



Invasive and Exotic Species Management for Sitka National Historical Park

2010 Summary Report

Natural Resource Data Series NPS/SITK/NRDS—2010/104



ON THE COVER

Southeast Alaska Guidance Association crew and Student Conservation Association intern Katie Auer after pulling weeds around the Sitka National Historical Park Visitor Center.

Photograph by: Courtesy of Sitka National Historical Park

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Data in this report were collected and analyzed using methods based on established protocols and were analyzed and interpreted within the guidelines of the protocols. In addition, this report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data.

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Abbreviations

AKEPIC	Alaska Exotic Plant Information Clearinghouse
AKNHP	Alaska Natural Heritage Program
APCAM	Alien Plant Control and Monitoring Database
EPMT	Exotic Plant Management Team
NPS	National Park Service
SAGA	Southeast Alaska Guidance Association
SCA	Student Conservation Association
SITK	Sitka National Historical Park

Abstract

This report describes the work performed by the Alaska Exotic Plant Management Team at Sitka National Historical Park during the 2010 field season. The Exotic Plant Management Team staff at Sitka National historical Park was comprised of two Student Conservation Association interns; both staff members were hired with American Recovery and Reinvestment Act funding. For the seventh consecutive year, invasive plant inventory and control occurred at four locations in the park: the coast, the historic battlefield, the Russian Memorial, and the Visitor Center. Invasive plant populations were mapped using a Trimble Pro XRS with a Ranger datalogger and manual weeding was performed with the help of two Southeast Alaska Guidance Association crews. A total of 2,850 pounds of invasive weeds were removed within the park. Data was edited and analyzed using Pathfinder Office and ArcGIS. Three infestations were determined to be eradicated this year. Total canopy acres controlled (2.54) were slightly larger than in 2009 (2.30). A total of 7.15 acres of the park and 4.36 acres of non-park lands were surveyed in 2010.

Acknowledgments

Many thanks to the park staff, EPMT staff and AmeriCorps SAGA crews who assisted with buttercup eradication and public education mid-summer. If it were not for these hardworking crews, there would have been very little control done this summer. The SAGA crew was a big help in controlling the buttercups and the number of person hours they put forth was amazing. The members of the SAGA crew were an invaluable resource for the control efforts accomplished in 2010. Special thanks are also due to Alaska Exotic Plant Management Team Liaison Bonnie Million who provided invaluable information and support during my time as an intern. Also, special thanks to SITK park biologist Geoffrey Smith who provided irreplaceable identification help and computer support during my summer here.

Introduction

Sitka National Historical Park (SITK) is located on Baranof Island in southeast Alaska. No roads reach Sitka from the mainland and visitors arrive primarily by cruise ship, the Alaska Marine Highway System, chartered plane or regularly scheduled flights from Anchorage, Juneau, and Seattle. Alaska's oldest federally designated park contains over 2 miles of designated trails and numerous undesigned trails. At 113 acres in size, it is the smallest in the Alaska Region of the National Park Service (Fig. 1).



Figure 1. Map of Sitka National Historical Park.

The SITK trail system can be accessed from numerous points such as Sawmill Creek Road and the Visitor Center. In the summer visitors from all over the world walk the trails, potentially bringing invasive plants to this area. Year round, people use the trails to jog, fish, pick berries, walk children and dogs, walk their bikes, and push baby strollers. Maintenance staff drive park vehicles on the trails to access areas in need of repair. The park is bordered on the east by a trailer court, on the south by Sitka Sound and on the west/northwest by the closed Sheldon Jackson College. The Indian River runs through the park north to south towards the ocean. Wildlife such as mink, brown bear, black-tailed deer and bald eagles frequent the area as well as domestic dogs and cats.

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 invasive plant species in Alaska's NPS units. Invasive 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). In Alaska, NPS lands have thus far avoided invasion by many pernicious invasive species found in the lower 48 states (Westbrooks 1998). Several factors have contributed to the preservation of

Alaska ecosystems. Many parks in Alaska have remained relatively free of anthropogenic disturbances such as livestock grazing, wildfire suppression and altered hydrological regimes that encourage the introduction of invasive species. For these reasons 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 climate change, increases in construction-related disturbance, and tourism (AKEPIC 2005). Throughout Alaska, over 330 non-native plant species have been documented, accounting for approximately 15% of the flora (AKEPIC 2005). Fortunately, the NPS has the opportunity to stay ahead of invasive plant introductions in Alaska before these species become a problem, but research and active management must be maintained (Densmore et al. 2001).

SITK is unique among Alaska NPS units because of its small size and urban setting. The park is surrounded by the city of Sitka. Invasive plants are introduced to the park from the influx of summer visitors, the escape of planted ornamentals from Sitka lawns and gardens (Fig. 2), and ongoing park maintenance and construction activities. The park's small size makes it relatively easy to monitor and control incoming plant species, but park managers must remain vigilant.

Alaska Exotic Plant Management Team (EPMT) work has occurred in SITK annually since 2004. Unlike efforts in 2004 and 2005 that primarily focused on inventorying the park, the purpose of the 2006 thru 2008 EPMT seasons in SITK were to 1) re-treat creeping buttercup (*Ranunculus repens*) along the trails between the footbridge and the outhouse; 2) control common dandelions (*Taraxacum officinale* ssp. *officinale*) along the shoreline; 3) monitor the areas surveyed in 2004-8 to detect changes; and 4) look for new invasive species in the park.

2010 priorities closely mirrored those of 2009. Monitoring and controlling creeping buttercup on the coastal berm, Visitor Center area and trail edges remained a high priority. New focuses of the 2010 season included 1) looking for and inventorying any more Japanese knotweed (*Polygonum cuspidatum*) infestations and mapping previously treated areas; 2) monitoring European mountain ash (*Sorbus aucuparia*) in the park for eventual treatment with herbicide; and 3) re-treating creeping buttercup along trails near Russian Memorial, battle site and coast near the Visitor Center. Information on the status and number of invasive 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.



Figure 1. An infestation of Japanese knotweed in a private garden near the boundary of SITK.

Methods

Alaska EPMT fieldwork at SITK occurred from May 17th through August 6th, 2010. 2010 SITK EPMT staff consisted of two Student Conservation Association (SCA) interns. Areas monitored during this period included the most frequently used trails, the maintenance and Visitor Center area, the coastline and part of the east banks of the Indian River. Efforts in 2010 were focused in the area near the Visitor Center, on the park walking trails and on the coastline. Hand pulling was the only control method used and control efforts were supplemented with Southeast Alaska Guidance Association (SAGA) AmeriCorps crews to treat larger infestations.

A Trimble Pro XRS with a Ranger datalogger was used for all data collection during monitoring and control events. This unit was equipped with the Alaska EPMT standardized data dictionary. Areas with and without non-native species were inventoried at accuracies sufficient enough to allow for the inter-annual comparisons of changes in invasive plant patch sizes. The data dictionary provides sufficient detail for describing the type, size, and density of invasive plant infestations and for population into two distinct databases: Alien Plant Control and Monitoring (APCAM), a nationwide NPS database for invasive plant data, and Alaska Exotic Plant Information Clearinghouse (AKEPIC), a collaborative, interagency, web-based database for tracking Alaska weeds.

Results & Discussion

Species Summaries

The lack of documentation of new invasive species within SITK this year may have been due to the increased focus on the treatment of the two most invasive species, creeping buttercup and common dandelion, and the inexperience of the 2010 SITK EPMT staff. Just because new species were not mapped in 2010 should not lead one to assume that there were not any.

The continued monitoring, mapping and control of invasive species in SITK is still an urgent priority. In the open areas and mowed lawns common dandelion, white clover (*Trifolium repens*), common plantain (*Plantago major*), creeping buttercup, and mouse-ear chickweed (*Cerastium fontanum*) are common. In shadier wooded areas, tall buttercup (*Ranunculus acris*) and European mountain ash grow abundantly. Escaped ornamental garden plants in the western corner of the park, near the Visitor Center, and along Lincoln Street are also a concern. There are a number of large invasive plant infestations along the east park boundary adjacent to Sawmill Creek Road that could spread into the park. These include species oxeye daisy (*Leucanthemum vulgare*), reed canarygrass (*Phalaris arundinacea*), and common timothy (*Phleum pratense*).

The Alaska Natural Heritage Program (AKNHP) 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 (Carlson et al. 2008). This ranking is used by land managers to help determine treatment priorities given limited resources.

Shepherd's purse – *Capsella bursa-pastoris*

2010 was the first season that this species has been documented within SITK. Four small infestations, totaling 0.015 acres, were found by the Visitor Center and at three locations along the river trail. No treatments occurred in 2010 but it is possible that containment and possibly eradication of this species could occur given the relatively small size of the infestation. Shepherd's purse has an Alaska invasiveness rank of 40.

Perennial cornflower – *Centaurea montana*



Figure 2. Perennial cornflower.

In 2008, 2009 and 2010 perennial cornflower was identified and controlled in the area of the park known as Merrill Rock and along Lincoln Street (Fig. 3). In 2010 all plants were removed along with as much of the root systems as possible, about 15 lbs in all. Previous years have reported that perennial cornflower was spreading vegetatively rather than by seed; this appears to hold true in the 2010 season. In 2009 a much larger infestation was recorded (0.027 acres in 2009 versus 0.001 acres in 2010) so it appears that yearly hand pulling is effectively reducing the infestation size. Perennial cornflower is growing in private gardens located directly across the street from the park, so monitoring for this species will be

required even after existing plants are eliminated from the park. Perennial cornflower has not yet been ranked for invasiveness in Alaska.

Mouse-ear chickweed – *Cerastium fontanum*

Mouse-ear chickweed is prevalent both inside and outside the park boundary. The species is most often found in open areas and along trails within SITK, such as the Fort Site. It is a tiny plant with a low invasive rating of 36. Due to its size and prevalence, control would be time consuming, especially in areas like the park Visitor Center and the Fort Site where turf lawns are constantly maintained in a disturbed state by weekly mowing. During the 2010 season a small 0.055 acre infestation near Merrill Rock was hand-pulled.

Snow-in-summer – *Cerastium tomentosum*

Snow-in-summer was first discovered growing between the rocks separating the coast from Lincoln Street in 2006 (Fig. 4). The infestation is small, only 0.0006 acres in 2010, and easily removed in both 2009 and 2010. In 2010, infestations of snow-in-summer were mapped along Sawmill Creek Road just outside of the east park boundary. This species may continue to be introduced into the park from this and other plantings in local gardens across Lincoln Street. Constant monitoring and removal of plants is required to prevent this plant from moving deeper into the park. Snow-in-summer has not yet been ranked for invasiveness in Alaska.



Figure 3. Snow-in-summer.

Purple foxglove – *Digitalis purpurea*

Only one infestation of purple foxglove was found within SITK in 2010, in the Visitor Center garden. Foxglove is a popular garden plant that is found in most yards in Sitka, including on properties along Lincoln Street, with an invasiveness rank of 51. In 2009 and 2010 there were a few seedlings observed within SITK, so this species should continue to be monitored and removed when discovered. Seedlings persist for more than five years (Link, pers. comm. 2010). Land bordering the park on Sawmill Creek Road and Lincoln Street should be monitored to prevent foxglove from entering SITK.

Oxeye daisy – *Leucanthemum vulgare*

Oxeye daisy is a popular ornamental plant with an invasiveness rank of 61 that is prevalent in local gardens, along roadsides, and in open areas. In SITK this species can be found along Lincoln Street and in the garden at the Visitor Center. No treatments occurred in 2010 for this species.

Yellow toadflax – *Linaria vulgaris*

Yellow toadflax (also referred to as butter and eggs) was not found in the park in 2010. In 2006, the species was found outside the park in a parking lot of Sheldon Jackson College, though plants have not been observed at this location in subsequent years. This area should be monitored closely as the college has since closed and is presumably empty. With an invasiveness rank of 69, this species is very difficult to remove once established.

Apple – *Malus pumila*

Ring analysis of the single apple tree growing in the park near the Fort Site suggests that the tree located there was planted during World War II. Because of the potential historical value of the tree and its inability to thrive in its understory habitat, it is recommended that the tree be allowed to continue to grow in this area.

Pineapple weed – *Matricaria discoidea*

This species was removed from a 0.039 acre area near the Visitor Center in 2010. In 2007 a small infestation was discovered in the upper Visitor Center parking lot and near the Russian Memorial. In 2010 this species was re-inventoried at this site, but was present in lower densities. It should be monitored closely in future years. When pineapple weeds' relatively low invasiveness ranking of 32 and the plant's limited distribution are considered, the threat of this species to the native flora of SITK appears to be low (Carlson et al. 2008).

European 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 is prevalent and frequently planted. Approximately 0.042 acres of flowering forget-me-nots were mapped in the Merrill Rock area in 2010. These plants were likely derived from seeds from ornamental plantings located in a private garden across Lincoln Street.

Reed canarygrass – *Phalaris arundinacea*

Sawmill Creek Road, just outside the SITK northern boundary, is the only known location of reed canarygrass but it has great potential to spread and displace native species, particularly in riparian habitats. The species has an invasiveness ranking of 83; this is one of the highest ranked invasive species currently found in Alaska (Carlson et al. 2008). Annual monitoring of the species should continue throughout SITK. If this plant is detected within the park the entire plant with root system should be removed because re-growth from remaining rhizomes is probable.

Common timothy – *Phleum pretense*

This plant is currently restricted in its distribution to Sawmill Creek Road, just outside the SITK northern boundary, since the removal of a small infestation in 2005 from the Totem Trail. 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. Future EPMT staff should monitor the Sawmill Creek Road sidewalk in June before the area becomes overgrown, and again in late summer.

Common plantain – *Plantago major*

Common plantain grows well in highly disturbed habitats but rarely spreads into less disturbed areas. Hand digging is effective in removing the whole plant, making control of smaller infestations such as those at Indian River and the Totem Trail possible. Very little control of this species was done in previous years. In 2010 several common plantain plants were removed from the Visitor Center lawns. Disturbed areas should be carefully monitored to ensure this species does not spread further within the park.

Japanese knotweed – *Polygonum cuspidatum*

Control of this persistent species has occurred within SITK since 2001 yet it has continued to re-sprout from the same two locations it was removed at in all subsequent years. The species has an invasiveness ranking of 87; in addition to reed canary grass discussed above this is also one of the highest ranked exotic species currently found in Alaska (Carlson et al. 2008). Previous removal of the plant's above-ground foliage has reduced the vigor of these populations, both along the trail and near the footbridge. The park biologist has continued to remove shoots since 2002. In 2010 no evidence of this species could be found anywhere in the park. With the continued depletion of the energy reserves in the root system the species appears to have been effectively controlled but monitoring in this area should also continue to ensure that the plant

was not washed further downstream. Since at least 2006, there have been two strong plantings of this species on private property across the street from the Visitor Center and Merrill Rock area. Monitoring of this area in the park should continue to be a priority.

Sweet cherry – *Prunus avium*

A single sweet cherry tree is growing along the beach at the southern tip of the park. The fruits are palatable, and park staff have promised to harvest all the fruits the tree produces. The tree should be monitored to determine if seedlings are appearing in the vicinity. If seedlings are found around the tree all plants should be removed.

Creeping buttercup – *Ranunculus repens*



Figure 4. Southeast Alaska Guidance Association crew pulling creeping buttercup along the SITK coastline.

Creeping buttercup is the most widespread of all non-native species within the park in both open and shaded habitats. The species is common along trails and in maintained turf and appears to be capable of displacing the undisturbed, native forest herbaceous understory, including deer heart (*Maianthemum dilatatum*), small-flowered buttercup (*Ranunculus uncinatus*), and large-leaved avens (*Geum macrophyllum*). While slugs readily consumed native vegetation, they appear to avoid creeping buttercup, suggesting this buttercup may be unpalatable. Since no habitat in the park seems immune to creeping buttercup invasion, this species continues to be a priority for control within the park. Recruiting volunteers for control activities in late June to mid-July

while the plants are in full flower will ensure easier identification of target plants (Fig. 5). Between 2006 and 2009 efforts were focused on removing this species from the area east of the footbridge, near the battle site and near the shore side of the Visitor Center. In 2010 efforts were focused on the battlefield site, between the coast and the tree line, and near the Visitor Center. Control work was also performed near the Russian Memorial. Priority should continue to be placed on removing small infestations of this plant, especially where it threatens native species. Soil knives or hori-hori knives were used by SITK EPMT staff in 2010 to insure that more of the plant's root system was removed. In 2010 questions were raised about the identification of the buttercups in the park whether they are creeping or tall. SITK EPMT staff may be observing hybrid plants formed from both creeping and tall buttercup, as some plants show diagnostic features of both species. It is recommended that a more detailed identification of the buttercups in the park be determined in 2011, including taking samples for an in-depth identification by AKNHP botanists.

Rugosa rose – Rosa rugosa

Locally referred to as the Sitka rose, this plant is native to China, Japan, and Korea (Fig. 6). It is believed that the rugosa rose infestation in Sitka originated at the Alaska Agricultural Experimental Station. The station's first superintendent Charles Georgeson was reported to have introduced this species between 1903 -1921 and later sent it to other areas of Alaska for cultivation (Gardner 2010). The 2007 planting of rugosa rose near the Visitor Center acts to exclude foot traffic from the hills above the center. In 2010 a rugosa rose bush was discovered near the battlefield information sign and removed. This area should be monitored again in 2011.



Figure 5. Rugosa rose.

Curly dock – Rumex crispus

Curly dock identification can easily be confused with other regionally common docks, such as western dock (*Rumex aquaticus*). Curly dock should be identified and monitored early in the summer before the grasses on the Sawmill Creek Road sidewalk obstruct viewing of the area. Curly dock was found growing outside of the park along the Sawmill Creek Road in 2006, but was not relocated between 2007 and 2010 due to tall vegetation impeding the surveys. Bitter dock (*Rumex obtusifolius*) was observed during the 2000 invasive plant survey but has not been observed in subsequent years. Monitoring should begin as early as possible as dock plants are quickly hidden by the growth of grasses.

Birdseye Pearlwort – Sagina procumbens

Birdseye pearlwort was seen growing in maintained turf lawns near the Visitor Center, Russian Bishop's House and by Arrowhead Trailer Park in 2006, but was not observed in 2007 or 2008. The species made a comeback in 2009 in the old picnic area on the west side of the park where the soil is still recovering from past disturbance and was promptly removed. Additional infestations were found and removed from the lower Visitor Center parking lot and the circular walkway in between the upper parking lot and main Visitor Center in 2009. In 2010 small infestations were discovered and removed in the courtyard and maintenance yard behind the Visitor Center. Birdseye pearlwort is locally called Irish or Scottish moss and sold as a groundcover in Sitka.

European mountain-ash – *Sorbus aucuparia*



Figure 6. European mountain-ash.

European mountain-ash has been planted widely in Sitka in yards and along roadsides (Fig. 7). Mountain-ash seeds are consumed by birds and subsequently redistributed following passage through the gut, thereby expanding the seed rain far beyond an immediate tree (Dickerson and Campbell 1991). Hundreds of mountain-ash trees now grow within SITK; individual plants range from small (< 0.5 m tall) seedlings to trees exceeding ten meters in height. The species has the potential to readily displace native vegetation (AKEPIC 2005). Although European mountain-ash may hybridize with native *Sorbus sitchensis*

or *S. scopulina* (Douglas 1999), the mountain-ashes in SITK display the characteristics of the non-native species (Table 1).

Table 1. Comparison of traits of native and non-native mountain-ash species (Douglas 1999, Hultén 1968).

	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 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	Forests to subalpine areas

Smaller seedlings are easily pulled from the ground by hand. A few seedlings were removed along trails while transiting to other control sites between 2006 and 2007. In 2008 and 2009, closer monitoring of the area around the coastal berm directly east/south of the Visitor Center discovered several foot high seedlings; these were removed. During the 2010 season seedlings were pulled while encountered during the more intense creeping buttercup treatments along the coastal berm.

Seedlings are growing in a variety of areas in the park: along the shoreline, along Sawmill Creek Road, on riverbanks, on the coastal berm, along the trails system and around the maintenance buildings and wood carving shed behind the Visitor Center. The trees seem to be very tolerant of marginal conditions. A seedling was found growing on a beach log much closer to the salt water than any other woody species, including the salt-tolerant species Sitka alder (*Alnus viridis* spp. *sinuate*) (Link pers. comm. 2010). Due to the ability of this invasive plant to adapt to new environments and displace other species, it is considered a high-priority species in SITK. Any seedlings of European mountain-ash should be removed when located.

European mountain-ash re-sprouts after cutting (AKEPIC 2005), so simply cutting larger trees will likely result in widespread re-growth over many years. Experimentation should be performed to determine the most effective method to remove mature European mountain-ash. The selective application of an herbicide such as an appropriate triclopyr to recently cut stumps may inhibit re-sprouting.

Common Dandelion – *Taraxacum officinale ssp. officinale*

Common dandelions are found in SITK at sunny locations, including the mowed lawns near the Visitor Center, the Russian Bishop's House, the Fort Site, along the shoreline, the riverbanks, along Sawmill Creek Road and at the battlefield site. Based on the density of plants and the level of continued disturbance, common dandelion control work should be focused on the coastline and riverbanks where human disturbance is minimal and native plant community structure are still intact. Areas with extensive human trampling will be more difficult to control over the long term. In 2006, 2007 and 2008, control work at the historic battle site focused on removing dandelions from the coastal margin. An effort was made in 2010 to remove common dandelion from the coastal margin, but as plants had already gone to seed, a greater focus was placed on invasive buttercups. It is recommended that common dandelions are made an early-season priority. If whole plants cannot be dug out and removed, seed heads can be removed to limit seed rain from this invasive on the area surrounding an infestation. Repeat control events will be needed in subsequent years to deplete the seed bank in the soil in all areas. Mapping early in the season is recommended as dandelions are harder to locate after summer growth has covered the species' basal rosettes and flowering stalks.

Red Clover – *Trifolium pratense*

Red clover has been observed in previous years outside the park along Sawmill Creek Road. During the 2010 season, SITK EPMT discovered and hand pulled 0.311 acres along the coastal berm and 0.336 acres at the Russian Bishop's House with assistance from SAGA crews. Continued annual monitoring for this species within SITK should focus on open, sunny areas of the park. Infestations of red clover appear to be increasing in number and density along the edges of the park.

White Clover – *Trifolium repens*

White clover has successfully invaded many of the sunnier locations within and outside of the park. The creeping nature of this species makes manual control difficult. Efforts should be made to remove smaller infestations, before they become established. The turf areas in the park at the Fort Site, the Visitor Center and the Russian Bishop House have large populations of clover. The clover populations are confined to open areas and do not appear to be spreading to low-light areas. Small infestations of white clover at the Russian Bishops House and the Visitor Center picnic area were pulled in 2010 but a comprehensive effort was not made. White clover grows well in mowed areas; these areas should be carefully monitored. Hand pulling is an effective treatment method for controlling this species; the infestation of white clover around the Visitor Center was found to be smaller in 2010 after manual treatment was performed in 2009.

Other Species

The 2002 vascular plant inventory identified four other non-native species that were not detected in 2010 because focus was on removal and eradication of the higher ranking invasive plants. Closer observation in future years on the following invasive plants would be wise: lambsquarter

(*Chenopodium album*), annual bluegrass (*Poa annua*), Kentucky bluegrass (*Poa pratensis*), and black bindweed (*Polygonum convolvulus*).

A single specimen of lambsquarters was found in gravel near the beach at the south end of the park; however no survey was done for this plant in 2010. Identification of lambsquarters to species is now known to be dependent on seed characteristics, so future surveys will need to look for these features. Annual bluegrass was found in the turf lawn at the Fort Site and near the Visitor Center, but was not resurveyed in 2010. Kentucky bluegrass was found near the southeastern tip of the park on the bank of the Indian River, on beach gravels approximately 300 meters southeast of the Visitor Center and on a log near the mouth of the Indian River. No survey was performed for Kentucky bluegrass in 2010. Non-native bluegrass species, including annual and Kentucky bluegrass, are presumably dominant grasses in open, mowed areas, such as the Fort Site, the Visitor Center lawn, and the Russian Bishop's House lawn. It is likely that the two species were overlooked due to uncertainty in identification. Black bindweed was identified at several forested areas along a trail near the Visitor Center in previous years but was not relocated in 2010. Increased effort to find these species in subsequent years is recommended.

Recommended plans for 2011 field season

In the future, prevention and rapid removal of invasive plants will save time and money. Well-trained personnel are essential for monitoring and control efforts. Park projects should use best management prevention practices to avoid introducing or spreading invasive plants. EPMT staff should learn to identify local plants before the start of the growing season. Development of educational programs for park staff, Sitka residents and visitors will improve awareness of invasive plant issues. Increased community awareness will also serve to increase recruitment of volunteers for control events.

In 2007 there was extensive construction on Sawmill Creek Road and bridge. In 2008 and 2009, there was further construction work performed around the main park Visitor Center. These construction projects may have introduced invasive plants to the park. These disturbed areas should be monitored closely in future years. It is recommended that surveys for Japanese knotweed continue. Overall, earlier detection of all invasive plants is recommended. Survey work performed before June is most effective, and is therefore recommended for future years.

Table 2. Suggested schedule for SITK EPMT seasonal staff.

May	• Survey for common dandelion in the spring, before seeding has begun. Recruit volunteers to remove plants, particularly along the park shoreline, river edge, and intertidal meadow. If this is not possible, de-head as many dandelions as possible. • Learn to identify plants in the park (both native and non-native). • Provide educational programs for interpretative, resource management, and maintenance staff regarding the threats from invasive species. • Collect specimens absent from the herbarium.
June	• Monitor the park to assess the distribution of non-native species. • Continue control efforts on common dandelion. • Remove any European mountain-ash seedlings found. • Control creeping buttercup. • Check for and control any regrowth of Japanese knotweed. • Provide educational programs for the community and for visitors. • Collect specimens absent from herbarium.
July	• Control creeping buttercup, oxeye daisy, foxglove, and other species. Recruit volunteers to help with removal of these plants. • Provide educational programs for the community and for visitors. • Collect specimens absent from the herbarium.
August	• Continue control efforts on all species. • Collect specimens absent from the herbarium.
September	• Continue control efforts on all species. • Complete data processing and report writing. • Collect specimens absent from the herbarium.

Other Thoughts

SITK has many areas that are unaffected by non-native species despite the park's urban setting, extensive foot traffic by humans, bikes and dogs, and ample sources of non-native seeds/plants in outlying areas. Future efforts to reduced 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 disrupted by the loss of wind-thrown trees are more susceptible to plant invasion, so continued monitoring should be maintained after disturbance.

Ornamental plantings at SITK should represent the cultural history of the park. The garden in front of the Russian Bishop's House should reflect the Russian occupation of Sitka, Alaska. If ornamental species were not planted during the period of Russian occupation, they should not be planted near historic structures in the park. Near the Visitor Center, the landscape should reflect the natural ecology of Baranof Island. The recent addition of native plants to the landscape in front and back of the Visitor Center is a welcome change but more effort is needed if plantings are to be maintained.

Sitka hosts numerous for-profit gardening businesses, community groups and agency offices. Great potential exists to partner with these organizations for education and outreach opportunities.

EPMT staff should work with the gardening community and plant retailers to discourage the planting of invasive species of concern and encourage the planting of native species. EPMT staff should approach the city of Sitka about joining on a memorandum of understanding for weed control on area lands. Partnerships with nonprofit organizations such as the Sitka Conservation Society, the Girl Scouts, the Boy Scouts and local schools may also provide valuable volunteer resources. Finally, other state and federal agencies in the greater Sitka area can also offer valuable partnership assistance.

The SITK interpretive division should be encouraged to help in organizing and publicizing community weed pulls. Printed material with contact information for local EPMT staff should also be provided to the interpretive division for distribution to the public. Finally, EPMT staff should provide training to interpretive division staff on common questions and answers about invasive plant issues at SITK so that interpretive staff can discuss these topics with the public.

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

Common Name	Taxon	Inside park?	Source of Observation (a)	AK Weeds Ranking (b)
Shepherd's purse	<i>Capsella bursa-pastoris</i>	Yes	2, 9	40
Perennial cornflower	<i>Centurea montana</i>	Yes	4, 5, 6, 7, 8, 9	not ranked
Mouse-ear chickweed	<i>Cerastium fontanum</i>	Yes	2, 4, 5, 6, 7, 8, 9	36
Snow-in-summer	<i>Cerastium tomentosum</i>	Yes	5, 6, 7, 8, 9	not ranked
Lambsquarters	<i>Chenopodium album</i>	Yes	2	37
Foxglove	<i>Digitalis purpurea</i>	Yes	1, 2, 3, 4, 5, 6, 9	51
Oxeye daisy	<i>Leucanthemum vulgare</i>	Yes	1, 2, 3, 4, 6, 7, 8, 9	61
Yellow toadflax	<i>Linaria vulgaris</i>	No	4	69
Campion	<i>Lychnis/Silene</i>	Yes	4	not ranked
Apple	<i>Malus pumila</i>	Yes	4, 5, 6, 7, 8	not ranked
Pineapple weed	<i>Matricaria discoidea</i>	Yes	2, 3, 4, 6, 8, 9	32
Forget-me-not	<i>Myosotis scorpiodes</i>	Yes	4, 5, 6, 7, 8, 9	not ranked
Reed canarygrass	<i>Phalaris arundinacea</i>	No	4, 8, 9	83
Common timothy	<i>Phleum pretense</i>	Yes	2, 4, 8, 9	56
Common plantain	<i>Plantago major</i>	Yes	1, 2, 3, 4, 5, 6, 7, 8, 9	44
Annual bluegrass	<i>Poa annua</i>	Yes	2, 8	46
Kentucky bluegrass	<i>Poa pratensis</i>	Yes	2, 8	52
Black bindweed	<i>Polygonum convolvulus</i>	Yes	2, 8	50
Japanese knotweed	<i>Polygonum cuspidatum</i>	Yes	1, 2, 3, 4, 5, 6, 7, 8, 9	87
Sweet cherry	<i>Prunus avium</i>	Yes	4, 5, 6, 7, 8, 9	not ranked
Creeping buttercup	<i>Ranunculus repens</i>	Yes	1, 2, 3, 4, 5, 6, 7, 8, 9	54
Rugosa rose	<i>Rosa rugosa</i>	Yes	5, 6, 7, 8, 9	not ranked
Common sheep sorrel	<i>Rumex acetosella</i>	Yes	1, 4, 5, 6, 7, 8	51
Curly dock	<i>Rumex crispus</i>	Yes	4, 8, 9	48
Bitter dock	<i>Rumex obtusifolius</i>	Unknown	1	48
Birdseye pearlwort	<i>Sagina procumbens</i>	Yes	4, 8, 9	not ranked
European mountain-ash	<i>Sorbus aucuparia</i>	Yes	2, 3, 4, 5, 6, 7, 8, 9	59
Perennial sow thistle	<i>Sonchus arvensis</i>	No	4	73
Common dandelion	<i>Taraxacum officinale</i>	Yes	1, 2, 3, 4, 5, 6, 7, 8, 9	58
Red clover	<i>Trifolium pratense</i>	Yes	2, 4, 8, 9	53
White clover	<i>Trifolium repens</i>	Yes	1, 3, 4, 5, 6, 7, 8, 9	59

(a)

1 = 2000 Invasive Plant Inventory
 2 = 2002 AKNHP Vascular Plant Survey
 3 = 2004 Invasive Plant Inventory
 4 = 2005 Invasive Plant Inventory
 5 = 2006 Invasive Plant Inventory

6 = 2007 Invasive Plant Inventory
 7 = 2008 Invasive Plant Inventory
 8 = 2009 Invasive Plant Inventory
 9 = 2010 Invasive Plant Inventory

(b) – Alaska invasiveness ranking based on the threat to native ecosystems in Alaska from low (0) to high (100) (Carlson et al 2008)