Exotic Plant Management in Sitka National Historical Park
Sitka, Alaska
Summer 2006 Field Season Report

Figure 1 – Tribal Civilian Community Corps (TCCC) and Whitney Rapp, Exotic Plant Program Coordinator, in front of Sitka National Historical Park's Visitor Center.

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Abstract

For the third consecutive year, the Exotic Plant Management Team (EPMT) worked in Sitka National Historical Park (SITK) to document the distribution and percent cover of non-native plant species and to control these species. In 2006, the focus of effort in SITK shifted from inventory to control work. Within the 0.753 ha (1.86 acres) of the park surveyed in 2006, one new species, snow in summer (*Cerastium tomentosum*), was identified bringing the total count of non-native plant species observed to 29. Creeping buttercup (*Ranunculus repens*) was still the most widespread species throughout the park in both sunny and shaded areas, which makes its control a management priority since it continues to aggressively displace native herbaceous species. European mountain-ash (*Sorbus aucuparia*) is also widespread within SITK and is propagating primarily along edge habitats, including roads, shoreline, riverbanks, and trails. SITK is the only Alaska Region NPS unit with Japanese knotweed (*Polygonum cuspidatum*), an extremely aggressive species. Through persistent removal by Geof Smith (SITK Biologist) and the EPMT team over many years, this species is under control, although it continues to sprout each year in two locations. With the assistance of an AmeriCorps Tribal Civilian Community Corps (TCCC) crew and SITK staff, 218 person-hours were spent during the EPMT visit (June 4-9, 2006) controlling exotic plants. During this focused effort, more than 454 kg (1,000 lb) of exotic plant material were removed, including mouse-ear chickweed (*Cerastium fontanum*), foxglove (*Digitalis purpurea*), plantain (*Plantago major*), Japanese knotweed (*Polygonum cuspidatum*), creeping buttercup (*Ranunculus repens*), common dandelion (*Taraxacum officinale* ssp. *officinale*), and white clover (*Trifolium repens*). Additional control work was performed in SITK throughout the summer by Kitty LaBounty (SITK biotechnician). In subsequent years, monitoring should be a focus to determine the rate of spread of species already present, the effectiveness of control efforts, and whether new species are colonizing. Control work should continue to focused on removing small, disjunct infestations, populations in areas less disturbed by human activity, and along primary human travel corridors where humans and pets will likely spread seeds.

Introduction

Since 2001, baseline surveys for non-native plant species have been carried out on National Park Service (NPS) lands in Alaska. These surveys provide the baseline data used in formulating long-term monitoring and control plans for exotic plant species in Alaska's NPS units. Exotic plant species are a concern to resource managers because they threaten the genetic integrity of native flora through hybridization (D'Antonio et. al 2001), can outcompete resident plant species for limited resources, and can change the structure and function of ecosystems through alterations of geochemical and geophysical processes (Ruesnik et. al 1995, Gordon 1998). Already, 1.1 million ha (2.6 million acres) or over 3% of the 34 million ha (83 million acres) managed by the NPS nationwide are infested with non-native plant and animal species (Drees 2004). Conservative estimates of the economic costs of biotic invasions are $137 billion in the United States annually (Pimental et al. 2004).

In Alaska, NPS lands have thus far avoided invasion by many pernicious exotic species found in the lower 48 states (Westbrooks 1998). Several factors have contributed to this. The first is

climate. Circumboreal flora are adapted to a wide range of climatic conditions that exotic plants cannot tolerate. In addition, many parklands in Alaska have remained relatively free of anthropogenic disturbances, such as livestock grazing, wildfire suppression, and altered hydrological regimes that encourage the introduction of exotic species, and parks in Alaska still retain all of their major floral and faunal ecosystem components (Densmore et. al 2001). Despite these protective factors, the threat of exotic plant invasion is increasing due to factors including global warming, increases in construction-related disturbance, and tourism. Throughout Alaska, over 170 non-native plant species have been documented, accounting for approximately 10% of the flora (Carlson et al. 2005). Fortunately, the NPS has the opportunity to stay ahead of exotic plant introductions in Alaska before they become a problem, but research and active management must begin now (Spencer 2001).

Sitka National Historical Park (SITK) is unique among Alaska NPS units in its very small size and urban setting, being surrounded by the city of Sitka. Exotic plant introductions are encouraged by the influx of summer visitors, the escape of planted ornamentals from Sitka lawns and gardens, and ongoing park maintenance, which create new areas of disturbances that can facilitate the establishment of exotic species. Fortunately, the park's small size makes it relatively easy to monitor and control incoming plant species, but park managers must remain vigilant. EPMT work has occurred in SITK annually since 2004. Unlike 2004 and 2005 efforts that primarily focused on inventorying the park, the purpose of the 2006 efforts in SITK were to 1) re-treat creeping buttercup along the trails between the footbridge and the outhouse; 2) control dandelions along the shoreline; 3) monitor the areas surveyed in 2004 and 2005 to detect changes; and 4) look for invasive species new to the park. Information on the status and number of exotic plant species in SITK will be used to help prioritize areas in the park and state for long-term monitoring and control of these species on Alaska NPS lands.

Methods and Materials

EPMT fieldwork at Sitka National Historical Park occurred June 4-9, 2006 following the 2006 Alaska EPMT data collection protocol. Areas monitored included the most frequently used trails and parts of the coastline. More time was spent controlling exotic species in 2006 than in previous years and effort was focused near the footbridge and the historic battle site. While on site, digital photos were taken opportunistically.

As before, Trimble GeoXT GPS units were used for all data collection during inventory and control events. Equipped with the Alaska EPMT standardized data dictionary (Table 1), the GeoXT can achieve submeter accuracy and ensure data integrity. Areas with and without non-native species were inventoried at a resolution to allow interannual comparisons of plant distributions. The data dictionary provides sufficient detail for describing the size, diversity, and severity of exotic plant infestations and for population of two distinct databases: APCAM (Alien Plant Control and Monitoring – a nationwide NPS database for exotic plant data) and AKEPIC (Alaska Exotic Plant Information Clearinghouse - a collaborative, interagency, web-based database for tracking Alaskan weeds).

Table 1. Fields used in GPS data dictionary and GIS shapefile for exotic plant surveys, summer 2006.

Location_Name	Location ID (sitka_nps, sitka_outside_nps)
Disturbance_Type	Disturbance Type (coastal, stream, river, glacier, fill importation, trampling, wind throw, slide, animal, material extraction, ORV disturbance, mowing, wildfire, logging, mining, grazing, plowing, brush cutting, herbicide, wind, thermal, volcano, abandoned homesite, or other). Because most of Alaska's exotic plants grow only on disturbed sites, we are tracking what disturbance types are being invaded by what species in NPS units.
Site_Description	Description of location.
Buffer_Distance_M	Buffer distance (in meters) to convert points and lines to polygons
Taxon	This is the dominant exotic plant species of a particular infestation. All species that have been reported from Alaska NPS units are on this list. "Other" is used for species not previously recorded with a description in the Remarks field. If the mapped area is free of exotic plants, "None" is used.
Phenology	Phenology of dominant exotic species (rosette, no_flower, full_flower, in_seed, stand_dead, or none)
%_Cover	Cover class percentage of dominant exotic species (0, 1, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 95, 100)
Stem_Count	The stem count of the dominant exotic species. A blank field indicates the number of plants was not counted.
Action	"Inventory" is the first documentation of a particular infestation, whereas "Monitor" is a follow-up visit to a previously inventoried site from this year or previous years. "Treatment" is the first control effort for a particular infestation and "Retreatment" applies to any subsequent control efforts in either the same or successive years. "Manual" involves pulling or digging. "Mechanical" involves actions like mowing, weed-whacking, chain-sawing, etc. "Chemical" involves the use of herbicides.
CntrlEffrt	Projected/actual control effort (low <1 hour, medium 1-8 hours, high >8 hours for one person)
Is_Exhaustive	"Yes" if all the exotic plants encountered were recorded. "No" if only a subset of species are recorded.
Comments	Any additional remarks.
Park_Unit	Associated park (SITK)
Is_Inside_Park	"Yes" if the area mapped is located on park land. "No" if it lies outside of the park boundary or on inholdings.
Recorder_Name	Recorder (WSR = Whitney Rapp)
Team_Name	AKEPMT = Alaska Exotic Plant Management Team
2Taxon, 3Taxon… 2Phenology, 3Phenology… 2%_Cover, 3%_Cover… 2StemCount, 3StemCount… 2Action, 3Action… 2Control_Effort, 3Control_Effort…	Additional fields for 9 other exotic taxa for each unique site including fields for Phenology, Percent Cover, Stem Count, Action, and Control Effort.
Spatial Accuracy Fields	Range of attributes to describe spatial information and precision
Date/Time	When the record was collected.
Acres	GIS-calculated acreage of each area

The data collected using the GPS was differentially corrected using the closest base station (Biorka, AK) and edited in GPS Pathfinder Office (Trimble, version 3.10). The corrected files were exported as shapefiles for use in ArcGIS (ESRI, version 9.1). The permanent dataset is a multiyear, multipark geodatabase maintained by the Alaska Region EPMT.

Results and Discussion

Following the intensive inventory efforts of 2004 and 2005, a relatively cursory inventory of SITK was conducted in 2006 to rapidly assess the park for new species or expansion of existing species. Within the relatively small subsection of the park (0.75 ha or 1.86 acres) inventoried, one new species, snow in summer (*Cerastium tomentosum*) was identified growing between the sidewalk of Lincoln Street and the shoreline. Otherwise, most of the species identified from previous years were relocated in similar locations and distributions. Since 2004, a total of 7.17 ha (17.71 acres) of the park has been inventoried.

The majority of the 2006 EPMT visit was spent controlling exotic species. Through the combined efforts of the eight-person TCCC crew, Kitty LaBounty (SITK), and Whitney Rapp (GLBA), 218 person-hours were spent removing over 454 kg (1,000 lbs.) of exotic species. The two primary control areas were 1) between the footbridge and the outhouse along the main trail and in the old picnic areas, and 2) along the shoreline edge primarily near the old battle site. In the first area, the targeted species was creeping buttercup. This site was selected based on the high density of the species, the high density of foot traffic, and the lower likelihood of control activities trampling desired native vegetation. In the second site, the targeted species was common dandelion. This site was selected based on the high density of dandelions and the potential for seed dispersal from this area to other coastal and open areas. Kitty LaBounty and Whitney Rapp worked to control creeping buttercup in one of the long-term vegetative plots near the battle site. All located foxglove (2^{nd} year) and Japanese knotweed plants (at least 5 years) were removed. Other exotic species were removed opportunistically during inventory and control work. Subsequent to the EPMT visit in June, Kitty LaBounty worked throughout the remainder of the summer to control exotic plants throughout SITK.

Non-native species previously identified within SITK that were not relocated in 2006 include shepherd's purse, lambsquarters, oxeye daisy, yellow toadflax, pineappleweed, reed canarygrass, common timothy, annual bluegrass, Kentucky bluegrass, black bindweed, curly dock, bitter dock, bird's-eye pearlwort, and red clover. Most of these species are likely still present within or near SITK; however, due to the time of year and reduced inventory effort, they were not documented in 2006. For instance, the bluegrasses are dominant grass species in lawn areas of SITK; however, effort was not made to document them in 2006. Appendix B shows the locations of most of the non-native species observed during 2005 and 2006. The shapefile generated from the field inventory may be used in GIS to access additional information, including the assessment of invasive plant densities and the estimated control effort needed to eradicate these infestations.

While in SITK, Whitney Rapp presented an evening program to interested community members and distributed informational materials. Additional outreach occurred throughout the week in

Sitka as visitors met us while we were working within the park. Collaboration with Brad Krieckhaus (USFS) occurred on June 9, 2006 where National Forest and other areas of Sitka were surveyed and exotic species were controlled as part of the reciprocal agreement for provision of housing while in Sitka.

Species Summaries

The identification of a new exotic species within SITK this year demonstrates the urgency of continued monitoring and control to protect the native plant communities. In the open areas, including mowed lawns, common dandelion, white clover, common plantain, creeping buttercup, and mouse-ear chickweed are ubiquitous. In shadier wooded areas, creeping buttercup and European mountain-ash are prevalent. Escaped ornamental garden plants in the western corner of the park and near the Visitor Center are another source of concern.

Perennial Cornflower - *Centaurea montana*

In 2006, a second population of perennial cornflower, an escaped ornamental species, was found growing along the sidewalk of Lincoln Street. This species appears capable of spreading vegetatively and persisting; however, it does not appear to be spreading effectively by seed since few satellite plants were found. Due to the small population size, this species could easily be controlled. Concerns were raised by Gene Griffin, SITK Chief of Resource Management, regarding removal of plants in the Merrill Rock section of the park. Since there was no time in 2006 to control plants in this area, the EPMT team did not pursue determining what the concerns were based on. Future EPMT efforts should determine 1) if there are sensitive areas of the park for management and 2) what if anything can be done in these areas.

Mouse-ear Chickweed - *Cerastium fontanum*

C. fontanum is prevalent outside of the park and in open areas within the park. At this point, mouse-ear chickweed distribution seems limited to disturbed areas with sufficient available light. Controlling this species would be time consuming; however, it may still be feasible and warranted since it has yet to invade all suitable habitats. Opportunistic removal of this species was done in 2006 near the historic battle site.

Snow in Summer - *Cerastium tomentosum*

Another escaped ornamental species was first identified this year growing in the rocks separating the shoreline and the sidewalk of Lincoln Street. Removal of this species would likely be easy; however, concerns have been raised regarding removal of plants from the Merrill Rock section of the park.

Figure 2 - Foxglove blooming near parking lot at Visitor's Center.

Foxglove - *Digitalis purpurea*

Foxglove is a popular garden ornamental that is escaping and thriving in the greater Sitka area. Most residents of the area I spoke with were not aware that this species is non-native. All known plants within the Totem Park portion of SITK were again removed in 2006, but seedlings may have been overlooked. Many of the neighboring properties to the park have *D. purpurea* in their yards, which indicates that seed dispersal is likely to continue. Once located, the plants are easily removed. Consequently, it is feasible to control this species on an annual basis.

Oxeye Daisy - *Leucanthemum vulgare*

The EPMT site visit in 2006 occurred before oxeye daisies had begun flowering; therefore, they were neither inventoried nor controlled. All the identifiable plants near the Visitor Center were removed in 2005, but seedlings were likely overlooked. Near Merrill Rock, daisies are still growing and the area is small enough that control is possible. Since *L. vulgare* is common outside of the park boundary, continued monitoring is necessary to ensure the species does not become established in other locations such as the Old Fort Site since it is an open area with suitable edge habitat.

Figure 3 - Oxeye daisy flowering behind Visitor Center.

Figure 4 – Oxeye daisy seedling. Seedlings can be very inconspicuous and easily overlooked during control efforts.

Yellow Toadflax - *Linaria vulgaris*

Yellow toadflax, also referred to as butter and eggs, has only been found outside of the park in a parking lot of Sheldon Jackson College. The species is not likely to spread into the adjoining parkland since a dense, shade-producing forest canopy will probably preclude its establishment. It is possible, however, for seeds of this species to be transported by people or animals to habitats with more available light. Continued monitoring for this species should occur parkwide because once established, this species is very difficult to remove.

Unidentified *Lychnis/Silene*

Although not positively identified in 2005, this plant with a white flower and silver foliage is likely a garden escapee since there are multiple other garden cultivars growing along the roadside near Merrill Rock. Upon positive identification, this species should be removed.

Apple – *Malus pumila*

A domestic apple tree is growing near the WWII bunkers in the vicinity of the Fort Site. Tree ring analysis suggests the tree to be from around WWII (Griffen pers. comm.). In the area are other *Malus* trees that appeared more likely to be native crabapples. None of the trees are thriving in their understory habitats, and the effect to the native ecosystem seems minor. Since the apple tree may serve as a valuable cultural link to WWII, it is recommended that the tree be allowed to continue to grow.

Pineapple Weed - *Matricaria discoidea*

Although previously identified from around the Visitor's Center, this species was found only at the eastern boundary of the park in 2005. The Alaska Natural Heritage Program has ranked many non-native species based on the species' observed threat to invade native communities and the subsequent difficulty of their removal. The scale is from 1-100 with a higher number indicating a greater threat. Combining pineapple weed's relatively low ranking (33 – Appendix A) and its limited distribution, the threat of this species to the native flora of SITK is low.

Forget-Me-Not - *Myosotis scorpiodes*

Although the forget-me-not (*M. alpestris* ssp. *asiatica*) is Alaska's state flower, it is rare to find it growing naturally in Southeast Alaska. In contrast, a European forget-me-not (*M. scorpioides*) is prevalent and frequently planted. It is also possible that the native species is being planted and consequently increasing its density and/or range. An isolated population of the European species of forget-me-not was found and removed in 2006 growing near the Russian Memorial. Several populations of blue, pink, and white flowering forget-me-nots are growing along the road near

Merrill Rock. Until clarification of how to manage the Merrill Rock area is reached, these forget-me-not populations should be monitored.

Figure 5 - Reed canarygrass growing along Sawmill Creek Road; however, it has not yet been observed within SITK.

Reed Canarygrass - *Phalaris arundinacea*

Currently only growing outside the park along Sawmill Creek Road, reed canarygrass has significant potential to spread and displace native species (Ranking 83 – Appendix A), particularly in wet and riparian habitats. Annual monitoring for the species should occur throughout SITK. If *P. arundinacea* is detected within the park, the entire plant with root system should be removed since regrowth from rhizomes is probable.

Common Timothy - *Phleum pratense*

Timothy is currently restricted in its distribution to areas outside the park and at one bench along the Totem trail where it was removed in 2005. Since it is common along the Sawmill Creek Road sidewalk, it is possible that seeds will be transported into the park by people or animals. Consequently, annual monitoring should continue.

Common Plantain - *Plantago major*

Plantain does well in highly disturbed habitats and rarely spreads into less-disturbed areas. Removal of this species is relatively easy, so it would be possible to remove the smaller populations such as along the Indian River and near the bench on the Totem Trail. Partial control was performed in 2006 along the Totem Trail.

Japanese Knotweed - *Polygonum cuspidatum*

Previous control work on this species has been very successful in reducing the vigor of the two populations. Only a few shoots were observed in June 2006 at each of the two areas where this species has historically been observed near the footbridge; however, Geof Smith continued to removed shoots throughout the rest of the summer. Despite at least five years of effort, this species is still repeatedly sprouting from its persistent roots. With continued monitoring and

control, this highly aggressive species (Ranking 87 – Appendix A) will likely remain under control and eventually the energy reserves in the root system will be depleted and the species could be eradicated.

Sweet Cherry – *Prunus avium*

A single cherry tree was found growing along the beach at the southern tip of the park in 2005. The fruits are palatable, and park staff promise to control the fruits annually. At this point, the tree should be monitored to determine if seedlings appear in the vicinity. If the tree does begin spreading, all plants should be immediately removed.

Figure 6 - The sweet cherry tree at the end of flowering growing amongst the logs on the coast of SITK.

Figure 7 – A part of the TCCC crew working to remove creeping buttercup near the pit toilet.

Creeping Buttercup - *Ranunculus repens*

Creeping buttercup has the most widespread distribution of all non-native species within the park, including both open and shaded habitats. Although common along trails and in mowed lawn areas, *R. repens* appears capable of displacing the native forest understory herbaceous species, including deer heart (*Maianthemum dilatatum*), small-flowered buttercup (*Ranunculus uncinatus*), and large-leaved avens (*Geum macrophyllum*), in areas without disturbance. Areas with extensive slug herbivory on native species showed relatively

little damage to *R. repens* suggesting that this species may be unpalatable or possibly even toxic. Since no habitat in the park seems immune to *R. repens* invasion, this is a priority control species. Recruiting volunteers for control activities in late June to mid-July while the plants are in full flower will ensure easy identification and expedient removal. In 2006, a concerted effort was undertaken to remove the species from the area east of the footbridge and near the battle site.

Figure 8 – One of three plantings of rugosa (Sitka) rose planted at the entrance of the Visitor Center in 2006.

Rugosa Rose – *Rosa rugosa*

The rugosa rose, locally referred to as the Sitka rose, is a native of China, Japan, and Korea that has been well documented to escape cultivation and effectively naturalize. The origin of the "Sitka" rose likely dates back to the establishment in Sitka of the Alaska Agricultural Experimental Station and its first superintendent Charles Georgeson who introduced the species between 1903-1921 and later sent it to other areas of Alaska for cultivation (Holloway 2006). The recent planting of rugosa roses near the visitor center will effectively limit foot traffic on the hills since the plants have thorns. If the plantings are maintained and not allowed to spread vegetatively, they are not likely to naturalize. Nevertheless, the selection of a native species, such as salmonberry or devil's club, may have been a more appropriate choice.

Figure 9 - Sheep sorrel growing along the disturbed shoreline in the northeastern corner of the park.

Common Sheep Sorrel - *Rumex acetosella*

First identified in 2005, sheep sorrel appears to be invading the eastern corner of the park from the neighboring Arrowhead Trailer Park. Since the distribution is currently restricted to the shore's bank, the species can be more easily controlled at this time. Once it spreads, however, control will be exponentially more difficult.

Curly Dock - *Rumex crispus*

Curly dock, which could be confused with the native western dock (*R. aquaticus*), was found growing along Sawmill Creek Road outside of the park boundary. Monitoring should continue for this species to ensure that it does not spread into the park. Bitter dock (*R. obtusifolius*) was observed in the 2000 exotic plant inventory but has not been observed since then.

Birdseye Pearlwort - *Sagina procumbens*

This species was seen growing in mowed lawn areas near the Visitor Center, Russian Bishop's House, and by Arrowhead Trailer Park. As a low-growing mat, this species tolerates mowing and trampling. At this point, it does not appear to be spreading beyond these mowed areas, which lowers the threat to native species.

Figure 10 – European mountain-ash showing the characteristic white pubescence that aids in distinguishing the exotic species from the native Sitka mountain-ash.

European Mountain-ash - *Sorbus aucuparia*

The European mountain-ash has been planted widely in Sitka in yards and along the roads. This species' prolific production of red berries, which are consumed by birds and redistributed, has resulted in hundreds of mountain-ash trees within SITK ranging from small (< 0.5 m tall) seedlings to trees exceeding ten meters in height. Although *S. aucuparia* may hybridize with the native *S. sitchensis*, the mountain-ashes in SITK display the characteristics of the non-native species (Table 2).

Smaller seedlings are easily pulled from the ground. In 2006, a few seedlings were removed along trails while transiting to other control sites. These seedlings are growing primarily in open areas, such as along the shoreline, roadside, riverbanks, and trails. The trees seem very tolerant of marginal conditions. For instance, a seedling was growing on a beach log much closer to the salt water than any other woody species, including Sitka alder (*Alnus viridis* ssp. *sinuata*), a relatively salt-tolerant native species. Due to their adaptability and ability to displace other species, all seedlings should be removed when located.

Mature European mountain-ash trees are adding structural diversity to the current forest. Many of the mature trees are hosting lichen and moss growth. Trees are likely being used for nesting

habitat. Complete removal of all mature trees would create widespread disturbance throughout much of the park, which would increase the likelihood of other non-native plant invasions. In addition, this species is very successful at stump and root sprouting, so cutting trees will likely result in widespread regrowth over many years. Due to these concerns, removal of mature *S. aucuparia* should be performed in stages with experimentation as to how best to kill the tree to eliminate regrowth. The selective use of an herbicide, such as a cambium swipe with Garlon 3A on the recently cut stump, would inhibit resprouting. Selective use of herbicides in Alaskan National Parks may be a viable option following the Alaska Region Exotic Plant Management Plan Environmental Assessment that is currently being drafted.

Table 2 – Comparison of traits of native and non-native mountain-ash species (Klinkenberg 2004, Hultén 1968). The hair color appears one of the easiest features to distinguish the two species.

	European Mountain-ash ***Sorbus aucuparia*** **(non-native)**	**Sitka Mountain-ash** ***Sorbus sitchensis*** **(native)**
Height	Small tree, 5-15 m	Medium to tall shrub, 1-4 m
Trunk/Stem	Primarily single stem, grayish, branched	Multi-stem, grayish-red, sparingly branched
Winter buds/ young growth	Grayish soft-hairy	Somewhat rusty-hairy
Leaves	11 to 15 (17) leaflets, sharp pointed at the tip, mostly smooth, saw-toothed almost to the base	7 to 11 leaflets, rounded to blunt at the tip, sometimes rusty-hairy below, coarsely saw-toothed for not more than ¾ their length
Flowers	Flat-topped; branches white-hairy; calyces hairy	Half-rounded; branches rusty-hairy; calyces mostly smooth
Fruits	Globe-shaped; not glaucous	Globe-shaped to ellipsoid; glaucous
Habitat	Cultivated, and escaped	Woods, up into subalpine region

Common Dandelion - *Taraxacum officinale* ssp. *officinale*

Dandelions are growing in sunny locations, including the mowed lawns near the Visitor Center, Russian Bishop's House, and Fort Site and along the shoreline, riverbanks (inclusive of the tidal meadows), and Sawmill Creek Road. Based on the density of plants and the level of continued disturbance, the focus of dandelion control work should be along the coastline and riverbanks where human disturbance is minimal and native plant community structure is still intact. Areas with extensive human trampling will be more difficult to control over the long term, and the native plant community has already been affected.

Figure 11 – The supratidal area of the historic battle site was dominated by dandelions prior to control work in June 2006.

Figure 12 – After control efforts were complete, the same meadow near the historic battle site had significantly fewer dandelions and a completely different perception for visitors.

In 2006, control work at the historic battle site focused on removing dandelions from the coastal margin. Although the effort occurred as the plants were distributing seeds, a significant difference was achieved. Repeat control events will be needed in subsequent years to deplete the seed bank in the soil.

Red Clover - *Trifolium pratense*

Thus far, red clover has been observed only outside the park along Sawmill Creek Road. Annual monitoring within SITK, particularly in more open areas, will ensure quick detection and rapid removal of this species.

White Clover - *Trifolium repens*

White clover has successfully invaded many of the sunnier locations within and outside of the park. Due to the creeping nature of this species where it roots at its nodes, controlling it is particularly difficult. Efforts should be made to remove the smaller populations, such as along the shoreline, before they become too widespread.

Figure 13 - White clover growing at the base of a totem along the Totem Trail.

Other Species

The 2002 vascular plant inventory identified five other non-native species that were not detected again this year: *Capsella bursa-pastoris*, *Chenopodium album*, *Poa annua*, *Poa pratensis*, and *Polygonum convolvulus*. According to Rob Lipkin of the Alaska Natural Heritage Program (pers. comm. 2005), shepherd's purse was found in the lawn near the visitor's center toward the beach. A single specimen of lambsquarters was found in gravel near the beach at the south end of park. Identification of lambsquarters to species is now known to be dependent on seed characteristics, so future surveys will need to look for these features. In the lawn at the Fort Site and near the Visitor Center, annual bluegrass was observed. Kentucky bluegrass was seen in three areas: near the southeastern tip of the park south of the mouth of the Indian River on the bank above the riprap; in beach gravels approximately 300 meters southeast of the Visitor Center; and on a log near the mouth of the Indian River. It is likely that the two *Poa* species were overlooked due to uncertainty in identification. Non-native *Poa* species, including *P. annua* and *P. pratensis*, are presumably dominant grasses in open, mowed areas, such as the Fort Site, the Visitor Center lawn, and the Russian Bishop's House lawn. Finally, black bindweed was seen in several forested areas along a trail near the Visitor Center. Increased effort to find these species in subsequent years is recommended.

Other Thoughts

Considering its urban setting, extensive foot traffic by humans and dogs, and ample sources of non-native seeds/plants in outlying areas, SITK thankfully still has many areas that have not yet been affected by non-native species. Reducing anthropogenic disturbance activities, such as trampling and tree removal, will help maintain a vigorously growing native plant community. Social trails should be minimized to reduce disturbance and the potential for introducing new species. Areas where the forest canopy has been compromised such as areas with wind-thrown

trees are more susceptible to invasions, so continued monitoring should be maintained and restoration plantings encouraged.

The maintained landscape of SITK should be a reflection of the local flora and cultural history of the place. The garden in front of the Russian Bishop's House should reflect the Russian occupation of Sitka, Alaska. If species like foxglove did not contribute to the Russian culture, they should not be perpetuated in the park. Near the Visitor Center, the landscape should reflect the natural diversity of native species from Baranof Island. The recent addition of native plants to the landscape in front of the Visitor Center is a welcome change.

The city of Sitka has numerous groups, organizations, and agencies where partnerships regarding invasive species should be developed. The gardening community and plant retailers should be educated regarding species of concern and encouraged to plant native species. Vegetation related boards of the City of Sitka should be consulted to work cooperatively. Partnerships with non-profit organizations such as the Sitka Conservation Society, Girl Scouts, Boy Scouts, and local schools may provide valuable volunteer resources. Finally, other state and federal agencies with interests in the greater Sitka area can also offer valuable assistance.

Other Non-Plant Exotic Species

Although no inventory efforts have been made to document other exotic taxa, some incidental observations and conversations have identified some non-native animals. Within Sitka National Historical Park, European starlings (*Sturnus vulgaris*) have been observed near the Visitor Center, feeding in the intertidal zone, and near the mouth of the Indian River. European starlings may be breeding within the park and are displacing native species (Smith pers. comm. 2006) Red squirrels (*Tamiasciurus hudsonicus*) were introduced to Baranof Island in the 1930s and are now prevalent within the park. During the same time, martens (*Martes americana*) were also introduced to the area; however, it is unknown whether they occupy SITK (Schrader and Hennon 2005). Although not observed within the park, visitors and park staff should be alert for the rough skin newt (*Taricha granulose*) that was accidentally released in Sitka in fall 2004 and has established in the area (Miller 2005). Domestic cats and dogs free roam the park occasionally (Smith pers. comm. 2006). No effort to determine exotic insects or diseases has been made. No additional information is currently available for other species.

Recommended plans for 2007 field season

Prevention and proactive removal will save time and money in the future with regard to invasive plant issues. Well-trained personnel are essential for monitoring and control efforts. In addition, park projects should use best management practices to avoid introducing or spreading exotic plants. Educational programs for park staff, Sitka residents, and visitors will further develop awareness for the issue. This heightened consciousness will improve recruitment of volunteers for control events.

May

- Survey for common dandelion when they are in peak bloom. Recruit volunteer crew to remove plants, particularly along shoreline, river edge, and intertidal meadow.
- Provide educational programs to interpretive, resource management, and maintenance staff regarding the threat of invasive species.
- Collect specimens absent from herbarium.

June

- Monitor park to determine distribution of non-native species.
- Remove all European mountain-ash seedlings found.
- Control creeping buttercup.
- Check and control regrowth of Japanese knotweed.
- Provide educational programs for the community and visitors.
- Collect specimens absent from herbarium.

July

- Control creeping buttercup, oxeye daisy, foxglove, and other species. Recruit volunteer crew to help with removal.
- Provide educational programs for the community and visitors.
- Collect specimens absent from herbarium.

August

- Continue controlling all species.
- Collect specimens absent from herbarium.

September

- Continue controlling all species.
- Complete data processing and report writing.
- Collect specimens absent from herbarium.

Acknowledgements

I would like to thank Gene Griffin, Geof Smith, and Kitty LaBounty for facilitating my work while at Sitka National Historical Park. The TCCC crew was an invaluable resource for the control efforts accomplished in 2006. The SITK interpretive division, in particular Lisa Matlock and Clarence Wadkins, helped in organizing and publicizing the public presentation I gave. The SITK Maintenance Division lent us tools. Ramona East was very helpful regarding SITK herbarium questions. For accommodating the TCCC crew and me in their bunkhouses, I would like to thank the Sitka Ranger District of the Tongass National Forest. For funding my position and the travel to SITK, I would like to thank the Alaska Region Exotic Plant Management Team. While at Glacier Bay National Park and Preserve, Susan Boudreau and Lewis Sharman are always available to assist and guide me. At the regional level, Jeff Heys provides abundant support and advice.

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Appendices

Appendix A – List of known invasive plants within/near SITK

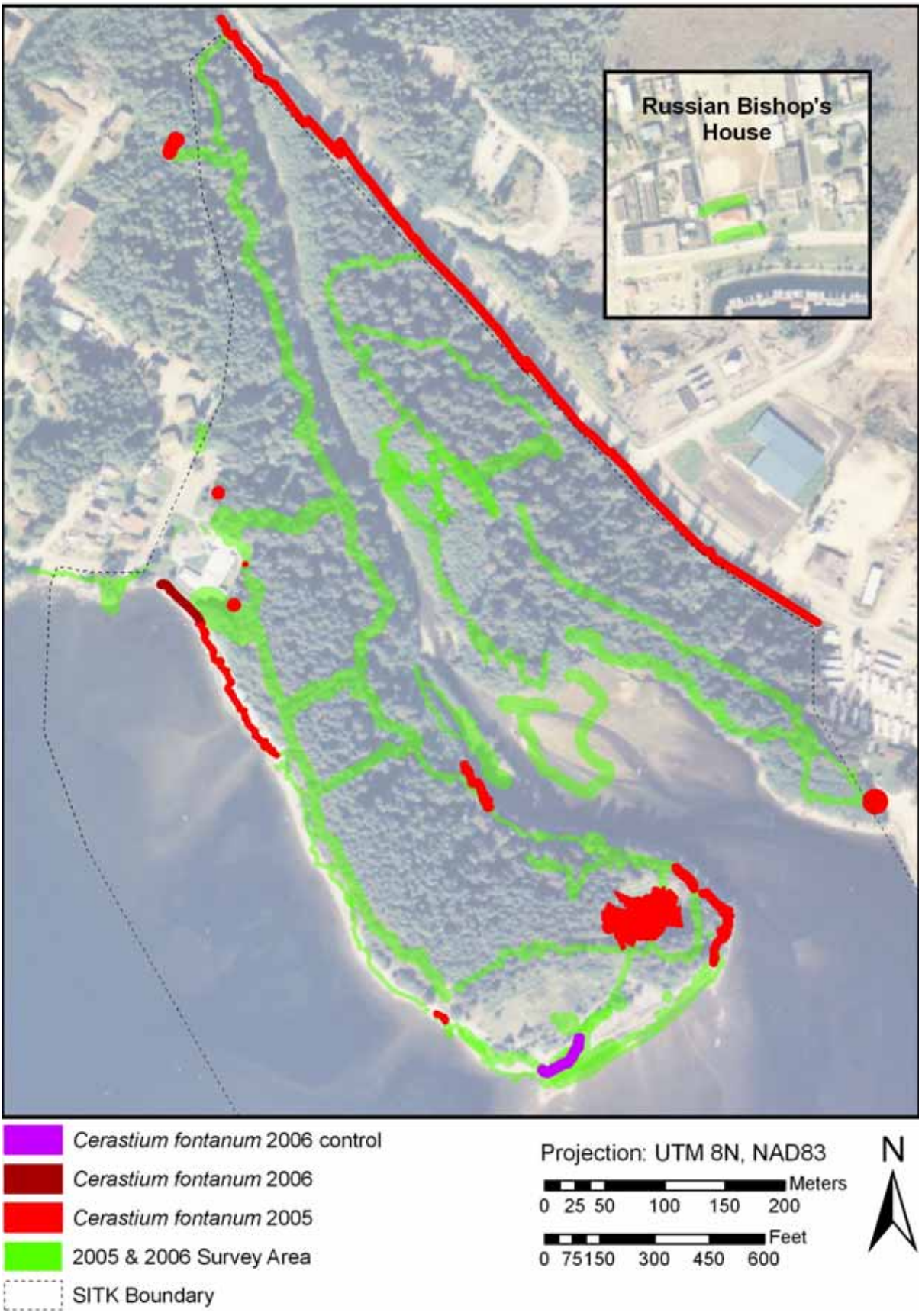
Common Name	Taxon	Observed inside park?	Source of Observation[a]	AK Weeds Ranking[b]
shepherd's purse	*Capsella bursa-pastoris*	Unknown	2	40
perennial cornflower	*Centaurea montana*	Yes	4, 5	not ranked
mouse-ear chickweed	*Cerastium fontanum*	Yes	2, 4, 5	39
snow in summer	*Cerastium tomentosum*	Yes	5	not ranked
lambsquarters	*Chenopodium album*	Yes	2	35
foxglove	*Digitalis purpurea*	Yes	1, 2, 3, 4, 5	51
oxeye daisy	*Leucanthemum vulgare*	Yes	1, 2, 3, 4	61
yellow toadflax	*Linaria vulgaris*	No	4	69
	Lychnis/Silene	Yes	4	not ranked
apple	*Malus pumila*	Yes	4, 5	not ranked
pineapple weed	*Matricaria discoidea*	Yes	2, 3, 4	33
forget-me-not	*Myosotis scorpiodes*	Yes	4, 5	not ranked
reed canarygrass	*Phalaris arundinacea*	No	4	83
common timothy	*Phleum pratense*	Yes	2, 4	56
common plantain	*Plantago major*	Yes	1, 2, 3, 4, 5	44
annual bluegrass	*Poa annua*	Yes	2	46
Kentucky bluegrass	*Poa pratensis*	Yes	2	52
black bindweed	*Polygonum convolvulus*	Yes	2	50
Japanese knotweed	*Polygonum cuspidatum*	Yes	1, 2, 3, 4, 5	87
sweet cherry	*Prunus avium*	Yes	4, 5	not ranked
creeping buttercup	*Ranunculus repens*	Yes	1, 2, 3, 4, 5	54
rugosa rose	*Rosa rugosa*	Yes	5	not ranked
common sheep sorrel	*Rumex acetosella*	Yes	1, 4, 5	51
curly dock	*Rumex crispus*	No	4	48
bitter dock	*Rumex obtusifolius*	Unknown	1	48
birdseye pearlwort	*Sagina procumbens*	Yes	4	not ranked
European mountain-ash	*Sorbus aucuparia*	Yes	2, 3, 4, 5	59
common dandelion	*Taraxacum officinale* ssp. *officinale*	Yes	1, 2, 3, 4, 5	58
red clover	*Trifolium pratense*	No	2, 4	53
white clover	*Trifolium repens*	Yes	1, 3, 4, 5	59

[a] - 1 = 2000 Exotic Plant Inventory, 2 = 2002 AKNHP Vascular Plant Survey; 3 = 2004 Exotic Plant Inventory; 4 = 2005 Exotic Plant Inventory; 5 = 2006 Exotic Plant Inventory

[b] - Ranking according to threat to native ecosystems in Alaska from low (0) to high (100) (http://akweeds.uaa.alaska.edu/akweeds_ranking_page.htm on 11/14/06)

Centaurea montana

Cerastium fontanum



Cerastium tomentosum

Digitalis purpurea

Leucanthemum vulgare

Linaria vulgaris

Unidentified *Lychnis/Silene*

Malus pumila

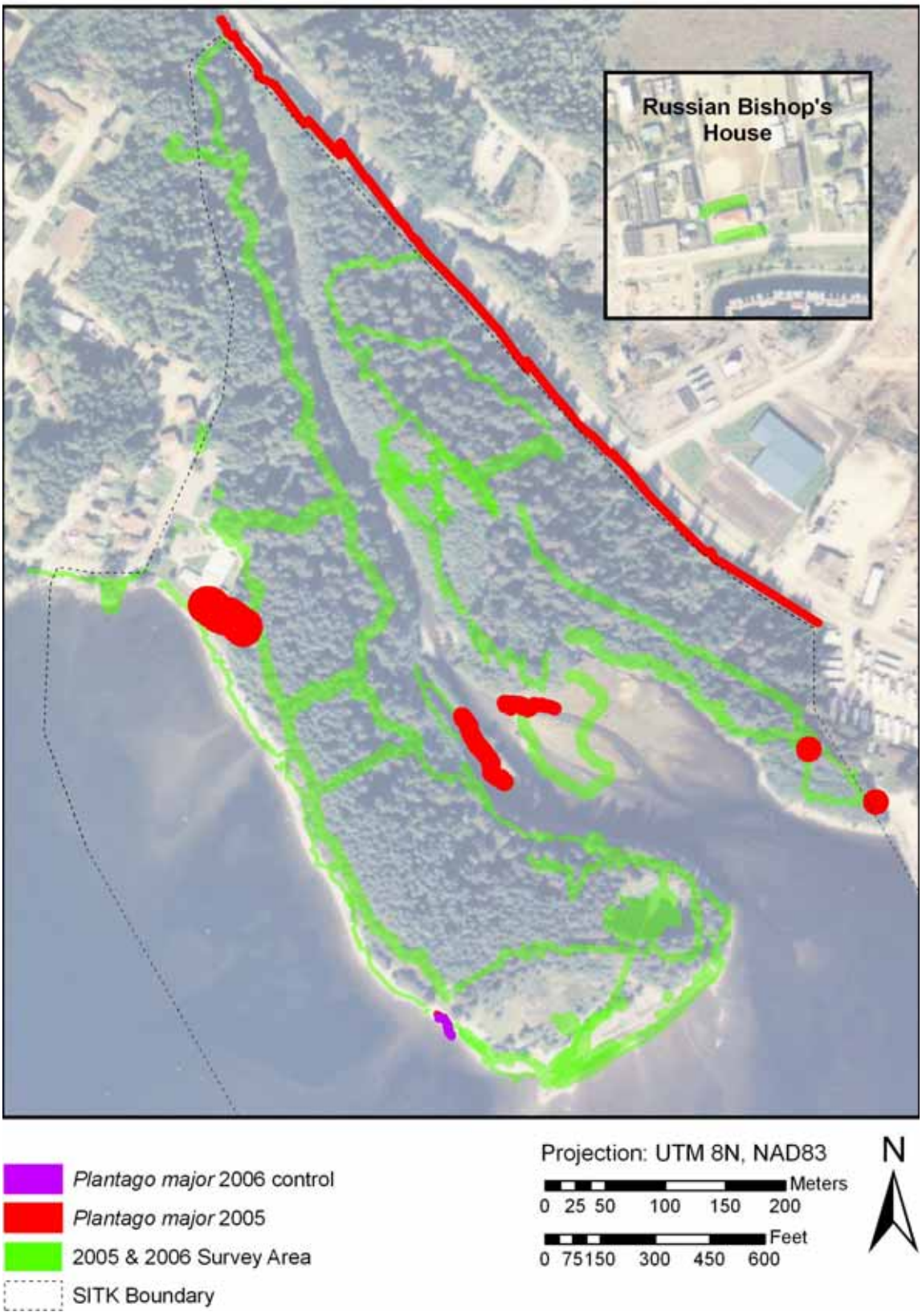
Matricaria discoidea

Myosotis scorpiodes

Phalaris arundinacea

Phleum pratense

Plantago major

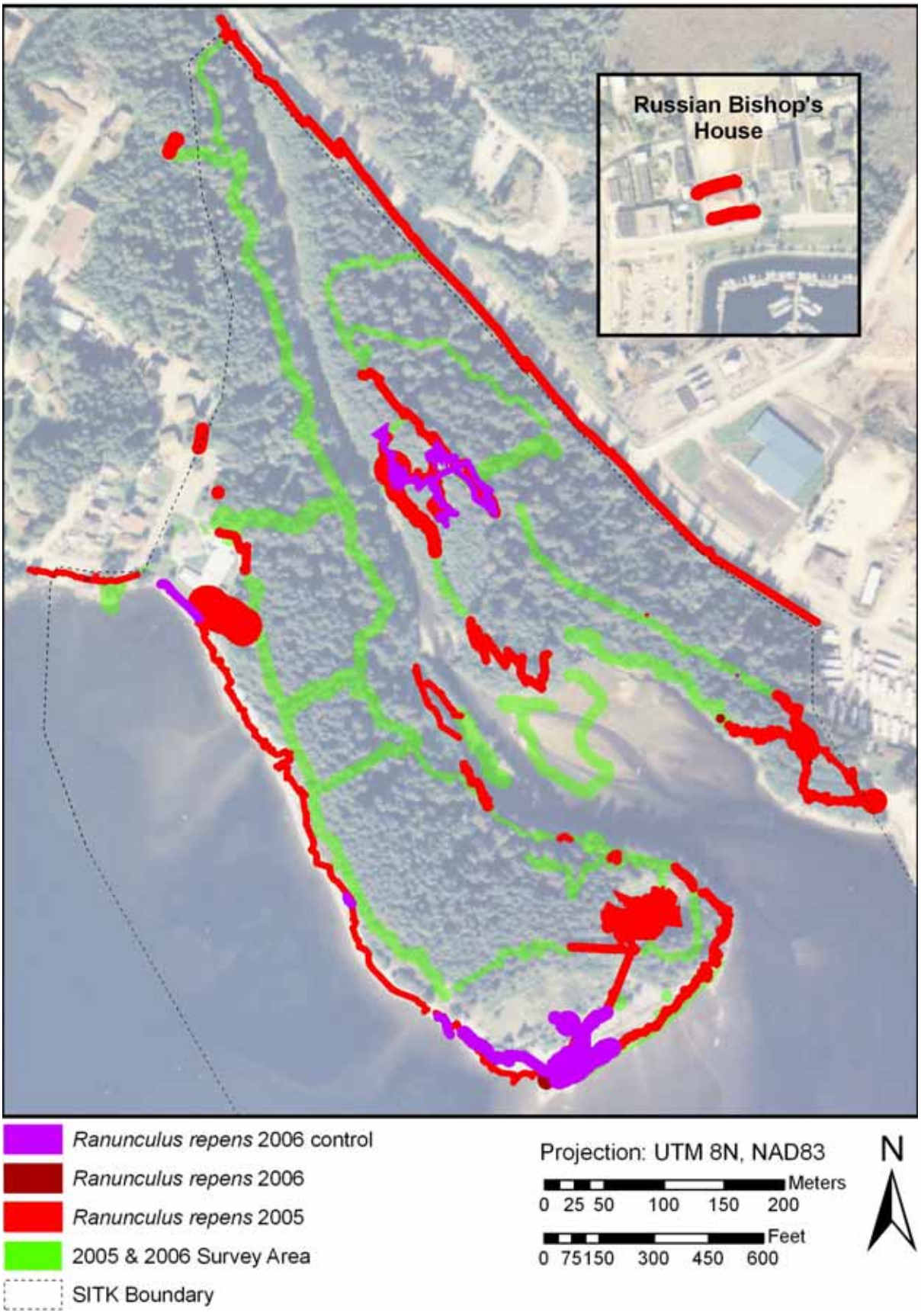


Polygonum cuspidatum

Prunus sp.


Russian Bishop's House
Projection: UTM 8N, NAD83
N
Meters
0 25 50 100 150 200
Feet
0 75150 300 450 600
Prunus sp. 2005
2005 & 2006 Survey Area
SITK Boundary

Ranunculus repens



Rosa rugosa

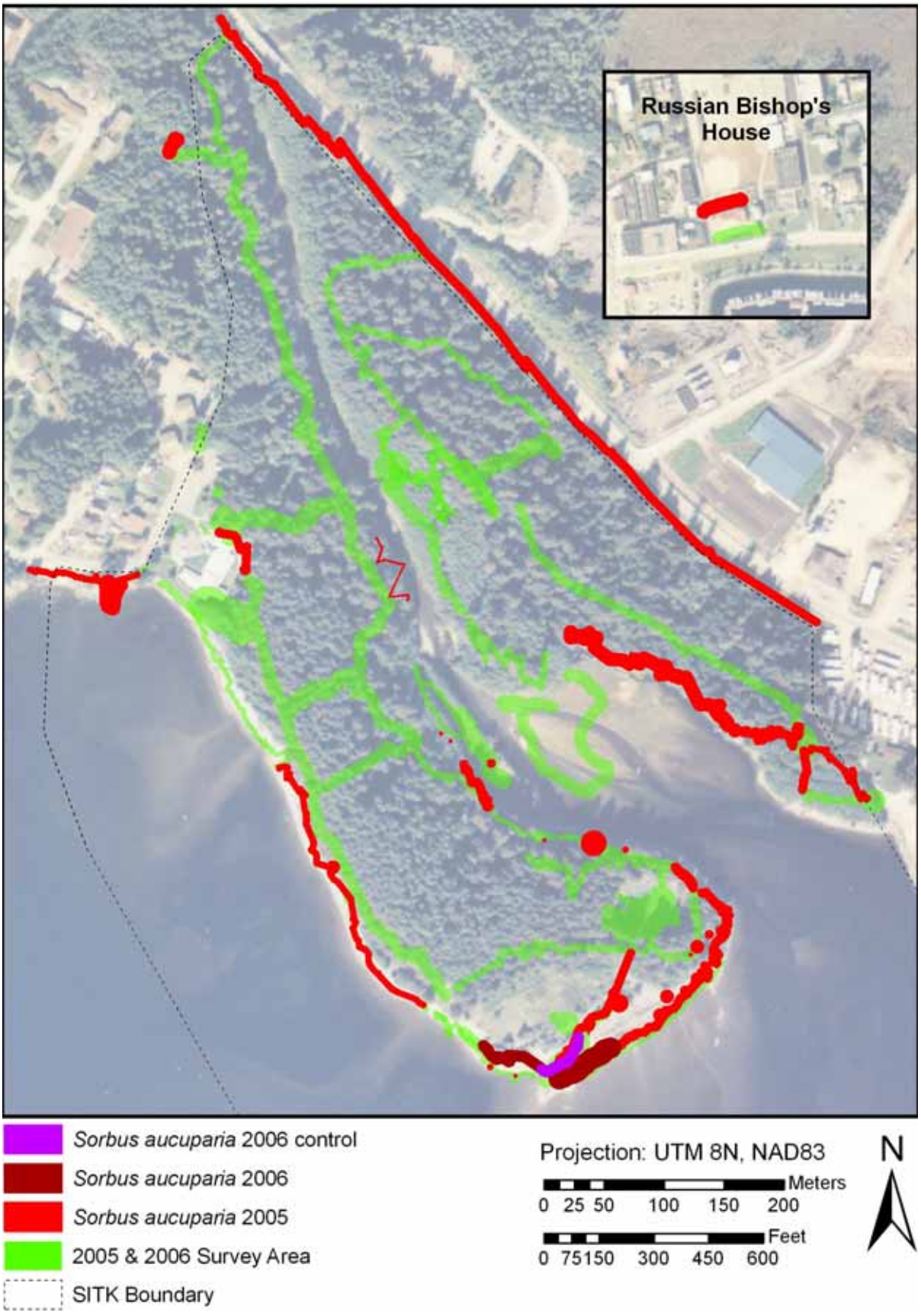

Russian Bishop's House
Projection: UTM 8N, NAD83
N
Meters
0 25 50 100 150 200
Feet
0 75150 300 450 600
Rosa rugosa 2006
2005 & 2006 Survey Area
SITK Boundary

Rumex acetosella

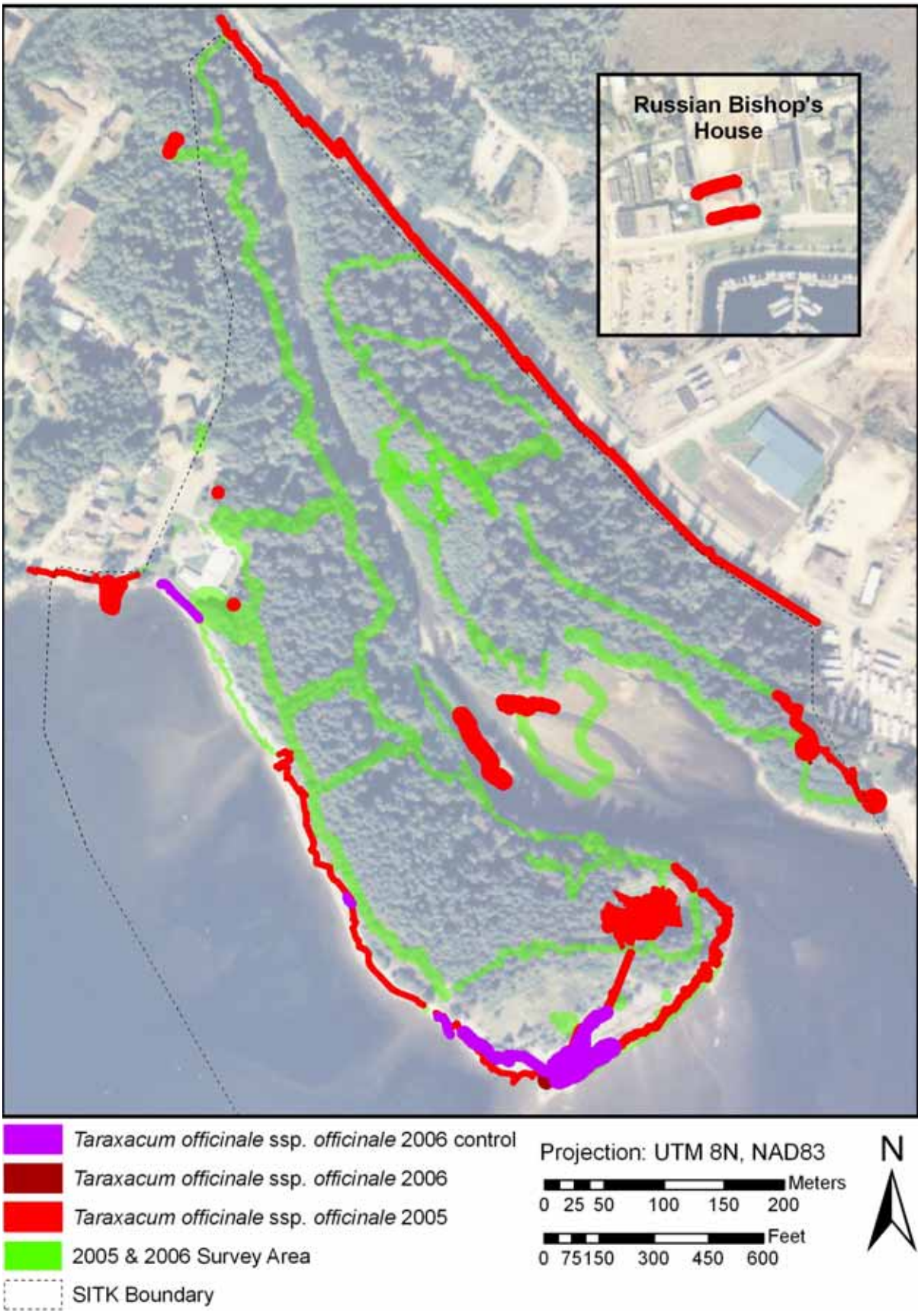
Rumex crispus

Sagina procumbens

Sorbus aucuparia

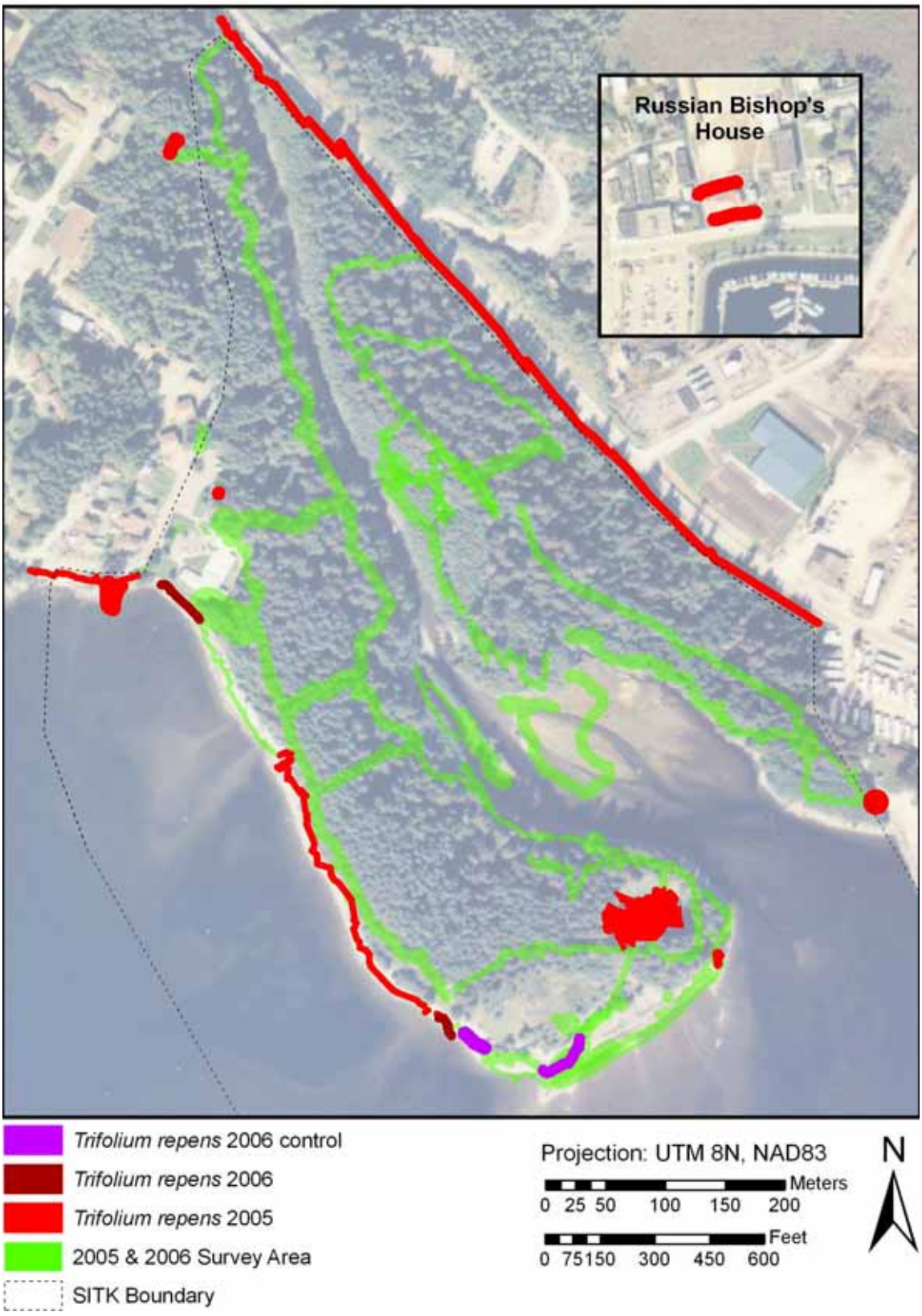


Taraxacum officinale ssp. *officinale*



Trifolium pratense

Trifolium repens



No Exotic Species Identified

Appendix C – Species biographies of select species prepared by the Alaska Natural Heritage Program

All documents from:
http://akweeds.uaa.alaska.edu/akweeds_ranking_geo.htm

Capsella bursa-pastoris
Cerastium fontanum ssp. *vulgare*
Chenopodium album
Digitalis purpurea
Leucanthemum vulgare
Linaria vulgaris
Matricaria discoidea
Phalaris arundinacea
Plantago major
Poa annua
Poa pratensis ssp. *pratensis*
Polygonum convolvulus
Polygonum cuspidatum
Ranunculus repens
Rumex acetosella
Rumex crispus
Silene spp.
Sorbus aucuparia
Taraxacum officinale
Trifolium pratense
Trifolium repens

Shepherd's purse

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

Synonyms: *Bursa bursa-pastoris* (L.) Britt., *Bursa bursa-pastoris* (L.) Britt. var. *bifida* Crépin, *Bursa gracilis* Gren., *Capsella rubella* Reut., *Thlaspi bursa-pastoris* L.
Other common names: None
Family: Brassicaceae

Description
Shepherd's purse is an annual or winter annual from a taproot, with an erect simple or branched stem usually 3 to 18 inches tall. The plant can be smooth or with simple and star like hairs. Basal leaves in rosettes, 1 to 6 inches long and up to 1½ inches wide, oblanceolate, more or less entire to pinnately lobed. The clasping stem leaves with lobed margins are stalkless and reduced in size upwards. Small white flowers appear in terminal clusters. Flowers, up to 3/8 inches across, are composed of 4 green sepals, 4 white petals, 6 stamens, and 1 pistil. The flowering stalk elongates during fruit development. The fruit is a triangular pod, 3/8 inches long, with about 20 seeds. Seeds are round to oblong, dull orange (Douglas and Meidinger 1998, Royer and Dickinson 1999, Whitson at al. 2000).

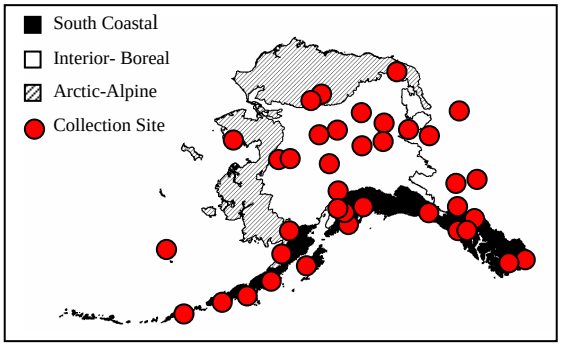
Shepherd's purse can be distinguished from native mustard, lyrate rockcress (*Arabis lyrata* L.), by its triangular seed pods, and its long, terminal racemose inflorescence.

Ecological Impact
Impact on community composition, structure, and interactions: Shepherd's purse is grazed by cattle, horses, yaks, sheep and rabbits (Crawley 1990). Its leaves are also eaten by insects and slugs (Aksoy et al. 1998, Dirzo and Harper 1980, Cook et al. 1996). Flowers are usually self-pollinated; however small insects, particularly flies and small bees, visit the flowers (Aksoy et al. 1998). Shepherd's purse is an host for nematode species and viruses (Royer and Dickinson 1999, Townshend and Davidson 1962).
Impact on ecosystem process: Shepherd's purse colonizes open ground and may inhibit the establishment of native species (Rutledge and McLendon 1996).

Biology and Invasive Potential
Reproductive potential: Shepherd's purse reproduces entirely by seeds. The number of seeds per plant varies mainly depending on habitat. Stevens (1932) recorded 38500 seeds per plant. Hurka and Haase (1982) in experiment recorded a minimum of 500 seeds and a maximum of 90000 seeds per plant. It can produce two or three generations in a year (Aksoy et al. 1998, Rutledge and McLendon 1996).
Role of disturbance in establishment: Shepherd's purse requires open soil and disturbance to germinate. Plants may appear on sites that have been redisturbed several decades after the last human disturbance (Densmore et al. 2001). In studies intense grazing led to greater densities of Shepherd's purse in perennial pastures (Harker et al. 2000).
Potential for long-distance dispersal: Seeds are small and light, and carried by wind or rain wash. They become sticky when moistened and can be dispersed on the feet of birds and mammals (Aksoy et al. 1998, Hurka and Haase 1982). Also they remain viable after passing through digestive tracts of birds, cattle, and horses (Rutledge and McLendon 1996).
Potential to be spread by human activity: Seeds may be transported in mud sticking to the feet of humans and to car tires (Aksoy et al. 1998, Densmore et al. 2001, Hurka and Haase 1982). Horticultural stock carried Shepherd's purse seeds as a contaminant (Hodkinson and Thompson 1997).
Germination requirements: Ripe seeds of Shepherd's purse are dormant and require a period of stratification before germination. Seeds germinate throughout the year, usually with a large peak in early

spring and a small peak in fall, at temperatures between 41°F and 86°F. Seeds of Shepherd's purse require light for germination (Aksoy et al. 1998, Baskin and Baskin 1986, Baskin and Baskin 1989, Popay and Roberts 1970).
Growth requirements: Shephard's purse is a plant of dry, open areas, showing some adaptability to moderate droughts. It is found mainly on clay to sandy loam with pH ranging from 5.0 to 8.0. Seedlings grow best at daytime temperatures of 68°F and nighttime temperatures of 59°F (Aksoy et al. 1998). This plant observed surviving winter temperatures as low as 10° F in Germany (Göppert 1881 cited in Aksoy et al. 1998).
Congeneric weeds: none
Listing: Capsella bursa-pastoris is listed as noxious weed in Colorado, Alberta, and Manitoba (Royer and Dickinson 1999, USDA, NRCS. 2006).

Distribution and abundance
Native and current distribution: Shephard's purse is native to Europe and West Asia. It has become cosmopolitan, and widely distributed throughout Europe, Asia, North America, Australia, and Africa. It was introduced into South America, New Zealand, and Tasmania (Hultén 1968). This species is well established in disturbed habitats of arctic of Greenland, Spitsbergen, Iceland, and Northland (Polunin 1957, Tolmatchev 1975). It has been documented in all ecogeographic regions of Alaska (Weeds of Alaska Database 2005, Hultén 1968, UAM 2004). Shepherd's purse is a common in cultivated crops, gardens, lawns, pastures, waste areas and roadsides (Alex and Switzer 1976, Aksoy et al. 1998, Royer and Dickinson 1999, Rutledge and McLendon 1996, Welsh 1974, Whitson at al. 2000).



Management
Shepherd's purse is a pioneer colonizer of disturbed areas and will not persist more than for 2-5 years unless the site is repeatedly disturbed. The plants can be easily pulled up by hand (Densmore et al. 2001).

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Last Updated January 23, 2006

Common mouse-ear chickweed (*Cerastium fontanum* ssp. *vulgare* (Hartman) Greuter & Burdet)
Sticky chickweed (*C. glomeratum* Thuill.)

Family: Caryophyllaceae

Common mouse-ear chickweed and sticky chickweed share similar biological and ecological attributes. Their ecological and community impacts are believed to be comparable and therefore we treat these species together.

Cerastium fontanum ssp. *vulgare* Synonyms: *C. adsurgens* Greene, *C. fontanum* ssp. *holosteoides auct.* non (Fries) Salman, van Ommering & de Voogd, *C. fontanum* ssp. *triviale* (Link) Jalas, *C. holosteoides* auct. non Fries, *C. holosteoides* var. *vulgare* (Hartman) Hyl., *C. triviale* Link, *C. vulgatum* L. 1762, non 1755, *C. vulgatum* var. *hirsutum* Fries, and *C. vulgatum* var. *holosteoides* auct. non (Fries) Wahlenb.
Other common names: big chickweed

Cerastium glomeratum Synonyms: *C. acutatum* Suksdorf, *C. glomeratum* var. *apetalum* (Dumort.) Fenzl, and *C. viscosum* auct. non L.
Other common names: none

Common mouse-ear chickweed. Photo by Mary Ellen Harte

Description
Common mouse-ear chickweed is a biennial or short-lived perennial with taproot. Flowering stems are prostrate, rooting at the nodes, forming clumps up to 15 inches across. Stems, 2 to 15 inches long, are covered with stiff glandular hairs. Stem leaves are opposite, lanceolate to ovate, up to 1 inch long, 1-nerved, coarsely hairy on both surfaces. Leaves of the flowering stems are larger, up to 1½ inches long. Flowers are erect or spreading, inconspicuous, commonly several to many in open clusters. Small flowers have 5 white, 2-cleft petals, about ¼ inches long. Petals are equal or nearly equal to the sepals. Sepals are hairy, papery-margined. Seeds are small in cylindrical, 10-valved capsules up to ½ inches long (Douglas and MacKinnon 1998, Hultén 1968, Welsh 1974).


Sticky chickweed. Larry Allain @ USGS National Wetlands Research Center

Sticky chickweed is very similar to common mouse-ear chickweed. Sticky chickweed can be distinguished be viscid stem and leaves. Flowers of sticky chickweed are more or less tightly clustered. Petals are shorter or only slightly longer than sepals (Douglas and MacKinnon 1998, Hultén 1968).

Number of native chickweeds are known from meadows and rocky slopes of Alaska and Yukon (field chickweed - *C. arvense* L., Fischer's chickweed – *C. fischerianum* Ser., and Bering chickweed - *C. beeringianum* Cham. & Schlechtand). These are usually matted perennials with petals longer than the sepals (Douglas and MacKinnon 1998, Cody 2000). Common chickweed (*Stellaria media* (L.) Vill.) can be distinguished by having a single line of hairs along each internode (Johnson et al. 1995, Hultén 1968, Welsh 1974)

Ecological Impact

Impact on community composition, structure, and interactions: Common mouse-ear and sticky chickweeds have not been observed in undisturbed plant communities in Alaska and its impact on native community composition is not documented. These species are a host for some nematode species (Townshend and Davidson 1962).

Impact on ecosystem process: Impact of common mouse-ear and sticky chickweeds on ecosystem processes is unknown.

Biology and Invasive Potential

Reproductive potential: Common mouse-ear chickweed and sticky chickweed reproduce by seeds and stems rooting at the nodes (Ohio perennial and biennial weed guide 2006).

Role of disturbance in establishment: Anthropogenic or natural disturbances are essential for the establishment of common mouse-ear chickweed and sticky chickweed from seeds (Broughton and McAdam 2002, Jesson et al. 2000, Ryan et al. 2002).

Potential for long-distance dispersal: Seabirds probably have some role in transport of seeds. Viable seeds of *Cerastium* species were found in pellets of sea gulls (Gillham 1956).

Potential to be spread by human activity: Common mouse-ear chickweed is a weed of gardens and lawns. It can be transported with horticultural stock (Hodkinson and Thompson 1997).

Germination requirements: Germination occurs throughout the year with peak of germination in fall and early spring. Maximum germination occurs at light and alternating temperatures of 68°F and 50°F (Grime et al. 1981, Williams 1983).

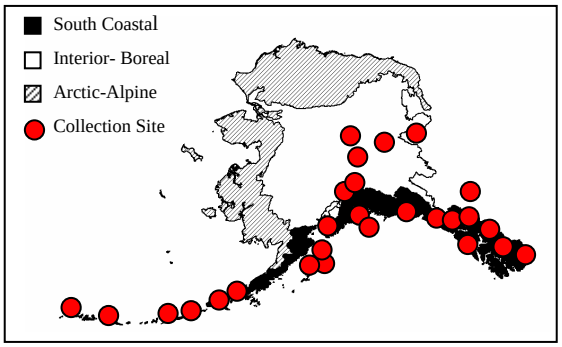
Growth requirements: The mouse-ear and sticky chickweeds are adapted to wide range of habitats, from dry open areas to moist woods, from mountain rocky slopes or river bars to nutrient rich sea-bird colonies (Jesson et al. 2000, Ryan et al. 2003). These weeds thrive in lawns and gardens and do not tolerate cultivation (Ohio perennial and biennial weed guide 2006).

Congeneric weeds: number of *Cerastium* species has been introduced into US but none of them listed as a noxious weed (USDA, NRCS 2006).

Listing: Cerastium fontanum ssp. *vulgarum* is listed as a noxious weed in Alberta and Manitoba, Canada. *Cerastium glomeratum* is not listed as a weed (Rice 2006).

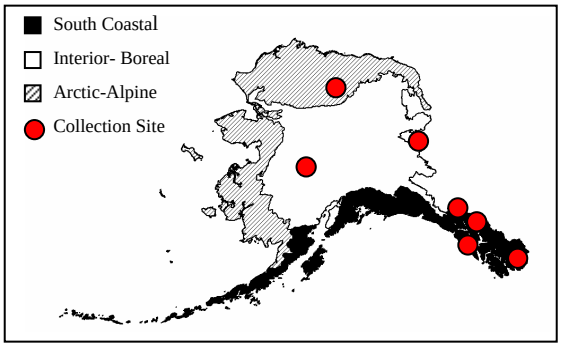
Distribution and abundance

Native and current distribution: Cerastium fontanum ssp. *vulgare* is native to Europe, Asia and Northern Africa. It is now found throughout the world. It is widely scattered in Alaska and Yukon. This species is a weed of roadsides, waste places, gardens and fields (Douglas and MacKinnon 1998, Welsh 1974).



Distribution of common mouse-ear chickweed in Alaska

Cerastium glomeratum is native to Eurasia. It is widespread in North America. It is known from many disjunct localities in Alaska and Yukon (Hultén 1968, Welsh 1974).



Distribution of sticky chickweed in Alaska

Management

Small population of common mouse-ear and sticky chickweeds can be controlled by hand-pulling. Herbicides can be effective when applied during active growth (AKEPIC 2005).

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Last Updated February 14, 2006

Lambsquarters

Chenopodium album L.

Synonyms: None
Other common names: pigweed, white goosefoot
Family: Chenopodiaceae

Description
Lambsquarters is an extremely variable plant, ranging in height from 6 inches to 3 ½ feet tall.It is a summer annual with bluish green stems which are branched, grooved, and blotched with red or purple. Leaves are alternate, simple, green above and mealy-white below. Leaf shape may be triangular, diamond-shaped, or lance-shaped. Flowers are minute and clustered into dense panicles. It blooms from June to September. Flowers are wind-pollinated.


Lambsquarters flowering plant

Lambsquarters is distinct from other Alaskan *Chenopodium* species in having a combination of smooth seeds, and broad, green leaves.

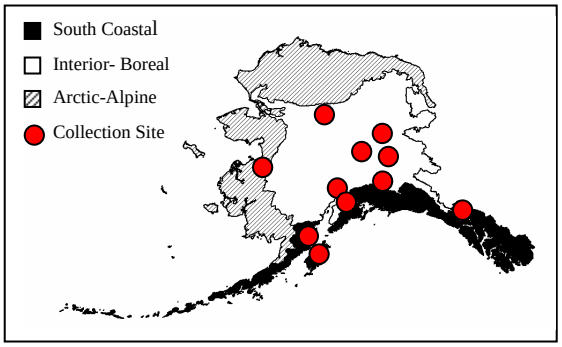
Ecological Impact
Impact on community composition, structure, and interactions: Lambsquarters has not been observed in undisturbed areas in Alaska. In other regions it has little or no effect on native plant communities. Plants are reported to be poisonous to sheep and pigs. It is an alternate host for a number of viral diseases of barley, beet, potato, turnip, and tobacco.

Impact on ecosystem process: It is unlikely that measurable impacts to ecosystem processes occur due to lambsquarters presence.

Biology and Invasive Potential
Reproductive potential: Lambsquarters is an annual that reproduces entirely by seeds. Each plant can produce over 500,000 seeds. Seeds remain viable in the soil for up to 40 years (Royer and Dickinson 1999).
Role of disturbance in establishment: In Alaska it colonizes disturbed areas and is present for only 1-3 years unless the site is repeatedly disturbed (Densmore et al. 2001). Buried seeds germinate on sites that have been re-disturbed several decades after the last human disturbance.
Potential for long-distance dispersal: Seeds can be carried by wind, but lack morphological adaptations for wind or animal dispersal.
Potential to be spread by human activity: Lambsquarters can contaminate grass and cereal seed. It also can be spread as contaminant of the topsoil and horticultural stock (Hodkinson and Thompson 1997). It does not spread along highway shoulders (Densmore et al. 2001).
Germination requirements: Seeds must be in the top 1 inch of soil to germinate.
Growth requirements: Lambsquarters has rapid growth, requiring moderate soil moisture. It grows best on disturbed, highly organic soil.
Listing: Chenopodium album is Noxious in Minnesota. “Weed” in Kentucky, Nebraska and Florida, United States, and Manitoba and Quebec, Canada (USDA 2003, Royer and Dickinson 1999).

Distribution and Abundance
Lambsquarters is a common weed of cultivated and recently disturbed areas throughout Canada and the United States. It is also found on river bottoms and eroded areas of overgrazed ranges, brush burns or logged forest openings, in desert grasslands, pinyon-juniper, and yellow pine forest of Arizona.
Native and current distribution: The species was introduced from Europe (Densmore at el. 2001,

Parker 1990). Its current distribution is worldwide, including Africa, North and South America, Australia, Hawaii, Greenland, and Norway).



Distribution of lambsquarters in Alaska

Management

Lambsquarters can be controlled by mechanical and chemical methods. It is strongly resistant to many common herbicides. No information was found about biological control.

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Last Updated April 4, 2006

Purple foxglove

Digitalis purpurea L.

Synonyms: None
Other common name: None
Family: Scrophulariaceae

Description
Foxglove is a herbaceous biennial or perennial with erect stems 3 to 6 feet tall. The lower leaves can grow to 12 inches long and 2 inches wide. They have a toothed margin and are soft-hairy above. The leaves are progressively smaller up the stem. It grows as a rosette the first year and in the second year it produces a leafy stock bearing a tall spike of bell-shaped, nodding flowers, originating from one side. Flowers are 1 1/2 to 2 3/8 inches long, generally pink (although ranging from white to purple) with dark spots on lower inside surface. The fruits is an ovoid capsule approximately 1/2 inch long, containing many minute seeds (Harris 2000, Whitson et al. 2000).

Photo by Dennis W. Woodland, Andrews University.

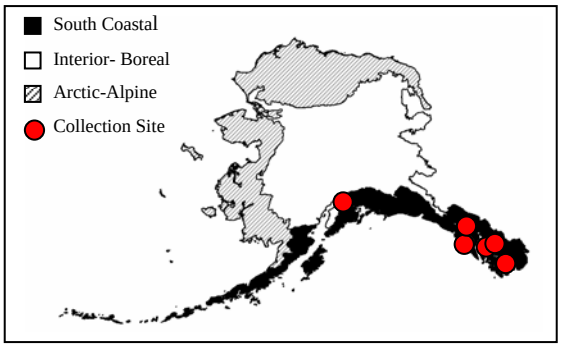
It is unlikely for this species to be mistaken for any other species in Alaska. All species of *Penstemon* in Alaska are under 2 feet in height. The pink-flowered *Mimulus lewisii* has a branched stem without a long spikes of flowers.

Ecological Impact
Impact on community composition, structure, and interactions: Foxglove readily colonizes disturbed areas, forming dense patches that displace natural vegetation (Harris 2000). It is toxic to human and animals (CUPPID 2004, Harris 2000, USDA 2002, Whitson et al. 2000). Rabbits and deer avoid the leaves of foxglove (Floridata 2002).
Impact on ecosystem process: As an invader of disturbed sites it is likely hinder natural successional processes.

Biology and Invasive Potential
Reproductive potential: Foxglove reproduces only by seed. Seeds remain viable in the soil at least five years (Harris 2000).
Role of disturbance in establishment: Roots of young plants are not able to penetrate turf or litter. Soil disturbance greatly increases establishment of seedlings (Harris 2000, Vazquez-Yanes et al. 1990).
Potential for long-distance dispersal: The small and numerous seeds are dispersed by wind and water (Harris 2000). However, the seeds lack specific adaptations for wind or animal dispersal.
Potential to be spread by human activity: It is cultivated as an ornamental plant and is grown commercially for a heart stimulant (Floridata 2002). It has escaped cultivation (Hultén 1968, Welsh 1974).
Germination requirements: Germination is best at warm temperatures (70-80°F). Seeds do not require cold stratification for germination (USDA 2002).
Growth requirements: Foxglove is adapted to fine and medium textured soils with pH ranging from 5.5 to 7. It requires 190 frost free days for successful development and reproduction. Foxglove can withstand temperature -13°F. It is shade intolerant (USDA 2002).

Congeneric weeds: *Digitalis lanata* Ehrh. is known as an invader of grasslands and woodlands in Wisconsin (WDNR 2004).
Listing: Foxglove is on the Colorado Invasive Weed Species List (BLM Colorado 2004).

Distribution and Abundance
This plant invades roadsides, disturbed areas, moist meadows, open woodland, and pastures (Harris 2000).
Native and current distribution: Foxglove is native to western Europe, the Mediterranean, and northwest Africa. It has become naturalized in other parts of Europe, Asia, Africa, South America, New Zealand, Canada, and much of the United States (Hultén 1968, USDA 2002, Wilson 1992).
In Alaska, it is widely established in the southeast, especially along road and logging disturbance. It is commonly planted as an ornamental throughout Southeast Alaska.



Distribution in Alaska

Management
Hand pulling can be an effective control of foxglove. Herbicides are more effective with large infestations. Control efforts are required for at least five years. Sites must be monitored for five to ten years after treatment, because of the long-lived seedbank. Biological control has not been pursued because of the plant's value in horticulture (Harris 2000).

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Last Updated November 23, 2004

Leucanthemum vulgare Lam.

Synonyms: *Chrysanthemum leucanthemum* L., *Leucanthemum leucanthemum* (L.) Rydb.
Common name: oxeye daisy, white daisy
Family: Asteraceae (Compositae)

Description

Oxeye daisy is a shallow-rooted plant with numerous stems from 1 to 3 feet tall. Stalked basal leaves are spatula-shaped, broadly toothed, and 2 to 5 inches long and 2 inches wide. The stem leaves are alternate, smooth, and glossy. The leaf stalks are short and clasp the stem. Solitary heads composed of white ray florets and yellow disc florets, 1 to 2 inches in diameter, are produced at the ends of stems. Seeds have no pappus (Hultén 1968, Royer and Dickinson 1999, Whitson et al. 2000).

In Alaska, the native arctic daisy (*Dendranthema arcticum*) could be confused with *Leucanthemum vulgare*. Arctic daisy is confined to rocky seashores and estuaries throughout coastal Alaska and is more low-growing, with wedge-shaped rather than spatulate basal leaves. All other Alaskan composite species with white ray flowers have either entire leaves or highly dissected leaves.

Ecological Impact

Impact on community composition, structure, and interactions: Oxeye daisy forms dense colonies, decreasing overall vascular plant diversity. It can quickly replace up to 50% of the grass species in pastures. The entire plant has a disagreeable odor and grazing animals avoid it. Moreover, the plant contains polyacetylenes and thiophenes that are generally highly toxic to insect herbivores. Oxeye daisy can host chrysanthemum stunt, aster yellows, tomato aspermy viruses, and several nematode species (Royer and Dickinson 1999). There is no known allelopathy potential.
Impact on ecosystem process: In heavy infestations there is an increase in the potential for soil erosion.

Biology and Invasive Potential

Reproductive potential: This species is a perennial that can spread both vegetatively and by seed. The plant flowers during its second year. Primarily insect pollinated, visitors include the insects from a number of different orders. Plant normally produces 1300 to 4000 fruits (Howarth and Welliams 1968). Seeds remain viable in the seed bank for at least 2-3 years.
Role of disturbance in establishment: Cutting, mowing, trampling and grazing promote establishment.
Potential for long-distance dispersal: Fruits are dispersed by wind, as well as in dung, but the fruits lack elongated pappus adapted for wind dispersal.
Potential to be spread by human activity: Seeds can be moved with timber, contaminated forage grass and legume seed. The plant continues to appear for sale in nurseries.
Germination requirements: Seedling germination is greater under increased moisture and is inhibited by continuous darkness. Dense groundcover can prevent establishment. Chilling and drought appear to have no effect on germination rates.
Growth requirements: Oxeye daisy is adapted to coarse and medium textured soil, pH 5.2-7. No cold-stratification required for germination. It withstands temperatures to -28°F, and requires 130 frost-free days (USDA 2002). This species has moderate summer porosity, and no coppice potential.
Listing: Noxious in Colorado, Minnesota (Secondary N. Weed), Montana (Cat. 1), Ohio, Washington (Class B), Wyoming (USDA 2002).

Distribution and Abundance

Introduced from Europe as an ornamental, it has escaped cultivation and is now common in native grasslands, pastures, waste areas, meadows, and roadsides. Oxeye daisy is a serious weed of 13 crops in 40 countries. In the U.S. it is found in every

state. It was introduced to the Pacific Northwest in the late 1800's.
Native and current distribution: Native to Europe (Mediterranean to Scandinavia) and Siberia. Populations have established in E. Asia, Iceland, Greenland, North and South America, Hawaii, Australia, and New Zealand (Hultén 1968).

Management
Oxeye daisy is easily killed by intensive cultivation. Herbicides active on oxeye daisy are available; these herbicides are not, however, specific. Application of nitrogen fertilizer is almost as effective as the herbicides at reducing canopy cover. Effective biocontrol insects or pathogens have not been found.

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Yellow toadflax

Linaria vulgaris P.Miller.

Synonyms: *Linaria linaria* (L.) Karst.
Other common name: butter and eggs, flaxweed, ramsted, wild snapdragon
Family: Scrophulariaceae

Description
The plant can reach a height of 2 feet and are rarely branched. Leaves are alternate, pale green, narrow, 2 ½ inches long. Flowers, resembling snapdragons, appear in dense terminal clusters. They are yellow with an orange throat and 1 to 2 inches long. The fruit is an ovate to egg-shaped capsule, 8 to 12 mm (ca. 3/8 – 1/2 inch) long. Seeds are flattened, ovate, winged (Royer and Dickinson 1999).

There are no other yellow, spurred species in Alaska that might be confused with yellow toadflax.

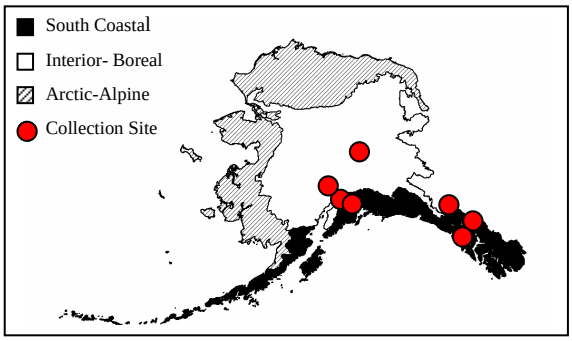
Ecological Impact
Impact on community composition, structure, and interactions: Yellow toadflax is a persistent, aggressive invader, capable of forming dense colonies; it can suppress native grasses and other perennials, mainly by intense competition for limited soil water. This species contains a poisonous glucoside that is reported to be unpalatable and moderately poisonous to livestock. Toadflax is an alternate host for tobacco mosaic virus.
Impact on ecosystem process: Unknown.

Biology and Invasive Potential
Reproductive potential: Yellow toadflax is a perennial that reproduces by seeds and creeping rhizomes. Plants are self-incompatible and insect pollinated. Seed production ranges from 1,500 to 30,000 seeds/individual, but seed viability is generally low. Seeds may remain dormant for periods up to 8-10 years. Vegetative reproduction may begin as soon as 2-3 weeks after germination, and it can establish from root fragments as short as ½ inch.
Role of disturbance in establishment: Disturbance promotes invasion and is necessary for establishment to occur. Once established, toadflax readily spreads into adjacent non-disturbed areas.
Potential for long-distance dispersal: Seeds are winged and can be carried by the wind. This species may also be dispersed by water and ants.
Potential to be spread by human activity: Toadflax can spread along highways. It has been found as a contaminant in commercial seed and is still is sold by some nurseries.
Germination requirements: Yellow toadflax requires open soil for germination (Densmore et al. 2001). Germination usually occurs in the top 2 cm of soil (Royer and Dickinson 1999). Germination success is generally low (Rutledge and McLendon 1996, Zouhar 2003).
Growth requirements: Seeds require a two to eight week period of chilling for successful germination (J. Gibson unpubl. data). It occurs on sandy and gravely soil on roadsides, pastures, cultivated fields, meadows, and gardens. Generally it does well in wet or dark areas with high fertility.
Congeneric weeds: *Linaria dalmatica* L., *L. genistifolia* (L.) P. Mill. (USDA 2002).
Listing: Linaria vulgaris is noxious in Colorado, Idaho, Nevada, New Mexico, Montana (Cat. 1), Oregon (B List), South Dakota, Washington (C List)

(Pokorny and Sheley 2003, USDA 2003). This species is a restricted noxious weed in Alaska (Alaska Administrative Code).

Distribution and Abundance

It was imported into North America in the late 1600s as an ornamental and for folk remedies. Yellow toadflax is found throughout the continental United States and in every Canadian province and territory.



Distribution of yellow toadflax in Alaska

Native and current distribution: Native to south-central Eurasia, the present world distribution includes most of Europe and Asia, Australia, New Zealand, South Africa, Jamaica, Chile, and North and South America (Hultén. 1968).

Management

Cutting, mowing and tilling are effective ways to eliminate plant reproduction through seeds. Herbicide treatment can significantly reduce plant infestation. The methods must be repeated annually for up to ten years to completely remove a stand. Vigorous, well adapted grasses can be used to compete with toadflax. Several insect species have been approved by the USDA. The weevil, *Gymnetron antirrhini*, is the most important agent for biological control in British Columbia and the northwestern U.S. Other species are shoot and flower-feeding beetle (*Brachypterolus pulicarius*) and root-boring moths *(Eteobalea serratella* and *E. intermediella*) (Carpenter and Murray 1998). (Fruits/seeds collected in Anchorage had ca. 20% infestation by an unknown weevil; M. Carlson - pers. obs.).

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Last Updated March 30, 2006

Pineappleweed

Matricaria discoidea DC.

Synonyms: *Artemisia matricarioides* auct. non Less, *Chamomilla suaveolens* (Pursh) Rydb., *Lepidanthus suaveolens* (Pursh) Nutt., *Lepidotheca suaveolens* (Pursh) Nutt., *Matricaria matricarioides* (Less) Porter, *M. suaveolens* (Pursh) Buch., *Santolina suaveolens* Pursh, *Tanacetum suaveolens* Pursh Hook.
Common name: disc mayweed
Family: Asteraceae.

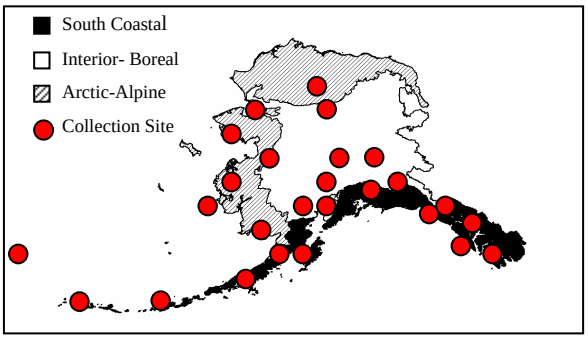
Description
Pineappleweed is a low-branching annual with leafy stems usually less than six inches tall, but sometimes up to one feet tall. The plant gives off a pineapple scent when crushed. Leaves are alternate, and divided several times into narrow segments. Small yellow disc florets are arranged in a cone-shaped head, 5 to 10 mm across. Ray florets are absent. Each head surrounded by several overlapping bracts with papery margins. It blooms from early spring to late autumn (Royer and Dickinson 1999, Whitson et al. 2000).

There are no other diminutive rayless composite species that may be confused with pineappleweed in Alaska.

Ecological Impact
Impact on community composition, structure, and interactions: This plant is not observed in undisturbed plant communities in Alaskan National Parks (Densmore et al. 2001). It has been reported as an alternate host for raspberry Scottish leaf curl virus (Royer and Dickinson 1999).
Impact on ecosystem process: Unknown.

Biology and Invasive Potential
Reproductive potential: Pineappleweed reproduces by seeds only.
Role of disturbance in establishment: Plants may appear when an area is disturbed by construction or trampling (Densmore et al. 2001).
Potential for long-distance dispersal: Seeds are gelatinous when wet and can stick to animals feet or fur. Seeds also can be dispersed by water (Rutledge and McLendon 1996).
Potential to be spread by human activity: Fruits disperse in mud attached to motor vehicles and can contaminate topsoil (Baker 1974, Hodkinson and Thompson 1997).
Germination requirements: Pineappleweed requires open soil and disturbance for germination (Densmore et al. 2001).
Growth requirements: Unknown.
Listing: Matricaria discoidea is listed as a weed in Kentucky, Nebraska, and Manitoba (Royer and Dickinson 1999, USDA, NRCS 2006).

Distribution and Abundance
Found throughout Canada and the United States. It is a common weed in Alaska, Yukon and Northwest Territories (Welsh 1974). It is often found growing on compacted soil in farmyards, waste areas, and roadsides.
Native and current distribution: Pineappleweed originated from western North America; it is now found in Europe, Asia, Greenland, Iceland, South America, and New Zealand (Hultén 1968).



Distribution of pineappleweed in Alaska

Management
Pineappleweed is easy to pull up, although several weedings may be necessary (Densmore et al 2001).

Herbicides are available, but this plant is resistant to a number of standard herbicides (Rutledge and McLendon 1996). No information is available on biological control.

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Last Updated March 30, 2006

Reed canarygrass

Phalaris arundinacea L.

Synonyms: *Phalaroides arundinacea* (L.) Raeusch.
Other common names: canary grass
Family: Poaceae

Description
Reed canarygrass is a robust, cool-season, sod-forming perennial that produces culms from creeping rhizomes, the culms grow ½ to 5 feet high. Leaf blades are flat, 2 to 6 inches long and ¼ to ½ inch wide. Flowers are arranged in dense, branched panicles. Immature panicles are compact and resemble spikes, but open and become slightly spreading at anthesis (Whitson et al. 2000). This taxon is morphologically variable, and more than ten varieties have been described.

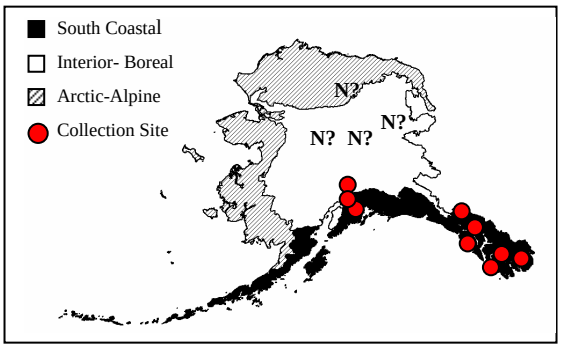
Reed canarygrass is unique having a single flower per spikelet and a more open, branched inflorescence (rather than a narrow spike as in timothy grass).

Ecological Impact
Impact on community composition, structure, and interactions: This grass form dense, persistent, monotypic stands in wetlands; these stands exclude and displace other plants. In Montana reed canarygrass poses a threat to the endangered aquatic plant *Howellia aquatilis*. Invasive populations of reed canarygrass are believed to be the result of crosses between cultivated varieties and native North American strains (Merigliano and Lesica 1998). Reed canarygrass grows too densely to provide adequate cover for small mammals and waterfowl. When in flower, it may case hay fever and allergies.
Impact on ecosystem process: It is promotes silt deposition and the consequent constriction of waterways and irrigation canals. Reed canarygrass may alter soil hydrology.

Biology and Invasive Potential
Reproductive potential: Reed canarygrass reproduces from seed and vegetatively from creeping rhizomes.
Role of disturbance in establishment: Invasion is promoted by disturbances such as ditching of wetlands and stream channelization, overgrazing, intentional planting, and alteration of water levels.
Potential for long-distance dispersal: Seeds have no adaptations for long-distance dispersal. Both rhizome fragments and seeds may wash downstream along streams and rivers.
Potential to be spread by human activity: Reed canarygrass has been planted widely for forage and erosion control.
Germination requirements: Seeds germinate more readily immediately following maturation. This species germinated well in experimental conditions after soaking in water at 50° C. Mechanical damage, increased light, and oxygen also successfully broke seed dormancy (Vose 1962).
Growth requirements: Reed canarygrass is adapted to fine and medium textured soils, pH 5.5-8. It is highly

anaerobic tolerant, shade intolerant, and does not require cold-stratification for germination. It is fire tolerant, withstands temperatures to -38°F, and requires 120 frost-free days for growth and reproduction. This species has dense porous summer vegetation, and no coppice potential (USDA 2002).
Listing: Phalaris arundinacea is a Noxious weed in Washington (Class C), Invasive weed in Nebraska, Tennessee, Wisconsin. It is a notorious global weed.

Distribution and Abundance
In the United States, the first agronomic trials probably began in the 1830s and it is now widespread in North America. Reed canarygrass is common in stream banks, margins of springs, and wet meadows, in central, south-central, and southeastern Alaska, southern Yukon, and northern British Columbia. It has ability to invade and dominate sedge meadows and wet prairies, may also pose a serious threat to upland oak savannas (Henderson 1991).
Native and current distribution: There is no consensus on its native status in North America (Merigliano and Lesica 1998) Hultén (1968) states, it is native to Europe, but some authors view it as native to Asia and North America as well (Welsh 1974). The present-day range extends throughout the Old and New Worlds, where it is found primarily in northern latitudes. Some populations of reed canarygrass are possibly native to Alaska. Four sites that may harbor native forms are from hot springs of interior Alaska (Big Windy, Kanuti, Kilo, and Manley Hot Springs; "N?" in figure).



Distribution of reed canarygrass in Alaska.

Management
Mechanical control methods may be feasible, however, the strategy may be too labor intensive and require a long-term time commitment. No herbicides are selective enough to be used in wetlands without the potential for injuring native species. Plants reestablish quickly from seeds after control methods are used. No biological control methods are known that are feasible for use in natural areas.

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Last Updated April 3, 2006

Common plantain

Plantago major L.

Synonyms: *Plantago asiatica* auct. non L., *Plantago halophila* Bickn.
Other common name: broadleaf plantain, buckhorn plantain, great plantain, rippleseed plantain
Family: Plantaginaceae

Description
Common plantain is an annual, biennial, or perennial with a thick rootstalk and extensive fibrous roots (up to 3 feet deep and wide). Flowering stalks can grow to 2 feet tall, but generally are 6 to 8 inches tall. Common plantain is hairless, except for a few hairs on the underside of leaves. It has a basal rosette of stalked, ovate to cordate leaves with smooth margins. The leaves are 2 to 12 inches long and up to 4 inches wide, and strongly 3 to 5-ribbed. The flowers are borne on one to many spikes from a leafless stalk. It has numerous small (2-4 mm in diameter), greenish-white flowers that fade to brown. Flowers are wind and fly pollinated and self-compatible. The fruit is an ovate capsule that splits around the middle; containing 5 to 30 seeds. The seeds are brownish-black, small, and elliptic to 4-sided (Sagar and Harper 1964, Royer and Dickinson 1999). This taxon is morphologically very variable and many subspecific forms have been recognized (Sagar and Harper 1964).

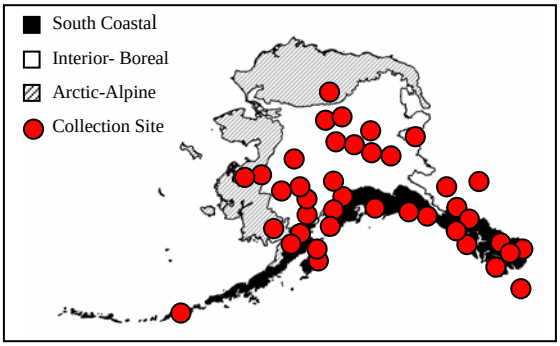
Six other species of plantain are known from Alaska, four of which are native. *Plantago major* is easily distinguished from these species by having broad, nearly hairless leaves and more than 6 seeds per capsule.

Ecological Impact
Impact on community composition, structure, and interactions: In Alaska, common plantain integrates into habitats with high disturbance and low interspecific competition (M.L. Carlson & I. Lapina – pers. obs.). It is known to reduce growth of corn and oats (Manitoba Agriculture and Food 2002). This taxon is an alternate host for number of viruses. Additionally, it serves as larval food for many species of butterflies and leaf miners (Sagar and Harper 1964).
Impact on ecosystem process: Unknown. This is an early pioneer species and may alter successional regimes.

Biology and Invasive Potential
Reproductive potential: Common plantain reproduces by seeds and from root fragments. A single plant can produce up to 14,000 seeds. Seeds are viable in soil for up to 60 years (Royer and Dickinson 1999, Rutledge and McLendon 1996).
Role of disturbance in establishment: Common plantain readily establishes in disturbed areas. In Alaska, plants often appear again on sites that have been redisturbed after previous disturbance (Densmore et al. 2001).
Potential for long-distance dispersal: Seeds are sticky when wet. They may adhere to soil particles, feathers, fur, skin, or vehicles (Royer and Dickinson 1999, Rutledge and McLendon 1996).
Potential to be spread by human activity: The plant travels widely with humans. Seeds can be spread by vehicles, contaminated topsoil, and commercial seeds (Hodkinson and Thompson 1997).
Germination requirements: This species has high variation in dormancy length, some seeds germinate in early spring, but many germinate later in the growing season. Seeds require light for germination. Between 60-90% germination of seeds is common (Palmblad 1968, Rutledge and McLendon 1996).
Growth requirements: It occupies a wide range of soils such as loam, clay, and sand, with pH ranging from 4.8 to 7.3. It is quite resistant to trampling, withstands temperatures to -38°F, and requires 85 frost-free days for successful growth and reproduction. It grows in infertile soil and has intermediate shade tolerance (Rutledge and McLendon 1996, USDA 2002).

Congeneric weeds: *Plantago media* L., *P. lanceolata* L., *P. patagonica* Jacq. (Royer and Dickinson 1999, Whitson et al. 2000).
Listing: Common plantain is listed as an invasive weed in Connecticut, Washington, Manitoba, and Quebec (USDA 2002). *Plantago* species are restricted noxious weeds in Alaska (Alaska Administrative Code 1987).

Native and current distribution
Many experts believe this taxon originated in Europe (Hultén 1968, Dempster 1993, Whitson et al. 2000), but it is now cosmopolitan in distribution. However, according to USDA Plants Database and ITIS (2003) this taxon is considered native to Alaska, Hawaii, and the continental US. Hitchcock and Cronquist (1973) recognize a native variety (var. *pachyphylla* Piper) of saline habitats and introduced variety (var. *major* L.). Greater study, using molecular and morphological markers and paleoecological study is necessary to tease apart the patterns of nativity of this species in Alaska.
Plantago major has been reported from all eco-regions of Alaska (Densmore et al. 2001, Hultén 1968, University of Alaska Museum 2003) and is found within 200 km of the arctic treeline. This species is a common weed in cultivated fields, lawns, roadsides, and waste areas. It can be found in open woods and in valleys and mid-montane sites.



Management
The plants can be pulled with relative ease, although several weedings may be necessary to eliminate plants germinating from buried seeds and root fragments. It is easily controlled by herbicides (Densmore et al. 2001, Rutledge and McLendon 1996).

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Last Updated December 21, 2004

Annual bluegrass

Poa annua L.

Synonyms: *Poa annua* var. *aquatica* Aschers., *Poa annua* var. *reptans* Hausskn.
Other common name: walkgrass
Family: Poaceae

Description
Poa annua is an annual to short-lived perennial tufted grass that often roots at lower nodes and can forms large mats. The stems are bright green and decumbent to more or less erect, ranging from 1¼ to 12 inches long. Leaf blades are soft-haired and 1/16 to 1/8 inch (1-4 mm) wide, light green, and prow-tipped. The flattened sheaths are loose and hairless. The inflorescence is 3/4 to 4 inches long and oval to pyramid-shaped (Hutchinson and Seymour 1982, Royer and Dickinson 1999). This species is very variable and numerous infraspecific taxa have been described (Hutchinson and Seymour 1982).

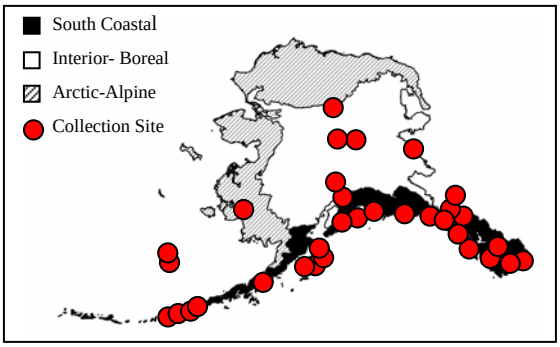
Poa annua is the only primarily annual bluegrass in Alaska. It is also identified by the presence of a small (1/2 the size of the second) claw-like first glume.

Ecological Impact
Impact on community composition, structure, and interactions: Annual bluegrass often forms dense mats that can reduce nutrient availability in the upper soil horizons. However, generally it does not compete well with established plants. This species hybridizes with *P. glauca* and *P. pratensis* at least in Britain. The seeds are eaten by numerous species of bird. Vegetative portions are probably eaten by deer since their scat often contains its seeds. A wide range of invertebrates feed on annual bluegrass (Hutchinson and Seymour 1982).
Impact on ecosystem process: As a pioneer species *Poa annua* often dominates and may limit colonization by native species. Results from the field experiments suggested that native seed germination and survival is reduced by the presence of annual bluegrass litter (Bergelson 1990).

Biology and Invasive Potential
Reproductive potential: Annual bluegrass reproduces primarily by seed. It grows and reproduces rapidly. Seed production may exceed 20,000 in a season under ideal conditions (Hutchinson and Seymour 1982, Rutledge and McLendon 1996). Longevity of seeds varies from about a year to about 6 years for decumbent varieties (Chippendale and Milton 1934, Hutchinson and Seymour 1982, Roberts and Feast 1973).
Role of disturbance in establishment: It persists on sites that are kept open by trampling by livestock or human activities (Hutchinson and Seymour 1982). Cutting annual bluegrass below 1/4 to ½ inch increases seedling vigor and increases the competitive ability of this grass. This taxon readily establishes along introduced mineral substrates in south-central and southeast Alaska (M.L. Carlson & I. Lapina – pers. obs.).
Potential for long-distance dispersal: Annual bluegrass has a low to medium potential for dispersal based on seed weight and seed shape. Seeds are likely dispersed by rain, wind, and birds. Seeds remain viable after passing through the digestive tracts of some animals such as cows, horses, and deer (Hutchinson and Seymour 1982, Rutledge and McLendon 1996).
Potential to be spread by human activity: Seeds can be carried in mud on boots and vehicles. It is commonly transported as an impurity of lawn grass seed (Hutchinson and Seymour 1982, Rutledge and McLendon 1996, Whitson et al. 2000).
Germination requirement: Annual bluegrass starts germinating in late summer or fall as soil temperatures fall below 70°F and significant moisture is available. It continues to germinate throughout winter if temperatures are not too cold (cf. Hutchinson and Seymour 1982).

Growth requirements: Annual bluegrass is adapted to all soil textures with pH 4.8 – 8.0. It has a relatively low nutrient requirement and grows well in moist areas in full sun. It withstands temperatures to -47°F, and requires 60 frost-free days for growth and reproduction. Annual bluegrass has low drought and fire tolerance (USDA 2002).
Congeneric weeds: *P. pratensis* L., *P. compressa* L., *P. trivialis* L. (Hultén 1968, Royer and Dickinson 1999, Whitson et al. 2000).
Listing: This plant listed as invasive weed in 15 states of the United States (Royer and Dickinson 1999, USDA 2002).

Distribution and Abundance
Poa annua thrives in lawns, gardens, cultivated crops, pastures, roadsides, areas of habitation and other open areas (Hutchinson and Seymour 1982).
Native and current distribution: Annual bluegrass is a native of Europe but is now distributed worldwide. It was introduced to North Africa, Mexico, Central and South America, New Zealand, Australia. It is also found above the Arctic circle (Hultén 1968, Hutchinson and Seymour 1982). This taxon has been collected in South Coastal, Interior-Boreal, and Arctic-Alpine ecoregions in Alaska (Hultén 1968, University of Alaska Museum 2003).



Management
Controlling annual bluegrass manually is very expensive and inefficient. Hoeing or hand-weeding must be done frequently, as new flushes of seedling plants germinate after the older seedlings are removed. A number of herbicides are available, but they are not specific to annual bluegrass (Rutledge and McLendon 1996).

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Last Updated December 12, 2004

Kentucky bluegrass (*Poa pratensis* ssp. *pratensis* L.)

Spreading bluegrass (*Poa pratensis* ssp. *irrigata* (Lindm.) Lindb. f.)

Rough bluegrass *(Poa trivialis* L.)

Family: Poaceae

Kentucky bluegrass, spreading bluegrass, and rough bluegrass share similar biological and ecological attributes. Their ecological and community impacts are believed to be comparable and therefore we treat these species together.

Poa pratensis ssp. *pratensis* Synonyms: *Poa agassizensis* Boivin & D. Löve, *Poa angustifolia* L., *Poa pratensis* ssp. *agassizensis* (Boivin & D. Löve) Taylor & MacBryde, *Poa pratensis* ssp. *angustifolia* (L.) Lej., *Poa pratensis* var. *angustifolia* (L.) Gaudin, *Poa pratensis* var. *domestica* Laestad., *Poa pratensis* var. *gelida* (Roemer & J.A. Schultes) Böcher, *Poa pratensis* var. *iantha* Wahlenb.
Taxonomic notes: Kentucky bluegrass is a subspecies of a larger species complex with native and non-native forms. The systematics of this group and nativity of its components does not appear to be well understood. ITIS and PLANTS databases treat this subspecies as native to Alaska; however, we adopt the treatment of local experts (Hultén 1968, Cody 1996), who consider it introduced to Alaska and the Yukon.
Other common names: none

Poa pratensis ssp. *irrigata* Synonyms: *Poa pratensis* var. *rigens* (Hartman) Wahlenb., *Poa pratensis* ssp. *rigens* (Hartman) Tzvelev, *Poa pratensis* ssp. *subcaerulea* (Sm.) Hiitonen, *Poa subcaerulea* Sm.
Taxonomic notes: this subspecies in the *P. pratensis* complex appears to be universally treated as non-native.
Other common names: none

Poa trivialis Synonyms: none
Other common names: none

Description
Kentucky bluegrass and spreading bluegrass are strongly rhizomatous, mat-forming, perennials, ranging from 0.5 to 2.5 feet tall. Rough bluegrass lacks rhizomes and is tufted with decumbent bases of the culms growing to 3 feet tall. Leaf blades are flat to folded, smooth, with a double mid-rib. Leaf tips are prow-shaped as in most *Poa* species. Sheaths are rounded to somewhat keeled, partially closed, and smooth. The inflorescence is a broadly pyramidal compact panicle. Spikelets are coarse and large in all three taxa (Sather 1996, Welsh 1974).


Kentucky bluegrass

Kentucky bluegrass and spreading bluegrass can be separated from other Alaskan *Poa* taxa by a combination of traits. Most notable is that it is rhizomatous and mat-forming with relatively wide (1.5-4 mm) flat leaves. Kentucky bluegrass generally has 5 branches on the lowest whorl of the inflorescence, while spreading bluegrass most often has 2 branches on the lowest whorl and has shorter, spreading culms. Both of these taxa also have large anthers (1-2 mm long), a tuft of long cobwebby hairs at the base of the lemma, but not between the keel and marginal nerve. Additionally, they have normal glumes (short, broad, and rounded).


Spreading bluegrass

Rough bluegrass is distinguished by an acute, long (4-5 mm) ligule of upper leaves, a very prominent nerve between keel and marginal nerve on lemma, and by narrow, curved, highly acute first glume (Hultén 1968).


Rough bluegrass

Ecological Impact

Impact on community composition, structure, and interactions: Kentucky bluegrass is known to compete with native species, reducing overall diversity and altering species composition (Rutledge and McLendon 1996, Sather 1996, Wisconsin DNR 2003). It is less nutritious and has a shorter growing period than native grasses and therefore it can negatively impact grazing species (Sather 1996). However, Kentucky bluegrass has been noted for positive effects in wildlife management. It can be an important component in the diets of elk and mule deer. The leaves and seeds are eaten by many species of rodents, rabbits, and songbirds. Kentucky bluegrass-dominated grasslands create habitat for species of small mammals and birds (Uchytil 1993). It is a host for number of pest insects and diseases (Butterfield et al. 1996). In Alaska, this species is rarely found in undisturbed sites (J. Conn – pers. comm.)

Impact on ecosystem process: Kentucky bluegrass may retard or cause long-term alterations to successional patterns (Butterfield et al. 1996). This species does not appear to seriously hamper succession in Alaska.

Biology and Invasive Potential

Reproductive potential: These grasses are reproductively aggressive, spreading from seed and rhizomes in the case of Kentucky and spreading bluegrasses. Kentucky bluegrass can produce 200 seeds per panicle in the first year. In soil samples from a pasture in the Netherlands a maximum of 560 seed/m^2 was reported (Sather 1996). The production of more than 1000 seeds per rough bluegrass plant has been documented (Froud-Williams and Ferris 1987). Rhizomes can extend the horizontal growth of the bluegrass plants as much as 2 square meters in 2 years (Rutledge and McLendon 1996, Sather 1996).

Role of disturbance in establishment: Kentucky bluegrass readily establishes by seeds on disturbed sites. The species increases with grazing and burning (Sather 1996, Weaver and Darland 1948). These grasses appear to require some level of substrate disturbance for successful invasion.

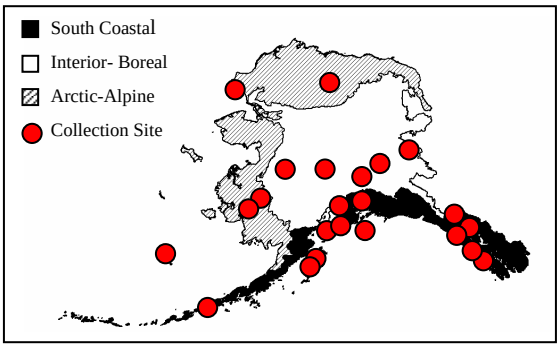
Potential for long-distance dispersal: Seeds can be spread short distances (Froud-Williams and Ferris 1986). These grasses do not have clear adaptations for long-distance dispersal.

Potential to be spread by human activity: They are commonly planted as a lawn and pastures grasses. Over 100 cultivars have been developed (Butterfield et. al. 1996). It is used in Alaska, Colorado, and Wisconsin for soil stabilization along highway road ways (Uchytil 1993).

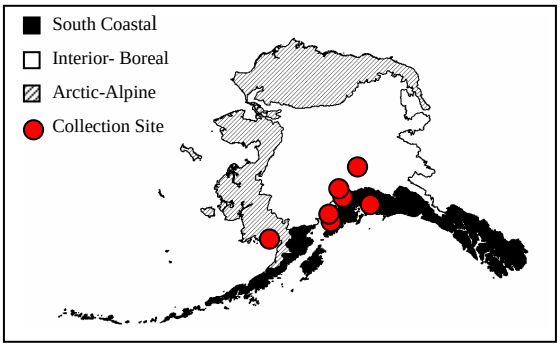
Germination requirement: *Poa pratensis* is a fall germinating species. Freshly harvested seeds require a cold treatment at 41° to 59°F for 10-14 days for germination. *Poa trivialis* can germinate in a wide range of temperatures, but those less than 50°F delay germination. Both species require light, but are known to germinate from depths as great as 42 inches

within the first four years after burial (Sather 1996, Froud-Williams and Ferris 1987, Budd 1970).
Growth requirements: These grasses are adapted to fine and medium textured soils with pH between 5 and 8. These grasses prefer rich soils. Precipitation optimum ranges of 20 to 50 inches annually. Kentucky and spreading bluegrasses do not tolerate shading. Kentucky bluegrass withstands temperatures to -38°F, and requires 90 frost-free days. Optimum temperatures for growth are between 61° and 90°F. Rough bluegrass withstands temperatures to -28°F, and requires 120 frost-free days (Gubanov et al 2003, USDA 2002).
Congeneric weeds: *Poa annua* L. and *P. compressa* L. (Hultén 1968, Royer and Dickinson 1999, Whitson et al. 2000).
Listing: Poa pratensis listed as an invasive weed in Nebraska and Wisconsin. *Poa trivialis* is restricted weed seed in New Jersey and Virginia (Invaders Database System 2003, USDA 2002).

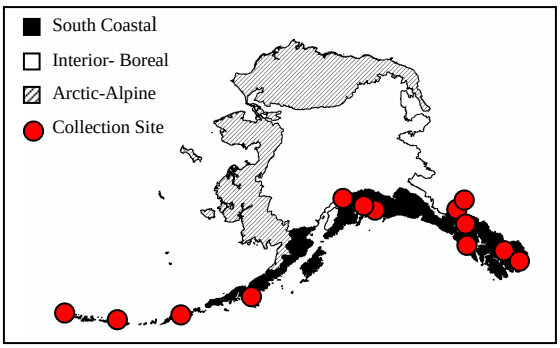
Distribution and Abundance
Kentucky, spreading, and rough bluegrasses can be found in meadows, open woodlands, prairies, and disturbed sites. In the western states, Kentucky bluegrass frequently occurs as an understory species, dominant in open aspen, ponderosa pine, sagebrush, and riparian habitats (Uchytil 1993).
Native and current distribution: Kentucky bluegrass is generally considered to be an exotic in North America. However, some botanists argue that populations in remote mountain meadows of the western United States may be native (Gleason and Cronquist 1963). It is found naturalized in all states and in Canada from Labrador to the west coast. Spreading bluegrass is clearly an introduced lawn grass. These grasses have been introduced into S. America, New Zealand, and Australia (Hultén 1968). Kentucky bluegrass and spreading bluegrass have been collected in all ecogeographic regions in Alaska (however, many of these collections may represent native subspecies). Rough bluegrass is documented in South Coastal ecogeographic region (Weeds of Alaska Database 2005, UAM 2005, Hultén 1968).



Distribution of Kentucky bluegrass (*Poa pratensis*) in Alaska



Distribution of spreading bluegrass (*Poa pratensis* ssp. *irrigata*) in Alaska



Distribution of rough bluegrass (*Poa trivialis*) in Alaska

Management
These bluegrasses rarely produce pure stands. Kentucky bluegrass's rhizomatous habit permits it to penetrate areas between plants. Eradication of the grass may not be feasible, since practices that will damage it generally harm the co-occurring species more (Sather 1996). The only realistic management goals may be to reduce vigor and contain its spread (Butterfield et al. 1996, Uchytil 1993).

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Last Updated October 13, 2005

Black bindweed

Polygonum convolvulus L. (*Fallopia convolvulus* (Linnaeus) Á. Löve)

Synonyms: *Bilderdykia convolvulus* (Linnaeus) Dumortier; *Fallopia convolvulus* var. *subalata* (Lejeune & Courtois) D. H. Kent; *Reynoutria convolvulus* (Linnaeus) Shinners; *Tiniaria convolvulus* (Linnaeus) Webb & Moquin-Tandon ex Webb & Berthelot
Other common names: climbing buckwheat, climbing knotweed, cornbind, dullseed cornbind, pink smartweed, wild buckwheat
Family: Polygonaceae

Description
Black bindweed is an annual climbing herb with a thin and deep root, and is not rhizomatous. The stem is slender, up to 3 feet long, with long internodes. It is freely branched from the base, sometimes with a reddish tinge, trailing on the ground or twining around other plants. The leaves are alternate, 1-1½ inches long, long-petioled, elongate-ovate or arrow-shaped with backward-pointed basal lobes. The leaves emerge fom a papery sheath that surrounds the stem. Flowers are small, inconspicuous, up to ¼ inch long and grouped in short axillary clusters of 2 to 6 flowers. The fruit is a triangular achene with an obtuse base and pointed top (FNA 1993+, Royer and Dickinson 1999).


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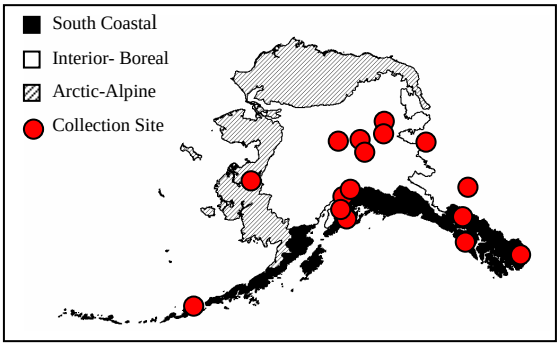
Black bindweed may be confused with field bindweed (*Convolvulus arvensis* L.), if not flowering. In contrast to black bindweed, field bindweed is a deep-rooted perennial with extensive creeping rhizomes, rounded tips of leaves and large funnel-shaped pink or white flowers. It does not have papery leaf sheaths (Royer and Dickinson 1999, Whitson et al. 2000).

Ecological Impact
Impact on community composition, structure, and interactions: Black bindweed has the ability to quickly cover bare ground and spread rapidly. The seeds and leaves are important food for birds (Wilson et al. 1999). Black bindweed is an alternate host for number of fungi, viruses, and nematode species (Cooper and Harrison 1973, Royer and Dickinson 1999, Townshend and Davidson 1962).
Impact on ecosystem process: Black bindweed quickly covers bare soil (Hume et al. 1983, Rutledge and McLendon 1996). It may prevent the establishment of native species.

Biology and Invasive Potential
Reproductive potential: The plant is an annual and reproduces entirely by seeds. Each plant is capable of producing over 30,000 seeds (Stevens 1932, Forsberg and Best 1964). The hard seed coat allows for several years of dormancy (Chippendale and Milton 1934, Conn and Deck 1995, Roberts and Feast 1973).
Role of disturbance in establishment: Black bindweed tends to colonize disturbed ground (Rutledge and McLendon 1996). Small-scale animal disturbances can be sufficient for black bindweed to establish (Milton et al. 1997).
Potential for long-distance dispersal: Seeds can be dispersed by water over short distances (Rutledge and McLendon 1996).
Potential to be spread by human activity: Seeds can be dispersed by farm machinery. This plant is also a common cereal crop contaminants (Gooch 1963, Rutledge and McLendon 1996).
Germination requirements: Emergence of seedlings occurs throughout the growing season. Germination occurs at between ¼ to 2 inches deep, although research has shown emergence from 7 ½ inches deep (Forsberg and Best 1964). Light is not required for germination. Seeds of black bindweed germinate at temperatures of 36° – 86°F, with maximum germination occurring at 41° to 59°F.

Growth requirements: Black bindweed occurs on a wide range of soil types (Hume et al. 1983). Shading usually suppresses the growth of black bindweed (Haman and Peeper 1983).
Congeneric weeds: *Polygonum cuspidatum* Sieb. & Zucc., *P. perfoliatum* L., *P. polystachyum* Wallich ex Meisn., *P. sachalinense* F. Schmidt ex Maxim. are declared noxious weeds in number of American states (USDA, NRSC 2006*).* Also *Polygonum arenastrum* Jord. ex Boreau, *P. caespitosum* Blume, *P. aviculare* L., *P. orientale* L., *P. persicaria* L., and *P. lapathifolium* L. are listed as a weeds in PLANTS Database (USDA, NRSC 2006). A number of *Polygonum* species native to North America have a weedy habit and are listed as noxious weeds in some of the American states. Although the latest taxonomy considers these species as a species of three different genera: *Polygonum*, *Fallopia* and *Persicaria* (FNA 1993+), they are closely related taxa and can be considered as congeneric weeds.
Listing: Fallopia convolvulus is declared noxious in Alaska, Alberta, Manitoba, Minnesota, Oklahoma, Quebec, and Saskatchewan (Alaska Administrative Code 2006, Rice 2006).

Distribution and abundance
Native and current distribution: Black bindweed has been introduced from Eurasia. It is now found throughout Canada and the United States (Royer and Dickinson 1999). It has also been introduced into Africa, South America, Australia, New Zealand, and Oceania (Hultén 1968, USDA, ARS 2003). Black bindweed has been collected in all ecogeographic regions of Alaska (UAM 2006). It is a common weed in cultivated fields, gardens, and orchards. It may also be found on waste grounds, in thickets, on roadsides, and occasionally in pastures and on river banks (Hume 1983).



Management
Mechanical methods have only limited success in controlling black bindweed. A number of chemicals are recommended for control of this weed. Several pathogenic fungi have been studied as a potential biocontrol agent for this weed (Dal-Bello and Carranza 1995, Mortensen and Molloy 1993).

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Japanese knotweed

Polygonum cuspidatum Sieb. & Zucc.

(*Fallopia japonica* (Houtt.) R. Decr.)

Other synonyms: *Pleuropterus cuspidatum* (Sieb. & Zucc.) Moldenke; *P. zuccarinii* (Small) Small; *Polygonum zuccarinii* Small; *Reynoutria japonica* Houtt
Other common names: Japanese bamboo, fleeceflower
Family: Polygonaceae

Description
Japanese knotweed is a perennial with long creeping rhizomes. Stems are stout, hollow reddish-brown, 4 to 9 feet tall, and swollen at the nodes. Twigs often zigzag slightly from node to node. Leaves are alternate, short-petioled, broadly ovate with more or less truncate bases and acuminate tips, and 2 to 6 inches long. Rhizomes are thick, extensive, 5-6 m long, and store large quantities of carbohydrates. Plants are dioecious with male and female flowers on separate plants. The inflorescences are branched, open, and lax, with numerous flowers (ca. 2 mm long). This species is pollinated by insects (Whitson et al. 2000).

All other native species of *Polygonum* in Alaska are considerably smaller and without broad leaves. Giant knotweed (*P. sachalinense*) or hybrids between Japanese and giant knotweeds may also be present in Alaska. Giant knotweed has more heart-shaped leaf bases and less tapered tips than Japanese knotweed.

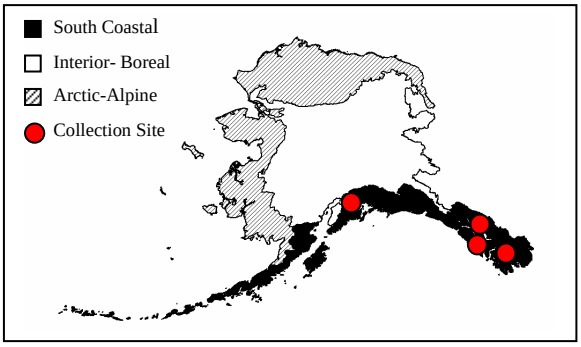

Japanese knotweed flowering stem

Ecological Impact
Impact on community composition, structure, and interactions: Japanese knotweed forms single-species stands, reducing of biodiversity through outshading native vegetation. This species clogs waterways and lowers the quality of habitat for wildlife and fish. It reduces the food supply for juvenile salmon in the spring. Japanese knotweed hybridizes with the introduced giant knotweed, *Polygonum sachalinense* (Saiger 1991).
Impact on ecosystem process: There is an increased risk of soil erosion due to the presence of this species. Dead stems and leaf litter decompose very slowly and form a deep organic layer, which prevents native seeds from germinating, thus altering the natural succession of native plant species. During dormant periods, dried stems and leaves and can create a fire hazard.

Biology and Invasive Potential
Reproductive potential: Reproduction is primarily by vegetative regeneration of rhizomes and fresh stems. Very small fragments of rhizome (as little as 0.7 grams) can produce a new plant. Seed production in Britain varies from none when fertile male plants are rare to several hundred seeds nearer to sources of *F. baldschuanica* and *F. sachalinensis* (Beerling et. al. 1994). No systematic study of the seed longevity has been undertaken, but seed stored at room temperature, retained viability for four years.
Role of disturbance in establishment: Japanese knotweed can establish in native habitats with little or no observable disturbance.
Potential for long-distance dispersal: Plant fragments washed downstream are capable of producing new colonies. Example of dispersal across marine waters has also been reported (Beerling et. al. 1994). Fruits disperse primarily with wind.
Potential to be spread by human activity: Japanese knotweed has been planted as an ornamental in Southeast Alaska and in the Anchorage area and

commonly escapes from gardens. Additionally, transportation of soil containing rhizome fragments on construction/maintenance equipment is possible.
Germination requirements: Germination rates are high either after 5 months storage at room temperature, or 3 months at 2-4°C (36-40°F).
Growth requirements: Japanese knotweed has been observed growing in a variety of soil types, including silt, loam, and sand, with pH levels ranging from 4.5 to 7.4. This species requires high light environments and can tolerate high temperatures, salinity, and drought (Saiger 1991).
Congeneric weeds: *Polygonum perfoliatum* L., *P. polystachyum* Wallich ex Meisn., and *P. sachalinense* F. Schmidt ex Maxim. are declared noxious in a number of American states (USDA, NRSC 2006). Also *Polygonum arenastrum* Jord. ex Boreau, *P. caespitosum* Blume, *P. convolvulus* L., *P. persicaria* L., *P. lapathifolium* L., *P. orientale* L., and *P. aviculare* L. are listed as a weeds in the PLANTS Database (USDA, NRSC 2006). A number of *Polygonum species* native to North America have a weedy habit and are listed as noxious weeds in some of the American states. Although the latest taxonomy considers these species as members of three different genus: *Polygonum, Fallopia* and *Persicaria* (FNA 1993+), they are closely related taxa and can be considered as congeneric weeds.
Listing: Polygonum cuspidatum is declared Noxious in California (List B), Oregon (List B), and Washington (List C) (USDA 2002).

Distribution and Abundance
Japanese knotweed was introduced to North America in the late 1800's. It is now widely found in at least 42 states in the United States, and most Canadian provinces. In Alaska it is invasive plant with established infestations in the Tongass National Forest. This species is often found near water sources, such as along streams and rivers, in waste places, utility rights-of-way, neglected gardens, and around old homesites. In Europe, the northern limit of distribution corresponds with the boundary of not less than 120 frost-free days (Beerling et. al. 1994).
Native and current distribution: A native of Japan, Northern China, Taiwan, and Korea, it is now a serious invasive plant in Europe, the United Kingdom, North America, and New Zealand.



Distribution of Japanese knotweed in Alaska

Management
Control methods are expensive and extremely labor intensive. Grubbing and hand pulling are effective for small initial populations. Mechanical methods followed by herbicide treatments will provide some control in infested areas. The species requires a number of herbicide treatments (4 or more time per season) over several years before it is completely eradicated. Monitoring of the treated areas for at least one growing season after treatment is recommended. Research has only recently begun on biological control.

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Last Updated April 4, 2006

Introduction
These two species of buttercups share similar biological and ecological attributes. We treat the description, distribution and abundance separately, but combine the discussion of ecological impacts and control methods.

Creeping buttercup
Ranunculus repens L.

Synonyms: *Ranunculus repens* var. *degeneratus* Schur, *R. repens* var. *erectus* DC., *R. repens* var. *glabratus* DC., *R. repens* var. *linearilobus* DC., *R. repens* var. *pleniflorus* Fern., *R. repens* var. *typicus* G. Beck, *R. repens* var. *villosus* Lamotte.
Common name: none
Family: Ranunculaceae

Description

Creeping buttercup is a perennial herb with stems up to 3 feet long and slender fibrous roots. Decumbent stems root freely at their nodes and are often slightly hollow with long spreading hairs. Basal leaves are ½ to 3 ½ inches long and up to 4 inches wide, egg-shaped to triangular, and 3-foliolate with toothed margins. Light-colored spots are often present on the basal leaves. Stem leaves are alternate with the lower long-stalked form transitioning upward to the simple to 5-parted bracts. Flower stems are long and erect. Flowers are few and showy with 5 yellow petals; petal number may be 6 to 9. Globose seedheads contain about 12 flattened and rounded fruits with a short backward-turned beak (Douglas and Meindinger 1999, Welsh 1974, Whitson et al. 2000). The plant overwinters as a rosette with small green leaves (Harper 1957).

Infestation of creeping buttercup. Photo by Thomas Heutte, USDA Forest Service

Tall buttercup
Ranunculus acris L.

Synonyms: none
Common names: meadow buttercup
Family: Ranunculaceae

Description

Tall buttercup is a biennial or short-lived perennial herb growing from a cluster of fibrous roots. Erect stems are up to 3 feet tall, smooth and hollow, leafy below and branched above. Basal leaves are long-stalked, divided deeply into 3 to 7 coarsely lobed segments and persistent. Stem and basal leaves are soft-haired on both sides. The flowers are long-stalked with 5 shiny golden-yellow petals and 5 sepals. Seeds are disc-shaped, reddish brown with a short hook (Douglas and Meindinger 1999, Welsh 1974, Royer and Dickinson 1999).

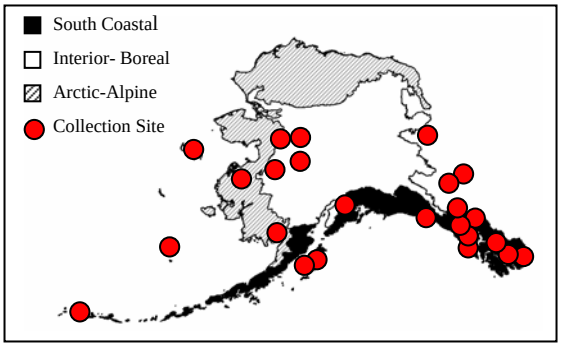
Photo by Kenneth J. Sytsma, University of Wisconsin-Madison, Wisconsin State Herbarium

Photo by Tom Heutte, USDA Forest Service

Creeping buttercup can be distinguished from other buttercup species by its horizontal growth habit, creeping stems that root at the nodes, spherical head of achenes and long (6-10 mm) petals (Douglas and Meidiger 1999, Hultén 1968).

Distribution and Abundance

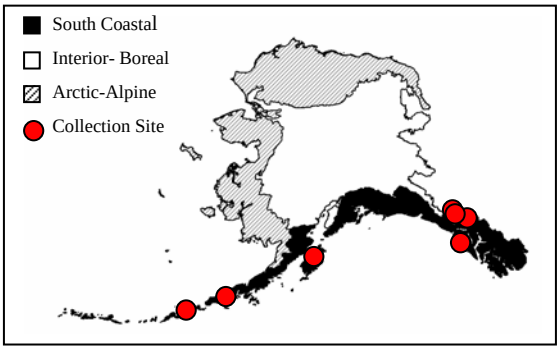
Creeping buttercup originated in Europe and extends northward to 72° N in Norway. It is now naturalized in many temperate regions of the globe including North, Central, and South America, Asia, Africa, Australia, and New Zealand (Harper 1975, Hultén 1968, NAPPO 2003). In Alaska this species has been documented from all ecogeographic regions (Hultén 1968). It occurs on disturbed soils including gardens, croplands, grasslands, woodlands, and semi-aquatic communities, such as swamps, margins of ponds, rivers, and ditches (Harper 1957, Lovett-Doust et al. 1990).



Tall buttercup can be distinguished from other buttercup species by its upright growth habit and deeply lobed and toothed leaves.

Distribution and Abundance

Tall buttercup is widely distributed across Europe, ranging north to 71° N in Norway. It has established in North America, South Africa, Asia, and New Zealand (Harper 1957, Hultén 1968). In Alaska this species has been documented from the South Coastal ecogeographic region. It is found in grassland, woodland, and occasionally sand dune communities.



Ecological Impact

Impact on community composition, structure, and interactions: The secondary compound protoanemonin released in the sap of creeping and tall buttercups is poisonous and can cause death to grazing animals if consumed. Geese and other birds readily eat leaves and seeds of buttercup (Lovett-Doust et al. 1990). The flowers are visited by honey bees, butterflies, moths, bugs, and beetles for pollen or nectar. Buttercups host microorganisms and viruses, insects, and nematodes (Harper 1957, Lovett-Doust et al. 1990, Royer and Dickinson 1999).

Hybridization has been documented between *Ranunculus acris* and *R. uncinatus* (Welsh 1974).
Impact on ecosystem process: Buttercup readily occupies open areas and may hinder colonization by native species.

Biology and Invasive Potential
Reproductive potential: Reproduction may be by seed, stolon, or rhizome (Harper 1957).
Role of disturbance in establishment: Seedlings establish readily in open ground and rapidly colonize bare areas in the year following germination (Harper 1957).
Potential for long-distance dispersal: Although most seeds are dropped near the parent plant, some seeds are dispersed farther by wind or in the dung of birds, farm animals, and small rodents (Harper 1957, Lovett-Doust et al. 1990).
Potential to be spread by human activity: Seeds can be dispersed by attachment to clothes and tires. Creeping buttercup may have been introduced as an ornamental plant into North America (Lovett-Doust et al. 1990).
Germination requirements: Seed germination usually occurs in late spring. Successful germination and early establishment appears to require open soil.
Growth requirements: Buttercups are adapted to a very wide range of soil types. Because they can withstand waterlogging buttercups occur mainly in heavy wet clay soils but can also thrive in sand or gravel if adequate moisture is present. Buttercups do not establish on well-drained soils. They are able to tolerate some salinity and can be found on beaches and in salt marshes. They can tolerate frost, but not prolonged dry periods (Harper 1957, Lovett-Doust et al. 1990).
Congeneric weeds: *Ranunculus abortivus* L., *R. arvensis* L., *R. bulbosus* L., *R. sardous* Crantz are invasive in other areas of the United States (USDA 2002).
Listing: Ranunculus repens and *R. acris* are considered weeds in the United States and Canada (Royer and Dickinson 1999, Whitson et al. 2000).

Management
Herbicides are generally recommended for control of buttercups. Plants may be weakened by cultivation, but parts of the caudex and stolon may regenerate and cause population increases. Plowing provides ideal conditions for germination of seed and is therefore not recommended as an eradication technique (Harper 1957, Lovett-Doust et al. 1990).

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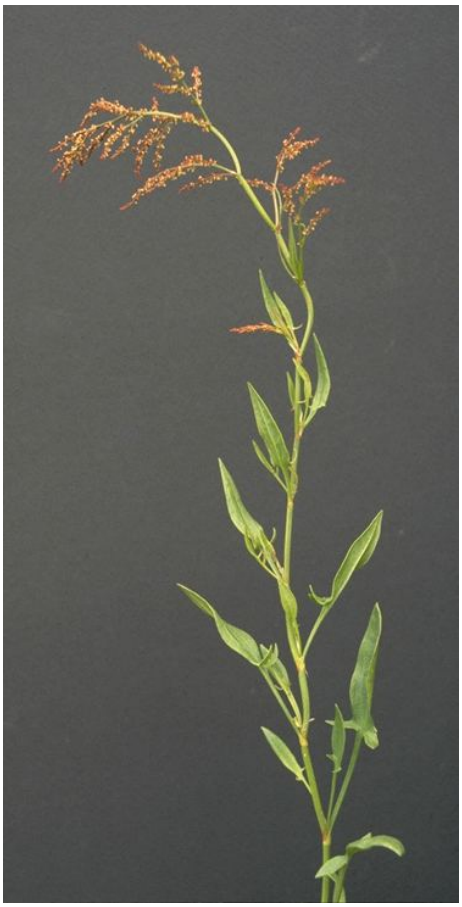
Sheep sorrel (*Rumex acetosella* L.)

Synonyms: *Acetosella acetosella* (L.) Small, *A. tenuifolia* (Wallr.) A. Löve, *A. vulgaris* (Koch) Fourr., *Rumex acetosella* ssp. *angiocarpus* (Murb.) Murb., *R. acetosella* var. *pyrenaeus* (Pourret) Timbal-Lagrave, *R. acetosella* var. *tenuifolius* Wallr., *R. angiocarpus* Murb., *R. tenuifolius* (Wallr.) A. Löve
Other common names: field sorrel, red sorrel, common sheep sorrel
Family: Polygonaceae

Description
Sheep sorrel is an annual or sometimes a perennial, ½ to 2 feet tall, with slender, creeping rhizomes. Lower leaves are arrow-shaped with 2 conspicuous basal lobes pointing outward. Leaf blades are ½ to 3 inches long. Basal leaves are long stalked. Stem leaves are more slender and sometimes without basal lobes, short stalked to sessile. A membranous sheath surrounds the stem at each node. Leaves and stems have a sour taste. Flowers are arranged in branched loose, leafless, terminal panicles. The male and female flowers are born on separate plants. The male flowers are orange-yellow and the female flowers are red-orange. Flowers consist of three scale-like sepals and three petals. The fruits are small, three-angled, enclosed in three persistent flower scales (Pojar and MacKinnon 1994, Whitson et al. 2000).

The native Alaska grassleaf sorrel (*R. graminifolius*) is found in a few locations north of the Brooks Range and Beringia sorrel (*R. beringensis*) is a native species of the Alaska Peninsula north to the arctic slope along the Bering Sea. Both species are similar to sheep sorrel, but have narrowly linear leaves, sometimes without basal lobes (FNA 1993+, Hultén 1968).
Introduced garden sorrel (*R. acetosa* L.) has been recorded from Kodiak and Unalaska (Hultén 1968, UAM 2006). It is a perennial, stout plant up to 3 feet tall. The leaves are oblong-lanceolate, up to 4 inches long with lobes pointing downward. It can be distinguished from native garden sorrel (*R. lapponicus*) by having a short, broad, strongly fringed sheaths (Douglas and MacKinnon 1999). Native garden sorrel is widespread in all ecogeographic regions of Alaska (UAM 2006).

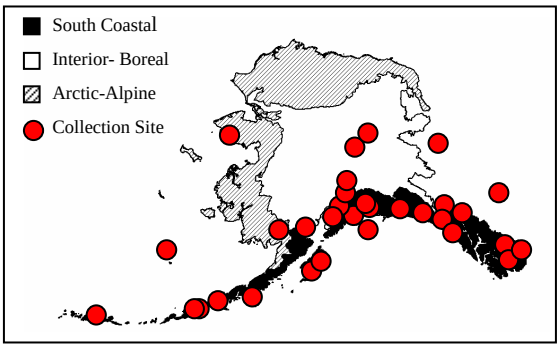
Ecological Impact
Impact on community composition, structure, and interactions: Sheep sorrel is able to form dense stands and displace native grasses and forbs. This plant contains oxalic acid which can be poisonous to livestock and may be toxic to wildlife species (Cal-IPC 2005). Sheep sorrel is grazed by mule deer (Nixon et al. 1970, Kruger and Donart 1974). Sheep sorrel seeds are a rich source of food for birds (Schmidt 1936, Swenson 1985, Wilson et al. 1999).
Impact on ecosystem process: Sheep sorrel is documented as one of the common colonizers of the burned areas (Hall 1955, Fonda 1974, Weaver et al. 1990). This species may impede the reestablishment of the native species and affect natural successional processes.


Sheep sorrel flowering stem. Oregon State University, Weed Science.

Biology and Invasive Potential
Reproductive potential: Sheep sorrel reproduces by seeds and from creeping roots and rhizomes (Kiltz

1930). The plant is capable of producing up to 1,600 seeds per season (Stevens 1932, Escarre and Thompson 1991).
Role of disturbance in establishment: Sheep sorrel rapidly colonizes clearcuts, burned, and flood-disturbed sites (Hall 1955, Fonda 1974, Weaver et al. 1990). Animal disturbances such as mole hills or cattle tracks can be sufficient for establishment of sheep sorrel in natural communities (Putwain et al. 1968).
Potential for long-distance dispersal: Seeds can be dispersed by wind, water, and insects (ants) (Houssard and Escarre 1991).
Potential to be spread by human activity: Seeds of sheep sorrel can be transported on vehicle tires, agricultural equipment, with nursery stock, or contaminated seeds and hay (Gooch 1963). Seeds remain viable after passing through the digestive tracts of domestic birds and animals (Evershed and Warburton 1918, Dorph-Peterson 1925).
Germination requirements: Sheep sorrel requires open soil for germination (Putwain et al. 1968).
Growth requirements: Sheep sorrel grows in a wide range of soil types, including sandy loam, sand, silt, and gravel. It prefers acidic soils with low fertility.
Congeneric weeds: *Rumex crispus* L. is declared a Noxious in Iowa (USDA, NRCS 2006).
Listing: Rumex acetosella is declared a Noxious in Connecticut and Iowa (USDA, NRCS 2006).

Distribution and abundance
Native and current distribution: Sheep sorrel is a forb of European origin. Today it is naturalized throughout temperate North America and has been introduced into South America, Africa, and Hawaii (Hultén 1968). Sheep sorrel is a weed of disturbed sites, such as roadsides, abandoned fields, gardens, lawns, and pastures (Pojar and MacKinnon 1994, Welsh 1974, Whitson et al. 2000). It can also become established in grasslands (Swenson 1985), montane meadows (Boyd et al. 1993, Leege et al. 1981), and undisturbed open forests (Fyles 1989). Sheep sorrel can be found on riverbars, beaches (Fonda 1974, Pojar and MacKinnon 1994), and freshwater and brine marshes (Fiedler and Leidy 1987). It has been used for revegetation in mining regions.



Management
Control of sheep sorrel can be difficult because of its creeping rhizomes and long-lived seeds. Plants are too low to be affected by mowing or grazing and it usually survives prescribed burning. Repeated cultivation and frequent removal of resprouted plants will eventually exhaust the population. Several herbicides are available for use in pastures and lawns. Liming the soil may also help eradicate sheep sorrel (Rutledge and McLendon 1996).

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Curly dock (*Rumex crispus* L.)

Bitter dock (*R. obtusifolius* L.)

Dooryard dock (*R. longifolius* DC.)

Family: Polygonaceae

Rumex crispus Synonyms: None
Other common names: Curley dock, narrowleaf dock, sour dock, yellow dock
Rumex obtusifolius Synonyms: *Acetosa oblongifolia* (L.) A.& D. Löve, *Rumex obtusifolius* ssp. *agrestis* (Fries) Danser, *R. obtusifolius* ssp. *sylvestris* (Wallr.) Rech. f., *R. obtusifolius* var. *sylvestris* (Wallr.) Koch
Other common names: bluntleaf dock, broadleaf dock
Rumex longifolius Synonyms: *R. domesticus* Hartman
Other common names: None

Description
Curly dock, bitter dock, and dooryard dock are closely related and are very similar in appearance. These are robust perennials with a fleshy deep taproot. The reddish erect stems are usually unbranched and grow up to 5 feet tall. Before flowering plants develop a basal rosette of leaves. Basal leaves are lance-shaped, up to 12 inches long. Flowers are small, greenish red, in dense terminal clusters up to 2 feet long. The flower is composed of three outer green tepals and three inner red tepals. The entire plant turns reddish-brown at maturity. The fruit is three-sided and enclosed by the inner winged tepals. Curly dock has truncate or cuneate base of the leaves and strongly crisped margins. Dooryard dock and bitter dock can be distinguished from other species by the heart-shaped leaf bases and smooth, normally entire, flat margins. Bitter dock can be also distinguished from other docks by its tepals with distinctly dentate margins (FNA 1993+, Royer and Dickinson 1999, Whitson et al. 2000).

Several native docks with basal rosette of leaves occur in Alaska. Arctic dock (*R. arcticus*) and western dock (*R. occidentalis*, also known as *R. fenenstratus*) can be found in wet meadows, marshes, and river banks throughout Alaska. These species can be distinguished by a combination of characteristics (see table below). Hybrids between many species of the subgenus *Rumex* commonly occur (Cavers and Harper 1964).


Curly dock (*Rumex crispus*) flowering stem.

Comparison and distinguishing characteristics of five species of *Rumex*

Species	**basal leaves**	**flower clusters**	**fruit scale**
curly dock (*R. crispus*), introduced	tapered bases, strongly crisped margins	dense	entire margins, with 3 tubercles
bitter dock (*R. obtusifolius*), introduced	broad, heart-shaped bases, margins entire, flat	usually lax and widely spaced	distinctly dentate, tubercles usually 1
dooryard dock (*R. longifolius*), introduced	rounded-truncate bases, margins entire	normally dense	margins entire, tubercles normally absent
arctic dock (*R. arcticus*), native	tapered bases, margins entire, flat	interrupted	margins entire, tubercles absent
western dock (*R. occidentalis*), native	heart-shaped or rounded bases, margins entire	dense to interrupted	margins entire, tubercles absent

Ecological Impact

Impact on community composition, structure, and interactions: Curly dock and dooryard dock readily establish in semi-natural graminoid-forb roadside habitats in Southcentral Alaska and create a new layer of vegetation (M. Carlson – pers. obs., I. Lapina – pers. obs.). It likely pushes out native species once established. The seeds and vegetation of docks can be toxic to animals (Royer and Dickinson 1999). Bitter dock is avoided by rabbits, but it appeared to be a favorite food plant of deer (Amphlett and Rea 1909, cited in Cavers and Harper 1964). Dock species are also an alternate host for number of viruses, fungus (Dal Bello and Carranza 1995), and nematodes (Edwards and Taylor 1963, Townshend and Davidson 1962).

Impact on ecosystem process: Impact of exotic docks on ecosystem processes has not been documented.

Biology and Invasive Potential

Reproductive potential: Plants reproduce only by seeds. The number of seeds per plant may vary from less than 100 to more than 60,000 per season. Plants can resprout from underground parts of the plant after damage (Cavers and Harper 1964, Monaco and Cumbo 1972).

Role of disturbance in establishment: Seedlings of dock usually do not become established in closed communities. Soil disturbance and removal of vegetation are required for dock's establishment (Cavers and Harper 1964).

Potential for long-distance dispersal: Seeds can be dispersed for a long distance by wind and water. The spines on the seeds of bitter dock facilitate distribution on animals' fur and bird feathers (DiTomaso and Healy 2003, Cavers and Harper 1967).

Potential to be spread by human activity: Seeds can be easily dispersed by attaching to clothing and fur of domestic animals. Seeds can also pass thought the digestive system of cattle (Cavers and Harper 1964). Curly dock is a common contaminant of commercial seeds (Dorph-Petersen 1925, Singh 2001) and soil (DiTomaso and Healy 2003).

Germination requirements: Seeds germinate at the optimum temperature of 68°-77° F in both light and dark. Germination can occur in any month, but peaks with the seedling emergence in early spring and fall (Benvenuti et al. 2001, Cavers and Harper 1964).

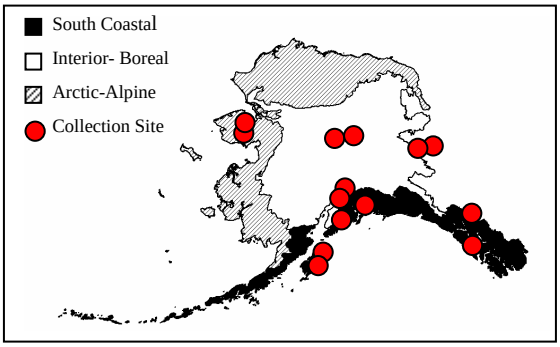
Growth requirements: These docks are found on nearly all type of soils, except the most acidic. They are most adapted to moist to wet soils and can tolerate poor drainage. Mature plants can withstand severe cold and drought (Cavers and Harper 1964, DiTomaso and Healy 2003).

Congeneric weeds: *Rumex acetosella* is declared noxious in Connecticut and Iowa (USDA, NRCS 2006).

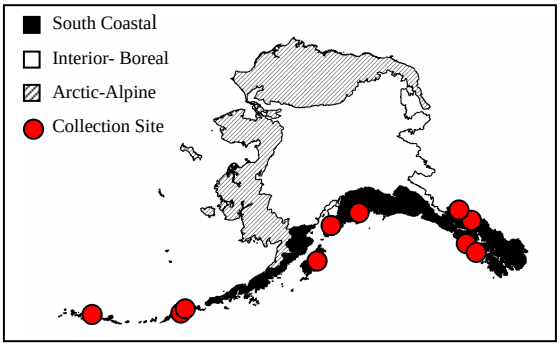
Listing: Rumex crispus is declared noxious in Indiana, Iowa, Michigan and Minnesota (USDA, NRCS 2006).

Distribution and abundance

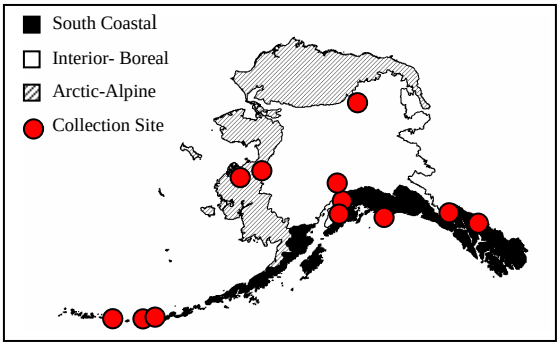
Native and current distribution: Curly, bitter and dooryard dock are indigenous to Europe and Asia. They have been introduced into North and South Africa, North and South America, Australia and New Zealand.



Distribution of curly dock (*R. crispus*) in Alaska



Distribution of bitter dock (*R. obtusifolius*) in Alaska



Distribution of dooryard dock (*R. longifolius*) in Alaska

They are species of disturbed substrates, such as agricultural fields, roadsides, and waste grounds (DiTomaso and Healy 2003, Hultén 1968, Welsh 1974). These species are especially likely to invade riparian areas, including wet meadows, riverbanks, pond edges, and irrigation ditches (DiTomaso and Healy 2003).

Management

All exotic docks are very difficult to eradicate. High seed production, long-lived seed banks, and the ability to regenerate from root fragments make control difficult. Hand-cutting plants below the ground or herbicide application can control infestations (Cavers and Harper 1964, DiTomaso and Healy 2003).

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Introduction
A number of *Silene* species have been introduced to Alaska. Because these species share similar biological and ecological attributes we treat each species description, distribution and abundance separately, but combine the discussion of ecological impacts and control methods.

Night-flowering catchfly *Silene noctiflora* L.

Synonyms: *Melandrium noctiflorum* (L.) Fries
Other common names: night-flowering silene, sticky cockle
Family: Caryophyllaceae

Description

Night-flowering catchfly is an annual plant with sticky hairs throughout and 1 to 3 woody stems growing up to 3 feet tall. Stems are swollen at the nodes. Leaves are opposite, covered with sticky hairs and are reduced in size upwards. Basal leaves are stalked, oblong and 1½ to 7 inches long whereas stem leaves are stalkless, 1 to 3 inches long and up to 1½ inches wide. Fragrant flowers in terminal clusters open at night. The 5, deeply notched petals are white to pink, ¾ to 1½ inches long and enclose 10 stamens and 3 styles. The fruit is a capsule with 3 compartments, opening at maturity by 6 backwards-curling teeth. There are 10 distinct green veins on the seed capsule. Seeds are kidney-shaped, grey, and about 1 mm long (Douglas and MacKinnon 1998, Royer and Dickinson 1999).

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Night-flowering catchfly is often confused with white cockle (*Silene latifolia* ssp. *alba*). Night-flowering catchfly has perfect flowers with both stamens and styles in the same flower, while white cockle has male and female plants and a female calyx with 20 prominent veins.

White cockle *Silene latifolia ssp. alba* L.

Synonyms: *Lychnis alba* P.Mill., *L. vespertina* Sibthorp, *Melandrium album* (P. Mill.) Garcke, *Silene alba* (P. Mill.) Krause, *S. pratensis* (Rafn) Godr. & Gren.
Other common names: bladder campion, evening lychnis, white campion
Family: Caryophyllaceae

Description

White cockle is a short-lived perennial or biennial growing 1 ½ to 3 ½ feet tall. Plants are either male or female. Both plant sexes have coarse, sticky hairs. Leaves are opposite, linear and about ¾ inches wide and 1 to 4 inches long. Similar to night-flowering catchfly, lower leaves are stalked, while upper leaves are stalkless. Fragrant flowers, about 1 inch across, open in the evening and close in the morning. Flowers are composed of 5, deeply notched white petals that enclose 10 stamens on male flowers and 4 or 5 styles in female flowers. The male calyx has 10 prominent veins whereas the female calyx has 20 prominent veins on calyx. The fruit is an ovate capsule, ½ to ¾ inches long, which opens by 10 teeth. Seeds are kidney-shaped, grey to brown, and about 1.5 mm long (Douglas and MacKinnon 1998, Royer and Dickinson 1999, Whitson et al. 2000).

Jennifer Anderson @ USDA-NRCS PLANTS Database

Bladder campion
Silene vulgaris (Moench) Garcke

Synonyms: *Oberna commutate* (Guss.) S. Ikonnikov, *Silene cucubalis* Wibel, *S. inflate* Sm., *S. latifolia* (P. Mill.) Britten & Rendle, non Poir.
Other common names: bladder silene, cowbell, maiden's tears, rattleweed
Family: Caryophyllaceae

Description

Bladder campion is a hairless perennial rising from a woody rootstock. Stems are up to 3 feet tall, branched from the base, smooth, and swollen at the nodes. Leaves are stalkless, smooth, ovate or lanceolate, 1¼ to 3¼ inches long and ½ to 1¼ inches wide. A white, powdery film gives leaf surfaces a pale green appearance. Flowers, about ½ inches wide, are found in clusters of 5 to 30 at the ends of branches. The flower is composed of 5 united and deeply notched petals, 10 stamens, and 3 styles. The initially slender calyx develops to a greatly inflated, often purplish, papery sac-like structure surrounding the bulbous fruit. Fruit opens at the toothed calyx top. The numerous seeds are small and grayish (Douglas and MacKinnon 1998, Royer and Dickinson 1999, Whitson et al. 2000).

Brother Alfred Brousseau @ USDA-NRCS PLANTS Database

White cockle is similar to bladder campion, but is more or less hairy and has male and female flowers on different plants. Night-flowering catchfly has

Red catchfly
Silene dioica (L.) Clairville

Synonyms: *Lychnis dioica* L., *Melandrium dioicum* (L.) Cross. & Germ., *Melandrium dioicum* ssp. *rubrum* (Wieg.) D. Löve
Other common names: red campion
Family: Caryophyllaceae

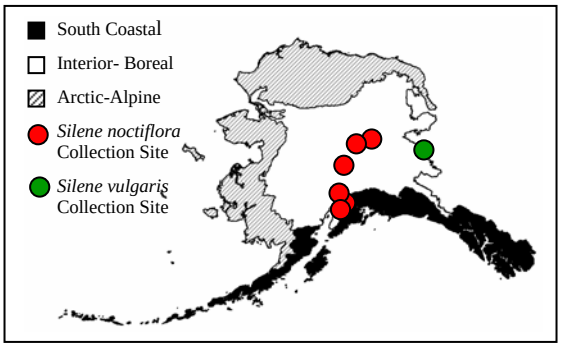
Description

Red catchfly is biennial or perennial herb rising from a fibrous root. Stems are erect, several, branched, glandular above, and 2 to 3 feet tall. Leaves are hairy. Egg-shaped basal leaves narrow to winged stalks. Stem leaves are opposite, broadly elliptic, 1½ to 4 inches long, and 1 to 1½ inches wide. Unisexual flowers are arranged in clusters. The flower is composed of 5, deeply notched, red to purplish or pink petals. The fruit is an egg-shaped capsule with 5 toothed valves. Seed are black (Douglas and MacKinnon 1998).

sticky hairs throughout (Douglas and MacKinnon 1998).

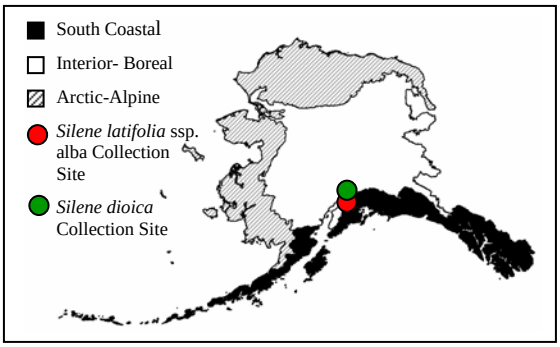
Distribution and Abundance in Alaska

Night-flowering catchfly has been collected from Fairbanks, Anchorage, Nome, Juneau, Healy, and the Kenai Peninsula (Hultén 1968, UAM 2004). Bladder campion has been documented from the Yukon Territory and in the vicinity of Dawson (Cody 1996, UAM 2004). Both species are found on disturbed sites such as roadsides and waste areas.



Distribution and Abundance in Alaska

White cockle has been documented from Eklutna Valley and the Matanuska and Susitna valleys in Alaska (AK Weed Database 2004, UAM 2004). Red catchfly has been collected from Palmer, Alaska (AK Weed Database 2004). All plants were collected on disturbed ground.



Ecological Impact

Impact on community composition, structure, and interactions: These species compete for moisture, nutrients, and sunlight in pastures and crowd native plants. The species are unpalatable to grazing animals. *Silene* species are alternate hosts for numerous viruses (Royer and Dickinson 1999). Hybrids of *S. dioica* and *S. latifolia* ssp. *alba* have been collected in Canada (Douglas and MacKinnon 1998). Plants are pollinated by moth, bee, and butterfly (Kay et al. 1984).
Impact on ecosystem process: *Silene* species occupy disturbed ground and likely hinder colonization by native species. These weeds can decrease soil moisture and nutrient availability (Royer and Dickinson 1999).

Biology and Invasive Potential

Reproductive potential: These plants reproduce primarily by seed. Each plant of night-flowering catchfly is capable of producing up to 2,600 seeds, over 82% of which are viable after 5 years. White cockle plants produce over 24,000 seeds (Royer and Dickinson 1999) and red catchfly plants produced more than 4,500 seeds in an experimental garden in Britain (Kay et al. 1984). White campion and bladder campion are able to reproduce vegetatively by root and stem fragments (Whitson et al. 2000).
Role of disturbance in establishment: Silene species can colonize open ground. Buried seeds remain viable and germinate readily after soil disturbance (Guide to Weeds in British Columbia 2002).
Potential for long-distance dispersal: Most seeds fall from the parent plant to the ground and are therefore not dispersed long distances (Guide to Weeds in British Columbia 2002).
Potential to be spread by human activity: Seeds are very similar to those of crop clovers and are difficult to separate. Consequently seed impurities have been a major source of dispersal. Seeds also are capable of germination after passing through the digestive tract of domestic animals (McNeill 1980, Royer and Dickinson 1999, Whitson et al. 2000).
Germination requirements: Some seeds germinate in the autumn but most remain dormant over the winter. Seeds germinate readily at a relatively high temperature of 68°F. Some populations may require light for germination. (Guide to weeds in British Columbia 2002, McNeill 1980, Thompson 1975).
Growth requirements: Silene species typically grow on sandy or gravelly substratum, but are also found on loamy soils (McNeill 1980).

Congeneric weeds: The *Silene* genus is comprised of a number of serious agricultural weeds (Royer and Dickinson 1999, Whitson et al. 2000).
Listing: Night-flowering catchfly, white cockle, and bladder campion are declared Federal noxious weeds in Canada. These species are also listed as weeds in Connecticut, Wisconsin, and Washington (Royer and Dickinson 1999).

Distribution and abundance
Native and current distribution: Silene species were introduced to North America from Europe and Asia. They are now found throughout Canada and the United States. These plants are important weeds of pastures, grain fields, and gardens. They are also found along highways, railroad tracks, and in waste places (Gubanov et al. 2003, McNeill 1980, Royer and Dickinson 1999)

Management
Mowing or burning is unlikely to control *Silene* species because of its large seed bank. Cultivation usually increases the infestation by facilitating the spread of *Silene*. Herbicides provide limited control as *Silene* species are resistant or somewhat resistant to many common herbicides. No biological control agent is available (Guide to weeds in British Columbia 2002, McNeill 1980).

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European mountain ash

Sorbus aucuparia L.

Synonyms: *Pyrus aucuparia* (L.) Gaertn., *Sorbus aucuparia* L. var. *xanthocarpa* Hartwig & Rumpler
Other common names: rowan
Family: Rosaceae

Description
European mountain ash is an upright tree growing up to 25 – 40 feet high with a rounded open crown. The bark is grayish or yellowish green and smooth. Leaves are alternate, pinnately compound, and 5 to 8 inches long. The leaflets number 11 to 15 and are dull dark green above and paler below. Clusters (3 to 5 inches across) of small white flowers appear in May. Fruits are bright deep orange small pomes, ripening in September, persistent (Welsh 1974).

European mountain ash is distinguishable from all other native species of *Sorbus* in Alaska as being a tree (all the other species are shrubs).

Ecological Impact
Impact on community composition, structure, and interactions: Unknown – however, this species is able to integrate into largely undisturbed coastal rainforest communities and dominate (e.g., Sitka Nat. Historic Park). It has been reported to invade forest communities in Wisconsin (Wisconsin Department of Natural Resourses 2003).

Impact on ecosystem process: Unknown. Fruits are highly desirable to birds, so there is a potential for alterations in abundance and composition of avian fauna (Gilman and Watson 1994). European mountain ash hybridizes with native *S. scopulina* and *S. sitchensis* where there ranges overlap (Pojar and MacKinnon 1994).

Biology and Invasive Potential
Reproductive potential: European mountain ash is a perennial that grows rapidly (max. 35 ft at 20 years), establishes by seeds, cuttings, or propagates by bare roots. However, there is no vegetative spread (USDA 2002). Seeds are numerous and small (125,000/lbs), with many thousands of seeds produced per plant per year. Seeds have a strong innate dormancy that lifts gradually over a few years. The seeds remain viable in the soil for five years or more (Granström 1987). *Germination requirements:* This species germinated well in experimental conditions of multiple years in moist soil (2 cm in soil, under moss/litter layer) in central Sweden then full light and 20° C (Granström

1987). Cold-stratification is necessary for successful germination (USDA 2002).
Growth requirements: This species is suited to coarse textured soils (no adaptation to fine soils) of pH ranging from 5.5 to 7.5. It is unsuited to anaerobic, calcareous, saline, or low moisture soils. It grows in moderately fertile soil and has intermediate shade tolerance (USDA 2002).
Role of disturbance in establishment: Unknown.
Potential for long-distance dispersal: Spread by birds (thrushes and waxwings) and small mammals (Dickinson and Campbell 1991) and by ornamental planting.
Potential to be spread by human activity: European mountain ash is widely planted as an ornamental in southern and southeastern Alaska, where it has escaped (Welsh 1974). It has been reported to be spread as contaminant of horticultural stock (Hodkinson and Thompson 1997). It has moderate summer foliage porosity. There is no known toxicity, allelopathy, or coppice potential.

Cogeneric weeds: number of *Sorbus* species has been introduced into North America; however no one is listed as a weed.
Listing: not listed in any state.

Distribution and Abundance
Originally from most of Europe, northern Africa, and western Asia, it has naturalized in 27 northern states, in many climatic areas, throughout moist cool regions of North America. It is unsuited to interior Alaska (i.e., USDA hardiness zone 2 or less).
Native and current distribution: Europe (Spain to Balkans, north to British Isles/Nordic countries, and east to Ural Mountains), Iceland.

Management
Control measures for this species are largely untested. It has the ability to resprout after cutting. Many natural seed predators are present in Scandinavia, which likely limit its spread and establishment. It is unknown if these or similar predators are present in North America.

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Common dandelion

Taraxacum officinale G.H. Weber. Ex. Wiggers

Synonyms: None
Other common name: blowball, dandelion, faceclock
Family: Asteraceae (Compositae)

Description
Common dandelions are 2 to 20 inches tall. Leaves are 2 to 16 inches long, 1/2 to 4 inches broad, pinnately lobed to pinnatifid, with a large, rounded terminal lobe. Leaves are stalkless. The midrib of the leaf is often hollow and winged near the base. Yellow flower heads are composed of ray florets and rise from the basal leaves on hollow stalks. Heads are 1 to 2 inches across, and surrounded by 2 rows of floral bracts. The whole plant contains a white milky juice (Welsh 1974).

The genus *Taraxacum* is a taxonomically confusing group, due to asexual reproduction and local diversification. The genus has been subject to many divergent interpretations, with hundreds of specific names have been published.

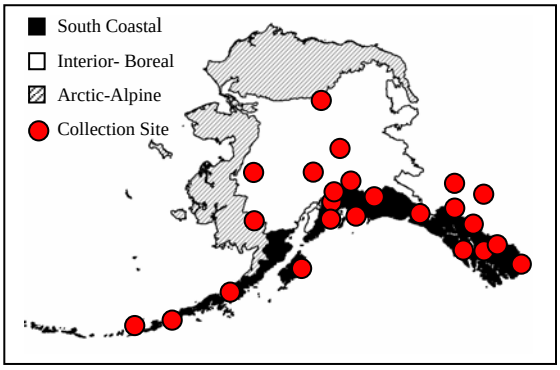
Current taxonomic treatments describe *T. officinale* as encompassing three subspecies, two introduced in Alaska (ssp. *officinale* and ssp. *vulgare*) and one native (ssp. *ceratophorum*) in the state (USDA Plants Database 2003). The non-native subspecies lack horns on the involucral bracts and have substantially larger heads than all native subspecies and species of Alaskan dandelions. The native species are found primarily in undisturbed herbaceous, especially alpine meadows.

Ecological Impact
Impact on community composition, structure, and interactions: Dandelion competes with native plants for moisture and nutrients. It is commonly eaten by moose, bears, sharp-tailed grouse, pocket gophers, deer, elk, and bighorn sheep. Sage grouse and deer populations benefit from increased production of dandelion (Esser 1993). This species is important source of nectar and pollen for bees in Alaska (Esser 1993). Its presence may therefore alter pollination ecologies of co-occurring plants. It is also an alternate host for number of viruses (Royer and Dickinson 1999).
Impact on ecosystem process: Dandelion is one of the earliest colonizers after disturbances and likely causes modest impacts in natural succession. It may achieve a peak in dominance within two to three years (Auchmoody and Walters 1988). In Alaska it often establishes in existing herbaceous layer, changing the density of the layer. It also can form a new herbaceous layer on nearly mineral soil along banks and roadsides.

Biology and Invasive Potential
Reproductive potential: Dandelion reproduces by seeds and by new shoots from the root crowns (Whitson et al. 2000). Each plant produces up to 5,000 seeds (Royer and Dickinson 1999). The species creates a long-lived seedbank (Pratt 1984). Seeds of dandelion were viable up to 5 years in soil samples from Montana (Bard 1952), and up to 9 years in experiments in Nebraska (Burnside et al. 1996).
Role of disturbance in establishment: Dandelion readily colonizes disturbances. It sprouts from the caudex after cutting (Staniforth and Scott 1991). It is

generally found on disturbed substrates in Alaska, but also establishes in meadows (M. Carlson – pers. obs.).
Potential for long-distance dispersal: Spreading pappus and light seed weight enable seeds travel a considerable distances by wind. In tall grass prairie communities in Iowa, achenes of dandelion were blown several hundred meters from the nearest source population (Platt 1975).
Potential to be spread by human activity: It is likely spreading by vehicles and horticultural materials (Hodkinson and Thompson 1997). It is a common contaminate in crop and forage seeds (Rutledge and McLendon 1996).
Germination requirements: Seeds must be in the top 1 inch of soil to germinate (Royer and Dickinson 1999). Litter and mulch inhibit germination. Germination is highest on burned sites (Esser 1993).
Growth requirements: Common dandelion is adapted to all type of soils with pH levels of 4.8 – 7.5. This species withstands temperatures to -38°F, and requires 100 frost-free days. It has relatively porous summer vegetation and does not require cold stratification for germination (USDA 2002).
Congeneric weeds: *Taraxacum scanicum* Dahlstedt (Hultén 1968).
Listing: Noxious weed in Alberta, Manitoba, Quebec, Saskatchewan (Invaders Database System 2003).

Distribution and abundance
Native and current distribution: Dandelion is of Eurasian origin but has become naturalized throughout the United States. It occurs in all 50 states and almost all Canadian provinces. Also it is introduced into southern Africa, South America, New Zealand, Australia, and India (Esser 1993, Hultén 1968). *Taraxacum officinale* has been reported from all three primary eco-regions of Alaska (Hultén 1968, ALA 2004). It invades meadows in Glacier Bay National Park and Preserve, and Nenana and Stikine Rivers bars (M. Shephard – pers. obs.). Dandelain colonizes burned areas in Kenai Peninsular (P. Spencer – pers. obs.).



Dandelion grows in moist sites, including lawns, meadows, pastures and overgrazed areas. It is also occurs along highway and railroad rights-of-ways, waste places, and old fields. It is a threat in montane forest and alpine zones of western Montana since it invades partially disturbed or undisturbed native communities. In Montana, dandelion competes with conifer seedlings (Esser 1993).

Management
Dandelion can be readily controlled with herbicides and spring burning. Hand pulling is generally ineffective as plants readily resprout from unextracted rootcrowns.

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Red clover

Trifolium pratense L.

Synonyms: *Trifolium pratense* L. var. *frigidum* auct. non Gaudin, *T. pratense* L. var. *sativum* (P. Mill.) Schreb.
Other common names: None
Family: Fabaceae

Description
Red clover is a perennial herb from a taproot, up to three feet tall, with several erect or ascending stems. The whole plant is covered with soft hairs. Leaves are alternate, compound with three leaflets, lance-elliptic, ½ to 2½ inches long, often with V-shaped marks. Stipules persistent, conspicuously veined, up to one inch long. Inflorescence is a dense, globe-shaped head, 1 to 1½ inches wide. Flowers are pink, purple, or red. Pods are egg-shaped, one-two-seeded (Welsh 1974, Douglas et al. 1999).


Inflorescence and leaf of red clover. Tom Huette, USDA Forest Service.


Red clover along the road. Tom Huette, USDA Forest Service.

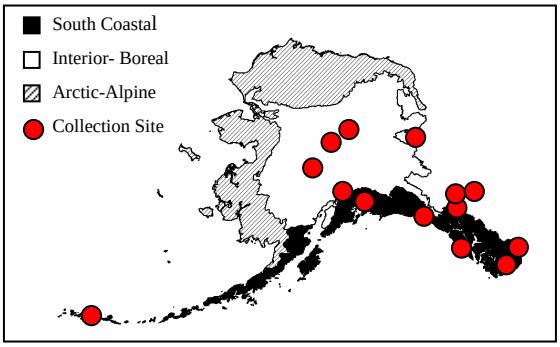
There are many other exotic clover species in Alaska. Pink to red flowers distinguish red clover from other clovers. White clover (*T. repens*) and alsike clover (*T. hybridum*) are similar but are generally more prostrate and have smaller leaflets and white to pinkish flowers (Hultén 1968).

Ecological Impact
Impact on community composition, structure, and interactions: Red clover is capable of creating very dense stands (Gettle et al. 1996a) and large biomass (Gettle et al. 1996b, Hofmann and Isselstein 2004), which influences the structure of the community. Red clover can also reduce the number of individual of grass species in the community (Gettle et al. 1996a). Moose and mule deer can graze on red clover. The leaves of red clover are also eaten by beaver, woodchuck, muskrat, meadow mice, and sharp-tailed grouse. Seeds are eaten by crow, horned lark, and ruffed and sharp-tailed grouse. Red clover is visited by bumblebees and sometimes by introduced honeybees (Graham 1941).
Impact on ecosystem process: Red clover increases soil nitrogen levels by fixing atmospheric nitrogen (USDA, NRCS 2006). The alteration of soil condition may delay establishment of native species (Rutledge and McLendon 1996) and facilitate colonization by other exotic plant species.

Biology and Invasive Potential
Reproductive potential: Red clover reproduces by seeds. It can produce a moderate amount of seeds (11 – 1,000) (Densomore et al. 2001).
Role of disturbance in establishment: If seeded, red clover can successfully establish in pastures (Gettle et al. 1996a, b). Soil disturbances, and cutting or grazing of competitive vegetation facilitate establishment (Guretzky et al. 2004, Hofmann and Isselstein 2004).
Potential for long-distance dispersal: Seeds of red clover are large and are not adapted to long distance dispersal.
Potential to be spread by human activity: Red clover is a forage crop. It is also recommended for erosion control. Seeds of red clover are commercially available. It has been planted for forage in Alaska (Panciera et al. 1990, Sparrow et al. 1993).

Germination requirements: Red clover can be seeded by drill or broadcast. For agricultural purposes seed should be inoculated. Seeds germinate in ¼ to ½ inch soil depth (USDA, NRCS 2006). Optimum temperature range for germination is from 59° to 68°F (Brar et al. 1991).
Growth requirements: Red clover is best adapted to medium and fine textured well-drained soils. It grows best on soils with pH 6.0 to 7.5. Red clover requires a minimum of 90 frost free days for successful growth and reproduction (USDA, NRCS 2006). Seedlings of red clover can withstand temperatures as low as 28°F. Some seedlings can survive temperatures as low as 17°F (Meyer and Badaruddin 2001).
Congeneric weeds: *Trifolium arvense* L., *T. campestre* Schreb., *T. incarnatum* L., *T. repens* L. (USDA, NRCS 2006).
Listing: Trifolium pratense is not considered invasive in North America (Rice 2006).

Distribution and abundance
Native and current distribution: Red clover is often planted as a forage crop, escapes and becomes established on roadsides, clearcuts, lawns, gardens and meadows (Rutledge and McLendon 1996, Welsh 1974). Red clover is native to southeastern Europe and Asia Minor. Today its distribution range includes Europe, southwest Asia, Africa, and North America (Hultén 1968). Red clover can be found throughout the United States and Canada (USDA, NRCS 2006).



Distribution of red clover in Alaska

Management
Red clover can be controlled by mechanical methods (Densmore et al. 2001). It is appear to be resistant to some chemicals (Rutledge and McLendon 1996).

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White clover

Trifolium repens L.

Synonyms: *Trifolium repens* L. var. *atropurpureum* hort.
Other common names: ladino clover, Dutch clover
Family: Fabaceae (Leguminosae)

Description
White clover is a perennial prostrate plant. The stems are up to 2 feet long, rooting at the nodes. Leaves are alternate, palmately trifoliate with ovate leaflets. Flowers white to pinkish white appear in terminal globe-shaped clusters. Seeds are round and very small (776,000/lbs) (USDA 2003, Welsh 1974).

This is the only decumbent white to pink-flowered clover in Alaska.

Ecological Impact
Impact on community composition, structure, and interactions: White clover rapidly invades vegetated and bare areas and became dominant (Thorhallsdottir 1990). Plant may delay establishment of native species. It is reported to be poisonous to cattle. It is an alternate host for alfalfa mosaic and pea mottle viruses (Royer and Dickinson 1999).
Impact on ecosystem process: White clover alters edaphic conditions due to nitrogen fixation (USDA 2002).

Biology and Invasive Potential
Reproductive potential: This species reproduced by seeds and creeping stems that root at nodes. White clover is mostly self-incompatible, and is cross pollinated by insects. It can produce large number of seeds. Some seeds retain viability after 30 years.
Role of disturbance in establishment: In Alaska it is found in sites disturbed in recent years (Densmore et al. 2001).
Potential for long-distance dispersal: Most seed is likely spread incidentally be the movement of animals and humans.
Potential to be spread by human activity: This species is seeded because of its ability to fix nitrogen and quickly stabilize soil.
Germination requirements: white clover can germinate without cold stratification at the temperature 50°F and above.
Growth requirements: White clover is adapted to fine and medium textured soils, pH levels of 6 – 7.5. It is shade intolerant. This species withstands temperatures to -39°F, and requires 150 frost-free days. This species has relatively porous summer vegetation (USDA 2002).
Congeneric weeds: *Trifolium arvense* L., *T. campestre* Schreb., *T. incarnatum* L., *T. repens* L. (USDA, NRCS 2006).
Listing: listed as a weed in Nebraska.

Distribution and Abundance
White clover was common as a forage crop in Canada prior to 1749 (Royer and Dickinson 1999). Now it is a weed of waste areas, lawns, and ditches. White clover is found throughout Canada and the United States and is often found north of the Arctic Circle. It also occurs in the moist meadows in the yellow pine and spruce fir ranges in Arizona (Parker 1990).
Native and current distribution: White clover is native to Europe and Asia. It has been introduced to north and southern Africa, North and South America, New Zealand, Australia, Tasmania, and India (Hultén 1968).

Management
Populations are widespread and relatively dense. Eradication would be very difficult for this species. The priority is to keep plant from establishing in new disturbed sites. Several herbicides can be used to control white clover.

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