

# Invasiveness Ranking of 50 Non-Native Plant Species for Alaska



Timm Nawrocki<sup>1</sup>, Helen Klein<sup>1</sup>, Matthew Carlson<sup>1</sup>, Lindsey Flagstad<sup>1</sup>, Jeff Conn<sup>2</sup>, Rob DeVelice<sup>3</sup>, Ashley Grant<sup>4</sup>, Gino Graziano<sup>5</sup>, Bonnie Million<sup>6</sup>, and Whitney Rapp<sup>7</sup>

April 8, 2011

## Report Prepared by:



Alaska Natural Heritage Program, University of Alaska Anchorage  
707 A Street  
Anchorage, Alaska 99501

## Report prepared for:



Alaska Association of Conservation Districts  
1700 E Bogard Road, Suite 203-A  
Wasilla, Alaska 99654

<sup>1</sup> Alaska Natural Heritage Program, University of Alaska Anchorage, 707 A Street, Anchorage, AK 99501

<sup>2</sup> Agricultural Research Service, U.S. Department of Agriculture, 319 O'Neil Building, 905 Koyukuk Street – UAF Campus, Fairbanks, AK 99775

<sup>3</sup> Forest Service, U.S. Department of Agriculture, 3301 C Street, Suite 300, Anchorage, AK 99503

<sup>4</sup> Cooperative Extension Service, University of Alaska Fairbanks, 1675 C Street, Anchorage, AK 99501

<sup>5</sup> Plant Materials Center, Division of Agriculture, Alaska Department of Natural Resources, 5310 S. Bodenbug Spur, Palmer, AK 99645

<sup>6</sup> National Park Service, U.S. Department of the Interior, 240 West 5<sup>th</sup> Avenue, Anchorage, AK 99501

<sup>7</sup> National Park Service, U.S. Department of the Interior, P.O. Box 7, King Salmon, AK 99613

## Summary

Quantifying the potential threat posed by non-native plant species to the natural areas of Alaska aids land managers in effectively prioritizing problematic species and applying limited resources towards their control. Approximately 40% (114 of 284) of the non-native plant species known or expected to occur in Alaska have been ranked according to their potential invasiveness in natural areas. This project assigns invasiveness ranks to 50 additional non-native plant species and reevaluates five previously ranked species that have been shown to display more aggressive behavior than their initial rank indicated. Invasiveness ranks for all 164 non-native species ranked for Alaska as of April 2011, are provided, ordered by invasiveness and by species name.

Cover Photos: [Left] *Rosa rugosa* growing along the coastal trail in Anchorage, Alaska; [Center] Sapling of *Prunus virginiana*; [Right] Infestation of *Centaurea montana*.

## Contents

Introduction .....	1
Non-Native Plants in Alaska .....	2
Invasiveness Ranking System.....	4
Overview and Aims .....	5
Methods.....	6
Results.....	8
Discussion.....	10
References .....	12
Appendix 1: Scores of Invasiveness Ranking of 164 Non-Native Plants Ordered by Invasiveness.....	16
Appendix 2: Scores of Invasiveness Ranking of 164 Non-Native Plants Ordered by Species Name .....	23
Appendix 3: Blank Invasiveness Ranking Form .....	<b>Error! Bookmark not defined.</b>

## Figures

Figure 1: Ecogeographic Regions of Alaska.....	5
Figure 2: Frequency of Distribution of Invasiveness Ranks of 114 Non-Native Plants Ranked as of 2008 ..	9
Figure 3: Frequency of Distribution of Invasiveness Ranks of 164 Non-Native Plants Ranked as of 2011 ..	9

## Tables

Table 1: Number and Percent of Infestations per Disturbance Type .....	3
--	---

This page intentionally left blank.

## Introduction

Human activities have increased the rate and extent of species introductions far beyond natural levels, especially over the past century (Lodge 1993). In fact, the rate of species introductions is estimated to be 100 to 1000 times the natural background rate (Gaston et al. 2003). Non-native species are well accepted to have caused detrimental environmental and economic impacts throughout the world (Mito and Uesugi 2004, Sinden et al. 2004, Turpie 2004, Liu et al. 2005). The invasion of non-native species has been recognized as the second greatest threat to biodiversity, superseded only by the direct destruction of habitat in the United States (Pimm and Gilpin 1989, U.S. Congress 1993, Myers 1997, Wilcove et al. 1998, Stein et al. 2000). Approximately 42% of threatened and endangered species are primarily impacted by invasive species (Pimentel et al. 2005).

Not all non-native<sup>8</sup> plant species pose a serious threat to native ecosystems, however. Only a small proportion of introduced species establishes self-sustaining populations, and an even smaller proportion invades natural ecosystems (Williamson and Fitter 1996a). Invasive<sup>9</sup> plants, however, cause significant and sometimes irreparable ecological damage. Aggressive plant invaders alter ecosystem processes and threaten native biodiversity, community structure, and community composition (Hughes et al. 1991, Cronk and Fuller 1995, Walker and Smith 1997, Stein et al. 2000). Introduced plant species can also have serious economic impacts; in the United States, introduced plants cause a 9% reduction in crop yields resulting in \$24 billion of lost agricultural revenue per year out of a potential value of \$267 billion per year for all U.S. crops (Pimentel et al. 2005). The ecological disturbance caused by invasive plant species results in additional economic losses and expenditures each year for land managers nationwide (Westbrooks 1998).

Although the processes of invasion are not completely understood, more detrimental non-native plants often exhibit shared traits, including: early maturation, prolific seed production, the ability to spread vegetatively, potential for long-distance dispersal, long-lived seed banks, seed dormancy, tall growth, large leaf size, toxic chemicals, and structures that cause injury to animals or discourage herbivory (Williamson and Fitter 1996b, Westbrooks 1998, Richardson and Pyšek 2006, Mason et al. 2008).

Non-native plants have greater success invading regions that are climatically similar to their native ranges (Williamson et al. 1986, Cronk and Fuller 1995), and crop species in particular have a higher probability of establishing self-sustaining populations because they are often selected to grow well in the regions to which they are introduced (Williamson and Fitter 1996a). Additionally, plants that are associated with agricultural products have increased opportunities to be introduced to new regions (Westbrooks 1998).

The susceptibility of native plant communities to invasion is largely a function of the degree to which the communities are naturally or anthropogenically disturbed (Hobbs and Huenneke 1992, Lake and Leishman 2004) and the number of propagules that arrive in those communities (Richardson and Pyšek 2006). Communities that are intermittently subject to the addition or removal of resources (light, nutrients, or soil moisture) are more susceptible to invasions than communities with relatively stable resources (Davis et al. 2000). Communities are often invaded when suitable non-native plant propagules arrive immediately following fluctuations in resource levels (Davis et al. 2000, Richardson

---

<sup>8</sup> Non-native plants are plants that are present in a given area because of their accidental or intentional introduction by human activities (AKEPIC 2005).

<sup>9</sup> Invasive plants are non-native plants that produce viable offspring in large numbers and have the potential to establish and spread in natural areas (AKEPIC 2005).

and Pyšek 2006). Plant invasions have been correlated with increased trade, which provides many opportunities for non-native species to spread to new regions (Levine and D'Antonio 2003). Roadsides also aid in the dispersal and expansion of non-native plant populations as they create continuous disturbed habitat corridors (Christen and Matlack 2006). The ever increasing volume and scale of global commerce and land development provides multiple vectors and substrates for introduction and establishment of invasive plant species worldwide.

## Non-Native Plants in Alaska

Alaska has not yet been affected by the invasion of non-native plants to the same degree as the other 49 states of the U.S. (Carlson and Shephard 2007, *cf.* DiTomaso and Healy 2007). The naturalized taxa currently represent nearly 15% of the vascular flora of Alaska, with new invasive plant species recorded every year (AKEPIC 2011). This proportion is not particularly high compared to most other states; for example, 18% of the flora of California (Hickman 1993), approximately 30% of the flora of Oregon (Kaye pers. comm. cited in Carlson and Shephard 2007), and 49% of the flora of Hawaii (Randall and Hoshovsky 2000) are non-native. However, the harsh climate and relatively limited scales of anthropogenic disturbance and trade have not prevented the introduction of non-native species to Alaska, and the impacts of non-native plants within the state are increasing (Carlson and Shephard 2007).

Over the last ten years, there has been a marked acceleration in the rate of introduction of non-native plants to Alaska, probably driven by increases in the movement of goods and people (Carlson and Shephard 2007). In 1968, 174 non-native plant species were recorded in Alaska (Hultén 1968). Since 1968, the rate of introductions to the state has increased so that by 2006 the number of non-native plant species recorded in Alaska had risen to 283, although 36 species were likely extirpated during that time (Carlson and Shephard 2007), and by 2011 the number had risen to 314. A total of 175 non-native plant taxa appear to have naturalized in Alaska and an additional 139 non-native taxa are apparently ephemeral.

More recently, federal and state agencies have conducted invasive plant surveys to ascertain the type and extent of plant invasions in the state (e.g. Densmore et al. 2001, DeVelice 2003, Duffy 2003, Cortés-Burns et al. 2008, Rapp 2009, Flagstad and Cortés-Burns 2010). The Alaska Exotic Plant Information Clearinghouse ([AKEPIC](#)) database maintains current knowledge on infestation locations within Alaska, aiding the development and adaptation of effective management strategies. In response to the acceleration in the rate of introduction of non-native plants to Alaska, land managers across the state have started to develop weed management plans to minimize additional introductions and mitigate the impacts of invasive plants on their lands (e.g. Slemmons 2007, BLM Central Yukon Field Office 2009, Gary 2010, Heidemann et al. 2010, Cortés-Burns et al. 2011, Flagstad et al. 2011).

In Alaska, the occurrence of non-native plants is strongly correlated with anthropogenically disturbed areas, such as cities, towns, roads, trails, railroads, recreation sites, logged areas, quarries, gravel pits, and agricultural fields. Fill importation in particular accounts for over 70% of recorded infestations, far more than any other disturbance type (see Table 1 below). Additionally, most non-native plant populations in Alaska are small and occur at low percent cover; 50% of recorded infestations occupy 0.004 hectares (.01 acre) or less and 66% of recorded infestations occur at 5% ground cover or less (AKEPIC 2011). Most infestations smaller than 1 hectare can be eradicated; however, the eradication of infestations larger than 1000 hectares is an unrealistic goal (Rejmánek and Pitcairn 2002). Because most non-native plant populations are small and are associated with anthropogenic disturbance (AKEPIC

2011), it is still possible to prevent large ecological disasters similar to those that have beleaguered most states in the contiguous U.S.

However, numerous infestations in Alaska have also been associated with natural disturbances, such as coastal processes, fluvial processes, animal activities, fire, and geomorphic processes (AKEPIC 2011). Riparian and coastal plant communities are particularly vulnerable to the invasion of non-native species (AKEPIC 2011). Invasive plant species (e.g. *Melilotus alba*, *Crepis tectorum*, *Hieracium umbellatum*) have increasingly been documented invading natural ecosystems (Lapina et al. 2007, Cortés-Burns et al. 2008, Conn et al. 2008b, Villano and Mulder 2008, Flagstad and Cortés-Burns 2010), and some species (e.g. *Hieracium aurantiacum*, *Prunus padus*, *Caragana arborescens*) have been observed growing in areas with little or no perceivable disturbance (Carlson et al. 2006, Cortés-Burns et al. 2008, Flagstad 2010, AKEPIC 2011).

**Table 1: Number and Percent of Infestations per Disturbance Type**

Disturbance Type	Classification	Number of Records	Percent*
Fill Importation (e.g. Road or Railroad Grade)	Anthropogenic	68485	70.01
Mowing	Anthropogenic	2386	2.44
Material Extraction	Anthropogenic	1635	1.67
Other Mechanical Substrate Alteration or Removal	Anthropogenic	1514	1.55
ORV Disturbance	Anthropogenic	1066	1.09
Handtool Substrate Alteration or Removal	Anthropogenic	741	0.76
Mechanical Brush/Tree Cutting	Anthropogenic	640	0.65
Abandoned Homesite	Anthropogenic	294	0.30
Plowing	Anthropogenic	144	0.15
Logging	Anthropogenic	103	0.10
Mining	Anthropogenic	76	0.08
Herbicide Application	Anthropogenic	2	0.00
Trampling	Anthropogenic/Natural	2963	3.03
Forest Fire	Anthropogenic/Natural	98	0.10
Grazing	Anthropogenic/Natural	81	0.07
Coastal/Beach	Natural	1743	1.78
River Action	Natural	491	0.50
Caribou/moose/animal related disturbance site	Natural	204	0.21
Stream Action	Natural	182	0.19
Glaciation	Natural	75	0.08
Landslide/Avalanche	Natural	66	0.07
Windthrow	Natural	56	0.06
Wind Erosion/Deposition	Natural	19	0.02
Volcanic Action	Natural	3	0.00
Disturbance information not recorded	Unknown	14761	15.09

\*Data from AKEPIC database current as of March, 2011. Percents are derived from 97828 total records.

In some cases, the presence of a particular non-native species has favored the establishment of another non-native species. Non-native members of the Fabaceae family are particularly problematic in this regard because of their association with nitrogen-fixing bacteria. The addition of nitrogen to the soil favors the establishment or proliferation of non-native species (Symstad 2004), which may delay natural successional processes. For example, on the Matanuska and Stikine River floodplains, the establishment of *Melilotus alba* appears to have facilitated the invasion of *Crepis tectorum* and *Taraxacum officinale* ssp. *officinale* (Conn and Seefeldt 2009). Removal of the non-native legume does not immediately return nutrient cycling patterns to their pre-invasion states (Symstad 2004).

Recently, specific pathways for the introduction and spread of non-native plant species in Alaska have been identified and quantified (Conn et al. 2008a, Conn et al. 2010, Conn unpublished data 2010). Locally produced and imported straw and soil from locally sold container-grown ornamental plants have been identified as pathways for the introduction and spread of non-native plant propagules in Alaska (Conn et al. 2008a, Conn et al. 2010). Grass seed, crop seed, wildflower seed mixes, and bird seed sold by vendors in Alaska have also been shown to contain invasive plant propagules (Conn unpublished data 2010). Some non-native species have escaped from cultivation as crops or ornamental plants (Quarberg et al. 2009, AKEPIC 2011) or have been associated with revegetation efforts (Wright 2008, Conn pers. obs., Riley pers. comm.). Road systems in particular appear to facilitate the spread of non-native plants in Alaska (AKEPIC 2011).

### **Invasiveness Ranking System**

Because resources for managing invasive plants are limited, the threat of particular non-native species should be evaluated before expensive management is attempted so that resources can be directed towards controlling the most threatening species (Hébert 2001, Wainger and King 2001). In 2008, the Alaska Natural Heritage Program in collaboration with the US Forest Service, USDA Agricultural Research Service, US Geological Survey, National Park Service, and UAF Cooperative Extension Service developed a ranking system for Alaska (Carlson et al. 2008). The system is a synthesis, with additions and alterations to make it appropriate for the conditions present in Alaska, of four previously existing ranking systems (Carlson et al. 2008): Invasive Exotic Plant Species in Virginia (Heffernan et al. 2001), California Exotic Pest Plant Council (Warner et al. 2003), the Australian AQIS Weed Risk Assessment System (Pheloung et al. 1999), and Southwest Exotic Species Ranking System (Hiebert and Stubbendieck 1993). This system was designed to be a robust, transparent, and repeatable procedure that allows multiple users to generate consistent ranks for unranked non-native species or to rerank previously evaluated species based on new information. Since its development, the Invasiveness Ranking System for Alaska has been adapted for use by other states (Jordan et al. 2010).

The ranking system consists of a climate screening and an evaluation of the ecological impacts, biological characteristics and dispersal ability, ecological amplitude and distribution, and feasibility of control. The climate screening evaluates the likelihood of a species establishing in the Pacific Maritime, Interior-Boreal, and Arctic-Alpine ecogeographic regions of Alaska (see Figure 1) based on known occurrences in climatically similar regions of the world. Species that have not been documented from Alaska and do not pass the climate screening are not ranked. However, species that have not been documented from Alaska but do pass the climate screening are ranked because they have the potential to become established in Alaska in the future.

Sections are weighted according to their relative importance: the ecological impacts section has 40 possible points, the biological characteristics and ecological attributes sections each have 25 possible points, and the feasibility of control section has 10 possible points. Ecological (as opposed to economic



or human health) impacts are given emphasis due to the wealth of natural areas in state and the interest of land managers in protecting those areas. Section scores are the sums of the numerical ranks assigned to specific criteria within each section. The criteria included were those that best predicted the overall invasiveness of the species and are evaluated based on the information available for a species. When information is not available for a specific criterion, the total points possible for the section is reduced to avoid assigning lower invasiveness ranks to species based on the absence of information. The overall invasiveness ranks are scaled from 0 to 100, with 0 representing a plant that poses no threat to native ecosystems and 100 representing a plant that poses a major threat to native ecosystems (Carlson et al. 2008).

**Figure 1: Ecogeographic Regions of Alaska**



Black represents the Pacific Maritime, white represents the Interior-Boreal, and hatched represents the Arctic-Alpine ecogeographic regions of Alaska. The dashed grey line represents the Alaska-Canada border (Nowacki et al. 2001).

After the development of the ranking system, ranks were assigned to 114 non-randomly chosen non-native plant species. Species were selected by a committee of weed scientists to represent the perceived degrees of invasiveness and distribution in Alaska. While the majority of ranked species do not display traits that make them cause for concern in natural areas, some species have the potential to cause significant ecological impacts. Ecological impacts and biological characteristics were found to be the best predictors of overall invasiveness score; however, the ability of non-native plants to establish and spread in Alaska was not necessarily correlated with the degree of ecological impact (Carlson et al. 2008).

## **Overview and Aims**

The ranks of the non-native plant species ranked in 2008 have provided land managers with a valuable resource to aid in the prioritization of control efforts. However, of the approximately 300 non-native

plant species known to occur in Alaska, only 114 were evaluated in 2008. The increasing movement of people and goods in and out of Alaska results in the introduction of additional non-native species to the state. Thus, there is a continuous need among land managers and the general public for easily accessible information describing the ecological impacts, biological characteristics, ecological distributions, and feasibility of control for additional non-native species. A number of species, including *Elodea canadensis* and *Persicaria wallichii*, have become problematic in Alaska since the 2008 ranking effort, and many species that frequently occur in Southeast Alaska were not previously ranked. The knowledge gap for unranked species can hinder the ability of land managers to effectively identify problematic infestations and prioritize their control. This report presents the ranks of an additional 50 non-native plant species that have recently emerged as threats to the integrity of ecosystems in Alaska.

Several of the invasiveness ranks assigned to species in 2008 were perceived to be too low to adequately reflect the behavior of those species in Alaska. To remedy this problem, the ranks of *Caragana arborescens*, *Crepis tectorum*, *Galeopsis tetrahit* s. l. (*G. bifida* and *G. tetrahit*), *Lupinus polyphyllus*, and *Tanacetum vulgare* were re-evaluated based on new information. The revisions also included updates to the taxonomy and distribution of these previously ranked species.

## Methods

Species were selected for ranking non-randomly based on input from state and federal land managers, perceived threat to natural ecosystems, frequency of occurrence, and/or recent introduction to Alaska. *Phragmites australis* and *Acroptilon repens* have not yet been documented from Alaska but were ranked because they exhibit invasive behavior in geographically proximal and climatically similar habitats. *Caragana arborescens*, *Crepis tectorum*, *Galeopsis tetrahit* s. l. (*Galeopsis bifida* and *Galeopsis tetrahit*), *Lupinus polyphyllus*, and *Tanacetum vulgare* were selected for reranking based on the consensus among botanists, ecologists, and land managers in Alaska that the scores for these species lower than the plants' perceived impacts.

Distribution maps showing where each species has been collected in the Pacific Maritime, Interior-Boreal, and Arctic-Alpine ecogeographic regions were compiled for the species that have been documented from Alaska using data from the Flora of Alaska and Neighboring Territories (Hultén 1968), AKEPIC (AKEPIC 2011), and the University of Alaska Museum Herbarium (UAM 2011). Infrequently, sites from personal observations or other sources were also added to the distribution maps. The distribution maps for *Phragmites australis* and *Acroptilon repens*, which have not been recorded in Alaska, were left blank.

Invasiveness was assessed following the method developed by Carlson et al. (2008). Climate screening was performed to determine the likelihood of a non-native plant species establishing in an ecogeographic region in which it is not currently present. Species documented from all three ecogeographic regions of Alaska were not screened for climatic similarity. Ecogeographic regions in which a particular species had not been documented were evaluated for similarity to known locations of the species worldwide using the CLIMEX climate matching program (CLIMEX 1999). CLIMEX compares long-term meteorological databases to produce a percent climate match value between two locations, which enables the evaluation of the invasiveness of non-native plants in the context of their current and possible ecogeographic distributions within Alaska. We weighted the parameters of maximum temperature, minimum temperature, rainfall total, and rainfall pattern equally when comparing locations. The locations of known occurrences of the ranked species were compared to one

representative weather station for each ecogeographic region of Alaska: Juneau represented the Pacific Maritime ecogeographic region, Fairbanks represented the Interior-Boreal ecogeographic region, and Nome represented the Arctic-Alpine ecogeographic region. A 40% climatic similarity between locations was the lowest acceptable value to justify the potential occurrence of a species in a particular ecogeographic region (Carlson et al. 2008). Species that were not known to occur in any locations with a 40% or higher climatic similarity with Juneau, Fairbanks, or Nome were considered highly unlikely to establish in the respective ecogeographic region.

Information on the occurrence of ranked species in climatically similar locations was gathered from AgroAtlas (Afonin et al. 2008) for Russia and Eastern Europe, NatureGate (NatureGate 2011) for Finland, and various herbaria hosted by the Global Biodiversity Information Facility (GBIF 2011) primarily for Norway, Sweden, Canada, and the U.S. When available, information on the climate-related habitat requirements of species also influenced the climate screening with the result that several species were determined to be unlikely to establish in a particular ecogeographic region even though they occur in a climatically similar area. The degree of climatic similarity or the extent of occurrence in Alaska of a species did not factor into the invasiveness score.

Four of the authors (T. Nawrocki, H. Klein, M. Carlson, and L. Flagstad,) produced preliminary ranks and species biographies for each of the selected species. Similar congeneric species were ranked together (*Alchemilla mollis* and *Alchemilla monticola*; *Mentha spicata* and *Mentha × piperita*). Overall invasiveness ranks were the sum of scores from 21 questions grouped into four sections: Ecological Impacts (40 points), Biological Characteristics and Dispersal Ability (25 Points), Ecological Amplitude and Distribution (25 points), and Feasibility of Control (10 points). Each question was given a score as appropriate for the level of documentation found based on the guidelines provided in the question (see Appendix 3 for a blank invasiveness ranking sheet and Carlson et al. 2008 for descriptions of evaluation criteria).

Documentation for questions came primarily from sources in Alaska, Canada, the continental U.S., Russia, and Europe. Common sources for information included the Biology of Canadian Weeds (a series of articles produced for the Canadian Journal of Plant Science), Weeds of California and Other Western States (DiTomaso and Healy 2007), AgroAtlas (Afonin et al. 2008), NatureGate (NatureGate 2011), Flora of North America (Flora of North America Editorial Committee 1993+), Electronic Atlas of the Plants of British Columbia and The Illustrated Flora of British Columbia (Klinkenberg 2010), Fire Effects Information System (USDA Forest Service 2011), and eFloras (eFloras 2008). The current ranges of species in the United States and Canada was derived from the PLANTS Database (USDA 2011) and the Flora of North America. Published literature was reviewed from several online databases. Additionally, documentation for some species included personal observations from botanists, ecologists, and land managers in Alaska who have had experience with those species. Once the scoring and documentation was completed for a group of species, the rank documents and species biographies were sent to the remaining authors (J. Conn, R. DeVelice, A. Grant, G. Graziano, B. Million, and W. Rapp) for review.

Botanists and vegetation ecologists from the US Forest Service, USDA Agricultural Research Service, National Park Service, Alaska Department of Natural Resources, and UAF Cooperative Extension Service met as a committee to provide revisions to the ranks prior to their finalization. Ranks were adjusted to fit the behavior of the species in Alaska based on the knowledge and experience of the reviewers and any additional literature sources. The scores of the newly ranked species were compared to the scores of previously ranked species to ensure consistency in scoring and to identify potential outliers. Rank

documents and species biographies were considered finalized after incorporating the input from the committee meeting.

The reranking process followed the same procedure as the ranking process outlined above. Information for all documentation was updated and the scores of some sections were altered based on previously unavailable information.

## Results

Invasiveness ranks of all species reviewed in 2011 are given in Appendix 3. None of the species selected for ranking were rejected from consideration as a result of the climate screening process. *Phragmites australis* and *Acroptilon repens* were the only species ranked that have not been found in any locations in Alaska as of April 2011. All species ranked in 2011 were found in or are likely to occur in the Pacific Maritime ecogeographic region, and 92% of species ranked in 2011 are known from, or are likely to occur, in all three ecogeographic regions of Alaska. *Persicaria wallichii* was the only species that was not known to occur in any locations with 40% or greater climatic similarities with the Interior-Boreal or Arctic-Alpine ecogeographic regions. *Hedera helix*, *Holcus lanatus*, and *Ilex aquifolium* were determined to be unlikely to establish in the Interior-Boreal and Arctic-Alpine ecogeographic regions based on additional published information on climate-related requirements.

Species that have recently become problematic in Alaska generally received high ranks. *Elodea canadensis*, *Persicaria wallichii*, and *Prunus virginiana* received ranks of 79, 80, and 74, respectively. *Phragmites australis*, which has not been documented from Alaska as of April 2011, received the highest rank (83) and *Lapsana communis*, which is largely associated with fill importation along roadsides in Alaska, received the lowest rank (33) of the 50 species ranked in 2011. The invasiveness ranks of each of the five reranked species increased. *Crepis tectorum* showed the smallest increase, moving from 54 to 56, while *Lupinus polyphyllus* showed the largest increase, moving from 55 to 71.

The invasiveness ranks of the 164 non-native species ranked as of April 2011, are summarized in Appendix 1 and 2. The overall range of scores for all species ranked as of April 2011, has not changed: the lowest score is 25 for *Lepidium densiflorum*, which is largely confined to anthropogenically disturbed sites, and the highest score is 90 for *Myriophyllum spicatum*, an aquatic invasive not known from Alaska. Previously, the mean invasiveness score was 58.3 (n = 114) and the distribution of rank values was moderately bimodal with a peak near the mean and a second peak between 85 and 90 (Figure 2).

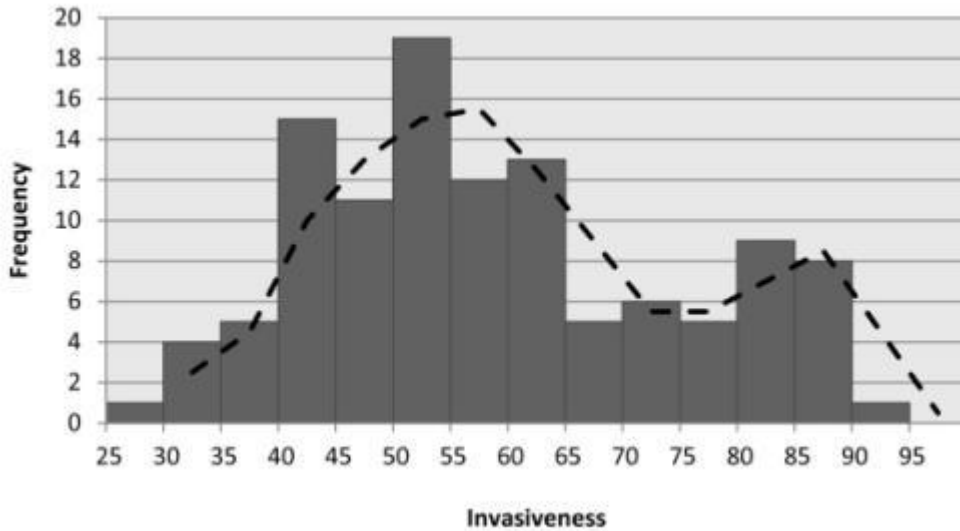


Figure 2: Frequency of Distribution of Invasiveness Ranks of 114 Non-Native Plants Ranked as of 2008. The dashed line represents a two-period moving average showing the bimodal peaks in the distribution of invasiveness scores from 2008 (Carlson et al. 2008).

With the inclusion of the newly ranked species ( $n = 164$ ), the distribution of rank values approaches normality, as the 2011 ranking effort added 12 species to the 65 to 80 range (Figure 3). However, the distribution is still slightly skewed towards higher rank values. The peak between 85 and 90 disappears when only those species that have been found in Alaska as of April 2011, are factored into the distribution. The new mean invasiveness rank is 56.8, standard deviation is 15.1 and the new median invasiveness rank is 54.

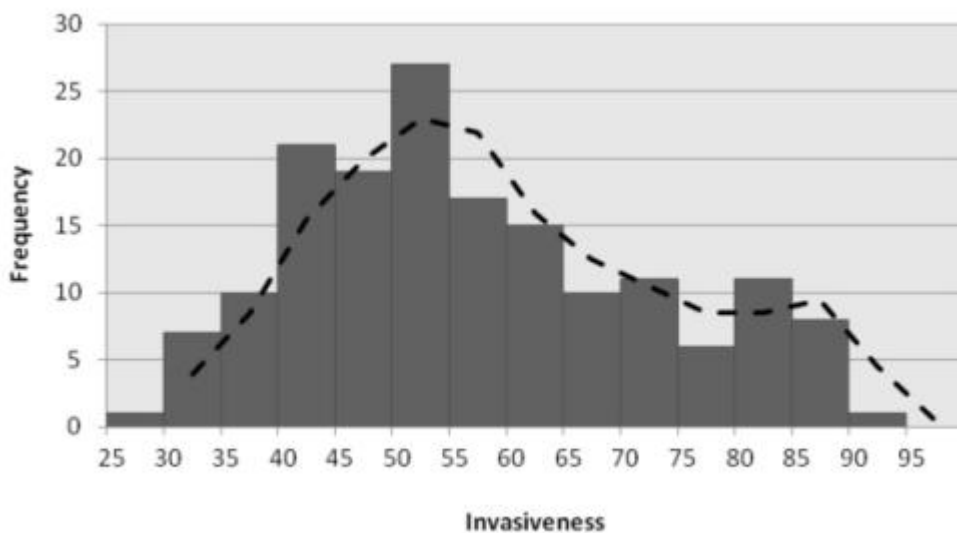


Figure 3: Frequency of Distribution of Invasiveness Ranks of 164 Non-Native Plants Ranked as of 2011. The dashed line represents a two-period moving average showing that the frequency of distribution for all species ranked as of 2011 is approaching normality.

## Discussion

The invasiveness ranks have been divided into six segments groups (see Appendix 1). Species with scores greater than or equal to 80 are considered “Extremely Invasive” and species with scores between 70 and 79 are considered “Highly Invasive;” both of these categories represent plants that pose serious threats to natural ecosystems in Alaska. Species with scores between 60 and 69 are considered “Moderately Invasive” and species with scores between 50 and 59 are considered “Modestly Invasive;” these groups pose threats to natural ecosystems in Alaska but are not as likely to successfully invade or cause major ecosystem impacts. Species with scores between 40 and 49 are considered “Weakly Invasive” and species with scores less than 40 are considered “Very Weakly Invasive;” these species are unlikely to invade and alter natural ecosystems significantly (Carlson et al. 2008). The species varied widely in their perceived invasiveness. Species not known from the state, however, often ranked moderately to highly invasive. The higher ranks of species not found in the state likely reflects a selection bias, as species that are problematic in other states or provinces were of high interest to land managers and were differentially selected.

When invasive species become established in an ecosystem, a strategic approach for control is required to minimize their effects or limit their spread. Effective control relies on a clear understanding of the target species, including its biology, the ecosystem it has infested, pathways associated with its introduction, and effective control techniques. The information provided in the rank documents and species biographies contribute to an overall understanding of the target species. Rank documents and species biographies for all 164 ranked plant species are provided on the Alaska Weed Ranking Project website (<http://aknhp.uaa.alaska.edu/botany/akepic>). Although not part of this project, current distribution information for non-native species in Alaska can be obtained from the AKEPIC portal (<http://aknhp.uaa.alaska.edu/maps/akepic.php>). The invasiveness ranks provide a tool to aid land managers in deciding which infestations warrant the expenditure of limited resources to control.

Invasiveness ranks should not be construed as final. Species may be reranked in the future as our understanding of their impacts on natural habitats and their general biology in Alaska changes or as additional information becomes available. No ranking system can perfectly reflect a species’ behavior in all locations and contexts. Since Alaska is large and ecologically varied, species may be more invasive in some locations than in others. For example, *Lythrum salicaria* has an annual growth habit in and the interior, but has a perennial growth habit in southern Alaska. Species have been ranked for their potential invasiveness to known or perceived suitable natural habitats within each ecoregion. A lack of available information has added uncertainty to the ranks of some species. Invasiveness ranks that are calculated from lower total possible scores have higher levels of uncertainty (i.e. questions answered as unknown increase the uncertainty of the overall invasiveness rank). The invasiveness ranks are partially based on information on the invasiveness of the species outside of Alaska. However, some species, such as *Melilotus alba* and *Caragana arborescens*, behave more aggressively in Alaska than in other states. We suggest that future ranking efforts target the species most often encountered in the state.

We stress that prioritization of non-native species for control efforts should be based on additional information than the invasiveness ranks alone. The invasiveness ranks do not take into account the objectives of land managers, population numbers and trajectories, or rate of spread. Control of invasive

species that are still uncommon in Alaska should take precedence over invasive species that are widespread on state and local scales. Similarly, outlying populations that are small and disjunct should be prioritized over populations that are continuous and large. For management purposes, invasiveness ranks should be viewed in conjunction with site specific information such as population size, location, habitat, and management goals and resources. The “Treatment Prioritization Tool” (AKEPIC 2005) has been developed to prioritize infestations based on infestation specific characteristics, of which the invasiveness rank of the species is just one factor. Weed management plans developed for specific regions of the state also take site specific factors and invasiveness rank into consideration and provide further guidance for treatment prioritization (Slemmons 2007, BLM Central Yukon Field Office 2009, Gary 2010, Heidemann et al. 2010, Cortés-Burns et al. 2011, Flagstad et al. 2011).

## References

- Afonin, A., S. Greene, N. Dzyubenko, and A. Frolov (eds.). 2008. AgroAtlas. Interactive Agricultural Ecological Atlas of Russia and Neighboring Countries. Economic Plants and their Diseases, Pests and Weeds [Online]. <http://www.agroatlas.ru>
- AKEPIC database. Alaska Exotic Plant Information Clearinghouse Database. 2011. Available: <http://akweeds.uaa.alaska.edu/>
- AKEPIC. 2005. Invasive Plants of Alaska. Alaska Exotic Plant Information Clearinghouse Database, Alaska Association of Conservation Districts Publication. Anchorage, AK. 294 p.
- BLM Central Yukon Field Office. 2009. Draft Dalton Management Area Integrated Invasive Plant Strategic Plan. Central Yukon Field Office, Bureau of Land Management, U.S. Department of the Interior. Fairbanks, AK. 24 p.
- Carlson, M., and M. Shephard. 2007. Is the spread of non-native plants in Alaska accelerating? In: Harrington, T., and S. Reichard (eds.). Meeting the challenge: invasive plants in Pacific Northwest ecosystems. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, OR. General Technical Report PNW-GTR-694. 111-127 p.
- Carlson, M., I. Lapina, and H. Cortés-Burns. 2006. Campbell Tract Weed Inventory: Invasive Non-Native Plant Survey. Report for Alaska State Office, Bureau of Land Management, U.S. Department of the Interior. 34 p.
- Carlson, M., I. Lapina, M. Shephard, J. Conn, R. Densmore, P. Spencer, J. Heys, J. Riley, and J. Nielsen. 2008. Invasiveness Ranking System for Non-Native Plants of Alaska. Alaska Region, Forest Service, U.S. Department of Agriculture. R10-TP-143. 218 p.
- Christen, D., and G. Matlack. 2006. The Role of Roadsides in Plant Invasions: A Demographic Approach. Conservation Biology. 20(2). 385-391 p.
- CLIMEX. 1999. CLIMEX for Windows, Predicting the effects of climate on plants and animals. Version 1.1a. CISRO Publishing. Collingwood, Australia.
- Conn, J., Ph. D., Research Agronomist, Agricultural Research Service, U.S. Department of Agriculture, 319 O'Neil Building, 905 Koyukuk St. – UAF Campus, Fairbanks, Alaska 99775. Tel: (907) 474-7652 – Pers. obs.
- Conn, J. Unpublished Data. Quantifying and Identifying Weed Seed Contaminants in Crop Seed, Grass Seed, Wildflower Mixes, and Bird Seed. Agricultural Research Service, U.S. Department of Agriculture. Fairbanks, AK. Presentation at the Committee for Noxious and Invasive Plants Management in Alaska annual meeting 2010. Fairbanks, AK.
- Conn, J., C. Stockdale, and J. Morgan. 2008a. Characterizing Pathways of Invasive Plant Spread to Alaska: I. Propagules from Container-Grown Ornamentals. Invasive Plant Science and Management. 1(4). 331-336 p.
- Conn, J., C. Stockdale, N. Werdin-Pfisterer, and J. Morgan. 2010. Characterizing Pathways of Invasive Plant Spread to Alaska: II. Propagules from Imported Hay and Straw. Invasive Plant Science and Management. 3(3). 276-285 p.
- Conn, J., K. Beattie, M. Shephard, M. Carlson, I. Lapina, M. Herbert, R. Gronquist, R. Densmore, and M. Rasy. 2008b. Alaska *Melilotus* Invasions: Distribution, Origin, and Susceptibility of Plant Communities. Arctic, Antarctic, and Alpine Research. 40(2). 298-308 p.
- Conn, J., and S. Seefeldt. 2009. Invasive White Sweetclover (*Melilotus officinalis*) Control with Herbicides, Cutting, and Flaming. Invasive Plant Science and Management. 2(3). 270-277 p.
- Cortés-Burns, H., I. Lapina, S. Klein, M. Carlson, and L. Flagstad. 2008. Invasive Plant Species Monitoring and Control - Areas impacted by 2004 and 2005 Fires in Interior Alaska: A survey of Alaska BLM lands along the Dalton, Steese, and Taylor Highways (revisit work). Report funded by the Alaska State Office, Bureau of Land Management, U.S. Department of the Interior. Anchorage, AK. 162 p.
- Cortés-Burns, H., T. Nawrocki, E. Johnson, and D. Collet. 2011. Unalakleet Wild River Invasive Plant Management Plan. Report for Anchorage Field Office, Bureau of Land Management, U.S. Department of the Interior. Anchorage, AK. 30 p.
- Cronk, Q., and J. Fuller. 1995. Plant invaders: the threat to natural systems. Chapman and Hall. London, UK. 243 p.
- Davis, M., J. Grime, and K. Thompson. 2000. Fluctuating resources in plant communities: a general theory of invasibility. Journal of Ecology. 88(3). 528-534 p.
- Densmore, R., P. McKee, and C. Roland. 2001. Exotic Plants in Alaskan National Park Units. Alaska Biological Science Center, U.S. Geological Survey and Denali National Park and Preserve, National Park Service, U.S. Department of the Interior. Anchorage, AK. 150 p.
- DeVelice, R. 2003. Non-Native Plant Inventory: Kenai Trails. R10-TP-124. Chugach National Forest, Forest Service, U.S. Department of Agriculture. Anchorage, AK. 21 p.
- DiTomaso, J., and E. Healy. 2007. Weeds of California and Other Western States. Vol. 1. University of California Agriculture and Natural Resources Communication Services, Oakland, CA. 834 p.



- Duffy, M. 2003. Non-Native Plants of the Chugach National Forest: A Preliminary Inventory. R10-TP-111. Chugach National Forest, Forest Service, U.S. Department of Agriculture. Anchorage, AK. 92 p.
- eFloras. 2008. Published on the Internet <http://www.efloras.org> [accessed 1 April 2011]. Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, Cambridge, MA.
- Flagstad, L. 2010. 2009 Campbell Tract Non-Native Plant Survey: Revisiting Permanent Monitoring Transects Established in 2006. Report for Anchorage Field Office, Bureau of Land Management, U.S. Department of the Interior. 45 p.
- Flagstad, L., and H. Cortés-Burns. 2010. Tracking weeds along the Iditarod National Historic Trail, Final Report. Report for Anchorage Field Office, Bureau of Land Management, U.S. Department of the Interior. Anchorage, AK. 51 p.
- Flagstad, L., H. Cortés-Burns, C. Norlen, H. Klein, and L. Simpson. 2011. Draft BLM Campbell Tract Invasive Plant Management Plan. Report for Anchorage Field Office, Bureau of Land Management, U.S. Department of the Interior. Anchorage, AK. 36 p.
- Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 16+ vols. New York and Oxford.
- Gary, G. 2010. Municipality of Anchorage Invasive Plant Management Plan. Report for Municipality of Anchorage and Anchorage Cooperative Weed Management Area. Anchorage, AK. 62 p.
- Gaston, K., A. Jones, C. Hannah, and S. Chown. 2003. Rates of species introduction to a remote oceanic island. *Proceedings of The Royal Society B*. 270: 1091–1098.
- GBIF. 2011. Global Biodiversity Information Facility. <http://www.gbif.org/>
- Heidemann, M., G. Aguiar, C. Ashlock, A. Christie, J. Day, G. Finstad, G. Garcia, J. Guritz, M. Herbert, J. Jack, D. Masiak, N. Nordstrand, S. Seefeldt, and A. Tonne. 2010. UAF Campus Invasive Plant Management Plan. Recommendations from the Invasive Plant Task Force. School of Natural Resources and Agricultural Sciences, University of Alaska Fairbanks. Fairbanks, AK. 33 p.
- Heffernan, K., P. Coulling, J. Townsend, and C. Hutto. 2001. Ranking Invasive Exotic Species in Virginia. Natural Heritage Technical Report 01-13. Division of Natural Heritage, Virginia Department of Conservation and Recreation. Richmond, VA. 27 p.
- Hébert, M. 2001. Strategic plan for noxious and invasive plants management in Alaska. Cooperative Extension Service, University of Alaska Fairbanks. Fairbanks, AK. 35 p.
- Hickman, J. (ed.). 1993. *The Jepson Manual: Higher Plants of California*. University of California Press. Berkeley, CA. 1400 p.
- Hobbs, R., and L. Huenneke. 1992. Disturbance, Diversity, and Invasion: Implications for Conservation. *Conservation Biology*. 6(3). 324-337 p.
- Hughes, F., P. Vitousek, and T. Tunison. 1991. Alien Grass Invasion and Fire in the Submontane Zone of Hawaii. *Ecology*. 72(2). 743-747 p.
- Hultén, E. 1968. *Flora of Alaska and Neighboring Territories*. Stanford University Press, Stanford, CA. 1008 pp.
- Jordan, M., G. Moore, and T. Weldy. 2010. New York State Ranking System for Evaluating Non-Native Plant Species for Invasiveness. The Nature Conservancy and Brooklyn Botanic Garden. [5 April 2011] [http://nyis.info/Resources/PDF/New\\_York\\_State\\_Invasive\\_Plant\\_Ranking\\_System.pdf](http://nyis.info/Resources/PDF/New_York_State_Invasive_Plant_Ranking_System.pdf)
- Klinkenberg, B. (Editor) 2010. E-Flora BC: Electronic Atlas of the Plants of British Columbia. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia. Vancouver, BC. [1 April 2011] Available: <http://www.geog.ubc.ca/biodiversity/eflora/index.shtml>
- Lake, J., and M. Leishman. 2004. Invasion success of exotic plants in natural ecosystems: the role of disturbance, plant attributes, and freedom from herbivores. *Biological Conservation*. 117(2). 215-226 p.
- Lapina, I., S. Klein, and M. Carlson. 2007. Non-native Plant Species of the Fairbanks Region: 2005 - 2006 Surveys. Alaska Natural Heritage Program, University of Alaska, Anchorage. Report funded by and prepared for State and Private Forestry, Forest Service, U.S. Department of Agriculture. 50 p.
- Levine, J., and C. D'Antonio. 2003. Forecasting Biological Invasions with Increasing International Trade. *Conservation Biology*. 17(1). 322-326 p.
- Liu, J., S. Liang, F. Liu, R. Wang, and M. Dong. 2005. Invasive alien plant species in China: regional distribution patterns. *Diversity and Distributions*. 11(4). 341-347 p.
- Lodge, D. 1993. Biological Invasions: Lessons for Ecology. *Trends in Ecology and Evolution*. 8(4). 133-137 p.
- Mason, R., J. Cooke, A. Moles, and M. Leishman. 2008. Reproductive output of invasive versus native plants. *Global Ecology and Biogeography*. 17(5). 633-640 p.

- Mito, T. and T. Uesugi. 2004. Invasive Alien Species in Japan: The Status Quo and the New Regulation for Prevention of their Adverse Effects. *Global Environmental Research*. 8(2). 171-191 p.
- Myers, N. 1997. Global biodiversity II: Losses and threats. In: Meffe, G., and C. Carroll (eds.). *Principles of Conservation Biology* 2<sup>nd</sup> Edition. Sinauer Associates. Sunderland, MA. 729 p.
- NatureGate. 2011. Finland Nature and Species. Helsinki, Finland. <http://www.luontoportti.com/suomi/en/>
- Nowacki, G., P. Spencer, M. Fleming, T. Brock, and T. Jorgenson. 2001. Unified ecoregions of Alaska. U.S. Geological Survey, U.S. Department of the Interior. Open file-report 02-297. 2 page map.
- Pheloung, P., P. Williams, and S. Halloy. 1999. A weed risk assessment model for use as a biosecurity tool evaluating plant introductions. *Journal of Environmental Management*. 57(4). 239-251 p.
- Pimm, S., and M. Gilpin. 1989. Theoretical issues in conservation biology. In: Roughgarden, J., R. May, and S. Levin (eds.). *Perspectives in Ecological Theory*. Princeton University Press. Princeton, NJ. 394 p.
- Pimentel, D., R. Zuniga, and D. Morrison. 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecological Economics*. 52(3). 273-288 p.
- Quarberg, D., T. Jahns, and J. Chumley. 2009. Alaska Cereal Grains Crop Profile. FGV-00041. University of Alaska Fairbanks, Cooperative Extension Service. Fairbanks, AK. [25 March 2011] <http://www.ipmcenters.org>
- Randall, J., and M. Hoshovsky. 2000. California's wildland invasive plants. In: Bossard, C., J. Randall, and M. Hoshovsky (eds.). 2000. *Invasive Plants of California's Wildlands*. University of California Press. Berkeley, CA. 11-27 p.
- Rapp, W. 2009. Invasive Plant Management in Glacier Bay National Park and Preserve: Summer 2008 Field Season Report. Glacier Bay National Park and Preserve, National Park Service, U.S. Department of the Interior. Gustavus, AK. 154 p.
- Rejmánek, M., and M. Pitcairn. 2002. When is eradication of exotic pest plants a realistic goal? In: Veitch, C., and M. Clout (eds.). 2002. *Turning the Tide: The Eradication of Invasive Species*. Species Survival Commission, International Union for Conservation of Nature. 414 p.
- Richardson, D., and P. Pyšek. 2006. Plant invasions: merging the concepts of species invasiveness and community invasibility. *Progress in Physical Geography*. 30(3).409-431 p.
- Riley, J., Horticulture Agent, Cooperative Extension Service, University of Alaska Fairbanks, 1675 C Street, Anchorage, Alaska 99501. Tel: (907) 786-6306. – Pers. comm.
- Sinden, J., R. Jones, S. Hester, D. Odom, C. Kalisch, R. James, and O. Cacho. 2004. The economic impact of weeds in Australia. Cooperative Research Centre for Australian Weed Management. Armidale, Australia. 55 p.
- Slemmons, C. 2007. Integrated Weed Management Strategy Focusing on Early Detection / Rapid Response for the Kenai Peninsula – Cooperative Weed Management Area. Homer Soil Water and Conservation District. Homer, AK. 19 p.
- Stein, B., L. Kutner, and J. Adams. 2000. *Precious heritage: the status of biodiversity in the United States*. Oxford University Press, Oxford. 416 p.
- Symstad, A. 2004. Secondary Invasion Following the Reduction of *Coronilla varia* (Crownvetch) in Sand Prairie. *American Midland Naturalist*. 152(1). 183-189 p.
- Turpie, J. 2004. The role of resource economics in the control of invasive alien plants in South Africa. *South African Journal of Science*. 100(1). 87-93 p.
- U.S. Congress, Office of Technology Assessment. 1993. Harmful non-indigenous species in the United States. OTA-F-565. U.S. Government Printing Office. Washington, D.C. 391 p.
- USDA. 2011. The PLANTS Database. National Plant Data Center, Natural Resources Conservation Service, United States Department of Agriculture. Baton Rouge, LA. <http://plants.usda.gov>
- USDA Forest Service. 2011. Fire Effects Information System. Fire Sciences Laboratory, Rocky Mountain Research Station, Forest Service, U.S. Department of Agriculture. [1 April 2011] <http://www.fs.fed.us/database/feis/>
- Villano, K., and C. Mulder. 2008. Invasive plant spread in burned lands of interior Alaska. Final report for Alaska Region, National Park Service, U.S. Department of the Interior and National Aeronautics and Space Administration. Fairbanks, AK. 25 p.
- Wainger, L., and D. King. Priorities for weed risk assessment: Using a landscape context to assess indicators of functions, services, and values. In: Groves, R., F. Panetta, and J. Virtue (eds.). *Weed Risk Assessment*. CSIRO Publishing. Collingwood, Australia. 34-51 p.
- Walker, L., and S. Smith. 1997. Impacts of invasive plants on community and ecosystem properties. In: Luken, J., and J. Thieret (eds.). *Assessment and Management of Plant Invasions*. Springer-Verlag. New York, NY. 329 p.
- Warner, P., C. Bossard, M. Brooks, J. DiTomaso, J. Hall, A. Hawald, D. Johnson, J. Randall, C. Roye, M. Ryan, and A. Stanton. 2003. Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands. California Exotic Pest Plant Council and Southwest Vegetation Management Association. <http://www.cal-ipc.org/> and <http://www.swvma.org/>. 24 p.

- Westbrooks, R. 1998. Invasive Plants: Changing the Landscape of America. Federal Interagency Committee for the Management of Noxious and Exotic Weeds. Washington, D.C. 109 p.
- Wilcove, D., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 1998. Quantifying Threats to Imperiled Species in the United States. *BioScience*. 48(8). 607-615 p.
- Williamson, M., and A. Fitter. 1996a. The Varying Success of Invaders. *Ecology*. 77(6). 1661-1666 p.
- Williamson, M., and A. Fitter. 1996b. The Characters of Successful Invaders. *Biological Science*. 78(1). 163-170 p.
- Williamson, M., K. Brown, M. Holdgate, H. Kornberg, R. Southwood, and D. Mollison. 1986. The Analysis and Modelling of British Invasions. *Philosophical Transactions of the Royal Society of London, Series B, Biological Sciences*. 314(1167). 505-522 p.
- Wright, S. 2008. A Revegetation Manual for Alaska. Alaska Plant Materials Center, Division of Agriculture, Alaska Department of Natural Resources. Palmer, AK. 70 p.

## Appendix 1: Summary Scores of Invasiveness Ranks of 164 Non-Native Plants Ordered by Invasiveness

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Myriophyllum spicatum</i> <sup>†</sup>	Eurasian watermilfoil	38	20 (22)	20	9	87 (97)	90	Yes	Yes	Yes	2008
<i>Fallopia × bohemica</i> <sup>10</sup>	Bohemian knotweed	33	21	23	7 (7)	84 (97)	87	Yes	Yes	—	2008
<i>Fallopia japonica</i> <sup>10</sup>	Japanese knotweed	33	21	23	7 (7)	84 (97)	87	Yes	Yes	—	2008
<i>Fallopia sachalinensis</i> <sup>10</sup>	giant knotweed	33	21	23	7 (7)	84 (97)	87	Yes	Yes	—	2008
<i>Centaurea stoebe</i>	spotted knapweed	34	22	21	9	86	86	Yes	Yes	—	2008
<i>Spartina alterniflora</i> <sup>11†</sup>	smooth cordgrass	40	17	23	6	86	86	Yes	—	—	2008
<i>Spartina anglica</i> <sup>11†</sup>	common cordgrass	40	17	23	6	86	86	Yes	—	—	2008
<i>Spartina densiflora</i> <sup>11†</sup>	denseflower cordgrass	40	17	23	6	86	86	Yes	—	—	2008
<i>Spartina patens</i> <sup>11†</sup>	saltmeadow cordgrass	40	17	23	6	86	86	Yes	—	—	2008
<i>Euphorbia esula</i> <sup>†</sup>	leafy spurge	31	21	23	9	84	84	Yes	Yes	—	2008
<i>Lythrum salicaria</i> <sup>12</sup>	purple loosestrife	34	20	21	8	84	84	—	Yes	—	2008
<i>Lythrum virgatum</i> <sup>12</sup>	European wand loosestrife	34	20	21	8	84	84	—	Yes	—	2008
<i>Phalaris arundinacea</i>	reed canarygrass	33	20	24	6	83	83	Yes	Yes	Yes	2011
<i>Phragmites australis</i>	common reed	36	16	23	8	83	83	Yes	Yes	Yes	2011
<i>Impatiens glandulifera</i>	ornamental jewelweed	29	22	22	7	80 (98)	82	Yes	Yes	—	2008
<i>Heracleum mantegazzianum</i> <sup>†</sup>	giant hogweed	33	22	17	9	81	81	Yes	Yes	Yes	2008
<i>Melilotus alba</i>	white sweetclover	29	22	21	9	81	81	Yes	Yes	Yes	2008
<i>Hydrilla verticillata</i> <sup>†</sup>	hydrilla	38	17 (22)	14	9	78 (97)	80	Yes	Yes	Yes	2008
<i>Nymphaea odorata</i> ssp. <i>odorata</i>	American white waterlily	36	18	18	6 (7)	78 (97)	80	Yes	—	—	2008
<i>Persicaria wallichii</i>	Himalayan knotweed	31	18 (22)	19	7 (7)	75 (94)	80	Yes	—	—	2011
<i>Elodea canadensis</i>	Canadian waterweed	27	19 (20)	23	6	75 (95)	79	Yes	Yes	Yes	2011

<sup>10</sup> *Fallopia ×bohemica*, *F. japonica* and *F. sachalinensis* ranked together.

<sup>11</sup> *Spartina* species ranked together.

<sup>12</sup> *Lythrum* species ranked together.

<sup>†</sup>Species not known to occur in Alaska as of April, 2011.

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Hieracium aurantiacum</i> <sup>13</sup>	orange hawkweed	29	23	19	8	79	79	Yes	Yes	Yes	2008
<i>Hieracium caespitosum</i> <sup>13</sup>	meadow hawkweed	29	23	19	8	79	79	Yes	Yes	Yes	2008
<i>Bromus tectorum</i>	cheatgrass	34	15	23	6	78	78	Yes	Yes	Yes	2008
<i>Rubus discolor</i>	Himalayan blackberry	38	18	12	9	77	77	Yes	—	—	2008
<i>Cirsium arvense</i>	Canada thistle	26	19	21	10	76	76	Yes	Yes	Yes	2008
<i>Caragana arborescens</i>	Siberian peashrub	29	15	23	5 (7)	72 (97)	74	Yes	Yes	Yes	2011
<i>Prunus padus</i>	European bird cherry	31	21	17	5	74	74	Yes	Yes	—	2008
<i>Prunus virginiana</i>	chokecherry	19 (30)	21 (23)	18	5 (7)	63 (85)	74	Yes	Yes	Yes	2011
<i>Hedera helix</i>	English ivy	27	16 (23)	23	6	72 (98)	73	Yes	—	—	2011
<i>Sonchus arvensis</i>	perennial sowthistle	22	21	21	9	73	73	Yes	Yes	—	2008
<i>Vicia cracca</i>	bird vetch	27	16	21	9	73	73	Yes	Yes	Yes	2008
<i>Rosa rugosa</i>	rugosa rose	28	16	20	6 (7)	70 (97)	72	Yes	Yes	Yes	2011
<i>Lepidium latifolium</i>	broadleaved pepperweed	28	17 (22)	16	6 (7)	67 (94)	71	—	Yes	Yes	2008
<i>Lupinus polyphyllus</i> <sup>14</sup>	bigleaf lupine	24	18 (23)	20	8	70 (98)	71	Yes	Yes	Yes	2011
<i>Alliaria petiolata</i>	garlic mustard	24 (30)	16	16	7	63 (90)	70	Yes	—	—	2008
<i>Brachypodium sylvaticum</i> <sup>†</sup>	false slender brome	31	19 (23)	14	5	69 (98)	70	Yes	Yes	Yes	2008
<i>Cytisus scoparius</i>	Scotch broom	26	17	18	8	69	69	Yes	—	—	2008
<i>Linaria vulgaris</i>	yellow toadflax	22	17	21	9	69	69	Yes	Yes	Yes	2008
<i>Melilotus officinalis</i>	yellow sweetclover	24	18	19	8	69	69	Yes	Yes	Yes	2008
<i>Coronilla varia</i>	crownvetch	26	17	17	6 (7)	66 (97)	68	Yes	Yes	Yes	2011
<i>Geranium robertianum</i>	herb Robert	22	18 (23)	21	5	66 (98)	67	Yes	Yes	Yes	2011
<i>Ilex aquifolium</i>	English holly	24	16	18	9	67	67	Yes	—	—	2011
<i>Acroptilon repens</i> <sup>†</sup>	Russian knapweed	24	16	20	6	66	66	Yes	Yes	Yes	2011
<i>Iris pseudacorus</i>	yellowflag iris	24	15	21	6	66	66	Yes	Yes	Yes	2011
<i>Lonicera tatarica</i>	Tatarian honeysuckle	22	19 (23)	18	6	65 (98)	66	Yes	Yes	—	2008
<i>Lotus corniculatus</i>	birdsfoot trefoil	22	16	18	9	65	65	Yes	Yes	Yes	2011
<i>Campanula rapunculoides</i>	rampion bellflower	18	16 (20)	20	5 (7)	59 (92)	64	Yes	Yes	Yes	2008

<sup>13</sup> *Hieracium aurantiacum* and *H. caespitosum* ranked together.

<sup>14</sup> The non-nativity of *Lupinus polyphyllus* is debated.

<sup>†</sup>Species not known to occur in Alaska as of April, 2011.

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Medicago sativa ssp. falcata</i>	yellow alfalfa	15 (30)	17	15 (19)	7	54 (84)	64	Yes	Yes	Yes	2008
<i>Hieracium pilosella</i>	mouse-ear hawkweed	22	15	18	8	63	63	Yes	Yes	Yes	2011
<i>Hordeum jubatum</i> <sup>15</sup>	foxtail barley	18	16	20	9	63	63	Yes	Yes	Yes	2008
<i>Schedonorus arundinaceus</i>	tall fescue	22	17	18	4 (7)	61 (97)	63	Yes	Yes	Yes	2011
<i>Senecio jacobaea</i>	tansy ragwort	20	15	20	8	63	63	Yes	Yes	Yes	2008
<i>Bromus inermis ssp. inermis</i>	smooth brome	20	16	18	8	62	62	Yes	Yes	Yes	2008
<i>Alnus glutinosa</i> †	European alder	24	16	14	5	59 (97)	61	Yes	Yes	Yes	2008
<i>Carduus acanthoides</i> <sup>16</sup> †	plumeless thistle	22	17	14	8	61	61	Yes	Yes	Yes	2008
<i>Carduus nutans</i> <sup>14</sup> †	musk thistle	22	17	14	8	61	61	Yes	Yes	Yes	2008
<i>Carduus pycnocephalus</i> <sup>14</sup> †	Italian thistle	22	17	14	8	61	61	Yes	Yes	Yes	2008
<i>Carduus tenuiflorus</i> <sup>14</sup> †	slender-flowered thistle	22	17	14	8	61	61	Yes	Yes	Yes	2008
<i>Cirsium vulgare</i>	bull thistle	20	19 (23)	18	3	60 (98)	61	Yes	Yes	Yes	2008
<i>Leucanthemum vulgare</i>	oxeye daisy	20	15	18	8	61	61	Yes	Yes	Yes	2008
<i>Hordeum murinum ssp. leporinum</i>	leporinum barley	18	17	17	8	60	60	—	Yes	—	2008
<i>Elymus repens</i>	quackgrass	20	15	19	5	59	59	Yes	Yes	Yes	2008
<i>Medicago sativa ssp. sativa</i>	alfalfa	13 (30)	17	16	7	53 (90)	59	Yes	Yes	Yes	2008
<i>Sorbus aucuparia</i>	European mountain ash	22	14	16	7	59	59	Yes	—	—	2008
<i>Trifolium repens</i>	white clover	22	15	14	8	59	59	Yes	Yes	Yes	2008
<i>Linaria dalmatica</i>	Dalmatian toadflax	16	14	19	9	58	58	—	Yes	—	2008
<i>Taraxacum officinale ssp. officinale</i>	common dandelion	18	14	18	8	58	58	Yes	Yes	Yes	2008
<i>Aegopodium podagraria</i>	bishop's goutweed	20	9	21	5 (7)	55 (97)	57	Yes	Yes	Yes	2011
<i>Gypsophila paniculata</i>	baby's-breath	20	14	18	3 (7)	55 (97)	57	Yes	Yes	Yes	2008
<i>Hieracium lachenalii</i>	common hawkweed	13 (30)	12 (23)	18	7	50 (88)	57	Yes	Yes	Yes	2011
<i>Potentilla recta</i> †	sulfur cinquefoil	20	13	17	7	57	57	Yes	Yes	—	2008
<i>Tanacetum vulgare</i>	common tansy	20	15 (23)	19	5	59 (98)	60	Yes	Yes	Yes	2011

<sup>15</sup> The non-nativity of *Hordeum jubatum* is debated; however this species is often considered a nuisance weed.

<sup>16</sup> *Carduus* species ranked together.

†Species not known to occur in Alaska as of April, 2011.

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Trifolium hybridum</i>	alsike clover	22	12	18	5	57	57	Yes	Yes	Yes	2008
<i>Alchemilla mollis</i> <sup>17</sup>	lady's mantle	12 (20)	13	14	2 (3)	41 (73)	56	Yes	Yes	Yes	2011
<i>Alchemilla monticola</i> <sup>15</sup>	hairy lady's mantle	12 (20)	13	14	2 (3)	41 (73)	56	Yes	Yes	Yes	2011
<i>Convolvulus arvensis</i>	field bindweed	18	14	16	8	56	56	Yes	Yes	Yes	2008
<i>Crepis tectorum</i>	narrowleaf hawkbeard	16	16	20	4	56	56	Yes	Yes	Yes	2011
<i>Holcus lanatus</i>	common velvetgrass	18	15 (23)	15	7	55 (98)	56	Yes	—	—	2011
<i>Myosotis scorpioides</i>	European forget-me-not	16	15	18	0 (0)	49 (90)	54	Yes	Yes	Yes	2011
<i>Phleum pratense</i>	timothy	14	14	19	7	54	54	Yes	Yes	Yes	2008
<i>Ranunculus acris</i> <sup>18</sup>	tall buttercup	16	13 (23)	15	9	53 (98)	54	Yes	Yes	Yes	2008
<i>Ranunculus repens</i> <sup>16</sup>	creeping buttercup	16	13 (23)	15	9	53 (98)	54	Yes	Yes	Yes	2008
<i>Stellaria media</i> (seabird colonies)	common chickweed	14	12	20	8	54	54	Yes	Yes	Yes	2008
<i>Dactylis glomerata</i>	orchardgrass	16	10	22	5	53	53	Yes	Yes	Yes	2008
<i>Elymus sibiricus</i>	Siberian wildrye	20	13	12 (19)	1 (3)	46 (87)	53	Yes	Yes	Yes	2011
<i>Trifolium pratense</i>	red clover	16	12 (22)	16	7	51 (97)	53	Yes	Yes	Yes	2008
<i>Vicia villosa</i>	winter vetch	22	11 (22)	12 (19)	3	48 (91)	53	Yes	Yes	—	2008
<i>Zostera japonica</i> †	dwarf eelgrass	30	10	8	1 (3)	49 (93)	53	Yes	Yes	—	2008
<i>Alopecurus pratensis</i>	meadow foxtail	10	16	20	4 (7)	50 (97)	52	Yes	Yes	Yes	2011
<i>Hypericum perforatum</i>	common St. Johnswort	11	15	18	8	52	52	Yes	Yes	Yes	2008
<i>Lolium perenne</i>	perennial ryegrass	16	15	18	3	52	52	Yes	Yes	Yes	2011
<i>Poa pratensis</i> ssp. <i>irrigata</i> <sup>19</sup>	spreading bluegrass	12	14	19	7	52	52	Yes	Yes	Yes	2008
<i>Poa pratensis</i> ssp. <i>pratensis</i> <sup>17</sup>	Kentucky bluegrass	12	14	19	7	52	52	Yes	Yes	Yes	2008
<i>Poa trivialis</i> <sup>17</sup>	rough bluegrass	12	14	19	7	52	52	Yes	Yes	Yes	2008
<i>Verbascum thapsus</i>	common mullein	20	9	16	7	52	52	Yes	Yes	—	2008
<i>Digitalis purpurea</i>	purple foxglove	16	11	19	5	51	51	Yes	Yes	—	2008
<i>Hieracium umbellatum</i>	narrowleaf hawkweed	13 (30)	16 (20)	9	4 (7)	42 (82)	51	Yes	Yes	Yes	2008
<i>Leontodon autumnalis</i>	fall dandelion	16	14	16	3 (7)	49 (97)	51	Yes	Yes	Yes	2011

<sup>17</sup> *Alchemilla* species ranked together.

<sup>18</sup> *Ranunculus* species ranked together.

<sup>19</sup> *Poa pratensis* ssp. *irrigata*, *P. pratensis* ssp. *pratensis*, and *P. trivialis* ranked together.

†Species not known to occur in Alaska as of April, 2011.

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Rumex acetosella</i>	common sheep sorrel	12	16	16	7	51	51	Yes	Yes	Yes	2008
<i>Brassica rapa</i>	birdsrape mustard	14	13	18	5	50	50	Yes	Yes	Yes	2011
<i>Fallopia convolvulus</i>	black bindweed	12	16	17	5	50	50	Yes	Yes	Yes	2008
<i>Galeopsis bifida</i> <sup>20</sup>	splitlip hempnettle	16	11	17	6	50	50	Yes	Yes	Yes	2011
<i>Galeopsis tetrahit</i> <sup>18</sup>	brittlestem hempnettle	16	11	17	6	50	50	Yes	Yes	Yes	2011
<i>Tragopogon dubius</i>	yellow salsify	20	11	16	3	50	50	Yes	Yes	—	2008
<i>Trifolium dubium</i>	suckling clover	14	13	18	5	50	50	Yes	Yes	Yes	2011
<i>Alopecurus geniculatus</i>	water foxtail	12	14	15 (19)	4 (7)	45 (91)	49	Yes	Yes	Yes	2011
<i>Arctium minus</i>	common burdock	16	16	14	3	49	49	Yes	Yes	Yes	2011
<i>Glechoma hederacea</i>	ground ivy	14	12	14	8	48	48	Yes	Yes	Yes	2008
<i>Medicago lupulina</i>	black medick	10	18	15	5	48	48	Yes	Yes	Yes	2008
<i>Rumex crispus</i> <sup>21</sup>	curly dock	10	16	14	8	48	48	Yes	Yes	Yes	2008
<i>Rumex longifolius</i> <sup>19</sup>	dooryard dock	10	16	14	8	48	48	Yes	Yes	Yes	2008
<i>Rumex obtusifolius</i> <sup>19</sup>	bitter dock	10	16	14	8	48	48	Yes	Yes	Yes	2008
<i>Symphytum officinale</i>	common comfrey	16	12	13	7	48	48	Yes	Yes	Yes	2011
<i>Tripleurospermum inodorum</i>	scentless chamomile	13	13 (23)	15	6	47 (98)	48	Yes	Yes	Yes	2008
<i>Brassica napus</i>	rapeseed mustard	13	14	14	6	47	47	Yes	Yes	Yes	2011
<i>Persicaria lapathifolia</i> <sup>22</sup>	curlytop knotweed	6	16	15 (19)	7	44 (94)	47	Yes	Yes	Yes	2008
<i>Persicaria maculosa</i> <sup>20</sup>	spotted ladysthumb	6	16	15 (19)	7	44 (94)	47	Yes	Yes	Yes	2008
<i>Achillea ptarmica</i>	sneezeweed	14	12	15	2 (3)	43 (93)	46	Yes	Yes	Yes	2008
<i>Centaurea montana</i>	perennial cornflower	9 (30)	12 (23)	13	5 (7)	39 (85)	46	Yes	Yes	Yes	2011
<i>Poa annua</i>	annual bluegrass	8	13	18	7	46	46	Yes	Yes	Yes	2008
<i>Sonchus asper</i>	spiny sowthistle	13	14	14	5	46	46	Yes	Yes	Yes	2011
<i>Sonchus oleraceus</i>	annual sowthistle	13	14	14	5	46	46	Yes	Yes	Yes	2011
<i>Amaranthus retroflexus</i>	redroot pigweed	12	14	15	4	45	45	Yes	Yes	Yes	2011
<i>Polygonum aviculare</i>	prostrate knotweed	7	15	16	7	45	45	Yes	Yes	Yes	2008

<sup>20</sup> *Galeopsis* species ranked together.

<sup>21</sup> *Rumex crispus*, *R. longifolius*, and *R. obtusifolius* ranked together.

<sup>22</sup> *Persicaria lapathifolia* and *P. maculosa* ranked together.



Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Hypochaeris radicata</i>	hairy catsear	14	14	13	3	44	44	Yes	Yes	Yes	2011
<i>Lappula squarrosa</i>	European stickseed	10	12	17	5	44	44	Yes	Yes	Yes	2008
<i>Plantago major</i>	common plantain	8	13	16	7	44	44	Yes	Yes	Yes	2008
<i>Mentha × piperita</i> <sup>23</sup>	peppermint	8	14 (22)	13	5 (7)	40 (94)	43	Yes	Yes	Yes	2011
<i>Mentha spicata</i> <sup>21</sup>	spearmint	8	14 (22)	13	5 (7)	40 (94)	43	Yes	Yes	Yes	2011
<i>Cotula coronopifolia</i>	common brassbuttons	14	11 (23)	9	7	41 (98)	42	Yes	—	—	2008
<i>Euphrasia nemorosa</i>	common eyebright	16	10	12	3 (7)	41 (97)	42	Yes	Yes	Yes	2011
<i>Silene chalconica</i>	Maltese cross	14	10	14	0 (0)	38 (90)	42	Yes	Yes	Yes	2011
<i>Silene dioica</i> <sup>24</sup>	red catchfly	13	9	13	7	42	42	Yes	Yes	Yes	2008
<i>Silene latifolia</i> <sup>22</sup>	white cockle	13	9	13	7	42	42	Yes	Yes	Yes	2008
<i>Silene noctiflora</i> <sup>22</sup>	nightflowering silene	13	9	13	7	42	42	Yes	Yes	Yes	2008
<i>Silene vulgaris</i> <sup>22</sup>	bladder campion	13	9	13	7	42	42	Yes	Yes	Yes	2008
<i>Stellaria media</i> (non-seabird sites)	common chickweed	10	12	15	5	42	42	Yes	Yes	Yes	2008
<i>Thlaspi arvense</i>	field pennycress	11	12	14	5	42	42	Yes	Yes	Yes	2011
<i>Anthemis cotula</i>	mayweed chamomile	8	12	14	7	41	41	Yes	Yes	—	2008
<i>Descurainia sophia</i>	herb sophia	8	13	18	2	41	41	Yes	Yes	Yes	2008
<i>Hesperis matronalis</i>	dames rocket	10	10 (22)	17	2 (7)	39 (94)	41	Yes	Yes	—	2008
<i>Lolium multiflorum</i>	Italian ryegrass	14	10	15	2	41	41	Yes	Yes	Yes	2008
<i>Senecio sylvaticus</i>	woodland ragwort	15	12	12	2	41	41	Yes	Yes	Yes	2011
<i>Capsella bursa-pastoris</i>	shepherd's purse	7	11	18	4	40	40	Yes	Yes	Yes	2008
<i>Lamium album</i>	white deadnettle	10	9 (22)	13	7	39 (97)	40	Yes	Yes	Yes	2011
<i>Hordeum vulgare</i>	common barley	8	12	14	5	39	39	Yes	Yes	Yes	2011
<i>Papaver croceum</i>	Icelandic poppy	10	10	15	0 (0)	35 (90)	39	Yes	Yes	Yes	2011
<i>Poa compressa</i>	Canada bluegrass	6	10	17	5 (7)	38 (97)	39	Yes	Yes	Yes	2008
<i>Sagina procumbens</i>	birdseye pearlwort	6	12	15	5 (7)	38 (97)	39	Yes	Yes	Yes	2011
<i>Chenopodium album</i>	lambquarters	5	12	15	5	37	37	Yes	Yes	Yes	2008

<sup>23</sup> *Mentha* species ranked together.

<sup>24</sup> *Silene dioica*, *S. latifolia*, *S. noctiflora*, and *S. vulgaris* ranked together.

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Cerastium fontanum</i> ssp. <i>vulgare</i> <sup>25</sup>	big chickweed	6	8	15 (19)	5	34 (94)	36	Yes	Yes	Yes	2008
<i>Cerastium glomeratum</i> <sup>23</sup>	sticky chickweed	6	8	15 (19)	5	34 (94)	36	Yes	Yes	Yes	2008
<i>Senecio vulgaris</i>	common groundsel	4	12	15	5	36	36	Yes	Yes	Yes	2008
<i>Veronica serpyllifolia</i> ssp. <i>serpyllifolia</i>	thymeleaf speedwell	5 (30)	9	10	7 (7)	31 (87)	36	Yes	Yes	Yes	2011
<i>Deschampsia elongata</i>	slender hairgrass	12	13	4 (19)	3 (7)	32 (91)	35	Yes	Yes	Yes	2011
<i>Saponaria officinalis</i>	bouncingbet	5 (30)	8 (22)	12	2 (3)	27 (80)	34	Yes	Yes	—	2008
<i>Spergularia rubra</i>	red sandspurry	8	6 (22)	15	2 (4)	31 (91)	34	Yes	Yes	Yes	2011
<i>Viola tricolor</i>	johnny jumpup	6	8	14	5 (7)	33 (97)	34	Yes	Yes	Yes	2011
<i>Lapsana communis</i>	nipplewort	8	4	16	5	33	33	Yes	Yes	Yes	2011
<i>Matricaria discoidea</i>	pineappleweed	5	9	15	3	32	32	Yes	Yes	Yes	2008
<i>Spergula arvensis</i>	corn spurry	2	11	14	5	32	32	Yes	Yes	Yes	2008
<i>Mycelis muralis</i>	wall lettuce	7	11 (23)	8	4	30 (98)	31	Yes	—	—	2008
<i>Lepidium densiflorum</i>	common pepperweed	1 (30)	9 (23)	8	4	22 (88)	25	Yes	Yes	Yes	2008
<i>Centaurea solstitialis</i> <sup>26</sup>	yellow star-thistle										2008
<i>Crupina vulgaris</i> <sup>24</sup>	common crupina										2008

<sup>25</sup> *Cerastium* species ranked together.

<sup>26</sup> *Centaurea solstitialis* and *Crupina vulgaris* were rejected from consideration in the climate screening phase.

## Appendix 2: Scores of Invasiveness Ranking of 164 Non-Native Plants Ordered by Species Name

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Achillea ptarmica</i>	sneezeweed	14	12	15	2 (3)	43 (93)	46	Yes	Yes	Yes	2008
<i>Acroptilon repens</i> <sup>†</sup>	Russian knapweed	24	16	20	6	66	66	Yes	Yes	Yes	2011
<i>Aegopodium podagraria</i>	bishop's goutweed	20	9	21	5 (7)	55 (97)	57	Yes	Yes	Yes	2011
<i>Alchemilla mollis</i> <sup>27</sup>	lady's mantle	12 (20)	13	14	2 (3)	41 (73)	56	Yes	Yes	Yes	2011
<i>Alchemilla monticola</i> <sup>24</sup>	hairy lady's mantle	12 (20)	13	14	2 (3)	41 (73)	56	Yes	Yes	Yes	2011
<i>Alliaria petiolata</i>	garlic mustard	24 (30)	16	16	7	63 (90)	70	Yes	—	—	2008
<i>Alnus glutinosat</i> <sup>†</sup>	European alder	24	16	14	5	59 (97)	61	Yes	Yes	Yes	2008
<i>Alopecurus geniculatus</i>	water foxtail	12	14	15 (19)	4 (7)	45 (91)	49	Yes	Yes	Yes	2011
<i>Alopecurus pratensis</i>	meadow foxtail	10	16	20	4 (7)	50 (97)	52	Yes	Yes	Yes	2011
<i>Amaranthus retroflexus</i>	redroot pigweed	12	14	15	4	45	45	Yes	Yes	Yes	2011
<i>Anthemis cotula</i>	mayweed chamomile	8	12	14	7	41	41	Yes	Yes	—	2008
<i>Arctium minus</i>	common burdock	16	16	14	3	49	49	Yes	Yes	Yes	2011
<i>Brachypodium sylvaticum</i> <sup>†</sup>	false slender brome	31	19 (23)	14	5	69 (98)	70	Yes	Yes	Yes	2008
<i>Brassica napus</i>	rapeseed mustard	13	14	14	6	47	47	Yes	Yes	Yes	2011
<i>Brassica rapa</i>	birdsrape mustard	14	13	18	5	50	50	Yes	Yes	Yes	2011
<i>Bromus inermis</i> ssp. <i>inermis</i>	smooth brome	20	16	18	8	62	62	Yes	Yes	Yes	2008
<i>Bromus tectorum</i>	cheatgrass	34	15	23	6	78	78	Yes	Yes	Yes	2008
<i>Campanula rapunculoides</i>	rampion bellflower	18	16 (20)	20	5 (7)	59 (92)	64	Yes	Yes	Yes	2008
<i>Capsella bursa-pastoris</i>	shepherd's purse	7	11	18	4	40	40	Yes	Yes	Yes	2008
<i>Caragana arborescens</i>	Siberian peashrub	29	15	23	5 (7)	72 (97)	74	Yes	Yes	Yes	2011
<i>Carduus acanthoides</i> <sup>28†</sup>	plumeless thistle	22	17	14	8	61	61	Yes	Yes	Yes	2008
<i>Carduus nutans</i> <sup>25†</sup>	musk thistle	22	17	14	8	61	61	Yes	Yes	Yes	2008
<i>Carduus pycnocephalus</i> <sup>25†</sup>	Italian thistle	22	17	14	8	61	61	Yes	Yes	Yes	2008
<i>Carduus tenuiflorus</i> <sup>25†</sup>	slender-flowered thistle	22	17	14	8	61	61	Yes	Yes	Yes	2008
<i>Centaurea montana</i>	perennial cornflower	9 (30)	12 (23)	13	5 (7)	39 (85)	46	Yes	Yes	Yes	2011
<i>Centaurea solstitialis</i> <sup>29</sup>	yellow star-thistle										2008
<i>Centaurea stoebe</i>	spotted knapweed	34	22	21	9	86	86	Yes	Yes	—	2008
<i>Cerastium fontanum</i> ssp. <i>vulgare</i> <sup>30</sup>	big chickweed	6	8	15 (19)	5	34 (94)	36	Yes	Yes	Yes	2008

<sup>27</sup> *Alchemilla* species ranked together.

<sup>28</sup> *Carduus* species ranked together.

<sup>29</sup> *Centaurea solstitialis* was rejected from consideration in the climate screening phase.

<sup>30</sup> *Cerastium* species ranked together.

<sup>†</sup>Species not known to occur in Alaska as of April, 2011.

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Cerastium glomeratum</i> <sup>26</sup>	sticky chickweed	6	8	15 (19)	5	34 (94)	36	Yes	Yes	Yes	2008
<i>Chenopodium album</i>	lambsquarters	5	12	15	5	37	37	Yes	Yes	Yes	2008
<i>Cirsium arvense</i>	Canada thistle	26	19	21	10	76	76	Yes	Yes	Yes	2008
<i>Cirsium vulgare</i>	bull thistle	20	19 (23)	18	3	60 (98)	61	Yes	Yes	Yes	2008
<i>Convolvulus arvensis</i>	field bindweed	18	14	16	8	56	56	Yes	Yes	Yes	2008
<i>Coronilla varia</i>	crownvetch	26	17	17	6 (7)	66 (97)	68	Yes	Yes	Yes	2011
<i>Cotula coronopifolia</i>	common brassbuttons	14	11 (23)	9	7	41 (98)	42	Yes	—	—	2008
<i>Crepis tectorum</i>	narrowleaf hawksbeard	16	16	20	4	56	56	Yes	Yes	Yes	2011
<i>Crupina vulgaris</i> <sup>31</sup>	common crupina										2008
<i>Cytisus scoparius</i>	Scotch broom	26	17	18	8	69	69	Yes	—	—	2008
<i>Dactylis glomerata</i>	orchardgrass	16	10	22	5	53	53	Yes	Yes	Yes	2008
<i>Deschampsia elongata</i>	slender hairgrass	12	13	4 (19)	3 (7)	32 (91)	35	Yes	Yes	Yes	2011
<i>Descurainia sophia</i>	herb sophia	8	13	18	2	41	41	Yes	Yes	Yes	2008
<i>Digitalis purpurea</i>	purple foxglove	16	11	19	5	51	51	Yes	Yes	—	2008
<i>Elodea canadensis</i>	Canadian waterweed	27	19 (20)	23	6	75 (95)	79	Yes	Yes	Yes	2011
<i>Elymus repens</i>	quackgrass	20	15	19	5	59	59	Yes	Yes	Yes	2008
<i>Elymus sibiricus</i>	Siberian wildrye	20	13	12 (19)	1 (3)	46 (87)	53	Yes	Yes	Yes	2011
<i>Euphorbia esula</i> <sup>†</sup>	leafy spurge	31	21	23	9	84	84	Yes	Yes	—	2008
<i>Euphrasia nemorosa</i>	common eyebright	16	10	12	3 (7)	41 (97)	42	Yes	Yes	Yes	2011
<i>Fallopia × bohemica</i> <sup>32</sup>	Bohemian knotweed	33	21	23	7 (7)	84 (97)	87	Yes	Yes	—	2008
<i>Fallopia convolvulus</i>	black bindweed	12	16	17	5	50	50	Yes	Yes	Yes	2008
<i>Fallopia japonica</i> <sup>29</sup>	Japanese knotweed	33	21	23	7 (7)	84 (97)	87	Yes	Yes	—	2008
<i>Fallopia sachalinensis</i> <sup>29</sup>	giant knotweed	33	21	23	7 (7)	84 (97)	87	Yes	Yes	—	2008
<i>Galeopsis bifida</i> <sup>33</sup>	splitlip hempnettle	16	11	17	6	50	50	Yes	Yes	Yes	2011
<i>Galeopsis tetrahit</i> <sup>30</sup>	brittlestem hempnettle	16	11	17	6	50	50	Yes	Yes	Yes	2011
<i>Geranium robertianum</i>	herb Robert	22	18 (23)	21	5	66 (98)	67	Yes	Yes	Yes	2011
<i>Glechoma hederacea</i>	ground ivy	14	12	14	8	48	48	Yes	Yes	Yes	2008
<i>Gypsophila paniculata</i>	baby's-breath	20	14	18	3 (7)	55 (97)	57	Yes	Yes	Yes	2008
<i>Hedera helix</i>	English ivy	27	16 (23)	23	6	72 (98)	73	Yes	—	—	2011
<i>Heracleum mantegazzianum</i> <sup>†</sup>	giant hogweed	33	22	17	9	81	81	Yes	Yes	Yes	2008
<i>Hesperis matronalis</i>	dames rocket	10	10 (22)	17	2 (7)	39 (94)	41	Yes	Yes	—	2008

<sup>31</sup> *Crupina vulgaris* was rejected from consideration in the climate screening phase.

<sup>32</sup> *Fallopia ×bohemica*, *F. japonica* and *F. sachalinensis* ranked together.

<sup>33</sup> *Galeopsis* species ranked together.

<sup>†</sup>Species not known to occur in Alaska as of April, 2011.

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Hieracium aurantiacum</i> <sup>34</sup>	orange hawkweed	29	23	19	8	79	79	Yes	Yes	Yes	2008
<i>Hieracium caespitosum</i> <sup>31</sup>	meadow hawkweed	29	23	19	8	79	79	Yes	Yes	Yes	2008
<i>Hieracium lachenalii</i>	common hawkweed	13 (30)	12 (23)	18	7	50 (88)	57	Yes	Yes	Yes	2011
<i>Hieracium pilosella</i>	mouse-ear hawkweed	22	15	18	8	63	63	Yes	Yes	Yes	2011
<i>Hieracium umbellatum</i>	narrowleaf hawkweed	13 (30)	16 (20)	9	4 (7)	42 (82)	51	Yes	Yes	Yes	2008
<i>Holcus lanatus</i>	common velvetgrass	18	15 (23)	15	7	55 (98)	56	Yes	—	—	2011
<i>Hordeum jubatum</i> <sup>35</sup>	foxtail barley	18	16	20	9	63	63	Yes	Yes	Yes	2008
<i>Hordeum murinum</i> ssp. <i>leporinum</i>	leporinum barley	18	17	17	8	60	60	—	Yes	—	2008
<i>Hordeum vulgare</i>	common barley	8	12	14	5	39	39	Yes	Yes	Yes	2011
<i>Hydrilla verticillata</i> <sup>†</sup>	hydrilla	38	17 (22)	14	9	78 (97)	80	Yes	Yes	Yes	2008
<i>Hypericum perforatum</i>	common St. Johnswort	11	15	18	8	52	52	Yes	Yes	Yes	2008
<i>Hypochaeris radicata</i>	hairy catsear	14	14	13	3	44	44	Yes	Yes	Yes	2011
<i>Ilex aquifolium</i>	English holly	24	16	18	9	67	67	Yes	—	—	2011
<i>Impatiens glandulifera</i>	ornamental jewelweed	29	22	22	7	80 (98)	82	Yes	Yes	—	2008
<i>Iris pseudacorus</i>	yellowflag iris	24	15	21	6	66	66	Yes	Yes	Yes	2011
<i>Lamium album</i>	white deadnettle	10	9 (22)	13	7	39 (97)	40	Yes	Yes	Yes	2011
<i>Lappula squarrosa</i>	European stickseed	10	12	17	5	44	44	Yes	Yes	Yes	2008
<i>Lapsana communis</i>	nipplewort	8	4	16	5	33	33	Yes	Yes	Yes	2011
<i>Leontodon autumnalis</i>	fall dandelion	16	14	16	3 (7)	49 (97)	51	Yes	Yes	Yes	2011
<i>Lepidium densiflorum</i>	common pepperweed	1 (30)	9 (23)	8	4	22 (88)	25	Yes	Yes	Yes	2008
<i>Lepidium latifolium</i>	broadleaved pepperweed	28	17 (22)	16	6 (7)	67 (94)	71	—	Yes	Yes	2008
<i>Leucanthemum vulgare</i>	oxeye daisy	20	15	18	8	61	61	Yes	Yes	Yes	2008
<i>Linaria dalmatica</i>	Dalmatian toadflax	16	14	19	9	58	58	—	Yes	—	2008
<i>Linaria vulgaris</i>	yellow toadflax	22	17	21	9	69	69	Yes	Yes	Yes	2008
<i>Lolium multiflorum</i>	Italian ryegrass	14	10	15	2	41	41	Yes	Yes	Yes	2008
<i>Lolium perenne</i>	perennial ryegrass	16	15	18	3	52	52	Yes	Yes	Yes	2011
<i>Lonicera tatarica</i>	Tatarian honeysuckle	22	19 (23)	18	6	65 (98)	66	Yes	Yes	—	2008
<i>Lotus corniculatus</i>	birdsfoot trefoil	22	16	18	9	65	65	Yes	Yes	Yes	2011
<i>Lupinus polyphyllus</i>	bigleaf lupine	24	18 (23)	20	8	70 (98)	71	Yes	Yes	Yes	2011
<i>Lythrum salicaria</i> <sup>36</sup>	purple loosestrife	34	20	21	8	84	84	—	Yes	—	2008
<i>Lythrum virgatum</i> <sup>32</sup>	European wand loosestrife	34	20	21	8	84	84	—	Yes	—	2008

<sup>34</sup> *Hieracium aurantiacum* and *H. caespitosum* ranked together.

<sup>35</sup> The non-nativity of *Hordeum jubatum* and *Lupinus polyphyllus* is debated.

<sup>36</sup> *Lythrum* species ranked together.

<sup>†</sup>Species not known to occur in Alaska as of April, 2011.

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Matricaria discoidea</i>	pineappleweed	5	9	15	3	32	32	Yes	Yes	Yes	2008
<i>Medicago lupulina</i>	black medick	10	18	15	5	48	48	Yes	Yes	Yes	2008
<i>Medicago sativa</i> ssp. <i>falcata</i>	yellow alfalfa	15 (30)	17	15 (19)	7	54 (84)	64	Yes	Yes	Yes	2008
<i>Medicago sativa</i> ssp. <i>sativa</i>	alfalfa	13 (30)	17	16	7	53 (90)	59	Yes	Yes	Yes	2008
<i>Melilotus alba</i>	white sweetclover	29	22	21	9	81	81	Yes	Yes	Yes	2008
<i>Melilotus officinalis</i>	yellow sweetclover	24	18	19	8	69	69	Yes	Yes	Yes	2008
<i>Mentha</i> × <i>piperita</i> <sup>37</sup>	peppermint	8	14 (22)	13	5 (7)	40 (94)	43	Yes	Yes	Yes	2011
<i>Mentha spicata</i> <sup>33</sup>	spearmint	8	14 (22)	13	5 (7)	40 (94)	43	Yes	Yes	Yes	2011
<i>Mycelis muralis</i>	wall lettuce	7	11 (23)	8	4	30 (98)	31	Yes	—	—	2008
<i>Myosotis scorpioides</i>	European forget-me-not	16	15	18	0 (0)	49 (90)	54	Yes	Yes	Yes	2011
<i>Mysiophyllum spicatum</i> †	Eurasian watermilfoil	38	20 (22)	20	9	87 (97)	90	Yes	Yes	Yes	2008
<i>Nymphaea odorata</i> ssp. <i>odorata</i>	American white waterlily	36	18	18	6 (7)	78 (97)	80	Yes	—	—	2008
<i>Papaver croceum</i>	Icelandic poppy	10	10	15	0 (0)	35 (90)	39	Yes	Yes	Yes	2011
<i>Persicaria lapathifolia</i> <sup>38</sup>	curlytop knotweed	6	16	15 (19)	7	44 (94)	47	Yes	Yes	Yes	2008
<i>Persicaria maculosa</i> <sup>34</sup>	spotted ladythumb	6	16	15 (19)	7	44 (94)	47	Yes	Yes	Yes	2008
<i>Persicaria wallichii</i>	Himalayan knotweed	31	18 (22)	19	7 (7)	75 (94)	80	Yes	—	—	2011
<i>Phalaris arundinacea</i>	reed canarygrass	33	20	24	6	83	83	Yes	Yes	Yes	2008
<i>Phleum pratense</i>	timothy	14	14	19	7	54	54	Yes	Yes	Yes	2008
<i>Phragmites australis</i>	common reed	36	16	23	8	83	83	Yes	Yes	Yes	2011
<i>Plantago major</i>	common plantain	8	13	16	7	44	44	Yes	Yes	Yes	2008
<i>Poa annua</i>	annual bluegrass	8	13	18	7	46	46	Yes	Yes	Yes	2008
<i>Poa compressa</i>	Canada bluegrass	6	10	17	5 (7)	38 (97)	39	Yes	Yes	Yes	2008
<i>Poa pratensis</i> ssp. <i>irrigata</i> <sup>39</sup>	spreading bluegrass	12	14	19	7	52	52	Yes	Yes	Yes	2008
<i>Poa pratensis</i> ssp. <i>pratensis</i> <sup>35</sup>	Kentucky bluegrass	12	14	19	7	52	52	Yes	Yes	Yes	2008
<i>Poa trivialis</i> <sup>35</sup>	rough bluegrass	12	14	19	7	52	52	Yes	Yes	Yes	2008
<i>Polygonum aviculare</i>	prostrate knotweed	7	15	16	7	45	45	Yes	Yes	Yes	2008
<i>Potentilla recta</i> †	sulfur cinquefoil	20	13	17	7	57	57	Yes	Yes	—	2008
<i>Prunus padus</i>	European bird cherry	31	21	17	5	74	74	Yes	Yes	—	2008
<i>Prunus virginiana</i>	chokecherry	19 (30)	21 (23)	18	5 (7)	63 (85)	74	Yes	Yes	Yes	2011
<i>Ranunculus acris</i> <sup>40</sup>	tall buttercup	16	13 (23)	15	9	53 (98)	54	Yes	Yes	Yes	2008
<i>Ranunculus repens</i> <sup>36</sup>	creeping buttercup	16	13 (23)	15	9	53 (98)	54	Yes	Yes	Yes	2008

<sup>37</sup> *Mentha* species ranked together.

<sup>38</sup> *Persicaria lapathifolia* and *P. maculosa* ranked together.

<sup>39</sup> *Poa pratensis* ssp. *irrigata*, *P. pratensis* ssp. *pratensis*, and *P. trivialis* ranked together.

<sup>40</sup> *Ranunculus* species ranked together.

†Species not known to occur in Alaska as of April, 2011.

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Rosa rugosa</i>	rugosa rose	28	16	20	6 (7)	70 (97)	72	Yes	Yes	Yes	2011
<i>Rubus discolor</i>	Himalayan blackberry	38	18	12	9	77	77	Yes	—	—	2008
<i>Rumex acetosella</i>	common sheep sorrel	12	16	16	7	51	51	Yes	Yes	Yes	2008
<i>Rumex crispus</i> <sup>41</sup>	curly dock	10	16	14	8	48	48	Yes	Yes	Yes	2008
<i>Rumex longifolius</i> <sup>37</sup>	dooryard dock	10	16	14	8	48	48	Yes	Yes	Yes	2008
<i>Rumex obtusifolius</i> <sup>37</sup>	bitter dock	10	16	14	8	48	48	Yes	Yes	Yes	2008
<i>Sagina procumbens</i>	birdseye pearlwort	6	12	15	5 (7)	38 (97)	39	Yes	Yes	Yes	2011
<i>Saponaria officinalis</i>	bouncingbet	5 (30)	8 (22)	12	2 (3)	27 (80)	34	Yes	Yes	—	2008
<i>Schedonorus arundinaceus</i>	tall fescue	22	17	18	4 (7)	61 (97)	63	Yes	Yes	Yes	2011
<i>Senecio jacobaea</i>	tansy ragwort	20	15	20	8	63	63	Yes	Yes	Yes	2008
<i>Senecio sylvaticus</i>	woodland ragwort	15	12	12	2	41	41	Yes	Yes	Yes	2011
<i>Senecio vulgaris</i>	common groundsel	4	12	15	5	36	36	Yes	Yes	Yes	2008
<i>Silene chalcedonica</i>	Maltese cross	14	10	14	0 (0)	38 (90)	42	Yes	Yes	Yes	2011
<i>Silene dioica</i> <sup>42</sup>	red catchfly	13	9	13	7	42	42	Yes	Yes	Yes	2008
<i>Silene latifolia</i> <sup>38</sup>	white cockle	13	9	13	7	42	42	Yes	Yes	Yes	2008
<i>Silene noctiflora</i> <sup>38</sup>	nightflowering silene	13	9	13	7	42	42	Yes	Yes	Yes	2008
<i>Silene vulgaris</i> <sup>38</sup>	bladder campion	13	9	13	7	42	42	Yes	Yes	Yes	2008
<i>Sonchus arvensis</i>	perennial sowthistle	22	21	21	9	73	73	Yes	Yes	—	2008
<i>Sonchus asper</i>	spiny sowthistle	13	14	14	5	46	46	Yes	Yes	Yes	2011
<i>Sonchus oleraceus</i>	annual sowthistle	13	14	14	5	46	46	Yes	Yes	Yes	2011
<i>Sorbus aucuparia</i>	European mountain ash	22	14	16	7	59	59	Yes	—	—	2008
<i>Spartina alterniflora</i> <sup>43†</sup>	smooth cordgrass	40	17	23	6	86	86	Yes	—	—	2008
<i>Spartina anglica</i> <sup>39†</sup>	common cordgrass	40	17	23	6	86	86	Yes	—	—	2008
<i>Spartina densiflora</i> <sup>39†</sup>	denseflower cordgrass	40	17	23	6	86	86	Yes	—	—	2008
<i>Spartina patens</i> <sup>39†</sup>	saltmeadow cordgrass	40	17	23	6	86	86	Yes	—	—	2008
<i>Spergula arvensis</i>	corn spurry	2	11	14	5	32	32	Yes	Yes	Yes	2008
<i>Spergularia rubra</i>	red sandspurry	8	6 (22)	15	2 (4)	31 (91)	34	Yes	Yes	Yes	2011
<i>Stellaria media</i> (non-seabird sites)	common chickweed	10	12	15	5	42	42	Yes	Yes	Yes	2008
<i>Stellaria media</i> (seabird colonies)	common chickweed	14	12	20	8	54	54	Yes	Yes	Yes	2008
<i>Symphytum officinale</i>	common comfrey	16	12	13	7	48	48	Yes	Yes	Yes	2011
<i>Tanacetum vulgare</i>	common tansy	20	15 (23)	19	5	59 (98)	60	Yes	Yes	Yes	2011

<sup>41</sup> *Rumex crispus*, *R. longifolius*, and *R. obtusifolius* ranked together.

<sup>42</sup> *Silene dioica*, *S. latifolia*, *S. noctiflora*, and *S. vulgaris* ranked together.

<sup>43</sup> *Spartina* species ranked together.

†Species not known to occur in Alaska as of April, 2011.

Scientific Name	Common Name	Ecological Impact	Biological Characteristics	Distribution	Control	Total	Invasiveness	Pacific Maritime	Interior-Boreal	Arctic-Alpine	Rank Year
<i>Taraxacum officinale</i> ssp. <i>officinale</i>	common dandelion	18	14	18	8	58	58	Yes	Yes	Yes	2008
<i>Thlaspi arvense</i>	field pennycress	11	12	14	5	42	42	Yes	Yes	Yes	2011
<i>Tragopogon dubius</i>	yellow salsify	20	11	16	3	50	50	Yes	Yes	—	2008
<i>Trifolium dubium</i>	suckling clover	14	13	18	5	50	50	Yes	Yes	Yes	2011
<i>Trifolium hybridum</i>	alsike clover	22	12	18	5	57	57	Yes	Yes	Yes	2008
<i>Trifolium pratense</i>	red clover	16	12 (22)	16	7	51 (97)	53	Yes	Yes	Yes	2008
<i>Trifolium repens</i>	white clover	22	15	14	8	59	59	Yes	Yes	Yes	2008
<i>Tripleurospermum inodorum</i>	scentless chamomile	13	13 (23)	15	6	47 (98)	48	Yes	Yes	Yes	2008
<i>Verbascum thapsus</i>	common mullein	20	9	16	7	52	52	Yes	Yes	—	2008
<i>Veronica serpyllifolia</i> ssp. <i>serpyllifolia</i>	thymeleaf speedwell	5 (30)	9	10	7 (7)	31 (87)	36	Yes	Yes	Yes	2011
<i>Vicia cracca</i>	bird vetch	27	16	21	9	73	73	Yes	Yes	Yes	2008
<i>Vicia villosa</i>	winter vetch	22	11 (22)	12 (19)	3	48 (91)	53	Yes	Yes	—	2008
<i>Viola tricolor</i>	johnny jumpup	6	8	14	5 (7)	33 (97)	34	Yes	Yes	Yes	2011
<i>Zostera japonica</i> †	dwarf eelgrass	30	10	8	1 (3)	49 (93)	53	Yes	Yes	—	2008