,		5	
	e.	found in high-quality natural areas with no known major disturbance for 100 years 10						
		DENA KATM KEFJ SITK WRS						
			1	1	1	1	1	
2.	Ab	oundance						
	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 distu	urbed sites u	p to 10	years		3
		c. long-term (more than 10 years) modification	or retardatio	on of suc	cession		7
		d. invades and modifies existing native commun					10
		e. invades and replaces native communities					15
		1	DENA	KATM	1 KEFJ	SITK	WRST
			0	0	0	0	0
	4.	Significance of threat to park resources	-	Ū.	Ū.	Ū.	÷
		a. threat to secondary resources negligible					0
		b. threat to areas' secondary (successional) resources	irces				2
		c. endangerment to areas' secondary (successional) resol		• 6			4
		d. threat to areas' primary resources	iur) resource				8
		e. endangerment to areas' primary resources					10
		e. endangerment to areas primary resources	DENA	KATM	IVEEI	SITK	WRST
				-	0	0	$\frac{WKST}{0}$
	5	Lovel of viewel impost to on ecologist	0	0	0	0	0
	5.	Level of visual impact to an ecologist					0
		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	DEM			a mu	5
				KATM		SITK	WRST
			5	5	5	5	5
Total F							50
Total b	by pa	rk		KATM		SITK	WRST
_	_		12	12	12	12	12
В.	Inr	ate 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	1 KEFJ	SITK	WRST
			5	5	5	5	5
	2.	Mode of reproduction					
		a. reproduces almost entirely by vegetative mea	ns				1
		b. reproduces only by seeds					3
		c. reproduces vegetatively and by seed					5
			DENA	KATM	1 KEFJ	SITK	WRST
			3	3	3	3	3
	3.	Vegetative reproduction					
		a. no vegetative reproduction					0
		b. vegetative reproduction rate maintains popula	ation				1
		c. vegetative reproduction rate results in modera		in popul	lation siz	ze	3
		d. vegetative reproduction rate results in rapid in				-	5
				KATM		SITK	WRST
			$\frac{DLIM}{0}$	0	0	0	0
			Ū	0	0	0	0

					127	
4.	 Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year 					0 1 3 5
	u. one of more times a year	DENA	KATM	KEFJ	SITK	WRST
		5	5	5	5	5
5.	Number of seeds per plant					1
	a. few (0-10)b. moderate (11-1,000)					1 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	DFNA	KATM	KFFI	SITK	5 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				itions	3
	c. can germinate in existing vegetation in a wide ra	•			SITK	5 WDST
		$\frac{DENA}{0}$	KATM 0	<u>KEFJ</u>	<u> </u>	<u>WRST</u> 0
8.	Competitive ability	Ū	0	0	0	0
	a. poor competitor for limiting factors					0
	b. moderately competitive for limiting factors					3
	c. highly competitive for limiting factors	DENIA			arter	5
			KATM 3	<u>KEFJ</u> 3	<u>SITK</u> 3	WRST 3
9.	Known level of impact in natural areas	3	3	3	3	3
).	a. not known to cause impacts in any other natural	area				0
	b. known to cause impacts in natural areas, but in o		tats and	climate	zones	1
	c. known to cause low impact in natural areas in sin					3
	d. known to cause moderate impact in natural areas					
	e. known to cause high impact in natural areas in si					10
		DENA 0	KATM 0	<u>KEFJ</u> 0	<u>SITK</u> 0	WRST
Possi	ble	U	U	U	0	0 50
by pa		DENA	KATM	KEFJ	SITK	WRST
• 1		24	24	24	24	24

Total Total

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

л.							
	1. Ni	umber of populations (stands)					
	a.	several; widespread and dense					1
	b.	intermediate number; patchy					3
	с.	few; scattered					5
			DENA	KATM	KEFI	SITK	WRST
			1	3	3	3	1
	2 4		1	5	5	5	1
		real extent of populations					
		> 50					1
	b.						2 3
	с.	5-10					
	d.	< 5ha					5
			DENA	KATM	KEFJ	SITK	WRST
			5	5	5	5	5
в	Fase o	f Control	-	-		-	-
Ъ.		ed banks					
							0
	a.	5)				0
		seeds remain viable in the soil for 2-3 years					5
	c.	seeds viable in the soil for 1 year or less					15
			DENA			SITK	WRST
			15	15	15	15	15
	2. Ve	egetative regeneration					
	a.	any plant part is a viable propagule					0
	b.						5
	υ.	sprouts from roots of stumps					
		1 1	d growth				
	о. с.		-		KEEI	SITK	10
			DENA	KATM		SITK	10 <u>WRST</u>
	c.	no resprouting following removal of abovegroun	-		KEFJ 5	<u>SITK</u> 5	10
	с. 3. Le	no resprouting following removal of abovegroun	DENA 5	KATM 5			10 <u>WRST</u> 5
	c. 3. Le a.	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure	DENA 5 es require	KATM 5			10 <u>WRST</u> 5
	c. 3. Le a. b.	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re	DENA 5 es require	KATM 5			10 <u>WRST</u> 5 1 5
	c. 3. Le a. b.	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment	DENA 5 es require quired	KATM 5 ed			10 WRST 5 1 5 10
	c. 3. Le a. b.	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment	DENA 5 es require quired	KATM 5 ed			10 <u>WRST</u> 5 1 5
	c. 3. Le a. b. c.	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment	DENA 5 es require quired al treatme	KATM 5 ed	5		10 WRST 5 1 5 10
	c. 3. Le a. b. c.	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment	DENA 5 es require quired al treatme	KATM 5 ed ent	5	5	10 WRST 5 1 5 10 15
	c. 3. Le a. b. c. d.	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanica	DENA 5 es require quired al treatme DENA	KATM 5 ed ent KATM	5 KEFJ	5 SITK	10 WRST 5 1 5 10 15 WRST
	 c. 3. Let a. b. c. d. 4. Al 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanical pundance and proximity of propagules near park	DENA 5 es require quired al treatme DENA	KATM 5 ed ent KATM	5 KEFJ	5 SITK	10 WRST 5 1 1 5 10 15 WRST 1
	 c. 3. Let a. b. c. d. 4. Al a. 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanicat pundance and proximity of propagules near park many sources of propagules near park	DENA 5 es required quired al treatmo DENA 1	KATM 5 ed ent KATM 1	5 <u>KEFJ</u> 1	5 SITK	10 WRST 5 10 15 WRST 1 0
	 c. 3. Let a. b. c. d. 4. All a. b. 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanicat bundance and proximity of propagules near park many sources of propagules near park, but these ar	DENA 5 es requira quired al treatma DENA 1 e readily	KATM 5 ed ent KATM 1	5 <u>KEFJ</u> 1	5 SITK	10 WRST 5 1 1 5 10 15 WRST 1 0 5
	 c. 3. Let a. b. c. d. 4. All a. b. c. 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanicat bundance and proximity of propagules near park many sources of propagules near park few sources of propagules near park, but these ar few sources of propagules near park, but these ar	DENA 5 es requira quired al treatma DENA 1 e readily	KATM 5 ed ent KATM 1	5 <u>KEFJ</u> 1	5 SITK	10 WRST 5 1 1 5 10 15 WRST 1 0 5 10
	 c. 3. Let a. b. c. d. 4. All a. b. 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanicat bundance and proximity of propagules near park many sources of propagules near park, but these ar	DENA 5 es require quired al treatmo DENA 1 e readily re not rea	KATM 5 ed ent <u>KATM</u> 1 r disperse dily disp	5 <u>KEFJ</u> 1 ed persed	5 <u>SITK</u> 1	10 WRST 5 10 15 WRST 1 0 5 10 5 10 15
	 c. 3. Let a. b. c. d. 4. All a. b. c. 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanicat bundance and proximity of propagules near park many sources of propagules near park few sources of propagules near park, but these ar few sources of propagules near park, but these ar	DENA 5 es require quired al treatmo DENA 1 e readily re not rea	KATM 5 ed ent KATM disperse dily disp KATM	5 KEFJ 1 ed bersed KEFJ	5 <u>SITK</u> 1 SITK	10 WRST 5 1 1 5 10 15 WRST 1 0 5 10
	 c. 3. Let a. b. c. d. 4. Al a. b. c. d. 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanicat bundance and proximity of propagules near park many sources of propagules near park few sources of propagules near park, but these ar few sources of propagules near park, but these ar no sources of propagules are in dose proximity	DENA 5 es require quired al treatmo DENA 1 e readily re not rea	KATM 5 ed ent <u>KATM</u> 1 r disperse dily disp	5 <u>KEFJ</u> 1 ed persed	5 <u>SITK</u> 1	10 WRST 5 10 15 WRST 1 0 5 10 5 10 15
C.	 c. 3. Let a. b. c. d. 4. Al a. b. c. d. 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanicat bundance and proximity of propagules near park many sources of propagules near park few sources of propagules near park, but these ar few sources of propagules near park, but these ar	DENA 5 es required al treatmo <u>DENA</u> 1 e readily re not rea <u>DENA</u>	KATM 5 ed ent KATM disperse dily disp KATM	5 KEFJ 1 ed bersed KEFJ	5 <u>SITK</u> 1 SITK	10 WRST 5 10 15 WRST 1 0 5 10 5 10 15 WRST
C.	c. 3. Le a. b. c. d. 4. Al a. b. c. d. Side E	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanicat bundance and proximity of propagules near park many sources of propagules near park few sources of propagules near park, but these ar few sources of propagules near park, but these ar no sources of propagules are in dose proximity	DENA 5 es required al treatmo DENA 1 re readily re not rea 0	KATM 5 ed ent KATM disperse dily disp KATM	5 KEFJ 1 ed bersed KEFJ	5 <u>SITK</u> 1 SITK	10 WRST 5 10 15 WRST 1 0 5 10 5 10 15 WRST
C.	 c. 3. Let a. b. c. d. 4. All a. b. c. d. Side E 1. co 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanicat bundance and proximity of propagules near park many sources of propagules near park few sources of propagules near park, but these ar few sources of propagules near park, but these ar no sources of propagules are in dose proximity ffects of Chemical/Mechanical Control Measures ntrol measures will cause major impacts to commu-	DENA 5 es require quired al treatme <u>DENA</u> 1 re readily re readily e not rea <u>DENA</u> 0	KATM 5 ed ent KATM disperse dily disp KATM	5 KEFJ 1 ed bersed KEFJ	5 <u>SITK</u> 1 SITK	10 WRST 5 1 1 5 WRST 1 0 5 10 15 WRST 0
C.	 c. 3. Let a. b. c. d. 4. All a. b. c. d. Side E 1. co 2. co 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanical bundance and proximity of propagules near park few sources of propagules near park few sources of propagules near park, but these ar few sources of propagules near park, but these ar no sources of propagules are in dose proximity ffects of Chemical/Mechanical Control Measures ntrol measures will cause major impacts to commu- ntrol measures will cause moderate impacts to commu-	DENA 5 es required quired al treatmo <u>DENA</u> 1 e readily e not rea <u>DENA</u> 0 unity	KATM 5 ed ent KATM disperse dily disp KATM	5 KEFJ 1 ed bersed KEFJ	5 <u>SITK</u> 1 SITK	10 <u>WRST</u> 5 1 5 10 15 <u>WRST</u> 1 0 5 10 15 <u>WRST</u> 0 0 5 0 0 5
C.	 c. 3. Let a. b. c. d. 4. All a. b. c. d. Side E 1. co 2. co 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanicat bundance and proximity of propagules near park many sources of propagules near park few sources of propagules near park, but these ar few sources of propagules near park, but these ar no sources of propagules are in dose proximity ffects of Chemical/Mechanical Control Measures ntrol measures will cause major impacts to commu-	DENA 5 es requira quired al treatmo <u>DENA</u> 1 e readily re not rea <u>DENA</u> 0 unity munity munity	<u>KATM</u> 5 ed ent <u>KATM</u> 1 disperse dily disp <u>KATM</u> 0	5 <u>KEFJ</u> 1 ed bersed <u>KEFJ</u> 0	5 SITK 1 SITK 0	10 <u>WRST</u> 5 1 5 10 15 <u>WRST</u> 1 0 5 10 15 <u>WRST</u> 0 0 5 10 15 <u>WRST</u> 0 5 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 10 15 <u>WRST</u> 15 <u>WRST</u> 15 <u>WRST</u> 15 <u>WRST</u> 0 5 10 15 <u>WRST</u> 0 5 10 15 <u>WRST</u> 15 <u>WRST</u> 0 5 15 <u>WRST</u> 0 5 15 <u>WRST</u> 0 5 15 <u>WRST</u> 0 5 15 <u>WRST</u> 0 5 15 <u>WRST</u> 0 5 15 <u>WRST</u> 0 5 15 <u>0</u> 5 15 <u>0</u> 15 <u>0</u> 15 <u>15</u> 15 <u>15</u> 15 <u>15</u> 15 15 15 15 15 15 15 15 15 15
C.	 c. 3. Let a. b. c. d. 4. All a. b. c. d. Side E 1. co 2. co 	no resprouting following removal of abovegroun evel of effort required repeated chemical or mechanical control measure one or two chemical or mechanical treatments re can be controlled with one chemical treatment effective control can be achieved with mechanical bundance and proximity of propagules near park few sources of propagules near park few sources of propagules near park, but these ar few sources of propagules near park, but these ar no sources of propagules are in dose proximity ffects of Chemical/Mechanical Control Measures ntrol measures will cause major impacts to commu- ntrol measures will cause moderate impacts to commu-	DENA 5 es requira quired al treatmo <u>DENA</u> 1 e readily re not rea <u>DENA</u> 0 unity munity munity	KATM 5 ed ent KATM disperse dily disp KATM	5 <u>KEFJ</u> 1 ed bersed <u>KEFJ</u> 0	5 <u>SITK</u> 1 SITK	10 WRST 5 1 5 10 15 WRST 1 0 5 10 15 WRST 0 0 5 0 0 0 5 0 0 0 5 0 0 0 0 5 0 0 0 0 5 0 0 0 0 0 0 5 0 0 0 0 0 0 0 5 0 0 0 0 0 0 0 0 0 0 0 0 0

D. Effectiveness of Community Management1. the following options are not effective

2. cultural techniques (burning, f	e ,	0		129	5
3. routine management of commu burning, flooding, controlled of	5 1	-		.g., presc	10 10
	DE	NA KATM	KEFJ	SITK	WRST
	0	0	0	0	0
E. Biological Control					
1. biological control not feasible	(not practical possible, or p	robable)			0
2. potential may exist for biologi					5
3. biological control feasible					10
e	DEI	NA KATM	KEFJ	SITK	WRST
	0	0	0	0	0
Total Possible					100
Total by park	DEI	NA KATM	[KEFJ	SITK	WRST
	42	2 44	44	44	42

130 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.

	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	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	

Species Ranking Summary Form for Trifolium hybridum and T. repens

^aPreviously collected in this park unit.

^bNo 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 1
 - b. found in sites disturbed within the last 10 years
 - c. found in midsuccessional sites disturbed 11-50 years before present (BP)
 - d. found in late-successional sites disturbed 51-100 years BP
 - found in high-quality natural areas with no known major disturbance for 100 years e. 10

2

			DENA	KATM KEFJ	SITK	WRST
			1	1	1	1
2.	Ab	undance				
	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

					133	3
	3.	Effect on natural processes and charactera. plant species having little or no effectb. delays establishment of native species in distuc. long-term (more than 10 years) modification ofd. invades and modifies existing native communication	or retardation of s	-		0 3 7 10
		e. invades and replaces native communities	DENIA VAT		CITV	15 WRST
			DENA KAT 0	<u>im kefj</u> 0	<u>SITK</u>	$\frac{WRST}{0}$
	4.	Significance of threat to park resources a. threat to secondary resources negligible b. threat to areas' secondary (successional) resources	urces	0	0	0 2
		c. endangerment to areas' secondary (successiond. threat to areas' primary resources	al) resources			4 8
		e. endangerment to areas' primary resources				10
		······································	DENA KAT	ГM 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 landscapec. significant visual impact on natural landscape				2 4
		c. significant visual impact on natural landscaped. major visual impact on natural landscape				4 5
		al major (isual impact on natural landscape	DENA KAT	ГM KEFJ	SITK	WRST
			2	2	2	2
Total P	ossi	ble				50
Total b	y pa	rk	DENA KAT		SITK	WRST
П	τ		9	9	9	10
В.	1nr 1.	ate Ability of Species to Become a Pest Ability to complete reproductive cycle in area of o	concern			
	1.	a. not observed to complete reproductive cycle in area of c	loncern			0
		b. observed to complete reproductive cycle				5
			DENA KAT	IM KEFJ	SITK	WRST
			5	5	5	5
	2.	Mode of reproduction				1
		a. reproduces almost entirely by vegetative meanb. reproduces only by seeds	18			1
		b. reproduces only by seedsc. reproduces vegetatively and by seed				3 5
		e. reproduces vegetatively and by seed	DENA KAT	IM KEFJ	SITK	WRST
			5	5	5	5
	3.	Vegetative reproduction				
		a. no vegetative reproduction				0
		b. vegetative reproduction rate maintains popula		1		1
		c. vegetative reproduction rate results in moderad. vegetative reproduction rate results in rapid in			ze	35
		d. vegetative reproduction rate results in rapid in	DENA KAT		SITK	WRST
			1	1	1	1

134							
	4.		equency of sexual reproduction for mature plant				0
		a. b.	almost never reproduces sexually in area once every five or more years				0 1
		о. с.	every other year				3
		с. d.	one or more times a year				5
		u.	one of more times a year	DENA	KATM KEFJ	SITK	WRST
				5	5	5	5
	5.	Nu	umber 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.	Di	spersal ability				
		a.	little potential for long-distance dispersal				0
		b.	great potential for long-distance dispersal				5
				-	KATM KEFJ	SITK	WRST
	_	~		5	5	5	5
	7.		rmination requirements				0
		a.	requires open soil and disturbance to germinate			• , •	0
		b.	can germinate in vegetated areas but in a narrow	-	-	itions	3
		c.	can germinate in existing vegetation in a wide ra	-		SITV	5 WDST
				<u>DENA</u> 3	KATM KEFJ 3	<u>SITK</u> 3	<u>WRST</u> 3
	8.	Co	ompetitive ability	5	5	5	5
	0.	a.					0
		b.	moderately competitive for limiting factors				3
		с.	highly competitive for limiting factors				5
		с.	inging competitive for initiality factors	DENA	KATM KEFJ	SITK	WRST
				3	3	3	3
	9.	Kn	nown 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 o		tats and climate	zones	1
		c.	known to cause low impact in natural areas in si				3
		d.	known to cause moderate impact in natural areas	s in simila	ar habitats and c	limate z	ones 5
		e.	known to cause high impact in natural areas in s	imilar hal	oitats and climat	te zones	10
				DENA	KATM KEFJ	SITK	WRST
				1	1	1	1
Total							50
Total	by pa	ırk		DENA	KATM KEFJ	SITK	WRST
				31	31	31	31

	г	., .					135	i
п.			lity of Control or Management undance Within Park					
	A.		Number of populations (stands)					
		1.	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					2 3
			d. < 5ha					5
				DENA	KATM	KEFJ	SITK	WRST
				5		5	5	3
	В.		se of Control					
		1.	Seed banks					0
			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	DENA	KATM	VEEI	SITK	15 WRST
				$\frac{DENA}{0}$	KAIM	0	<u> </u>	$\frac{WKST}{0}$
		2.	Vegetative regeneration	0		0	0	0
		2.	a. any plant part is a viable propagule					0
			b. sprouts from roots or stumps					5
			c. no resprouting following removal of aboveground	d growth	1			10
				-	KATM	KEFJ	SITK	WRST
				5		5	5	5
		3.	Level of effort required					
			a. repeated chemical or mechanical control measure		ed			1
			b. one or two chemical or mechanical treatments rec	quired				5
			c. can be controlled with one chemical treatment	_				10
			d. effective control can be achieved with mechanica					15
					KATM		SITK	WRST
		4	A hundred and manimiter of managements many soul	1		1	1	1
		4.	Abundance and proximity of propagules near park a. many sources of propagules near park					0
			a. many sources of propagules near parkb. few sources of propagules near park, but these are	- readily	disperse	he		0 5
			c. few sources of propagules near park, but these are	•	.			10
			d. no sources of propagules are in dose proximity		uny unsp	<i>ciscu</i>		10
			a. no sources of propagates are in cose proximity	DENA	KATM	KEFJ	SITK	WRST
				0		0	0	0
	C.	Sid	le Effects of Chemical/Mechanical Control Measures	-		-	-	-
		1.	control measures will cause major impacts to commu	nity				0
		2.	control measures will cause moderate impacts to com	-				5
		3.	control measures will have little or no impact on com	-				15
			-	-	KATM	KEFJ	SITK	WRST
				15		15	15	15
	D.		ectiveness of Community Management					
		1.	the following options are not effective					0

2.	cultural techniques (burning, flooding) can be used t	to control	target species		5
3.	routine management of community or restoration or preservation practices (e.g., prescri				
	burning, flooding, controlled disturbance) effectivel	y controls	s target species		10
		DENA	KATM KEFJ	SITK	WRST
		10	10	10	10
E. B	iological Control				
1.	biological control not feasible (not practical possible	e, or prob	able)		0
2.	potential may exist for biological control				5
3.	biological control feasible				10
	, , , , , , , , , , , , , , , , , , ,	DENA	KATM KEFJ	SITK	WRST
		0	0	0	0
Total Poss	sible				100
Total by p	park	DENA	KATM KEFJ	SITK	WRST
		39	39	39	37

Species Ranking Summary Form for Trifolium pratense

	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	b	_	_	_	
KATM	np°	-	_	-	_	
KEFJ	np ^d	-	-	-	Low ^e	
SITK	np	-	-	-	-	
WRST	7	28	35	60	Low	

^aPreviously collected in this park unit. ^bNo data. ^cNot yet collected in this park ^dFound outside park but may invade park.

^eShould be monitored.

Species Ranking Form for Trifolium pratense

Significance of Impact I. 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 2 c. found in midsuccessional sites disturbed 11-50 years before present (BP) 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 SITK WRST DENA KATM KEFJ 1 b. areal extent of populations (1) < 5 ha 1 2 (2) 5-10 ha (3) 11-50 ha 3 (4) >50 ha 5 WRST DENA KATM KEFJ SITK 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 7 c. long-term (more than 10 years) modification or retardation of succession d. invades and modifies existing native communities 10 invades and replaces native communities e. 15 SITK WRST DENA KATM KEFJ 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 endangerment to areas' primary resources 10 e. WRST DENA KATM KEFJ SITK 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		02
		c. significant visual impact on natural landscape		<u>-</u> 4
		d. major visual impact on natural landscape		5
			DENA KATM KEFJ SITK	WRST
				4
Total F				50
Total b	y pa	ark	DENA KATM KEFJ SITK	<u>WRST</u> 7
В	Inr	nate Ability of Species to Become a Pest		/
Б.	1.		cern	
		a. not observed to complete reproductive cycle		0
		b. observed to complete reproductive cycle		5
			DENA KATM KEFJ SITK	WRST
	2	Mode of reproduction		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 populatio		1
		b. vegetative reproduction rate maintains populatioc. vegetative reproduction rate results in moderate	increase in population size	1 3
		b. vegetative reproduction rate maintains populatio	increase in population size ease in population size	1 3 5
		b. vegetative reproduction rate maintains populatioc. vegetative reproduction rate results in moderate	increase in population size ease in population size	1 3
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant 	increase in population size ease in population size	1 3 5 WRST
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area 	increase in population size ease in population size	1 3 5 <u>WRST</u> 0
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years 	increase in population size ease in population size	1 3 5 <u>WRST</u> 0 1
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years c. every other year 	increase in population size ease in population size	1 3 5 <u>WRST</u> 0 0 1 3
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u>	1 3 5 <u>WRST</u> 0 0 1 3 5
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years c. every other year 	increase in population size ease in population size	1 3 5 <u>WRST</u> 0 0 1 3
	4.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in areases b. once every five or more years c. every other year d. one or more times a year 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u>	1 3 5 <u>WRST</u> 0 1 3 5 WRST
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u>	1 3 5 <u>WRST</u> 0 1 3 5 <u>WRST</u> 5
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u>	1 3 5 <u>WRST</u> 0 1 3 5 <u>WRST</u> 5
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) 	increase in population size ease in population size <u>DENA KATM KEFJ</u> <u>SITK</u> <u>DENA KATM KEFJ</u> <u>SITK</u>	1 3 5 WRST 0 1 3 5 WRST 5
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) 	increase in population size ease in population size <u>DENA KATM KEFJ SITK</u>	1 3 5 WRST 0 1 3 5 WRST 5 1 3 5 WRST
		 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) c. many-seeded (>1,000) 	increase in population size ease in population size <u>DENA KATM KEFJ</u> <u>SITK</u> <u>DENA KATM KEFJ</u> <u>SITK</u>	1 3 5 WRST 0 1 3 5 WRST 5
	5.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) 	increase in population size ease in population size <u>DENA KATM KEFJ</u> <u>SITK</u> <u>DENA KATM KEFJ</u> <u>SITK</u>	1 3 5 WRST 0 1 3 5 WRST 5 1 3 5 WRST
	5.	 b. vegetative reproduction rate maintains population c. vegetative reproduction rate results in moderate in d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) c. many-seeded (>1,000) Dispersal ability	increase in population size ease in population size <u>DENA KATM KEFJ</u> SITK <u>DENA KATM KEFJ</u> SITK <u>DENA KATM KEFJ</u> SITK	$ \begin{array}{r} 1\\ 3\\ 5\\ WRST\\ 0\\ 0\\ 0\\ 1\\ 3\\ 5\\ WRST\\ 5\\ 1\\ 3\\ 5\\ WRST\\ 3\\ 6\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$
	5.	 b. vegetative reproduction rate maintains populatio c. vegetative reproduction rate results in moderate if d. vegetative reproduction rate results in rapid increases Frequency of sexual reproduction for mature plant a. almost never reproduces sexually in area b. once every five or more years c. every other year d. one or more times a year Number of seeds per plant a. few (0-10) b. moderate (11-1,000) c. many-seeded (>1,000) Dispersal ability a. little potential for long-distance dispersal 	increase in population size ease in population size <u>DENA KATM KEFJ</u> <u>SITK</u> <u>DENA KATM KEFJ</u> <u>SITK</u>	$ \begin{array}{r} 1\\ 3\\ 5\\ WRST\\ 0\\ 0\\ 1\\ 3\\ 5\\ WRST\\ 5\\ 1\\ 3\\ 5\\ WRST\\ 3\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$

				139)
7.	Germination requirements				0
	a. requires open soil and disturbance to germinateb. can germinate in vegetated areas but in a narrow result.	range or	in special condi	tions	0 3
	c. can germinate in existing vegetation in a wide rar			uons	5
		-	KATM KEFJ	SITK	WRST
					3
8.	Competitive ability				
	a. poor competitor for limiting factors				0
	b. moderately competitive for limiting factorsc. highly competitive for limiting factors				3 5
	e. Inginy competitive for initialing factors	DENA	KATM KEFJ	SITK	WRST
		<u></u>		51111	3
9.	Known level of impact in natural areas				
	a. not known to cause impacts in any other natural a				0
	b. known to cause impacts in natural areas, but in ot				1
	c. known to cause low impact in natural areas in sind. known to cause moderate impact in natural areas				3 ones 5
	e. known to cause high impact in natural areas in sir				10
			KATM KEFJ	SITK	WRST
					1
Total Possi		DEMA		CITIC	50
Total by pa	rk	DENA	KATM KEFJ	SITK	WRST 28
II. Feasibi	lity of Control or Management				20
	undance Within Park				
1.	Number of populations (stands)				
	a. several; widespread and dense				1
	b. intermediate number; patchy				3
	c. few; scattered	DENA	KATM KEFJ	SITK	5 WRST
		DENA	KAIWI KLI'J	SIIK	5
2.	Areal extent of populations				U
	a. > 50				1
	b. 11-50 ha				2
	c. 5-10 d. < 5ha				3 5
	u. < 511a	DFNA	KATM KEFJ	SITK	WRST
				5111	5
B. Eas	e of Control				
1.					-
	a. seeds remain viable in the soil for at least 3 years				0
	b. seeds remain viable in the soil for 2-3 yearsc. seeds viable in the soil for 1 year or less				5 15
	c. seeds videre in the son for 1 year of less	DENA	KATM KEFJ	SITK	WRST
			•		0

140				
	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 abovegroun	÷	~ ~ ~ ~ ~ ~	10
		DENA KATM KEFJ	SITK	WRST
3	8. Level of effort required			5
	a. repeated chemical or mechanical control measur	es required		1
	b. one or two chemical or mechanical treatments re			5
	c. can be controlled with one chemical treatment	1		10
	d. effective control can be achieved with mechanic	al 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 a	re readily dispersed		5
	c. few sources of propagules near park, but these a			10
	d. no sources of propagules are in dose proximity	5 1		15
		DENA KATM KEFJ	SITK	WRST
~ ~				5
	Side Effects of Chemical/Mechanical Control Measures	•,		0
	 control measures will cause major impacts to comm control measures will cause moderate impacts to con 			0 5
	 control measures will cause inductate impacts to con control measures will have little or no impact on cor 			15
	. control measures will have have of no impact on cor	DENA KATM KEFJ	SITK	WRST
				15
D. E	Effectiveness of Community Management			
	. the following options are not effective			0
	2. cultural techniques (burning, flooding) can be used t			5
3	8. routine management of community or restoration or	· ·	g., presc	
	burning, flooding, controlled disturbance) effectivel	DENA KATM KEFJ	SITK	10 WRST
				10
E. E	Biological Control			10
	. biological control not feasible (not practical possible	e, or probable)		0
2				5
3	8. biological control feasible		armer	10
		DENA KATM KEFJ	SITK	WRST
Total Pos	ssible			0 100
Total by		DENA KATM KEFJ	SITK	WRST
j	r ···			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.

Ecology 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.