

**MANAGEMENT OF UPLAND INVASIVE PLANTS ON 64-ACRES
AT THE PADILLA BAY NATIONAL ESTUARINE RESEARCH
RESERVE IN 2011**

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INTRODUCTION

Padilla Bay National Estuarine Research Reserve (NERR) is one of 28 Reserves located throughout the coastal and Great Lakes regions of the United States. The site was designated in 1980 and opened its doors to the public in 1982. The Breazeale Interpretive Center is the hub of the Reserve's activities and is located on a 64-acre upland parcel on Bay View Ridge in Skagit County, Washington.

Bay View Ridge was, before the time of white settlement, an old growth forest of Douglas-fir, western red cedar, western hemlock and Sitka spruce (Willis, 1973; Kruckeberg, 1991). Native tribes used the area for hunting and foraging for a few thousand years before early explorers arrived and had well-developed cultures (Kruckeberg, 1991). The Spanish explorer, Jose Narvaez, sailed through these waters in 1791 and gave Padilla Bay its name (Alexander, *et al.* 1992). Although not well documented, trappers probably arrived in the early 1800s. Surveyors arrived in the 1800s and the area around Bay View was surveyed in the 1870s (United States Coast Survey "t-sheets"). European settlers arrived in the mid-1800s and the first dikes (levees) were built in 1863 (Willis, 1973). The ridge was logged off from 1865 to about 1911. Starting about 1907, settlers cleared the "stump farms" left after logging in order to convert the land to pasture or farms (Willis, 1973). The Breazeale brothers purchased part of the land where the Interpretive Center now sits and were willed the rest of the land by an adjoining neighbor, "Doc" McHenry. They cleared the stumps sometime in the 1930s or 1940s and eventually grazed dairy cows on the land. Management of the site went to the Washington Department of Game in the 1970s, while Edna Breazeale still owned the land. Washington State Department of Ecology acquired the site in 1980 as a donation from Edna Breazeale. The site then became part of the National Estuarine Sanctuary Program under the National Oceanic and Atmospheric Administration. The name of this system was later changed to the National Estuarine Research Reserve System. The Breazeale Interpretive Center opened in 1982 and was built to house museum-type exhibits, to provide a theater and classroom for visiting school groups and offices for staff. The Upland Trail, a 0.8-mile pedestrian footpath, was created in the early 1980s and is a loop trail with a self-guided interpretive booklet.

This 64-acre site has been highly disturbed by human activities over time. As European settlement moved east to west, they brought with them plants from “home” and other unintended hitch-hiking seeds. The disturbances created by logging and then farming disrupted the topsoil and native seed banks and opened pathways for non-native plants to gain a foothold. Plants in their native environs encounter constraints placed on them such as by climate, nutrient availability, disease, pests, and competition by other plants. Often, when these plants are moved to new habitats they find a “release” from one or more of these constraints and flourish in their new locations. Some flourish to the point of out-competing native species. They produce seed, which becomes part of the seed bank. Disturbance of the soil and seed bank often encourages germination. This is evident when you pull weeds, creating a disturbance, only to find more of the same weed coming up in a day or two or a different weed sprouting up with vigor. Those seeds residing in the seed bank can remain viable for a few months or even decades, depending on the species.

Weed control efforts in the Padilla Bay NERR’s upland habitats started only after Padilla Bay’s Natural Resources staff had the estuarine *Spartina* infestation controlled to the point where they could turn their focus, at least part of the year, to the uplands. Weed control efforts on this site were started in 2002 with removal of English holly from the wooded area the Upland Trail loops through. It continued in 2003 with removal of English ivy in the southeast woods. In 2004, removal of blackberry from selected sites along the Upland Trail commenced.

In 2004, Padilla Bay NERR hired a contractor to write a “PBNERR Upland Habitat Management Plan” (GeoEngineers, 2004). One of the goals in all the management areas listed in the plan is to “implement a noxious weed management program.” One of the three major goals established in the PBNERR Management Plan is to protect and improve habitat and biological diversity within the Reserve and the Puget Sound biogeographic region (Wash. State Dept. of Ecology, 2008). The fundamental approach to natural resource stewardship in that plan is to: 1) protect lands and resources, 2) conserve habitats, species, functions, and processes; and 3) restore habitats, species, functions and processes. The plan states that one of the natural resource issues in the

Reserve is exotic species. It suggests that staff should monitor the upland area and locate and control species on the state and county noxious weed lists.

Washington State publishes a Noxious Weed List every year. State agencies are required by law to control noxious weeds (RCW.17.10.145 – State agencies' duty to control the spread of noxious weeds) which states:

All state agencies shall control noxious weeds on lands they own, lease, or otherwise control through integrated pest management practices. Agencies shall develop plans in cooperation with county noxious weed control boards to control noxious weeds in accordance with standards in this chapter. All state agencies' lands must comply with this chapter, regardless of noxious weed control efforts on adjacent lands.

The noxious weed information below is for species on our site that are on the state noxious weed list. That section is followed by descriptions of some "problem plants".

NOXIOUS WEED INFORMATION

Class A noxious weeds are non-native plants that are limited in distribution in Washington State. Eradication is required by law.

Geranium, Shiny

Shiny geranium (*Geranium lucidum*) is a Class A noxious weed as of 2009. This annual species is from Eurasia (King County, 2009c). The first record of it on the Reserve was in 2006 by Dr. David Giblin (University of Washington, Herbarium). It also exists on private property to the south and at Bay View State Park property as well (which is also to the south). True eradication would involve the cooperation of all landowners that have it present on their land.

Reproduction: Seeds mature and spread late June to early July. The seeds are ejected 15-20 feet from the drying capsule. Seeds germinate late summer to early fall.

Control methods: Physical (hand pull or dig before seed set), and chemical (can apply an herbicide such as Roundup).

Impacts: Shiny geranium does well in disturbed habitats, such as roadsides. It can spread into forest and grassland habitat and outcompete native species (King County, 2009d).

Class B noxious weeds are non-native species whose distribution is limited to portions of Washington State. In regions where Class B species are already abundant, they are not designated for control. Containing the infestation is the primary goal so the plants do not spread to areas that are not infested.

Broom, Scotch

Scotch (or Scot's) Broom (*Cystis scoparius*) is a Class B noxious weed in Washington State, but is not listed as a Class B designate in Skagit County. This perennial plant was originally introduced from Europe and is toxic to animals and people (contains quinolizidine alkaloids). The plants bloom between March and June.

Reproduction: A single plant can produce more than 12,000 seeds a year and seeds can last up to 30 years in soil (Hulting *et al.*, 2008).

Control methods: Physical (pulling), chemical (glyphosate and/or 2,4-D applied from spring to late summer)

Impacts: It forms dense, monotypic stands, reducing wildlife habitat and hindering re-vegetation of upland sites and wetland buffers (King County, 2009b). Scotch broom also alters the soil through acidification and addition of organic matter, which may hinder re-establishment of native species (Hulting *et al.*, 2008).

Catsear, Common

Common catsear (*Hypochaeris radicata*) is a Class B noxious weed in Washington State, but is not listed as a Class B designate in Skagit County. It is a perennial plant native to Europe and grows in lawns and pastures in full sun (Washington State NWCB, 2009). It is widely established in western Washington.

Reproduction: It spreads by seed but does not create a seed bank. It flowers May-August.

Control methods: 2,4-D (a selective herbicide) provides good control.

Impacts: This plant invades lawns and is toxic to livestock and horses.

Geranium, Robert's

Robert's geranium (*Geranium robertianum*) is an introduced species from Eurasia and is a Class B noxious weed in this state but is not listed as a Class B designate in Skagit County (Pojar & MacKinnon, 1994; Washington State NWCB, 2009c). It is considered a winter or spring annual.

Reproduction: Seeds mature and spread late June to early July. The seeds are ejected 15-20 feet from the drying capsule. Seeds germinate late summer to early fall.

Control methods: Physical (hand pull or dig before seed set), and chemical (can apply an herbicide such as Roundup)

Impacts: Robert's geranium is a threat to forest understory, can grow in shade, spreads quickly and appears to crowd out native species (King County, 2009d).

Thistle, Bull & Thistle, Canada

Bull Thistle (*Cirsium vulgare*) & Canada Thistle (*Cirsium arvense*) have been elevated to Class B noxious weeds in 2009 from Class C and both are originally from Eurasia (Washington State NWCB, 2009; Pojar & MacKinnon, 1994). They are not listed as Class B designates in Skagit County. These thistle are present not only on the 64-acre site, but on Hat Island as well.

Reproduction: Bull thistle flowers May-October and spreads rapidly by seed and germinates in the summer and fall. The plant overwinters as a rosette. Canada Thistle flowers June – September, with male and female flowers being produced on separate plants. The seeds are dispersed by wind. Seed can remain viable in soil up to 22 years (Beck, 2008). Once a plant is established, vegetative spread is rapid. Roots may spread 12 – 15 feet a year and grow to a depth of 10 feet. Root segments with vegetative buds can produce new plants.

Control methods: Cultural, mechanical, chemical (2,4-D or glyphosate), biological

Impacts: Bull thistle can infest meadows or pasture and may shade out seedlings of native plants. Canada thistle can reduce forage in pastures. It competes effectively for light, nutrients and water.

Class C noxious weeds are widely distributed in Washington or are of special interest to the agricultural industry. This class allows a county to enforce control if it is beneficial to that county.

Blackberry, Evergreen & Blackberry, Himalayan

Evergreen blackberry (*Rubus lacinatus*) was introduced from Europe and Himalayan blackberry (*Rubus discolor*) was introduced from India via England (Pojar and MacKinnon, 1994). Both these non-native plants are perennials. Seeds are thought to remain viable in the soil for a number of years. They are both Class C Noxious Weeds in Washington State, added to the list just this year (Washington State NWCB, 2009).

Reproduction: Plants sprout from seed and then spread vegetatively. The best germination occurs once the seed has passed through a bird's digestive tract. The seed germinates mainly in the spring. *Rubus discolor* has a germination success of between 10 – 33% (Hoshovsky, 1989).

Control methods: Mechanical, physical, chemical

Impacts: These non-native blackberries shade out native understory vegetation and can become large impenetrable thickets. They can also prevent the establishment of desirable native shade intolerant trees such as Pacific Madrone and Douglas-fir (King County, 2009a).

Canarygrass, Reed

Reed Canarygrass (*Phalaris arundinaceae*) is a Class C noxious weed and wetland perennial grass. It is not clear whether the grass is introduced or indigenous along parts of the coast. Humans have aided in its spread and it grows in wet areas of disturbed sites (Pojar & MacKinnon, 1994). It is found in wet places in disturbed sites. Reproduction: It reproduces through seeds and creeping rhizomes. It flowers May to mid-June and the seeds ripen in late June. It creates a vast seed bank.

Control methods: Mechanical or chemical, then replant with native species.

Impacts: This species can invade most types of wetlands and spreads aggressively.

Ivy, English

Four cultivars of English Ivy (*Hedera helix* "Baltica", "Pittsburgh" and "Star", *Hedera hibernica* "Hibernica") are recognized as Class C noxious weeds in Washington (Washington State NWCB, 2009). English ivy is a woody evergreen vine that grows as a ground cover for up to ten years before flowering.

Reproduction: Ivy can reproduce through seed or vegetatively via runners. It can also grow from root fragments.

Control methods: Cut and pull vines, dig roots. Herbicide application on freshly cut "mother" vines may also kill the plants.

Impacts: The vines can cover native understory plants, climb and kill trees by shading them and inhibit native plant seed germination through shading.

PROBLEM PLANTS AT THE RESERVE

A few plants that are native or not on the noxious weed list are considered problem plants at the Reserve. We are trying to hold succession at a certain stage in the open meadows. Woody plants that spread into this area are removed. Holly is found in our forested areas and we try to remove it to keep it from gaining a foothold in those habitats. Russian Olive is not native and found in one location at the Reserve. We have not fully eliminated it yet. The fruits are spread by birds and small mammals, so we monitor it on a regular basis.

Hawthorne, Black

Black Hawthorne (*Crataegus douglasii*) is native to the Pacific Northwest and grows in moist, open places (Pojar & MacKinnon, 1994). The fruits and seeds are spread by birds. This plant has started spreading rapidly in the past couple of years on the Reserve's 64-acre site. It is invading our meadow area and is difficult to remove because of the hardness of the wood and the thorns. It grows best in sun in areas with moist soils. It provides food and cover for birds and rodents (Nuttall, 2009). They form dense, impenetrable thickets or hedges. They generally dominate the understory in black cottonwood, eastern cottonwood, quaking aspen and Ponderosa pine.

Reproduction: They produce fruits that are transported by birds and rodents. The fruits produce many fertile seeds.

Control: Use a cut stump herbicide application or dig when small as they develop long taproots.

Impacts: It has the potential to create impenetrable thorny thickets. This is a problem when trying to manage the meadow as open habitat.

Holly, English

English holly (*Ilex aquifolium*) is an ornamental plant. It is not on the Washington State Noxious Weed List but is of concern because birds disseminate the berries. It is found on the Reserve's 64-acre site and on Hat Island. English holly thrives in cold, shaded areas. Holly roots and grows faster in the fall than in the spring. It also thrives in low light conditions.

Reproduction: English holly is pollinated by bees and produces berries. It also spreads by suckering and layering

Control: Pull or dig small plants or apply herbicide with cut stump or frilling method on established plants. Foliar treatment is not very effective.

Impacts: It also provides dense shade and can compete with forest understory.

Olive, Russian

Russian Olive (*Elaeagnus angustifolia*) is a perennial plant native to southeastern Europe and western Asia. It is a small, very thorny shrub that can grow to 30 feet. It can fix nitrogen so can grow on bare mineral soils. It invades old fields, woodland edges and disturbed sites. It was introduced to the U.S. in the late 1800s after first being cultivated in Germany (Plant Conservation Alliance's Alien Plant Working Group, 2009). The seed is spread by birds or mammals that eat the fruit. It is found in at least one location on the 64-acre site.

Reproduction: Reproduction is primarily by seed, although there can be vegetative propagation.

Control: Control can be achieved by a cut stump application of glyphosate in late summer

Impacts: Russian olive can out-compete native vegetation, interfere with natural plant succession and nutrient cycling and tax water reserves.

CONTROL METHODS IN 2011

We employed the following methods to control noxious upland weeds on the Reserve this year:

Canadian & Bull thistle. This year we mowed infestations present in the upper half of the 64-acre site where the Breazeale Interpretive Center is located to reduce/suppress seed set and hired Timberline Silvics, Inc. to spray an herbicide (Milestone, an aminopyralid) on the 10 acres nearest to Bayview-Edison Road and around the Interpretive Center.

(Mechanical & Chemical)

Shiny geranium. This is the third year we hand-pulled shiny geranium along BayView-Edison Road in late spring. In addition, in an effort to create a larger buffer between us and the encroaching infestation, we mowed shiny geranium in a pasture adjacent to the south, then pulled and bagged everything we found to keep it from going to seed. We then covered that site with black plastic. We hand-pulled the shiny geranium along the east slope next to the road (south of the pasture) and pulled most of the shiny geranium in the yard at the top of the slope. Our approach this year was to prevent seed set as much as possible and to not use herbicides. We also set up a small experiment to test three approaches: hand-pulling, covering, and planting grass seed. We will collect data through at least spring 2012. (Physical)

Blackberry. We dug both Himalayan and Evergreen blackberry from the restoration sites we re-planted with native species in 2006 and 2007. We re-visited an alder stand to the north of the current restoration where we have removed blackberry in the past, but have not had time to control it for 2-3 years.

Reed canarygrass. We clipped and bagged seed heads and sprayed the infestations with Rodeo®(glyphosate)/R-11®(adjuvant) on 9/6/11.

Robert's geranium. No control efforts yet this year.

English holly. No control efforts yet this year.

English ivy. We did not encounter English ivy on the 64-acre site this year.

DISCUSSION

The approach to all noxious weeds on our site should be: 1) systematic, 2) thorough, and 3) repeated annually. Our limitations currently are: 1) state hiring freeze, 2) state contracting freeze, and 3) budget constraints.

The highest priority weed is Shiny Geranium, which is a Class A noxious weed. We are required by law to eradicate it every year. Shiny geranium is found in limited distribution on the 64-acre site. It is largely along Bayview-Edison Road and appears to be spreading north from the properties south of the Interpretive Center. We have hand-pulled shiny geranium from the roadside for two years. It is an annual, blooming in spring and producing seed during the summer. The seed germinates in late summer. Our neighbor to the south is willing to control the plant, but needs help to do so as their acreage is fairly large. They first noticed it when they removed English ivy from their property. The geranium seemed to gain a foothold after that event. It will take a concerted effort to actually eradicate it. Luckily, it is an annual plant, so once we start controlling seed set, we should be able to get ahead of it.

Robert's geranium, a Class B noxious weed, is found in the forest understory along the Upland Trail and may be in the southeast forested area as well. We have not done a thorough mapping effort of this species on our property. It seems to get a foothold in disturbed sites (such as where we removed blackberry).

Blackberry is prolific in the Pacific Northwest. Although we are used to seeing both Himalayan and Evergreen blackberry growing "wild", they are both non-native plant species that are Class C weeds and tend to dominate along forested edges and open fields, forming thickets up to ten feet in height. We do have one species of native blackberry (Pacific trailing), which tends to grow along edges of forests and in areas that have been opened up by windfall. We started blackberry removal (Himalayan & Evergreen) in 2006 at three sites along the northern section of trail. After blackberry removal, we re-planted the areas with native trees (Douglas-fir, western hemlock, red alder, cascara, and bitter cherry) and understory plants (salal, sword fern, red-flowering currant, twinberry, ocean spray, etc.). Even though alder is sometimes perceived as a "weedy" species, it was planted because it is the first tree in a normal forest succession in this area and grows fast, providing shade that we hoped would suppress blackberry. We have weeded these

areas at least annually since re-planting to suppress new blackberry and thistle growth. The alder are approximately 20 feet tall now.

We have made repeated attempts to control Canada and Bull thistle but due to conflict with higher priority control efforts (*Spartina*), weather, and lack of available staff we have never been able to treat the entire 64-acre site in a single season. Cattle are pastured in the property to the north and they eat everything but thistle, which continues to go to seed. Canada thistle is best sprayed in the bud stage, which lasts about a month and that month is notoriously wet here. We spot-sprayed a 4-acre area of thistle in 2009 with some success. There was thistle in that site again in 2010, but most of it was not flowering. There was thistle in that site in 2011, but it was not as widespread as in 2009.

Spring is not always conducive to fieldwork. The weather limits our effectiveness. Hand-pulling is possible, but trampling and disturbing field and forest during wet weather can increase the possibility of germination of weed seeds. Clearing large areas of plants without immediate re-planting often leads to germination of other weed seeds and new infestations.

Spraying weeds with herbicides in the spring is limited by wet weather as the 64-acre site is underlain by a clay layer, which means the topsoil gets saturated quickly and the site experiences sheet flow. The herbicide needs time to dry on the plant and must be such that it does not mobilize in the rain or there is a danger of killing non-target plants down slope. Summer is a better time to spray, but our natural resources staff (one full-time and one 3-month position) are consumed with survey and control of non-native estuarine plants at that time (*Spartina anglica*, Class A; *Spartina alterniflora*, Class B). That means we could contract for additional help, but we have experienced contracting and hiring freezes the past couple of years and are now looking at reduced state budgets.

This forces us to be more creative in coming up with solutions where we have such labor-intensive tasks as weed control. Volunteers have been very helpful, but the work parties have been small. That means there is either competition for volunteers in our area and/or we did not advertise the event to a broad enough group. We also have to weigh the impact of trampling vs. weed removal in more sensitive areas. We can ask volunteers to endure such monotonous tasks as hand-weeding, but we cannot expect that they will be available on an unlimited basis.

Adjacent property owners may or may not be controlling noxious weeds on their sites so there may be continual seed sources for our property even when the weeds are controlled on our site. A coordinated weed removal effort with adjacent property owners would be a more effective approach.

SUMMARY

Noxious weed identification and control is an ongoing activity at the NERR. The state and county noxious weed lists are reviewed annually and any changes in status are noted and addressed with control programs to the best of our staff and budget constraints.

We have made progress in addressing English Ivy, Scotch Broom, Himalayan and Evergreen Blackberry and Reed Canarygrass. We are having limited success controlling thistle and hired someone to help control the site for us this year. Shiny geranium continues to be a priority for us.

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