December 2018

Sultan River Environmental Restoration Project

Final Report

AdoptAStreamFoundation

Table of Contents

Introduction

In 2012, the Snohomish County PUD (PUD) Aquatic Resource Committee (ARC) approved a proposal by the Washington Department of Fish and Wildlife (WDFW) to control invasive knotweed (*Polygonum spp*.) and Himalayan blackberry (*Rubus armeniacus*) within 150' of the Sultan River, along the lower 6 miles of the river. In 2013, Adopt A Stream Foundation (AASF) was selected to perform this work, and began by canvassing landowners within the contracted work area, seeking permission to access their properties for the purpose of inventorying knotweed and blackberries. It was soon evident that Himalayan blackberries presented an almost insurmountable challenge to control due to their widespread nature and the fact that many people viewed them favorably for their berries. The ARC was presented with a proposal to amend the original scope of the project by adding control of Scotch broom (*Cytisus scoparius*), English ivy (*Hedera helix*), English holly (*Ilex aquifolium*), Evergreen blackberry (*Rubus laciniatus*) and butterfly bush (*Buddleia davidii*), and implementing a more targeted control of Himalayan blackberries – in areas where they were not already widespread. The five species added to the project were identified during canvassing efforts as being present but uncommon, making control reasonable. The control efforts selected would utilize a combination of manual, mechanical and chemical means. Once 90% control was achieved at a given site, typically following 2 years of active treatment, the site would be revegetated with native trees, shrubs and ground cover, as appropriate for the site. The contract originally allowed 4 years to complete this work, however, during subsequent follow-up canvassing efforts, new locations of target weeds were discovered. The contract was amended to increase funding and allow an additional 2 years for treatment and revegetation work. The following sections present a chronology of actions during the 6 year program.

2013 & 2014

Surveying

In 2013 & 2014, AASF surveyed the lower 6 miles of the Sultan River for invasive plants (Appendix A, Maps 1 & 2) using a Global Positioning System (GPS) unit. During raft surveys along the lower 3 miles of river, the species, area in square feet and/or numbers of individual stems for Japanese knotweed, Scotch broom, English holly, blackberries and butterfly bush were recorded along with a brief description about each point. AASF survey crews also conducted foot surveys to complete mapping of the entire 6 miles. Most of this mapping took place in City of Sultan parks (Appendix A, Maps 3 & 4).

Staff generally found it easier to identify individual stems of Scotch broom, English holly, and English ivy while on foot rather than in the raft. Results from the raft and ground surveys were compiled into a Geographic Information System (GIS) shapefile, summarized in Table 1.

Table 1: Total Stems and Square Feet of Invasive Plants Observed

	Himalayan Blackberry	Knotweed	Ivy	Holly	Scotch broom	Butterfly bush	TOTAL
Number Stems				12	158	4	174
Square Feet	38,833	3,220	2,048	192	632	16	44,941

Canvassing

AASF also canvassed properties in 2013-2014. Over 130 private landowners were contacted to see if they would allow AASF to control invasive plants on their properties (Appendix A, Map 5). Twenty private landowners signed landowner agreements to have restoration work completed (Appendix A, Map 6). However in 2013, not all twenty landowners were selected for restoration on their properties. A total of five private landowners were willing to work with AASF staff in 2013; Hambleton, Eiler, Peterson, Watkins and Carlson.

Restoration

The Hambleton property had extensive Japanese knotweed to be treated which did not begin until 2015 (see following section: 2015 & 2016). The Eiler's property had English ivy that AASF helped manage, but at the time did not re-vegetate. AASF worked with the Watkins and Carlson landowners to manage blackberry and English ivy. The Peterson's had Japanese knotweed growing on their property high in the watershed that AASF treated.

Figure 1: Preparing to do a float survey for the lower 3 miles of the Sultan River

Volunteer Party

In March of 2014, AASF held a volunteer event in Osprey Park. Five people were recruited for this event using the online resource VolunteerMatch.org and the City of Sultan Volunteer Coordinator, Donna Murphy, who posted the event on her listserv. At this event, we removed English ivy, blackberry and English holly by digging up

the roots. Volunteers girdled English ivy off trees in “rings of life.” This event lasted 3 hours and we were able to remove small and sporadic groups of invasive weeds.

Figure 2: (left) Ecologist Brooke Clement leads a volunteer event to remove ivy

2015 & 2016

Weed Treatment

In 2015, AASF continued treatment of large previously treated patches, treated sporadic weeds within Osprey Park, re-vegetated Reese and Osprey parks, removed Scotch broom from the lower 3 miles of the Sultan River corridor, and seeded, strawed and coired 1500 square feet of steep slope on the Hambleton Property (Appendix A, Map 7).

In 2016, AASF removed Scotch broom within the lower 3 miles of the Sultan River. Small plants were pulled and larger stalks were cut at ground level and left to desiccate over the summer. Larger Scotch broom plants were not up-rooted to avoid causing ground disturbance, which could increase germination of seeds lying dormant in the soil. For Scotch broom that was not easily accessible by land, AASF accessed these patches from the Sultan River. Once a patch was identified, it would be located using a GPS unit and subsequently treated. The team then continued downstream to the next patch. Scotch broom were composted on site, in locations that were not suitable for Scotch broom seeds to propagate. Patches of Scotch broom varied in size, with one particularly large patch across the river from Osprey Park taking two days to remove.

Figure 3: (Left) Scotch Broom invasion across from Osprey Park. (Right) Same area after the Scotch broom has been removed.

In March 2015, AASF began focusing on English holly. Prior to leaf out of surrounding deciduous plants, the dark green leaves of the evergreen English holly were more visible, making treatment more thorough. English holly within the contracted work area at Osprey Park was injected with herbicide using a lance. Suckers coming up around the main stock were cut and dabbed with herbicide.

During 2015 and 2016, AASF treated the extensive knotweed patch on the Hambleton property using a mechanized sprayer. Due to the newly exposed restoration area, AASF installed erosion control Best Management Practices (BMP's) so the slope was not left bare through the wet winter/spring season. The BMP's included coir wrap, seed and straw.

Planting

In 2015, a supplemental planting was conducted to replace dead or missing trees and to add more low growing shrub/groundcover plants to fill in bare areas. AASF and EarthCorps used a Gator utility vehicle to transport trees as close to the planting areas as possible. Once near the planting areas, trees were carried by hand to the location where they would be planted. While being planted, each tree was flagged with fluorescent flagging to facilitate future monitoring. Mulch and grass seed were not installed during planting due to concern that they would be washed away by winter flood waters. In February 2016, the plants had a ring of mulch installed around them and a cover grass seed spread to inhibit invasive seed that may still be in the soil from sprouting. By 2017, AASF had installed 2,100 trees and shrubs between Reese and Osprey parks.

The next priority for treatment was approximately 7 acres within Reese and Osprey parks that had received 2 years of treatment but were showing some re-growth. When treating in Osprey Park, extra attention was given to areas that had already been re-vegetated. Since glyphosate is a non-selective herbicide, any drift could easily kill the planted native trees. Invasive blackberries are prolific seeders, resulting in additional treatment requirements within areas already treated. Once previously treated patches had been sprayed, AASF focused on sporadic invasive

weeds that were mixed in with native plants. Treatment was done using a combination of careful spot spray treatments and cut / dab treatment. In 2016, AASF was granted a 2-year extension to treat theses sporadic weeds.

Figure 4: Staging trees to be planted at Reese Park.

2017

By 2017, AASF had installed 2,100 trees and shrubs between Reese and Osprey parks. AASF continued maintenance at the Hambleton property included re-treating knotweed sprouts at the site. The coir fabric and straw were successful at preventing erosion of the slope, as well as suppressing weeds. AASF planted a total of 100 plants (50 willow stakes, 25 rose and 25 salmonberry shrubs) at the Hambleton property.

Figure 5: Hambelton Property (Left) Laying down the coir fabric after spraying (Right) AASF applying herbicide to knotweed.

2018

Osprey Park & Reese Park Weed Management

With the project extensions, AASF continued to manage weeds at Osprey and Reese parks (Appendix A Map 9 & 10). In the spring of 2018, staff targeted English ivy that had crept into the restoration area at Osprey Park. AASF found patches mainly on the side channel on the upstream, northwest end of the park. English ivy was girdled off the base of three alder trees. AASF also managed English ivy at Reese Park next to the side channel by pulling up vines that had crept into the restoration area.

In the summer of 2018, staff used a 5% glyphosate mixture of herbicide to target Japanese knotweed growing within the restoration area at Osprey Park. Past AASF staff members successfully treated large patches within the side channel, however Japanese knotweed is a particularly virulent weed and many small shoots were re-growing. Small shoots proved to be easy targets for AASF staff to apply foliar spray. Most of the shoots were knee height or less in over the roughly 2-acre area.

AASF also targeted Himalayan blackberries in the summer of 2018. Staff used the cut/dab method in areas of blackberries that were overwhelming established conifers. In particular, some of the western red cedars that AASF staff had planted in previous years were over six feet tall, but they were encroached by blackberries. This treatment will help the conifers establish themselves before the blackberries return.

AASF staff continued weed management of Reese and Osprey parks. Staff surveyed the areas along the Sultan River and side-channels within the parks for Japanese knotweed, English ivy and butterfly bush. Knotweed had re-grown in some areas, especially along the side channel in Osprey Park, but was at a perfect height to foliar spray. English ivy was girdled along several trees in Reese and Osprey parks within the 150' buffer of the waterway. AASF purchased an herbicide lance to inject butterfly bush and larger English ivy stems growing on the upstream end of the side channel in Reese Park. The lance injected 1% imazapyr solution to treat the invasive weeds. Also, AASF brush-cut some blackberry bushes that were encroaching on established plantings at the parks.

Figure 6: (Left) Butterfly bush injected with new AASF herbicide lance. (Right) Ivy growing in side channel at Osprey Park to be girdled; finished in 2018

Private Landowners

Outside of Reese and Osprey parks, AASF contacted landowners that they had worked with previously. Seven landowners were interested in continuing work with AASF. Each landowner committed to continuing to work on maintaining their invasive plants after 2018 when AASF would no longer be able to manage the weeds. This commitment is essential to ensure the revegetation efforts are successful. The following landowners were willing to make that commitment: Hambleton, Eiler, Sokolowski, Donnelly and Peterson.

Hambleton

Past efforts were remarkably successful at treating this quarter-acre infestation and only a few shoots re-grew at the site following initial treatment in 2015. In 2018, AASF treated the sparse Japanese knotweed re-growth with a 5% glyphosate foliar spray with backpack sprayers. While on site, AASF also treated encroaching blackberries. Blackberries were growing in from the sides of the restoration area threatening to take over the newly opened area. The Hambleton restoration site is steep and has some unique properties. It seems to have actively eroded in the past perhaps due to the steep topography. AASF subcontracted with EarthCorps to re-plant this restoration area. After discussion with the PUD and the landowner, AASF chose to plant densely because of the high mortality from the past planting, to shore up the soil to prevent erosion, and to prevent invasive plants from re-propagating the area.

Eiler

The Eiler's property borders the Sultan River and a side channel. When AASF staff approached the landowners in 2013, English ivy and some Himalayan blackberries overran their property. Staff removed the English ivy in 2013 and the landowner continued to maintain the site. However, the English ivy came back and threatened

to re-take the property. AASF staff approached the landowners again in 2018 and received permission to take a second attack at the ivy. Initially, the landowners were reluctant to have their property planted, but after some discussion that, a) their property would be re-inundated by the ivy without an introduction of native plants and b) with the ivy removed and no revegetation, they would be more vulnerable to high-flow erosion on their property, they gave permission for planting some native trees and shrubs. The Eiler's restoration area is 0.15 acres on 140' of riparian zone.

Peterson

The Peterson property is unique in that AASF staff discovered Japanese knotweed growing on their land at a location higher in the watershed than previously observed. In 2013, staff discovered the patch off a section of driveway perhaps introduced there from fill that was deposited some time ago. Staff foliar sprayed the Japanese knotweed. There was no need to replant it as it was a small patch. With the contract extension in place, staff got back in touch with the Petersons in 2018 and checked on their property. Staff discovered six stems of Japanese knotweed and foliar sprayed them with a 5% glyphosate mixture. No follow-up planting was needed at Peterson's because the knotweed was managed before it got out of control and there is a well-established canopy at the site. The treated area on this property is less than 100 square feet.

Sokolowski

Mr. Sokolowski owns 330' of shoreline and blackberry covered 0.3 acres of that. In 2018, AASF cut down all of the blackberry plants and treated them with a foliar spray of 5% glyphosate in preparation for planting. This restoration site was steep and rocky, perhaps from bank rip-rap. AASF decided to plant densely with hardy shrubs that can grow quickly in the rocky conditions.

Donnelly

AASF worked with this landowner to help manage his infestation of blackberry in 2018. The landowner's property spanned 250' of riverfront, with 0.15 acres covered in blackberry. In 2018, PUD contractors mowed the invasive plants down and treated them with herbicide. The Donnelly project is located directly below the Bonneville Power Administration lines. Therefore, no trees could be planted in this restoration area. The project is located adjacent to a berry farm, so flowering shrubs were an ideal choice.

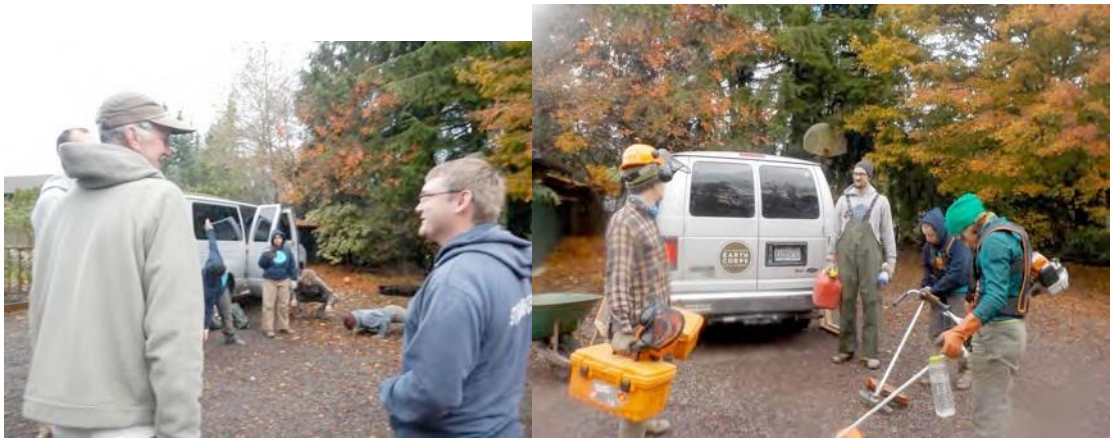


Figure 7: (Left) AASF meeting with private landowners (Right) EarthCorps gearing up for restoration work

Conclusions

Over the course of 6 years, with the help of EarthCorps, PUD, and Sultan Public Works, AASF was able to map and restore a significant area of the Sultan River drainage. AASF canvassed over 130 properties, obtained 20 signed landowner participation agreements, plus access to 2 public parks, treated all Japanese knotweed identified within 150' of the lower 6 miles of the Sultan River. re-vegetated over 5 acres of treated areas and installed 3,382 trees, including large 15 gallon trees and live stakes. Even though all invasive plants for the lower 6 miles were not

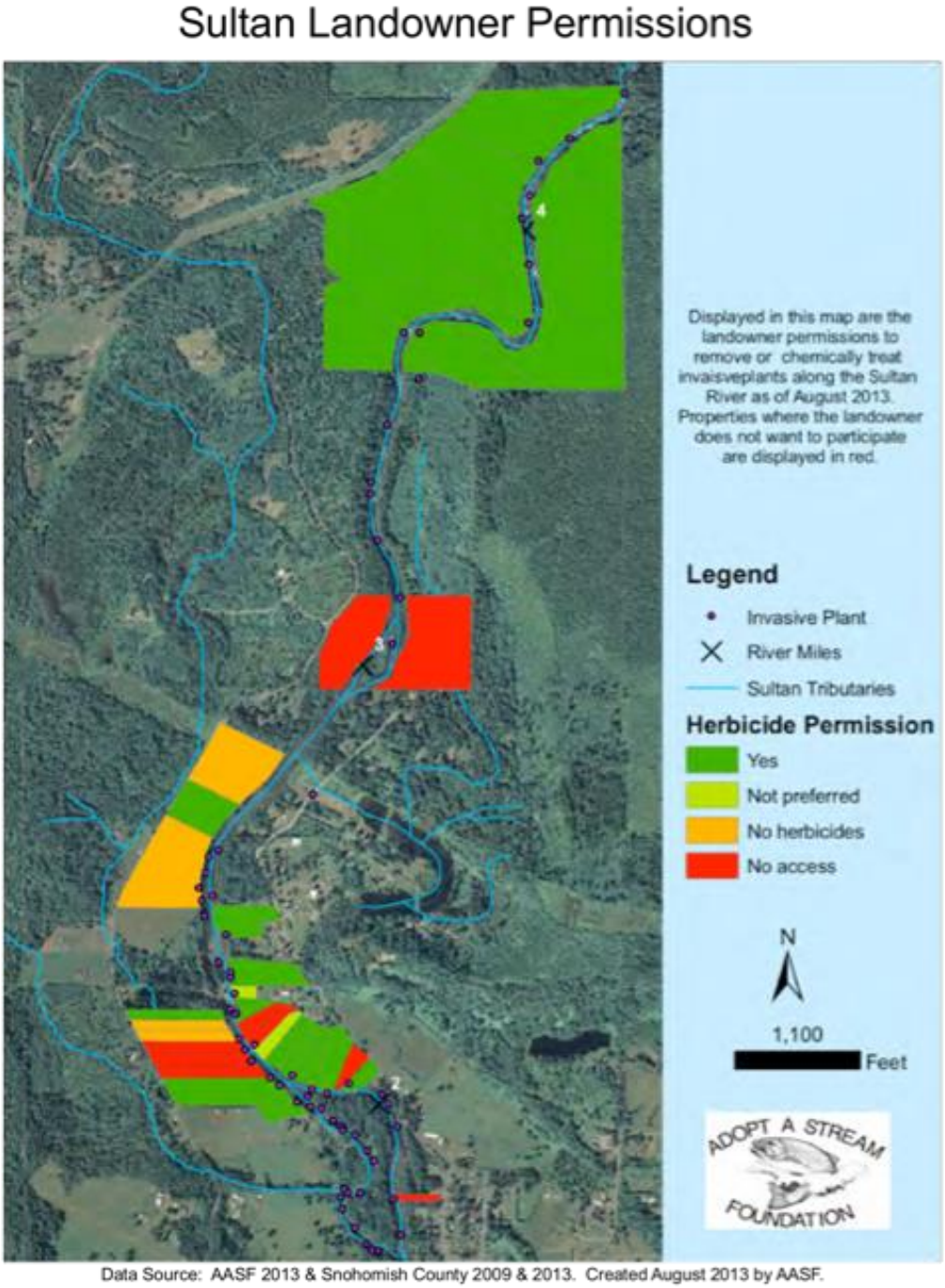
eradicated there has been a significant amount of progress towards achieving this goal.

Treatment of invasive weeds was successful. Since treatment within a 150' buffer for the lower 6 miles of the Sultan River is a very ambitious task, requiring a systematic approach including prioritization by the severity of the invasion and species of weed. All known Japanese knotweed patches upstream of river mile 0.5 have been treated, and after 2018 there should be no knotweed upstream of this point. All known butterfly bush and Scotch broom patches upstream of Osprey Park have been removed. Two butterfly bushes, one large and one small, were discovered and treated just upstream of Reese Park. Approximately 45 large English holly were treated, with the majority of these being in Osprey Park. With the work that AASF has done, the overall area that English ivy covered decreased significantly with treatment on private properties. This has reduced these patches to the point that landowners can continue to manage these invasive weeds on their own. There is still a substantial amount of Himalayan blackberry that was mapped along the Sultan River, however this weed has invaded so much area that it would not be feasible to eradicate with current weed management practices.

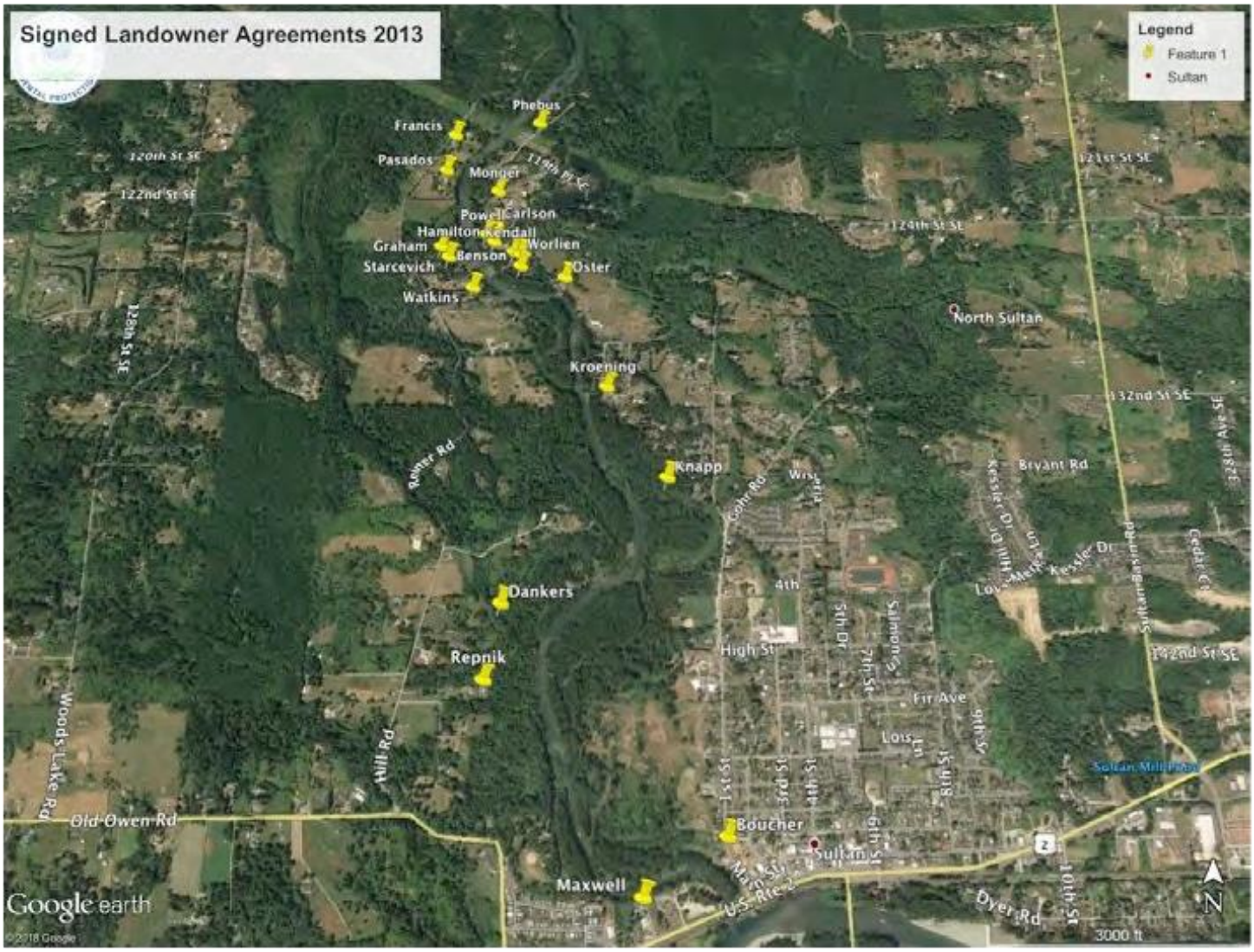
There are several things that could be done to continue the success of the project. Continue to monitor for Japanese knotweed resprouting in the restoration area. The 150' buffer has been well managed for Japanese knotweed. Just outside that buffer, particularly in Osprey Park by the basketball courts, there is substantial growth of knotweed. AASF applied for grant funding to manage this Japanese knotweed but was not awarded the grant. English ivy was found on many sites and was managed well by AASF. Continual maintenance, especially the English ivy on private land, will need to occur. The landowners that AASF worked with in 2018 all said that they will continue to maintain the ivy as needed. Scotch broom seemed all but eradicated, however, due to its seeds' ability to survive for decades in the soil, continued monitoring is advised. English holly has also been largely removed by AASF but, like the knotweed, was growing outside of the conservation area of 150' in Osprey Park and will need to be treated eventually to eradicate it. Finally, blackberries are ubiquitous in all of the project sites in some capacity. AASF targeted blackberries that were immediately endangering the planting areas around trees in Osprey and Reese parks. AASF made great strides with private landowners like Sokolowski and Donnelly with removing blackberry off of their riparian zones and revegetating these areas. Continued maintenance and landowner outreach would increase the success of removing invasive plants from this watershed. All of the private landowners that AASF worked with in 2018 seemed enthusiastic to continue work with AASF subject to the availability of a funding mechanism.

Appendix A: Maps

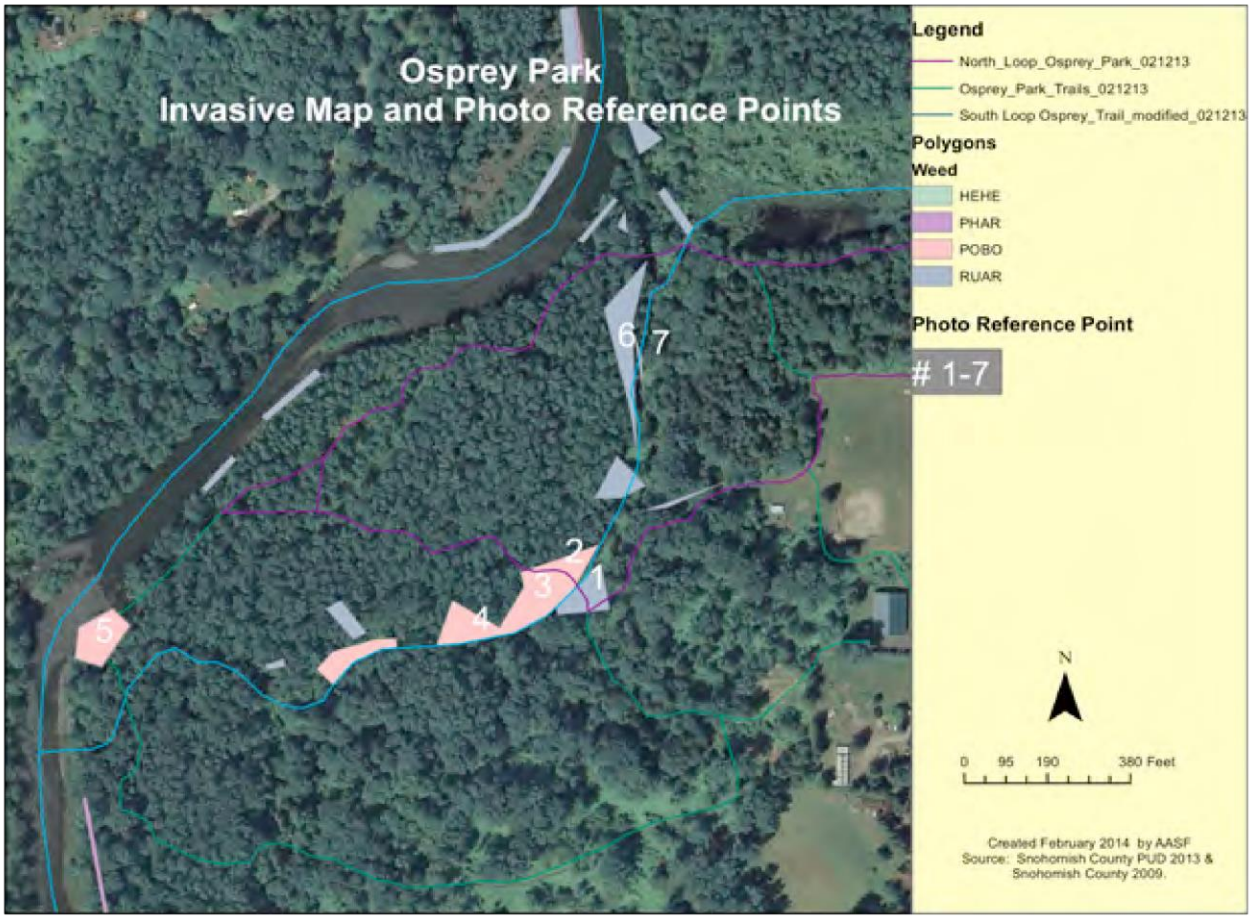
Map 1: Sultan Landowner Permissions 2013



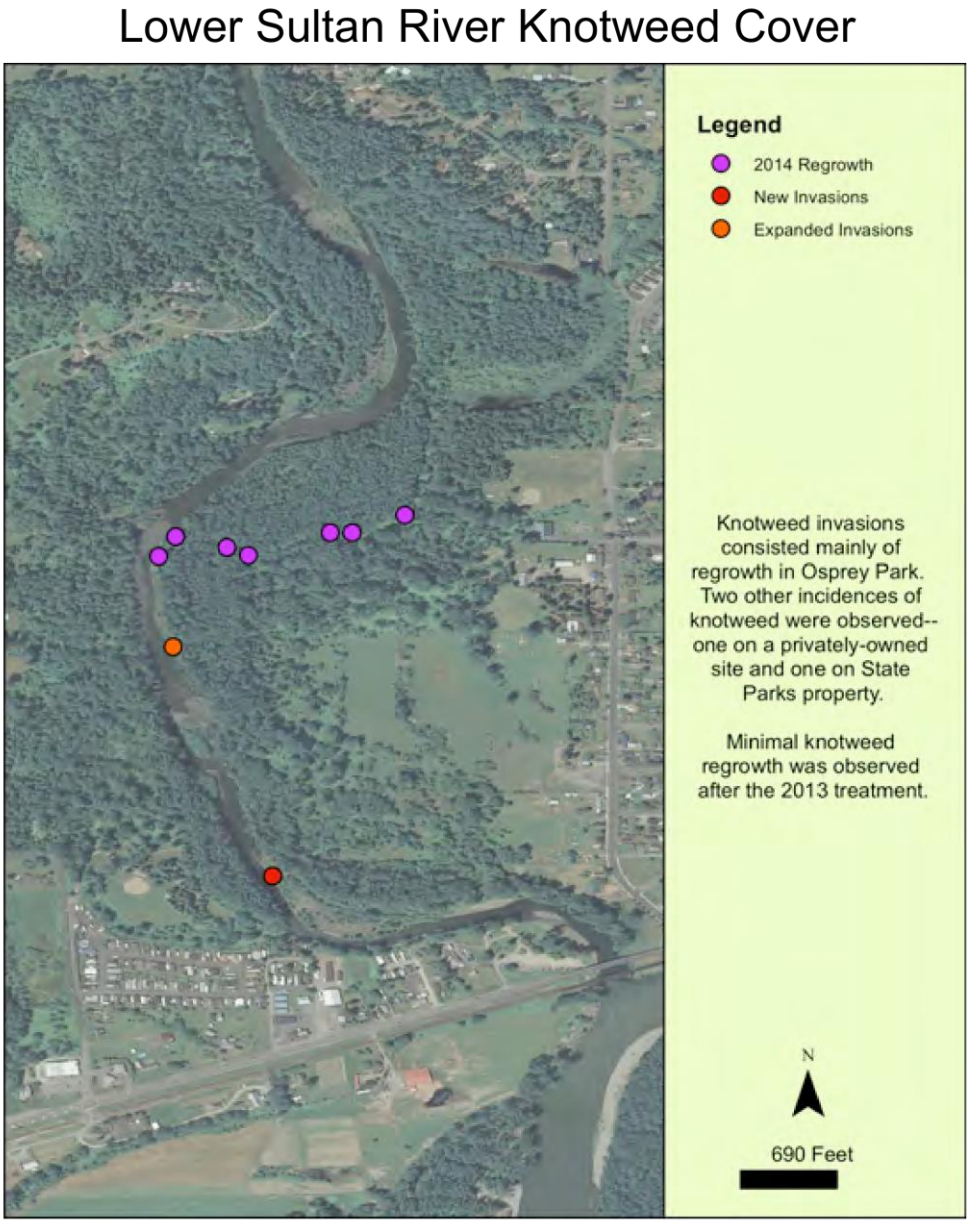
Map 2: Sultan Landowner Agreements 2013



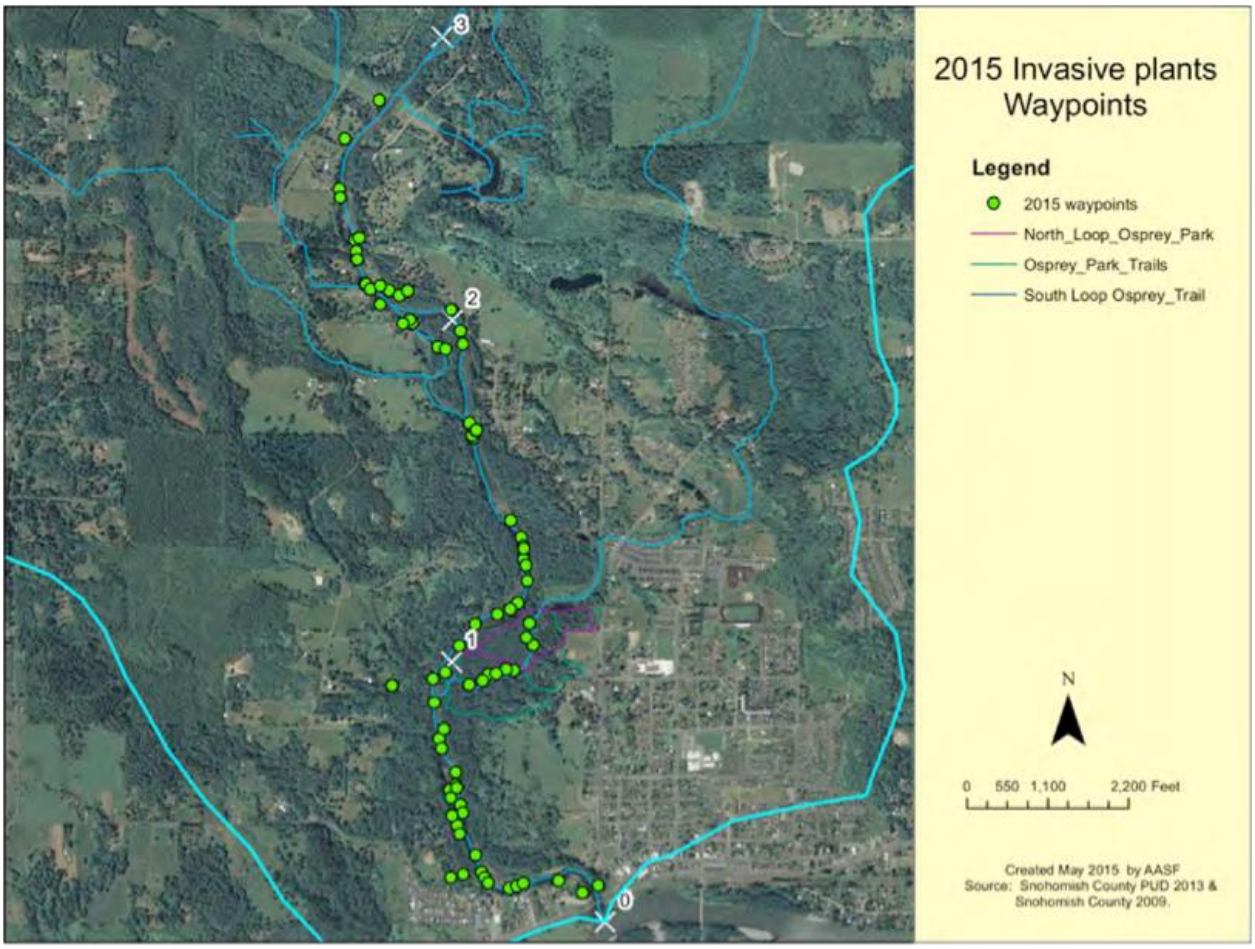
Map 3: Invasive Mapping in Osprey Park 2013



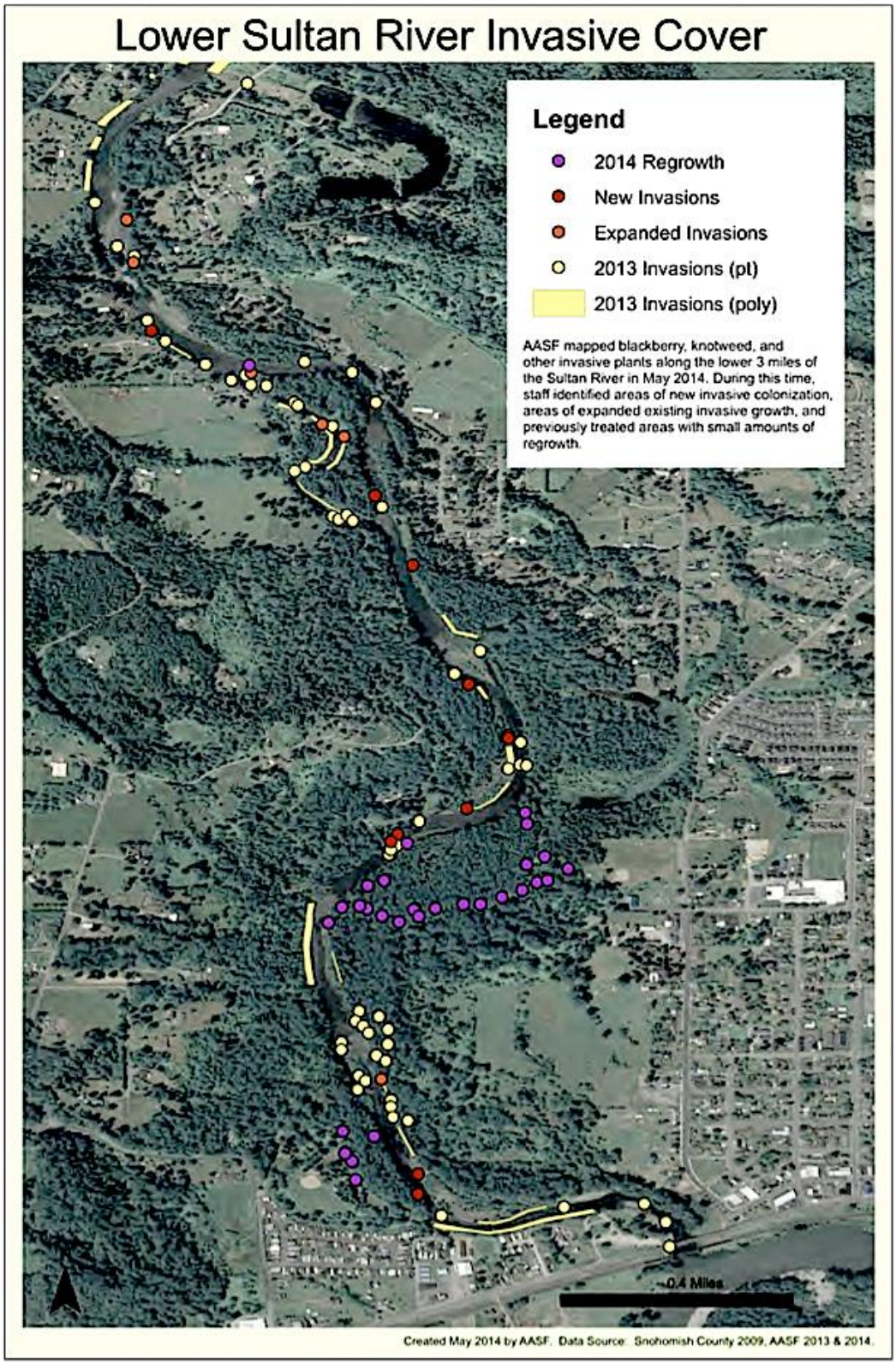
Map 4: Knotweed found in Osprey Park 2013 & 2014



Map 5: Invasive Plant Waypoints 2015

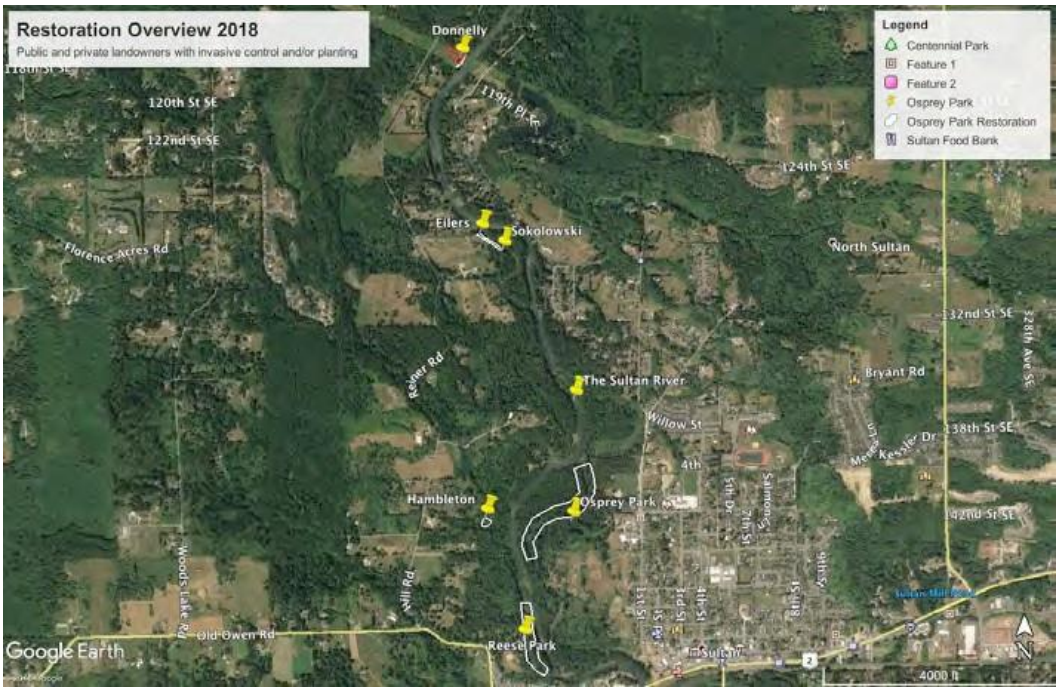


Map 6: Invasive Plant Cover 2013 & 2014



Map 7: Hambleton Property Restoration Area

Map 8: Private Landowner Restoration 2018



Map 9: Reese Restoration in 2018

Map 10: Osprey Restoration in 2018

Appendix B: Plant Lists

Osprey and Reese Parks 2014		
Plant list	**Number**	**Pot Size (gallon)**
Vine maple	33	1
Big leaf maple	33	1
Red alder	33	1
Western serviceberry	33	1
Beaked hazelnut	17	1
Red dogwood	33	1
Black hawthorn	33	1
Salal	33	1
Ocean spray	67	1
Black twinberry	67	1
Tall Oregon grape	33	1
Crabapple	33	1
Oso berry	100	1
Ninebark	100	1
Thimbleberry	133	1
Sitka spruce	133	1
Douglas fir	33	1
Salmonberry	333	1
Red elderberry	67	1
Snowberry	83	1
Western red cedar	133	1
Slough sedge	333	Plug
Big leaf maple	17	10
Sitka spruce	33	10
Douglas fir	67	10
Western red cedar	83	10
Total	**2100**	

Hambleton 2016		
Plant list	**Number**	**Pot Size (gallon)**
Willow species	50	2
Nootka rose	25	2
Salmonberry	25	2
TOTAL	**100**	

Hambleton 2018		
Plant list	**Number**	**Pot Size (gallon)**
Grand fir	10	2

Sitka spruce	10	2
Western hemlock	10	2
Western red cedar	10	2
Big leaf maple	10	2
Mock orange	25	1
Nootka rose	40	1
Snowberry	25	1
Paper birch	25	1
Quaking aspen	15	1
Vine maple	25	1
Oregon ash	20	1
Red alder	25	1
Ninebark	25	1
Red dogwood	10	1
Black hawthorn	25	1
Ocean spray	25	1
Hazelnut	25	1
Willow Cuttings	200	Live stakes
TOTAL	**560**	

Eiler 2018		
Plant list	**Number**	**Pot Size (gallon)**
Sword fern	20	1
Kinnikinnick	30	1
Shore pine	4	5
Cascara	2	2
Oso berry	2	2
Mock orange	2	2
Hazelnut	2	2
TOTAL	**62**	

Sokolowski 2018		
Plant list	**Number**	**Pot Size (gallon)**
Red dogwood	100	1
Willow spp	100	1
Ninebark	50	1
Salmonberry	50	1
TOTAL	**300**	

Donnelly 2018		
Plant list	**Number**	**Pot Size (gallon**
Nootka rose	10	2
Mock orange	25	2

Snowberry	25	2
Vine maple	25	2
Red dogwood	10	2
Hazelnut	25	2
Black hawthorn	25	2
Ocean spray	25	2
Twinberry	25	2
Oso berry	25	2
Ninebark	25	2
Thimbleberry	15	2
TOTAL	**260**	

Appendix C: Photos

PHOTOS 2013: Canvassing and mapping

Photo 1. Osprey Park knotweed, September 2013

Photo 2. Osprey Park ivy

Photo 3. Reese Park, May 2013

PHOTOS 2014

Photo 4. Mapping, May 2014

Photo 5. Mapping, May 2014

Photo 6. Cut dab butterfly bush, August 2014

Photo 7. Cut dab butterfly bush, August 2014

Photo 8. Cut dab butterfly bush, August 2014

Photo 9. Eiler's ivy control, September 2014

Photo 10. Trees delivered, November 2014

Photo 11. EarthCorps, November 2014

Photo 12. Mulch, December 2014

Photo 13. Mulch, December 2014

Photo 14. Mulch, December 2014

PHOTOS 2015

Photo 15. Hambleton, August 2015

Photo 16. Hambleton, August 2015

Photo 17. Beaver net, August 2015

Photo 18. Herbivory, August 2015

Photo 19. Monitoring, August 2015

Photo 20. Beaver net, September 2015

Photo 21. Spray, September 2015

Photo 22. Spray 2, September 2015

Photo 23. Spray, September 2015

Photo 24. 15 gallon, November 2015

Photo 25. 15 gallon, November 2015

PHOTOS 2016

Photo 26. Mulch, February 2016

Photo 27. Mulched, February 2016

Photo 28. Mulch, February 2016

Photo 29. Mulch, February 2016

Photo 30. Trees, February 2018

Photo 31. Butterfly bush, March 2018

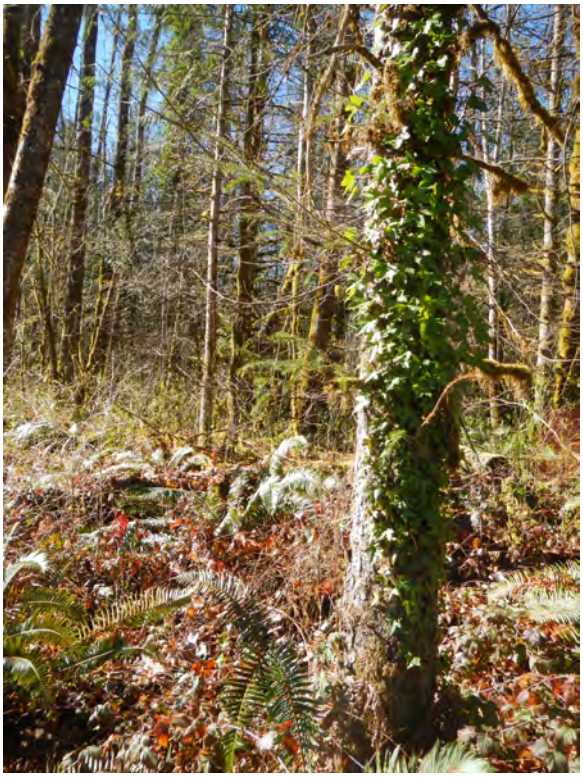


Photo 32. Osprey ivy, March 2018

Photo 33. Donnelly blackberries, March 2018

Photo 34. Peterson knotweed, May 2018

Photo 35. Sultan ivy removal, May 2018

Photo 36. Sultan ivy removal, May 2018

Photo 37. Eilers, June 2018

Photo 38. Sokolowski, June 2018

Photo 39. Sokolowski, June 2018

Photo 40. Eilers, June 2018

Photo 41. Donnelly, September 2018

Photo 42. Donnelly 1, September 2018

Photo 43. Donnelly 2, September 2018

Photo 44. Donnelly 3, September 2018

Photo 45. Donnelly 4, September 2018

Photo 46. Donnelly 5, September 2018

Photo 47. EarthCorps/landowner, November 2018

Photo 48. EarthCorps/landowner, November 2018