

Exotic Plant Management in Sitka National Historical Park Sitka, Alaska Summer 2007 Field Season Report



Figure 1-Tribal Civilian Community Corps (TCCC) at coastline of Sitka National Historical Park

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Abstract

For the fourth 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 2007, the focus of effort in SITK continued the 2006 goals of control work and inventory. Within the 6.331 acres of the park surveyed in 2007, a species of sow thistle (probably *Sonchus arvensis*) was identified, bringing the total count of non-native species observed to 30. 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*) continues to spread within SITK, propagating 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) and SITK staff 200 person-hours (5hrs/day for 5 days w/8 people=200 hrs) were spent during the EPMT visit (June 25-29, 2007) controlling exotic plants. During this focused effort, more than 168 kg (450 lbs) of exotic plant material were removed, including creeping buttercup (*Ranunculus repens*), common dandelion (*Taxaxacum officinale*), white clover (*Trifolium repens*), mouse-ear chickweed (*Cerastium fontanum*), plantain (*Plantago major*), and Japanese knotweed (*Polygonum cuspidatum*). Additional control work was performed in SITK through July by Kristi Link (SITK biotechnician). In subsequent years, monitoring should be continued to determine rate of spread of species already present, the effectiveness of control efforts, and whether new species are colonizing. Control work should continue to focus 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 out-compete resident plant species for limited resources, and can change the structure and function of ecosystems through alternations 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 is 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 and 2007 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 intermittently from June 1 through July 19, 2007 following the 2007 Alaska EPMT data collection protocol. Areas monitored included the most frequently used trails, shoreline next to the Visitor Center and part of the coastline. Like 2006, more time was spent controlling invasive species in 2007 than in previous years and efforts were focused near the footbridge, the historic battle site and southern coastline. Digital photos were taken when possible. The TCCC crew worked in SITK from June 25-29, 2007 concentrating on creeping buttercup as the prime invasive species.



Figure 2 – Volunteers and park staff digging out creeping buttercup.

A Trimble Pro XRS with a Ranger datalogger was used for all data collection during monitoring and control events. Equipped with the Alaska EPMT standardized data dictionary (Table 1), the Pro XRS 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 Alaska weeds).

Table 1. Fields used in GPS data dictionary and GIS shapefile for exotic plant surveys, summer 2007.

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 grown 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 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 moving, weed-whacking, chain-sawing, etc. “Chemical” involves the use of herbicides.
CntroEffrt	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 (KLL = Kristi Link)
Team_Name	AKEPMT = Alaska Exotic Plant Management Team
2Taxon, 3Taxon... 2Phenology, 3Phenolgy... 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 (usually CORS, Gustavus(GUS2), AK) and edited in Trimble GPS Pathfinder Office (version 4.0). 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 EMPT.

Results and Discussion

Following the intensive inventory efforts of 2004 and 2005, a relatively cursory inventory of SITK was conducted in 2006 and again in 2007 to rapidly assess the park for new species or expansion of existing species. Within the relatively small subsection of the park 6.331 acres monitored, one new species, probably perennial sow thistle (*Sonchus arvensis*) was identified growing in a recently planted flower bed near the visitor center near shore. Otherwise, most of the species identified from previous years were relocated in similar locations and slightly increased distributions. Since 2004, a total of 20.661 acres of the park has been inventoried.



Figure 3- *Sonchus arvensis* in park native plant bed.

The majority of the 2007 EMPT summer was spent controlling exotic species and monitoring/mapping the park area with the Trimble unit for changes in distribution or new invasive species. Through the combined efforts of the eight-person TCCC crew and Kristi Link (SITK), 200 person-hours were spent removing over 184 kg (450 lbs.) of exotic species. The three primary

control areas were 1) the visitor center area nearest the shoreline, 2) the southern shoreline edge near the old battle site, 3) between the foot bridge and the outhouse along the main trail, the old picnic areas, and the trail junctions leading away from the bridge (towards Sawmill Creek). The targeted species in all areas worked was creeping buttercup, dandelions, white clover and mouse-ear chickweed. #1 site was selected based on the high density of species, high visibility of the conspicuous yellow flowers and the lower likelihood of control activities trampling desired native vegetation. In #2 site, the primary targeted species was the 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. Kristi Link worked to control seed dispersal in early June by 'beheading' those dandelions already in seed to limit dispersal. The TCCC returned to this site in later June to continue to dig/pull them from the ground. This is an area that needs to be constantly monitored early in the spring with control measures beginning as early as possible. All located mouse-ear chickweed on the shoreline and Japanese knotweed plants near the bridge were removed. There was a concerted effort to eradicate large patches of white clover around some of the totem poles near the shore. Other exotic species were removed opportunistically during the monitoring and control work. Kristi Link worked through July 19th to continue to map, monitor and control exotic plants throughout SITK.

Non-native species previously identified within SITK that were not relocated in 2007 included black bindweed, shepherd's purse, lambsquarters, annual bluegrass, Kentucky bluegrass, red clover, curly dock, common timothy, reed canarygrass, bitter dock, bird's-eye pearlwort and yellow toadflax. Most of these species are likely still present within or near SITK; however, due to the time of year and field staffing, they were not documented in 2007. For instance, the bluegrasses are still the dominant grass species in lawn areas of SITK; however, effort was not made to document them in 2007. The spatial data 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.

Before the 'Sitka Community Weed Pull' on June 30, Kristi presented a brief program to interested community members and distributed informational materials. During the two months of summer in SITK while monitoring/mapping and controlling invasives, much effort was made to educate any interested visitors on a daily basis, distribute brochures on invasive plants and answer questions.

Species Summaries

The identification of a new exotic species within SITK again this year, demonstrates the urgency of continued monitoring, mapping 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 continue to prevail. Escaped ornamental garden plants in the western corner of the park and near the Visitor Center are becoming more widely dispersed.

Perennial Cornflower - *Centaurea montana*

In 2007, more patches of perennial cornflower, an escaped ornamental species, were found growing along the sidewalk of Lincoln Street as well as creeping down onto the edge of the understory towards Merrill Rock. This species is persistent and continues to spread vegetatively rather than by seed. Control might be possible but labor intensive; plant clumps and all roots would have to be dug out by hand. There may be time in 2007 to control plants in this area before the season ends.

Mouse-ear Chickweed - *Cerastium fontanum*

C. fontanum is prevalent outside the park and in open areas within the park. It is a small inconspicuous plant that needs sufficient light in disturbed areas or along the coast or tucked into old logs and on the sides of trails intermittently. Controlling this species, what was visible in allotted time, was time consuming but produced results and would be worth the effort since it has yet to invade other habitats. The historic battle site area has a large but dispersed population and should be monitored and controlled whenever possible.

Snow in Summer - *Cerastium tomentosum*

In 2006, this species was first identified growing in the rocks separating the shoreline and the sidewalk of Lincoln Street and continues to spread vegetatively but not by seed. There may be time in the 2007 season to control this species, but if not, future EPMT efforts should determine 1) if there are sensitive areas of the park for management and 2) what can be done in these areas.

Foxglove - *Digitalis purpurea*

Foxglove is a popular garden ornamental that continues to spread and thrive throughout Sitka. This year there were very few plants within the Totem Park portion of SITK, but this should continue to be monitored as seedlings persist for more than five years (personal experience). They are easily identified and removed, thus it is feasible to control this species on an annual basis.

Oxeye Daisy - *Leucanthemum vulgare*

This species was not inventoried nor controlled in 2006, because it was too early in the season for flowers to appear. In 2007, many seedlings were removed and those in full bloom were easily controlled. Near Merrill Rock, behind the Visitor Center and in scattered sites throughout the park, they've been located and controlled. *L. vulgare* is very common outside the park boundary; in fact it's a species preferred by many Sitkans. Most of the people I talked with were unaware that this

species is the carrier of viruses that easily spread to other garden plants. Continued education and monitoring is necessary to ensure the species does not become established in other locations.

Yellow Toadflax - *Linaria vulgaris*

Yellow Toadflax (also referred to as butter and eggs) was found outside the park in 2006, but not in 2007 in a parking lot of Sheldon Jackson College but should be continued to be monitored in this area. It is a species not likely to spread into the adjoining parkland since the dense, shade-producing canopy will preclude its establishment but seeds could be transported by people or animals to habitats with more available light. 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 still 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 at this time.

Pineapple Weed – *Matricaria discoidea*

Although previously identified from around the Visitor Center, this species was found only at the eastern boundary of the park in 2005 but was discovered in the Visitor Center parking lot and near the Russian Memorial in 2007 (small distribution). 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 weeds' relatively low ranking (33 – Appendix A) and its limited distribution, the threat of this species to the native flora of SITK is low.



Figure 5 – Pineapple weed growing by bench near Russian Memorial.

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. scorpiodes*) is prevalent and frequently planted. Plants were found and removed in 2006 near the Russian Memorial. Several populations of blue, pink, and white flowering forget-me-nots are growing along the road near Merrill Rock in 2006 and 2007. Until clarification of how to manage the Merrill Rock area is reached, these forget-me-not populations should be monitored.

Reed Canarygrass – *Phalaris arundinacea*

Sawmill Creek Road is the only known location of *P. arundinacea* but it has great potential to spread and displace native species (Ranking 83 – Appendix A), particularly in riparian habitats. Annual monitoring of the species should continue throughout SITK. If this plant is detected, the entire plant with root system needs to be removed since regrowth from rhizomes is probable.

Common Timothy – *Phleum pratense*

This plant is currently restricted in its distribution to areas outside the park. Since it is common along the Sawmill Creek Road sidewalk, it is possible that seeds will be transported into the park by

animals or people, thus annual monitoring should continue.

Common Plantain – *Plantago major*

P. major does well in highly disturbed habitats and rarely spreads into less-disturbed areas. Removal is relatively easy making it possible to remove the smaller populations such as along the Indian River and near the bench on the Totem Trail. Very little control of this species was done in 2007.

Japanese Knotweed – *Polygonum cuspidatum*

Removal of this persistent species has occurred since 2001 yet it continues to resprout from the same two locations it has been ‘removed’. Previous removal of it has reduced the vigor of these populations, both near the footbridge. The park biologist, Geoffrey Smith has continued to remove shoots since 2005. With continued monitoring and removal, 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. In 2007, there were two strong populations of this plant across the street (on private property) from the Visitor Center and Merrill Rock area; diligent monitoring of this part of the park should continue to be a priority since once this plant gets a hold, its very difficult to remove.

Sweet Cherry – *Prunus avium*

One cherry tree is still growing along the beach at the southern tip of the park since its discovery in 2005. The fruits are palatable, and park staff continue to promise to control the fruits annually. The tree should be monitored to determine if seedlings are appearing in the vicinity, however. If the tree does begin to spread, all plants should be removed.

Creeping Buttercup – *Ranunculus repens*

R. repens has the most widespread distribution of all non-native species within the park, including both open and shaded habitats. It is common along trails and in mowed lawn areas and appears capable of displacing the native forest understory herbaceous species, including deer heart (*Maianthemum dilatatum*), small-flowered buttercup (*R. uncinatus*), and large-leaved avens (*Geum macrophyllum*), in areas without disturbance. Areas with extensive slug herbivory on native species showed relatively little damage of *R. repens*, suggesting this species may be unpalatable or possibly even toxic. Since no habitat in the park seems immune to *R. repens* invasion, this continues to be the priority control species. Recruiting volunteers for control activities in late June to mid-July while the plants are in full flower will ensure easier identification and removal. In both 2006 and 2007, efforts were focused on removal of this species from the area east of the footbridge,

near the battle site and near the shore side of the visitor center. Focus should continue on removal of small blocks of this plant, especially where it's threatening native species.



Figure 6 – TCCC crew digging out more creeping buttercup in Old Fort area.

Rugosa Rose – *Rosa rugosa*

Locally referred to as the Sitka rose, this plant is native to China, Japan, and Korea and has been well documented to escape cultivation and efficiently 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 this 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 plants are maintained and monitored to prevent spreading vegetatively, they are not likely to naturalize.

Common Sheep Sorrel – *Rumex acetosella*

First identified in 2005, sheep sorrel continues to slowly invade the eastern corner of the park from the neighboring Arrowhead Trail Park. Since its distribution is currently restricted to the shore’s banks, the species can be easily controlled at this time. Once it spreads, control will be exponentially more difficult.

Curly Dock - *Rumex crispus*

R. crispus is easily confused with the native western dock (*R. aquaticus*). It should be identified and monitored early in the summer before the grasses on the Sawmill Creek Road sidewalk get too tall to monitor. In 2006, it was found growing along this area, outside the park boundary but was not found in the 2007 survey due to tall grasses. Bitter dock (*R. obtusifolius*) was observed in the 2000 exotic plant inventory but has not been observed since then. This is a difficult species to monitor as it interbreeds with other docks; identification can be difficult.

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 in 2006, but has not been observed in 2007. Monitoring in these areas should continue however.

European Mountain-ash – *Sorbus aucuparia*

This species 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 and 2007, 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* spp. *sinuate*), 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, Hulten 1968). The hair color appears one of the easiest features to distinguish the two species.

	European Mountain-ash <i>Sorbus aucuparia</i> (non-native)	Sitka Mountain-ash <i>Sorbus sitchensis</i> (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	7-11 leaflets, rounded to blunt at the tip, sometimes rusty-hairy below, coarsely saw-toothed for not more than $\frac{3}{4}$ 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. In 2006 and 2007, control work at the historic battle site focused on removing dandelions from the coastal margin. In 2006, the effort occurred as the plants were distributing seeds, yet a significant difference was achieved. In 2007, many of the seed heads had been removed earlier to prevent seeding and it was difficult to locate those dandelions in the tall grass that had since grown over the area. It would be invaluable to have volunteers assist in the removal of the entire plant earlier in subsequent years if possible, but if this isn’t possible, continue beheading the seedheads seems like the only reasonable solution at this time. Either way, 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.

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 (W.Rapp pers. comm. 2005), shepard'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 the 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. Increases effort to find these species in subsequent years is recommended.

Other Thoughts

Considering its urban setting, extensive foot traffic by humans, bikes 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 and hollyhocks didn't 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.. 2006/2007). Red squirrels (*Tamiasciurus hudsonicus*) were introduced to Baranof Island in the 1930's 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.. 2006/2007). No effort to determine exotic insects or diseases has been made. An invasive species of snail has been increasing in populations at the Starrigaven area of the National Forest. It is an aggressive black slug that preys on native banana slugs and should be monitored as it is not yet been seen in SITK. No additional information is currently available for other species.

Recommended plans for 2008 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. There was much construction work done on/near the Sawmill Creek sidewalk and bridge area which may provide more opportunity for other invasives to enter from this area. This area should be monitored closely in future years.

May

- ✚ Survey for common dandelion when they are in peak bloom, before seeding has begun. Recruit volunteer crew to remove plants, particularly along shoreline, river edge, and intertidal meadow.
- ✚ Provide educational programs to interpretative, 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 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 the herbarium.

August

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

September

- ✚ Continue controlling all species.

- ✚ Complete data processing and report writing.
- ✚ Collect specimens absent from the herbarium.

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Figure 7 - TCCC member eradicating more creeping buttercup in Old Fort site.

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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)
shepard's purse	<i>Capsella bursa-pastoris</i>	Unknown	2	40
perennial cornflower	<i>Centurea montana</i>	Yes	4, 5, 6	not ranked
mouse-ear chickweed	<i>Cerastium fontanum</i>	Yes	2, 4, 5, 6	39
snow-in-summer	<i>Cerastium tomentosum</i>	Yes	5, 6	not ranked
Lambsquarters	<i>Chenopodium album</i>	Yes	2	35
Foxglove	<i>Digitalis purpurea</i>	Yes	1, 2, 3, 4, 5, 6	51
oxeye daisy	<i>Leucanthemum vulgare</i>	Yes	1, 2, 3, 4, 6	61
yellow toadflax	<i>Linaria vulgaris</i>	No	4	69
	<i>Lychnis/Silene</i>	Yes	4	not ranked
apple	<i>Malus pumila</i>	Yes	4, 5, 6	not ranked
pineapple weed	<i>Matricaria discoidea</i>	Yes	2, 3, 4, 6	33
forget-me-not	<i>Myosotis scorpiodes</i>	Yes	4, 5, 6	not ranked
Reed canarygrass	<i>Phalaris arundinacea</i>	No	4	83
common timothy	<i>Phleum pratense</i>	Yes	2, 4	56
common plantain	<i>Plantago major</i>	Yes	1, 2, 3, 4, 5, 6	44
annual bluegrass	<i>Poa annua</i>	Yes	2	46
Kentucky bluegrass	<i>Poa pratensis</i>	Yes	2	52

black bindweed	<i>Polygonum convolvulus</i>	Yes	2	50
Japanese knotweed	<i>Polygonum cuspidatum</i>	Yes	1, 2, 3, 4, 5, 6	87
sweet cherry	<i>Prunus avium</i>	Yes	4, 5, 6	not ranked
creeping buttercup	<i>Ranunculus repens</i>	Yes	1, 2, 3, 4, 5, 6	54
rugosa rose	<i>Rosa rugosa</i>	Yes	5, 6	not ranked
common sheep sorrel	<i>Rumex acetosella</i>	Yes	1, 4, 5, 6	51
curly dock	<i>Rumex crispus</i>	No	4	48
bitter dock	<i>Rumex obtusifolius</i>	Unknown	1	48
birdseye pearlwort	<i>Sagina procumbens</i>	Yes	4	not ranked
European mountain-ash	<i>Sorbus aucuparia</i>	Yes	2, 3, 4, 5, 6	59
common dandelion	<i>Taraxacum officinale</i> spp. <i>officinale</i>	Yes	1, 2, 3, 4, 5, 6	58
red clover	<i>Trifolium pratense</i>	No	2, 4	53
white clover	<i>Trifolium repens</i>	Yes	1, 3, 4, 5, 6	59
perennial sow thistle	<i>Sonchus arvensis</i>		6	

(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; 6 = 2007 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)