

I-5/SR 502 Interchange Mitigation Site

USACE NWP 200501249

Southwest Region

2010 MONITORING REPORT

Wetland Assessment and Monitoring Program

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I-5/SR 502 Interchange Mitigation Site

(The Johnson Wetland Mitigation Site and the Gee Creek Riparian Area)

USACE IP 200501249

	General Site Information	
	USACE IP Number	200501249
	Mitigation Location	9 miles north of Vancouver and 5 miles west of battleground in Clark County
	LLID Number	1226411457911
	Construction Date	2008
	Monitoring Period	2010-2019
	Year of Monitoring	1 of 10
	Type of Project Impact¹	Wetland
	Area of Project Impact	6.42 acres
	Type of Mitigation	Wetland Establishment
Area of Mitigation	12.0 acres	5.2 acres

¹ For additional information on wetland/riparian buffer impacts and mitigation acreages see Appendix 3, Table 5.

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Summary of Monitoring Results and Management Activities (2010)

Performance Standards	2010 Results ²	Management Activities
Wetland Hydrology	Present	
90% survival in the Forested, Scrub-shrub, Emergent, and Buffer areas	89% survival (CI _{80%} = 87-91%)	Installation of 4,600 containerized plants. And 75 large container trees (Western Red cedar . Irrigation system management and automatic operation of 26 valves over 20+ acres.
90% survival in the Riparian Enhancement area	96% survival (CI _{80%} = 96-97%)	Targeted replanting as necessary.
Blackberry species and Class A weeds will not exceed 15% at the Johnson mitigation site and Japanese knotweed shall not be present	5% cover knotweed not observed	Herbicide application and manual removal of invasive species throughout the spring and summer of 2010. Pre-emergent herbicide application in riparian enhancement areas in early Spring, 2011
Reed Canarygrass will not exceed 20% at the Johnson mitigation site	Less than 2%	
Reed Canarygrass will be managed at a threshold of 10% below the existing baseline conditions	Cover exceeds this threshold	

Report Introduction

This report summarizes Year-1 of 10 monitoring activities at the Interstate 5/State Route (SR) 502 Interchange Mitigation Site. Included are a site description, the performance standards, an explanation of monitoring methods, and an evaluation of site development. Monitoring activities included vegetation surveys, photo-documentation (Appendix 6) and assessments of wetland hydrology. At the Johnson mitigation site, vegetation monitoring occurred on August 23, 24, and 25, 2010 and hydrology monitoring occurred in March and April, 2010 (Appendix 3, Table 1, 2). At the Gee Creek Riparian restoration site, vegetation monitoring occurred on September 8th and 9th.

² Estimated values are presented with their corresponding statistical confidence interval. For example, 89% survival (CI_{80%} = 87-91%) means we are 80% confident that the true survival value is between 87% and 91%.

What is the I-5/SR 502 Interchange (The Johnson Wetland Mitigation Site and the Gee Creek Riparian Area) Mitigation Site?

This 39.8-acre mitigation site (Figure 1) consists of establishment, enhancement, and preservation areas. This site was created to compensate for the loss of 6.42 acres of wetlands due to the construction of new Interstate (I) 5 on and off ramps and a bridge that spans I-5 to connect to SR 502. This large and diverse mitigation site is designed to provide a variety of functions including wildlife habitat, water quality improvement, nutrient and sediment retention, groundwater recharge, base flow contributions to Gee Creek, and flood flow attenuation.



Figure 1 Johnson Site Sketch

The Johnson Mitigation Site contains an existing pond surrounded by a mosaic of emergent, scrub-shrub, and forested wetland communities. The existing forested area in the northwestern corner of the site is underplanted with western red cedar. Appendix 4 includes a vicinity map and description of the Gee Creek riparian mitigation area.

What are the performance standards for this site?

Performance Standard 1

The soils will be saturated to the surface, or standing water will be present 12 inches or less below the surface for at least 10% of the growing season (growing season as defined in the Soil Survey of Clark County, WA., USDA, 1972) in years when rainfall meets or exceeds the 30-year precipitation average.

Performance Standard 2

At monitoring year 1, there will be a minimum survival rate of 90% in the area identified on the Planting Plan as Forested, Scrub Shrub, Emergent, and Buffer areas.

Performance Standard 3

At monitoring year 1, there will be a minimum survival rate of 90% in area identified on the Planting Plan as Riparian Enhancement Areas.

Performance Standard 4

The aerial extent of Blackberry Species and Class A noxious weeds will not exceed 15% in the combined emergent, scrub shrub, forest, and buffer planting areas of the Johnson mitigation site. Japanese Knotweed shall not be present in any amount within the mitigation site.

Performance Standard 5

The aerial extent of Reed Canarygrass will not exceed 20% in the combined emergent, scrub shrub, forest, and buffer planting areas of the Johnson mitigation site.

Performance Standard 6

The aerial extent of Reed Canarygrass in the Johnson mitigation site will be managed at a threshold of 10% below the existing baseline conditions established in Performance Standard 6A.

Appendix 1 provides the complete text of the performance standards for this project, and Appendix 5 shows the planting plan (Corlett 2009).

How were the performance standards evaluated?

WSDOT staff collected hydrology data using methods described in the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997) (Performance Standard 1). Four permanent hydrology pit locations were established in Year-1 of monitoring and recorded on a map. During each monitoring visit, visual observations are made to determine the extent of inundation and surface saturation. Depth and location of standing water is recorded. At each pit location, in the absence of inundation or surface saturation, subsurface observations are made.

The unequal-area belt transect method was used to evaluate standards for vegetative survival at the Johnson site and at the Gee Creek riparian site (Performance Standards 2 and 3). At the Johnson site, a baseline was established parallel to NE 29th Ave (Figure 2). Twenty-five transects were randomly placed perpendicular to the baseline. One-meter wide belt transects were positioned along the length of each transect. For the Gee Creek Riparian area, a segmented baseline was established parallel to the south and northbound lanes of Interstate 5 (Figure 3). Twenty-five transects were randomly placed perpendicular to the baseline. Two-meter wide belt transects were positioned along the length of each transect.

Invasive species cover was estimated qualitatively (Performance Standards 4, 5, and 6).

For additional details on the methods, see Appendix 2 of this report or view the [WSDOT Wetland Mitigation Site Monitoring Methods Paper](#) (WSDOT 2008).

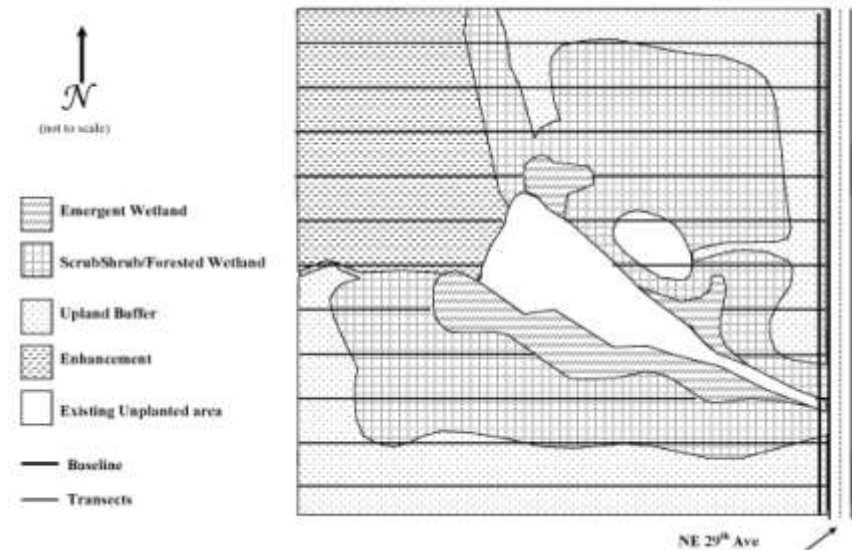


Figure 2 Johnson Site Sampling Design (2010)

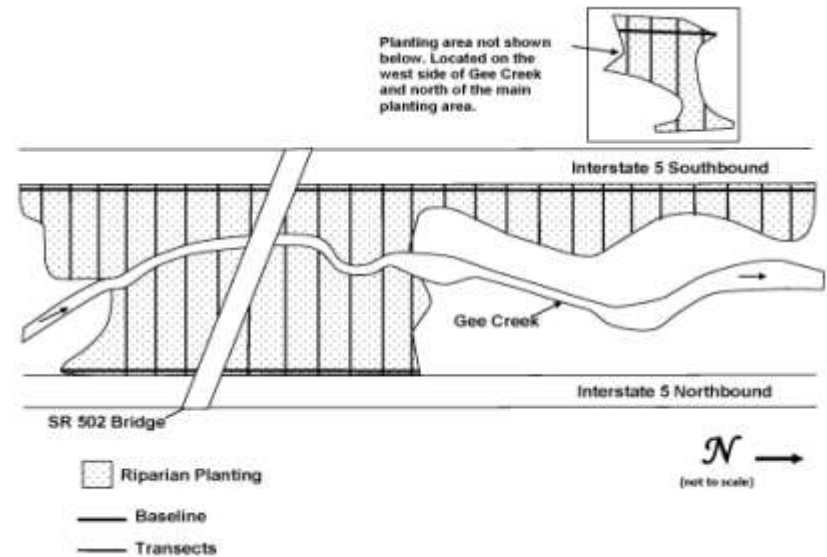


Figure 3 Gee Creek Site Sampling Design (2010)

How is the site developing?

This project is being mitigated for at two different locations, the Johnson Site (Figure 1) and the Gee Creek Riparian area (Appendix 4, Figure 4), both of which require a ten year monitoring period. The riparian area has one performance standard that pertains to its development and the remaining standards apply to the Johnson site.

Johnson Wetland Mitigation Site

The Johnson site is just beginning to develop following initial planting. With the fully functioning irrigation, the planted species are becoming established in each zone. Initial planting in the buffer was hampered by a legal access disagreement between the WA Attorney General's office and Clark Public Utilities, resulting in low plant survival. This issue was resolved in the early summer of 2010, and the site irrigation system is now fully functioning, providing at least two inches of water per week in all zones (26 valves). Starting in the late summer of 2010, emergent areas in the northern wetland basins are watered twice a week for a total of four inches of water. For the most part, the scrub-shrub and forested zones have high survival rates. The buffer area is struggling a bit more than the rest of the site due to the reasons noted above and competition with native grass species. The emergent zones near the existing pond are thriving with both planted and naturally colonizing species. The site is designed to impound seasonal runoff and move it through the three-tier wetland system through the early growing season. However, the need to keep winter water levels low to facilitate dormant season planting and poor quality of soil in the lowest portions of the excavated basins have caused these emergent areas to struggle a bit to survive.

Structures that support general habitat functions are in place. Twenty-five habitat structures and fourteen perch poles were installed on the site. There are micro-depressions present that could prove suitable for native amphibian habitat. While monitoring the site, several species of birds were observed using the perch poles and habitat structures. Tree frogs were observed in the existing forested area and bull frogs were observed in the existing pond area and the emergent zone. Coyote tracks, garter snakes, raccoons, and rabbits have also been observed during monitoring visits.

Establishment and maintenance efforts have been extensive and include: manual weed removal, mechanical mowing of blackberry in the upland forest enhancement (underplanting) area, and targeted chemical treatment, replanting (See Appendix 3, Table 4 for species and amounts), and maintenance and management of the irrigation system installed under the contract

Gee Creek Riparian Area

The Gee Creek Riparian area has high survival of woody vegetation. An extensive bark mulch blanket has helped these plantings become established but has not entirely excluded the weeds (non-native and invasive) starting to colonize the planting area. Vegetation on the edge of the creek is presently dominated by reed canarygrass (*Phalaris arundinacea*), but treatment of the

riparian enhancement area should allow the planted and colonizing trees and shrubs to develop into a dense community of native riparian vegetation with time.

Results for Performance Standard 1
(Wetland hydrology):

The growing season as defined in the Soil Survey of Clark County, WA (USDA, 1972) is from April 1st to November 4th, 217 days, ten percent of which is 21.7 days. The months of March and April, 2010 were within the 30 year average range for rainfall (See Appendix 3, Table 2). The second and third monitoring visits, March 11, 2010 and April 5, 2010 are 28 days apart and demonstrated inundation or saturation in the top 12 inches of the soil. The visit in March is not within the growing season range specified by the Soil Survey. However, the observations made at the time of monitoring indicate hydrology is present on site. The soils observed on site are fine and clayey and are slightly compacted due to the site's recent construction (2008) (see results in Appendix 3, Table 1). This could possibly be the cause of some of the varied results observed at the time of monitoring including surface inundation (Photo 1).

Results for Performance Standard 2
(90% survival in the Forested, Scrub-shrub, Emergent, and Buffer areas):

The survival of planted woody species in the forested, scrub-shrub, and buffer areas is 89% (CI_{80%} = 87-91%). This is just under the value required for the standard but; the confidence interval includes values above the standard. The buffer zone appeared more stressed than other areas on site. This could possibly be attributed to previous issues with irrigation in the buffer as well as competition from grasses. The scrub-shrub and forested zones appear to have higher survival in most areas (Photo 2). Plant height across the site ranges from 0.5



Photo 1 Surface water (March 2010)



Photo 2 Woody cover in the scrub-shrub wetland (August 2010)

to one meter tall. Many woody species were replaced throughout the site. For amounts and species replaced, see Appendix 3, Table 4.

The emergent zone was addressed qualitatively with cover estimates for each planting area labeled on the planting plan. Overall, approximately half of the planting areas are thriving (Photo 3). The results are listed in a table located in Appendix 3, Table 3.

Results for Performance Standard 3

(90% survival in the Riparian Enhancement area):

Survival in the riparian area is 96% ($CI_{80\%} = 96-97\%$). Most species planted in mulched area have high survival (Photo 4). The northwestern corner of the site appears to have the highest mortality. Dominant species in this area include western serviceberry (*Amelanchier alnifolia*) and snowberry (*Symphoricarpos albus*). Sub-dominants include western red cedar (*Thuja plicata*), tall oregongrape (*Mahonia aquifolium*), and Oregon white oak (*Quercus garryana*).



Photo 3 Herbaceous cover in the emergent zone (August 2010)



Photo 4 Woody cover in Gee Creek riparian area (September 2010)

Results for Performance Standard 4

(Blackberry Species and Class A noxious weeds will not exceed 15% in the combined planting zones, Japanese knotweed shall not be present):

This standard was evaluated qualitatively due to the low amount of non-native invasive species observed on site. Cover is estimated at five percent across the site. Japanese knotweed was not observed.

Results for Performance Standard 5 and 6

(Reed Canarygrass will not exceed 20% in the combined planting zones and cover of Reed Canarygrass will be managed at 10% below the existing baseline conditions):

Cover of reed canarygrass is estimated at less than five percent across the site. The cover measured in 2009 (post-construction) was 824.7 square feet. The amount of cover has gone up this year to 4,666.3 square feet. At this time, we do not have access to pre-construction baseline information to determine if this value is more or less than the amount observed before the site was constructed.

What is planned for this site?

The SW Region plans on installation of at least two above ground "stage gauges" at the Johnson Site to provide continuous hydrologic data in the form of a hydrograph in monitoring years 3, 5, 7.(As per Mitigation Plan Objective 2, Standard 2C, Page 35). The irrigation system will be activated again in the late spring of 2011 and run continuously through October on a pre-set program. Weed control is ongoing and there are plans to replant the emergent zones and other areas with low survival.

Appendix 1 – Goals and Performance Standards

The following excerpt is from the *I-5/SR 502 Interchange Final Wetland Mitigation Plan* (WSDOT 2006). The performance criteria addressed this year are identified in bold font.

Objectives, Performance Measures and Success Standards

The following list of objectives describes the proposed mitigation at the Johnson Wetland Mitigation site.

1. Create 12.0 acres of new wetland with three separate Cowardin vegetation classes and enhance 5.2 acres of existing wetland within the mitigation site.
2. Provide suitable hydrology for the creation of 12.0 acres of wetland, provide headwater storage and enhance discharge (base flow) to the Gee Creek system.
3. Develop site topography to create 12.0 acres of wetland.
4. Provide wetland function by creating and enhancing emergent, scrub shrub, and forested wetland, and the establishment and enhancement of buffer zones by promoting the development of dense native plant communities.
5. Promote the development of native wetland plant communities by limiting the growth and spread of noxious and nuisance vegetation, including Reed Canarygrass.

The performance standards below provide the benchmarks for measuring the successful ecological development of the wetland mitigation site. Monitoring of mitigation success standards begins immediately following initial planting with the collection of baseline data and initial (year 1) survival standards.

Objective 1: Create 12.0 acres of new wetland with three separate Cowardin vegetation classes and enhance 5.2 acres of existing wetland within the mitigation site.

Performance Standards	Monitoring Methods
1. Interim Performance Measure Wetlands will be delineated at monitoring year	Conduct wetland delineation using current USACE methodology, the Washington

5 to assess the development of estimated wetland conditions and Cowardin vegetation classes noted in tables 2 and 2a.	State Wetland Delineation Manual (WDOE, 1997), and applicable supplements at year 5.
2B. Success Standard (final year of monitoring) At monitoring year 10, the wetland area will be delineated to demonstrate that the mitigation site contains 12.0 acres of total wetland in compliance with the estimated acreages of Table 2. Visual acreage estimates of the various Cowardin vegetation classes will be conducted to document site development consistent with the approximate Cowardin acreages noted on Table 2.	Conduct wetland delineation using current methods at year 10 to provide documentation of wetland acreage and make visual observations of Cowardin vegetation classes.

Contingency: If surveyed wetland acreages or visual estimates of Cowardin vegetation classes fall significantly short of the estimated acreages of Table 2 or Table 2a at year 10, WSDOT will consult the various resource agencies for developing appropriate adaptive management or remedial procedures.

Objective 2: Provide suitable hydrology for the creation of 12.0 acres of wetland, provide headwater storage, and enhance discharge (base flow) to the Gee Creek system.

Performance Standards	Monitoring Methods
2A. Interim Performance Measure The soils will be saturated to the surface, or standing water will be present 12 inches or less below the surface for at least 10% of the growing season (growing season as defined in the Soil Survey of Clark County, WA., USDA, 1972) in years when rainfall meets or exceeds the 30-year precipitation average.	Conduct field reviews of wetland hydrology including visual observations, photographs, and/or documentation of primary hydrologic indicators (using current delineation methods) during years with formal monitoring.
2B Interim Performance Measure The wetland will provide increased headwater	Provide volumetric calculations of existing and new storage potential with the as-built

storage compared to baseline conditions in constructed depressions and swales.	plans submitted within year 1. Provide photographic documentation in monitoring years 3, 5, and 7 of the extent of seasonal ponding at three fixed-location photo documentation points.
2C Interim Performance Measure The site will provide measurable seasonal discharge (frequency, duration) to the downstream tributary of Gee Creek.	Install one above-ground monitoring station in the discharge swale that has the capability of providing continuous measures of depth over time. Provide hydrologic data in the form of a hydrograph in monitoring years 3, 5, and 7.
2D. Success Standard (final year of monitoring) At monitoring year 10, the wetland will be delineated using current methods and visual documentation provided to assure that the site contains a minimum of 12.0 acres of total wetland.	Conduct wetland delineation using current USACE methodology, the Washington State Wetland Delineation Manual (WDOE, 1997), and applicable supplements at year 10 to provide documentation of wetland acreage and hydrology.
2E. Success Standard (final year of monitoring) At monitoring year 10, the wetland will provide increased headwater storage (seasonal ponding) and have a measurable seasonal discharge to the downstream tributary as compared to baseline conditions.	Provide photographic and survey (GPS) documentation and long-term hydrologic well data (hydrographs) to demonstrate storage potential and seasonal discharge.

Contingency: If surveyed wetland acreages fall significantly short of the estimated acreages of Table 2 or Table 2a at year 10, WSDOT will consult the various resource agencies for developing appropriate adaptive management or remedial procedures.

Objective 3: Develop site topography to create 12.0 acres of wetland.

Performance Standards	Monitoring Methods
3A. Success Standard The site will be graded consistent with the	As-built grading plans and photographic documentation will be submitted within year

grading plan (figure 18), to support 12.0 acres of wetland and the Cowardin vegetation classes noted on Table 2a.	1. As-built grading plans will also include the location of habitat structures, photo documentation points, and monitoring wells.
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Objective 4: Provide wetland function by creating and enhancing emergent, scrub shrub, and forested wetland, and the establishment and enhancement of buffer zones on the Johnson mitigation site by promoting the development of dense native plant communities.

Performance Standards	Monitoring Methods
<p>3A. Success Standard The wetland mitigation site will be planted in accordance with the wetland planting plan, figure 19.</p>	As-built plans documenting that the mitigation site has been planted according to the planting plan will be submitted within year 1.
<p>4B. Success Standard At monitoring year 1, there will be a minimum survival rate of 90% in the area identified on the Planting Plan as Forested, Scrub Shrub, Emergent, and Buffer areas.</p>	Conduct major plant assessment of contract-installed vegetation (plant counts based on as-built plans).
<p>4C. Success Standard At monitoring year 3, 5, and 7, there will be a minimum density of native trees and/or shrubs in Forested, Scrub Shrub, and Buffer areas as follows: <u>Forested wetland</u></p> <ul style="list-style-type: none"> ▪ minimum density of 400 living native trees per acre ▪ minimum density of 4,000 living native shrubs per acre ▪ at least 2 species of native trees and 4 species of native shrubs will be present in the forested area. No single species will provide more 60% total aerial cover. 	Use current monitoring protocols (see Monitoring Plan) to determine density (number of living trees per acre) and species diversity in scrub shrub, forested, and buffer areas.

<p><u>Scrub Shrub wetland:</u></p> <ul style="list-style-type: none"> ▪ minimum density of 4,000 living native shrubs per acre ▪ at least 4 species of native shrubs will be present in the Scrub Shrub area. No single species will be present in the forested area. No single species will provide more 0% total aerial cover. 	
<p>4D. Success Standard</p> <p>At monitoring year 3, 5, and 7, there will be a minimum percent cover of native emergent vegetation in emergent areas as follows:</p> <ul style="list-style-type: none"> ▪ Year 3 – minimum of 50% aerial cover of native facultative wet and wetter species within the emergent zone. ▪ Year 5 – minimum 60% aerial cover of native facultative wet and wetter species within the emergent zone. ▪ Year 7 – minimum 65% aerial cover of native facultative wet and wetter species within the emergent zone. ▪ At least 5 species of native herbaceous facultative wet and wetter species will be present in the emergent area. No single species will provide more 70% total aerial cover. 	<p>Use current monitoring protocols (see Monitoring Plan) to determine percent cover of native emergent vegetation in the emergent areas.</p>
<p>4E. Success Standard (final year monitoring)</p> <p>At monitoring year 10, there will be a minimum density of native trees and/or shrubs in Forested, Scrub Shrub, and Buffer areas as follows:</p> <p><u>Forested:</u></p> <ul style="list-style-type: none"> ▪ minimum density of 300 living native trees per acre ▪ minimum density of 3,000 living native shrubs 	<p>Use current monitoring protocols (see Monitoring Plan) to determine density (number of living trees per acre) and species diversity in scrub shrub, forested, and buffer areas.</p>

<p>per acre</p> <ul style="list-style-type: none"> ▪ At least 2 species of native trees and 4 species of native shrubs will be present in the forested area. No single species will provide more 60% total aerial cover. <p><u>Scrub Shrub:</u></p> <ul style="list-style-type: none"> ▪ minimum density of 3,000 living native trees per acre ▪ At least 4 species of native shrubs will be present in the Scrub Shrub area. No single species will provide more 60% total aerial cover. <p><u>Buffer</u></p> <ul style="list-style-type: none"> ▪ minimum density of 300 living native trees per acre ▪ minimum density of 3,000 living native shrubs per acre ▪ At least 2 species of native trees and 4 species of native shrubs will be present in the forested area. No single species will provide more 60% total aerial cover. 	
<p><i>4F. Success Standard</i></p> <p>At monitoring year 10, there will be a minimum percent cover of native emergent vegetation in emergent areas as follows:</p> <ul style="list-style-type: none"> ▪ minimum of 75% aerial cover of native facultative wet and wetter species within the emergent zone. ▪ At least 5 species of native herbaceous facultative wet and wetter species will be present in the emergent area. No single species will provide more 70% total aerial cover. 	

Contingency: If the monitoring reports indicate insufficient establishment and/or plant survival, those areas not meeting current-year standard(s) will be replanted to bring them in compliance with the failing current-year standard(s).

Objective 5: Enhance watershed function by creating and enhancing native forested riparian areas.

Performance Standards	Monitoring Methods
<p>5A. Success Standard Riparian areas will be planted in accordance with planting plans developed for the areas.</p>	<p>As-built plans documenting that the riparian areas have been planted according to the planting plan will be submitted within year 1.</p>
<p>5B. Success Standard At monitoring year 1, there will be a minimum survival rate of 90% in area identified on the Planting Plan as Riparian Enhancement Areas.</p>	<p>Conduct major plant assessment of contract-installed vegetation (plant counts based on as-built plans).</p>
<p>5C. Success Standard</p> <ul style="list-style-type: none"> ▪ At monitoring year 3, 5, and 7, there will be a minimum density of native trees and/or shrubs riparian enhancement areas as follows minimum density of 400 living native trees per acre ▪ minimum density of 4,000 living native shrubs per acre ▪ At least 2 species of native trees and 4 species of native shrubs will be present in the forested area. No single species will provide ore 0% total aerial cover. 	<p>Use current monitoring protocols (see Monitoring Plan) to determine density (number of living trees per acre) and species diversity in scrub shrub, forested and buffer areas.</p>
<p>5D. Success Standard (final year monitoring) At monitoring year 10, there will be a minimum density of native trees and/or shrubs in riparian enhancement areas as follows:</p> <ul style="list-style-type: none"> ▪ minimum density of 300 living native trees per 	<p>Use current monitoring protocols (see Monitoring Plan) to determine density (number of living trees per acre) and species diversity in scrub shrub, forested, and buffer areas.</p>

acre <ul style="list-style-type: none"> ▪ minimum density of 3,000 living native shrubs per acre ▪ At least 2 species of native trees and 4 species of native shrubs will be present in the forested area. No single species will provide more 60% total aerial cover. 	
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Contingency: If the monitoring reports indicate insufficient establishment and/or plant survival, those areas are not meeting current-year standard(s) will be replanted to bring them in compliance with the failing current-year standard(s).

Objective 6: Promote the development of native wetland plant communities by limiting the growth and spread of noxious and nuisance vegetation, including Reed Canarygrass.

Performance Standards	Monitoring Methods
<p>6A. Success Standard Conduct a pre-construction survey of the existing extent of invasive vegetation including Reed Canarygrass, Blackberry Species, and Japanese Knotweed, to establish a baseline for invasive species monitoring and management at years 1, 3, 5, 7, and 10.</p>	Provide photographic and map (GPS or notations on plan sheets) documentation of existing stands of Reed Canarygrass, Blackberry species, and Japanese Knotweed.
<p>6B. Success Standard At monitoring years 1, 3, 5, 7, and 10, Invasive Species will be managed as follows:</p> <p>The aerial extent of Blackberry Species and Class A noxious weeds will not exceed 15% in the <u>combined</u> emergent, scrub shrub, forest, and buffer planting areas of the Johnson mitigation site.</p>	Observe and map (notations on plan sheets) locations of Reed Canarygrass, Blackberry Species, and Japanese Knotweed as part of annual vegetation surveys using current monitoring techniques. For larger stands, GPS measurements of stand perimeters will be provided to measure the extent of change over time. Observations will form the basis of on-going site management and integrated vegetation management

<p>Japanese Knotweed shall not be present in any amount within the mitigation site.</p> <p><u>Reed Canarygrass – Created wetland areas</u> The aerial extent of Reed Canarygrass will not exceed 20% in the <u>combined</u> emergent, scrub shrub, forest, and buffer planting areas of the Johnson mitigation site.</p> <p><u>Existing wetland (enhancement) areas</u> The aerial extent of Reed Canarygrass in the Johnson mitigation site will be managed at a threshold of 10% below the existing baseline conditions established in Performance Standard 6A. In monitoring years 7 and 10 (final year of monitoring), Reed Canarygrass will exist as an understory component that does not compete the dominant native tree and shrub species or exceed existing baseline conditions.</p>	<p>activities.</p>
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Contingency: Implement a long-term integrated vegetation management plan to maintain the aerial extent of invasive species at or below the established thresholds. Weed management activities may be conducted in all monitoring years. Japanese Knotweed discovered during monitoring or routine site visits and maintenance, it shall be immediately removed and chemically treated for elimination.

Appendix 2 – Methods

At the Johnson site, to assess vegetation standards, a 400-meter baseline was established parallel to NE 29th Ave on the east side of the site. Twenty-five temporary sampling transects were placed perpendicular to the baseline using a systematic random sampling method (Figure 2). Survival of woody species in the buffer, and scrub-shrub and forested wetland zones (Performance Standard 2) was assessed using the unequal belt transect method. Twenty-five one-meter wide unequal sample units were placed along the sampling transects.

At the Gee Creek riparian area, to assess vegetation standards, a 761-meter baseline was established in three segments parallel to Interstate 5 north and south bound lanes on each side of the creek. Twenty-five temporary sampling transects were placed perpendicular to the baseline using a systematic random sampling method (Figure 3). Survival of woody species in the riparian planting zones (Performance Standard 3) was assessed using the unequal belt transect method. Twenty-five two-meter wide unequal sample units were placed along the sampling transects.

WSDOT staff collected hydrology data using methods described in the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997) (Performance Standard 1). Reed canarygrass (*Phalaris arundinacea*) located on site were mapped with the Global Positioning System (Trimble TSCI data logger) (Performance Standard 6).

For additional details on the methods view the [WSDOT Wetland Mitigation Site Monitoring Methods Paper](#) (WSDOT 2008).

Appendix 3 – Data Tables

Table 1 Hydrology Observations

Date	Surface Observations	Subsurface Observations	
March 2, 2010	Hydrology was observed in most intended areas. Soils are very fine and clayey on this site. Often observed water on top of the soil surface, but when a monitoring pit was dug, the soil was very hard and compact with no standing water or any saturation observed in the pit.	Pit 1	Standing water at 15" and saturation at 5" after 1 hour and 15 minutes
		Pit 2	None
		Pit 3	No standing water
		Pit 4	Standing water at 16.5" and saturation at 11" after 32 min.
March 11, 2010	All wetland areas either inundated or saturated to the soil surface. Raining before and during site visit.	Pit 1	Surface saturation to shallow inundation*
		Pit 2	Surface saturation to shallow inundation
		Pit 3	Surface saturation to shallow inundation
		Pit 4	Surface saturation
April 5, 2010	Raining during site visit, most soils saturated at the surface or inundated.	Pit 1	Saturation at 12", standing water at 16" after 30 minutes
		Pit 2	Standing water at 8" after 30 minutes
		Pit 3	Top 2" saturated due to precipitation but no other saturation or inundation
		Pit 4	Standing water at 9" after 30 minutes

* Pit 1 location was saturated to shallowly inundated, but dug a pit anyway. Pit showed apparent saturation (water seeping into pit) from about 0"-3" and water collected in bottom of pit to 13" after 50 minutes.

Table 2 Average Rainfall from WETS Station : BATTLE GROUND, WA0482 and Wunderground Weather station KWABATTL3

Month	30 year average (inches)	30% chance will have		2010 total rainfall per month
		Less than	More than	
March	5.47	4.31	6.30	4.81
April	4.29	3.16	5.03	4.23

Table 3 Emergent Cover Estimates

Planted species	E1*	E2	E3	E4	E5	E6
slough sedge (<i>Carex obnupta</i>)	Present	Absent	Absent	Absent	Absent	Absent
small-fruited bulrush (<i>Scirpus microcarpus</i>)	Present	Present	Present	Present	Absent	Present
hardstem bulrush (<i>Schoenoplectus acutus</i>)	Present	Absent	Absent	Absent	Absent	Absent
spike rush (<i>Eleocharis palustris</i>)	Present	Present	Present	Present	Absent	Present
burreed (<i>Sparganium emersum</i>)	Present	Present	Absent	Absent	Absent	Absent
wapato (<i>Sagittaria latifolia</i>)	Present	Absent	Absent	Absent	Absent	Absent
% cover of planted herbs	70	5	15	<1	0	25
% cover of all herbs	80	50	65	2	<1	95

*Note – E1, E2, etc. refer to specific planting areas on the planting plan.

In response to the Joint Agency Letter (dated March 17, 2010) concern regarding bare ground in the emergent areas –

The estimated cover for all herbs in each emergent zone is given above. The area not covered by herbs is bare ground in most zones.

Emergent areas E4 and E5 are not thriving. E4 has a small area of herbaceous growth, but the rest of the area meant to be emergent is developing with willows (*Salix* spp.). E5 is almost completely bare ground. It is located in an area where there was a break in the irrigation system and the plantings did not appear to receive any water through the heat of the summer.

Table 4 Johnson site woody species plant replacement amounts

Douglas-fir (<i>Pseudotsuga menziesii</i>)	2 gallon	590
western red cedar (<i>Thuja plicata</i>)	3 gallon	220
bigleaf maple (<i>Acer macrophyllum</i>)	3 gallon	195
Oregon white oak (<i>Quercus garryana</i>)	3 gallon	205
quaking aspen (<i>Populus tremuloides</i>)	1 gallon	150
tall oregongrape (<i>Mahonia aquifolium</i>)	1 gallon	3830

Total of 4,600 containerized plants replaced in the winter of 2009/2010.

Table 5 Buffer Impacts and Mitigation Summary (from Final Wetland Mitigation Plan. WSDOT, 2006)

Type of Impact	Buffer
Area of Impact	10.47 acres

Location of Mitigation	Johnson Site	Gee Creek Riparian
Type of Mitigation	Forested Upland Buffer	Riparian Buffer
Area of Mitigation	16.9 acres	11.0 acres

Appendix 4 – Riparian Area

The Gee Creek Riparian Area is located in the median of Interstate 5 (Figure 3). This area consists of 9.8 acres of preserved mature riparian forest and approximately 11.0 acres of riparian forest establishment.

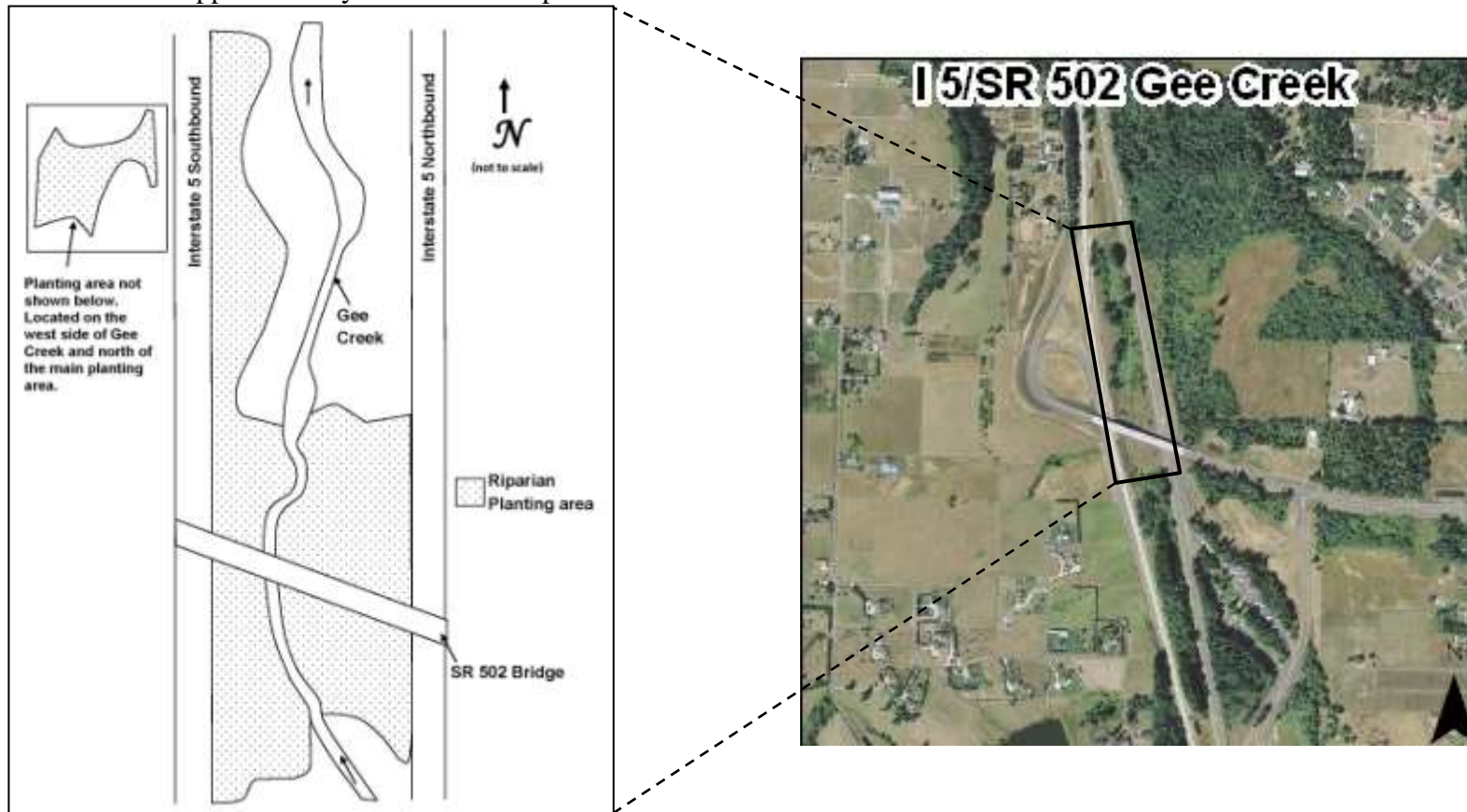


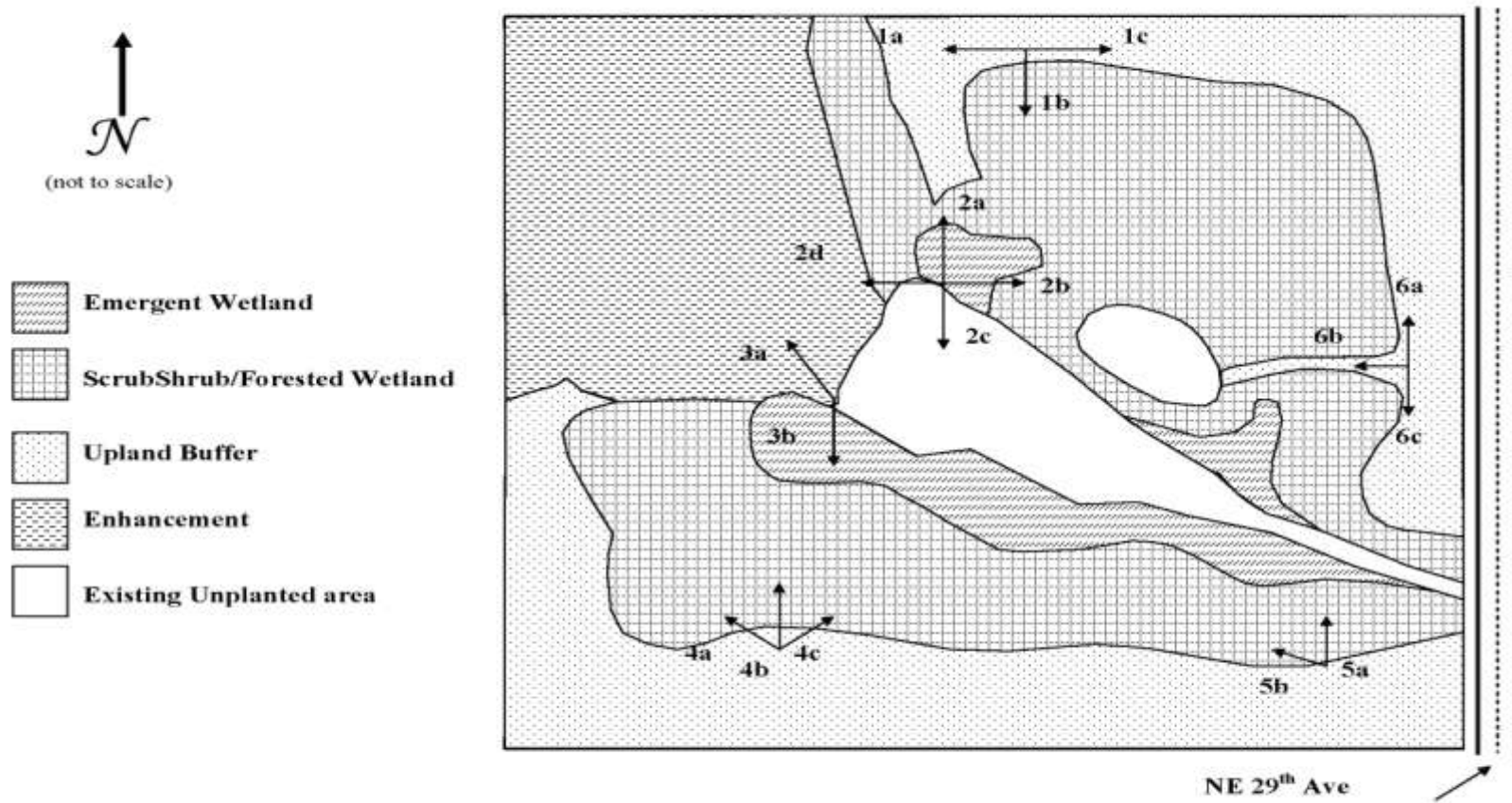
Figure 4 Gee Creek Site Sketch

PLANT MATERIAL SCHEDULE

EMERGENT (E)		2.87 ACRES		T1		E2		E3		E4		E5		E6	
common name	botanical name	triangle spacing	plant quantity	1.95	0.42	0.31	0.15	0.10	0.33	0.10	0.10	0.10	0.10	0.10	0.33
1. alough willow	<i>Salix alba</i>	18 inch	15,000	8,500	2,350	1,750	850	550	1,850	1,850	1,850	1,850	1,850	1,850	1,850
2. small fruit bur oak	<i>Quercus macrocarpa</i>	18 inch	6,800	1,900	1,400	700	400	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
3. horsetail bur oak	<i>Quercus macrocarpa</i>	18 inch	12,800	3,500	2,500	1,200	700	300	750	750	750	750	750	750	750
4. spike rush	<i>Echinochloa polystachya</i>	18 inch	0,400	1,100	800	400	200	200	200	200	200	200	200	200	200
5. bur oak	<i>Quercus macrocarpa</i>	18 inch	13,000	3,600	2,600	1,200	700	300	750	750	750	750	750	750	750
6. w. redbud	<i>Glomera glabra</i>	18 inch	8,400	2,300	1,700	850	550	1,850	1,850	1,850	1,850	1,850	1,850	1,850	1,850
			84,000	23,400	17,300	8,500	5,000	2,000	7,500	7,500	7,500	7,500	7,500	7,500	7,500
			34,200	9,450	7,000	3,450	2,100	745	2,450	2,450	2,450	2,450	2,450	2,450	2,450

SCRUB SHRUB (SS)		4.64 ACRES		SS1		SS2		SS3		SS4		SS5	
common name	botanical name	triangle spacing	plant quantity	0.77	0.16	0.38	0.31	1.70	0.91	0.91	0.91	0.91	0.91
1. red cedar dogwood	<i>Cornus sericea</i>	3 ft.	10,300	1,700	1,300	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
2. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
3. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
4. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
5. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
6. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
7. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
8. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
9. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
10. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
11. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
12. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
13. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
14. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
15. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
16. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
17. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
18. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
19. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
20. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
21. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
22. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
23. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
24. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
25. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
26. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
27. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
28. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
29. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
30. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
31. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
32. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
33. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
34. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
35. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
36. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
37. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
38. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
39. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
40. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
41. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
42. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
43. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
44. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
45. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
46. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
47. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
48. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
49. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
50. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
51. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
52. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
53. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
54. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
55. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
56. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
57. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
58. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
59. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
60. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
61. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
62. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
63. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
64. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
65. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
66. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
67. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
68. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
69. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
70. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
71. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
72. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
73. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
74. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
75. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
76. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200	150	250	450	50	50	50	50	50	50
77. black locust	<i>Rhus glabra</i>	3 ft.	1,500	200									

Appendix 6 – Photo Points Johnson Site



The photographs below were taken from permanent photo-points at the Johnson site on August 25th, 2010 and document current site development.



Photo Point 1a



Photo Point 1b



Photo Point 1c



Photo Point 2a



Photo Point 2b



Photo Point 2c



Photo Point 2d



Photo Point 3a



Photo Point 3b



Photo Point 4a



Photo Point 4b



Photo Point 4c



Photo Point 5a



Photo Point 5b



Photo Point 6a

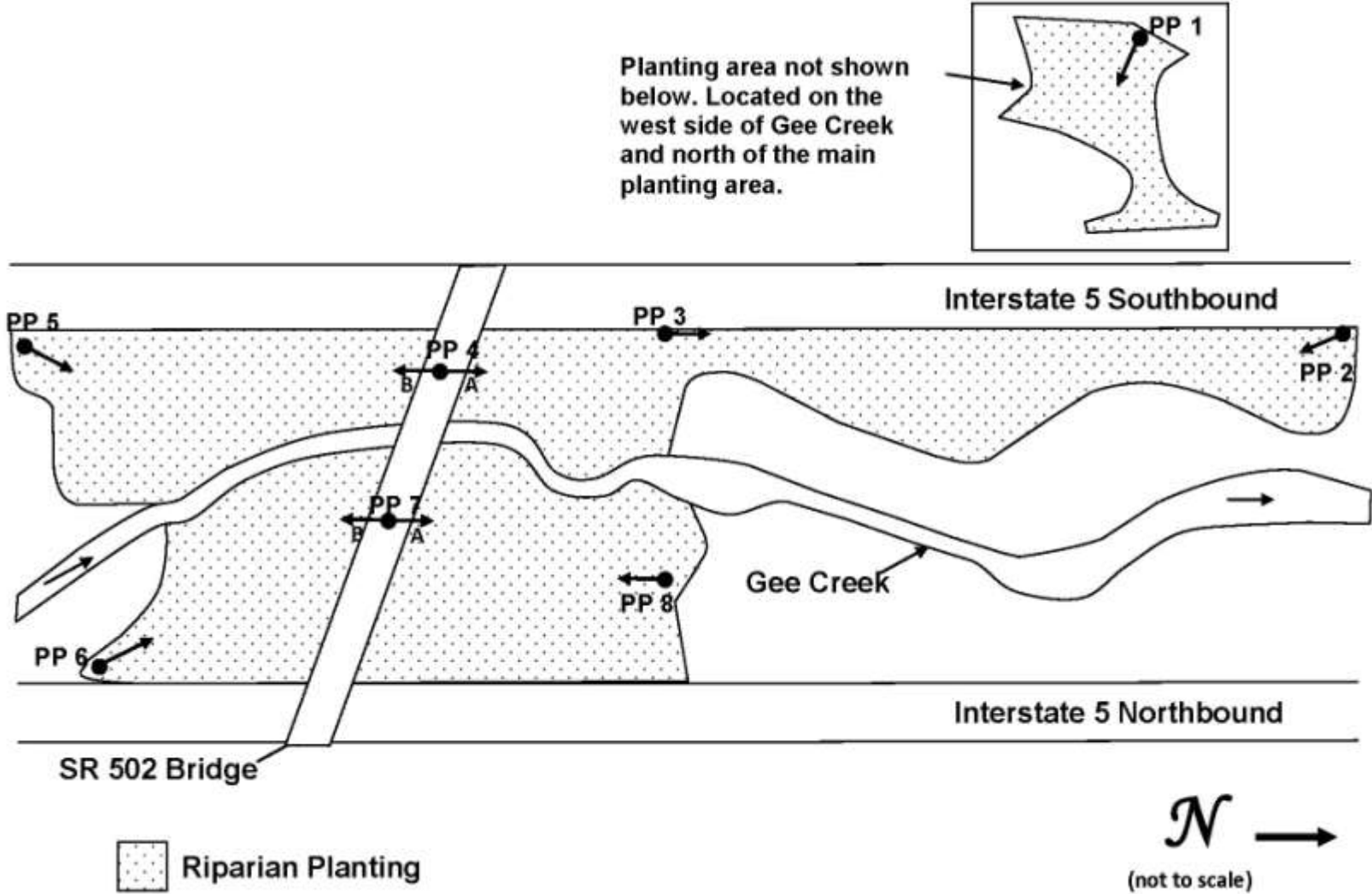


Photo Point 6b



Photo Point 6c

Gee Creek Riparian Area



The photographs below were taken from permanent photo-points at the Gee Creek Riparian area on September 8th, 2010 and document current site development.



Photo Point 1



Photo Point 2



Photo Point 3



Photo Point 4a



Photo Point 4b



Photo Point 5



Photo Point 6



Photo Point 7a



Photo Point 7b



Photo Point 8

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1. Ecology. See Washington State Department of Ecology.
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4. Washington State Department of Transportation (WSDOT), Southwest Region Environmental Services. 2006. I-5/SR 502 Interchange Final Wetland Mitigation Plan. USACE Addendum, August 8, 2006. Clark County Addendum, November 2006.
5. Washington State Department of Transportation (WSDOT) WSDOT Wetland Mitigation Site Monitoring Methods (12 June 2008). <http://www.wsdot.wa.gov/NR/rdonlyres/C211AB59-D5A2-4AA2-8A76-3D9A77E01203/0/MethodsWhitePaper052004.pdf>