Pilchuck Creek Mitigation Site

SR 532 Corridor Improvements-Camano Island to I-5
(MP 0.00 to MP 9.98)
USACE NWP (14) NWS-2008-1082, WIN # A53210G

SR 530/Skaglund Hill Slide Permanent Repair
USACE NWP (14) NWS-2010-773, WIN # A53034F

SR 9 Pilchuck Creek Replace Bridge
USACE NWP (14) NWS-2011-299, WIN # A00934R

Northwest Region

2015 Monitoring Report
Wetlands Program
Issued March 2016

Washington State Department of Transportation

Environmental Services Office

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SR 532 Corridor Improvements – Camano Island to I-5 (MP 0.00 to Mp 9.98), USACE NWP (14) NWS-2008-1082

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SR 9 Pilchuck Creek Replace Bridge, USACE NWP (14) NWS-2011-299

General Site Information		
USACE NWP 14 Numbers	NWS-2008-1082 NWS-2010-773 NWS-2011-299	
Mitigation Location	West of Old 99 and north of 236th St. NW, Snohomish County	
LLID Number	1222190482144	
Construction Date	2008-2010	
Monitoring Period	2011-2020	
Year of Monitoring	5 of 10	
Area of Project Impact[1]	Freshwater Wetland	Estuarine Wetland
	2.92 acres	0.01 acre
Type of Mitigation	Freshwater Wetland Re-establishment/Rehabilitation	Estuarine Wetland Re-establishment
Area of Mitigation	17.69 acres	0.24 acre

[1]See Appendix 3, Tables 1 and 22 for a breakdown of impacts and mitigation by project. The estuarine impacts are compensated for at the SR 532 Estuarine Mitigation site.

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Summary of Monitoring Results and Management Activities (2015)

Year 10 Performance Criteria Unless otherwise noted	2015 Results[3]	Management Activities
Wetland Delineation	24.81 acres delineated in April 2014	
Native woody species will have at least 60% cover in the woody wetland.	95% cover	
Native facultative or wetter herb species will have at least 70% cover in the emergent wetland.	90% cover	
As-built documentation and wildlife use of site.	As-builts submitted and wildlife use observed.	
Native woody species will have at least 50% cover in the buffer.	85% cover	
Native facultative or wetter herb species will have at least 45% cover in the emergent wet buffer. (**Year-5**)	34% cover ($CI_{80\%}$ = 28-40%)	
Noxious weeds and species listed in Table 20 will have less than 30% cover in the wetland and less than 30% cover in the buffer.	Wetland: <5 % cover Buffer: < 5% cover	Herbicide and manual weed control efforts will continue in 2016.
Reed canarygrass will be less than 50% cover in the wetland and 50% cover in the buffer.	Wetland: <5 % cover Buffer: < 5% cover	
Non-native blackberries will have less than 15% cover in the wetland and less than 15% cover in the buffer.	Wetland: <5 % cover Buffer: < 5% cover	
Japanese knotweed and purple loosestrife will be eradicated.	None observed on site	
Performance Standard 4 and Permit Requirement I from NWS-2008-1081		
Native facultative or wetter species will have at least 30% cover in the permanently ponded areas.	Mosaic of cover ranging from 0% to 80%	

Report Introduction

This report summarizesYear-5 monitoring activities at the State Route (SR) 532 Pilchuck Creek Mitigation Site. Included are a site description, the performance standards, an explanation of monitoring methods, and an evaluation of site success. Monitoring activities included vegetation surveys and photo-documentation. Vegetation monitoring occurred on August 26 and September 1, 2015.

[3] Estimated values are presented with their corresponding statistical confidence interval. For example, 34% cover ($CI_{80\%}$ = 28-40%) means we are 80% confident that the true cover value is between 28% and 40%.

What is the SR 532 Pilchuck Creek Mitigation Site?

This 30-acre mitigation site (Figure 1) is a restored and rehabilitated wetland west of old SR 99. This site was created to compensate for the loss of 2.92 acres of wetlands due to road improvements along SR 530, SR 532 and SR 9. The design for this site involves wetland restoration of formerly farmed, tiled, and drained wetland with a forested and shrub buffer. The site is intended to improve wildlife habitat and hydrologic functions by restoring natural hydrological processes and providing increased water/vegetation interspersion.

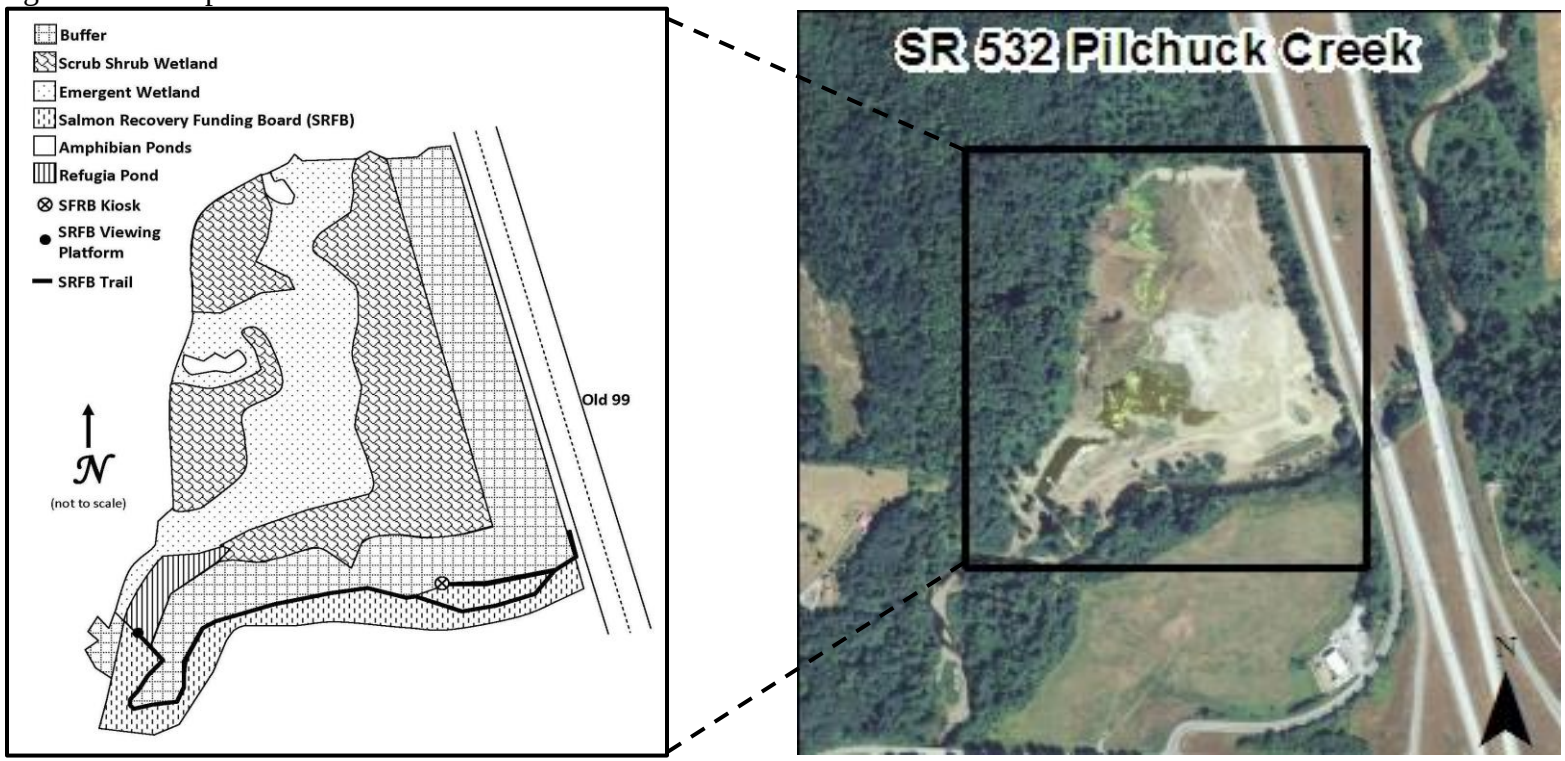


Figure 1 Site Sketch

The SR 532 Pilchuck Creek Mitigation Site consists of a mosaic of forested, scrub-shrub, emergent and aquatic vegetation areas with permanent and seasonal ponding. In addition, 0.69 acre of stream channel habitat off of Pilchuck Creek was established to provide rearing and refugia habitat for salmonid and resident fish and amphibian species. Appendix 2 includes site directions.

What are the performance standards for this site?

Year 5

Performance Standard 1
Native facultative or wetter herbaceous vegetation (planted and volunteer) will achieve a minimum of 45 percent cover in the emergent wet buffer communities.

Year 10

Performance Standard 1
The wetland areas will be delineated using current methods to assure that the mitigation site contains a minimum of 17.81 acres of wetland.

Performance Standard 2
Native facultative or wetter woody species (planted and volunteer) will achieve a minimum of 60 percent cover in the woody wetland communities.

Performance Standard 3
Native facultative or wetter herbaceous vegetation (planted and volunteer) will achieve a minimum of 70 percent coverage in the emergent wetland communities.

Performance Standard 4/ Permit Requirement I from NWS-2008-1081
Native facultative or wetter species (planted and volunteer) will achieve a minimum of 30 percent cover in permanently ponded zones. Should the site not have permanently ponded zones this performance standard would not be applicable.

Performance Standard 5
- As built plans document the excavation work for the stream/refugia pond and amphibian ponds.
- As built plans document the plugging and re-contouring of the perimeter ditch system.
- As built plans document LWD and habitat structures.
- Evidence or direct observation of wildlife species utilizing the mitigation site.

Performance Standard 6
Native woody species (planted and volunteer) will achieve a minimum of 50 percent cover in the buffer planting areas.

Performance Standard 7
Snohomish County Class A, Class B, Class B Undesignated, and Class C noxious weeds and species listed in Table 20 will not exceed 30 percent cover in the wetland or 30 percent cover in the buffer within the mitigation site.

Performance Standard 8
Reed canarygrass (*Phalaris arundinacea*) will not exceed 50 percent cover in the wetland or 50 percent cover in the buffer within the mitigation site.

Performance Standard 9
Non-native blackberries (*Rubus armeniacus* and *R. laciniatus*) will not exceed 15 percent cover in the wetland or 15 percent cover in the buffer within the mitigation site.

Performance Standard 10
The presence of Japanese knotweed species and purple loosestrife will initiate eradication measures.

Appendix 1 shows the As Built (WSDOT 2012).

How were the performance standards evaluated?

WSDOT staff performed a wetland delineation using methods described in the *Corps of Engineers Wetlands Delineation* Manual (Environmental Laboratory 1987), *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0) (USACE 2010) and a Global Positioning System (Trimble Mapping Grade) (Performance Standards 1). The site was delineated on March 31 and April 1, 2014 and has met the final-year year ten wetland acreage requirements. On February 26, 2015 a request to discontinue hydrology monitoring was sent to USACE and Ecology. This request was accepted on March 24 and April 2, 2015 respectively.

The site has developed more rapidly than anticipated and has been meeting the year-10 final year standards for the forested and scrub-shrub wetland woody, buffer woody cover, emergent cover, and invasive cover, for two years. On May 26, 2015 a request to discontinue quantitative sampling for all but one of the vegetative performance standards was sent to USACE and Ecology, this request was accepted on May 28 and June 1, 2015 respectively. All vegetative performance standards were assessed qualitatively, except for herbaceous cover in the wet buffer. For additional details on the methods, see the WSDOT Wetland Mitigation Site Monitoring Methods Paper (WSDOT 2008). The figure and table below document the sampling methodology utilized for Performance Standard 1 from Year-5, emergent cover in the wet buffer.

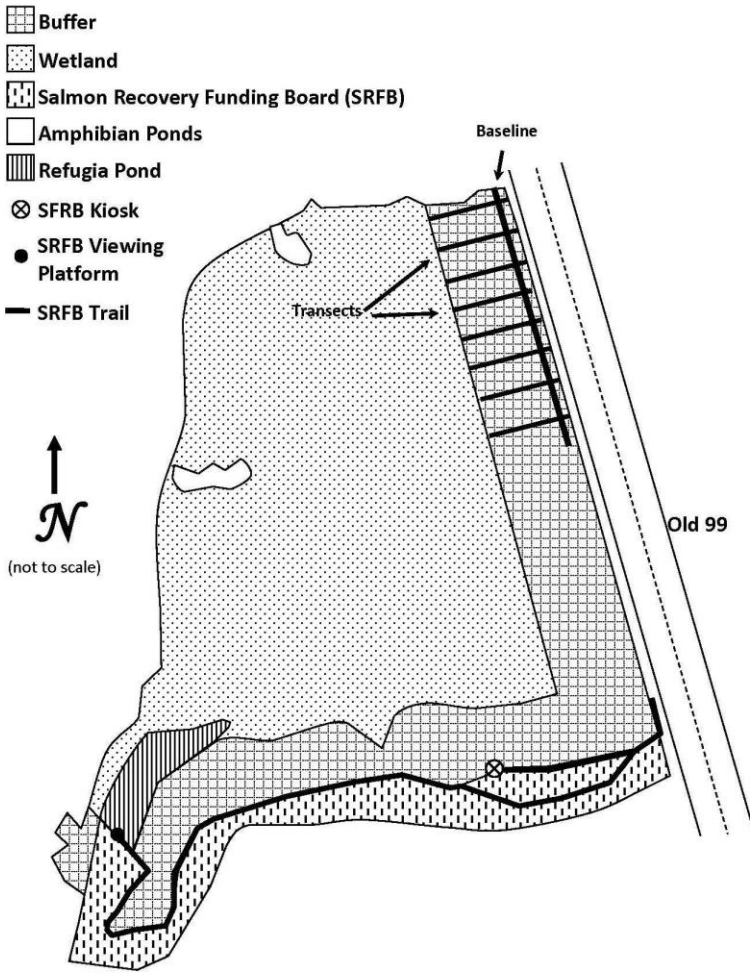


Figure 2 Site Sampling Design (2015)

Placement of Baseline: From north to south along the eastern border of the site within the wet buffer.

	PS 1 (Year-5)
Attribute	Cover
Target pop.	Herbaceous
Zone	Buffer
Sample method	Line Intercept
SU length	20 m
SU width	N/A
Points per SU	40
Total # of SU	30

How is the site developing?

The site is currently meeting all of the Year-10 performance standards for the third year in row except for herbaceous cover in the wet buffer. The wetland area delineated on site meets or exceeds the intended mitigation acreage.

This site has developed a thriving and diverse vegetation community. The wetland on site has developed into a mosaic of open water, herbaceous vegetation, and clusters of woody vegetation. This interspersion of habitats is in constant flux due to the continuing presence of beaver on site.

A summer storm occurred in between the two vegetation monitoring visits causing a number of the larger black cottonwood (*Populus balsamifera*) to blow down within the wet buffer (Photo 1). This may benefit the overall herbaceous cover by opening areas that are experiencing stem exclusion to colonization. Without these openings this performance standard may be difficult to meet due to the dense cover of woody species shading out the entire herbaceous layer in portions of the wet buffer.

It is estimated that approximately 25 percent of the *Typha* species are the hybrid *Typha x gluaca*. Cattail species make up approximately a third of the total herbaceous cover; despite this the performance standard is still being met. The progress or spread of *Typha x gluaca* shall be monitored to determine if the emergent zone needs to be re-sampled quantitatively in Year-7.

The site was intended to provide wildlife, water quality, and water quantity functions and with the successful achievement of the performance standards, it appears that these functions are supported. Year round water storage coupled with the successful vegetation communities present indicate the water quality and quantity functions are being supported on this mitigation site.

Photo 1
Black cottonwood blow down (September 2015)

Results for Performance Standard 1 (Year-5)
(Native herbaceous 45% minimum cover in the wet buffer):

Native facultative or wetter herbaceous cover in the wet buffer is estimated at 34% cover ($CI_{80\%}$ = 28-40%), with a total of thirteen species sampled. The herbaceous layer varies dramatically based on a north to south gradient of decreasing hydrology as well the degree of canopy closure throughout the wet buffer. The northern portion (Photo 2) tends to have more standing water and as a result more canopy gaps allowing for a more robust herbaceous layer. The southern portion (Photo 3) tends to be dryer with much more closed canopy resulting in a "stem exclusion" stage.

Results for Performance Standard 1
(The wetland areas will be delineated using current methods to assure that the mitigation site contains a minimum of 17.81 acres of wetland):

A delineation conducted in April 2014 indicated wetland acreage was 24.81 acres (WSDOT 2014). See Appendix 4.

Results for Performance Standard 2
(Native facultative or wetter woody species (planted and volunteer) will achieve a minimum of 60% cover):

Native facultative or wetter woody species cover is estimated at 95 percent. The dominant species present in the scrub shrub wetland include Sitka willow (*Salix sitchensis*) and Pacific willow (*Salix lasiandra*) with and average height of three meters. Black cottonwoods (*Populus balsamifera*) are reaching heights up to seven meters creating the beginning of canopy differentiation (Photo 4).

Photo 2
Herbaceous cover in the north buffer (August 2015)

Photo 3

Herbaceous cover in the south buffer (August 2015)

Results for Performance Standard 3
(Native facultative or wetter herbaceous vegetation will achieve a minimum of 70% coverage in the emergent wetland):

The cover of native herbaceous species in the emergent wetland is estimated at 90 percent. This estimate includes all cattail species of which potentially 25 percent maybe the hybrid *x gluaca*. If the hybrid is excluded the cover is estimated at 80 percent.

Results for Performance Standard 4
(Native facultative or wetter species will achieve a minimum of 30% cover in permanently ponded zones):

Native herbaceous cover within the permanently ponded areas is estimated at 50 percent cover overall. However, areas that are too deep to cross had varying degrees of cover. Some small ponds had 0% cover, others had 80% cover. The areas of permanent ponding change continually due to beaver activity on site. The water level has been observed to raise at least six inches in some areas overnight shifting the areas of ponding and making it difficult to determine what is permanent ponding or not.

Results for Performance Standard 5
(As-built documentation and wildlife use of site):

As-built documentation is complete and located in Appendix 1. Wildlife observed on site during monitoring include chorus frogs, a Pacific jumping mouse, beaver sign, coyote and deer tracks, and deer and rabbit scat, (Photo 5). A total of 37 separate species of birds have been observed on site with several species of ducks observed in the permanently inundated areas and belted kingfishers observed hunting. Passerines were observed using the habitat structures and the perch poles were white washed. Amphibian egg masses were observed in the wetland in the spring.

Photo 4
Native woody cover (September 2015)

Photo 5
Beaver dam (September 2015)

Results for Performance Standard 6
(Native woody species will achieve a minimum of 50% cover in the buffer):

Native woody cover in the buffer is estimated at 85 percent. The dominant species present in the buffer include black cottonwood (*Populus balsamifera*), red alder (*Alnus rubra*), and willows (*Salix spp.*) ranging in height between three and seven meters tall (Photo 6).

Results for Performance Standard 7
(Snohomish County noxious weeds and species listed in Table 20 will have less than 30% cover in the wetland and less than 30% cover in the buffer):

Snohomish County listed species and species listed on Table 20 in Appendix 3 observed in the wetland include: reed canarygrass (*Phalaris arundinacea*), cutleaf blackberry (*Rubus laciniatus*), and bull thistle (*Cirsium vulgare*). Total cover of these species located in the wetland is estimated at less than five percent.

Snohomish County listed species and species listed on Table 20 in Appendix 3 observed in the buffer include: reed canarygrass (*Phalaris arundinacea*), cutleaf blackberry (*Rubus laciniatus*), Himalayan blackberry (*Rubus armeniacus*), bull thistle (*Cirsium vulgare*), and Scotch broom (*Cytisus scoparius*). Total cover of these species in the buffer remains low as well, estimated at less than five percent.

Photo 4
Herbaceous cover in the emergent zone (Sept 2015)

Photo 5
Herbaceous cover in the permanently ponded areas (Sept 2015)

Results for Performance Standard 8
(Non-native blackberries will have less than 15% cover in the wetland and less than 15% cover in the buffer):

Cover of non-native blackberry species across the site is low, at less than five percent. Blackberries were observed across the site, but primarily in the buffer.

Results for Performance Standard
(Japanese knotweed and purple loosestrife will be eradicated):

No Japanese knotweed or purple loosestrife were observed on site

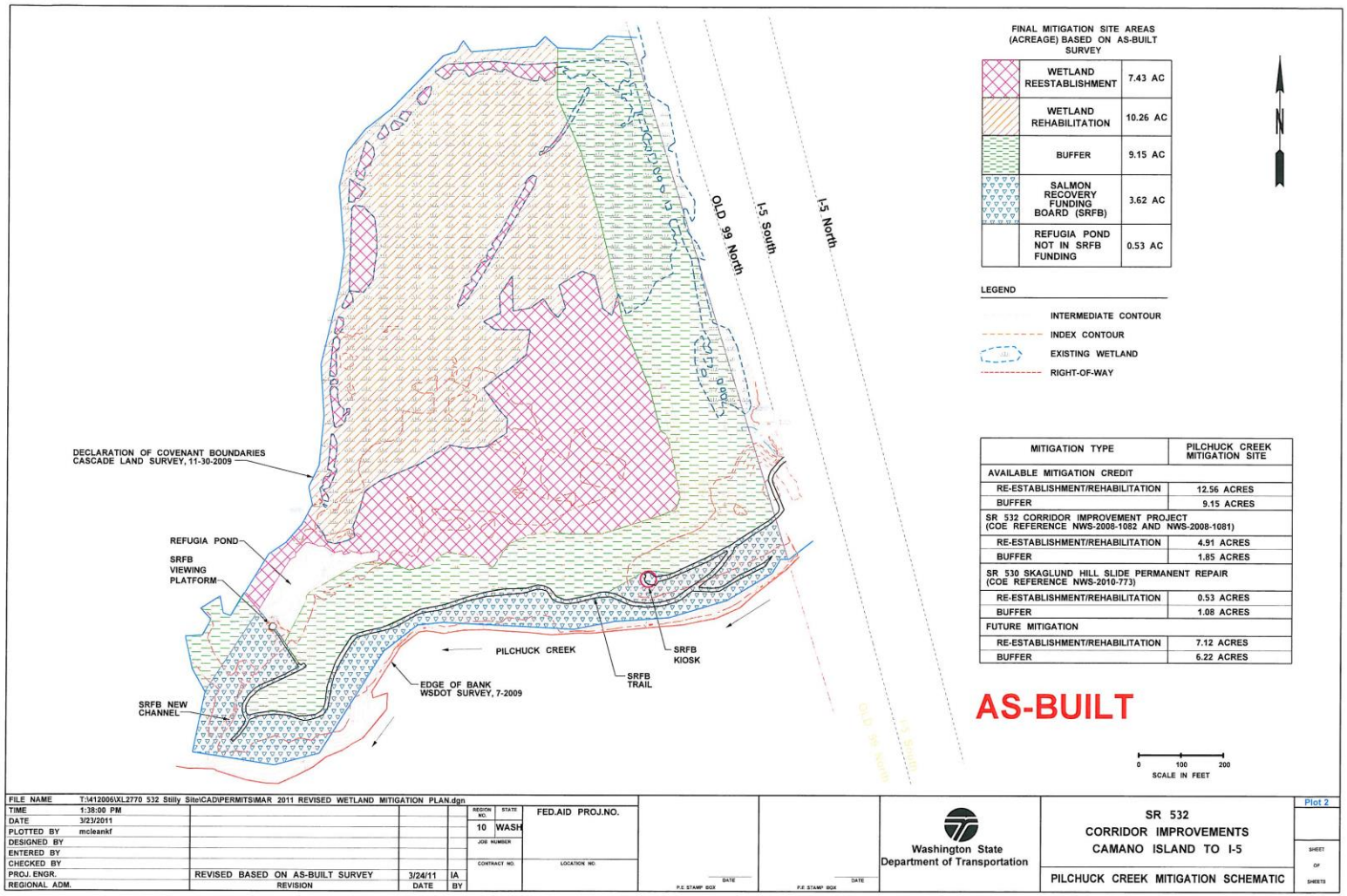
Photo 6
Woody cover in the upland buffer (September 2015)

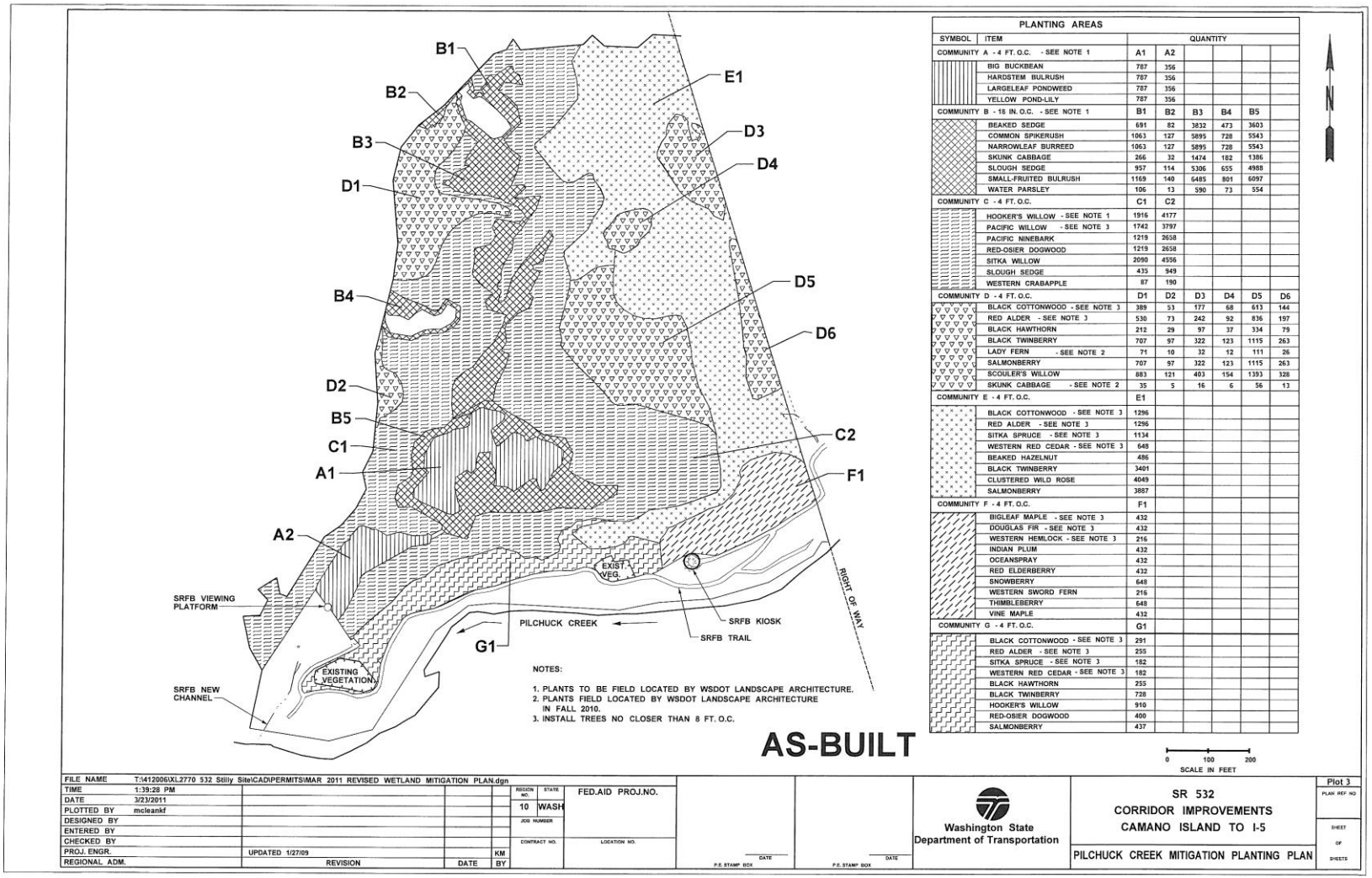
What is planned for this site?

The region has plans to continue weed control as needed. No management activity will occur to address the cover of emergent species in the wet buffer. No emergent community was planted in buffer (see Appendix 1) and the emergent species present exist as an understory to the planted forest/shrub community. As stated in WSDOT (2010 p.58), "WSDOT expects beaver activity at this mitigation site and intends to initially plant woody species, but also expects the "*self-designing capacity of nature*" to ultimately determine vegetation communities". The buffer was planted as a forest/shrub community and to date continues to develop on this trajectory, impeding the development of an emergent community. Beaver activity on site has increased and any changes in community type will be documented.

Appendix 1 – As-Built

(from WSDOT 2012)





PLANTING AREAS							
SYMBOL	ITEM	QUANTITY					
COMMUNITY A - 4 FT. O.C. - SEE NOTE 1		A1	A2				
	BIG BUCKBEAN	787	356				
	HARDSTEM BULRUSH	787	356				
	LARGELEAF PONDWEED	787	356				
	YELLOW POND-LILY	787	356				
COMMUNITY B - 18 IN. O.C. - SEE NOTE 1		B1	B2	B3	B4	B5	
	BEAKED SEDGE	691	82	3832	473	3603	
	COMMON SPIKERUSH	1063	127	5895	728	5543	
	NARROWLEAF BURREED	1063	127	5895	728	5543	
	SKUNK CABBAGE	266	32	1474	182	1386	
	SLOUGH SEDGE	957	114	5306	655	4988	
	SMALL-FRUITED BULRUSH	1169	140	6485	801	6097	
	WATER PARSLEY	106	13	590	73	554	
COMMUNITY C - 4 FT. O.C.		C1	C2				
	HOOKER'S WILLOW - SEE NOTE 1	1916	4177				
	PACIFIC WILLOW - SEE NOTE 3	1742	3797				
	PACIFIC NINEBARK	1219	2658				
	RED-OSIER DOGWOOD	1219	2658				
	SITKA WILLOW	2090	4556				
	SLOUGH SEDGE	435	949				
	WESTERN CRABAPPLE	87	190				
COMMUNITY D - 4 FT. O.C.		D1	D2	D3	D4	D5	D6
	BLACK COTTONWOOD - SEE NOTE 3	389	53	177	68	613	144
	RED ALDER - SEE NOTE 3	530	73	242	92	836	197
	BLACK HAWTHORN	212	29	97	37	334	79
	BLACK TWINBERRY	707	97	322	123	1115	263
	LADY FERN - SEE NOTE 2	71	10	32	12	111	26
	SALMONBERRY	707	97	322	123	1115	263
	SCOULER'S WILLOW	883	121	403	154	1393	328
	SKUNK CABBAGE - SEE NOTE 2	35	5	16	6	56	13
COMMUNITY E - 4 FT. O.C.		E1					
	BLACK COTTONWOOD - SEE NOTE 3	1296					
	RED ALDER - SEE NOTE 3	1296					
	SITKA SPRUCE - SEE NOTE 3	1134					
	WESTERN RED CEDAR - SEE NOTE 3	648					
	BEAKED HAZELNUT	486					
	BLACK TWINBERRY	3401					
	CLUSTERED WILD ROSE	4049					
	SALMONBERRY	3887					
COMMUNITY F - 4 FT. O.C.		F1					
	BIGLEAF MAPLE - SEE NOTE 3	432					
	DOUGLAS FIR - SEE NOTE 3	432					
	WESTERN HEMLOCK - SEE NOTE 3	216					
	INDIAN PLUM	432					
	OCEANSPRAY	432					
	RED ELDERBERRY	432					
	SNOWBERRY	648					
	WESTERN SWORD FERN	216					
	THIMBLEBERRY	648					
	VINE MAPLE	432					
COMMUNITY G - 4 FT. O.C.		G1					
	BLACK COTTONWOOD - SEE NOTE 3	291					
	RED ALDER - SEE NOTE 3	255					
	SITKA SPRUCE - SEE NOTE 3	182					
	WESTERN RED CEDAR - SEE NOTE 3	182					
	BLACK HAWTHORN	255					
	BLACK TWINBERRY	728					
	HOOKER'S WILLOW	910					
	RED-OSIER DOGWOOD	400					
	SALMONBERRY	437					

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Washington State Department of Transportation

SR 532
CORRIDOR IMPROVEMENTS
CAMANO ISLAND TO I-5

PILCHUCK CREEK MITIGATION PLANTING PLAN

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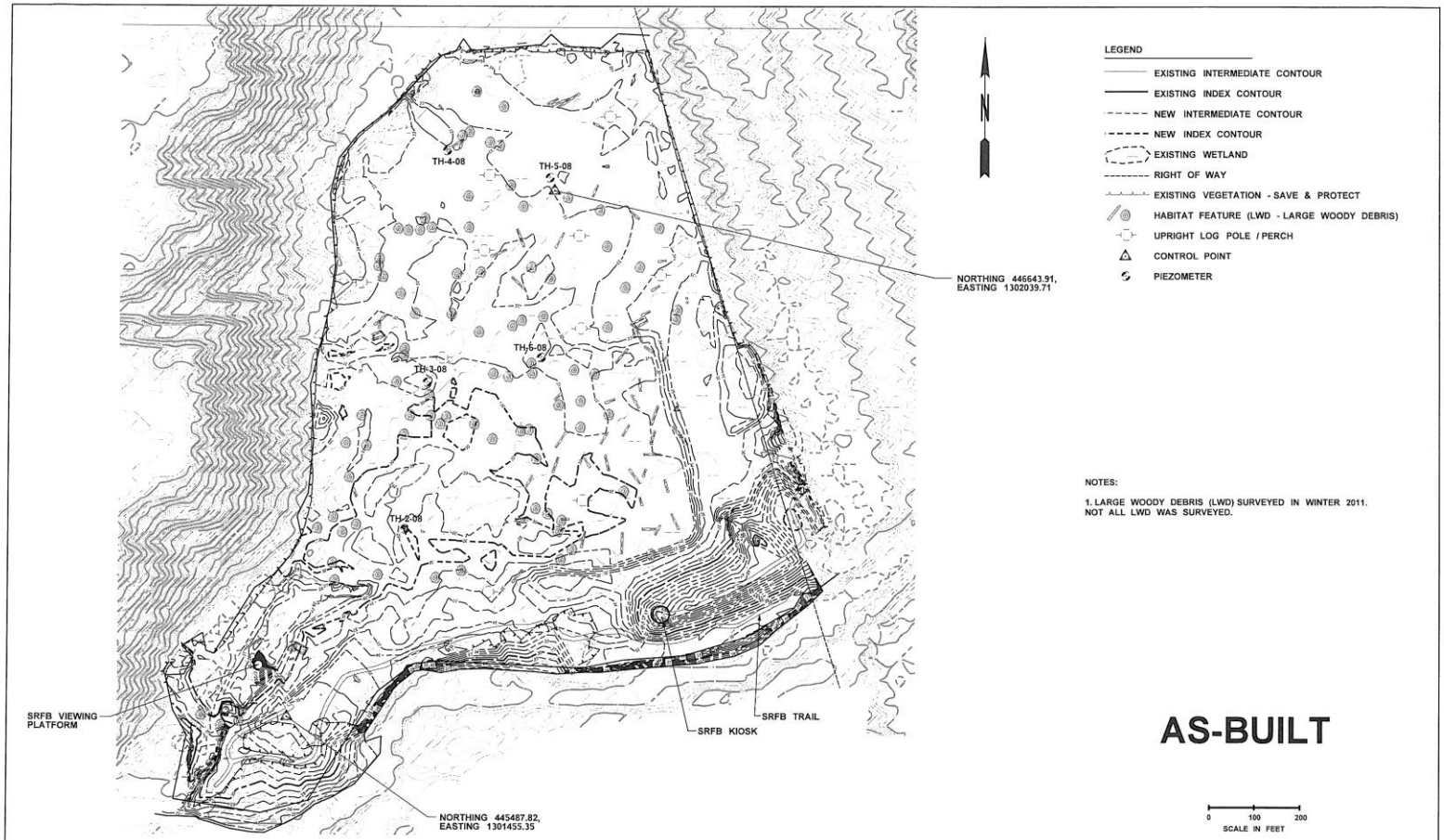
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LEGEND
EXISTING INTERMEDIATE CONTOUR
EXISTING INDEX CONTOUR
NEW INTERMEDIATE CONTOUR
NEW INDEX CONTOUR
EXISTING WETLAND
RIGHT OF WAY
EXISTING VEGETATION - SAVE & PROTECT
HABITAT FEATURE (LWD - LARGE WOODY DEBRIS)
UPRIGHT LOG POLE / PERCH
CONTROL POINT
PIEZOMETER
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P.E. STAMP BOX
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Washington State Department of Transportation
SR 532
CORRIDOR IMPROVEMENTS
CAMANO ISLAND TO I-5
PILCHUCK CREEK MITIGATION GRADING PLAN
Plot 11
PLAN REF NO
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Appendix 2 – Photo Point Map and Photos

The photographs below were taken from permanent photo-points on September 1, 2015 and document current site development.

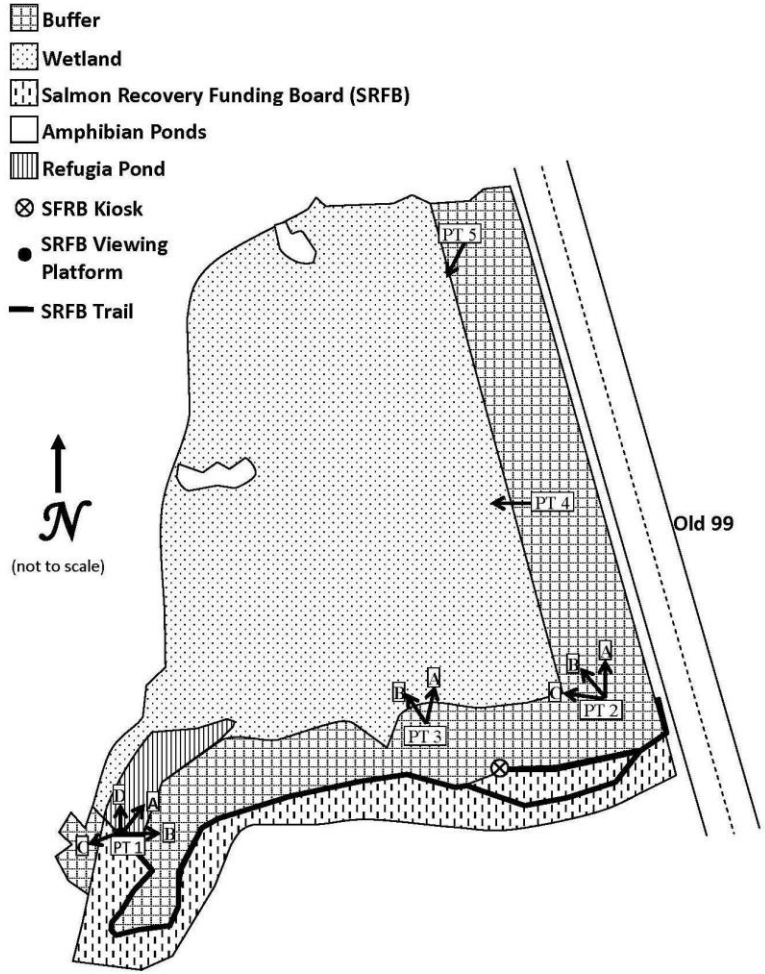

Photo Point 1a

Photo Point 1b

Photo Point 1c

Photo Point 1d

Photo Point 2a

Photo Point 2b

Photo Point 2c

Photo Point 3a

Photo Point 3b

Photo Point 4

Photo Point 5

Driving Directions:
From Olympia, take I-5 north. Drive approximately 100 miles and take exit 210 for 236th street Northeast. At the end of the off-ramp, turn left onto 236th street NE and drive over I-5. Take the first right onto Old 99N. Drive approximately half a mile and pull off on the west side of the road. Park next to the trail head.

Appendix 3 – Data Tables

Table 1. Impacts by Project

Project	Permit	Wetland Impact	Estuarine Wetland Impacts	Stream Impacts	Stream Buffer Impact	Wetland Buffer Impact
SR 532 Corridor Improvements Project[a]	USACE NWP (14) NWS-2008-1082	2.27	0.01[d]	0.05	0.86	1.61
SR530/Skaglund Hill Slide Permanent Repair[b]	USACE NWP (14) NWS-2010-773	0.31	N/A	N/A	N/A	0.48
SR 9/Pilchuck Creek Bridge Replace[c]	USACE NWP (14) NWS-2011-299	0.34	N/A	0.01	0.77	1.44[e]

[a]Acreage numbers sourced from WSDOT 2009 Revised Addendum
[b]Acreage numbers sourced from WSDOT 2010, Summary Table on page iii.
[c]Acreage numbers sourced from WSDOT 2012, Summary Table on page iii.
[d]Estuarine impacts are mitigated for at the SR 532 Estuarine Mitigation site. (USACE NWP (14) NWS-2008-1081)
[e]Buffer impacts for this project are mitigated for at the SR 9 Pilchuck Buffer mitigation site

Table 22. Wetland Mitigation Credit Dispersal by Project (Table sourced from WSDOT 2012, page 44)

Mitigation Type	Pilchuck Mitigation Site (ac)	Total Remaining (ac)
Available Mitigation Credit		
Re-establishment/rehabilitation	**12.56***	**12.56**
Buffer	**9.15**	**9.15**
SR 532 Corridor Improvement project (COE Reference NWS-2008-1082 and NWS-2008-1081)		
Re-establishment/rehabilitation	4.91	7.65
Buffer	1.85	7.30
SR 530 Skaglund Hill Slide Permanent Repair (COE Reference NWS-2010-773)		
Re-establishment/rehabilitation	0.53	7.12
Buffer	1.08	6.22
SR 9 Pilchuck Creek Replace Bridge (COE Reference NWS-2011-299)		
Re-establishment/rehabilitation	0.67	6.45
Buffer	0.00	6.22
Future Mitigation		
Re-establishment/rehabilitation	6.45	6.45
Buffer	6.22	6.22

*The 12.56 available mitigation credit for re-establishment/rehabilitation is adjusted from the actual 17.69 acres of wetland located on the site. "Rehabilitation typically receives one-half the acreage credit of re-establishment." (from WSDOT 2012, page 40).

Table 20. Non-native invasive species (from WSDOT 2010, page 55)

Scientific Name	Common Name
Buddleia alternifolia	Fountain butterfly bush
Cirsium arvense	Canadian thistle
Cirsium vulgare	Bull thistle
Cytisus scoparius	Scotch broom
Hedera helix	English ivy
Ilex aquifolium	English holly
Iris pseudacorus	paleyellow iris
Myriophyllum spicatum	Eurasian water milfoil
Phalaris arundinacea	Reed canarygrass
Prunus laurocerasus	English laurel
Rubus laciniatus	Evergreen blackberry
Rubus armeniacus	Himalayan blackberry

Appendix 4 – Delineation Report

Literature Cited

1. Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Vicksburg (MS): US Army Engineer Waterways Experiment Station. Technical Report Y-87-1. Available at: http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf]

2. [NOAA] National Oceanic and Atmospheric Administration (US) [Internet]. 2013. Preliminary Record of Climatological Observations. Available at: http://cdo.ncdc.noaa.gov/dlyp/DLYP

3. [NRCS] Natural Resources Conservation Service [Internet]. 2014. Field Office Technical Guide. US Department of Agriculture. Available at: http://efotg.sc.egov.usda.gov/efotg_locator.aspx

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