



Non-Native Plants *of* Chugach National Forest

A Preliminary Inventory



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ABSTRACT

This report is a summary of four preliminary surveys of alien plants in Chugach National Forest, Alaska. The surveys were performed in 1997 and 1998. A total of 119 sites were inventoried in the Cordova-Copper River Delta and Kenai Peninsula areas. They were located in “front country” areas such as visitor facilities, trailheads and roads where infestations were likely to occur. Each survey described details of landscape, natural vegetation, physical disturbance, and recorded the percent cover of alien plant species found at each site. Sixty-three alien plant taxa were observed, including 2 listed as prohibited noxious weeds and 4 as restricted in Alaska. A literature review found an additional 62 alien plant taxa that have been previously reported for the general area. Alien plants were most commonly encountered in heavily developed areas with open ground and construction areas, but several occurrences were recorded beyond visitor facilities in natural communities. Recommendations for further surveys and identification of problem taxa were made.

Keywords: Vascular plants, exotic plants, alien invasive plants, noxious weeds, south-central Alaska

INTRODUCTION

Alien invasive plants are a growing problem worldwide and have caused major ecological, economic, and even environmental problems. Presently, 10.5% of the plant taxa in Alaska are non-native (Rejmanek and Randall 1994, in Westbrooks, 1998). In parts of the country such as New England, alien species make up fully one-third of the total flora (Seymour 1993). In some countries with a long history of human immigration and agriculture, like Great Britain, plant origins are so obscured by the passage of time that it is difficult to tell native plants from aliens (Marren 1999). In 1994, the economic impact of weeds on the U.S. economy was estimated to be more than \$20 billion in losses and control costs annually, with \$5 billion alone in non-crop related sectors such as forestry and highway right-of-ways. Two-thirds of all endangered species are potentially being impacted by non-native species (Westbrooks 1998). According to the Aquatic Nuisance Species Task Force, the rate of infestation of federal lands by weeds is 4,600 acres per day (ANSTF, <http://www.anstaskforce.gov>).

Although Alaska is, as yet, still pristine compared to other places, many non-native plant species have already become well established. Some have been known for decades to exist around human habitation, but each year new – and potentially dangerous – introductions are detected. In 2001, garlic mustard (*Alliaria petiolata* (Bieb.) Cavara & Grande), an aggressive alien species known to overrun understory habitats in many states, was discovered in the Juneau area (Tu and Meyers-Rice 2001). That population was destroyed and it was hoped that the threat was over. But a year later another, even larger population was discovered. This species may now be firmly established in the area (Spitzer 2002). Japanese knotweed (*Polygonum cuspidatum* Sieb. & Zucc.), which invades natural habitats in southeast Alaska, has been introduced in Anchorage and could pose a serious problem in the south central area, including nearby Chugach National Forest (Densmore et al. 2001). Purple loosestrife (*Lythrum salicaria* L.), a scourge of wetlands in the lower 48, has been planted in Anchorage gardens. Though as of yet it has not been observed outside of cultivation, and is considered to “not do well this far north” by local nurseries that carry it (Faltz Landscaping, personal communication), its presence is still cause for great concern.

It is still possible for managers in Chugach National Forest to protect Forest resources before non-native plants become serious problems, as they have in other National Forests. One of the first steps in dealing with the threat of alien plant invasions, as identified by the Alaska Committee for Noxious and Invasive Plants, to which the Forest Service is a signatory agency is to develop baseline data to determine the present extent of non-native species (Hébert, 2002). The Forest’s own Revised Management Plan calls for the prevention “of the introduction and spread of exotic plants, and to reduce areas of current infestation” (USDA, 2002). Its stated objective to achieve this goal is to “identify infestations of exotic plant species and maintain infestation data in a standard database.” This report summarizes the results of four recent preliminary surveys of alien plant species in two geographic regions of the Forest.

SCOPE

Survey sites

To obtain the broadest and most basic inventory of alien species, surveys were conducted in habitats most likely to harbor non-native plants. The surveys were limited to the “front-country,” with an emphasis on areas of human disturbance such as roads, trailheads and recreation sites. A few areas of natural disturbance such as gravel bars and sand dunes were surveyed for comparison, as well as undisturbed habitats such as forests, meadows and bogs adjacent to visitor facilities. The study did not encompass “back-country” public use cabins, long trails, or areas that could only be reached by air, boat, or extensive hiking. Those sites were left to future projects. A survey of biologists currently working across the Forest in natural vegetation communities was conducted for this paper, to give a thumbnail sketch of the distribution of

alien plants outside of developed areas.

While emphasis was placed on U.S. Forest Service lands and right of ways, a large portion of the survey took place on inholdings within Forest Service land, since much of the land around the road corridors has been conveyed to the state of Alaska and private holders. The town sites of Cordova, Cooper Landing and Moose Pass, surrounded by Forest Service land, are areas of high infestation levels. State highways link all of the sites together and (on the Kenai Peninsula) to the Anchorage metropolitan area. The road system represents the most direct transmission route of alien species. When on private land, surveys were conducted on public right-of-ways, such as roadsides and parking lots.

A definition of terms

Originally, the focus of the Cordova surveys was to document the occurrence of noxious weeds. The scope was refined to document all alien plant species that have been introduced in the area, with an emphasis on locating noxious weeds. The word “weed” is often used as a pejorative term to describe plants that are pioneering, adventive, aggressive, invasive, or generally unappealing – native or non-native. Taylor (1990) described the native bedstraw *Galium aparine* L. as “an ungainly tangle of rank vegetation.” Some native plants, such as water milfoil (*Myriophyllum sibiricum* Komarov, synonym *M. exalbescens* Fern.) and the wildflower dwarf dogwood (*Cornus canadensis* L.), are “officially” considered weeds (USDA Agricultural Research Center 1971, University of Illinois 1981, Mulligan 1981) when they get in the way of human activity. A few states have further classified aggressive native plants such as horsetail (*Equisetum arvense* L.) as noxious (State of Oregon 1997). At this point, no native plants are specifically considered noxious in Alaska.

Though not all alien species are invasive or aggressive, the phrase “noxious weed” has specific meaning defined in the Alaska Administrative code (Title 11, Chapter 34, Plant Health and Quarantine), and refers to any plant considered especially destructive and difficult to control. Special attention was given to locating such species. This report is limited to plants that are not considered native to Alaska and will use the words “alien,” “exotic” or “non-native” to refer to plants that are not indigenous to the state, regardless of their life history. The origin of some plants is not fully known. Plants of ambiguous origin were therefore noted when encountered, and are described in greater detail below.

The nomenclature used in this report follows the National Plant Database (USDA-NRCS 2001). When plant names differ from those used in Hultén (1968) or by the University of Alaska-Fairbanks Museum/Herbarium (ALA 1999), synonyms are included in parenthesis. Recent taxonomic revisions have led to some confusion concerning several taxa. For example, although our common native yarrow (*Achillea borealis* Bong.) and the Eurasian introduction (*A. millefolium* L.) are presently treated as varieties of one species, called *A. millefolium* L., they remain separate as a native taxon and an introduced one (see Hultén, 1973). Similarly, the native bluegrass *Poa alpigena* (E. Fries) Lindm. is now considered to be a subspecies of *P. pratensis* L., but it would be misleading to list *P. pratensis* as a native plant. Whether named on a specific or subspecific level, the taxa remain distinct (though admittedly sometimes difficult to tell apart, and interbreeding may blur the distinctions). Both of these plants were observed on the surveys, identified by morphological features and habit, but voucher specimens were not obtained. Due to the brief time allotted for fieldwork, specimens were collected for only a very few plants. Non-vascular plants and fungi were not included in the surveys.

STUDY AREAS

The first of the four surveys was performed during the summer of 1997 (Duffy, 1997) in the Cordova Ranger District, on the east end of Prince William Sound. Sites ran along the Copper River Highway, from

the town of Cordova to just past the Million Dollar Bridge. Sites along Power Creek Road and Orca Road were also surveyed. The three Kenai Peninsula surveys took place in 1998 (Duffy 1998, DeLapp 1998, and Lipkin 1998) within the Seward Ranger District and the northwestern corner of the Glacier Ranger District, south of Turnagain Arm. These surveys extended from mile 8.2 to mile 75 on the Seward Highway, on the Sterling Highway from the Seward intersection to mile 55, and the Hope Road from the Seward Highway to its terminus. Smaller roads surveyed included Quartz Creek Road, Palmer Creek Road (to the Swettman mine) and Resurrection Creek Road (Map 1).

A comparison of the general characteristics of the two ecosystems included in the Kenai Peninsula surveys, including acreage, number of sites surveyed, and selected developments, is found in Table 1.

CORDOVA

The Cordova study area is a coastal plain of glacial and alluvial deposits with scattered bedrock ridges. Elevations are not far above sea level along the coastal plain, which is bordered to the north and west by mountains reaching 7,730 feet (2370 meters) in elevation. The Copper River lies at its east end, and the Gulf of Alaska to the south. The large mountain valleys are filled with glaciers, and the rivers draining them are silty and braided. The climate is maritime, with temperatures moderated by the ocean and heavy precipitation. It has a growing season of 107 days. During this season, average monthly precipitation is 7.8 inches and the temperature averages 50 degrees F. The landscape is constantly changing due to water and wind erosion, deposition of sediments and isostatic rebound (DeVelice et al. 1999). The Copper River has a striking microclimate. Downstream of the Copper River Canyon, conditions are much more extreme than Cordova and more like that of interior Alaska. Colder temperatures and intense winds can delay the phenology of vegetation there up to three weeks (Boggs 2000).

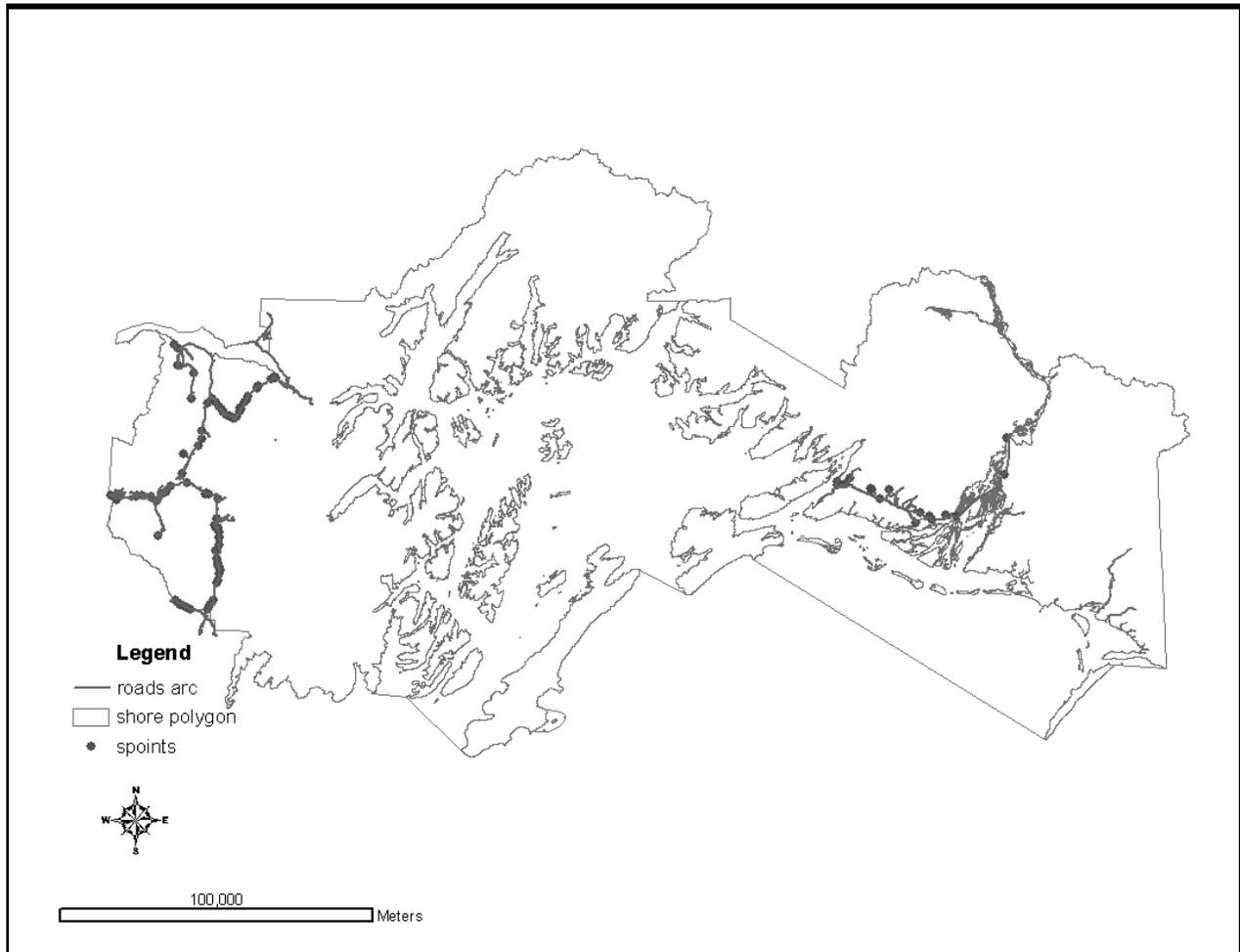
The survey sites around the town of Cordova were within the Northern Gulf Fjordlands ecosection. East of the Eyak River, the sites were within the Northern Gulf Forelands section, and the Childs Glacier sites at the edge of the Alaska Mountains section (Davidson 1996). Common vegetation communities observed there included Sitka spruce-western hemlock forests west of the Eyak River, and extensive alder-willow scrubs, black cottonwood forests, mixed broadleaf-coniferous forests, marshes and bog meadows to the east. Sparsely vegetated dunes and large gravel bars occur along the Copper River.

KENAI PENINSULA

The Kenai Mountains reach 6200 feet (1900 meters) and are separated by broad, U-shaped glacial valleys. Several of these valleys have glaciers in their upper reaches and are drained by braided rivers, but there are numerous clear water rivers as well. Large lakes are common. Soils on the steep slopes are derived from glacial deposits, with many rocky outcrops. Some of the valley bottoms are narrow, and soils there are derived from glacial alluvial outwash. The climate is transitional between maritime and continental. Average rainfall varies from 20 to 80 inches (50 to 200 cm) per annum, and the mean annual temperature is 39 degrees F (3.9 degrees C), five degrees warmer than the Copper River Delta (DeVelice et al. 1999). Environmental stress is not as extreme as in the Cordova area, but the extensive spruce forests of the peninsula are currently being severely affected by the spruce bark beetle (*Dendroctonus rufipennis* Kirby [Scolytidae]).

Almost all of the Kenai sites were in the Kenai Mountains ecosection. The 22 sites in the Seward area south of Kenai Lake were in the Northern Gulf Fjordlands ecosection (Davidson 1996). Coniferous and mixed coniferous-broadleaf forests dominate mountain slopes and valleys, and riparian areas have exten-

sive alder-willow scrub, and alpine areas support dwarf ericaceous scrub and meadow communities. Several survey sites were within a mile of a research natural area on Kenai Lake (USDA Forest Service 2002)



Map 1. Locations of 109 sites sampled by Duffy (1997, 1998), DeLapp (1998), and Lipkin (1998) on the Chugach National Forest. Road sites C1, C2, K1, K6, K21, K33, K41, K45, K49, and K51 are not shown since the data reported from these sites represent pooled information from multiple stop points along each respective road. Also, site K20 is not included since the gps location was aberrant. Note that all sample sites (shown as red dots) are near or adjacent to roads (shown as brown lines).

Table 1. General Characteristics of the two Ecosections of the Kenai Peninsula Surveys (modified from DeLapp 1998)

Features	Kenai Mountains Ecosection	Northern Gulf Fjordlands Ecosection	Totals for Kenai Peninsula sites
Size of Area (acres)	776,903	71,619	848,522
Communities	Cooper Landing, Moose Pass, Hope	(Seward nearby)	Cooper Landing, Moose Pass, Hope (Seward nearby)
Roads (miles)	84	23	107
Trails (miles)	269	48	317
Railroad (miles)	29	14	43
Developed recreation sites	106	17	123
Repeaters	7	0	7
Exotic plant taxa found	57	20	59
Sites surveyed	78	22	100

METHODS

Areas most likely to harbor populations of alien plants were identified and accessed by automobile and on foot. These consisted of areas of human disturbance, such as roadsides, visitor service areas, construction sites and trailheads. Latitude and longitude coordinates were determined for most sites using a hand-held Garmin GPS II-Plus unit. The coordinates of the DeLapp and Lipkin surveys were determined from maps. All coordinates were recorded in degrees –minutes format. At each site, the entire disturbed/developed area (such as a picnic area, parking area, road entrance, and interpretive kiosk, etc.) was inventoried, including the immediate margins of the undisturbed/natural areas. Sites were recorded on 1: 63,360-scale quad maps and are listed in Tables 2 and 3.

Table 2. Sites surveyed during the 1997 Cordova inventory

Site #	Name of site
C1.	Copper River Highway west (miles 5, 10, 15, 20, 25)
C2.	Copper River Highway east (miles 31, 35, 40, 45, 50, 52)
C3.	USFS kiosk at Alaska ferry terminal
C4.	USFS Copper River Delta Welcome kiosk
C5.	Alaganik Slough recreation area
C6.	Alaganik Slough rest area and boat ramp
C7.	Eyak River boat ramp
C8.	Cabin Lake picnic area
C9.	Child's Glacier recreation area
C10.	Old railroad bed at mile 41 (both sides of creek)
C11.	Dune area on Copper River at mile 27.5
C12.	Saddlebag Glacier road and trail head
C13.	Haystack Trail
C14.	Pipeline Lakes/McKinley Lake trails
C15.	Crater Lake Trail
C16.	Power Creek Road
C17.	Eyak River Trail
C18.	USFS Cordova District Headquarters
C19.	Cordova town site

Table 3. Sites surveyed during the 1998 Kenai inventories.

Site #	Name of site
K1.	Sterling Highway, mile markers 40, 45, 50, 55
K2.	Town of Cooper landing
K3.	Junction of Seward and Sterling Highways
K4.	Tern Lake visitor facilities
K5.	Gravel bar of Quartz Creek
K6.	Snug Harbor Road
K7.	Russian Lakes Trail (upper)
K8.	Russian Lakes Trail (lower)
K9.	Resurrection Pass Trail
K10.	Kenaitze Interpretive Site
K11.	Russian River Campground
K12.	Quartz Creek Road
K13.	Quartz Creek Campground entrance (closed)
K14.	Crescent Creek Campground
K15.	Crescent Creek Trail
K16.	Bean Creek Road/clear cuts
K17.	Kenai River Ferry
K18.	Broadview Station

- K19. Cooper Landing Boat ramps
- K20. Cooper Creek Campground
- K21. Seward Highway South, miles 20, 25, 30, 35
- K22. Pull off 1
- K23. Pull off 2
- K24. Town of Moose Pass
- K25. Ptarmigan Campground
- K26. Ptarmigan Trail
- K27. Lawing Work Center
- K28. Trail Creek Campground
- K29. Carter Lake Trail
- K30. Johnson Pass Trail, south end
- K31. Victor Creek Trail
- K32. Fish Hatchery
- K33. Seward Highway, Middle, mile markers 40, 45, 50, 55
- K34. Tenderfoot Campground
- K35. Lower Summit Lake Pull off
- K36. Devil's Pass Trail
- K37. Summit Creek Trail
- K38. Hope Road Junction
- K39. Quarry, mile 49
- K40. Revegetation site (same as mile 55)
- K41. Hope Road, mile markers 5, 10, 15
- K42. Town of Hope
- K43. Porcupine Campground
- K44. Gull Rock Trail
- K45. Palmer Creek Road
- K46. Coeur d'Alene Campground
- K47. Swettman Mine area
- K48. Resurrection Trail
- K49. Resurrection Road (including parking lot of resort)
- K50. Mine tailings
- K51. Seward Highway North, mile markers 60, 65, 70, 75
- K52. Turnagain Pass- winter sports area
- K53. Bertha Creek Campground
- K54. Granite Creek Campground
- K55. Johnson Pass Trail, north end
- K56. Quarry, mile 61.9
- K57. Meadows at Turnagain Pass
- K58. Old gravel pad, mile 59.7
- K59. Mile 21.2, Private Drive near Rocky Creek
- K60. Mile 25, Falls Creek
- K61. Mile 25.2, Pullout
- K62. Lower Trail Lake trail
- K63. Mile 59.0, Pullout
- K64. Sixmile Creek
- K65. Silvertip Creek
- K66. Mile 60.5
- K67. Mile 61.4, East fork of Sixmile Creek

- K68. Mile 61.8, Powerline
- K69. Mile 62.7
- K70. Mile 64.8, Pullout
- K71. Mile 65.4, Pullout
- K72. Mile 67.6, Lyons Creek
- K73. Mile 69.8, Parking area
- K74. Mile 71, Pullout
- K75. Mile 71.3, Pullout
- K76. Mile 74.5, Pullout
- K77. Ingram Creek Pullout
- K78. Ingram Creek scenic pullout on south side of highway
- K79. Mile 3.7, Chugach National Forest boundary
- K80. Mile 4.6, Pullout at stream crossing
- K81. Mile 5.5, Gated side road to north – intersection, road and clearcut at road's end
- K82. Mile 5.9, Small dikes deflecting river flow away from road
- K83. Mile 6.1, Small pulloff on north side of road
- K84. Mile 6.2, Pulloff by river
- K85. Mile 6.6, Scenic overlook of Exit Glacier
- K86. Mile 7.0, Resurrection River Trailhead Parking lot and trail
- K87. Mile 8.2, CNF Boundary and pullout
- K88. Mile 9.2, Pullout and dirt road, west side of highway
- K89. Mile 9.2-10.8, Highway with narrow shoulder and no pullouts
- K90. Mile 10.8, Pullout, east side of highway
- K91. Mile 11.4, Pullouts, both sides of highway
- K92. Mile 11.5, Pullout, east side of highway
- K93. Mile 13.2, Grayling Lake pullout, east side of highway
- K94. Mile 14, Railroad crossing and pullout on east side of highway
- K95. Mile 14.5, Pullout and old road on west side of highway
- K96. Mile 14.7, Pullout on east side of highway
- K97. Mile 15, Road margin, by large wetland on east side of highway.
- K98. Mile 15.2, Snow River access road, east side of highway
- K99. Mile 16.1, Pullout on east side of highway
- K100. Mile 17.1, Primrose Road and Campground, and Lost Lake Trailhead.

Each site inventory consisted of describing the vegetation, native species, landscape, and nature of disturbance or development. Ocular estimates of the percent cover of alien species were made, and each taxon was assigned a cover class according to the protocol outlined by Stensvold (project proposal, personal communication) of **low**, **medium**, or **high** levels of infestation. These classes were sufficient for the Cordova area, but the Kenai area sites required an additional class of **very high** levels for the extremely dense covers encountered. The mean value of each cover class was later used for analysis (Table 4). Photographs of a selection of sites representing the four infestation levels are provided in Appendix I.

Several sites along the Seward Highway were inventoried twice, and those cover estimates were averaged. Percent cover for the Seward area sites was recorded using the conventional class categories of **rare**, **occasional**, **common**, and **abundant**. Because they did not fit exactly with the methodology used in the other surveys, these sites were kept separate in the analysis, although frequencies of occurrence could be com-

pared. Plants that were uncertainly alien were always noted, and cover estimates were recorded at some sites, but were not used in the analysis. Photographs of representative sites are found in Appendix I.

Table 4. Cover classes used during the surveys

cover class	range of percent cover	average cover (used for analysis)
Low	trace-5%	3%
Medium	5-25%	15%
High	25-50%	38%
Very high	50-100%	75%
Low-medium		9%
Medium-high		27%
High-very high		56%

Highways were surveyed in a slightly different manner. Stops were made every 5 miles, and the road margin on both sides was surveyed for 100 feet in both directions. The data from these stops were pooled into geographic units, each of these being considered a “site.” Smaller roads, such as Snug Harbor Road and Palmer Creek Road, were similarly surveyed, except stops were made randomly along their length.

Town sites were also surveyed using random stops within their boundaries, and included the solid waste transfer stations. Campground surveys included all camping loops and adjoining visitor facilities. Hiking trails were surveyed in two parts: notes on the trailhead area were made separately from the trail itself. Surveys of trails were limited to approximately the first half-mile of the trail, including the trail surface and its immediate margin. In special cases, such as parts of the Resurrection Trail that were logged to control spruce beetle infestation and fire hazard, the trail survey included random departures alternating to the left and right, approximately ten meters off of the trail, to observe the effects of the opened canopy.

RESULTS

A total of 63 alien plant taxa were found (Table 5). Twenty-five species of alien plants were found at the 19 sites of the Cordova survey (sites C1-19, Duffy 1997). Fifty-nine aliens were observed at the 100 Kenai survey sites (sites K1-58 Duffy, 1998; sites K21-27, 31, 32, 38, 51-78 Lipkin, 1998; and sites 79-100 DeLapp, 1998). Thirty-nine of these plants were not found in the Cordova survey, while four species were found in Cordova that were not found in the Kenai area surveys.

Seventy-one percent of the alien taxa observed were members of only six families: **Poaceae** (10 taxa), **Asteraceae** (9), **Brassicaceae** (9), **Fabaceae** (7), **Caryophyllaceae** (6) and **Polygonaceae** (4).

Table 5. Alien plants observed during the 1997 and 1998 surveys

<i>Achillea millefolium</i> L. var. <i>millefolium</i>	common yarrow
<i>Achillea ptarmica</i> L.	sneezeweed
<i>Agrostis gigantea</i> Roth	redtop

<i>Alopecurus geniculatus</i> L.	water foxtail
<i>Alopecurus pratensis</i> L.	field foxtail
<i>Brassica napus</i> L.	rapeseed mustard
<i>Brassica rapa</i> L.	field mustard
<i>Bromus inermis</i> Leyss.	smooth brome
<i>Capsella bursa-pastoris</i> (L.) Medik.	shepherd's purse
<i>Capsella rubella</i> Reut.	shepherd's purse
<i>Cerastium fontanum</i> Baumg.	larger mouse-eared chickweed
<i>Cerastium glomeratum</i> Thuill.	mouse-eared chickweed
<i>Chenopodium album</i> L.	lamb's quarters
<i>Chenopodium berlandieri</i> Moq	pitseed goosefoot
<i>Crepis tectorum</i> L.	annual hawksbeard
<i>Dactylis glomerata</i> L.	orchard grass
<i>Deschampsia elongata</i> (Hook.) Munro	slender hairgrass
<i>Elymus repens</i> (L.) Gould	quackgrass
(synonyms <i>Agropyron repens</i> L., <i>Elytrigia repens</i> (L.) Desv.)	
<i>Elymus sibiricus</i> L.	Siberian wildrye
<i>Erysimum cheiranthoides</i> L. ssp. <i>cheiranthoides</i>	wormseed mustard
<i>Galeopsis bifida</i> Boenn.	hempnettle
<i>Hieracium aurantiacum</i> L.	orange hawkweed
<i>Leontodon autumnalis</i> L.	fall dandelion
<i>Lepidium densiflorum</i> Schrad.	common peppergrass
<i>Leucanthemum vulgare</i> Lam.	ox-eye daisy
(synonym <i>Chrysanthemum leucanthemum</i> L.)	
<i>Linaria vulgaris</i> P. Mill.	butter-and-eggs
<i>Lolium perenne</i> L. ssp. <i>multiflorum</i> (Lam.) Husnot	Italian ryegrass
(synonym <i>Lolium multiflorum</i> Lam.)	
<i>Lolium perenne</i> L. ssp. <i>perenne</i>	perennial ryegrass
(synonym <i>Lolium perenne</i> L.)	
<i>Lupinus polyphyllus</i> Lindl.	large-leaved lupine
<i>Matricaria discoidea</i> DC.	pineappleweed
(synonym <i>Matricaria matricarioides</i> (Less.) Porter)	
<i>Medicago sativa</i> L.	alfalfa
<i>Melilotus albus</i> Desr.	white sweet clover
<i>Melilotus officinalis</i> (L.) Lam.	yellow sweet clover
<i>Myosotis palustris</i> L.	water forget-me-not
<i>Neslia paniculata</i> (L.) Desv.	ball mustard
<i>Papaver nudicaule</i> L. ssp. <i>nudicaule</i>	Iceland poppy
<i>Phleum pratense</i> L.	Timothy
<i>Plantago major</i> L. var. <i>major</i>	common plantain
<i>Poa annua</i> L.	annual bluegrass
<i>Poa compressa</i> L.	Canada bluegrass
<i>Poa palustris</i> L.	fowl bluegrass
<i>Poa pratensis</i> L.	Kentucky bluegrass
<i>Poa trivialis</i> L.	rough bluegrass
<i>Polygonum aviculare</i> L.	knotweed
<i>Polygonum convolvulus</i> L.	wild buckwheat
<i>Potentilla anserina</i> L.	silverweed
<i>Ranunculus acris</i> L.	tall buttercup

<i>Ranunculus repens</i> L.	creeping buttercup
<i>Rumex acetosella</i> L.	sheep sorrel
<i>Rumex crispus</i> L.	curled dock
<i>Silene latifolia</i> Poir. ssp. <i>alba</i> (P. Mill.) Greuter & Burdet (synonym <i>Lychnis alba</i> Mill.)	bladder campion
<i>Silene noctiflora</i> L. (synonym <i>Melandrium noctiflorum</i> (L.) E. Fries)	night flowering silene
<i>Spergularia rubra</i> (L.) J.& K. Presl	purple sand spurry
<i>Stellaria media</i> (L.) Vill.	common chickweed
<i>Taraxacum officinale</i> G.H. Weber ex Wiggers	common dandelion
<i>Thlaspi arvense</i> L.	pennycress
<i>Trifolium hybridum</i> L.	alsike clover
<i>Trifolium pratense</i> L.	red clover
<i>Trifolium repens</i> L.	white clover
<i>Tripleurospermum inodorum</i> (L.) Schultz-Bip.	scentless mayweed
<i>Turritis glabra</i> L.	tower mustard
<i>Veronica serpyllifolia</i> L. var. <i>serpyllifolia</i>	thyme-leaved speedwell
<i>Viola tricolor</i> L.	johnny-jump-up pansy

In addition, the following species are of ambiguous origin and were noted during surveys:

<i>Hordeum jubatum</i> L.	squirreltail grass
<i>Festuca rubra</i> L.	red fescue*
<i>Deschampsia beringensis</i> Hultén	Bering hairgrass*
<i>Deschampsia cespitosa</i> (L.) Beauv	tufted hairgrass*
<i>Phalaris arundinacea</i> L.	reed canary grass*
<i>Plantago major</i> L. var. <i>pilgeri</i> Domin	Pilger's common plantain
<i>Potentilla norvegica</i> L.	rough cinquefoil

* possibly non-native strains used in revegetation projects.

Site summaries, with brief descriptions of the area, comments on the floristics, disturbance and/or development, and infestation levels are listed in Appendix II. Six plants listed in the state noxious weed statutes were found. None of the alien plants observed were listed on the Federal noxious weed list (USDA 1999). Alien species, in almost all cases, were most abundant in areas that had the most human disturbance.

All of the sites contained many native plants, especially those considered “weedy” (that is, successful on disturbed or marginal sites). A list of native species prepared by DeLapp (1998) for the Seward area sites is found in Appendix III. Few sites in the Cordova area were dominated by any one alien species, with the exception of the heavily developed town site area. Outside of town, only at Alaganik Slough Recreation area and Alaganik Slough rest stop was the total infestation level of all non-natives taken together considered high. Many Kenai Peninsula sites, however, were dominated by one or more alien species. The most commonly seen alien plants over the entire study area were common dandelion, annual bluegrass, white clover, common plantain, alsike clover, pineappleweed, and Kentucky bluegrass. Table 6 shows the average cover, constancy and importance values of the top twenty exotic plants encountered for the Cordova and the two Kenai Mountains surveys north of Kenai Lake. Average cover was calculated by dividing the sum of all cover values by the number of occurrences; constancy is the number of occurrences of each species divided by the total number of sites, and importance value is the square root of the product of average cover and constancy.

Table 6. Importance values of twenty alien plants, Kenai and Cordova surveys combined

PLANT NAME	average % cover	constancy	importance value
<i>Taraxacum officinale</i>	30	78	48
<i>Poa annua</i>	26	80	46
<i>Trifolium repens</i>	33	60	45
<i>Plantago major</i> var. <i>major</i>	23	74	41
<i>Trifolium hybridum</i>	23	49	34
<i>Matricaria discoidea</i>	18	60	33
<i>Poa pratensis</i>	16	69	33
<i>Phleum pratense</i>	18	46	29
<i>Achillea millefolium</i> var. <i>millefolium</i>	13	58	27
<i>Cerastium fontanum</i>	15	48	27
<i>Lolium perenne</i> ssp. <i>perenne</i>	47	9	21
<i>Ranunculus repens</i>	24	14	19
<i>Lolium perenne</i> ssp. <i>multiflorum</i>	40	8	18
<i>Rumex crispus</i>	15	20	17
<i>Stellaria media</i>	18	14	16
<i>Leucanthemum vulgare</i>	11	20	15
<i>Crepis tectorum</i>	8	24	14
<i>Bromus inermis</i>	17	9	13
<i>Elymus repens</i>	13	12	13
<i>Rumex acetosella</i>	11	15	13

Frequencies of occurrence of the ten most common alien plants in each ecosection were calculated and are compared in Table 7. Mean cover and importance values could not be compared due to the discrepancy in methodology. Road sites where data from several stops were pooled together, were also omitted.

Table 7. Ten most frequently encountered alien plants, grouped by geographic unit

Kenai Peninsula, Kenai Mountains Ecoregion

70 sites (not counting road sites)

Plant name	# occurrences	constancy
<i>Taraxacum officinale</i>	57	81
<i>Poa annua</i>	57	81
<i>Plantago major</i> var. <i>major</i>	52	74
<i>Poa pratensis</i>	48	69
<i>Trifolium repens</i>	46	66
<i>Matricaria discoidea</i>	43	61
<i>Achillea millefolium</i> var. <i>millefolium</i>	42	60
<i>Phleum pratense</i>	37	53
<i>Trifolium hybridum</i>	34	49
<i>Cerastium fontanum</i>	32	46

Seward area, Gulf Fjordlands Ecoregion

22 sites (no road sites surveyed)

Plant name	# occurrences	constancy
<i>Poa annua</i>	10	45
<i>Trifolium repens</i>	10	45
<i>Taraxacum officinale</i>	9	41
<i>Rumex crispus</i>	9	41
<i>Plantago major</i> var. <i>major</i>	8	36
<i>Matricaria discoidea</i>	8	36
<i>Lolium perenne</i> ssp. <i>perenne</i>	8	36
<i>Phleum pratense</i>	4	18
<i>Medicago sativa</i>	4	18
<i>Melilotus officinalis</i>	4	18

Cordova area, Gulf Forelands and Gulf Fjordlands Ecoregions

17 sites (not counting road sites)

Plant name	# occurrences	constancy
<i>Poa annua</i>	15	88
<i>Taraxacum officinale</i>	11	65
<i>Plantago major</i> var. <i>major</i>	11	65
<i>Ranunculus repens</i>	11	65
<i>Poa pratensis</i>	10	59
<i>Achillea millefolium</i> var. <i>millefolium</i>	8	47
<i>Cerastium fontanum</i>	8	47
<i>Matricaria discoidea</i>	7	41
<i>Poa trivialis</i>	6	35
<i>Veronica serpyllifolia</i> var. <i>serpyllifolia</i>	5	29

Noxious alien plants

Two prohibited and four restricted noxious weeds were observed during the survey, all in the Kenai Peninsula section. Quack grass (*Elymus repens*), a very aggressive prohibited plant, was observed at 13 sites. Hempnettle (*Galeopsis tetrahit*) is also listed as a prohibited plant. Plants fitting the description of *Galeopsis bifida* were found on the Kenai surveys. *Galeopsis bifida* is considered distinct by Hultén (1968) and USDA NRCS (2001) but only a variety of *G. tetrahit* by Welsh (1974), and it seems probable that its status should mirror that of *G. tetrahit*. It was found at 3 sites (Table 8). Both of these plants were found in town sites, a source of infestation. They were apparently also introduced through revegetation work, more likely through the use of hay bales and contaminated topsoil than as impurities in seed mixes. The Alaska Administrative code states that no seeds of prohibited plants may be present in seed mixes, and restricted plants may be present only in very small amounts.

Table 8. Occurrences of prohibited plants

Prohibited plants	Site number and name	
Hemp-nettle (<i>Galeopsis tetrahit</i> / <i>G. bifida</i>)	K1	Sterling Highway mile 55
	K24	Town of Moose Pass
	K42	Town of Hope
Quack grass (<i>Elymus repens</i>)	K9	Resurrection Trail
	K17	Kenai River Ferry
	K19	Cooper Landing boat ramps
	K20	Cooper Creek campground
	K22	Seward Highway mile 20.2
	K24	Town of Moose Pass
	K27	Lawing Work Center
	K38	Hope Road junction
	K41	Hope Road mile 15
	K42	Town of Hope
	K51	Seward Highway North
K61	Seward Highway mile 25.2	
K94	Seward Highway mile 14	

Plantain, annual bluegrass, butter and eggs, and wild buckwheat are considered “restricted weeds.” The first two were found at a great majority of sites in both Cordova and the Kenai areas. The latter were found only on the Kenai Peninsula: butter and eggs was found at 9 sites, and wild buckwheat was found at 3.

DISCUSSION

What is considered an alien plant

Status as native or alien is not always easy to determine. Some plants may be native to one part of the state but adventive to others, introduced into new locations by human activity. Several, like common plantain, have a variety that is thought to be native (*Plantago major* L. var. *pilgeri* Domin) while a different one has been introduced (*Plantago major* L. var. *major*). The origin of some plants is unknown. Squirreltail barley (*Hordeum jubatum* L.) is thought by some to be native, and by others to be alien. Taylor (1990) even goes

so far as to suggest that nettles (*Urtica* spp.) have their recent origin in Eurasia, though this view is not commonly held in Alaska. (see also USDA 1971; USDA NRCS 2001). Rough cinquefoil (*Potentilla norvegica* L.) was considered “probably both native and introduced” by Hultén (1968) It was a common plant in disturbed areas. Some populations may have been introduced from elsewhere in North America. Reed canary grass (*Phalaris arundinacea* L.) is used as a forage crop and erosion control plant. It is considered to be introduced and invasive in many other states, but is thought to be native in natural habitat here in the north (Haber 1996). Reed canary grass that is used for revegetation projects, however, is almost certainly from sources outside of the state and can become a problem. It is currently being tracked by the (AKNHP 2000) Alaska Natural Heritage Program. It was found at 2 sites in the Russian River recreation area, and was possibly planted as part of revegetation projects.

Besides reed canary grass, there are other species native to Alaska that may not have been native to this part of the state. Hultén (1968) referred to the buttercup *Ranunculus abortivus* L. as “sometimes adventive”, and it was found in a heavily disturbed area at site K56. Sawbeak sedge (*Carex stipata* Muhl.) is new to the Cordova area and has few occurrences outside of southeast Alaska and the Kenai peninsula. It was found growing in a ditch along Power Creek Road (C16), and considering its sporadic range in Alaska and the habitat in which it was growing, there is a small chance it may be adventive to the site.

Cultivars of some native plants, like red fescue (*Festuca rubra* L.), were seeded onto road margins, especially around areas of major roadwork. ‘Arctared’ fescue was developed from plants in the Matanuska Valley, and so is considered to be a native variety. But Nancy Moore of the Alaska Plant Materials Center (personal communication, June 2002) said that it is uncertain if the original plants were native to the Valley, or were in fact a variety brought in with the colonists decades before, that had since become established. We may never be certain of its origins, but ‘Arctared’ is widely used for revegetation. Even if these cultivars have been produced from Alaskan populations, the extent of the differences between their genetic make-up and local wild populations is not known. Kentucky bluegrass, known to be alien in Alaska, was collected from the town of Hope and was the base material for the ‘Nugget’ cultivar, also widely used in the north (Alderson, J. and W.C. Sharp 1994).

Since most of the alien plants are well known, these points about seemingly native plants may be extremely fine points of distinction. But they give a fuller (if more complex) idea of the genetic integrity of the biosystem. Elsewhere, common reed (*Phragmites australis* (Cav.) Trin ex Steud.) a native grass, has only recently become a serious pest, especially in eastern North America. It is suspected that introduced Eurasian strains are responsible for its invasion and dominance of new sites (Marks et al. 2002).

Cordova Area Summary

The alien flora of the Cordova/Copper River Delta area is very small compared to the Kenai Peninsula. Non-native plants in the study area were, by and large, confined to areas of great human modification and use, and nearly disappeared when leaving the road corridors.

The number and abundance of alien species were observed to decline as distance from Cordova increased. The eastern half of the Copper River Highway (site C2) had only one roadside alien species, compared to 11 species on the western half (site C1). In addition to the distance from town, this was probably due (as described above) to the harsh conditions of the Copper River, since species richness was lower there for native species as well. The dunes area (site C11), on a very exposed portion of an island in the Copper River, had very few native species and no alien species at all.

Areas of human activity and places where heavy machinery is used, such as boat ramps, had more alien

species and greater cover. Boat ramps appeared to be especially likely places for propagules to be dislodged during loading and unloading. Areas of dense shade, such as the hiking trails in forests, had no alien plants. Many of our native “weedy” species are adapted to disturbance and flourish in the areas recently exposed by glaciers, wind and water. Competition from native species in harsh environments may partly account for the low infestation levels, but the isolation of the area is probably much more significant. At the present time, Cordova is a very small community that has no direct road connection to the rest of the state.

Kenai Peninsula Area Summary

Although small compared to other parts of North America, the alien flora of the Kenai study area was found to be extensive and well established. As with Cordova, exotics were rarely seen in undisturbed areas, though they were seen more extensively at the major heavily used trailheads, where trails were also wider and more open to sunlight. Hiking trails with dense canopy cover and thick ground cover (conditions similar to those in Cordova) were much less likely to have large numbers of alien plants. Victor Creek trail (site K31) was one such area, and compared to the Resurrection trail (site K48), it looked primeval.

The first mile of the Resurrection trail had both an open canopy and a lot of disturbed soil, two factors that are beneficial to alien species. But it also has a long and sustained history of human use. Conn and DeLapp (1983) observed that in Alaska, the age of farm fields since clearing was directly related to number and cover of alien species. This may also be true of other types of clearing and site disturbance besides farm fields, such as mining at the Resurrection trail.

Comparison of the two geographic areas

The difference between the Kenai and the Cordova surveys is an order of magnitude. The area surveyed on the Kenai Peninsula is four times larger than that of the 1997 survey. Resident and tourist populations are many times greater than for Cordova. Direct road access links the Kenai Peninsula to the rest of the state, and in addition there is a greater volume of ferry and air traffic. The Anchorage metropolitan area is nearby and provides not only regular weekend travel, but is a constant source of alien plant seeds and other propagules. Though no surveys specifically concerning alien plants have been seen for the Anchorage area, even casual observations reveal much greater alien species richness and degree of cover. Non-native plants there spread along hiking trails in the Chugach Mountains to a surprising degree. All of these factors appear to be much more significant in the abundance and distribution of alien plants at survey sites than their location within a particular ecosection.

Human activity

The economy of the Kenai Peninsula is much more diverse than Cordova. Mines and mining claims are numerous. Recreation for the Peninsula is much more extensive and diverse, including the use of horses and other pack animals, mountain biking, river rafting and “combat fishing.” Horses are used for pack trips, and spread seeds through their silage and waste. Straw used for the bedding and transportation of sled dogs may contain agricultural weed seeds (Michaud 2002). Mountain biking is very popular, and the bikes may not only transport seeds or other propagules, but are likely to cause disturbance to trail surfaces.

According to Bowker (2001), outdoor activities such as hiking, fishing, hunting, off-road vehicle use and recreational vehicle camping are predicted to rise by almost 30% by the year 2020. Some activities such as “adventure” recreation (climbing, etc.) may rise by 50%. The number of bikers is expected to increase by 91,500 and general off-road motor activities users by 65,900 in twenty years. Currently there are more than 7 million fishing trips annually. Tourism is also expected to rise. Many of these activities would provide ideal dispersal of alien plant propagules into backcountry resources.

Garden species

The increased levels of human use also increase the possibility that alien species will intentionally be introduced. During the survey, garden species were included only outside of gardens, and only if they were not planted intentionally, though it is difficult to know this for sure. Orange hawkweed, ox-eye daisy, pansy, campion, the non-native forget-me-not, and Iceland poppy are all well-known garden plants, and were all found during the survey. They may have been spread along roads and in towns to “beautify” them. Some of these plants are used by the state Department of Transportation, though usually only in urban areas (Sanner, personal communication). Orange hawkweed has been planted on roadsides in the Girdwood area.

Anonymous introductions by private individuals are nearly impossible to track. However, though most seed mixes contain annuals. These populations are ephemeral and usually disappear after a season or two. But at one cabin along the Resurrection trail, the cabin journal contains the entry of a visitor who enjoys dandelions so much, that this person actually packed in and planted a number of them to add color and a crop of delightful seed heads to the environs (O’Donnell, personal communication). This entry did, interestingly, draw the ire of other visitors who added their thoughts to the journal.

Other significant situations

Besides high human use, three other differences from the Cordova are worth noting, especially: environmental change due to the spread of the spruce bark beetle, the occurrence of alien species considered “noxious weeds,” and extensive highway work. The spruce bark beetle has killed mature spruce (*Picea* spp.) trees over large areas of forest. Wildfires that have burned in the wake of the beetle kills have further opened the canopy and ground surface. Although opened areas were observed to be quickly covered in bluejoint, fireweed, Nootka lupine and other native tall forbs, non-native plants may gain a foot hold, as have Timothy and field foxtail at sites K8 and K9. More data are needed before any conclusions about these areas can be drawn.

Agriculture is a small part of the economy of the Kenai Peninsula, especially in the eastern half. The only prohibited noxious plants seen are common weeds of agricultural land, and were probably introduced through infected topsoil from agricultural land further north. Once established, however, they will be difficult to remove.

Widespread highway work and the subsequent revegetation of disturbed areas create an ideal setting for the introduction and spread of new alien species. Seed sources are well regulated and control efforts are generally effective, but due to the scale of work some non-natives may gain a foothold. Most of the road cuts that were inventoried were seeded with cultivars of native grasses. A typical mix used by the Alaska Department of Transportation during the Canyon Creek projects contained 40% red fescue ‘Arctared’, 50% Bering hairgrass ‘Norcoast’ (or tufted hairgrass ‘Nortran’ as a substitute), and 10% annual ryegrass. A test form of slender wheat grass (*Elymus trachycaulus* (Link) Gould ex Shinnars ssp. *trachycaulus*, synonym *Agropyron pauciflorum* (Schwein.) A.S. Hitch.) was also used in small amounts (Carol Sanner, AK-DOT, personal communication).

Allowable levels of non-prohibited or restricted alien species in seed mixes are .5% (Stoney Wright, Alaska Plant Materials Center, personal communication). Even though standards are strict, some alien species may be inadvertently introduced in seed mixes, though it is felt that such introductions are small and could easily be dealt with if follow-up eradication procedures are taken. Unintentional introductions of non-native plants were observed in all such sites, usually in small numbers. A more likely culprit than the seed mix itself is topsoil brought to the site that contains propagules- the likely source of the quackgrass and hempnettle infestations that were seen. Hay bales used for erosion control also appear to be a source of infestation, since the hay used in them is likewise not required to be weed free. In some cases, alien

species are added to the seed mix deliberately as part of the revegetation effort, especially “wildflowers” such as ox-eye daisy (which was accidentally spread on a few road cuts by a contractor during one of the Canyon Creek Projects).

Once established, it is possible that infestations can spread through the grading of roads. This appeared to be the case on the Palmer Creek road, where dandelion might be spread when taproots are sheared off and transported for some distance, where they can sprout again. Cody (1996) speculated that this might be the case with purple sand spurry in the Yukon Territory (which was also found on the Kenai surveys).

Some alien species, like tannual ryegrass, have beneficial qualities and are used extensively in erosion control. Though there is a growing trend to use only cultivars of native species, non-native plants will certainly continue to be used. Many of the alien plants observed are specifically planted as forage crops (clovers, for example), soil conditioners, or ornamental species, and this use is not likely to abate. In circumstances where they can be contained, these plants can be economically beneficial, and in very few cases provide forage to native animals. During one of the Kenai surveys, a pair of pine grosbeaks was observed feeding preferentially on the ripe seed pods of mouse-ear chickweed. But while benefits of alien plants have been documented (Sheley and Petroff 1999, Mulligan 1979), these qualities are dwarfed by the negative effects of invasive species.

Areas of little or no infestation

Since sites were chosen based on their potential for harboring alien species, very few sites were found without them. A few sites were chosen to represent more natural habitats that were vulnerable to infestation by natural disturbance regimes or that received unfocused visitation (that is, without official trails). Several types are described below. Many visitor facilities were developed next to waterways with large gravel bars. Overall, infestation levels in these areas were low to very low, and sometimes no alien plants were observed.

Gravel bars

The gravel bar at Quartz Creek, where it flows under the Sterling Highway (K5), had low to medium levels of mouse-eared chickweed and common yarrow, and medium to high levels of Iceland poppy, which might have been planted. Falls Creek (K60) had low levels of Timothy, annual bluegrass, and dandelion; Sixmile Creek (K64) had low dandelion infestation. Silvertip Creek (K65), East Fork of Sixmile Creek (K67), and Lyons Creek (K72) had no aliens, and Snow River (K98) had “few if any.” Gravel bars at Ptarmigan Creek (K26) and Granite Creek (K54) campgrounds had low levels of the commonest aliens. The bar at Cooper Creek campground (K20) was “relatively free” and the Bertha Creek campground (K53) gravel bar had none. While infestation appears to be low at the present time, gravel bars are considered the natural areas most likely to harbor alien species, and should be closely monitored.

Logged areas

Recently logged areas (site K16, off of Bean Creek Road, and C8, near the Cabin Lake picnic area) also showed very little infestation, though few of these sites were visited. Forest canopies around two trails appeared to have been thinned because of beetle kill, and a few exotics had expanded beyond the trail surface. At the lower trailhead of the Russian Lakes Trail (K8), Timothy was observed, and the southern trailhead of the Resurrection Trail at the Sterling Highway (K9) had a few field foxtail plants growing in thick feathermoss. In both of these cases, only a few plants were found.

Alpine and densely forested areas

The Turnagain Pass alpine area (site K57) presently receives sporadic visitor use outside of the visitor facilities at the winter sports staging areas, but has a high level of vehicular traffic. A few unofficial trails have developed, but no alien plants were seen in the natural alpine tundra communities (alien plants were observed, however, at the road margins and unofficial campsites). At the Swettman Mine (K47), bluegrasses and dandelion did occur but were sparse, and only in the immediate area of the abandoned outbuildings.

On trails where forest canopy covers were high and disturbance low (such as the Victor Creek trail K31, and Haystack trail C13), few aliens were seen- usually none beyond the beginning of the trail. Bog meadows along the Eyak River trail (C17) and Pipeline Lakes Trail (C14) also had no alien species. The differences between the alpine meadow, bog meadow, and deep forest sites, as compared to the gravel bars, point to the importance of disturbance regime in susceptibility to alien invasion.

An exception to this conclusion seems to be along the mouth of the Copper River. Site C11, a dune area in the Delta, had no alien plants. Site C2, the eastern portion of the Copper River Highway, had only one occurrence (a low level of Kentucky bluegrass) compared with medium levels of 11 taxa along the western section (C1). In this particular area, low infestation levels seem to be due more to an increase in disturbance than a decrease, since environmental conditions of this microclimate are so extreme. But it is also true that these sites were among the most remote surveyed. They should be monitored to chart any changes in infestation.

Other alien plants reported for the area

Many other alien species have been recorded for the Kenai Peninsula - Prince William Sound - Copper River Delta area. Hultén (1968) documented the occurrence of 30 alien species within the Kenai survey area and 10 alien species within the Cordova area. He considered it possible that 16 others might occur in the Kenai and a further 24 for the Cordova area. Anchorage has perhaps the largest infestation levels of alien plants in the state. A floristic inventory of Ft. Richardson, in northeastern Anchorage (about seventy miles away from the Kenai Peninsula by car), documented 60 alien species (Lichvar et al, 1997).

The 63 species observed during the Kenai and Cordova surveys represent about half of the alien plants that have been previously reported. A list of additional non-natives reported for south-central Alaska (including Anchorage), which may possibly occur within Forest boundaries but which were not found during the surveys, is included as Appendix IV. Other Alaska/Yukon floras and field guides were consulted to compile this list (Welsh 1974, Pojar & MacKinnon, 1994), as well as data from the University of Alaska Museum/Herbarium (Al Batten, personal communication) and unpublished results of projects currently in progress.

Since the surveys of 1997 and 1998, much fieldwork has been done in the Chugach National Forest and surrounding area. Wetland vegetation classification studies in the western Kenai Peninsula by Gratz (personal communication) found 6 alien species in 21 of 904 plots. He reports that fowl bluegrass (*Poa palustris* L.) is "quite common around the extensive timber harvests done on the Kenai recently." Spotted knapweed (*Centaurea biebersteinii* DC., synonym *C. maculosa* auct. non Lam.) has been reported from Valdez by Stensvold (Michael Shephard, personal communication).

Within the Chugach Forest boundaries, Boggs (2000) found 17 occurrences of four alien species in 471 vegetation plots in the Copper River Delta, and documented two other species outside of plots. The Coastal Alaska inventory (Bert Mead, personal communication) reported Dewey sedge (*Carex deweyana* Schwein., a possibly introduced species), bulbous sedge (*Poa bulbosa* L.) and nightshade (*Solanum* sp.) in sites within Chugach National Forest and some areas close by. DeVelice reported stickseed (*Lappula* sp.), dooryard dock (*Rumex longifolius* DC.), Dewey sedge, wood bluegrass (*Poa nemoralis* L.), and fowl bluegrass in 45

of 2293 ecoplots studied during fieldwork for a classification of plant community types of the Chugach National Forest (Map 2). Most of the non-natives are concentrated in the areas near Hope and Cordova, but there are notable occurrences in remote areas east of the Copper River. During a rare plant survey, I performed in Forest lands in Prince William sound, I found no alien taxa at the alpine, wetland and coastal sites I visited (Duffy, 1993), but during field work east of the Copper River in 1997, I observed alsike clover that had persisted in an area where a mining operation had been abandoned many decades before.

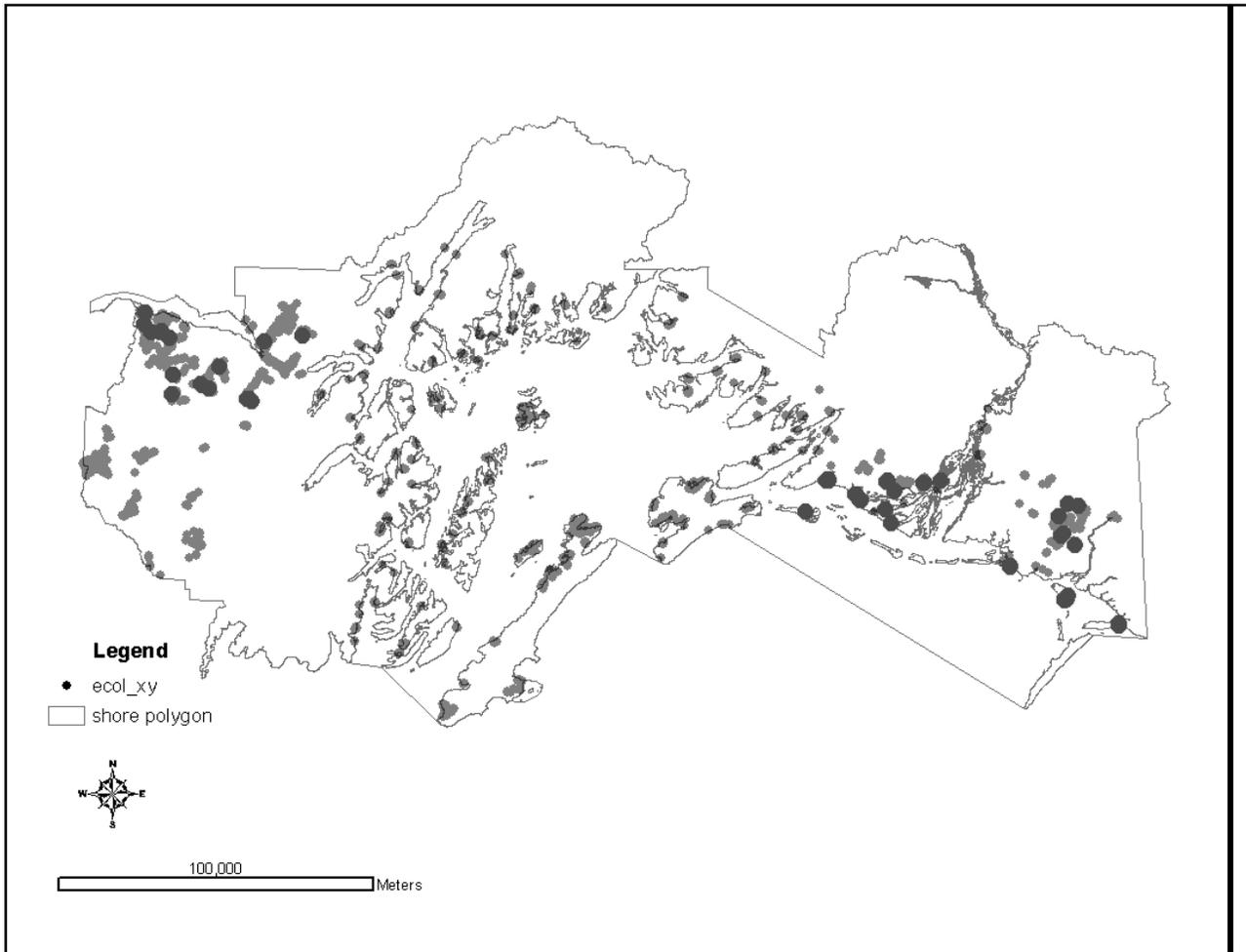
These data, though preliminary, add a fuller understanding of the distribution of alien species to the Cordova and Kenai surveys. They illustrate that though non-native plants are for the most part presently confined to areas of human disturbance, they have begun to infest wetlands and other natural communities. Unlike the surveys of 1997 and 1998, the study sites for these projects were chosen either to represent natural communities or were chosen at random, and give a rough idea of the extent of alien species occurrences away from developed sites.

Evaluating the threat of alien plant taxa

The most important question managers may ask about non-native plants is how will they affect natural systems? Which species will remain casual introductions, and which will develop into problems? Plants that raise the most concern are those that spread aggressively into natural vegetation and are difficult to eradicate, crowding out more desirable native species. Invasive plants dominate the communities they invade, reducing species diversity, seriously diminishing native populations, and in some cases even change physical characteristics of a site such as hydrology. State prohibitions of noxious weeds are aimed at preventing problems from starting or getting worse. Half of the species on the prohibited list have not yet been found to occur in Alaska, and with vigilance, hopefully they will not be introduced. But there are many alien species not specifically mentioned on the list that concern managers and biologists.

Besides the state prohibited and restricted lists, little has been done locally to rank individual species. The 1997 and 1998 surveys were designed to record the extent of alien plant populations but did not measure trends or rank them as to their potential to become problems. Several studies provide models for future investigation. To determine the importance of problem species, Haber (1996) polled Canadian managers who rated invasive plants based on three criteria: degree of impact (severe, moderate, limited), extent of impact (widespread, local), and status (spreading, stable). The most important species were identified for national, regional, and local concern.

One program that seems very promising has been developed by the U.S. National Park Service. A software program that ranks invasiveness in alien plants has been developed and is currently in use (APRS Implementation Team. 2001). The Alien Plants Ranking System (APRS) is a computer-implemented system that separates innocuous alien plants from invasive ones, and helps identify those species that currently impact a site, and those that have a high potential to do so in the future. This system has been used in five Alaska parks (Densmore, McKee and Roland 2001). Two of these parks - Wrangell-St. Elias and Kenai Fjords - border Chugach National Forest and share many of the same conditions, concerns and issues. Table 9 lists the species observed during the Chugach surveys that occur on those lists. The descriptions of problem plants in those parks would be useful for managers in the Chugach. In that study, plants were grouped according to their ability to persist and spread after introductions, and further, those that could invade natural areas. However, hempnettle, the bluegrasses, and many other plants observed during the Chugach surveys were not discussed in their report. Japanese knotweed and bird vetch are both listed by the NPS as invaders, and though they were not observed during the Chugach surveys, they have been identified as potentially serious problem species in south-central Alaska and should be watched for.



Map 2. Alien and potentially alien plant species occurrences on 72 (large red dots) of 2177 plots documented in the Chugach National Forest plant ecology database linked to a GIS. The 72 occurrences include the following species: alien taxa - *Brassica rapa*, *Cerastium fontanum*, *Lupinus polyphylus*, *Polygonum aviculare*, *Rumex longifolius*, *Veronica serpyllifolia*, *Agrostis gigantea*, and *Phleum pratense*; potentially alien (ambiguous origin) - *Carex deweyana*, *Festuca rubra*, *Myriophyllum spicatum*, *Poa nemoralis*, *P. palustris*, and *P. pratense*.

Table 9. Exotic plants that persist, spread or invade natural areas (modified from Densmore, McKee and Roland, 2001)

Exotics that persist and spread in disturbed areas:

annual hawkbeard (*Crepis tectorum* L.)
quackgrass (*Elymus repens* (L.) Gould)
ox-eye daisy (*Leucanthemum vulgare* Lam.)
butter-and-eggs (*Linaria vulgaris* P. Mill.)
large-leaved lupine (*Lupinus polyphyllus* Lindl.)
yellow sweet clover (*Melilotus officinalis* (L.) Lam.)
common plantain (*Plantago major* L. var. major)
creeping buttercup (*Ranunculus repens* L.)
sheep sorrel (*Rumex acetosella* L.)
common dandelion (*Taraxacum officinale* G.H. Weber ex Wiggers)
alsike clover (*Trifolium hybridum* L.)
red clover (*Trifolium pratense* L.)
white clover (*Trifolium repens* L.)

Exotics that invade natural areas:

white sweet clover (*Melilotus albus* Desr.)

Even though the Chugach surveys did not measure the potential threats of the alien plants encountered, some conclusions can be drawn. The vast majority of alien plants seen during these surveys were found only on disturbed habitats. Even large local populations dropped to insignificant levels in adjacent natural habitat. Two natural habitats harbored small populations of alien species: gravel bars (with a natural disturbance regime) and forests with canopies artificially opened around trailheads. At the former, dandelion, annual bluegrass, common yarrow, mouse-eared chickweed, and Iceland poppy were observed, and the tall grasses Timothy and field foxtail were observed at the latter. Along with the prohibited and restricted plants, these species form a core group of species of concern. Quackgrass, especially, is considered a serious problem. It is known to be allelopathic, and is one of the most difficult weeds to control (Batcher 2002).

Ox-eye daisy is known to be an aggressive plant in open areas (Sheley and Petroff 1999). Plants in Table 8 should also be a part of the core group. Although reed canary grass may be native in Alaska, the strains observed in revegetated areas may not be. Since this grass is a serious pest in the lower 48 and many Canadian provinces, it should be added to this list. In addition to those plants actually observed on the surveys, there are several plants that are known from the Anchorage area and could become serious threats if they expand their range into Forest lands. These include Japanese knotweed, bird vetch (*Vicia cracca* L.), and purple loosestrife.

Several recent developments will greatly aid Chugach National Forest managers in dealing with exotic plant infestations. The Alaska Department of Fish and Game has identified eight plants as species that pose the most significant threat to wetland habitat (Fay 2002). The state-wide Committee for Noxious and Invasive Plant Management (CNIPM) has formed with the aim to identify invasive plant threats and coordinate monitoring, eradication, and public awareness efforts. They hold regular meetings and offer many

resources, including a website (<http://www.cnipm.org>). The Alaska Exotic Plant Information Clearinghouse (AKEPIC-<http://www.agdc.usgs.gov.akepic>) Mapping Project is developing a database to track and map present alien plant infestations and list potential future threats. Data from the Cordova and Kenai surveys have been formatted according to the protocol outlined in their manual (Binnian and Shephard 2002) and submitted for inclusion into their database.

CONCLUSION

Chugach National Forest is not currently experiencing the major problems of alien invasives facing other National Forests, but non-natives are well documented from one end to the other. Generally speaking, the Copper River area has a fairly small non-native plant presence. The low number of alien species is not surprising, given Cordova's small size and isolation. Of the 25 species of alien plants found during the survey there, most were found in the Cordova town site, where the container port and ferry terminal appear to be the main sources of introduction. None of those found are considered noxious weeds, though annual bluegrass and common plantain are restricted weeds. The delta area may see radical change in the next decade with the possible logging of Chugach Corporation land east of the Copper River. If the proposed road to Carbon Mountain is built and logs are routed through the port of Cordova, the increase in traffic, heavy machinery and shipping could also increase the Chitna and the Million Dollar Bridge may have a similar effect.

Alien plants were observed to be widespread in the Kenai Peninsula surveys, and likewise they were almost always limited to areas of human disturbance. But unlike the Cordova area, at several sites they were so abundant that they were the dominant plants. Fifty-nine species were observed on the Kenai surveys. Two plants found on these surveys, quack grass and hemp nettle, are listed as prohibited noxious weeds by the State of Alaska Administrative Code. Several others are restricted weeds. Extensive areas of road work were revegetated with native cultivars, and infestations of exotic species in these areas were seen. In a few instances, non-natives were found outside areas of broken ground where the only disturbance was the removal of the canopy. These tall grasses- field foxtail and Timothy- as well as reed canary grass (which may or may not be native populations) were the only species observed off of the hiking trails, growing in mostly native vegetation with closed ground cover. Unlike many of the widespread weeds that are adapted to trampling in pastures, these aliens may be capable of establishing themselves in natural communities, and special attention to monitoring these species would be worthwhile.

Important factors affecting alien plant populations in the western Chugach National Forest appear to be the high level of human use, the diversity of human use (including the use of pack animals, agriculture, mountain biking and other means of mechanical recreation), the change in natural communities due to spruce bark beetle, road construction, and revegetation projects. All of these factors are projected to increase over time.

FUTURE WORK

These four surveys were the first step in implementing objectives of the Revised Forest Plan (USDA Forest Service 2002) to “conduct surveys to determine abundance and distribution of exotic plants, particularly in areas affected by management decisions” (page 5-8). In an age of climate change, developing a clear picture of present vegetation patterns, including the distribution and numbers of alien plant species, will allow future biologists to accurately assess change. Future investigation will complete the preliminary picture of alien plants in Chugach National Forest, and will prepare the way for infestation monitoring, eradication, and/or control programs. Additional projects towards this goal might include:

Preliminary inventories of front country areas not yet surveyed. Portage, Whittier, Valdez, Seward and Girdwood are all areas of growth and harbor populations of alien plants. Large stands of reed canary grass, possibly from sources outside the state, were observed at Glacier Ranger District headquarters in Girdwood. Infestation levels of non-native plants in very small communities like Tatitlik are presently unknown. The Whittier Tunnel project has just opened a formerly isolated community to increased traffic, and to further infestation of exotics as well.

Voucher specimens of alien plant occurrences. Collections should be made to document the occurrences of alien taxa, especially of groups like bluegrasses (*Poa* spp.) that look superficially similar, taxonomically unclear groups such as yarrow, and occurrences of plants that are new to the area.

Surveys of backcountry sites. Backcountry trails, cabins and kayak/boating campsites all receive high visitor use and are the interface between highly developed frontcountry facilities and the natural communities of remote areas. An approach similar to that used to survey the highways would be useful for long trails such as the Resurrection Trail.

Surveys in wild areas. Ecological field work in wild areas incidentally records the occurrence of alien species. Data from these studies should be brought together and analyzed. The presence of exotic species in the Prince William Sound Islands and Mainland Ecosubsections is poorly known. The enormous changes in the spruce forests caused by the spruce bark beetle may also influence the spread of non-native species, especially if non-native trees are used for reforestation. Monitoring programs that are tracking these changes are presently in progress, and their data will prove useful in tracking the role of alien species in ecological change. Other monitoring programs devoted to alien species in logging zones should be implemented.

Wetlands. Few wetlands were surveyed during this project and should be surveyed in the future. The majority of Alaska alien plants are upland disturbed site species, but several (*Bidens* spp., *Poa* spp., *Gnaphalium uliginosum* L., *Schoenoplectus maritimus* (L.) Lye, synonym *Scirpus paludosus* A. Nels.) are wetland species and Japanese Knotweed is a potentially serious threat. Both should be looked for in the Forest’s extensive wetland habitats.

Monitoring of surveyed sites. Sites already surveyed should be revisited at regular intervals to determine the trend of infestation. Highway revegetation programs would be especially useful in tracking the extent to which aliens invade the area. Many exotic species are spreading and are known to have occurred nearby. Species such as bird vetch (the ‘kudzu of the north’) is a serious problem in Anchorage and other parts of Alaska, and should be looked for.

Inclusion of alien plants in USFS field guides. Currently, field identification guides (such as DeVelice et al. 2001) focus on native plants, but inclusion of alien taxa, especially invasive plants to watch out for, would be very useful in the early identification of infestations in natural communities. Some National

Forests combine rare plant and non-native plant guides into one publication (Potash 1991, Houston, et al. 2001).

Other studies. In-depth projects could measure visitor use against alien species diversity; compare the non-native flora of the Chugach with the Tongass, or other forests outside of the state. A useful study would be to compare localities that are accessible by road with isolated communities, like Cordova and many of the towns of southeast.

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Appendix I

Photographs



Photo 1, left. Low infestation of *Poa annua* along a portion of the Victor Creek Trail (Site K31). Levels were higher in the parking area, and are here seen diminishing as the forest canopy closes.



Photo 2, right. Low to medium infestation of *Poa annua* (middle of trail), at Saddlebag Glacier trailhead (site C12).



Photo 3, left. Medium infestation of *Taraxacum officinale* and *Achillea millefolium* at mile 20 of the Copper River Highway (site C1).



Photo 4, right. Heavy infestation of *Ranunculus repens* and *Poa annua* at the Crater Lake Trail parking area (site C15).



Photo 5. Site with very high level of *Trifolium repens* and *Taraxacum officinale*, south end of the Resurrection Pass Trail (site K9).



Photo 6. Road improvements and revegetation along the Seward Highway (Hope Road junction, (site K38).

Appendix II

Site descriptions

Cordova survey

Site C1. Copper River Highway west (miles 5, 10, 15, 20, 25)

Cordova town site east to mile 27

The first five stops along the road were considered site 1. The road was paved, with a gravel margin, to the airport at mile 13, and was completely gravel beyond. The vegetation at the roadsides was mostly alder and willow scrub, with some wet meadows and forested areas. Along the entire margin many pioneering herbaceous species grew abundantly.

Achillea millefolium L. var. *millefolium* (medium)

Agrostis gigantea Roth (low)

Cerastium fontanum Baumg. (medium)

Leucanthemum vulgare Lam. (medium)

Matricaria discoidea DC. (medium)

Phleum pratense L. (low)

Plantago major L. var. *major* (medium)

Poa annua L. (medium)

Poa pratensis L. (medium)

Poa trivialis L. (medium)

Ranunculus repens L. (medium)

Site C2. Copper River Highway east (miles 31, 35, 40, 45, 50, 52)

Mile 27 east to just past the Million Dollar Bridge

The vegetation along the highway changes abruptly when it crosses the first section of the Copper River at mile 27, reflecting the harsh climate of the river zone with its strong winds, blowing sand, colder temperatures and generally better drained substrates. Alder and willow scrub predominates, and species richness plummets. On the east side of the river, at about mile 39, the effects of the wind are less pronounced and the forest resumes, though with a very different feeling to it, much more like the interior portion of the state. Cottonwood, spruce and tall alder scrub were accompanied by herbaceous species at the road margin. This pattern extends to the Million Dollar Bridge. Past the bridge there are fewer trees and more tall alder and willow scrub.

Milepost 30 was missing, so the road was surveyed at milepost 31. It was past the bridge, at mile 50, that the only alien species encountered along the roadside - Kentucky bluegrass - was observed.

Poa pratensis L. (low)

Site C3. USFS kiosk at Alaska ferry terminal

60 33.34 145 45.20

The Alaska State Ferry terminal is approximately one-half mile north of town. The interpretive kiosks here were built on the gravel pad that was constructed for the ferry and shipping terminals, adjacent to the paved road. There is very little landscaping and most of the vegetation is “weedy”. This area is perhaps the most significant point of entry for alien species, with private automobiles, shipping containers, and heavy machinery all unloading here.

Achillea millefolium L. var. *millefolium* (medium)
Cerastium fontanum Baumg. (low)
Leucanthemum vulgare Lam. (medium) possibly planted
Matricaria discoidea DC. (medium)
Plantago major L. var. *major* (medium)
Poa annua L. (medium)
Poa pratensis L. (low)
Poa trivialis L. (low)
Potentilla norvegica L. (low)
Ranunculus repens L. (medium)
Rumex acetosella L. (low)
Rumex crispus L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (medium)
Trifolium repens L. (medium-high)

Site C4. USFS Copper River Delta Welcome kiosk
 60 30.10 145 30.61

The interpretive kiosk area at mile 10.9 consists of a small roofed, open-sided building with an adjacent gravel parking lot. It was built on a gravel pad extending into a wet sedge meadow that was bordered by tall Sitka willow, Barclay willow and alder scrub.

Achillea millefolium L. var. *millefolium* (medium)
Cerastium fontanum Baumg. (medium)
Leontodon autumnalis L. (low)
Leucanthemum vulgare Lam. (medium)
Matricaria discoidea DC. (medium)
Plantago major L. var. *major* (medium)
Poa pratensis L. (medium)
Poa trivialis L. (medium)
Ranunculus repens L. (medium)
Rumex acetosella L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (low)

Site C5. Alaganik Slough recreation area
 60 25.78 145 18.04

The Alaganik Slough Road begins at mile 16.8. It winds through spruce forest, alder and willow scrub, and wet sedge meadows. The recreation area is on the banks of the slough, with tall alder and willow scrub, low willow and sweetgale scrub and wet sedge meadows. There is a small roadside interpretive sign approximately one-quarter mile in, and at the end of the two mile long road there is a parking lot, camping area, boat ramp, boardwalk, and rest room facility. Most of the alien plants were found in the parking area and, especially, the boat ramp. Only common yarrow was found along the revegetated margins of the boardwalk. Plants that fit the description of Pilger's common plantain were also observed, with a low cover value.

Achillea millefolium L. var. *millefolium* (medium)

Cerastium fontanum Baumg. (low)
Hordeum jubatum L. (low)
Plantago major L. var. *major* (medium)
Poa annua L. (medium)
Poa pratensis L. (medium)
Poa trivialis L. (low)
Ranunculus repens L. (medium)
Taraxacum officinale G.H. Weber ex Wiggers (medium)

Site C6. Alaganik Slough rest area and boat ramp
60 26.28 145 12.70

This site is on the Copper River Highway at mile 22.2 where it crosses Alaganik Slough. There is a parking lot, rest room facility, interpretive signs, a boat ramp and access to the slough bank. Across the highway there is an overflow or long-term parking area. This parking area is at the base of a rocky spruce-hemlock forested knoll, but the main rest area is built on the sandy alluvium of the slough. It is surrounded by tall alder and willow scrub with small patches of spruce and low scrub/river bar herbaceous communities on the slough banks. A small shrub, possibly a cultivar in the rose family, was found next to the rest room. It had no inflorescence from which to identify it, and was likely not adventive but a planted specimen that was not responding well to the site. Plants that fit the description of Pilger's common plantain were also observed, with a low cover value.

Achillea millefolium L. var. *millefolium* (medium)
Cerastium fontanum Baumg. (medium)
Leucanthemum vulgare Lam. (low)
Plantago major L. var. *major* (medium)
Poa annua L. (medium)
Poa pratensis L. (low)
Poa trivialis L. (medium)
Ranunculus repens L. (medium-high)
Taraxacum officinale G.H. Weber ex Wiggers (medium)

Site C7. Eyak River boat ramp
60 31.69 145 33.04

Located at mile 5.9, the boat launch is nestled in a Sitka spruce forest at the riparian edge of the Eyak River. There is a large parking area, rest room facility and boat ramp. Ox-eye daisy was found here, but was obviously planted in a small garden at the rest rooms. It had not escaped to the roadsides or parking area, but it was interesting to see that native species, such as glandular willow-herb, had invaded the garden.

Achillea millefolium L. var. *millefolium* (medium)
Cerastium fontanum Baumg. (low)
Plantago major L. var. *major* (medium)
Poa annua L. (medium)
Poa pratensis L. (low)
Poa trivialis L. (low)
Ranunculus repens L. (medium)

Veronica serpyllifolia L. var. *serpyllifolia* (low)

Site C8. Cabin Lake picnic area
60 31.72 145 27.30

The picnic area at Cabin Lake is a small Forest Service right of way, surrounded by Eyak Corporation land. There are a few picnic tables in a clearing next to the lake, a parking lot, and a rest room facility. The area under the picnic tables was gravel and had large patches of hairgrass, most of which was not flowering, in addition to annual bluegrass. Some small trails extended into the hemlock forest; these were followed for a short way but did not harbor any alien species.

The three mile access road was also surveyed. It did not contain any species different from the picnic area. The clear cuts, although not on Forest Service land, were briefly visited since they represented areas of extensive disturbance. However, only common dandelion was found in the clear cut I walked through, and it grew on a gravel logging road. Even more curious was the gravel staging area/ dump/yarding area halfway between the highway and the picnic area. Although many non-native plants might be expected in such an area, none were observed.

Deschampsia elongata (Hook.) Munro (high) in the picnic area only
Poa annua L. (medium)
Ranunculus repens L. (medium)
Taraxacum officinale G.H. Weber ex Wiggers (low) in the clear cuts only
Veronica serpyllifolia L. var. *serpyllifolia* (low)

Site C9. Child's Glacier recreation area
60 40.10 144 45.61

The Childs Glacier area is located at mile 49, at the end of the maintained portion of the Copper River Highway, on the east side of the Copper River. It consists of a glacier observation area with picnic tables and rest rooms, an observation platform for the Million Dollar Bridge, a short access road, a parking lot and a mile-long hiking trail. The area is a mosaic of alder scrub and open cottonwood forest. Both of these bluegrasses were seen along the hiking trail and in the observation areas.

Poa annua L. (medium)
Poa pratensis L. (medium)

Site C10. Old railroad bed at mile 41 (both sides of creek)
60 33.68 144 46.55

The Copper River Highway diverges from the bed of the old Copper River Railway for a few miles near mile 38 and rejoins it again at mile 41. The old rail bed is presently used as an access route to a small salmon stream and is passable to the stream crossing. The area is a dense tall alder and willow scrub with occasional cottonwoods and wet sedge meadows. The three alien species were all found between the highway and the creek; approximately 100 yards of the rail bed south of the creek (which is now barely a trail) was surveyed but no non-natives were found.

Matricaria discoidea DC. (low)

Plantago major L. var. *major* (medium)

Poa annua L. (medium-high)

Site C11 Dune area on Copper River at mile 27.5

60 26.86 145 04.00

I chose this as a sight because it was in the middle of the Copper River zone, and because it seemed to have a lot of disturbance. It was a sand dune that appears to have been graded by heavy machinery, and to have been used by all-terrain recreation vehicles. The area, about two acres, was bordered by tall alder scrub. No alien plants were observed, at the immediate road margin nor in the disturbed sandy area. The day I surveyed the site it was extremely windy.

Site C12 Saddlebag Glacier road and trail head

60 27.06 145 07.64

The one mile long road leading to the trailhead was flooded, but not impassable. It wound through tall alder, willow scrub, and spruce forest. The parking area and trail head (there are no other facilities) were in a young, even aged spruce forest with a thick moss layer and sparse shrub layer. The only non-native observed was annual bluegrass, which occurred only at the immediate beginning of the trail, on the mulched trail surface. It disappeared after 15 feet, and no non-natives were observed along the trail, which was followed for .5 miles. Annual bluegrass was the only alien plant observed on the access road, which leads not only to the trailhead but to several designated firewood gathering areas.

Poa annua L. (low-medium)

Site C13. Haystack trail

60 27.64 145 16.69

The pull-off for the Haystack Trail was adjacent to the hemlock-forested outcrop, a wet meadow and a shallow pond. The trail itself runs through the hemlock forest of the outcrop, which has a thick moss layer but sparse understory. The trail is made of net-covered wooden steps and mulch; a few areas have gravel. The .8 mile trail was surveyed to its end, where there is an overlook of the delta. No alien species were observed along the trail, even at the first few feet of the trail, only in the pull-off area. Pinesap (*Monotropa hypopythis*) was observed along this trail.

Poa annua L. (low)

Taraxacum officinale G.H. Weber ex Wiggers (low)

Site C14. Pipeline Lakes/McKinley Lake trails

60 26.89 145 13.38

The Pipeline trail begins at the highway and ends 1.8 miles later at the mid-point of the 2.4 mile long McKinley Lake trail. The survey began at the Pipeline trailhead, continued to the trail junction, then back to the McKinley Lake trailhead, and back along the road. Both trails meander through beautiful but typical hemlock and hemlock-spruce forest; the Pipeline trail also crosses extensive wet sphagnum (locally called muskeg) meadows. There are several grave sites at both trailheads. Trails consisted of small sections of

gravel, mulch, bare mud, sphagnum in the meadows, and some wooden boards and bridges. No alien plants were seen along either trail except at the immediate trail heads- annual bluegrass at the Pipeline trail extended about 10 feet, and plantain extended about 3 feet along the McKinley trail head. The non-natives were found in the parking pull-offs but not along the road margin in between. The public use cabin at the McKinley Lake trailhead was occupied at the time and was not surveyed so as not to disturb the visitors. Pinesap (*Monotropa hypopitys*) was observed along both trails.

Achillea millefolium L. var. *millefolium* (low)
Cerastium fontanum Baumg. (low)
Matricaria discoidea DC. (low)
Plantago major L. var. *major* (medium)
Poa annua L. (medium-high)
Poa pratensis L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (medium)

Site C15. Crater Lake trail

60 32.80 145 42.50

The Crater Lake trail ascends the steep ridge north of Eyak Lake through spruce forest and up into the alpine zone. The day it was surveyed brought the heaviest downpours of the storm, and the trail was followed for only about half a mile. The trail consisted of mulch and bare mud, with some exposed bedrock. Annual bluegrass extended up the trailhead approximately 20 feet and was not seen again, but a few Kentucky bluegrass plants were observed about 500 feet up in a large opening of the forest canopy that the trail ran through. It was the only non-native seen on a forested trail away from the trailhead. The parking area had one of the biggest infestation levels seen outside of the town site.

Achillea millefolium L. var. *millefolium* (medium)
Matricaria discoidea DC. (low)
Plantago major L. var. *major* (high)
Poa annua L. (high)
Poa pratensis L. (low)
Ranunculus repens L. (high)
Taraxacum officinale G.H. Weber ex Wiggers (medium)
Trifolium repens L. (medium)
Veronica serpyllifolia L. var. *serpyllifolia* (low)

Site C16. Power Creek Road, small picnic area

60 33.82 145 40.61

The strong downpours caused flooding along the Power Creek Road, approximately 5.5 miles east of the airstrip, and the Power Creek trail could not be accessed. Random stops along the road showed populations of the four non-natives listed below to be extensive along the gravel road's margin. The rare Sawbeak sedge (*Carex stipata*) was observed approximately 2.2 miles east of the municipal airstrip, growing in a ditch at the roadside.

Plantago major L. var. *major* (high)
Poa annua L. (high)
Ranunculus repens L. (high)
Taraxacum officinale G.H. Weber ex Wiggers (medium)

Site C17. Eyak River trail

60 31.89 145 33.72

The trail winds along the base of cliffs next to the Eyak river in hemlock-spruce forest, and then moves away from the river through wet sphagnum meadows. The trail is mostly mulch and bedrock within the forest, and a net-covered wooden plank boardwalk through the meadows. The trail was followed for approximately a mile and a quarter. As with most of the other trails surveyed, no non-native plants were observed along the trail itself. Annual bluegrass and creeping buttercup extended about 60 feet along the open alder/spruce forest margin of the trailhead. A portion of the trail that runs along the river was flooded, so the bank of the river at that spot could not be checked for alien species. A single bog adder's mouth (*Hammarbya paludosa*) was found immediately adjacent to the boardwalk, approximately one mile into the trail. This entire area appears to be calcium rich, with spleenwort (*Asplenium viride*) growing on the cliffs and yellow sedge (*Carex flava*) in the meadows.

Poa annua L. (medium-high)

Ranunculus repens L. (medium)

Site C18. USFS Cordova District Headquarters

60 32.67 145 45.20

The grounds around the Forest Service headquarters and visitor center were surveyed separately from the rest of Cordova town site. Planted areas were not included, but these alien species were observed at the edges of the building, sidewalks, and parking area:

Cerastium fontanum Baumg. (medium)

Matricaria discoidea DC. (medium)

Plantago major L. var. *major* (medium-high)

Poa annua L. (medium)

Poa pratensis L. (medium)

Ranunculus repens L. (high)

Rumex crispus L. (low)

Taraxacum officinale G.H. Weber ex Wiggers (medium)

Trifolium repens L. (medium-high)

Veronica serpyllifolia L. var. *serpyllifolia* (low)

Site C19. Cordova town site

60 32.67 145 45.20 (same as USFS headquarters)

The town streets and parking lots were briefly surveyed. USFS lands were considered of a higher priority, so the town itself was not exhaustively searched and no doubt several alien species were missed. The town site is an important area for alien plants, however, in that many species can quickly become established in the developed area and eventually spread out from there. Plants that fit the description of Pilger's common plantain were also observed, with a medium cover value.

Achillea millefolium L. var. *millefolium* (high)

Achillea ptarmica L. (low)

Cerastium fontanum Baumg. (medium)
Leucanthemum vulgare Lam. (medium)
Lolium perenne L. ssp. *perenne* (high) planted as erosion control?
Matricaria discoidea DC. (high)
Papaver nudicaule L. ssp. *nudicaule* (low) only leaves observed
Plantago major L. var. *major* (high)
Poa annua L. (high)
Poa pratensis L. (medium)
Poa trivialis L. (medium)
Ranunculus repens L. (high)
Rumex acetosella L. (medium)
Rumex crispus L. (medium)
Stellaria media (L.) Vill. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium pratense L. (low)
Trifolium repens L. (high)
Veronica serpyllifolia L. var. *serpyllifolia* (medium)

Kenai Peninsula surveys

Site K1. Sterling Highway (mile markers 40, 45, 50, 55)

The Sterling Highway is an old, heavily used paved road with very narrow gravel margins, and has not had major improvements like those that have upgraded the Seward Highway. Red fescue was seen in several places, some of it a very red variety that may have been planted.

Achillea millefolium L. var. *millefolium* (medium)
Bromus inermis Leyss. (high)
Cerastium fontanum Baumg. (low)
Cerastium glomeratum Thuill. (low)
Chenopodium album L. (low)
Galeopsis bifida Boenn. (low)
Matricaria discoidea DC. (medium)
Phleum pratense L. (medium)
Plantago major L. var. *major* (medium)
Poa annua L. (medium)
Poa pratensis L. (high)
Polygonum aviculare L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (high)
Trifolium repens L. (high)

Site K2. Town of Cooper landing

60 29.39 149 49.91

The Sterling Highway in the Cooper Landing town site has a wider margin than on either side outside of town; many small businesses have large gravel parking lots. Recent improvements made to the state boat launch were treated separately. The landfill station, located several miles east of the town site, is heavily

used for the dumping of yard waste, as well as household garbage. *Potentilla norvegica* was also present. Plants that fit the description of Pilger's common plantain were also observed, with a high cover value.

Achillea millefolium L. var. *millefolium* (medium)
Brassica sp. (low)
Bromus inermis Leyss. (medium)
Capsella bursa-pastoris (L.) Medik. (medium)
Cerastium fontanum Baumg. (low)
Chenopodium album L. (low)
Crepis tectorum L. (medium)
Hordeum jubatum L. (low)
Leucanthemum vulgare Lam. (low-medium)
Linaria vulgaris P. Mill. (medium)
Matricaria discoidea DC. (high)
Phleum pratense L. (high)
Plantago major L. var. *major* (high)
Poa annua L. (high)
Poa pratensis L. (high)
Papaver nudicaule L. ssp. *nudicaule* (low)
Polygonum aviculare L. (low)
Rumex crispus L. (high)
Stellaria media (L.) Vill. (high)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Thlaspi arvense L. (low)
Trifolium hybridum L. (high)
Trifolium repens L. (very high)

Site K3. The junction of the Seward and Sterling Highways

60 31.95 149 33.14

The junction of the two highways at mile 37 is a large triangle of roads encompassing several acres. It had many large road cuts, several pull-offs and several intersections and ramps. Some roadside margins (on the Seward Highway side) were wide, and the immediately adjacent vegetation was scrubby willow and alder, with some forest and some exposed rock cliffs. Red fescue was abundant and possibly planted here.

Achillea millefolium L. var. *millefolium* (medium)
Bromus inermis Leyss. (low)
Crepis tectorum L. (low)
Dactylis glomerata L. (low)
Hordeum jubatum L. (medium)
Matricaria discoidea DC. (medium)
Phleum pratense L. (medium)
Plantago major L. var. *major* (low)
Poa annua L. (low)
Poa pratensis L. (low)
Polygonum aviculare L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (high)
Trifolium pratense L. (low)
Trifolium repens L. (very high)

Site K4. Tern lake visitor facilities

60 31.95 149 33.14 (same as junction)

The facilities at Tern lake appear to have been downgraded from a campground, and include a picnic ground, restrooms and (a short way down the road) a pull-off with an observation deck extending out into the water. The area is dominated by open cottonwood forest, willow/alder scrub, and a sedge lake margin. *Potentilla norvegica* and *Festuca rubra* were also present.

Achillea millefolium L. var. *millefolium* (high)
Cerastium fontanum Baumg. (low)
Crepis tectorum L. (low)
Hordeum jubatum L. (low)
Matricaria discoidea DC. (high)
Plantago major L. var. *major* (high)
Poa annua L. (high)
Poa pratensis L. (medium)
Rumex crispus L. (high)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (medium)
Trifolium repens L. (low)

Site K5. Gravel bar of Quartz Creek

60 31.34 149 38.40

A bridge crosses the creek at approximately mile 41, near the powerline substation. This site was chosen because it is a naturally disturbed area near the road. Open low cottonwood/alder/willow scrub, to .5 m tall was present on mostly open cobble with dwarf fireweed and other forbs. Dandelion was found at the road-side near the bridge. The red fescue found along the creek appeared to be native.

Achillea millefolium L. var. *millefolium* (medium)
Cerastium fontanum Baumg. (low)
Papaver nudicaule L. ssp. *nudicaule* (medium-high)

Site K6. Snug Harbor Road

This gravel road winds through alder scrub, cottonwood and spruce forests along the south shore of Kenai Lake, servicing the hydropower station. It gains a bit of elevation before ending at the power station's water inlet on Cooper Lake. Random stops were made along the road and the lakeshore at the hydrostation inlet was surveyed as well, since it is a popular destination for picnics and boat recreation.

Cerastium fontanum Baumg. (low)
Crepis tectorum L. (low)
Hordeum jubatum L. (low)
Leucanthemum vulgare Lam. (low)
Linaria vulgaris P. Mill. (low)
Matricaria discoidea DC. (low)
Papaver nudicaule L. ssp. *nudicaule* (low)
Phleum pratense L. (medium)
Plantago major L. var. *major* (medium)

Poa annua L. (medium-high)
Poa pratensis L. (medium-high)
Rumex crispus L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (medium)
Trifolium repens L. (high)

Site K7. Russian Lakes trail (upper trail head)

60 22.68 149 42.35

The small gravel parking area was surrounded by spruce and mountain hemlock forest, and the trail passes through a similar wet, scrubby forest. The trail itself consists mostly of packed dirt, but gravel was recently added to the first 10 m. There was evidence of horses in the parking lot, and the tracks of mountain bikes and heavy machinery on the trail.

Annual bluegrass and field foxtail were seen only on the trail, and there were confined to the trail itself- the foxtail at the edge, and the bluegrass on the surface.

Achillea millefolium L. var. *millefolium* (low)
Alopecurus pratensis L. (low)
Phleum pratense L. (low)
Plantago major L. var. *major* (medium)
Poa annua L. (low)
Poa pratensis L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)

Site K8. Russian Lakes trail (lower trail head)

60 28.46 149 57.40

The northern trailhead is located within the Russian River Campground area, and has a similar small gravel parking lot (here with a rest room facility), but the trail itself is markedly different from other trails in two ways. It appears to have very recently been modified to accommodate disabled visitors, and the forest has been logged to remove beetle-killed spruce. The open forest still retained its thick moss and herb layer, and with few shrubs it had a park-like appearance. There was little or no open soil, and bluejoint and tall forbs such as fireweed and lupine had not become established. The trail was freshly graveled, in places over 2 m wide, and had no plants growing on its surface. Plantain, annual bluegrass, yarrow and mouse-eared chickweed were found in low numbers at its edge. A powerline cut across the trail, and there the tall grasses field foxtail and reed canary grass had become established. Random departures off the trail found timothy growing in thick feathermoss, approximately 7 m off the trail. Reed canary grass (*Phalaris arundinacea* L., high) was also found at the parking area.

Achillea millefolium L. var. *millefolium* (low)
Alopecurus pratensis L. (medium) low at parking lot, high at power line
Cerastium fontanum Baumg. (low-medium)
Matricaria discoidea DC. (low)
Phleum pratense L. (low)
Plantago major L. var. *major* (low)
Poa annua L. (medium-high)
Taraxacum officinale G.H. Weber ex Wiggers (high)

Site K9. Resurrection Pass Trail (southern trail head)

60 29.12 149 57.02

The trailhead is accessed by a short gravel road, leading to a parking area with rest room facilities. There was a margin around the parking area that had been cleared some time ago, where clover and dandelion have become well established and abundant. Quackgrass was present, and possibly the result of the revegetation work. *Potentilla norvegica* was also present.

The trail had been logged to remove beetle-killed spruce, in the same manner as site 8, but somewhat earlier. Bluejoint and tall forbs had become well established, in some places obscuring the feathermoss layer. The trail surface is packed dirt, and ascends gradually through the remains of the spruce-cottonwood-aspen forest. Random departures from the trail found field foxtail growing 4 m away in feathermoss. Aliens on the trail included Kentucky bluegrass, annual bluegrass, hybrid clover, alsike clover, dandelion, timothy, plantain and pineapple weed.

Alopecurus pratensis L. (medium)

Elymus repens (L.) Gould (medium) possibly planted

Matricaria discoidea DC. (low-medium)

Phleum pratense L. (low)

Plantago major L. var. *major* (medium)

Poa annua L. (high)

Poa pratensis L. (high)

Taraxacum officinale G.H. Weber ex Wiggers (high)

Trifolium hybridum L. (low)

Trifolium repens L. (very high)

Site K10. Kenaitze Interpretive Site

60 29.03 149 57.22

This pull-off, near mile 53, had a small parking area and an interpretive trail made of wood chips. It wound through spruce forest along the riverbank. Dandelions were found on and at the edge of the trail; the other species in the parking area.

Lupinus polyphyllus Lindl. (low)

Poa annua L. (medium)

Poa pratensis L. (medium)

Taraxacum officinale G.H. Weber ex Wiggers (high)

Trifolium hybridum L. (high)

Site K11. Russian River Campground

60 29.11 149 58.70 (Grayling day use area)

The Russian River area is one of the top attractions on the Kenai Peninsula and the birthplace of “combat fishing”. The visitor facilities at the confluence of the Kenai and Russian Rivers are extensive. They include a paved access road, the visitor contact station, several parking pull-offs and day use areas, six large campgrounds, a group site/interpretive program pavilion, the Russian Lakes trailhead, and numerous trails, boardwalks and fish cleaning stations along the Russian River.

The river winds through cottonwood forest, with some spruce trees. There are large areas of tall scrub and extensive forb-bluejoint meadows. The entire area has seen major upgrades and improvements fairly

recently. The river trails are still in the process of being reconstructed to prevent over use and erosion, utilizing rubber erosion matting, aluminum riprap caging and burlap. Most of the trail is packed dirt with access to gravel bars, but there are many new wooden boardwalks. The campgrounds, all with paved loops, have been constructed with very little alteration even to the herbaceous vegetation. Most alien species, predictably, were seen on exposed soil at roadsides and the stairways leading to the river. Annual bluegrass, dandelion and pineapple weed were commonly seen in the areas roped off for revegetation. Very few aliens were seen off-trail in native vegetation. Stands of reed canary grass (high), found near the entrance station and the Russian Lakes trail head, may be native or may have been planted as an erosion control. The same may be said of the red fescue found along roads and in the campground.

Alopecurus pratensis L. (medium-high)
Crepis tectorum L. (medium-high)
Matricaria discoidea DC. (medium)
Phleum pratense L. (high)
Plantago major L. var. *major* (medium-high)
Poa annua L. (medium-high)
Poa pratensis L. (medium)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (high)
Trifolium repens L. (high)

Site K12. Quartz Creek Road quarry and environs

60 30.22 149 40.19

A short gravel road that parallels the Sterling Highway to the south eventually becomes little more than a trail. It winds through open cottonwood and spruce forests and tall alder scrub, near the wet meadows of Quartz Creek. It provides access to two campgrounds and the Crescent Lake trail. The road passes through an old gravel quarry, which was also surveyed. Rock harlequin (*Corydalis sempervirens*) and rough cinquefoil (*Potentilla norvegica*) were growing as weeds. A party of horse-riding tourists was encountered along the road. Plants that fit the description of Pilger's common plantain were also observed, with a low cover value.

Achillea millefolium L. (medium)
Capsella bursa-pastoris (L.) Medik. (low)
Cerastium fontanum Baumg. (high)
Cerastium glomeratum Thuill. (medium)
Chenopodium album L. (low)
Hordeum jubatum L. (low)
Linaria vulgaris P. Mill. (low)
Matricaria discoidea DC. (low)
Phleum pratense L. (low)
Plantago major L. var. *major* (medium)
Polygonum aviculare L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (medium)
Trifolium pratense L. (low)
Trifolium repens L. (high)

Site K13. Quartz Creek Campground

60 28.51 149 43.31

This campground was closed for renovations and could not be accessed, but the following aliens were observed at the entrance. Horse stables offering tourist pack rides were located across the road.

Achillea millefolium L. var. *millefolium* (low)

Trifolium hybridum L. (medium)

Trifolium repens L. (high)

Site K14. Crescent Creek Campground

60 29.99 149 41.09

A small campground with a gravel loop in mixed lowland spruce-aspen-cottonwood forest, quite open in places near the creek. There was a volleyball net set up on a lawn (which appeared to be of red top grass) and a trail to the sedge-bordered creek, which had exposed mud along its bank from trampling. The worm-seed mustard, found on this muddy bank, appeared to be the alien subspecies but may have been a young specimen of the widespread native subspecies. *Potentilla norvegica* was also present.

Achillea millefolium L. var. *millefolium* (medium)

Erysimum cheiranthoides L. ssp. *cheiranthoides* (low)

Matricaria discoidea DC. (medium)

Poa annua L. (medium)

Phleum pratense L. (medium-high)

Plantago major L. var. *major* (low)

Taraxacum officinale G.H. Weber ex Wiggers (high)

Trifolium repens L. (medium)

Site K15. Crescent Creek Trail

60 30.22 149 40.19

The gravel parking lot is located at the end of the maintained portion of Quartz Creek Road. The trail ascends through a fairly open birch-spruce forest, and is made of stony, packed dirt. Yarrow was observed at the trailhead, and annual bluegrass plants were observed about 5 meters into the trail, but no other aliens were observed.

Achillea millefolium L. var. *millefolium* (low)

Poa annua L. (low)

Poa pratensis L. (low)

Site K16. Bean Creek Road clear cuts

60 29.30 N 149 50.55 W

This gravel road leads to a housing subdivision, the Cooper Landing Community Center, and the new Princess Hotel. Another gravel road heads north from it up the mountain to a clear-cut area. These two roads were very briefly surveyed, and were found to be very similar to other such roads in the Cooper Landing area. The road was typical- species such as dandelion, clover and plantain were observed, but no new species of alien plants were encountered (although field clover was very common near the community center, and alsike clover was so abundant at the Princess Hotel that it perfumed the air). The logging road was followed for two miles. Random departures from the road found well-established blue joint-tall forb cover, but no alien species, which appeared to be restricted to the gravel road area.

Site K17. Kenai River Ferry

60 29.17 149 59.45

Located at mile 55, which is also the Forest boundary, the ferry area consists of large gravel parking lots, restroom facilities, a “beach” area with a maintained lawn, the ferry office, and dock. Several areas were roped off as revegetation zones, and some revegetation areas that utilized grass mixes were well established.

Bromus inermis Leyss. (medium)
Capsella bursa-pastoris (L.) Medik. (low)
Elymus repens (L.) Gould (medium) part of plantings?
Hordeum jubatum L. (medium)
Lepidium densiflorum Schrad. (low)
Plantago major L. var. *major* (high)
Poa annua L. (medium)
Poa pratensis L. (high)
Polygonum aviculare L. (medium)
Rumex crispus L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium repens L. (medium)

Site K18. Broadview Station

60 29.38 149 45.15

This Forest Service station contained a shop and several bunkhouses, a gravel parking area, a dirt trail to the outhouse and a R.A.W.S. weather station, all nestled in an aspen forest overlooking Kenai Lake.

Alopecurus pratensis L. (low)
Capsella bursa-pastoris (L.) Medik. (low)
Cerastium fontanum Baumg. (low)
Lolium perenne L. ssp. *perenne* (low)
Matricaria discoidea DC. (low)
Plantago major L. var. *major* (medium)
Poa annua L. (high)
Poa pratensis L. (medium)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (medium)
Trifolium repens L. (high)

Site K19. Cooper Landing Boat ramps

60 29.55 149 48.63

The state public use area has very recently been remodeled, and includes an expanded paved parking lot, restrooms, a large boat ramp, wooden interpretive walkways and extensive landscaping with erosion-control seed mixes. The mix contained mostly ryegrass (both varieties) and some native hairgrass, with quackgrass probably present as an impurity. Red sand spurry also appeared to be introduced as an impurity of the mix.

Squirrel tail grass and common knotweed were found at the old ramp located on the north side of the bridge, but not at the newly remodeled site on the south. Red fescue at the site did not appear to be seeded,

and *Potentilla norvegica* was also present.

Achillea millefolium L. var. *millefolium* (medium-high)
Bromus inermis Leyss. (medium)
Cerastium fontanum Baumg. (medium)
Crepis tectorum L. (low)
Elymus repens (L.) Gould (medium)
Lepidium densiflorum Schrad. (low)
Lolium perenne L. ssp. *multiflorum* (Lam.) Husnot (very high)
Lolium perenne L. ssp. *perenne* (very high)
Matricaria discoidea DC. (low)
Poa annua L. (high)
Poa pratensis L. (low)
Phleum pratense L. (medium)
Plantago major L. var. *major* (high)
Spergularia rubra (L.) J.& K. Presl (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (medium)
Trifolium pratense L. (low)
Trifolium repens L. (high)

Site K20. Cooper Creek Campground

60 92.05 149 52.78

Two gravel loops, on each side of the highway, in cottonwood-birch forest with some spruce trees. The Cooper Creek gravel bar was fairly free of alien species, which were common in the loops. This campground, with its older, more extensive gravel campsites and road margins, was quite different from the new campgrounds at the Russian River.

Achillea millefolium L. (low)
Cerastium fontanum Baumg. (medium)
Crepis tectorum L. (low)
Elymus repens (L.) Gould (medium)
Matricaria discoidea DC. (medium)
Phleum pratense L. (low)
Plantago major L. var. *major* (medium-high)
Poa annua L. (high)
Poa pratensis L. (medium)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (low)
Trifolium repens L. (medium-high)

Site K21. Seward Highway South (miles 20, 25, 30, 35)

The southern portion of the Seward Highway, although not recently renovated, is in better shape than the Sterling. It has fewer twists and turns and wider margins (with the exception of the narrow canyon just north of the town of Seward). Red fescue and hairgrass were found along the roadsides, as well as occasional rough cinquefoil.

Rob Lipkin adds:

From Tern Lake to mile 33 and from mile 32 - 28 there are mostly private houses along the roadside. In general, the road from Tern Lake to Seward seemed narrower with less new roadwork and, hence, less new revegetation and fewer adventive weeds.

Achillea millefolium L. var. *millefolium* (medium)
Alopecurus pratensis L. (low)
Capsella bursa-pastoris (L.) Medik. (low)
Cerastium fontanum Baumg. (low)
Cerastium glomeratum Thuill. (low)
Crepis tectorum L. (low)
Leucanthemum vulgare Lam. (low)
Lupinus polyphyllus Lindl. (low)
Matricaria discoidea DC. (medium)
Papaver nudicaule L. ssp. *nudicaule* (low)
Phleum pratense L. (medium-high)
Plantago major L. var. *major* (medium-high)
Poa annua L. (low-medium)
Poa pratensis L. (low)
Polygonum aviculare L. (low)
Rumex acetosella L. (low)
Rumex crispus L. (low)
Spergularia rubra (L.) J.& K. Presl (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (high)
Trifolium repens L. (medium-high)
Turritis glabra L. (low)

Site K22. Pull-off 1

60 22.85 149 21.05

This was one of two pull-offs that had such an abundance of alien species that they could readily be seen while driving by. Tower mustards were more than 2 m tall, and overall alien coverage was equal to, or perhaps greater than that of natives on the margins of the gravel area. The pull-off could fit approximately a half dozen vehicles, and below it on the west side were the tracks of the Alaska Railroad. Plants that fit the description of Pilger's common plantain were also observed, with a high cover value.

Achillea millefolium L. var. *millefolium* (medium)
Alopecurus pratensis L. (low)
Cerastium fontanum Baumg. (medium)
Elymus repens (L.) Gould (low)
Erysimum cheiranthoides L. ssp. *cheiranthoides* (medium)
Leucanthemum vulgare Lam. (medium)
Matricaria discoidea DC. (high)
Papaver nudicaule L. ssp. *nudicaule* (low)
Phleum pratense L. (medium-high)
Plantago major L. var. *major* (high-very high)
Poa annua L. (high)
Poa pratensis L. (medium)
Potentilla norvegica L. (low)
Rumex acetosella L. (high)

Rumex crispus L. (high)
Spergularia rubra (L.) J.& K. Presl (low)
Taraxacum officinale G.H. Weber ex Wiggers (high-very high)
Trifolium repens L. (high)
Turritis glabra L. (medium)

Site K23. Pull-off 2

60 23.74 14921.15

This second pull-off was a few miles north and about the same size as the other. It had a richer assortment of alien plants, though overall coverage was not as great. To the east of this pull-off was an open power line cut. The presence of night-flowering catchfly, orange hawkweed and a large number of ox-eye daisies suggests that the site may have been seeded with a commercial garden flower mix, though there is nothing garden like about this pull-off except for the flowers.

Achillea millefolium L. var. *millefolium* (medium-high)
Cerastium fontanum Baumg. (low-medium)
Crepis tectorum L. (low)
Hieracium aurantiacum L. (low)
Leucanthemum vulgare Lam. (high)
Linaria vulgaris P. Mill. (low)
Matricaria discoidea DC. (medium)
Phleum pratense L. (high)
Plantago major L. var. *major* (medium-high)
Poa annua L. (high)
Poa pratensis L. (medium)
Potentilla norvegica L. (medium)
Rumex acetosella L. (low-medium)
Rumex crispus L. (low-medium)
Silene noctiflora L. (low)
Stellaria media (L.) Vill. (low)
Taraxacum officinale G.H. Weber ex Wiggers (medium-high)
Trifolium hybridum L. (medium-high)
Trifolium pratense L. (medium)
Trifolium repens L. (medium-high)
Turritis glabra L. (high)

Site K24. Town of Moose Pass

60 29.40 149 22.08

The Seward Highway passes through the town site and has a wide margin on either side. Like Cooper Landing, many small businesses have large gravel parking lots. The landfill station, located in the town site, is also used for the dumping of yard waste. A transfer location used for dumping topsoil behind the post office was particularly rich in alien plants. *Potentilla norvegica* was also present throughout the town-site.

Achillea millefolium L. var. *millefolium* (medium)
Alopecurus geniculatus L. (low)
Alopecurus pratensis L. (low)
Brassica rapa L. (low)

Capsella bursa-pastoris (L.) Medik. (medium)
Cerastium fontanum Baumg. (medium-high)
Cerastium glomeratum Thuill. (low)
Crepis tectorum L. (low)
Elymus repens (L.) Gould (medium)
Galeopsis bifida Boenn. (low-medium)
Hordeum jubatum L. (low)
Leucanthemum vulgare Lam. (low)
Linaria vulgaris P. Mill. (low)
Matricaria discoidea DC. (medium-high)
Papaver nudicaule L. ssp. *nudicaule* (low)
Phleum pratense L. (high)
Plantago major L. var. *major* (high)
Poa annua L. (high)
Poa pratensis L. (medium-high)
Polygonum aviculare L. (medium)
Potentilla norvegica L. (medium)
Rumex acetosella L. (medium)
Rumex crispus L. (high-very high)
Stellaria media (L.) Vill. (medium-high)
Taraxacum officinale G.H. Weber ex Wiggers (high-very high)
Trifolium hybridum L. (high)
Trifolium pratense L. (low)
Trifolium repens L. (high-very high)
Turritis glabra L. (low-medium)

Site K25. Ptarmigan Campground

60 24.36 149 21.63

One of only a few lavatory campground loops in the study area. A gravel loop campground in a beautiful spruce forest, with the Ptarmigan Creek trail beginning nearby. Part of the creek near the campground is closed for revegetation (dandelion and timothy were observed within the enclosure). The margins of the campground loop had been very recently mown, so relative cover estimates may be slightly out of synch with other sites. All non-native plants were in disturbed areas and none were seen in the adjacent forested areas. Rough cinquefoil was present at the site.

Achillea millefolium L. var. *millefolium* (medium)
Cerastium fontanum Baumg. (low)
Crepis tectorum L. (low)
Lupinus polyphyllus Lindl. (low) in mown trail side.
Phleum pratense L. (low)
Plantago major L. var. *major* (low)
Poa annua L. (medium)
Poa pratensis L. (low)
Spergularia rubra (L.) J.& K. Presl (low)
Taraxacum officinale G.H. Weber ex Wiggers (medium)
Trifolium repens L. (medium)

Site K26. Ptarmigan Trail

60 24.36 149 21.63 (same as campground)

Down a side road from the campground access road there was a large gravel parking lot, with picnic areas and restrooms. The margins had been recently mown here as well. The trail was very busy, with many overnight and day hikers and picnickers. The parking lot contained a large island that appeared to be revegetated using burlap erosion control cloth and native flowers. The plants were abundant, and no aliens were seen among them. The non-natives were all at the edges of the lot, picnic areas and trail.

The trail itself followed the creek through very large Sitka spruce, some of which were showing evidence of beetle infection. The trail surface was gravel for the first 70 m, then dirt and spruce needles, and had very few alien plants (only annual bluegrass and timothy), even in relatively open areas.

Achillea millefolium L. var. *millefolium* (medium)
Alopecurus geniculatus L. (low-medium)
Cerastium fontanum Baumg. (high)
Phleum pratense L. (low)
Plantago major L. var. *major* (medium-high)
Poa annua L. (medium)
Poa pratensis L. (medium)
Taraxacum officinale G.H. Weber ex Wiggers (medium-high)
Trifolium repens L. (high)

Rob Lipkin adds:

The *Alopecurus*, *Cerastium*, *Phleum*, and *Trifolium* were concentrated in the area immediately around the trail head. Although the trail parallels the campground road, there were very few non-native species after the first 80 meters, principally:

Phleum pratense L. (medium)
Poa annua L. (low)

No non-native species were seen on the trail after it left the campground. I also surveyed the adjacent river bar (gravel and sand) for non-native species. Water levels were very high, but I did observe scattered individuals of *Poa annua* and *Taraxacum officinale* definitely present and apparently spreading along the river bar. *Hordeum brachyantherum* was abundant.

Site K27. Lawing Work Center

60 24.51 149 22.29

The Forest Service work area was an extensive complex of offices, maintenance yards and employee housing between the Alaska Railroad tracks and Kenai Lake. The area included gravel roads, dirt and wood chip trails, lawns, and compacted dirt at the lakeshore. A recently revegetated area near the cook shack was seeded with rye grass. There was sheep sorrel on the roadside just outside the compound, though not in the facility itself. Red fescue was present.

Achillea millefolium L. var. *millefolium* (low-medium)
Elymus repens (L.) Gould (low) along roadside
Leucanthemum vulgare Lam. (low) possibly planted?
Lolium perenne L. ssp. *perenne* (very high)
Matricaria discoidea DC. (high)
Phleum pratense L. (medium)
Plantago major L. var. *major* (high)
Poa annua L. (high)

Potentilla norvegica L. (medium)
Rumex acetosella L. (medium-high)
Rumex crispus L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (medium-high)
Trifolium repens L. (very high)

Rob Lipkin adds:

The Alaska Railroad Tracks were accessed across the highway from the Lawing Work Center. Most non-native plants were along the tracks with very few on the bordering, disturbed right-of-way with alder, fireweed, lupine, and willow.

Site K28. Trail Creek Campground

60 24.87 149 22.87

An extensive visitor facility accessed by a gravel road several miles long. There were four campground loops, with a separate picnic area, a large pavilion, a sand-surfaced volleyball court, and access to the lake-front. The campground hosts said the renovations were only three years old. Some of the spruce forest had been logged to remove beetle-infected trees.

Achillea millefolium L. var. *millefolium* (low)
Phleum pratense L. (low)
Plantago major L. var. *major* (medium)
Poa annua L. (low)
Poa pratensis L. (medium)
Taraxacum officinale G.H. Weber ex Wiggers (medium)
Trifolium repens L. (medium-high)

Site K29. Carter Lake Trail

60 30.14 149 26.51

Very similar to the Johnson Pass trailhead. The parking lot was also paved but a little bigger, and the restroom was closed due to bear activity in the area.

The trail, however, was wider and graveled. The forest of aspen and cottonwood gave way to a steep, wet, north-facing spruce slope. There was evidence of horses on the trail, and the alien species were observed the entire half-mile that was surveyed. Rough cinquefoil was observed in the parking area.

Matricaria discoidea DC. (medium)
Phleum pratense L. (low)
Plantago major L. var. *major* (high)
Poa annua L. (low-medium)
Poa pratensis L. (medium)
Stellaria media (L.) Vill. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)

Site K30. Johnson Pass Trail (south end)

60 30.24 149 25.87

A small paved parking lot with a restroom facility, its margin very narrow and recently mown. The forest was a mixture of spruce, aspen and birch forest with tall willow and alder at the edges. Red fescue and

rough cinquefoil were present.

The trail itself was packed dirt and crushed rock; part of the trail was over smoothed bedrock at the cliff area. Alien species appeared along the trail when the canopy opened and disappeared when it closed.

Achillea millefolium L. var. *millefolium* (low-medium)
Cerastium fontanum Baumg. (low)
Phleum pratense L. (low)
Plantago major L. var. *major* (medium)
Poa annua L. (medium)
Taraxacum officinale G.H. Weber ex Wiggers (medium-high)

Site K31. Victor Creek Trail

60 21.50 149 20.91

The very small gravel lot next to the creek had a margin of tall alder scrub with some spruce trees. A few unofficial camping sites were observed.

The trail began in the riparian zone, was gravel-surfaced, and extended for about 150 m before turning uphill through steep spruce and mountain hemlock forest that had a thick feathermoss layer and mulched-needle trail. The alien species grew almost completely in the riparian-gravel zone, with annual bluegrass forming an open lawn for the first several meters. The path through the forest contained only two annual bluegrass plants, and these were found in an open area where the trail crossed a power line right-of-way.

Rob Lipkin adds:

The trail runs through a spruce forest bordered by alders. The first 50 m of trail contained the highest concentration of non-native plant species, with the first 25 to 50 m containing especially high concentrations of *Poa annua* and *Achillea*. Nearly all non-native species drop out within 150 m. The trail winds up hill and crosses a powerline with *Poa annua* in the disturbed areas. The powerline was surveyed for 100m but no other non-native species were seen. *Taraxacum* and *Plantago*, though common in the parking area do not extend up the trail.

Achillea millefolium L. var. *millefolium* (low)
Cerastium fontanum Baumg. (low)
Phleum pratense L. (medium)
Plantago major L. var. *major* (medium)
Poa annua L. (medium-high)
Poa pratensis L. (low)
Stellaria media (L.) Vill. (low)
Taraxacum officinale G.H. Weber ex Wiggers (medium-high)
Trifolium repens L. (low-medium)

Site K32. Fish Hatchery

60 30.16 149 25.33

A large gravel parking lot with an interpretive kiosk at the north end of Upper Trail Lake. The edges of the lot were tall alder scrub and cottonwoods, and a small trail led to the lake.

Rob Lipkin adds:

At lakeside, the only non-native plants seen were: *Cerastium glomeratum*, *Cerastium fontanum*, and *Poa*

pratensis. *Festuca rubra* was also common at this site, very possibly from non-native sources. *Hordeum brachyantherum* was also present as a weedy colonizer.

Achillea millefolium L. var. *millefolium* (low)
Cerastium fontanum Baumg. (low)
Lepidium densiflorum Schrad. (low-medium)
Matricaria discoidea DC. (medium-high)
Phleum pratense L. (medium)
Plantago major L. var. *major* (medium)
Poa annua L. (medium)
Poa pratensis L. (medium)
Potentilla norvegica L. (low)
Rumex acetosella L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high) mostly medium, but very high in patches
Trifolium hybridum L. (low-medium)
Trifolium repens L. (high-very high)

Site K33. Seward Highway Middle (miles 40, 45, 50, 55)

This section of the Seward Highway extends between the Hope and Sterling junctions. It is a very heavily traveled paved road with wide margins. Much of the highway has been remodeled, and many areas have recently been revegetated. Squirreltail grass, ox-eye daisy, butter-and-eggs and Iceland poppy were observed along the road but were not present at any of the stops. Fowl bluegrass was observed at a small pond margin at mile 45. A pine seedling, less than 20 cm high, was observed at the road margin in front of the Summit Lodge. It did not appear to have been planted, but was most likely part of some landscaping scheme at one time.

Red fescue and hairgrass appear to have been used extensively in revegetation efforts, and the source of these plants may not be native. Because mile 55 represents an excellent example of the revegetation zones, it is described separately as site 40.

Achillea millefolium L. var. *millefolium* (low)
Bromus inermis Leyss. (low)
Capsella bursa-pastoris (L.) Medik. (low)
Chenopodium album L. (medium)
Crepis tectorum L. (medium)
Dactylis glomerata L. (medium)
Lolium perenne L. ssp. *multiflorum* (Lam.) Husnot (very high) -planted
Lolium perenne L. ssp. *perenne* (very high) -planted
Matricaria discoidea DC. (medium)
Phleum pratense L. (high-very high)
Plantago major L. var. *major* (medium)
Poa palustris L. (low)
Poa pratensis L. (medium)
Polygonum convolvulus L. (medium)
Rumex crispus L. (medium)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (high)
Trifolium repens L. (high)
Tripleurospermum inodorum (L.) Schultz-Bip. (low)

Site K34. Tenderfoot Campground

60 38.43 149 29.38

This campground was located on the eastern side of Summit Lake, reached by a gravel road. It was a small campground, in a cottonwood-spruce woodland near tree line. There was a small gravel shoreline cleared as a boat ramp, and the entire area had been recently mown. Red fescue was observed. Alpine timothy (*Phleum commutatum* L. var. *americanum* (Fourn.) Hult.) was present, but field timothy was not.

Matricaria discoidea DC. (low)

Plantago major L. var. *major* (high)

Poa annua L. (medium)

Poa pratensis L. (medium)

Taraxacum officinale G.H. Weber ex Wiggers (high)

Trifolium repens L. (high)

Site K35. Lower Summit Lake pull-off

60 39.59 149 28.39

A small pull-off next to the lake, with a gravel path to the lake spillway and what appeared to be an old gravel quarry just north. Alien species were especially abundant in that area. Red fescue was abundant and possibly planted.

Achillea millefolium L. var. *millefolium* (medium)

Capsella bursa-pastoris (L.) Medik. (low)

Crepis tectorum L. (low)

Leucanthemum vulgare Lam. (low)

Poa annua L. (high)

Poa pratensis L. (low)

Rumex crispus L. (low)

Taraxacum officinale G.H. Weber ex Wiggers (very high)

Trifolium hybridum L. (very high)

Trifolium pratense L. (low)

Trifolium repens L. (very high)

Veronica serpyllifolia L. var. *serpyllifolia* (medium)

Site K36. Devil's Pass Trail

60 33.60 149 34.72

The trailhead contained a small, newly paved parking lot and a restroom facility. Horses were observed in the parking area. A gravel road leading north passed a small interpretive site and continued parallel to the highway, with roads heading off to the western ridge, presumably to mining claims. This road was followed until it led back to the highway, but no non-native plants new to the site were seen.

The trail paralleled John's Creek through an open mixed birch-spruce forest. The trail was a packed, stony soil. Only annual bluegrass, timothy and plantain were observed on the trail itself.

Capsella bursa-pastoris (L.) Medik. (medium)

Matricaria discoidea DC. (medium)

Phleum pratense L. (high)

Plantago major L. var. *major* (low)
Poa annua L. (high)
Poa pratensis L. (medium)
Stellaria media (L.) Vill. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (low)
Trifolium repens L. (high)

Site K37. Summit Creek Trail

60 36.97 149 34.72

There were no facilities at this trailhead. The lot was freshly graveled, and it was surrounded by cottonwood-aspen-spruce forest. Red fescue was present.

The gravel trail was wide as it passed through the mixed forest. After about 100 m, it emerged into tall umbel meadows and cottonwood woodland, where the trail became a packed dirt.

Crepis tectorum L. (low)
Matricaria discoidea DC. (low)
Phleum pratense L. (low)
Poa annua L. (medium)
Poa pratensis L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (low)
Trifolium repens L. (high)

Site K38. Hope Road Junction

60 46.55 149 25.30

The intersection of Hope Road and the Seward Highway, at mile 56.3, has undergone a tremendous change in the past several years. A new bridge across Canyon Creek, several hundred meters of new roadbed, a rest stop, and access to Sixmile Creek have been built. The old bridge and most of the old roadbed remain, and are used now as rest stops and trails. Extensive revegetation has been accomplished. Many of the alien plants here result from the roadwork; some of them, like the rapeseed mustard, may not persist. Red fescue was probably planted, and rough cinquefoil was present.

Rob Lipkin adds:

The non-native plants were restricted to the disturbed gravel roadside areas and were not seen invading the surrounding forest. The site also had many native weedy species, especially *Rorippa islandica*. The west side of the road also had extensive stands of seeded *Lolium*. The trail (an old road) heads off uphill through a spruce, birch, and hemlock forest and had the non-native plants. These were concentrated in the old roadbed and did not extend onto the banks bordering the road or into the surrounding forest. They were, however, present along the road for over 1 km-- the extent of my survey. It is likely that the seeds of these species may have been carried on the wheels and undercarriage of vehicles. The *Veronica* was especially abundant in patches and fruiting with ripe seed. It was first seen approximately 50 m from the trailhead. *Hordeum brachyantherum* was also present in small amounts along the old roadbed. The disturbed roadside gravels had been seeded in the past and had *Deschampsia caespitosa* that was almost certainly from non-native sources.

Achillea millefolium L. var. *millefolium* (low)

Brassica napus L. (low-medium)
Capsella bursa-pastoris (L.) Medik. (low)
Cerastium fontanum Baumg. (medium)
Chenopodium album L. (high)
Crepis tectorum L. (low)
Elymus repens (L.) Gould (medium)
Hordeum jubatum L. (low)
Lolium perenne L. ssp. *multiflorum* (Lam.) Husnot (high-very high) -planted
Lolium perenne L. ssp. *perenne* (high-very high) -planted
Matricaria discoidea DC. (low-medium)
Phleum pratense L. (high-very high)
Plantago major L. var. *major* (medium)
Poa annua L. (medium-high)
Poa pratensis L. (low)
Polygonum aviculare L. (low)
Polygonum convolvulus L. (low)
Rumex crispus L. (medium)
Spergularia rubra (L.) J.& K. Presl (medium)
Stellaria media (L.) Vill. (low-medium)
Taraxacum officinale G.H. Weber ex Wiggers (medium)
Trifolium hybridum L. (high)
Veronica serpyllifolia L. var. *serpyllifolia* (medium-high)

Site K39. Quarry, mile 49

60 40.94 149 28.51

The gravel pit at mile 49 contained some areas of active mining, but most of the sparse vegetation occurred at the edges of the older sections near tall willow and alder scrub. *Potentilla norvegica* was present.

Capsella bursa-pastoris (L.) Medik. (low)
Cerastium fontanum Baumg. (low)
Crepis tectorum L. (high)
Matricaria discoidea DC. (medium)
Phleum pratense L. (low)
Plantago major L. var. *major* (medium)
Poa annua L. (medium)
Poa pratensis L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium repens L. (high)
Veronica serpyllifolia L. var. *serpyllifolia* (medium)

Site K40. Revegetation site (same as mile 55)

60 45.87 149.26.90

This stop along the Seward Highway was revegetated on both sides, and is a good representation of what these areas are like at the present time. Ryegrasses were used extensively for revegetation, and the red fescue here was probably seeded in as well. The road cuts are very tall, and some of them occasionally slump in heavy rains. Hay bales are used as erosion control barriers, and at this site several aliens (black bindweed, pigweed, shepherd's purse) were found growing only around these hay bales. This suggests that

while the seed mix used in revegetation may have been quite pure, alien species were able to arrive in other ways, such as the hay bales.

Achillea millefolium L. var. *millefolium* (low)
Capsella bursa-pastoris (L.) Medik. (low)
Chenopodium album L. (high)
Crepis tectorum L. (low)
Lolium perenne L. ssp. *multiflorum* (Lam.) Husnot (very high) planted
Lolium perenne L. ssp. *perenne* (high) planted
Matricaria discoidea DC. (medium)
Phleum pratense L. (very high)
Plantago major L. var. *major* (medium)
Poa annua L. (medium)
Polygonum convolvulus L. (medium)
Taraxacum officinale G.H. Weber ex Wiggers (low)

Site K41. Hope Road, mile 5, 10, 15

The Hope Road is a narrow paved road, but unlike the Sterling Highway it is not a busy thoroughfare and is in much better shape. The road margin is narrow (in some places nothing but a guardrail) and thickly vegetated with spruce and birch forests. Red fescue and rough cinquefoil were present, probably occurring as natives.

To safely access mile 10, I had to park at a rest stop beyond it and walk back to it. At the margin of the woods were several pansies. They did not appear to be planted, but were growing on a mound of earth. Perhaps this topsoil was dumped there and the pansies grew from seeds within it. Because it was found nowhere else during the survey and is possibly adventive, it is included here, but it is not likely to spread or persist.

Cerastium fontanum Baumg. (medium)
Crepis tectorum L. (low)
Elymus repens (L.) Gould (medium)
Hieracium aurantiacum L. (medium)
Matricaria discoidea DC. (medium)
Plantago major L. var. *major* (medium)
Phleum pratense L. (high)
Poa pratensis L. (medium)
Rumex acetosella L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (low)
Trifolium repens L. (high-very high)
Veronica serpyllifolia L. var. *serpyllifolia* (low)
Viola tricolor L. (low)

Site K42. Town of Hope

60 55.07 149 38.29

The town is built at the edge of a wet sedge meadow on Turnagain arm. Homes (and at least one hayfield) extend for a short way along the coast. The solid waste transfer station is located at the landfill, at the edge of town. Red fescue was observed.

Achillea millefolium L. var. *millefolium* (medium)
Alopecurus pratensis L. (low)
Bromus inermis Leyss. (low)
Capsella bursa-pastoris (L.) Medik. (medium)
Capsella rubella Reut. (low)
Cerastium fontanum Baumg. (very high)
Chenopodium album L. (medium)
Elymus repens (L.) Gould (high)
Galeopsis bifida Boenn. (high)
Hordeum jubatum L. (low)
Leucanthemum vulgare Lam. (low)
Linaria vulgaris P. Mill. (high)
Silene latifolia Poir. ssp. *alba* (P. Mill.) Greuter & Burdet (low)
Matricaria discoidea DC. (high)
Phleum pratense L. (very high)
Plantago major L. var. *major*(very high)
Poa annua L. (very high)
Poa pratensis L. (medium-high)
Polygonum aviculare L. (medium)
Potentilla anserina L. (low)
Ranunculus acris L. (medium)
Ranunculus repens L. (high)
Rumex acetosella L. (medium)
Rumex crispus L. (low)
Stellaria media (L.) Vill. (high)
Taraxacum officinale G.H. Weber ex Wiggers (very high)
Thlaspi arvense L. (low)
Trifolium hybridum L. (high)
Trifolium pratense L. (low)
Trifolium repens L. (very high)

Site K43. Porcupine Campground

60 55.81 149 39.57

This campground had a paved loop, a picnic area overlooking Turnagain Arm, and was lushly vegetated with Kenai birch and tall willow-alder scrub. The Gull Rock trail begins at the far end of the campground.

Cerastium fontanum Baumg. (medium)
Linaria vulgaris P. Mill. (low)
Matricaria discoidea DC. (medium)
Plantago major L. var. *major* (very high)
Phleum pratense L. (low)
Poa annua L. (very high)
Poa pratensis L. (medium)
Stellaria media (L.) Vill. (high)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (low)
Trifolium repens L. (high)
Veronica serpyllifolia L. var. *serpyllifolia* (high)

Site K44. Gull Rock Trail

60 55.81 149 39.57 (same as the Porcupine Campground)

This trail is a wide, packed dirt path that follows the coast through open, scrubby birch forest. It begins at the campground, and the trailhead species are listed there. There were many alien plants along the trail and they continued the entire half-mile that was surveyed.

Achillea millefolium L. var. *millefolium* (low)

Capsella rubella Reut. (low)

Cerastium fontanum Baumg. (high)

Poa pratensis L. (high)

Stellaria media (L.) Vill. (high)

Trifolium repens L. (medium-high)

Veronica serpyllifolia L. var. *serpyllifolia* (medium)

Site K45. Palmer Creek Road

A gravel road running south from Hope, climbing the ridge through mostly birch forests up into the sub-alpine scrub zone. This road leads to the Coeur d'Alene Campground and beyond to the Swettman Mine. The road was freshly graded, and it is possible this may add to the spread of dandelion since its taproot readily sprouts from broken pieces.

Alopecurus pratensis L. (low-medium)

Cerastium fontanum Baumg. (medium-high)

Hordeum jubatum L. (low)

Leucanthemum vulgare Lam. (medium)

Plantago major L. var. *major* (medium)

Rumex acetosella L. (medium)

Rumex crispus L. (medium)

Taraxacum officinale G.H. Weber ex Wiggers (high)

Trifolium repens L. (medium)

Site K46. Coeur d'Alene Campground

60 50.95 149 31.92

A very small walk-in campground that is quite remote. The facilities consist of a small gravel pull-off, a new restroom facility, and dirt trails that lead to the campsites. The sites were grassy areas with picnic tables and fire grates. Most were occupied, and only a brief survey was made.

Plantago major L. var. *major* (medium)

Poa annua L. (high)

Poa pratensis L. (medium)

Taraxacum officinale G.H. Weber ex Wiggers (high)

Site K47. Swettman Mine area

60 46.56 149 32.44

The gate was open beyond the Coeur d'Alene Campground, so I continued along the very narrow and rough dirt road. It passed out of the open forest, beyond the alder scrub and finally out of the sub-alpine

meadows into alpine dwarf ericaceous scrub, past the old Atco units. These are all that remain of the Swettman mine. Bluegrass and dandelion followed the road into the alpine zone and were sparsely represented around the Atco units. Had there been more time, it would have been interesting to explore the excavation sites and old mine buildings to see if any alien plants had persisted there.

Poa annua L. (low)

Poa pratensis L. (low)

Taraxacum officinale G.H. Weber ex Wiggers (medium)

Site K48. Resurrection Trail

60 52.21 149 37.66

The large gravel parking lot is located across the creek from the trailhead and is connected to it by a bridge. It is surrounded by old mine tailings, with open cottonwood forest, tall alder scrub and bare gravel at its margins. Across the bridge there is a restroom facility and horse tethers, with much evidence of recent use by horses. A small trail from the restrooms leads to an active mining claim. This popular trail is heavily used. As I was surveying the area, a party of mountain bikers began their trip.

The trail itself is gravel and very wide- in fact, the first section corresponds to what is given as the last bit of Resurrection Road on the topographic map. It passes through a moist, alluvial cottonwood-spruce forest, and alien species were common along the path, as were native weedy species, including rough cinquefoil. After about a quarter mile it emerges to an open scrubby area, where surprisingly there was a mountain bike concession. Here a bridge crosses the creek to the Resurrection Trail Resort. Alien plants were abundant in this open area, which continued for at least another half mile.

Achillea millefolium L. var. *millefolium* (low)

Alopecurus pratensis L. (low)

Capsella bursa-pastoris (L.) Medik. (medium)

Cerastium fontanum Baumg. (medium)

Hordeum jubatum L. (low)

Matricaria discoidea DC. (medium)

Phleum pratense L. (low)

Plantago major L. var. *major* (high)

Poa annua L. (high)

Poa pratensis L. (high)

Poa trivialis L. (low)

Polygonum aviculare L. (low)

Ranunculus repens L. (medium)

Rumex acetosella L. (low)

Stellaria media (L.) Vill. (high)

Taraxacum officinale G.H. Weber ex Wiggers (very high)

Trifolium hybridum L. (high)

Trifolium repens L. (very high)

Site K49. Resurrection Creek Road

Resurrection Creek Road begins on Palmer Creek Road, .75 miles south of the Hope Road, and continues for 2.5 miles to the parking lot for the Resurrection Trail. Just beyond this lot there is an unofficial camping area, and beyond this the road ends at a privately owned lodge. The gravel road is similar to Palmer Creek Road, though it never gains altitude and stays in the cottonwood-birch-spruce forest. Tailings from

old placer mining operations are extensive and were surveyed separately. The unofficial campground and the lodge's parking lot were included with the road. Red fescue and hairgrass were present and probably planted. Plants that fit the description of Pilger's common plantain were also observed, with a high cover value.

Achillea millefolium L. var. *millefolium* (medium)
Brassica sp. (low)
Cerastium fontanum Baumg. (medium-high)
Cerastium glomeratum Thuill. (low)
Crepis tectorum L. (medium)
Elymus sibiricus L. (low)
Leucanthemum vulgare Lam. (low)
Linaria vulgaris P. Mill. (medium)
Lolium perenne L. ssp. *perenne* (high)
Silene latifolia Poir. ssp. *alba* (P. Mill.) Greuter & Burdet (low)
Matricaria discoidea DC. (low)
Myosotis palustris L. (low)
Phleum pratense L. (medium)
Plantago major L. var. *major* (medium)
Poa annua L. (high)
Poa pratensis L. (medium)
Poa trivialis L. (low)
Rumex crispus L. (medium)
Stellaria media (L.) Vill. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (medium)
Trifolium pratense L. (low)
Trifolium repens L. (high)
Tripleurospermum inodorum (L.) Schultz-Bip. (low)

Site K50. Mine tailings along Resurrection Creek

60 52.21 149 37.66 (same as the trailhead; they extend a half mile north)

Some of the tailing mounds are bare, some have an open tall alder scrub, and many have cottonwood forest communities. Quite a few trees are over a foot in diameter, and many of the spaces between the mounds are wet or have small ponds. Non-native plants were found in the open gravelly areas, mixed with numerous native "weeds," such as red fescue and rough cinquefoil.

Poa annua L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (medium)
Trifolium repens L. (medium)

Site K51. Seward Highway North (miles 60, 65, 70, 75)

This section of the Seward Highway began at the point that it leaves the Turnagain coastal plain, at the sign that says "Welcome to Alaska's Kenai Peninsula." It is very similar to the section between the two junctions- a large portion of it has been remodeled, with enormous revegetated areas. At Turnagain Pass, the mixed forests and tall alder-willow scrubs are replaced by beautiful sub-alpine meadows. Red fescue and hairgrass were used extensively, possibly from non-native sources. Rough cinquefoil was present.

Achillea millefolium L. var. *millefolium* (high)
Bromus inermis Leyss. (low-medium)
Cerastium glomeratum Thuill. (medium)
Crepis tectorum L. (low-medium)
Elymus repens (L.) Gould (low)
Hordeum jubatum L. (low)
Lepidium densiflorum Schrad. (low)
Leucanthemum vulgare Lam. (low)
Lolium perenne L. ssp. *multiflorum* (Lam.) Husnot (low)
Matricaria discoidea DC. (low-medium)
Melilotus officinalis (L.) Lam. (low)
Phleum pratense L. (low)
Plantago major L. var. *major* (low-medium)
Poa annua L. (medium)
Poa pratensis L. (low-medium)
Polygonum aviculare L. (low)
Spergularia rubra (L.) J.& K. Presl (low-medium)
Taraxacum officinale G.H. Weber ex Wiggers (medium-high)
Trifolium hybridum L. (medium)
Trifolium pratense L. (low)
Trifolium repens L. (medium)
Tripleurospermum inodorum (L.) Schultz-Bip. (low)
Veronica serpyllifolia L. var. *serpyllifolia* (low)

Site K52. Turnagain Pass Winter Sports Area

60 47.23 149 12.66

The two rest stops at Turnagain Pass serve summer and winter traffic. This area is known as the “winter sports area”, with skiing trails on one side and snowmobile trails on the other. The rest stops have large parking areas and restroom buildings that have been locked (portable toilets are being used instead). Both rest areas were surveyed; they were nearly the same except that the eastern one had slightly lower abundance levels than the western. Also surveyed was the unofficial camping area at Lyons Creek; no new alien species were observed there. These areas are in the sub-alpine zone, with herbaceous meadows and willow-alder scrub at their margins.

Rob Lipkin adds:

The sites also have many native weedy species such as *Hordeum brachyantherum*, *Phleum commutatum*, and *Rhinanthus*. None of the non-native species were seen in the adjacent sub-alpine meadows [see site 57].

Achillea millefolium L. var. *millefolium* (medium)
Bromus inermis Leyss. (high-very high)
Cerastium fontanum Baumg. (medium)
Chenopodium album L. (medium)
Crepis tectorum L. (low-medium)
Matricaria discoidea DC. (high-very high)
Phleum pratense L. (low)
Plantago major L. var. *major* (high)
Poa annua L. (very high)
Poa pratensis L. (high)

Taraxacum officinale G.H. Weber ex Wiggers (high-very high)

Trifolium hybridum L. (high)

Trifolium pratense L. (low-medium)

Trifolium repens L. (high)

Site K53. Bertha Creek Campground

60 45.17 149 15.18

This small campground had one gravel loop in a spruce-cottonwood forest. It was bordered by the tall scrub of Bertha Creek. The creek had many small, nearby gravel bars that did not have any non-native plants. Red fescue here was probably occurring as a native plant.

Cerastium fontanum Baumg. (low)

Plantago major L. var. *major* (high)

Poa annua L. (high)

Poa pratensis L. (medium)

Taraxacum officinale G.H. Weber ex Wiggers (high)

Trifolium hybridum L. (high)

Trifolium repens L. (medium-high)

Site K54. Granite Creek Campground

60 43.33 149 17.67

This campground was similar to Bertha Creek, but was reached by a long access road. Its creek also had narrow gravel bars, but these had a few non-natives on them (the same species as the campsites).

Matricaria discoidea DC. (low)

Plantago major L. var. *major* (high)

Poa annua L. (high)

Poa pratensis L. (medium)

Taraxacum officinale G.H. Weber ex Wiggers (high)

Site K55. Johnson Pass Trail

60 43.53 149 16.52

The trailhead parking lot was part gravel, part paved and was reached by a short gravel access road. There was a small restroom facility. The spruce forest was open, with a wet meadow near the parking lot. The trail itself was packed dirt with some gravel. Mountain bike tracks were evident. Only dandelion and annual bluegrass were present on the trail, both in low levels but the latter being more common where the canopy opened. Rough cinquefoil was present.

Rob Lipkin adds:

This site had a parking area, outhouse, and access road. Most of the non-native species were found in the parking area with fewer along the access road. The roadside area near the pullout had extensive stands of *Deschampsia caespitosa* and *Festuca rubra*, both apparently from DOT seeding and most likely from non-native seed sources.

The rare native species *Potentilla drummondii* was found just near the outhouse in a meadow with *Deschampsia*, *Epilobium angustifolium*, *Lupinus nootkatensis*, *Phleum commutatum*, *Pedicularis verticillata*, *Artemisia arctica*, *Sanguisorba*, and *Polemonium acutiflorum*.

Achillea millefolium L. var. *millefolium* (medium)
Alopecurus pratensis L. (medium-high)
Cerastium fontanum Baumg. (low)
Matricaria discoidea DC. (medium-high)
Plantago major L. var. *major* (medium)
Poa annua L. (high)
Poa pratensis L. (medium-high)
Polygonum aviculare L. (low-medium)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium repens L. (medium-high)

Site K56. Quarry at mile 61.9

60 43.77 149 19.02

This was a gravel quarry of enormous size. It was mostly flat (unlike the quarry at mile 49, which was fairly deep) and had a large emerald-green pond at the far end. It was very sparsely vegetated. This is the only place that white sweet clover was found. There were six large plants in one section of the quarry. Also found at this site is a small buttercup (*Ranunculus abortivus* L.) that Hulten (1968) considered “sometimes adventive”. It would not be surprising if that was the case here, and the same may be said of the rough cinquefoil found with it.

Rob Lipkin adds:

This large material site is on the east side of the highway and is being colonized, mostly with native species including bent grass (*Agrostis*), hairgrass (*Deschampsia*), river beauty (*Epilobium latifolium*), alder (*Alnus*), rush (*Juncus bufonius*), and willow (*Salix*). Vegetative cover is sparse. *Deschampsia caespitosa* here was either native or introduced, but quite possibly native; the *Festuca rubra* was possibly native, but only found near the roadside gate and thus possibly from non-native roadside seed mix.

Achillea millefolium L. var. *millefolium* (low)
Cerastium fontanum Baumg. (low)
Cerastium glomeratum Thuill. (medium)
Hordeum jubatum L. (medium)
Lolium perenne L. ssp. *multiflorum* (Lam.) Husnot (low)
Lupinus polyphyllus Lindl. (low)
Melilotus albus Desr. (low-medium)
Plantago major L. (low)
Poa annua L. (low)
Poa pratensis L. (low-medium)
Taraxacum officinale G.H. Weber ex Wiggers (low)
Trifolium repens L. (low)

Site K57. Turnagain Pass Sub-alpine Meadows

60 46.25 149 13.60

One mile south of the Turnagain Pass rest areas there are superb mixed forb sub-alpine meadows. These were surveyed to determine if alien plants had entered the native community. I walked through the meadows on both side of the road in a zigzag pattern and covered most of the area not dominated by scrub. I found a few luggage tags and beer cans but no non-native plants. The only alien species were restricted to the road cuts and immediate margin.

Site K58. Old gravel pad

60 44.86 149 21.88

This appeared to be an old gravel pad on the west side of the highway at mile 59.7, perhaps used as a staging area during road construction. It has not been recently modified, and weedy species are well established. Most of these are aliens; rough cinquefoil, with medium cover, and hairgrass were also present. Just south is a meadow dominated by native plants.

Rob Lipkin adds:

The *Deschampsia* at the site was likely from the non-native sources used for revegetation along the highway.

Achillea millefolium L. var. *millefolium* (low)
Cerastium fontanum Baumg. (medium)
Chenopodium album L. (medium)
Crepis tectorum L. (low-medium)
Lupinus polyphyllus Lindl. (low)
Matricaria discoidea DC. (very high) mostly tiny plants
Phleum pratense L. (medium)
Plantago major L. var. *major* (low-medium)
Poa annua L. (low)
Poa compressa L. (low)
Poa pratensis L. (medium)
Poa trivialis L. (low-medium)
Polygonum aviculare L. (high) also tiny plants
Spergularia rubra (L.) J.& K. Presl (medium)
Taraxacum officinale G.H. Weber ex Wiggers (medium)
Trifolium hybridum L. (medium)
Trifolium repens L. (low)
Veronica serpyllifolia L. var. *serpyllifolia* (low)

Site K59 Mile 21.2 Private Drive near Rocky Creek

60 22.73 149 20.92

I was only able to survey the entry to this private driveway, but several non-native plants were evident:

Plantago major L. (medium)
Rumex acetosella L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (high)
Trifolium hybridum L. (medium)
Trifolium repens L. (medium)
Turritis glabra L. (low)

Site K60 Mile 25 Falls Creek

60 25.86 149 22.07

This is an old road or trail parallel to the railroad tracks that intersects the creek approximately 30 m from the road.

Achillea millefolium L. var. *millefolium* (low)

Phleum pratense L. (medium)
Plantago major L. (medium)
Poa annua L. (high)
Trifolium hybridum L. (low)
Trifolium repens L. (high)

The edge of the gravel bar of Creek (extending just off the end of the road) had:

Phleum pratense L. (low)
Poa annua L. (low)
Taraxacum officinale G.H. Weber ex Wiggers (low)

All of the above dropped out by the upstream end of the gravel bar.

Site K61 Mile 25.2 pullout
60 25.95 149 22.10

This is a small pullout by what appears to be a gage station. *Potentilla norvegica* L. had medium cover.

Achillea millefolium L. var. *millefolium* (low)
Elymus repens (L.) Gould (low-medium)
Matricaria discoidea DC. (medium)
Phleum pratense L. (medium)
Poa annua L. (high)
Taraxacum officinale G.H. Weber ex Wiggers (high)

Site K62 Lower Trail Lake trail
60 26.10 149 22.13

The small trail winds through a birch-spruce forest with an understory of dwarf dogwood, twinflower, and feather moss. The trail head (by the lake) had:

Matricaria discoidea DC. (medium)
Plantago major L. (medium)
Poa annua L. (high)
Taraxacum officinale G.H. Weber ex Wiggers (medium)
Trifolium hybridum L. (low)
Trifolium repens L. (high)

Poa annua was the only non-native plant to extend any distance along the trail, but even this species was only found in rare patches after the first 75 m. Isolated plants were seen up to 400 m from the trail head.

Site K63 Mile 59.0 Pullout
60 45.33 149 22.82

This site was a new pullout on the west side of the highway, adjacent to Sixmile Creek.

Cerastium fontanum Baumg. (low)

Cerastium glomeratum Thuill. (low)
Lolium perenne L. ssp. *multiflorum* (Lam.) Husnot (medium)
Lolium perenne L. ssp. *perenne* (medium-high) at edges, from roadside revegetation
Matricaria discoidea DC. (medium)
Phleum pratense L. (medium)
Plantago major L. (medium)
Poa annua L. (medium)
Poa pratensis L. (low)
Poa trivialis L. (low)
Potentilla norvegica L. (low)
Rumex crispus L. (low)
Stellaria media (L.) Vill. (low)
Taraxacum officinale G.H. Weber ex Wiggers (medium-high)

Site K64 Sixmile Creek

60 46.01 149 24.05

No non-native plants were seen along Sixmile Creek itself, with the exception of several individuals of *Taraxacum officinale*.

Site K65 Silvertip Creek

60 44.45 149 21.40

No non-native plants were seen along the creek.

Site K66 Mile 60.5 (61)

60 44.27 149 21.06

This is a large, recently used material site on the west side of the highway, just past Silvertip Creek. The newly scraped surfaces were devoid of vegetation. Adjacent surfaces had:

Achillea millefolium L. var. *millefolium* (low)
Brassica rapa L. (low)
Cerastium fontanum Baumg. (high)
Hordeum jubatum L. (low)
Poa pratensis L. (high)
Poa trivialis L. (low)
Polygonum aviculare L. (low)
Potentilla norvegica L. (medium)
Taraxacum officinale G.H. Weber ex Wiggers (low-medium)

The adjacent powerline was surveyed for 0.5 km in either direction but no non-native plants were seen.

Site K 67 Mile 61.4 East fork of Sixmile Creek

60 43.90 149 20.20

No non-native plants were seen along the creek.

Site K68 Mile 61.8 Powerline

60 43.77 149 19.37

The powerline pad and access is on the west side of the highway. The powerline itself had no non-native plants on the disturbed gravels of the right-of-way, but the driveway access to the pad had:

Matricaria discoidea DC. (medium)

Plantago major L. (medium-high)

Taraxacum officinale G.H. Weber ex Wiggers (low)

Site K69 Mile 62.7

60 43.68 149 18.42

This is an old site (with burnt logs) on the east side of highway, just south of Granite Creek campground. The site was very sparsely vegetated, mostly with native species of *Agrostis*, *Deschampsia*, *Calamagrostis canadensis*, *Rorippa*, and *Artemisia tilesii*.

Non-native species included:

Achillea millefolium L. var. *millefolium* (medium)

Capsella bursa-pastoris (L.) Medik. (medium)

Crepis tectorum L. (low)

Matricaria discoidea DC. (medium)

Phleum pratense L. (medium)

Plantago major L. (low)

Poa annua L. (medium)

Poa pratensis L. (high)

Polygonum aviculare L. (low)

Potentilla norvegica L. (low)

Spergularia rubra (L.) J.& K. Presl (medium)

Trifolium hybridum L. (medium)

Trifolium repens L. (low)

Site K70 Mile 64.8, Pullout

60 44.60 149 15.33

This pullout is just north of Spokane Creek. It is used as an unofficial camping spot and often has campers parked there. The disturbed gravel area (an old material site?) and driveway had the non-native plants:

Cerastium fontanum Baumg. (high)

Matricaria discoidea DC. (medium) at head of drive

Plantago major L. (medium) at head of drive

Poa annua L. (medium)

Poa pratensis L. (medium)

Taraxacum officinale G.H. Weber ex Wiggers (high)

Trifolium hybridum L. (medium)

The gravel bar of the creek had medium levels of *Taraxacum officinale* and low levels of *Poa pratensis*. Both of these were only seen near the highway crossing and did not extend far along the creek.

The highway margin near Spokane Creek was being revegetated with:

Deschampsia caespitosa (L.) Beauv. (very high)

Festuca rubra L (very high)

The massive stands of *Deschampsia* and *Festuca* are apparently from non-native seed sources (pers. comm. DOT, AK Mill and Feed).

Mixed in the grass seedings were considerable amounts of:

Cerastium fontanum Baumg. (medium)

Rumex graminifolius Lamb. (medium)

The *Rumex*, though native to Alaska, was not seen at any other site in the study area and may have been introduced unintentionally.

Site K71 Mile 65.4 Pullout.

60 45.00 149 14.95

The site has a small road to an old material site and unofficial camping area and is located on the west side of the highway, approximately 150 m south of the Bertha Creek Campground. The site was being naturally revegetated with *Equisetum arvense*, *Agrostis*, *Calamagrostis canadensis*, *Hordeum brachyantherum*, *Epilobium angustifolium*, and *Populus trichocarpa*. Most of the *Phleum* was the native *P. commutatum*. Most recolonization was occurring on the edges of the site- the disturbed gravels in the center of the site were very sparsely vegetated. Non-native species included:

Chenopodium berlandieri Moq. (low)

Matricaria discoidea DC. (medium)

Phleum pratense L. (low)

Taraxacum officinale G.H. Weber ex Wiggers (low)

Festuca rubra L. was abundant, apparently from the adjacent highway revegetation project with large stands of *Festuca* and *Deschampsia*.

The “road” (a dirt track) extends toward the creek and had few if any non-native species.

Site K72 Mile 67.6 Lyons Creek

60 46.72 149 13.18

A pullout and road extending to several ponds near Lyons Creek.

Achillea millefolium L. var. *millefolium* (low)

Cerastium fontanum Baumg. (medium-high)

Leucanthemum vulgare Lam. (medium-high)

Matricaria discoidea DC. (high)

Plantago major L. (high)

Poa annua L. (high)

Poa pratensis L. (medium-high)

Trifolium hybridum L. (medium)

Trifolium pratense L. (low)

Trifolium repens L. (medium)

Festuca rubra was abundant, but it is not clear if it is from native or non-native sources.

No non-native plants were seen on the active creek gravels and no non-native plants were seen in any of the aquatic sites.

Site K 73 Mile 69.8 Parking area

60 48.80 149 09.57

This site has a short asphalt cul-de-sac and parking area on the west side of the highway. It is backed by a hemlock-spruce forest. Leading into the forest is a short trail with the non-native species:

Leucanthemum vulgare Lam. (medium)

Poa annua L. (medium)

Poa pratensis L. (medium)

All of the above were only found on the trail itself and did not extend into the adjacent forest. A small pond with buckbean (*Menyanthes*) was also nearby and had no non-native plants in it.

Site K74 Mile 71 Pullout

60 48.85 149 09.67

A small asphalt pullout on the east side of the highway. The gravels alongside this small pullout had the non-native species:

Achillea millefolium L. var. *millefolium* (medium) large, single clump

Matricaria discoidea DC. (very high)

Plantago major L. (medium)

Poa annua L. (high)

Poa pratensis L. (low)

Taraxacum officinale G.H. Weber ex Wiggers (high)

Trifolium hybridum L. (high)

Trifolium repens L. (medium-high)

Site K 75 Mile 71.3 Pullout

60 49.03 149 09.19

A small pullout on the west side of the highway, with an outcrop and small waterfall.

Non-native plants seemed to be limited to a narrow gravel margin next to the asphalt pullout. *Trifolium* was found by the roadside but was not in the pullout itself.

Achillea millefolium L. var. *millefolium* (medium)

Matricaria discoidea DC. (low)

Plantago major L. (medium)

Poa annua L. (high)

Taraxacum officinale G.H. Weber ex Wiggers (medium)

Trifolium hybridum L. (high)

Trifolium repens L. (low-medium)

No non-native species were seen on the cliff face, the screes, the adjacent forest, or along the creek.

Site K 76 Mile 74.5 Pullout

60 50.29 149 04.86

A small pullout on the east side of the highway. Non-native species included:

Achillea millefolium L. var. *millefolium* (medium)
Lolium perenne L. ssp. *multiflorum* (Lam.) Husnot (medium) roadside
Matricaria discoidea DC. (medium)
Plantago major L. (high)
Poa annua L. (high)
Poa compressa L. (low)
Poa pratensis L. (medium)
Rumex acetosella L. (medium)
Trifolium hybridum L. (high)
Trifolium repens L. (low)

Site K 77 Ingram Creek Pullout

60 50.82 149 03.68

This site is a small pullout on the west side of the highway, near the “Welcome to Alaska’s Kenai Peninsula” sign.

The parking area and roadside are disturbed gravels backed by an alder thicket. There is a transition area of *Alnus crispa*, *Calamagrostis canadensis*, *Agrostis*, *Deschampsia*, *Epilobium angustifolium*, *Salix*, *Achillea*, *Populus trichocarpa*, *Rorippa islandica*, and *Sambucus*. The highest diversity of non-native and weedy species is in the alder transition zone. (This area is apparently heavily fertilized by humans and dogs.) All weeds drop out before the hemlock-spruce forest backing the alder zone. *Potentilla norvegica* L. had medium cover.

Achillea millefolium L. var. *millefolium* (high)
Cerastium fontanum Baumg. (high)
Hordeum jubatum L. (low)
Matricaria discoidea DC. (medium)
Phleum pratense L. (medium)
Plantago major L. (medium)
Plantago major L. (high)
Poa annua L. (high)
Taraxacum officinale G.H. Weber ex Wiggers (medium)
Trifolium repens L. (low)
Veronica serpyllifolia L. var. *serpyllifolia* (low)

Site K 78 Ingram Creek scenic pullout on south side of highway

60 50.67 149 03.04

This large pullout is on the south side of the highway (as it turns east along the coast towards Portage) across from the mouth of Ingram Creek. This site is at the edge of the study area and was incompletely surveyed, but a number of non-native species were seen:

Achillea millefolium L. var. *millefolium* (medium-high)
Matricaria discoidea DC. (medium-high)
Poa annua L. (high)
Poa pratensis L. (high)
Taraxacum officinale G.H. Weber ex Wiggers (medium)

Trifolium hybridum L. (high)
Trifolium repens L. (medium-high)

Festuca rubra was abundant, though it was unclear whether this was from native or non-native sources. No non-native species were seen on the silt banks of the creek and slough.

Resurrection River Road sites (mileage calculated from Seward Highway):

Site K79 Chugach National Forest boundary - MP3.7

60 10.20 149 30.07

Pullout, both sides of road (pavement ends here). Habitat consists of coarse roadside gravel and riverbank. Alluvial.

Lolium perenne L. ssp. *perenne* (abundant)
Medicago sativa L. (common)
Melilotus officinalis (L.) Lam. (abundant)

Site K 80 MP4.6 - Pullout at stream crossing

60 10.60 149 31.63

Alluvial gravel, hardened ground of campsite along creek, some recent road work.

Lolium perenne L. ssp. *perenne* (abundant)
Medicago sativa L. (common)
Melilotus officinalis (L.) Lam. (common)
Poa annua L. (common)
Trifolium repens L. (common)

Site K 81a MP5.5 - Gated side road to north - intersection

60 10.95 149 33.25

Alluvial forest off road shoulder (flowing sheets of water in forest from recent heavy rains).

Lolium perenne L. ssp. *perenne* (common)
Trifolium repens L. (common)

Site K 81b MP5.5 - Gated side road to north - road and clearcut at road's end

60 10.95 149 33.25 (same as K81)

Alluvial forest, much standing and running water along and on primitive road. Road ends in hardened ground of landing of old clearcut. Some campfire rings, recent cutting of downed cottonwood. Primarily native forest species along road to landing. Weedy species common on landing. *Potentilla norvegica* L. was occasional.

Lolium perenne L. ssp. *perenne* (common)
Matricaria discoidea DC. (common)
Neslia paniculata (L.) Desv. (rare)
Phleum pratense L. (occasional)

Taraxacum officinale G.H. Weber ex Wiggers (occasional)

Site K82 **MP5.9 - small dikes deflecting river flow away from road**
60 10.95 149 33.48

bare gravel - unvegetated. No weed species.

Site K 83 **MP6.1 - small pulloff on north side of road**
60 10.97 149 33.55

scattered weeds in gravel of road

Lolium perenne L. ssp. *perenne* (common)

Trifolium repens L. (occasional)

Site K84 **MP6.2 - pulloff by river**
60 10.97 149 33.67

bare gravel to riverbank

Lolium perenne L. ssp. *perenne* (common)

Site K 85 **MP6.6 - scenic overlook of Exit Glacier**
60 11.20 149 34.42

Gravel roadbank, vegetated median. *Potentilla norvegica* L. was occasional.

Lolium perenne L. ssp. *perenne* (common)

Medicago sativa L. (common)

Melilotus officinalis (L.) Lam. (common)

Poa annua L. (occasional)

Poa pratensis L. (occasional)

Trifolium repens L. (common)

Site K 86 **MP7.0 - Resurrection River Trailhead Parking lot and trail**
60 11.73 149 35.22

Coarse gravel of parking area, with vegetated gravel slope down to standing pools of water. Vegetated median.

Bromus inermis Leyss. (occasional)

Lolium perenne L. ssp. *perenne* (common)

Medicago sativa L. (occasional)

Melilotus officinalis (L.) Lam. (common)

Phleum pratense L. (occasional)

Poa annua L. (occasional)

Taraxacum officinale G.H. Weber ex Wiggers (occasional)

Trifolium pratense L. (occasional)

Trifolium repens L. (common)

First 50 meters of trail consists of open habitat with coarse gravel on trail, where weeds are relatively widespread. Trail trends into more closed forest at trail register, where weeds become much less common. Weeds are almost entirely limited to initial stretch of trail. Open and closed areas of trail beyond register are almost entirely devoid of weed species. Recent trail work. No new weed occurrences past trailhead area for first mile of trail.

Lolium perenne L. ssp. *perenne* (occasional)

Poa annua L. (rare)

Resurrection River bridge and roadside. Coarse alluvial gravel and roadbank.

Crepis tectorum L. (occasional)

Lolium perenne L. ssp. *perenne* (common)

Taraxacum officinale G.H. Weber ex Wiggers (occasional)

Trifolium repens L. (occasional)

Seward Highway, northbound (mileage calculated from Seward):

Site K 87 MP8.2 - CNF Boundary and pullout

60 10.20 149 23.90

Roadside gravel and shore of small stream. Vegetated (regularly brushed) roadside.

Matricaria discoidea DC. (occasional)

Plantago major L. (abundant)

Poa annua L. (common)

Rumex crispus L. (occasional)

Trifolium repens L. (common)

Site K 88 MP9.2 - Pullout and dirt road, west side of highway

60 10.98 149 23.18

Roadside gravel and wet dirt of old road across wooden bridge. Some garbage dumped on dirt road.

Potentilla norvegica L. was occasional.

Dactylis glomerata L. (occasional)

Matricaria discoidea DC. (occasional)

Taraxacum officinale G.H. Weber ex Wiggers (occasional)

Trifolium repens L. (occasional)

Site K 89 MP9.2-10.8 - Highway with narrow shoulder and no pullouts

60 10.98 149 23.18 (same as 88)

Roadside gravel.

Plantago major L. (common)

Site K 90 **MP10.8 - Pullout, east side of highway**

60 11.86 149 22.37

Sparsely vegetated gravel. Some garbage. Campfire ring.

Matricaria discoidea DC. (common)

Plantago major L. (common)

Poa annua L. (occasional)

Rumex crispus L. (occasional)

Site K 91 **MP11.4 - Pullouts, both sides of highway**

60 14.80 149 21.31

Coarse gravel and sparse herbs, vegetated drainage ditch.

Chenopodium album L. (rare)

Crepis tectorum L. (occasional)

Leucanthemum vulgare Lam. (common)

Matricaria discoidea DC. (common)

Taraxacum officinale G.H. Weber ex Wiggers (common)

Trifolium repens L. (occasional)

Site K 92 **MP11.5 - Pullout, east side of highway**

60 15.25 149 20.98

Coarse gravel by railroad tracks ("Divide"). Trailhead on west side of highway.

Linaria vulgaris P. Mill. (rare, along railroad tracks)

Matricaria discoidea DC. (common)

Plantago major L. (common)

Poa annua L. (occasional)

Rumex crispus L. (occasional)

Taraxacum officinale G.H. Weber ex Wiggers (occasional)

Site K 93 **MP13.2 - Grayling Lake pullout, east side of highway**

60 16.57 149 20.58

Paved parking lot and alluvial and roadside gravel.

Matricaria discoidea DC. (common)

Phleum pratense L. (occasional)

Plantago major L. (common)

Poa annua L. (occasional)

Rumex crispus L. (occasional)

Grayling Lake Trailhead parking lot on west side of highway. Paved parking lot with adjacent vegetated gravel.

Plantago major L. (common)

Poa annua L. (occasional)

Trifolium repens L. (common)

Grayling Lake Trail. Gravel surface through open forest and alder. Weed species quickly diminish with increasing distance from the parking lot.

Plantago major L. (common)

Poa annua L. (occasional)

Site K 94 MP14 - Railroad crossing and pullout on east side of highway

60 17.18 149 20.35

Gravel parking area and railroad embankment.

Crepis tectorum L. (occasional)

Elymus repens (L.) Gould (occasional)

Rumex crispus L. (occasional)

Taraxacum officinale G.H. Weber ex Wiggers (occasional)

Site K 95 MP14.5 - Pullout and old road on west side of highway

60 17.55 149 20.72

Roadside gravel and wet mineral surface of unmaintained road through alder, with small social trail along edge of muskeg. Some garbage dumped on dirt road.

Plantago major L. (common)

Poa annua L. (occasional)

Site K 96 MP14.7 - Pullout on east side of highway

60 17.60 149 20.75

Gravel of road shoulder.

Phleum pratense L. (occasional)

Poa annua L. (occasional)

Rumex crispus L. (occasional)

Site K 97 MP15 - No shoulder, by large wetland on east side of highway.

60 17.85 149 20.92

Plantago major L. (occasional)

Site K 98 MP15.2 - Snow River access road, east side of highway

60 18.20 149 21.19

Roadside gravel and unimproved road through alluvial alder and cottonwood to broad gravel floodplain of Snow River. Few, if any, weed species on the gravel floodplain.

Rumex crispus L. (occasional)

Taraxacum officinale G.H. Weber ex Wiggers (occasional)

Site K 99 **MP16.1 - Pullout on east side of highway**

60 19.13 149 21.44

Roadside gravel. *Potentilla norvegica* L. was occasional.

Rumex crispus L. (occasional)

Taraxacum officinale G.H. Weber ex Wiggers (occasional)

Site K 100 **MP17.1 - Primrose Road and Campground, and Lost Lake Trailhead.**

60 20.48 149 21.92

Paved road with gravel shoulder, 1.2 miles to terminus at Primrose Campground and Lost Lake Trailhead. Few weedy species along Lost Lake trail. Trailhead begins in forest. Recent (and ongoing) trail maintenance work.

Matricaria discoidea DC. (occasional)

Plantago major L. (common)

Poa annua L. (occasional)

Rumex crispus L. (occasional)

Taraxacum officinale G.H. Weber ex Wiggers (occasional)

Trifolium repens L. (occasional)

Appendix III

Native plants observed growing in weedy habitat (DeLapp 1998)

Achillea millefolium L. var. *borealis* (Bong.) Farw.
Agrostis exarata Trin.
Alnus viridis (Vill.) Lam. & DC. ssp. *sinuata* (Regel) A.& D. Love
Arabis lyrata L.
Arnica amplexicaulis Nutt.
Artemisia tilesii Ledeb.
Aster sp.
Calamagrostis canadensis (Michx.) Beauv.
Carex mertensii Prescott ex Bong.
Cerastium beeringianum Cham. & Schlecht.
Claytonia sibirica L.
Epilobium angustifolium L.
Equisetum arvense L.
Galium boreale L.
Geranium erianthum DC.
Geum macrophyllum Willd.
Hedysarum alpinum L.
Hordeum brachyantherum Nevski
Heuchera glabra Willd. ex Roemer & J.A. Schultes
Iris setosa Pallas ex Link
Picea sitchensis (Bong.) Carr.
Plantago macrocarpa Cham. & Schlecht.
Poa spp.
Polemonium acutiflorum Willd. ex Roemer & J.A. Schultes
Populus balsamifera L. ssp. *trichocarpa* Brayshaw
Prenanthes alata (Hook.) D. Dietr.
Pyrola asarifolia Michx.
Rhinanthus minor L.
Salix spp.
Sibbaldia procumbens L.
Streptopus amplexifolius (L.) DC.

and the mosses

Hylocomnium spendens (Hedw.) Schimp. in B.S.G.
Ceratodon purpureus

Appendix IV

List of alien plant taxa recorded for the Chugach National Forest area (from Anchorage south through the Kenai Peninsula, east through Prince William Sound and north to Chitina) not found during these surveys.

Agropyron smithii Rydb.
Agrostis stolonifera L.
Agrostis tenuis Sibth.
Amaranthus retroflexus L.
Anthemis cotula L.
Anthemis tinctoria L.
Antirrhinum orontium L.
Asperugo procumbens L.
Astragalus cicer L.
Avena fatua L.
Bidens cernua L.
Brassica juncea (L.) Czern.
Bromus hordeaceus L.
Bromus secalinus L.
Bromus tectorum L.
Carex deweyana Schwein.
Centaurea biebersteinii DC. (synonym *C. maculosa* auct. non Lam.)
Cirsium arvense (L.) Scop.
Cirsium vulgare (Savi) Ten.
Descurainia sophia (L.) Webb ex Prantl
Erucastrum gallicum (Willd.) O.E. Schulz
Festuca arundinacea (Schreb.) S.J. Darbyshire
Galeopsis tetrahit L.
Geranium pusillum L.
Helianthus annuus L.
Hypochoeris radicata L.
Lappula myosotis Moench
Lupinus x pseudopolyphyllus C.P. Sm.
Lythrum hyssopifolia L.
Medicago falcata L.
Medicago lupulina L.
Medicago sativa L.
Myriophyllum spicatum L. (sens. str.) unconfirmed report
Onobrychis vicifolia Scop.
Phalaris canariensis L.
Plantago lanceolata L.
Poa angustifolia L.
Poa bulbosa L.
Poa nemoralis L.
Poa subcoerulea Sm.
Polygonum cuspidatum Sieb. & Zucc.
Polygonum lapathifolium L.
Polygonum persicaria L.
Potentilla gracilis Dougl. ex Hook.
Prunella vulgaris L. ssp. *vulgaris*
Raphanus sativus L.
Rorippa sylvestris (L.) Bess.
Rumex acetosella L. ssp. *angiocarpus* (Murb.) Murb.
Rumex longifolius DC.

Rumex obtusifolius L.
Scirpus paludosus A. Nels.
Senecio vulgaris L.
Sinapsis arvensis L.
Sisymbrium altissimum L.
Solanum sp.
Sonchus asper (L.) Hill
Spergula arvensis L.
Taraxacum scanicum Dahlst.
Tragopogon dubius Scop.
Trifolium aureum Pollich
Triticum aestivum L.
Vicia cracca L.

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