

## 1. Background

Clean Water Services (District) is a county service district that serves the urban portion of Washington County. The District has 12 member cities (Cities) and owns and operates four wastewater treatment facilities (WWTFs) in the Tualatin River basin. The WWTFs and the municipal separate storm sewer system (MS4) are permitted by the Oregon Department of Environmental Quality (DEQ) under the District's watershed-based National Pollutant Discharge Elimination System (NPDES) permit. The District's watershed-based NPDES permit (Permit) was issued by DEQ on April 22, 2016, and became effective on June 1, 2016.

The Permit includes thermal load limits for the District's Rock Creek WWTF, Durham WWTF, and Forest Grove WWTF and Fernhill Natural Treatment System (NTS) based on the 2001 Temperature Total Maximum Daily Load for the Tualatin River. The Permit allows the District to offset the thermal loads from the Rock Creek WWTF, Durham WWTF, and Forest Grove WWTF and NTS by implementing a water quality credit trading program for temperature. The District's water quality credit trading program includes flow enhancement and riparian planting as specified in Schedule D.10 of the Permit and the District's DEQ-approved Thermal Load Management Plan (TLMP). The TLMP documents the District's approach and programs for offsetting the thermal load from the Rock Creek WWTF, Durham WWTF, and Forest Grove WWTF and NTS and specifies the District's methodology for calculating the thermal credits associated with the riparian planting and flow enhancement programs.

As required by Schedule D.10.f of the Permit, the District submitted information regarding thermal loads and credits in the July and August 2017 Discharge Monitoring Reports (DMRs) for the Rock Creek WWTF, Durham WWTF, and Forest Grove WWTF and NTS to demonstrate that the District is offsetting thermal loads from its WWTFs. The July and August DMRs include the aggregate thermal load from the WWTFs, aggregate thermal credits from flow enhancement, aggregate thermal credits from riparian shade, aggregate total thermal credits and the net thermal load to the Tualatin River.

Schedule D.10.g of the Permit also requires the District to submit a Water Quality Credit Trading Report annually by March 31 that summarizes the TLMP program implementation and performance over the previous year. The District's TLMP states that the following information will be presented in the annual report.

- Thermal loads discharged by the Rock Creek WWTF, Durham WWTF and Forest Grove WWTF and NTS (*Section 3, Table 5*)
- Allowed thermal loads for the Rock Creek WWTF, Durham WWTF and Forest Grove WWTF and NTS (*Section 3, Table 5*)
- Thermal load reduction activities – recycled water use, treatment facility changes including use of the NTS and source control activities (*Section 2*)
- Thermal load credits for flow enhancement (*Section 3, Table 6*)
- Thermal load credits for riparian shade (*Section 3, Table 7*)

In addition to the above information, the District's TLMP states that the following supporting information will be presented in the annual report.

For flow enhancement activities:

- The average daily effluent flow from the Rock Creek WWTF, Durham WWTF and Forest Grove WWTF for the period July 1 – August 31 (*Appendix E*)
- The average daily temperature of the effluent from the Rock Creek WWTF, Durham WWTF and Forest Grove WWTF for the period July 1 – August 31 (*Appendix E*)
- The average daily Tualatin River flow at the Farmington Bridge (River Mile 33) for the period July 1 – August 31; once the Fernhill NTS is operational, the average daily Tualatin River flow at Golf Course Road (*Appendix E*)
- The average daily flow enhancement rate from Hagg Lake and Barney Reservoir for the period July 1 – August 31 (*Appendix E*)
- Flow enhancement credits generated (*Section 3, Table 6*)

For riparian shade activities (at each site):

- Baseline vegetation conditions (density and width) (*Appendix A*)
- Enhanced vegetation conditions (type, width and anticipated density) (*Appendix A*)
- Stream characteristics (stream aspect, elevation, wetted width, near stream disturbance zone, incision) (*Appendix A*)
- Baseline thermal load blocked by existing vegetation and the anticipated thermal load blocked by the enhanced vegetation (*Section 3, Table 7*)
- Thermal credits from each riparian planting project (*Section 3, Table 7*)
- Riparian vegetation monitoring and maintenance activities (*Section 2 and Appendix A*)
- Baseline compliance assessment (*Section 2*)
- Documentation of the use of public conservation funds (*Section 2 and Appendix B*)

Information for the Forest Grove WWTF and NTS for August 2017 is not included in this report because the facility did not discharge in August 2017. The following report includes all of the above information and fulfills the requirements for submitting an annual report for the District's water quality trading activities for 2017.

## **2. 2017 Thermal Load Management Activities**

The thermal load management activities presented in this report are for the period from January 1 to December 31, 2017. This annual report fulfills the requirements identified in the 2016 Permit and associated TLMP.

The District implements a number of strategies to reduce the thermal load discharged from the WWTFs where feasible. These strategies are summarized in the following section. The water quality credit trading program, which includes flow enhancement and riparian planting activities, is used to offset the remaining thermal load from the WWTFs.

### **2017 THERMAL LOAD REDUCTION ACTIVITIES**

The District's TLMP states that, on an annual basis, the District will submit a report that specifies the actions taken to reduce the thermal load discharged from the WWTFs. The District's recycled water program, Fernhill NTS, WWTF improvements and source control activities were identified as methods that could be used to reduce the thermal load discharged by the WWTFs. The following is a summary of the actions taken in each of these areas in 2017.

**Recycled Water Program:** The District produced 69.4 million gallons of Class A recycled water at the Durham WWTF. This volume of recycled water represents a direct reduction in the thermal load discharged by the District's WWTFs. Recycled water from the Durham WWTF is used at three golf courses, two public school athletic fields, a City of Tigard natural area, Durham City Park and for on-site irrigation.

**Fernhill Natural Treatment System:** The District is also pursuing treatment facility improvements to reduce the thermal load discharged by the WWTFs. In 2017, the District began discharging treated effluent from the Forest Grove and Hillsboro WWTFs through the 95-acre Fernhill NTS at Forest Grove. Prior to implementing the NTS, the Forest Grove and Hillsboro WWTFs transferred wastewater through twin 24-inch pipelines to the Rock Creek WWTF for treatment and discharge during the dry season. The District implemented the Fernhill NTS in order to direct wastewater from the Forest Grove and Hillsboro service areas to the Forest Grove WWTF for treatment during the dry season; the treated effluent from the Forest Grove WWTF is then directed through the Fernhill NTS for further treatment prior to discharge to the Tualatin River. In June 2017, the District began directing 1.8 mgd of treated secondary effluent from the Forest Grove WWTF through the Fernhill NTS. In mid-July 2017, the District also began directing effluent flow from the Hillsboro WWTF to the Fernhill NTS and the daily average flow rate through the NTS increased to 3.8 mgd. In August 2017, effluent flow from the Hillsboro and Forest Grove WWTFs was directed to the Rock Creek WWTF for treatment as a result of performance issues at the Forest Grove WWTF.

**Wastewater Treatment Facility Improvements:** The District also pursues capital improvements to further reduce thermal loads discharged from the Rock Creek, Durham and Forest Grove WWTFs. Previously, the District built cogeneration facilities at the Durham and Rock Creek WWTFs to dissipate excess heat to the atmosphere rather than discharging it to the treatment facilities. Implementing these alternatives reduced the thermal load to the treatment facilities. In 2017, no significant changes were made at the Rock Creek, Durham and Forest Grove WWTFs that would have reduced the thermal load.

**Source Control:** The District regulates all significant industrial user discharges into the sanitary sewer system as part of its DEQ-approved industrial pretreatment program. In 2016 and 2017, the District worked collaboratively with two significant industrial dischargers to implement cooling systems at their facilities which resulted in a significant reduction in thermal load to the WWTFs.

## **2017 THERMAL LOAD TRADING ACTIVITIES**

This section contains a discussion of the District's flow enhancement and riparian planting activities, a summary of temperature management measures at the WWTFs and Fernhill NTS, recycled water use and source control activities in 2017 that affected the thermal load discharged to the Tualatin River.

## **FLOW ENHANCEMENT ACTIVITIES**

The District has 12,618 acre-feet of stored water available annually in Scoggins Reservoir (also known as Hagg Lake) and 1,654 acre-feet in Barney Reservoir. The District releases stored water during the summer and fall to maintain minimum stream flows in the Tualatin River, generate

thermal credits to offset a portion of the thermal load from the District’s WWTFs, enhance tributary flows, provide sustainable base flows in the upper Tualatin River, and improve dissolved oxygen levels and overall water quality in the Tualatin River. Stored water releases in July and August form the basis of the District’s flow enhancement credit.

In 2017, the District initiated stored water releases from Scoggins Reservoir on June 20. The District released an average of 46.3 cubic feet per second (cfs) during July and August in 2017 compared to an average of 38.3 cfs released during July and August from 2004 to 2016. The District initiated stored water releases from Barney Reservoir on September 1. The District continued to release stored water into October prior to the onset of fall rains. Table 1 shows the average monthly release rates from Scoggins and Barney reservoirs for the 2017 release season.

**Table 1: 2017 Average Monthly Release Rates from Scoggins and Barney Reservoirs**

Month	2017 Average Release Rate from Scoggins Reservoir (cfs)	2017 Average Release Rate from Barney Reservoir (cfs)	2017 Average Combined Stored Water Release Rate (cfs)
<b>June</b>	16.0	-	16.0
<b>July</b>	37.4	-	37.4
<b>August</b>	55.2	-	55.2
<b>September</b>	43.2	19.5	62.7
<b>October</b>	43.5	7.6	51.1

In 2017, the District used approximately 10,565 acre-feet (~84 percent) and 1,524 acre-feet (~92 percent) of the District’s stored water from Scoggins and Barney reservoirs, respectively.

## RIPARIAN PLANTING ACTIVITIES

The following sections summarize the riparian planting activities, riparian maintenance activities and shade monitoring activities conducted during the reporting period. For 2017, the District is enrolling 4.25 stream miles in the Tualatin River basin for thermal credit. Table 2 presents the riparian planting projects and the stream length associated with each project.

**Table 2: 2017 Riparian Planting Projects**

<b>Summary</b>	
Total Stream Miles: 4.25 mi	
<b>Project</b>	<b>Stream Length (ft)</b>
2186 - Metro - Woodard Natural Area	752
2190 - Metro - Farmington Natural Area	599
2213 - TSWCD - West Fork Dairy Creek	7890
2218 - Beaverton Creek - Quatama - 185th Ave	1454
2260 - TSWCD - McFee Creek	800
2261 - TSWCD - Davis Creek	1374
2262 - TSWCD - Abbey Creek	1530
2263 - Fanno Creek - Crawford Reach	800
2265 - Wapato View	5045
2345 - Metro - Carpenter Creek S	1800
2346 - Metro - Carpenter Creek N	382

TSWCD: Tualatin Soil and Water Conservation District

**Project Summaries:** Appendix A contains a project summary for each project credited in 2017. Project summaries contain general site information (site location, number of acres, location description, stream length and average width, plant communities, partners involved, project activities, etc.), a site assessment report, a summary of the thermal credits generated and the input and output data used to calculate the effective shade and thermal load blocked for each project.

**Capital Program:** Riparian planting projects implemented under the District's Capital Program mostly occur on public lands where large-scale restoration opportunities are available and multiple water quality and ecological benefits can be achieved. Project activities under this program include securing easements or stewardship agreements with property owners, site preparation activities, invasive species management, re-vegetation, monitoring and maintenance. Additional enhancement activities such as channel reconfiguration, large wood placement, gravel-boulder placement, and off-channel habitat creation are performed on a site-specific basis to improve a broader range of site functions. Seven riparian enhancement projects and 2.1 miles of riparian corridor were planted under the District's Capital Program in 2017.

**Landowner Incentive Program:** The District contracts with the Tualatin Soil and Water Conservation District (TSWCD) to provide incentives for enrolling landowners in an enhanced version of the U.S. Department of Agriculture's (USDA) Conservation Reserve Enhancement Program (ECREP) and Vegetated Buffer Areas for Conservation (VEGBAC) program. The ECREP has provided an opportunity to leverage local and federal programs. This collaboration has greatly increased the acceptance and implementation of restoration programs at the local level. The VEGBAC program is administered locally by the TSWCD and does not utilize federal funds. Riparian planting projects in rural areas primarily consist of site preparation, re-vegetation, invasive species management, monitoring and maintenance. In 2017, four riparian enhancement projects were undertaken under the District's Landowner Incentive Program: 2213-TSWCD-West Fork Dairy Creek, 2260-TSWCD-McFee Creek, 2261-TSWCD-Davis Creek and 2262-TSWCD-Abbey Creek, resulting in 2.2 miles of riparian planting.

**Baseline Compliance Assessment:** In accordance with Schedule D.10.c.ii of the Permit, the District conducts a baseline compliance assessment for each riparian planting project enrolled in the trading program. The District identifies the regulatory requirements regarding riparian areas that apply at each site and verifies the project is in compliance with the regulatory requirements. The District then determines the conditions that should be used to determine baseline for calculating thermal credit.

For riparian planting projects conducted in agricultural areas, local water quality management rules (Oregon Administrative Rules (OAR) chapter 603, division 95) developed by the Oregon Department of Agriculture (ODA) (also known as Senate Bill (SB) 1010) were identified as the regulatory requirements that apply. These rules include non-disturbance criteria for streamside riparian areas. The TSWCD with the support of local partners implements the Agricultural Water Quality Management Plan as a local management agency for the ODA. The TSWCD verifies that landowners are in compliance with applicable rules prior to enrollment; only projects that are in compliance with applicable rules are enrolled into the program. For sites that are deemed to be in compliance with these requirements, existing vegetation is used to define baseline conditions for determining thermal credit based on the non-disturbance criteria for streamside riparian areas. The four riparian planting projects conducted in agricultural areas in 2017 were deemed to be in

compliance with the ODA's local water quality management rules. Thus, existing conditions were used as baseline to determine thermal credit at these sites.

For riparian planting projects conducted in urban areas, the District's Design and Construction (D&C) Standards (Clean Water Services Resolution and Order 07-20) apply to all active construction sites and to all construction project sites undertaken since the mid-1990s. The District's D&C Standards require the enhancement and maintenance of a vegetated stream corridor. The District does not enroll projects for thermal credit in urban areas where riparian enhancement and maintenance are required by the D&C Standards.

The Cities also have regulations regarding riparian protection in urban natural resource areas. Three projects were implemented in 2017 that were located in urban areas. The 2186-Metro-Woodard Natural Area and the 2263-Fanno Creek-Crawford Reach projects are in the city of Tigard, and the 2218-Beaverton Creek-Quatama-185th Avenue project spans the border between the cities of Hillsboro and Beaverton. These cities' regulations regarding riparian protection are voluntary and do not require active riparian planting (City of Tigard Community Development Codes Chapter 18.775.020, City of Hillsboro Community Development Codes Section 12.27.225 and City of Beaverton Development Codes Section 60.12.05), therefore, existing conditions were used as baseline to determine thermal credits for all three projects.

The 2190-Metro-Farmington Natural Area, 2265-Wapato View, 2345-Metro-Carpenter Creek S and 2346-Metro-Carpenter Creek N projects, although located outside of the urban area, are not located where agricultural activities are occurring. As a result, neither the ODA's local water quality management rules nor the District's D&C Standards apply to these project sites and existing conditions were used as baseline for determining thermal credits.

**Public Conservation Funds:** The District's TLMP includes a requirement to document in the annual report the use of public conservation funds (PCFs) for each project enrolled in the trading program. Public conservation funds are defined in OAR 340-039-0005(4) as "[p]ublic funds that are targeted to support voluntary natural resource protection or restoration." OAR 340-039-0040(4) states that "[c]redits generated under an approved trading plan may not include water quality benefits obtained with public conservation funds. Where public sources of funding are used for credit-generating activities, it is the entity's responsibility to demonstrate compliance with this requirement in its annual report." Based on the definition of water quality benefits in the Water Quality Trading Internal Management Directive (IMD), credit-generating activities include site preparation, planting, monitoring and maintenance activities.

The District works with several partner agencies to implement riparian planting projects across the Tualatin watershed. For projects where PCFs are used, the District will use the following approaches to demonstrate that the thermal credits that are being claimed from these riparian shade projects are based on the District's contribution toward credit-generating activities (i.e., site preparation, planting, monitoring and maintenance activities).

For riparian planting projects conducted in agricultural areas, the District contracts with the TSWCD to implement projects through the ECREP and VEGBAC programs. PCFs are used for ECREP projects and the District takes credit based on the District's contribution to credit-generating activities. The percentage of credits available for District use is determined on a programmatic basis and accounts for the initial cost to implement the project, including site preparation and initial planting costs, and annual costs for monitoring and maintenance over a

20-year period. This methodology is described in more detail in Appendix B. Based on this approach, the District determined that 86 percent of the thermal credits generated by ECREP projects are available for District use.

For projects conducted through the VEGBAC program, PCFs are not used. The District funds the cost of all credit-generating activities and is therefore eligible for 100 percent of the thermal credits generated by these projects.

As part of the Capital Program, the District also partners with the Cities, Metro, Tualatin Hills Park & Recreation District (THPRD) and other agencies to implement riparian planting projects. For Metro and THPRD projects, the District has intergovernmental agreements that identify the work performed by each entity at a project site. The District conducts the credit-generating activities at these project sites, thus, 100 percent of the thermal credits generated at these sites are available for District use. For projects where the District partners with the Cities or other agencies such as the U.S. Fish and Wildlife Service, PCFs are not used. The District funds the cost of all credit-generating activities and is therefore eligible for 100 percent of the thermal credits generated by these projects.

A summary of the District’s contribution to credit-generating activities by program is shown in Table 3.

**Table 3: Program-Based District Contribution to Credit-Generating Activities**

Program	District Contribution to Credit-Generating Activities
ECREP	86%
VEGBAC	100%
Capital Projects	100%

**RIPARIAN MONITORING AND MAINTENANCE ACTIVITIES**

Site monitoring and maintenance play a critical role in ensuring the success of the riparian planting projects because re-vegetated sites need protection from a variety of threats including invasive species, herbivores and dry weather. As a result, the District implements a robust monitoring and maintenance program that includes qualitative and quantitative monitoring activities. The following sections outline the District’s approach toward monitoring and maintenance. The results of the activities at each project site are presented in site assessment reports; the reports for 2017 projects are presented in Appendix A and the reports for projects enrolled between 2004 and 2016 are available upon request.

**Qualitative and Quantitative Monitoring:** The District conducts qualitative and quantitative monitoring at riparian planting projects that are enrolled for thermal credit. Typically, monitoring is conducted during early fall prior to leaf drop. Site assessment reports document site conditions and include site-specific management actions.

Qualitative monitoring is conducted on an annual basis and is used to assess overall project health and project phase (i.e., transitional, established or stewardship phase). This assessment

approach not only helps project managers determine the necessary level of maintenance needed at each riparian planting project site (e.g., inter-planting, seeding, weed control, herbivore protections), but also accounts for the dynamic nature of riparian planting projects as they mature from initial plantings to stable riparian ecosystems.

Quantitative monitoring is conducted biennially and includes information regarding native tree and shrub counts, species composition, density and riparian structure. Stem densities, one of the parameters monitored, vary within and between projects due to a number of factors. Activity from native and non-native animals, soil conditions, seasonal inundation and dynamic stream morphology affect project areas differently. Additionally, variation in stem density reporting is inherent in the random plot monitoring protocol that is utilized. To achieve target stem densities, a number of factors are considered for management and plant mortality is factored into the number of stems that are inter-planted. Target stem densities are appropriate for evaluating the initial phases of a project; as projects mature and stem densities naturally decrease, additional information is also evaluated to determine management actions.

**Site Assessment Reports:** The District prepares a site assessment report for each site and uses the report to document site conditions, identify management actions taken and propose actions for the following year. Each site assessment report contains project-specific information including project acreage, the initial planting year, the year when thermal credit was taken and the stream length associated with the project. Site assessment reports also contain information regarding each plant community (e.g., riparian forest, forested wetland, upland forest, scrub-shrub) within a project. This information includes a list of categorized plant species, stem densities and the phase of each plant community. Site assessment reports for all 11 projects credited in 2017 are included in the project summaries in Appendix A. As described in the site assessment reports, all 11 projects were planted in 2015 or 2016 and range from four to over 30 acres in size. A majority of the projects were planted with a riparian forest type plant community; other plant communities used included scrub-shrub, forested wetland, oak woodland and oak savanna. Management actions completed in 2017 and additional management actions recommended for 2018 at these sites include inter-planting, invasive weed treatment and seeding.

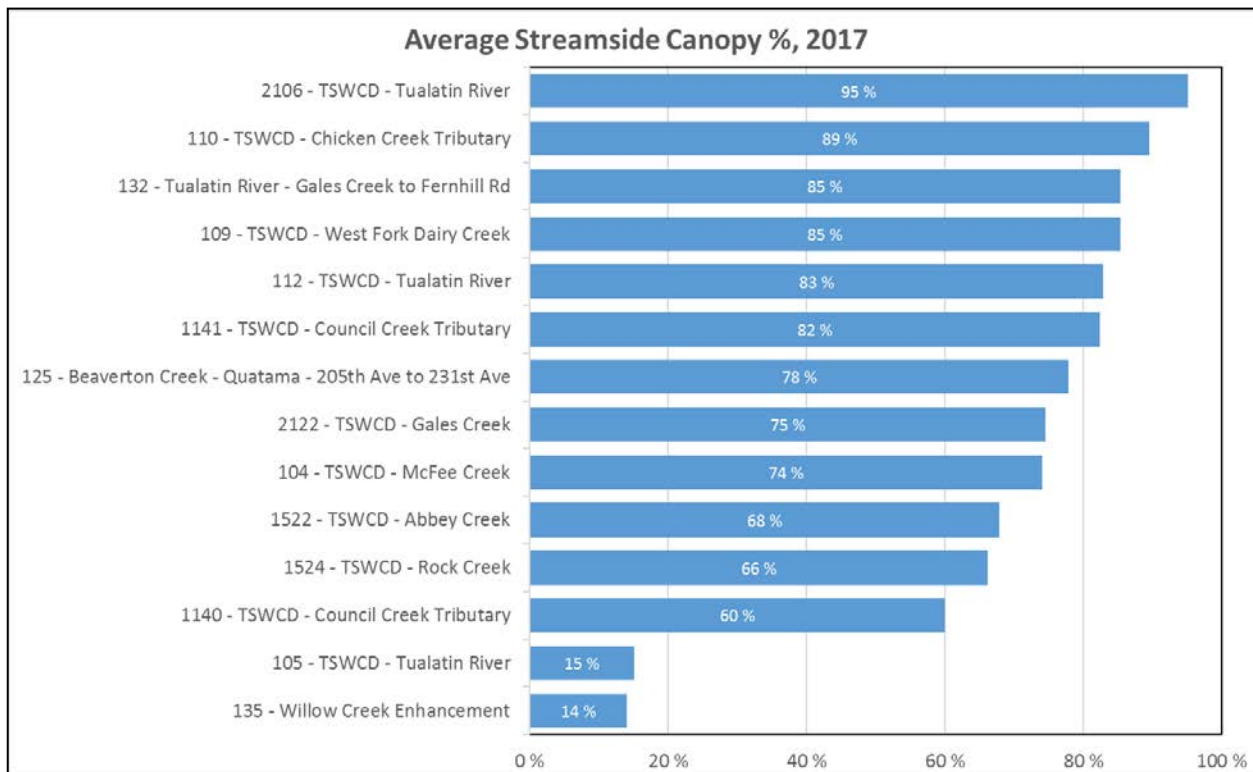
The District has site assessment reports for projects that were enrolled between 2004 and 2016 for which the District has taken thermal credit; these reports are available upon request. Site specific management actions completed in 2017 and recommended for 2018 are also presented in these site assessment reports.

## **SHADE MONITORING**

As noted in the previous section, the District conducts annual monitoring at each project site to assess plant survival, overall project health and project phase. In addition, the District collects data to assess shade at riparian projects every five years. Shade monitoring is conducted using field measurements and remotely sensed datasets, including Light Detection and Radar (LiDAR) and aerial photos. The shade monitoring protocol for the field measurements calls for establishing one monitoring point for each 500-foot stream segment of a project with a minimum of three monitoring points per project. At each monitoring point photographs and densiometer readings are taken. Photographic monitoring includes both upstream and downstream views. Shade is estimated as densiometer readings of canopy cover mid-channel and/or at each stream bank as determined by specific protocols for stream wadeability, bank incision and accessibility.



Figure 1 presents the shade monitoring results at the 14 sites that were monitored for shade in 2017.



**Figure 1: 2017 Shade Monitoring Results**

Twelve of the 14 projects that were monitored for shade in 2017 provided greater than 60 percent streamside canopy cover, with only two providing less than 15 percent shade. The 2106-TSWCD-Tualatin River, 110-TSWCD-Chicken Creek Tributary, 132-Tualatin River-Gales Creek to Fernhill Road and the 109-TSWCD-West Fork Dairy Creek projects had 85 percent or greater streamside canopy cover.

The 105-TSWCD-Tualatin River project had an average streamside canopy cover of 15 percent when monitored in 2017. Since its initial planting of 7,550 native trees and shrubs in 2007, invasive species and significant beaver activity have affected the project site, resulting in vegetation loss and dramatically changing stream characteristics. As a result, this site has had focused attention including invasive weed treatment and inter-planting as shown below and in Appendix D:

- 2008: 2,700 plants
- 2009: 3,500 plants
- 2010: 2,400 plants
- 2013: 5,000 plants
- 2014: 3,000 plants
- 2016: 4,650 plants

Targeted invasive species treatment was completed in 2017 and is planned for 2018. Fifty established trees were caged in 2017 to prevent beaver herbivory and seeding is planned for

2018. This site will continue to be monitored for invasive species, beaver activity and plant survival. The District anticipates that these additional actions will improve project performance.

The 135-Willow Creek Enhancement project had an average streamside canopy cover of 14 percent when monitored in 2017. This project was initially planted with 700 native trees and shrubs and credited in 2006. This project has extensive wetland complexes, significant beaver activity and ongoing challenges with invasive yellow flag iris, which have dramatically changed stream and riparian characteristics. Additional management actions taken include invasive weed treatment and inter-planting as noted in Appendix D. There is a planned inter-planting during 2018 of 2,000 plants. Targeted invasive species treatment was completed in 2017 and is planned for 2018. This site will continue to be monitored for invasive species and plant survival. The District anticipates that these additional actions will improve project performance.

Eleven of the 14 sites that were monitored for shade in 2017 were previously monitored for shade in 2012. With the exception of the sites mentioned above, the site assessment reports note that the projects are functioning well. There were minor decreases in shade at some project sites, likely due to challenges associated with field shade monitoring protocols and natural processes that alter stream and riparian characteristics. The District is evaluating the use of remotely sensed datasets, such as LiDAR and aerial photos, as well as the use of more emergent technologies, such as Unmanned Aircraft Systems (drones), to provide a more consistent measure of the changes in shade at project sites.

As previously discussed, the District is committed to ensuring the success of each of its riparian planting projects. The District monitors each project site extensively and evaluates plant survival, overall project health and project phase. Should a project not be producing adequate streamside canopy cover, the District implements additional management actions to ensure the project's success. Appendix D describes the challenges encountered at these sites and the additional management actions that have been taken at each site.

Such efforts have been successful in improving project conditions and overall performance. For example, projects 25-Dawson Creek-Evergreen Blvd and 36-Beaverton Creek-Transit Center were not producing adequate streamside canopy cover and were previously reported in Appendix D. However, the District implemented additional management actions at these sites including several inter-planting events. Over the years, more than 10,000 plants were planted adjacent to the stream at each project. These additional management actions resulted in an increase in streamside canopy cover; project 25-Dawson Creek-Evergreen Blvd increased from 36 percent in 2010 to 82 percent in 2017 and project 36-Beaverton Creek-Transit Center increased from 37 percent in 2010 to 82 percent in 2017. As a result, both of these projects were removed from Appendix D.

### **3. Calculation of Thermal Loads and Credits for 2017**

Schedule B.4.e of the Permit requires the District to report the aggregate thermal load to offset and the aggregate thermal credits for the Durham WWTF, Rock Creek WWTF and Forest Grove WWTF and NTS. As referenced in Table 4, shown below (which is Table B11 in Schedule B.4.e of the Permit), the aggregate thermal load to offset is the combined excess thermal load to offset from the Durham WWTF, Rock Creek WWTF and the Forest Grove WWTF and NTS. The aggregate thermal credit is the combined credits from riparian shade plantings and flow enhancement. The

aggregate thermal load to offset is the aggregate of the excess thermal load minus the allowable thermal load at each WWTF.

**Table 4: Aggregate Thermal Load to Offset and Aggregate Thermal Credits Generated**

Item	Time Period	Minimum Frequency	Sample Type/Action	Report
Aggregate Thermal Load to Offset <sup>a</sup>	July-August	Monthly	Calculation	Monthly Value
Aggregate Thermal Load Credit <sup>b</sup>	July-August			
<p>Notes:</p> <p>a.) The aggregate thermal load to offset is the combined thermal load to offset from the Durham and Rock Creek AWWTFs and the Forest Grove NTS.</p> <p>b.) The aggregate thermal load credit is the combined credits from riparian shade plantings and flow augmentation.</p>				

This section presents the aggregate thermal load to offset and the aggregate thermal load credits for the Rock Creek WWTF, Durham WWTF and Forest Grove WWTF and NTS for 2017. The Forest Grove WWTF and NTS did not discharge to the Tualatin River during August 2017, and therefore, thermal loads and credits for August 2017 are not included in this report.

### AGGREGATE THERMAL LOAD TO OFFSET

The excess thermal loads discharged from the Rock Creek WWTF, Durham WWTF and Forest Grove WWTF and NTS are based on daily maximum effluent temperature and daily average effluent flow conditions for each WWTF for the months of July and August. The time period of July 1 to August 31 is identified as the temperature credit trading period in the Permit and corresponds to the time of year when river temperatures are of most concern.

The excess thermal loads discharged from each WWTF are calculated on a daily basis for July and August using the equation from Schedule A.1.a.iv and Table B7 in the Permit:

$$\text{Excess Thermal Load} \left( \text{million} \frac{\text{kcal}}{\text{day}} \right) = Q_{PS} \times \Delta T \times \left( \frac{1000}{35.3} \right) \times 86400 \times 5/9$$

where:  $\Delta T = T_{PS} - T_{SP}$  (degrees F)  
 $Q_{PS}$  = treatment plant effluent flow (cfs)  
 $T_{PS}$  = treatment plant effluent temperature (degrees F)  
 $T_{SP}$  = system potential temperature (degrees F)

(Durham WWTF = 64.6°F, Rock Creek WWTF = 58.5°F, Forest Grove WWTF and NTS = 53.1°F)

Other factors:  $1000 \frac{\text{kg}}{\text{m}^3}$ ;  $35.3 \frac{\text{ft}^3}{\text{m}^3}$ ;  $86400 \frac{\text{sec}}{\text{day}}$ ;  $\frac{5^\circ\text{C}}{9^\circ\text{F}}$

The daily average effluent flow and daily maximum effluent temperatures that are used to calculate the excess thermal loads for each WWTF for July and August are presented in Appendix E.

The allowable thermal load, which represents the permitted thermal load, is also calculated for each WWTF for July and August. The aggregate thermal load to offset for the WWTFs is calculated as shown in the following equation:

$$\text{Aggregate Thermal Load to Offset} = \text{Aggregate Excess Thermal Load} - \text{Aggregate Allowable Thermal Load}$$

The aggregate excess thermal loads, aggregate allowable thermal loads and aggregate thermal loads to offset for the WWTFs for July and August 2017 are presented in Table 5. The Forest Grove WWTF and NTS did not discharge in August 2017; effluent flows were sent to the Rock Creek WWTF for treatment, therefore, thermal loads for the Forest Grove WWTF and NTS for August are not presented.

In 2017, the aggregate thermal load to offset from the WWTFs was 1,278 million kcal/day for July and 1,428 million kcal/day for August. Due to a calculation error, the aggregate thermal load to offset was previously reported as 1,525 million kcal/day in the August 2017 DMR. The August DMR has since been revised and reflects the values presented in this report.

**Table 5: Rock Creek WWTF, Durham WWTF and Forest Grove WWTF and NTS Aggregate Thermal Load Summary (July and August 2017)**

<b>Wastewater Treatment Facility Data Aggregate Summary</b>	
<b>July 2017</b>	
Aggregate excess thermal load for the Rock Creek and Durham WWTFs and Forest Grove WWTF & NTS:	1343 million kcal/d
Aggregate allowable thermal load for the Rock Creek and Durham WWTFs and Forest Grove WWTF & NTS:	65 million kcal/d
Aggregate thermal load to offset for the Rock Creek and Durham WWTFs and Forest Grove WWTF & NTS:	1278 million kcal/d
<b>August 2017*</b>	
Aggregate excess thermal load for the Rock Creek and Durham WWTFs:	1478 million kcal/d
Aggregate allowable thermal load for the Rock Creek and Durham WWTFs:	50 million kcal/d
Aggregate thermal load to offset for the Rock Creek and Durham WWTFs:	1428 million kcal/d
*NOTE: The Forest Grove WWTF and NTS did not discharge in August 2017	

## **AGGREGATE THERMAL LOAD CREDITS GENERATED**

This section presents the aggregate thermal load credits generated from flow enhancement and riparian planting for the Durham WWTF, Rock Creek WWTF and Forest Grove WWTF and NTS for July and August 2017.

**Flow Enhancement Credits:** Table 6 presents the median flow at the Farmington gauge and the average flow enhancement rate for July and August 2017 which were used to determine the aggregate thermal credits from flow enhancement for July and August at the Rock Creek WWTF, Durham WWTF and Forest Grove WWTF and NTS. The aggregate thermal credits from flow enhancement were 1,099 million kcal/day for July 2017 and 1,307 million kcal/day for August 2017. In July, the Oregon Water Resources Department updated its rating curve at the Farmington gauge which resulted in minor changes to the daily stream flows. This adjustment to the daily stream flows did not substantially change the thermal credits generated from flow

enhancement that were reported in the July DMRs. In August, the updated daily stream flows at Farmington were used to calculate the thermal credits from flow enhancement.

**Table 6: Flow Enhancement Information and Aggregate Thermal Credits from Flow Enhancement (July and August, 2017)**

<b>Flow Enhancement Summary</b>		
<b>July 2017</b>		
Median Farmington flow:	205	cfs
Average Flow Enhancement Rate:	37.4	cfs
Aggregate Thermal Credits from Flow Enhancement:	1099	million kcal/d
<b>August 2017</b>		
Median Farmington flow:	167	cfs
Average Flow Enhancement Rate:	55.2	cfs
Aggregate Thermal Credits from Flow Enhancement:	1307	million kcal/d

**Riparian Planting Credits:** As specified in Schedule D.10.g of the Permit, this report must include, at a minimum, for each new riparian shade project that is completed within the calendar year, the project name, project number, stream length planted, thermal load blocked and thermal credits generated.

Table 7 presents this information for the riparian planting projects credited in 2017. The table shows the stream miles planted, the thermal load blocked by existing vegetation conditions (baseline), the thermal load blocked by future enhanced vegetation conditions (modeled using a 20-year shade establishment period) and the overall thermal load reduction. Using riparian vegetation codes (Appendix F) and stream characteristic information as inputs, the “Shade-a-Lator” component of DEQ’s Heat Source temperature model was used to calculate effective shade and thermal load blocked with baseline riparian vegetation conditions, and effective shade and thermal load blocked for the future enhanced vegetation conditions. The difference between the thermal load blocked with enhanced conditions and the thermal load blocked with baseline conditions represents the reduction in thermal load (i.e., environmental benefit) associated with the riparian planting project. The District’s TLMP specifies a 2:1 trading ratio for calculating credit for shade (i.e., the thermal credit for shade is equal to 50 percent of the environmental benefit).

As described in the section on Public Conservation Funds (Section 2), the District claims a portion of the credits based on its contribution toward credit-generating activities for ECREP projects; the District funds all of the credit generating activities for the VEGBAC and Capital Programs and thus 100 percent of the thermal credits are available for District use. Table 7 also presents the thermal credits available, the percentage of credits that the District can claim based on its contribution to credit-generating activities, and the thermal credits obtained by the District.

For 2017, 42 million kcal/day of thermal credit were generated from riparian planting projects.

**Table 7: 2017 Riparian Planting Projects and Associated Thermal Credit**

THERMAL CREDIT FOR RIPARIAN SHADE							YEAR:	2017
<b>Summary</b>								
Total Stream Miles:		4.25 mi						
CWS Thermal Credit This Year:		4.2E+07 kcal/d						
<b>Restoration/Protection Record</b>								
Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2186 - Metro - Woodard Natural Area	Capital	752	5.5E+07	9.9E+07	4.4E+07	2.2E+07	100%	2.2E+07
2190 - Metro - Farmington Natural Area	Capital	599	3.8E+06	5.5E+06	1.7E+06	8.3E+05	100%	8.3E+05
2213 - TSWCD - West Fork Dairy Creek	ECREP	7890	2.3E+07	4.4E+07	2.1E+07	1.0E+07	86%	9.0E+06
2218 - Beaverton Creek - Quatama - 185th Ave	Capital	1454	5.8E+06	7.9E+06	2.1E+06	1.0E+06	100%	1.0E+06
2260 - TSWCD - McFee Creek	VEGBAC	800	4.3E+06	4.8E+06	4.5E+05	2.2E+05	100%	2.2E+05
2261 - TSWCD - Davis Creek	ECREP	1374	1.0E+05	2.2E+06	2.1E+06	1.1E+06	86%	9.1E+05
2262 - TSWCD - Abbey Creek	VEGBAC	1530	2.3E+06	2.7E+06	3.7E+05	1.9E+05	100%	1.9E+05
2263 - Fanno Creek - Crawford Reach	Capital	800	5.4E+06	7.5E+06	2.2E+06	1.1E+06	100%	1.1E+06
2265 - Wapato View	Capital	5045	8.3E+05	3.7E+06	2.8E+06	1.4E+06	100%	1.4E+06
2345 - Metro - Carpenter Creek S	Capital	1800	2.4E+06	1.0E+07	7.9E+06	3.9E+06	100%	3.9E+06
2346 - Metro - Carpenter Creek N	Capital	382	1.9E+04	1.8E+06	1.8E+06	9.0E+05	100%	9.0E+05
a) The "Thermal Load Reduction" represents the thermal load blocked by enhanced conditions minus the thermal load blocked by baseline conditions								
b) Using the District's 2:1 trading ratio, the "Thermal Credits Available" represent 50% of the "Thermal Load Reduction"								
c) "CWS Thermal Credits" represents the thermal credit claimed by the District based on its contribution to credit-generating activities								

#### 4. Reconciliation of Thermal Loads and Credits for 2017

Table B11 from Schedule B.4.e of the Permit requires the District to report the aggregate thermal load to offset and the aggregate thermal credits for the Durham WWTF, Rock Creek WWTF and Forest Grove WWTF and NTS as part of the July and August DMRs submitted to DEQ on a monthly basis. Tables 8 and 9 show a summary of what was included in the July 2017 and August 2017 DMR, respectively. Both tables present the aggregate excess thermal load; the aggregate allowable thermal load; the aggregate thermal load to offset from the Rock Creek WWTF, Durham WWTF and Forest Grove WWTF and NTS; the aggregate thermal credits generated with flow enhancement; the 429 million kcal/day of aggregate thermal credits generated with riparian plantings for 2004 – 2016; the total aggregate thermal load credit and the net thermal load to the Tualatin River. The 429 million kcal/day of aggregate thermal credits does not include the 42 million kcal/day of thermal credit generated in 2017 with riparian planting projects.

**Table 8: Aggregate Thermal Loads and Credits Summary (July 2017)**

Aggregate Excess Thermal Load	Aggregate Allowable Thermal Load	Aggregate Thermal Load to Offset	Aggregate Thermal Credits from Flow Augmentation	Aggregate Thermal Credits from Riparian Shade	Aggregate Thermal Load Credits	Net Thermal Load (to Tualatin River)
1343	65	1278	1099	429	1528	0
Units: million kcal/day						

**Table 9: Aggregate Thermal Loads and Credits Summary (August 2017)**

Aggregate Excess Thermal Load	Aggregate Allowable Thermal Load	Aggregate Thermal Load to Offset	Aggregate Thermal Credits from Flow Augmentation	Aggregate Thermal Credits from Riparian Shade	Aggregate Thermal Credits (total)	Net Thermal Load (to Tualatin River)
1478	50	1428	1307	429	1736	0
Units: million kcal/day						
Note: No discharge from the FG WWTF in August 2017						

For 2017, these tables show that the District continues to offset the excess thermal loads from the Rock Creek WWTF, Durham WWTF and Forest Grove WWTF and NTS using credits generated from flow enhancement and riparian shade planting activities as demonstrated by a zero net thermal load to the Tualatin River.

Schedule D.10.c.vi.1 of the District’s Permit specifies a target quantity of 33.4 million kcal/day of thermal credits to be generated annually during the five-year permit cycle using flow enhancement and riparian shade planting. This target quantity is based on anticipated 2025 design flows for the WWTFs, thermal loads associated with those flows and implementation of a thermal load reduction strategy. However, the Permit allows this target quantity to be updated based on updated information as long as the District generates the number of thermal credits required to offset the thermal load from the WWTFs. As shown above, the District generated enough thermal credits from flow enhancement and riparian shade planting activities to offset the thermal load from the WWTFs.

## **5. Riparian Planting Credits Available for 2018**

From 2004 through 2017, the District implemented 133 riparian shade projects, which resulted in the restoration of over 61 stream miles of riparian vegetation. Appendix C presents a summary of the riparian shade projects. The project name, credit year and project characteristics (wetted width and stream length) along with the thermal credit claimed by the District are presented in the table. The District takes thermal credits for those projects for which a valid contract or agreement is in place; all projects identified in Appendix C as being “active” are enrolled in the District’s water quality trading program.

The District has 128 projects currently enrolled in the water quality trading program, which have resulted in 465 million kcal/day of riparian shade credit. The riparian shade credit reflects the removal of one project, labeled as “inactive” in Appendix C, and its associated credits from the District’s portfolio because a valid contract or agreement is not currently in place.

Note that four projects that were previously planted under the District’s riparian planting program are no longer enrolled because the landowners have opted not to renew their contract or agreement. These projects and their associated credits have been removed from the District’s portfolio of projects.

Schedule D.10.f. i of the Permit requires the District to report new riparian shade credit information in the month following the date that the District initially claims credit. The District’s 465 million kcal/day of riparian shade credit takes into account the addition of 42 million kcal/day of riparian shade credits that were generated with this year’s 11 riparian shade projects and subtraction of the one project and associated thermal credits that were removed from the District’s portfolio this year. The 465 million kcal/day of riparian shade credit will be available for use in 2018 and will be reported in the April 2018 DMRs and in the July and August 2018 DMRs for the Rock Creek, Durham and Forest Grove WWTFs.

## **6. Environmental Benefits**

The District’s water quality credit trading program provides numerous ecosystem benefits beyond temperature benefits. The ecosystem benefits of riparian shading activities include improved stream functions (e.g., floodplain roughness, bank stabilization, peak flow attenuation, habitat creation), increased diversity of aquatic and terrestrial plant and animal species, filtering of stormwater runoff and improved water quality. The increased complexity of structure and diversity of restored riparian forests and scrub-shrub wetlands support many important ecosystem functions for the aquatic environment. One example is the colonization of some stream reaches by beavers, a keystone species for stream function in the basin. By raising the water table, beavers promote floodplain wetlands with enhanced plant, animal and geomorphic diversity in comparison to the original simplified stream channel. These features, and the resulting geomorphic complexity, enhance fish habitat quality and may also provide cold water refuges. Furthermore, the enhancement of riparian areas in and outside the District’s service area improves the overall health of the Tualatin River watershed and creates partnerships with positive outcomes for water quality.

The District’s release of stored water also provides multiple ecosystem benefits. The stored water used for flow enhancement provides cooling effects, buffers against temperature changes and results in higher dissolved oxygen levels and improved overall water quality to support



aquatic life. The District's stored water releases also sustain base flows in the upper Tualatin River that otherwise would not exist. The release of stored water, along with the release of highly treated discharges from the District's Rock Creek WWTF, Durham WWTF and Forest Grove WWTF and NTS, provides a sustainable base flow to the mainstem Tualatin River during the dry season.

## **7. Appendices**

Appendix A: Project Summaries for Riparian Planting Projects Credited in 2017

Appendix B: Documenting the Use of Public Conservation Funds

Appendix C: Riparian Shade Planting Projects (2004-2017)

Appendix D: Additional Management Actions

Appendix E: Identification of Trading Baselines for Flow Enhancement

Appendix F: Riparian Codes for Shade-a-Lator

## **Appendix A**

### **Project Summaries for Riparian Planting Projects Credited in 2017**

## 2186 – Metro – Woodard Natural Area

### Project Summary

<b>Project ID</b>	<b>Acres</b>
2186	10.59
<b>Location</b>	
Public property in Tigard, OR, traversed by Fanno Creek, located just south of SW Tiedman Ave.	
<b>Lat/Long</b>	<b>Number of Plants Installed</b>
-122.7842, 45.4328	10,300
<b>Stream Length</b>	<b>Average Stream Width</b>
752	32
<b>Initial Planting Year/Credit Year</b>	<b>CWS Thermal Benefits/Credits</b>
2016/2017	22.0 million kcal/day
<b>Plant Communities</b>	
Scrub-shrub, riparian forest, oak woodland (refer to the Site Assessment Report for additional information)	
<b>Partners</b>	
Metro	
<b>Riparian Planting Activities</b>	
Site preparation, targeted invasive species treatment and riparian plantings	
<b>Stream Enhancement Activities</b>	
None	

## Site Assessment Report

**Project Number: 2186**      **Project Name: Metro - Woodard Natural Area**

Project Acres: 10.59      Initial Planting Year: 2016      Initial Credit Year: 2017      Length of Stream: 752 ft

### Summary of Current Conditions by Plant Community Type

#### Plant Community: Oak Woodland

Stems per Acre: 2,825

Phase: Establishment

Native Tree	Native Shrub	Native Herbaceous	Invasives
black cottonwood	clustered wild rose	Alaska brome	common hawthorn
black hawthorn	mock-orange	Blue Wildrye	common teasel
Oregon ash	Pacific ninebark	camas	English holly
Oregon oak	red elderberry	slender hairgrass	English ivy
W. v. ponderosa pine	red-osier dogwood	spike bentgrass	Himalayan blackberry
	snowberry	taperfruit shortscale sedge	
	trailing blackberry	toad rush	
		willowherb	

#### Plant Community: Riparian Forest

Stems per Acre: 2,820

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
black hawthorn	black twinberry	American speedwell	Canada thistle
casacara	clustered wild rose	Blue Wildrye	common hawthorn
Oregon ash	elderberry	common beggarticks	common teasel
Oregon oak	hardhack spirea	slender hairgrass	herb Robert
W. v. ponderosa pine	Pacific ninebark	spike bentgrass	Himalayan blackberry
Western chokecherry	Pacific Willow	spotted touch-me-not	reed canary grass
	red-osier dogwood	toad rush	
	Scouler's Willow	western marsh cudweed	
	Sitka Willow	willowherb	
	snowberry	yellowcress	
	trailing blackberry		

#### Plant Community: Scrub-Shrub

Stems per Acre: 300

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
Oregon ash	red-osier dogwood	blue skullcap	Himalayan blackberry
	Scouler's Willow	common beggarticks	reed canary grass
		marsh seedbox	
		nutsedge	
		ovate spikerush	
		rice cutgrass	
		slender hairgrass	
		slough sedge	
		wapato	
		willowherb	
		yellowcress	
		yellowseed false pimpernel	

## Management Actions

Completed: 2017	Recommended: 2018
<input checked="" type="checkbox"/> Interplant	<input type="checkbox"/> Interplant
<input checked="" type="checkbox"/> Invasive weed treatment	<input checked="" type="checkbox"/> Invasive weed treatment
<input checked="" type="checkbox"/> Seeding	<input checked="" type="checkbox"/> Seeding
<input type="checkbox"/> Herbivore Control	<input type="checkbox"/> Herbivore Control
<input type="checkbox"/> Other	<input type="checkbox"/> Other
<input checked="" type="checkbox"/> Monitoring for Adaptive Management	<input checked="" type="checkbox"/> Monitoring for Adaptive Management

## Thermal Credit for Shade Enhancement

Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2186 - Metro - Woodard Natural Area	Capital	752	5.5E+07	9.9E+07	4.4E+07	2.2E+07	100%	2.2E+07

## Shade-a-Lator Input and Output Spreadsheets

### 2186-Metro-Woodard Natural Area: Input and Output Data for Baseline Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>										RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2186 - Metro - Woodard Natural Area	31.2%	4.8E+05	100	171	32	36	5	1100	1125	1125	1125	1125	1125	1100	1100	1125	1150	1125	1125	1100	1100	1000	1000	1000	1000	1000	
2186 - Metro - Woodard Natural Area	47.4%	7.3E+05	100	138	32	36	5	1175	1125	1100	1125	1100	1100	1125	1125	1100	1150	1125	1100	1100	1100	1100	1100	1100	1100	1100	
2186 - Metro - Woodard Natural Area	55.9%	8.6E+05	100	159	32	36	5	1150	1100	1100	1100	1300	1300	1300	1325	1375	1175	1175	1150	1100	1100	1100	1100	1100	1100	1100	
2186 - Metro - Woodard Natural Area	65.2%	1.0E+06	100	156	32	36	5	1175	1150	1100	1100	1300	1300	1300	1300	1300	1175	1175	1125	1100	1125	1150	1150	1125	1125		
2186 - Metro - Woodard Natural Area	46.7%	7.2E+05	100	91	32	36	5	1150	1100	1100	1300	1300	1300	1300	1300	1300	1150	1150	1150	1175	1175	1150	1150	1150	1150		
2186 - Metro - Woodard Natural Area	65.7%	1.0E+06	100	72	32	36	5	1175	1150	1150	1125	1325	1325	1350	1150	1150	1175	1175	1150	1125	1125	1150	1150	1150	1150		
2186 - Metro - Woodard Natural Area	66.2%	1.0E+06	100	127	32	36	5	1175	1150	1125	1175	1175	1175	1175	1175	1175	1175	1150	1150	1100	1125	1150	1175	1125	1150		
2186 - Metro - Woodard Natural Area	53.5%	4.3E+05	52	167	32	36	5	1175	1125	1100	1100	1125	1175	1175	1175	1175	1150	1125	1125	1125	1150	1125	1125	1125	1150		

### 2186-Metro-Woodard Natural Area: Input and Output Data for Enhanced Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>										RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2186 - Metro - Woodard Natural Area	70.9%	1.1E+06	100	171	32	36	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	1000	1000		
2186 - Metro - Woodard Natural Area	71.3%	1.1E+06	100	138	32	36	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175		
2186 - Metro - Woodard Natural Area	72.4%	1.1E+06	100	159	32	36	5	1175	1175	1175	1175	1375	1375	1375	1375	1375	1175	1175	1175	1175	1175	1175	1175	1175	1175		
2186 - Metro - Woodard Natural Area	72.5%	1.1E+06	100	156	32	36	5	1175	1175	1175	1175	1375	1375	1375	1375	1375	1175	1175	1175	1175	1175	1175	1175	1175	1175		
2186 - Metro - Woodard Natural Area	61.3%	9.4E+05	100	91	32	36	5	1175	1175	1175	1375	1375	1375	1375	1375	1375	1175	1175	1175	1175	1175	1175	1175	1175	1175		
2186 - Metro - Woodard Natural Area	66.4%	1.0E+06	100	72	32	36	5	1175	1175	1175	1175	1375	1375	1375	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175		
2186 - Metro - Woodard Natural Area	70.0%	1.1E+06	100	127	32	36	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175		
2186 - Metro - Woodard Natural Area	72.2%	5.8E+05	52	167	32	36	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175		

## 2190 – Metro – Farmington Natural Area

### Project Summary

<b>Project ID</b>	<b>Acres</b>
2190	6.96
<b>Location</b>	
Public property in Washington County, OR, adjacent to the Tualatin River, located between SW Farmington Rd. and SW River Rd.	
<b>Lat/Long</b>	<b>Number of Plants Installed</b>
-122.9479, 45.4495	22,343
<b>Stream Length</b>	<b>Average Stream Width</b>
599	123
<b>Initial Planting Year/Credit Year</b>	<b>CWS Thermal Benefits/Credits</b>
2016/2017	0.83 million kcal/day
<b>Plant Communities</b>	
Scrub-shrub, riparian forest, oak woodland (refer to the Site Assessment Report for additional information)	
<b>Partners</b>	
Metro	
<b>Riparian Planting Activities</b>	
Site preparation, targeted invasive species treatment and riparian plantings	
<b>Stream Enhancement Activities</b>	
None	

## Site Assessment Report

Project Number: 2190 Project Name: Metro - Farmington Natural Area

Project Acres: 6.96

Initial Planting Year: 2016

Initial Credit Year: 2017

Length of Stream: 599 ft

### Summary of Current Conditions by Plant Community Type

#### Plant Community: Oak Woodland

Stems per Acre: 567

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
black hawthorn	hardhack spirea	American bird's-foot trefoil	Canada thistle
casara	native wild rose	Blue Wildrye	common hawthorn
Oregon ash	serviceberry	coast tarweed	Himalayan blackberry
Oregon oak		slender hairgrass	
		slender rush	
		tall annual willowherb	
		willowherb	

#### Plant Community: Riparian Forest

Stems per Acre: 3,357

Phase: Establishment

Native Tree	Native Shrub	Native Herbaceous	Invasives
black hawthorn	beaked hazelnut	annual hairgrass	bull thistle
Oregon ash	clustered wild rose	cleavers	Canada thistle
	Pacific poison oak	common beggarticks	Himalayan blackberry
	red-osier dogwood	fringecup	reed canary grass
	serviceberry	large-leaved avens	
	snowberry	slender hairgrass	
	tall Oregon grape	slough sedge	
	thimbleberry	spotted touch-me-not	
	trailing blackberry	stinging nettle	
		taperfruit shortscale sedge	
		toad rush	
		western marsh cudweed	
		western meadow-rue	
		western swordfern	
		willowherb	
		woodland strawberry	



**Plant Community: Scrub-Shrub**

Stems per Acre: 2,967

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
black cottonwood	black twinberry	American bird's-foot trefoil	bull thistle
black hawthorn	hardhack spirea	American sloughgrass	common hawthorn
Oregon ash	native wild rose	coast tarweed	Himalayan blackberry
	Pacific poison oak	common woolly sunflower	morning-glory
	red-osier dogwood	common yarrow	
	Scouler's Willow	grooved rush	
	snowberry	gumweed	
	thimbleberry	horseweed	
	trailing blackberry	lupine	
		meadow barley	
		mountain tarweed	
		skunkweed	
		slender hairgrass	
		slough sedge	
		taperfruit shortscale sedge	
		water foxtail	
		western marsh cudweed	
		willowherb	

**Management Actions**

Completed: 2017	Recommended: 2018
<input checked="" type="checkbox"/> Interplant	<input checked="" type="checkbox"/> Interplant
<input checked="" type="checkbox"/> Invasive weed treatment	<input checked="" type="checkbox"/> Invasive weed treatment
<input checked="" type="checkbox"/> Seeding	<input checked="" type="checkbox"/> Seeding
<input type="checkbox"/> Herbivore Control	<input type="checkbox"/> Herbivore Control
<input type="checkbox"/> Other	<input type="checkbox"/> Other
<input checked="" type="checkbox"/> Monitoring for Adaptive Management	<input checked="" type="checkbox"/> Monitoring for Adaptive Management

## Thermal Credit for Shade Enhancement

Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2190 - Metro - Farmington Natural Area	Capital	599	3.8E+06	5.5E+06	1.7E+06	8.3E+05	100%	8.3E+05

## Shade-a-Lator Input and Output Spreadsheets

### 2190-Metro-Farmington Natural Area: Input and Output Data for Baseline Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- code only vegetation that CWS is responsible for										RIPARIAN CODES -- RIGHT BANK-- code only vegetation that CWS is responsible for									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2190 - Metro - Farmington Natural Area	13.0%	7.7E+05	100	216	123	153	3	1150	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
2190 - Metro - Farmington Natural Area	7.7%	4.5E+05	100	218	123	153	3	1125	1125	1150	1150	1175	1175	1175	1125	1100	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
2190 - Metro - Farmington Natural Area	11.6%	6.9E+05	100	236	123	153	3	1150	1175	1175	1175	1175	1175	1175	1125	1100	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
2190 - Metro - Farmington Natural Area	9.7%	5.7E+05	100	225	123	153	3	1125	1175	1175	1175	1000	1175	1175	1100	1100	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
2190 - Metro - Farmington Natural Area	12.8%	7.5E+05	100	219	123	153	3	1150	1175	1175	1175	1175	1000	1175	1150	1125	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
2190 - Metro - Farmington Natural Area	10.3%	6.0E+05	99	214	123	153	3	1125	1175	1175	1175	1175	1150	1125	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	

### 2190-Metro-Farmington Natural Area: Input and Output Data for Enhanced Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- code only vegetation that CWS is responsible for										RIPARIAN CODES -- RIGHT BANK-- code only vegetation that CWS is responsible for									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2190 - Metro - Farmington Natural Area	15.7%	9.3E+05	100	216	123	153	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
2190 - Metro - Farmington Natural Area	15.7%	9.3E+05	100	218	123	153	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
2190 - Metro - Farmington Natural Area	14.9%	8.8E+05	100	236	123	153	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
2190 - Metro - Farmington Natural Area	15.6%	9.2E+05	100	225	123	153	3	1175	1175	1175	1175	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
2190 - Metro - Farmington Natural Area	15.7%	9.3E+05	100	219	123	153	3	1175	1175	1175	1175	1175	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
2190 - Metro - Farmington Natural Area	15.7%	9.1E+05	99	214	123	153	3	1175	1175	1175	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	

## 2213 – TSWCD – West Fork Dairy Creek

### Project Summary

<b>Project ID</b>	<b>Acres</b>
2213	32.74
<b>Location</b>	
Private property on West Fork Dairy Creek in the Dairy Creek subbasin in rural Washington County, OR.	
<b>Lat/Long</b>	<b>Number of Plants Installed</b>
-123.1726, 45.6741	60,000
<b>Stream Length</b>	<b>Average Stream Width</b>
7,890	14
<b>Initial Planting Year/Credit Year</b>	<b>CWS Thermal Benefits/Credits</b>
2016/2017	9.0 million kcal/day
<b>Plant Communities</b>	
Riparian forest (refer to the Site Assessment Report for additional information)	
<b>Partners</b>	
Tualatin Soil and Water Conservation District and USDA Farm Service Agency	
<b>Riparian Planting Activities</b>	
Site preparation, targeted invasive species treatment, and riparian plantings	
<b>Stream Enhancement Activities</b>	
None	

## Site Assessment Report

Project Number: 2213

Project Name: TSWCD Project 2213 - West Fork Dairy Creek

Project Acres: 32.74

Initial Planting Year: 2016

Initial Credit Year: 2017

Length of Stream: 7,890 ft

### Summary of Current Conditions by Plant Community Type

#### Plant Community: Riparian Forest

Stems per Acre: 2,758

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
bigleaf maple	beaked hazelnut	Alaska brome	bittersweet nightshade
bitter cherry	black twinberry	annual hairgrass	bull thistle
black hawthorn	clustered wild rose	Blue Wildrye	Canada thistle
casara	elderberry	bracken fern	common teasel
Douglas-fir	hardhack spirea	California brome	hedge false bindweed
grand fir	mock-orange	cleavers	herb Robert
native cherry	native wild rose	common beggarticks	Himalayan blackberry
Oregon ash	nootka rose	common horsetail	morning-glory
pacific crab apple	osoberry, indian plum	Cooley's hedge-nettle	reed canary grass
red alder	Pacific ninebark	cow parsnip	thistle
vine maple	Piper's willow	cow-parsnip	
Western chokecherry	red elderberry	Cusick's popcornflower	
	red-osier dogwood	drops-of-gold	
	salmonberry	enchanter's nightshade	
	Sitka Willow	false lily of the valley	
	snowberry	feathery false lily of the valley	
	tall Oregon grape	field chickweed	
	thimbleberry	giant horsetail	
	trailing blackberry	giant wakerobin	
	Western wahoo	manroot	
		mild waterpepper	
		Pacific bleeding heart	
		Pacific waterleaf	
		piggyback	
		red baneberry	
		scouring rush	
		slender hairgrass	
		spike bentgrass	
		starry false lily of the valley	
		stinging nettle	
		taperfruit shortscale sedge	
		toad rush	
		veronica	
		western marsh cudweed	
		western swordfern	
		willowherb	
		woodland strawberry	

#### Management Actions

##### Completed: 2017

- Interplant
- Invasive weed treatment
- Seeding
- Herbivore Control
- Other
- Monitoring for Adaptive Management

##### Recommended: 2018

- Interplant
- Invasive weed treatment
- Seeding
- Herbivore Control
- Other
- Monitoring for Adaptive Management

## Thermal Credit for Shade Enhancement

Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2213 - TSWCD - West Fork Dairy Creek	ECREP	7890	2.3E+07	4.4E+07	2.1E+07	1.0E+07	86%	9.0E+06

## Shade-a-Lator Input and Output Spreadsheets

### 2213-TSWCD-West Fork Dairy Creek: Input and Output Data for Baseline Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>									RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>								
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft
2213 - TSWCD - West Fork Dairy Creek	89.6%	2.2E+05	100	285	5	11	5	1175	1175	1000	1000	1000	1000	1000	1000	1000	1175	1000	1000	1000	1000	1000	1000	1000	1000
2213 - TSWCD - West Fork Dairy Creek	89.2%	2.1E+05	100	277	5	11	5	1175	1175	1150	1100	1000	1000	1000	1000	1000	1150	1000	1000	1000	1000	1000	1000	1000	1000
2213 - TSWCD - West Fork Dairy Creek	39.9%	9.6E+04	100	263	5	11	5	1125	1100	1100	1100	1100	1000	1000	1000	1000	1150	1000	1000	1000	1000	1000	1000	1000	1000
2213 - TSWCD - West Fork Dairy Creek	38.6%	9.3E+04	100	254	5	11	5	1125	1100	1100	1100	1000	1000	1000	1000	1000	1125	1150	1000	1000	1000	1000	1000	1000	1000
2213 - TSWCD - West Fork Dairy Creek	41.6%	9.8E+04	99	257	5	11	5	1125	1100	1100	1000	1000	1000	1000	1000	1000	1150	1150	1150	1100	1100	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	53.8%	1.3E+05	100	196	5	11	5	1175	1175	1000	1000	1000	1000	1000	1000	1000	1125	1100	1100	1000	1000	1000	1000	1000	1000
2213 - TSWCD - West Fork Dairy Creek	75.4%	1.8E+05	100	194	5	11	5	1175	1175	1000	1000	1000	1000	1000	1000	1000	1175	1150	1125	1100	1000	1000	1000	1000	1000
2213 - TSWCD - West Fork Dairy Creek	69.6%	1.7E+05	100	206	5	11	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1100	1100	1000	1000	1000	1000	1000	1000
2213 - TSWCD - West Fork Dairy Creek	78.4%	1.9E+05	100	202	5	11	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1150	1100	1100	1000	1000	1000	1000	1000
2213 - TSWCD - West Fork Dairy Creek	70.6%	1.7E+05	100	203	5	11	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1150	1100	1100	1000	1000	1000	1000	1000	1000
2213 - TSWCD - West Fork Dairy Creek	81.8%	2.0E+05	100	173	5	11	5	1000	1175	1175	1175	1125	1100	1000	1000	1000	1175	1125	1000	1000	1000	1000	1000	1000	1000
2213 - TSWCD - West Fork Dairy Creek	64.1%	1.5E+05	100	203	5	11	5	1000	1175	1150	1000	1000	1000	1000	1000	1000	1000	1125	1100	1100	1100	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	85.5%	2.1E+05	100	239	5	11	5	1000	1175	1125	1100	1000	1000	1000	1000	1000	1000	1125	1100	1100	1100	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	67.7%	1.6E+05	100	222	5	11	5	1000	1175	1125	1100	1000	1000	1000	1000	1000	1000	1100	1100	1100	1100	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	87.0%	2.1E+05	100	242	5	11	5	1175	1175	1150	1100	1000	1000	1000	1000	1000	1000	1125	1100	1100	1100	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	91.4%	2.2E+05	100	259	5	11	5	1175	1175	1150	1125	1125	1100	1100	1100	1100	1000	1150	1100	1100	1100	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	85.7%	2.1E+05	100	215	5	11	5	1175	1150	1175	1175	1150	1100	1100	1100	1000	1000	1175	1125	1100	1100	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	69.6%	7.7E+05	100	119	23	32	16	1125	1125	1150	1150	1150	1150	1150	1175	1150	1175	1150	1150	1125	1100	1125	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	73.6%	8.1E+05	100	102	23	32	16	1125	1125	1100	1125	1150	1100	1100	1125	1150	1175	1175	1175	1150	1125	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	76.8%	8.5E+05	100	104	23	32	16	1175	1175	1125	1125	1100	1125	1150	1125	1125	1175	1175	1175	1175	1125	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	49.2%	5.4E+05	100	73	23	32	16	1000	1150	1150	1150	1125	1150	1125	1125	1125	1125	1150	1175	1175	1150	1125	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	51.9%	5.7E+05	100	334	23	32	16	1125	1125	1125	1150	1150	1125	1150	1175	1000	1150	1175	1150	1100	1100	1000	1000	1000	1125
2213 - TSWCD - West Fork Dairy Creek	50.8%	5.6E+05	100	316	23	32	16	1125	1150	1150	1125	1100	1125	1125	1150	1150	1125	1150	1175	1175	1150	1175	1150	1150	1175
2213 - TSWCD - West Fork Dairy Creek	43.6%	4.8E+05	100	293	23	32	16	1125	1125	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1125	1125	1125	1125	1125	1150
2213 - TSWCD - West Fork Dairy Creek	13.7%	1.5E+05	100	21	23	32	16	1100	1125	1150	1150	1000	1000	1000	1000	1000	1100	1100	1125	1125	1000	1000	1000	1000	1000
2213 - TSWCD - West Fork Dairy Creek	30.7%	3.4E+05	100	92	23	32	16	1000	1000	1000	1000	1000	1000	1000	1000	1000	1125	1100	1100	1100	1100	1125	1150	1125	1100
2213 - TSWCD - West Fork Dairy Creek	13.8%	1.5E+05	100	79	23	32	16	1000	1000	1000	1000	1000	1000	1000	1000	1000	1100	1125	1150	1150	1150	1175	1175	1175	1175
2213 - TSWCD - West Fork Dairy Creek	34.4%	3.8E+05	100	114	23	32	16	1000	1000	1000	1000	1000	1000	1000	1000	1000	1100	1150	1150	1175	1150	1150	1175	1150	1175
2213 - TSWCD - West Fork Dairy Creek	61.0%	6.7E+05	100	138	23	32	16	1150	1150	1150	1175	1175	1000	1000	1000	1000	1150	1125	1125	1150	1175	1150	1175	1150	1150
2213 - TSWCD - West Fork Dairy Creek	32.6%	3.6E+05	100	199	23	32	16	1100	1100	1100	1125	1125	1125	1150	1175	1175	1125	1150	1175	1175	1175	1150	1150	1150	1175
2213 - TSWCD - West Fork Dairy Creek	24.3%	2.7E+05	100	191	23	32	16	1100	1100	1125	1150	1175	1150	1150	1175	1150	1100	1100	1100	1175	1175	1150	1150	1000	1150
2213 - TSWCD - West Fork Dairy Creek	65.4%	7.2E+05	100	144	23	32	16	1125	1125	1150	1125	1150	1175	1175	1175	1175	1150	1175	1175	1175	1150	1150	1150	1125	1100
2213 - TSWCD - West Fork Dairy Creek	60.3%	6.7E+05	100	101	23	32	16	1150	1175	1175	1175	1175	1150	1150	1150	1150	1150	1150	1175	1175	1175	1125	1125	1150	1150
2213 - TSWCD - West Fork Dairy Creek	30.0%	3.3E+05	100	157	23	32	16	1125	1125	1125	1100	1125	1150	1125	1150	1175	1100	1100	1125	1150	1175	1175	1175	1150	1100
2213 - TSWCD - West Fork Dairy Creek	42.7%	4.7E+05	100	203	23	32	16	1125	1150	1125	1100	1100	1100	1100	1100	1100	1125	1150	1175	1175	1150	1150	1150	1150	1150
2213 - TSWCD - West Fork Dairy Creek	52.5%	5.8E+05	100	133	23	32	16	1100	1125	1125	1100	1100	1125	1125	1125	1125	1175	1125	1100	1100	1100	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	37.9%	4.2E+05	100	128	23	32	16	1100	1100	1100	1100	1100	1100	1100	1100	1100	1150	1125	1125	1100	1100	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	34.1%	3.8E+05	100	139	23	32	16	1100	1100	1100	1100	1100	1100	1100	1100	1100	1150	1100	1150	1100	1100	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	58.1%	6.4E+05	100	124	23	32	16	1100	1100	1100	1100	1100	1100	1100	1100	1100	1175	1175	1150	1125	1125	1100	1100	1100	1100
2213 - TSWCD - West Fork Dairy Creek	55.2%	6.1E+05	100	70	23	32	16	1100	1100	1100	1100	1100	1100	1100	1100	1100	1150	1175	1175	1175	1175	1175	1175	1150	1150



## 2213-TSWCD-West Fork Dairy Creek: Input and Output Data for Enhanced Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION				RIPARIAN CODES -- LEFT BANK-- code only vegetation that CWS is responsible for										RIPARIAN CODES -- RIGHT BANK-- code only vegetation that CWS is responsible for									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft	
2213 - TSWCD - West Fork Dairy Creek	89.6%	2.2E+05	100	285	5	11	5	1175	1175	1000	1000	1000	1000	1000	1000	1000	1175	1000	1000	1000	1000	1000	1000	1000	1000	
2213 - TSWCD - West Fork Dairy Creek	90.2%	2.2E+05	100	277	5	11	5	1175	1175	1175	1175	1000	1000	1000	1000	1000	1175	1000	1000	1000	1000	1000	1000	1000	1000	
2213 - TSWCD - West Fork Dairy Creek	92.1%	2.2E+05	100	263	5	11	5	1175	1175	1175	1175	1175	1000	1000	1000	1000	1175	1000	1000	1000	1000	1000	1000	1000	1000	
2213 - TSWCD - West Fork Dairy Creek	90.4%	2.2E+05	100	254	5	11	5	1175	1175	1175	1175	1000	1000	1000	1000	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000	
2213 - TSWCD - West Fork Dairy Creek	91.9%	2.2E+05	99	257	5	11	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	79.0%	1.9E+05	100	196	5	11	5	1175	1175	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000	
2213 - TSWCD - West Fork Dairy Creek	80.2%	1.9E+05	100	194	5	11	5	1175	1175	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000	
2213 - TSWCD - West Fork Dairy Creek	65.5%	1.6E+05	100	206	5	11	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	
2213 - TSWCD - West Fork Dairy Creek	65.3%	1.6E+05	100	202	5	11	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	
2213 - TSWCD - West Fork Dairy Creek	84.6%	2.0E+05	100	203	5	11	5	1175	1175	1175	1175	1175	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000	
2213 - TSWCD - West Fork Dairy Creek	77.2%	1.9E+05	100	173	5	11	5	1000	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000	
2213 - TSWCD - West Fork Dairy Creek	46.6%	1.1E+05	100	203	5	11	5	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	47.3%	1.1E+05	100	239	5	11	5	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	45.9%	1.1E+05	100	222	5	11	5	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	81.5%	2.0E+05	100	242	5	11	5	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	88.7%	2.1E+05	100	259	5	11	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	76.7%	1.8E+05	100	215	5	11	5	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	78.6%	8.7E+05	100	119	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	76.1%	8.4E+05	100	102	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	77.0%	8.5E+05	100	104	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	74.8%	8.3E+05	100	73	23	32	16	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	84.6%	9.3E+05	100	334	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1000	1175	1175	1175	1175	1175	1175	1000	1000	1175	
2213 - TSWCD - West Fork Dairy Creek	80.9%	8.9E+05	100	316	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	78.4%	8.7E+05	100	293	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	69.7%	7.7E+05	100	21	23	32	16	1175	1175	1175	1175	1000	1000	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000	
2213 - TSWCD - West Fork Dairy Creek	75.1%	8.3E+05	100	92	23	32	16	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	69.4%	7.7E+05	100	79	23	32	16	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	62.9%	6.9E+05	100	114	23	32	16	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	81.0%	8.9E+05	100	138	23	32	16	1175	1175	1175	1175	1175	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	72.5%	8.0E+05	100	199	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	74.0%	8.2E+05	100	191	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1175	
2213 - TSWCD - West Fork Dairy Creek	82.7%	9.1E+05	100	144	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	75.7%	8.4E+05	100	101	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	85.0%	9.4E+05	100	157	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	72.2%	8.0E+05	100	203	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	80.2%	8.9E+05	100	133	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	79.3%	8.8E+05	100	128	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	81.5%	9.0E+05	100	139	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	78.9%	8.7E+05	100	124	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2213 - TSWCD - West Fork Dairy Creek	79.1%	8.7E+05	100	70	23	32	16	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	





## 2218 – Beaverton Creek – Quatama – 185<sup>th</sup> Ave

### Project Summary

<b>Project ID</b>	<b>Acres</b>
2218	6.20
<b>Location</b>	
Public property on Beaverton Creek, in Washington County, OR, bisected by SW 18 <sup>th</sup> Ave.	
<b>Lat/Long</b>	<b>Number of Plants Installed</b>
-122.8682, 45.5081	3,950
<b>Stream Length</b>	<b>Average Stream Width</b>
1,454	18
<b>Initial Planting Year/Credit Year</b>	<b>CWS Thermal Benefits/Credits</b>
2016/2017	1.0 million kcal/day
<b>Plant Communities</b>	
Riparian forest (refer to the Site Assessment Report for additional information)	
<b>Partners</b>	
Washington County	
<b>Riparian Planting Activities</b>	
Site preparation, targeted invasive species treatment, and riparian plantings	
<b>Stream Enhancement Activities</b>	
None	

## Site Assessment Report

**Project Number: 2218**      **Project Name: Beaverton Creek - Quatama - 185th Ave**

Project Acres: 6.20

Initial Planting Year: 2016

Initial Credit Year: 2017

Length of Stream: 1,453 ft

### Summary of Current Conditions by Plant Community Type

#### Plant Community: Riparian Forest

Stems per Acre: 1,350

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
bignone maple	beaked hazelnut	fringe cup	English ivy
Oregon ash	blackcap	giant horsetail	Himalayan blackberry
red alder	Piper's willow	lady fern	reed canary grass
vine maple	Sitka Willow	slough sedge	
	snowberry	stinging nettle	
	trailing blackberry	taperfruit shortscale sedge	
		western swordfern	

#### Management Actions

##### Completed: 2017

- Interplant
- Invasive weed treatment
- Seeding
- Herbivore Control
- Other
- Monitoring for Adaptive Management

##### Recommended: 2018

- Interplant
- Invasive weed treatment
- Seeding
- Herbivore Control
- Other
- Monitoring for Adaptive Management

## Thermal Credit for Shade Enhancement

Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2218 - Beaverton Creek - Qualama - 185th Ave	Capital	1454	5.8E+06	7.9E+06	2.1E+06	1.0E+06	100%	1.0E+06

## Shade-a-Lator Input and Output Spreadsheets

### 2218-Beaverton Creek-Qualama-185<sup>th</sup> Ave: Input and Output Data for Baseline Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>										RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>								
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft	
2218 - Beaverton Creek - Qualama - 185th Ave	79.5%	6.9E+05	100	310	18	19	5	1175	1175	1175	1150	1150	1175	1175	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	66.7%	5.8E+05	100	359	18	19	5	1175	1175	1175	1100	1100	1150	1000	1000	1000	1150	1150	1150	1000	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	49.1%	4.2E+05	100	355	18	19	5	1125	1100	1100	1125	1125	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	39.4%	3.4E+05	100	348	18	19	5	1125	1100	1100	1150	1125	1000	1000	1000	1000	1125	1125	1150	1175	1175	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	54.3%	4.7E+05	100	6	18	19	5	1150	1175	1175	1150	1000	1000	1000	1000	1000	1125	1125	1150	1175	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	45.6%	3.9E+05	100	332	18	19	5	1150	1175	1175	1125	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	76.4%	6.6E+05	100	311	18	19	5	1175	1175	1000	1000	1000	1000	1000	1000	1000	1175	1175	1150	1000	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	7.5%	6.5E+04	100	276	18	19	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1150	1125	1100	1100	1100
2218 - Beaverton Creek - Qualama - 185th Ave	19.2%	1.7E+05	100	302	18	19	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1125	1100	1100
2218 - Beaverton Creek - Qualama - 185th Ave	34.5%	3.0E+05	100	357	18	19	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1150	1125	1125	1125
2218 - Beaverton Creek - Qualama - 185th Ave	41.5%	3.6E+05	100	29	18	19	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1150	1100	1100	1100	1100	1100	1100
2218 - Beaverton Creek - Qualama - 185th Ave	56.1%	4.8E+05	100	16	18	19	5	1150	1175	1175	1000	1000	1000	1000	1000	1000	1125	1150	1175	1150	1125	1125	1150	1125	1125	1125
2218 - Beaverton Creek - Qualama - 185th Ave	36.5%	3.2E+05	100	355	18	19	5	1100	1150	1150	1125	1125	1125	1000	1000	1000	1100	1150	1175	1175	1175	1175	1175	1175	1175	1175
2218 - Beaverton Creek - Qualama - 185th Ave	35.4%	3.1E+05	100	326	18	19	5	1100	1100	1125	1150	1150	1100	1000	1000	1000	1150	1175	1175	1175	1175	1175	1175	1175	1175	1175
2218 - Beaverton Creek - Qualama - 185th Ave	51.5%	2.4E+05	54	304	18	19	5	1125	1125	1175	1000	1000	1000	1000	1000	1000	1150	1175	1175	1150	1000	1000	1000	1000	1000	1000

### 2218-Beaverton Creek-Qualama-185<sup>th</sup> Ave: Input and Output Data for Enhanced Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>										RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>								
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft	
2218 - Beaverton Creek - Qualama - 185th Ave	79.7%	6.9E+05	100	310	18	19	5	1175	1175	1175	1175	1175	1175	1175	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	77.4%	6.7E+05	100	359	18	19	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	79.2%	6.8E+05	100	355	18	19	5	1175	1175	1175	1175	1175	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	83.8%	7.2E+05	100	348	18	19	5	1175	1175	1175	1175	1175	1000	1000	1000	1000	1175	1175	1175	1175	1175	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	73.9%	6.4E+05	100	6	18	19	5	1175	1175	1175	1175	1000	1000	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	53.8%	4.7E+05	100	332	18	19	5	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	76.8%	6.6E+05	100	311	18	19	5	1175	1175	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000
2218 - Beaverton Creek - Qualama - 185th Ave	7.5%	6.5E+04	100	276	18	19	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2218 - Beaverton Creek - Qualama - 185th Ave	19.3%	1.7E+05	100	302	18	19	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175
2218 - Beaverton Creek - Qualama - 185th Ave	34.9%	3.0E+05	100	357	18	19	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175
2218 - Beaverton Creek - Qualama - 185th Ave	43.0%	3.7E+05	100	29	18	19	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2218 - Beaverton Creek - Qualama - 185th Ave	71.3%	6.2E+05	100	16	18	19	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2218 - Beaverton Creek - Qualama - 185th Ave	82.1%	7.1E+05	100	355	18	19	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2218 - Beaverton Creek - Qualama - 185th Ave	84.2%	7.3E+05	100	326	18	19	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2218 - Beaverton Creek - Qualama - 185th Ave	79.5%	3.7E+05	54	304	18	19	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000

## 2260 – TSWCD –McFee Creek

### Project Summary

<b>Project ID</b>	<b>Acres</b>
2260	4.19
<b>Location</b>	
Private property on McFee Creek in the McFee Creek subbasin in rural Washington County, OR	
<b>Lat/Long</b>	<b>Number of Plants Installed</b>
-122.9665, 45.4055	10,000
<b>Stream Length</b>	<b>Average Stream Width</b>
800	15
<b>Initial Planting Year/Credit Year</b>	<b>CWS Thermal Benefits/Credits</b>
2016/2017	0.22 million kcal/day
<b>Plant Communities</b>	
Riparian forest (refer to the Site Assessment Report for additional information)	
<b>Partners</b>	
Tualatin Soil and Water Conservation District and USDA Farm Service Agency	
<b>Riparian Planting Activities</b>	
Site preparation, targeted invasive species treatment, and riparian plantings	
<b>Stream Enhancement Activities</b>	
None	

## Site Assessment Report

**Project Number: 2260**      **Project Name: TSWCD Project 2260 - McFee Creek**

Project Acres: 4.19      Initial Planting Year: 2016      Initial Credit Year: 2017      Length of Stream: 800 ft

### Summary of Current Conditions by Plant Community Type

#### Plant Community: Riparian Forest

Stems per Acre: 7,060

Phase: Establishment

Native Tree	Native Shrub	Native Herbaceous	Invasives
bigleaf maple	beaked hazelnut	bracken fern	Canada thistle
cascara	hardhack spirea	cleavers	English holly
Douglas-fir	low Oregon grape	common sweet cicely	herb Robert
Oregon ash	osoberry, indian plum	fringecup	Himalayan blackberry
red alder	Pacific ninebark	giant horsetail	reed canary grass
vine maple	serviceberry	piggyback	
western red cedar	snowberry	slender hairgrass	
	tall Oregon grape	slough sedge	
	thimbleberry	stinging nettle	
	trailing blackberry	taperfruit shortscale sedge	
		western swordfern	
		willowherb	

#### Management Actions

Completed: 2017	Recommended: 2018
<input checked="" type="checkbox"/> Interplant	<input type="checkbox"/> Interplant
<input checked="" type="checkbox"/> Invasive weed treatment	<input checked="" type="checkbox"/> Invasive weed treatment
<input checked="" type="checkbox"/> Seeding	<input type="checkbox"/> Seeding
<input type="checkbox"/> Herbivore Control	<input type="checkbox"/> Herbivore Control
<input type="checkbox"/> Other	<input type="checkbox"/> Other
<input checked="" type="checkbox"/> Monitoring for Adaptive Management	<input checked="" type="checkbox"/> Monitoring for Adaptive Management

## Thermal Credit for Shade Enhancement

Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2260 - TSWCD - McFee Creek	VEGBAC	800	4.3E+06	4.8E+06	4.5E+05	2.2E+05	100%	2.2E+05

## Shade-a-Lator Input and Output Spreadsheets

### 2260-TSWCD-McFee Creek: Input and Output Data for Baseline Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>										RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2260 - TSWCD - McFee Creek	82.9%	6.0E+05	100	335	15	22	5	1175	1150	1125	1150	1150	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175		
2260 - TSWCD - McFee Creek	59.1%	4.3E+05	100	283	15	22	5	1150	1100	1100	1100	1150	1175	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1125	1125	
2260 - TSWCD - McFee Creek	77.5%	5.6E+05	100	301	15	22	5	1175	1150	1125	1100	1100	1100	1100	1100	1125	1175	1175	1175	1175	1175	1175	1175	1150	1150	1150	
2260 - TSWCD - McFee Creek	66.8%	4.8E+05	100	52	15	22	5	1125	1100	1100	1100	1100	1100	1100	1100	1100	1175	1175	1175	1175	1175	1175	1175	1175	1150	1150	
2260 - TSWCD - McFee Creek	79.7%	5.7E+05	100	93	15	22	5	1150	1150	1125	1125	1100	1125	1150	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1150	
2260 - TSWCD - McFee Creek	83.4%	6.0E+05	100	85	15	22	5	1125	1100	1125	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2260 - TSWCD - McFee Creek	76.9%	5.5E+05	100	332	15	22	5	1150	1175	1150	1125	1125	1125	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	
2260 - TSWCD - McFee Creek	77.6%	5.6E+05	100	297	15	22	5	1175	1150	1125	1100	1150	1175	1175	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000	

### 2260-TSWCD-McFee Creek: Input and Output Data for Enhanced Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>										RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2260 - TSWCD - McFee Creek	87.2%	6.3E+05	100	335	15	22	5	1175	1175	1175	1175	1175	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2260 - TSWCD - McFee Creek	81.1%	5.8E+05	100	283	15	22	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2260 - TSWCD - McFee Creek	81.4%	5.9E+05	100	301	15	22	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2260 - TSWCD - McFee Creek	81.7%	5.9E+05	100	52	15	22	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2260 - TSWCD - McFee Creek	79.9%	5.8E+05	100	93	15	22	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2260 - TSWCD - McFee Creek	86.5%	6.2E+05	100	85	15	22	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2260 - TSWCD - McFee Creek	86.9%	6.3E+05	100	332	15	22	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	
2260 - TSWCD - McFee Creek	81.0%	5.8E+05	100	297	15	22	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000	

## 2261 – TSWCD – Davis Creek

### Project Summary

<b>Project ID</b>	<b>Acres</b>
2261	4.44
<b>Location</b>	
Private property on Davis Creek in the Davis Creek subbasin in rural Washington County, OR	
<b>Lat/Long</b>	<b>Number of Plants Installed</b>
-122.9779, 45.4648	8,500
<b>Stream Length</b>	<b>Average Stream Width</b>
1,374	4
<b>Initial Planting Year/Credit Year</b>	<b>CWS Thermal Benefits/Credits</b>
2016/2017	0.91 million kcal/day
<b>Plant Communities</b>	
Scrub-shrub (refer to the Site Assessment Report for additional information)	
<b>Partners</b>	
Tualatin Soil and Water Conservation District and USDA Farm Service Agency	
<b>Riparian Planting Activities</b>	
Site preparation, targeted invasive species treatment, and riparian plantings	
<b>Stream Enhancement Activities</b>	
None	

## Site Assessment Report

Project Number: 2261      Project Name: TSWCD Project 2261 – Davis Creek

Project Acres: 4.44      Initial Planting Year: 2016      Initial Credit Year: 2017      Length of Stream: 1,374 ft

### Summary of Current Conditions by Plant Community Type

#### Plant Community: Scrub-Shrub

Stems per Acre: 1,750

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
black hawthorn	hardhack spirea	American speedwell	bittersweet nightshade
Oregon ash	red-osier dogwood	common beggarticks	common hawthorn
	thimbleberry	common horsetail	Himalayan blackberry
	trailing blackberry	mild waterpepper	reed canary grass
		scouring rush	
		slender hairgrass	
		small duckweed	
		stinging nettle	
		willowherb	

#### Management Actions

Completed: 2017	Recommended: 2018
<input checked="" type="checkbox"/> Interplant	<input checked="" type="checkbox"/> Interplant
<input checked="" type="checkbox"/> Invasive weed treatment	<input checked="" type="checkbox"/> Invasive weed treatment
<input checked="" type="checkbox"/> Seeding	<input checked="" type="checkbox"/> Seeding
<input type="checkbox"/> Herbivore Control	<input type="checkbox"/> Herbivore Control
<input type="checkbox"/> Other	<input type="checkbox"/> Other
<input checked="" type="checkbox"/> Monitoring for Adaptive Management	<input checked="" type="checkbox"/> Monitoring for Adaptive Management



## Thermal Credit for Shade Enhancement

Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2261 - TSWCD - Davis Creek	ECREP	1374	1.0E+05	2.2E+06	2.1E+06	1.1E+06	86%	9.1E+05

## Shade-a-Lator Input and Output Spreadsheets

### 2261-TSWCD-Davis Creek: Input and Output Data for Baseline Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>									RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft	
2261 - TSWCD - Davis Creek	0.0%	0.0E+00	100	84	4	9	1	1000	1000	1000	1000	1000	1000	1000	1000	1000	1300	1300	1300	1325	1000	1000	1000	1000	1000	
2261 - TSWCD - Davis Creek	0.0%	0.0E+00	100	103	4	9	1	1000	1000	1000	1000	1000	1000	1000	1000	1000	1300	1300	1300	1300	1300	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	0.0%	0.0E+00	100	119	4	9	1	1000	1000	1000	1000	1000	1000	1000	1000	1000	1300	1300	1300	1300	1300	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	0.3%	6.5E+02	100	93	4	9	1	1000	1000	1000	1000	1000	1000	1000	1000	1000	1300	1300	1325	1000	1000	1000	1000	1000	1000	
2261 - TSWCD - Davis Creek	0.9%	1.7E+03	100	74	4	9	1	1300	1300	1300	1300	1300	1300	1300	1300	1000	1300	1325	1350	1350	1000	1000	1000	1000	1000	
2261 - TSWCD - Davis Creek	3.5%	6.7E+03	100	128	4	9	1	1300	1300	1300	1300	1300	1300	1300	1300	1325	1300	1325	1350	1375	1000	1000	1000	1000	1000	
2261 - TSWCD - Davis Creek	2.5%	4.8E+03	100	65	4	9	1	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1350	1375	1375	1000	1000	1000	1000	1000	
2261 - TSWCD - Davis Creek	0.6%	1.2E+03	100	109	4	9	1	1300	1300	1300	1300	1350	1325	1325	1000	1000	1300	1300	1300	1300	1350	1375	1000	1000	1000	
2261 - TSWCD - Davis Creek	0.0%	0.0E+00	100	110	4	9	1	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1000	1000	1000	1000	1000	1000	
2261 - TSWCD - Davis Creek	0.0%	1.9E+00	100	81	4	9	1	1300	1300	1300	1300	1300	1300	1300	1300	1325	1300	1300	1350	1000	1000	1000	1000	1000	1000	
2261 - TSWCD - Davis Creek	1.7%	3.3E+03	100	92	4	9	1	1300	1300	1300	1300	1300	1325	1350	1350	1350	1300	1375	1375	1000	1000	1000	1000	1000	1000	
2261 - TSWCD - Davis Creek	38.2%	7.3E+04	100	58	4	9	1	1300	1300	1300	1300	1300	1375	1375	1375	1375	1325	1350	1375	1000	1000	1000	1000	1000	1000	
2261 - TSWCD - Davis Creek	2.6%	5.0E+03	100	51	4	9	1	1300	1300	1325	1350	1350	1375	1375	1375	1350	1300	1300	1300	1325	1375	1000	1000	1000	1000	
2261 - TSWCD - Davis Creek	3.6%	5.1E+03	74	89	4	9	1	1300	1350	1375	1375	1375	1375	1375	1350	1300	1300	1325	1000	1000	1000	1000	1000	1000	1000	

### 2261-TSWCD-Davis Creek: Input and Output Data for Enhanced Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>									RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>								
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft
2261 - TSWCD - Davis Creek	81.2%	1.6E+05	100	84	4	9	1	1000	1000	1000	1000	1000	1000	1000	1000	1000	1375	1375	1375	1375	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	76.6%	1.5E+05	100	103	4	9	1	1000	1000	1000	1000	1000	1000	1000	1000	1000	1375	1375	1375	1375	1375	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	66.0%	1.3E+05	100	119	4	9	1	1000	1000	1000	1000	1000	1000	1000	1000	1000	1375	1375	1375	1375	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	83.3%	1.6E+05	100	93	4	9	1	1000	1000	1000	1000	1000	1000	1000	1000	1000	1375	1375	1375	1000	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	87.9%	1.7E+05	100	74	4	9	1	1375	1375	1375	1375	1375	1375	1375	1375	1000	1375	1375	1375	1375	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	83.9%	1.6E+05	100	128	4	9	1	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	86.0%	1.7E+05	100	65	4	9	1	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	86.7%	1.7E+05	100	109	4	9	1	1375	1375	1375	1375	1375	1375	1375	1000	1000	1375	1375	1375	1375	1375	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	86.4%	1.7E+05	100	110	4	9	1	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	91.5%	1.8E+05	100	81	4	9	1	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	86.6%	1.7E+05	100	92	4	9	1	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	84.9%	1.6E+05	100	58	4	9	1	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	84.0%	1.6E+05	100	51	4	9	1	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	1000	1000	1000	1000
2261 - TSWCD - Davis Creek	90.4%	1.3E+05	74	89	4	9	1	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	1000	1000	1000	1000	1000

## 2262 – TSWCD – Abbey Creek

### Project Summary

<b>Project ID</b>	<b>Acres</b>
2262	9.05
<b>Location</b>	
Private property on Abbey Creek in the Abbey Creek subbasin in rural Washington County, OR	
<b>Lat/Long</b>	<b>Number of Plants Installed</b>
-122.8169, 45.5769	13,400
<b>Stream Length</b>	<b>Average Stream Width</b>
1,530	4
<b>Initial Planting Year/Credit Year</b>	<b>CWS Thermal Benefits/Credits</b>
2016/2017	0.19 million kcal/day
<b>Plant Communities</b>	
Riparian forest (refer to the Site Assessment Report for additional information)	
<b>Partners</b>	
Tualatin Soil and Water Conservation District and USDA Farm Service Agency	
<b>Riparian Planting Activities</b>	
Site preparation, targeted invasive species treatment, and riparian plantings	
<b>Stream Enhancement Activities</b>	
None	

## Site Assessment Report

Project Number: 2262      Project Name: TSWCD Project 2262 - Abbey Creek

Project Acres: 9.05      Initial Planting Year: 2016      Initial Credit Year: 2017      Length of Stream: 1,530 ft

### Summary of Current Conditions by Plant Community Type

#### Plant Community: Riparian Forest

Stems per Acre: 2,650

Phase: Establishment

Native Tree	Native Shrub	Native Herbaceous	Invasives
bigleaf maple	baldhip rose	American speedwell	bull thistle
cascara	beaked hazelnut	American trailplant	Canada thistle
Douglas-fir	elderberry	American vetch	herb Robert
grand fir	hardhack spirea	Blue Wildrye	Himalayan blackberry
Oregon ash	native wild rose	bracken fern	reed canary grass
pacific crab apple	oceanspray	cleavers	
red alder	osoberry, indian plum	Cooley's hedge-nettle	
vine maple	Pacific ninebark	enchanter's nightshade	
western red cedar	red flowering currant	false lily of the valley	
	red huckleberry	fringecup	
	salmonberry	giant horsetail	
	serviceberry	inside-out flower	
	tall Oregon grape	lady fern	
	thimbleberry	little western bittercress	
	trailing blackberry	maidenhair fern	
	Western wahoo	Pacific trillium	
		Pacific waterleaf	
		piggyback	
		Siberian springbeauty	
		silverleaf phacelia	
		slender hairgrass	
		small-fruited bulrush	
		spike bentgrass	
		spotted touch-me-not	
		starry false lily of the valley	
		stinging nettle	
		taperfruit shortscale sedge	
		threeleaf foamflower	
		water parsely	
		western dock	
		western swordfern	
		wild ginger	
		willowherb	

#### Management Actions

Completed: 2017	Recommended: 2018
<input checked="" type="checkbox"/> Interplant	<input type="checkbox"/> Interplant
<input checked="" type="checkbox"/> Invasive weed treatment	<input checked="" type="checkbox"/> Invasive weed treatment
<input type="checkbox"/> Seeding	<input type="checkbox"/> Seeding
<input type="checkbox"/> Herbivore Control	<input type="checkbox"/> Herbivore Control
<input type="checkbox"/> Other	<input type="checkbox"/> Other
<input checked="" type="checkbox"/> Monitoring for Adaptive Management	<input checked="" type="checkbox"/> Monitoring for Adaptive Management

## Thermal Credit for Shade Enhancement

Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2262 - TSWCD - Abbey Creek	VEGBAC	1530	2.3E+06	2.7E+06	3.7E+05	1.9E+05	100%	1.9E+05

## Shade-a-Lator Input and Output Spreadsheets

### 2262-TSWCD-Abbey Creek: Input and Output Data for Baseline Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- code only vegetation that CWS is responsible for										RIPARIAN CODES -- RIGHT BANK-- code only vegetation that CWS is responsible for							
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft
2262 - TSWCD - Abbey Creek	80.3%	1.5E+05	100	21	4	6	2	1150	1150	1175	1175	1175	1175	1175	1175	1175	1150	1150	1175	1175	1175	1175	1175	1000	1000
2262 - TSWCD - Abbey Creek	90.3%	1.7E+05	100	31	4	6	2	1175	1175	1150	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000
2262 - TSWCD - Abbey Creek	72.3%	1.4E+05	100	12	4	6	2	1125	1150	1175	1175	1175	1175	1175	1175	1175	1125	1175	1175	1175	1175	1175	1175	1000	1000
2262 - TSWCD - Abbey Creek	40.5%	7.8E+04	100	328	4	6	2	1125	1100	1150	1150	1150	1175	1175	1175	1175	1100	1125	1150	1150	1150	1150	1125	1150	1150
2262 - TSWCD - Abbey Creek	59.1%	7.6E+04	67	340	4	6	2	1100	1125	1175	1175	1175	1175	1175	1175	1175	1150	1175	1175	1175	1175	1175	1125	1125	1175
2262 - TSWCD - Abbey Creek	89.7%	1.7E+05	100	318	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000
2262 - TSWCD - Abbey Creek	88.5%	1.7E+05	100	308	4	6	2	1175	1175	1150	1125	1125	1150	1175	1175	1150	1150	1175	1175	1150	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	88.9%	1.7E+05	100	302	4	6	2	1175	1175	1150	1150	1150	1150	1150	1150	1150	1150	1150	1175	1175	1175	1175	1175	1175	1150
2262 - TSWCD - Abbey Creek	86.4%	1.7E+05	100	280	4	6	2	1175	1125	1125	1125	1150	1125	1150	1150	1175	1175	1150	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	87.2%	1.7E+05	100	292	4	6	2	1175	1150	1125	1100	1150	1150	1125	1175	1175	1150	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	77.3%	1.5E+05	100	275	4	6	2	1150	1150	1150	1125	1125	1125	1150	1175	1175	1175	1175	1175	1175	1150	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	92.3%	1.8E+05	100	270	4	6	2	1175	1175	1150	1150	1150	1100	1175	1175	1150	1125	1150	1175	1175	1175	1125	1150	1175	1175
2262 - TSWCD - Abbey Creek	85.3%	1.6E+05	100	263	4	6	2	1150	1175	1150	1150	1125	1100	1125	1125	1125	1150	1150	1175	1175	1150	1150	1150	1150	1150
2262 - TSWCD - Abbey Creek	68.6%	1.3E+05	100	351	4	6	2	1125	1150	1175	1175	1175	1175	1175	1175	1175	1125	1150	1175	1175	1150	1125	1150	1150	1150
2262 - TSWCD - Abbey Creek	75.0%	1.4E+05	100	332	4	6	2	1150	1150	1175	1175	1175	1175	1175	1175	1175	1125	1150	1150	1150	1175	1150	1175	1175	1175
2262 - TSWCD - Abbey Creek	68.5%	8.2E+04	62	58	4	6	2	1100	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1150	1125	1125	1175	1175	1150

### 2262-TSWCD-Abbey Creek: Input and Output Data for Enhanced Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- code only vegetation that CWS is responsible for										RIPARIAN CODES -- RIGHT BANK-- code only vegetation that CWS is responsible for							
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft
2262 - TSWCD - Abbey Creek	88.9%	1.7E+05	100	21	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000
2262 - TSWCD - Abbey Creek	90.7%	1.7E+05	100	31	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000
2262 - TSWCD - Abbey Creek	87.9%	1.7E+05	100	12	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000
2262 - TSWCD - Abbey Creek	91.8%	1.8E+05	100	328	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	93.8%	1.2E+05	67	340	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	89.7%	1.7E+05	100	318	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000
2262 - TSWCD - Abbey Creek	91.5%	1.8E+05	100	308	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	91.6%	1.8E+05	100	302	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	91.7%	1.8E+05	100	280	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	91.8%	1.8E+05	100	292	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	91.3%	1.8E+05	100	275	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	93.1%	1.8E+05	100	270	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	93.6%	1.8E+05	100	263	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	94.0%	1.8E+05	100	351	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	93.2%	1.8E+05	100	332	4	6	2	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2262 - TSWCD - Abbey Creek	88.2%	1.1E+05	62	58	4	6	2	1175	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175

## 2263 – Fanno Creek – Crawford Reach

### Project Summary

<b>Project ID</b>	<b>Acres</b>
2263	7.27
<b>Location</b>	
Private property on Fanno Creek in Tigard, OR, located just north of SW Durham Rd.	
<b>Lat/Long</b>	<b>Number of Plants Installed</b>
-122.7538, 45.408	18,500
<b>Stream Length</b>	<b>Average Stream Width</b>
800	28
<b>Initial Planting Year/Credit Year</b>	<b>CWS Thermal Benefits/Credits</b>
2016/2017	1.1 million kcal/day
<b>Plant Communities</b>	
Forested wetland (refer to the Site Assessment Report for additional information)	
<b>Partners</b>	
City of Tigard	
<b>Riparian Planting Activities</b>	
Site preparation, targeted invasive species treatment, and riparian plantings	
<b>Stream Enhancement Activities</b>	
Large woody debris, grading, soil lifts, and live stakes/brush	

## Site Assessment Report

**Project Number: 2263**      **Project Name: Fanno Creek - Crawford Reach**

Project Acres: 7.27

Initial Planting Year: 2016

Initial Credit Year: 2017

Length of Stream: 800 ft

### Summary of Current Conditions by Plant Community Type

#### Plant Community: Forested Wetland

Stems per Acre: 1,929

Phase: Establishment

Native Tree	Native Shrub	Native Herbaceous	Invasives
black cottonwood	beaked hazelnut	American sloughgrass	common hawthorn
casacara	gooseberry	American speedwell	Himalayan blackberry
Oregon ash	hardhack spirea	common beggarticks	reed canary grass
Oregon oak	native wild rose	giant horsetail	
red alder	osoberry, indian plum	lady fern	
	Pacific ninebark	meadow barley	
	Pacific Willow	rice cutgrass	
	red-osier dogwood	skunk cabbage	
	snowberry	slender hairgrass	
	thimbleberry	slough sedge	
	trailing blackberry	spike bentgrass	
		spotted touch-me-not	
		stinging nettle	
		taperfruit shortscale sedge	
		western swordfern	
		yellowcress	

#### Management Actions

##### Completed: 2017

- Interplant
- Invasive weed treatment
- Seeding
- Herbivore Control
- Other
- Monitoring for Adaptive Management

##### Recommended: 2018

- Interplant
- Invasive weed treatment
- Seeding
- Herbivore Control
- Other
- Monitoring for Adaptive Management

## Thermal Credit for Shade Enhancement

Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2263 - Fanno Creek - Crawford Reach	Capital	800	5.4E+06	7.5E+06	2.2E+06	1.1E+06	100%	1.1E+06

## Shade-a-Lator Input and Output Spreadsheets

### 2263-Fanno Creek-Crawford Reach: Input and Output Data for Baseline Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- code only vegetation that CWS is responsible for									RIPARIAN CODES -- RIGHT BANK-- code only vegetation that CWS is responsible for									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft	
2263 - Fanno Creek - Crawford Reach	63.5%	8.5E+05	100	150	28	38	7	1125	1150	1175	1175	1175	1175	1000	1000	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000
2263 - Fanno Creek - Crawford Reach	68.2%	9.2E+05	100	123	28	38	7	1125	1175	1175	1150	1125	1175	1175	1175	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2263 - Fanno Creek - Crawford Reach	57.9%	7.8E+05	100	111	28	38	7	1150	1175	1175	1175	1175	1175	1175	1175	1175	1150	1175	1175	1175	1175	1175	1175	1175	1175	1150
2263 - Fanno Creek - Crawford Reach	32.4%	4.3E+05	100	166	28	38	7	1100	1175	1175	1175	1175	1175	1175	1175	1175	1100	1100	1150	1175	1175	1175	1175	1175	1175	1150
2263 - Fanno Creek - Crawford Reach	44.0%	5.9E+05	100	175	28	38	7	1175	1175	1175	1175	1175	1175	1175	1175	1000	1100	1100	1125	1175	1175	1175	1175	1175	1175	1175
2263 - Fanno Creek - Crawford Reach	48.0%	6.4E+05	100	190	28	38	7	1150	1175	1175	1000	1000	1000	1000	1000	1000	1125	1125	1150	1175	1175	1175	1150	1150	1175	1175
2263 - Fanno Creek - Crawford Reach	40.4%	5.4E+05	100	214	28	38	7	1150	1150	1125	1000	1000	1000	1000	1000	1000	1100	1150	1175	1175	1175	1150	1150	1150	1175	1150
2263 - Fanno Creek - Crawford Reach	44.3%	5.9E+05	100	227	28	38	7	1150	1175	1175	1000	1000	1000	1000	1000	1000	1100	1100	1125	1150	1150	1175	1150	1125	1100	1100

### 2263-Fanno Creek-Crawford Reach: Input and Output Data for Enhanced Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- code only vegetation that CWS is responsible for									RIPARIAN CODES -- RIGHT BANK-- code only vegetation that CWS is responsible for									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft	
2263 - Fanno Creek - Crawford Reach	71.7%	9.6E+05	100	150	28	38	7	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000
2263 - Fanno Creek - Crawford Reach	72.4%	9.7E+05	100	123	28	38	7	1175	1175	1175	1175	1175	1175	1175	1175	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2263 - Fanno Creek - Crawford Reach	70.7%	9.5E+05	100	111	28	38	7	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2263 - Fanno Creek - Crawford Reach	75.5%	1.0E+06	100	166	28	38	7	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2263 - Fanno Creek - Crawford Reach	73.3%	9.8E+05	100	175	28	38	7	1175	1175	1175	1175	1175	1175	1175	1175	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2263 - Fanno Creek - Crawford Reach	66.1%	8.9E+05	100	190	28	38	7	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2263 - Fanno Creek - Crawford Reach	64.9%	8.7E+05	100	214	28	38	7	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175
2263 - Fanno Creek - Crawford Reach	66.5%	8.9E+05	100	227	28	38	7	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175

## 2265 – Wapato View

### Project Summary

<b>Project ID</b>	<b>Acres</b>
2265	15.16
<b>Location</b>	
Public property on Wapato Creek in Washington County, OR, located just south of SW Dixon Mill Rd.	
<b>Lat/Long</b>	<b>Number of Plants Installed</b>
-123.1011, 45.4366	53,495
<b>Stream Length</b>	<b>Average Stream Width</b>
5,045	2
<b>Initial Planting Year/Credit Year</b>	<b>CWS Thermal Benefits/Credits</b>
2016/2017	1.4 million kcal/day
<b>Plant Communities</b>	
Scrub-shrub, riparian forest, oak woodland (refer to the Site Assessment Report for additional information)	
<b>Partners</b>	
Metro	
<b>Riparian Planting Activities</b>	
Site preparation, targeted invasive species treatment, and riparian plantings	
<b>Stream Enhancement Activities</b>	
Large woody debris and grading	



## Site Assessment Report

**Project Number: 2265**      **Project Name: Wapato View**

Project Acres: 15.16      Initial Planting Year: 2016      Initial Credit Year: 2017      Length of Stream: 5,045 ft

### Summary of Current Conditions by Plant Community Type

#### Plant Community: Oak Woodland

Stems per Acre: 1,950

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
bignone maple	beaked hazelnut	checkermallow	bittersweet nightshade
casara	black twinberry	cleavers	Canada thistle
Oregon oak	Pacific ninebark	fringe cup	Himalayan blackberry
	red flowering currant	skunkweed	
	snowberry	spike bentgrass	
	thimbleberry	water parsley	
	trailing blackberry	western swordfern	
		willowherb	

#### Plant Community: Riparian Forest

Stems per Acre: 1,390

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
black hawthorn	black twinberry	American sloughgrass	bittersweet nightshade
casara	hardhack spirea	coast tarweed	Canada thistle
Oregon ash	native wild rose	giant horsetail	common hawthorn
Oregon oak	Pacific ninebark	meadow barley	Himalayan blackberry
	Piper's willow	skunkweed	morning-glory
	red-osier dogwood	slender hairgrass	
	Sitka Willow	spike bentgrass	
	snowberry	toad rush	
	thimbleberry	western swordfern	
		willowherb	

#### Plant Community: Scrub-Shrub

Stems per Acre: 1,650

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
black hawthorn	black twinberry	American speedwell	bittersweet nightshade
casara	clustered wild rose	giant horsetail	common hawthorn
Oregon ash	hardhack spirea	meadow barley	Himalayan blackberry
	Pacific ninebark	slender hairgrass	morning-glory
	Piper's willow	spike bentgrass	reed canary grass
	red-osier dogwood	toad rush	
	Sitka Willow	willowherb	
	thimbleberry		

#### Management Actions

##### Completed: 2017

- Interplant
- Invasive weed treatment
- Seeding
- Herbivore Control
- Other
- Monitoring for Adaptive Management

##### Recommended: 2018

- Interplant
- Invasive weed treatment
- Seeding
- Herbivore Control
- Other
- Monitoring for Adaptive Management

## Thermal Credit for Shade Enhancement

Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2265 - Wapato View	Capital	5045	8.3E+05	3.7E+06	2.8E+06	1.4E+06	100%	1.4E+06

# Shade-a-Lator Input and Output Spreadsheets

## 2265-Wapato View: Input and Output Data for Baseline Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>										RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45 ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45 ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2265 - Wapato View	22.9%	2.2E+04	100	235	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1125	1125	1125	1125	1100	1100	1100	1100		
2265 - Wapato View	18.1%	1.7E+04	100	249	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1150	1150	1150	1100	1100	1100		
2265 - Wapato View	8.6%	8.2E+03	100	269	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1150	1100	1100	1100	1100	1100	1100	1100	1100		
2265 - Wapato View	0.0%	0.0E+00	100	254	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1100	1100	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	11.1%	1.1E+04	100	259	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1150	1150	1150	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	15.6%	1.5E+04	100	243	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1150	1125	1100	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	14.3%	1.4E+04	100	253	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1150	1125	1150	1150	1175	1175	1175	1175	1175		
2265 - Wapato View	22.1%	2.1E+04	100	228	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1150	1150	1125	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	12.0%	1.2E+04	100	251	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1150	1100	1100	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	14.8%	1.4E+04	100	245	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1150	1125	1100	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	18.3%	1.8E+04	100	245	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1150	1100	1000	1000	1000	1000	1000	1100		
2265 - Wapato View	24.8%	2.4E+04	100	245	2	6	5	1000	1125	1125	1100	1125	1150	1125	1000	1000	1125	1100	1100	1100	1100	1100	1100	1100	1000		
2265 - Wapato View	0.0%	0.0E+00	54	245	2	6	5	1100	1100	1100	1100	1100	1100	1000	1000	1000	1100	1100	1100	1100	1100	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	201	2	6	5	1100	1100	1000	1000	1000	1000	1000	1000	1000	1100	1100	1100	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	214	2	6	5	1100	1100	1100	1000	1000	1000	1000	1000	1000	1100	1100	1100	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	174	2	6	5	1100	1100	1100	1100	1000	1000	1000	1000	1000	1100	1100	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	176	2	6	5	1100	1100	1100	1000	1000	1000	1000	1000	1000	1100	1100	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	191	2	6	5	1100	1100	1100	1000	1000	1000	1000	1000	1000	1100	1100	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	196	2	6	5	1100	1100	1100	1000	1000	1000	1000	1000	1000	1100	1100	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	196	2	6	5	1100	1100	1100	1000	1000	1000	1000	1000	1000	1100	1100	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	8.0%	7.7E+03	100	207	2	6	5	1100	1100	1100	1100	1175	1175	1000	1000	1000	1100	1100	1100	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	0.5%	4.4E+02	100	216	2	6	5	1100	1100	1100	1100	1100	1100	1100	1100	1125	1100	1100	1100	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	244	2	6	5	1100	1100	1100	1100	1100	1100	1000	1000	1000	1100	1100	1100	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	244	2	6	5	1100	1100	1100	1100	1100	1100	1100	1000	1000	1100	1100	1100	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	244	2	6	5	1100	1100	1100	1100	1100	1100	1100	1000	1000	1100	1100	1100	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	27.5%	2.6E+04	100	244	2	6	5	1125	1100	1100	1100	1100	1100	1000	1000	1000	1100	1100	1100	1100	1100	1000	1000	1000	1000		
2265 - Wapato View	36.5%	3.5E+04	100	242	2	6	5	1125	1100	1100	1100	1100	1100	1000	1000	1000	1125	1100	1100	1100	1100	1100	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	248	2	6	5	1100	1100	1100	1100	1100	1100	1100	1000	1000	1100	1100	1100	1100	1100	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	206	2	6	5	1100	1100	1100	1100	1100	1100	1100	1000	1000	1100	1100	1100	1100	1100	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	186	2	6	5	1100	1100	1100	1100	1100	1100	1000	1000	1000	1100	1100	1100	1100	1100	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	221	2	6	5	1100	1100	1100	1100	1100	1000	1000	1000	1000	1100	1100	1100	1100	1100	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	236	2	6	5	1100	1100	1100	1100	1100	1000	1000	1000	1000	1100	1100	1100	1100	1100	1000	1000	1000	1000		
2265 - Wapato View	18.5%	1.8E+04	100	238	2	6	5	1100	1100	1100	1100	1100	1000	1000	1000	1000	1150	1150	1100	1100	1100	1100	1000	1000	1000		
2265 - Wapato View	47.4%	4.6E+04	100	241	2	6	5	1125	1100	1100	1100	1100	1000	1000	1000	1000	1175	1175	1100	1100	1100	1100	1000	1000	1000		
2265 - Wapato View	58.4%	5.6E+04	100	238	2	6	5	1150	1125	1100	1100	1100	1000	1000	1000	1000	1125	1100	1100	1100	1100	1000	1000	1000	1000		
2265 - Wapato View	85.8%	8.2E+04	100	229	2	6	5	1175	1175	1100	1100	1100	1100	1000	1000	1000	1175	1150	1100	1100	1100	1000	1000	1000	1000		
2265 - Wapato View	76.7%	7.4E+04	100	234	2	6	5	1175	1175	1150	1100	1100	1100	1000	1000	1000	1125	1100	1100	1100	1100	1000	1000	1000	1000		
2265 - Wapato View	78.6%	7.5E+04	100	247	2	6	5	1175	1150	1100	1100	1100	1100	1000	1000	1000	1125	1100	1100	1100	1100	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	233	2	6	5	1100	1100	1100	1100	1100	1100	1000	1000	1000	1100	1100	1100	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	31.4%	3.0E+04	100	222	2	6	5	1125	1150	1100	1100	1100	1100	1100	1000	1000	1100	1100	1100	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	222	2	6	5	1100	1100	1100	1100	1100	1100	1100	1000	1000	1100	1100	1100	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	79.1%	7.6E+04	100	224	2	6	5	1175	1175	1150	1100	1100	1100	1000	1000	1000	1150	1100	1100	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	23.2%	2.2E+04	100	224	2	6	5	1125	1100	1100	1100	1100	1100	1000	1000	1000	1100	1100	1100	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	45.3%	4.3E+04	100	224	2	6	5	1150	1150	1100	1100	1100	1000	1000	1000	1000	1100	1100	1100	1100	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	224	2	6	5	1300	1300	1300	1300	1300	1300	1000	1000	1000	1300	1300	1300	1300	1300	1000	1000	1000	1000		
2265 - Wapato View	55.5%	5.3E+04	100	224	2	6	5	1350	1350	1300	1300	1300	1300	1300	1000	1000	1300	1300	1300	1300	1300	1000	1000	1000	1000		
2265 - Wapato View	6.6%	6.4E+03	100	223	2	6	5	1300	1325	1300	1300	1300	1300	1300	1000	1000	1300	1300	1300	1300	1300	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	228	2	6	5	1300	1300	1300	1300	1300	1300	1300	1000	1000	1300	1300	1300	1300	1300	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	228	2	6	5	1300	1300	1300	1300	1300	1300	1300	1000	1000	1300	1300	1300	1300	1000	1000	1000	1000	1000		
2265 - Wapato View	0.0%	0.0E+00	100	227	2	6	5	1300	1300	1300	1300	1300	1300	1300	1000	1000	1300	1300	1300	1300	1300	1000	1000	1000	1000		

## 2265-Wapato View: Input and Output Data for Enhanced Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK -- <i>code only vegetation that CWS is responsible for</i>										RIPARIAN CODES -- RIGHT BANK -- <i>code only vegetation that CWS is responsible for</i>									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45 ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45 ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2265 - Wapato View	25.7%	2.5E+04	100	235	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175		
2265 - Wapato View	18.3%	1.8E+04	100	249	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175		
2265 - Wapato View	10.1%	9.7E+03	100	269	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175		
2265 - Wapato View	14.7%	1.4E+04	100	254	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	12.5%	1.2E+04	100	259	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000		
2265 - Wapato View	20.9%	2.0E+04	100	243	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	15.8%	1.5E+04	100	253	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175		
2265 - Wapato View	28.3%	2.7E+04	100	228	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000		
2265 - Wapato View	16.8%	1.6E+04	100	251	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	19.7%	1.9E+04	100	245	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	19.9%	1.9E+04	100	245	2	6	5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1175		
2265 - Wapato View	65.1%	6.2E+04	100	245	2	6	5	1000	1175	1175	1175	1175	1175	1175	1000	1000	1175	1175	1175	1175	1175	1175	1175	1175	1000		
2265 - Wapato View	94.3%	4.9E+04	54	245	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1175	1000	1000	1000	1000		
2265 - Wapato View	84.3%	8.1E+04	100	201	2	6	5	1175	1175	1000	1000	1000	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	89.8%	8.6E+04	100	214	2	6	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	87.2%	8.4E+04	100	174	2	6	5	1175	1175	1175	1175	1000	1000	1000	1000	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	86.0%	8.3E+04	100	176	2	6	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	83.4%	8.0E+04	100	191	2	6	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	84.6%	8.1E+04	100	196	2	6	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	84.6%	8.1E+04	100	196	2	6	5	1175	1175	1175	1000	1000	1000	1000	1000	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	90.0%	8.6E+04	100	207	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	93.1%	8.9E+04	100	216	2	6	5	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1000	1000	1000	1000	1000	1000		
2265 - Wapato View	94.1%	9.0E+04	100	244	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000		
2265 - Wapato View	94.1%	9.0E+04	100	244	2	6	5	1175	1175	1175	1175	1175	1175	1175	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000		
2265 - Wapato View	94.1%	9.0E+04	100	244	2	6	5	1175	1175	1175	1175	1175	1175	1175	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000		
2265 - Wapato View	94.3%	9.1E+04	100	244	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1175	1000	1000	1000	1000		
2265 - Wapato View	94.2%	9.0E+04	100	242	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1175	1175	1000	1000	1000		
2265 - Wapato View	94.2%	9.0E+04	100	248	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1175	1000	1000	1000	1000		
2265 - Wapato View	92.2%	8.9E+04	100	206	2	6	5	1175	1175	1175	1175	1175	1175	1175	1175	1000	1175	1175	1175	1175	1175	1000	1000	1000	1000		
2265 - Wapato View	90.2%	8.7E+04	100	186	2	6	5	1175	1175	1175	1175	1175	1175	1175	1000	1000	1175	1175	1175	1175	1175	1000	1000	1000	1000		
2265 - Wapato View	93.3%	9.0E+04	100	221	2	6	5	1175	1175	1175	1175	1175	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1000	1000	1000		
2265 - Wapato View	93.9%	9.0E+04	100	236	2	6	5	1175	1175	1175	1175	1175	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1000	1000	1000		
2265 - Wapato View	94.1%	9.0E+04	100	238	2	6	5	1175	1175	1175	1175	1175	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1000	1000	1000		
2265 - Wapato View	94.1%	9.0E+04	100	241	2	6	5	1175	1175	1175	1175	1175	1000	1000	1000	1000	1175	1175	1175	1175	1175	1175	1000	1000	1000		
2265 - Wapato View	94.0%	9.0E+04	100	238	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1175	1000	1000	1000	1000		
2265 - Wapato View	93.5%	9.0E+04	100	229	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1175	1000	1000	1000	1000		
2265 - Wapato View	93.9%	9.0E+04	100	234	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1175	1000	1000	1000	1000		
2265 - Wapato View	94.4%	9.1E+04	100	247	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1175	1000	1000	1000	1000		
2265 - Wapato View	93.1%	8.9E+04	100	233	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000		
2265 - Wapato View	92.8%	8.9E+04	100	222	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000		
2265 - Wapato View	92.8%	8.9E+04	100	222	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000		
2265 - Wapato View	93.1%	8.9E+04	100	224	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000		
2265 - Wapato View	93.1%	8.9E+04	100	224	2	6	5	1175	1175	1175	1175	1175	1175	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000		
2265 - Wapato View	93.0%	8.9E+04	100	224	2	6	5	1175	1175	1175	1175	1175	1000	1000	1000	1000	1175	1175	1175	1175	1000	1000	1000	1000	1000		
2265 - Wapato View	93.3%	9.0E+04	100	224	2	6	5	1375	1375	1375	1375	1375	1375	1375	1000	1000	1375	1375	1375	1375	1000	1000	1000	1000	1000		
2265 - Wapato View	93.3%	9.0E+04	100	224	2	6	5	1375	1375	1375	1375	1375	1375	1375	1000	1000	1375	1375	1375	1375	1000	1000	1000	1000	1000		
2265 - Wapato View	93.4%	9.0E+04	100	223	2	6	5	1375	1375	1375	1375	1375	1375	1375	1375	1000	1375	1375	1375	1375	1375	1000	1000	1000	1000		
2265 - Wapato View	93.4%	9.0E+04	100	228	2	6	5	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	1000	1000	1000		
2265 - Wapato View	93.4%	9.0E+04	100	228	2	6	5	1375	1375	1375	1375	1375	1375	1375	1375	1000	1375	1375	1375	1375	1375	1000	1000	1000	1000		
2265 - Wapato View	93.4%	9.0E+04	100	227	2	6	5	1375	1375	1375	1375	1375	1375	1375	1375	1000	1375	1375	1375	1375	1375	1375	1000	1000	1000		
2265 - Wapato View	93.3%																										

## 2345 – Metro – Carpenter Creek S

### Project Summary

<b>Project ID</b>	<b>Acres</b>
2345	23.68
<b>Location</b>	
Public property in Washington County, OR, traversed by Carpenter Creek, located just south of Tualatin Valley Highway.	
<b>Lat/Long</b>	<b>Number of Plants Installed</b>
-123.116223, 45.498311	43,776
<b>Stream Length</b>	<b>Average Stream Width</b>
1,800	16
<b>Initial Planting Year/Credit Year</b>	<b>CWS Thermal Benefits/Credits</b>
2015/2017	3.9 million kcal/day
<b>Plant Communities</b>	
Scrub-shrub, riparian forest (refer to the Site Assessment Report for additional information)	
<b>Partners</b>	
Metro	
<b>Riparian Planting Activities</b>	
Site preparation, targeted invasive species treatment, and riparian plantings	
<b>Stream Enhancement Activities</b>	
Large woody debris	

## Site Assessment Report

Project Number: 2345      Project Name: Metro - Carpenter Creek S

Project Acres: 23.68      Initial Planting Year: 2015      Initial Credit Year: 2017      Length of Stream: 1,800 ft

### Summary of Current Conditions by Plant Community Type

#### Plant Community: Riparian Forest

Stems per Acre: 2,183

Phase: Establishment

Native Tree	Native Shrub	Native Herbaceous	Invasives
bigleaf maple	beaked hazelnut	American bird's-foot trefoil	bittersweet nightshade
black cottonwood	black twinberry	American sloughgrass	common hawthorn
black hawthorn	hardhack spirea	American trailplant	common teasel
cascara	mock-orange	annual hairgrass	herb Robert
Oregon ash	native wild rose	bracken fern	Himalayan blackberry
red alder	nootka rose	cleavers	reed canary grass
	osoberry, indian plum	common beggarticks	spurgelaurel
	Pacific ninebark	cow-parsnip	
	Pacific poison oak	Cusick's popcornflower	
	Piper's willow	elegant calicoflower	
	red-osier dogwood	fragrant popcornflower	
	serviceberry	fringecup	
	Sitka Willow	horsetweed	
	snowberry	manroot	
	tall Oregon grape	meadow barley	
	thimbleberry	mild waterpepper	
	trailing blackberry	Pacific waterleaf	
		skunkweed	
		slender hairgrass	
		slough sedge	
		spike bentgrass	
		tall annual willowherb	
		taperfruit shortscale sedge	
		water foxtail	
		western marsh cudweed	
		western meadow-rue	
		western swordfern	
		western yellow cress	
		willowherb	

**Plant Community: Scrub-Shrub**

Stems per Acre: 567

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
black cottonwood	black twinberry	American sloughgrass	bittersweet nightshade
Oregon ash	hardhack spirea	American water horehound	reed canary grass
pacific crab apple	native wild rose	Blue Wildrye	
red alder	Pacific ninebark	common beggarticks	
	Pacific Willow	common cattail	
	Piper's willow	common spikerush	
	red-osier dogwood	cursed buttercup	
	Sitka Willow	horsetweed	
	snowberry	marsh seedbox	
	trailing blackberry	meadow barley	
		mild waterpepper	
		needle spikerush	
		needleleaf navarretia	
		nodding beggarticks	
		northern water plantain	
		ovate spikerush	
		rice cutgrass	
		skunkweed	
		slender hairgrass	
		small duckweed	
		softstem bulrush	
		spike bentgrass	
		water foxtail	
		western marsh cudweed	
		western yellow cress	
		willowherb	
		yellowcress	

**Management Actions**

Completed: 2017	Recommended: 2018
<input checked="" type="checkbox"/> Interplant	<input checked="" type="checkbox"/> Interplant
<input checked="" type="checkbox"/> Invasive weed treatment	<input checked="" type="checkbox"/> Invasive weed treatment
<input checked="" type="checkbox"/> Seeding	<input type="checkbox"/> Seeding
<input type="checkbox"/> Herbivore Control	<input type="checkbox"/> Herbivore Control
<input type="checkbox"/> Other	<input type="checkbox"/> Other
<input checked="" type="checkbox"/> Monitoring for Adaptive Management	<input checked="" type="checkbox"/> Monitoring for Adaptive Management

## Thermal Credit for Shade Enhancement

Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2345 - Metro - Carpenter Creek S	Capital	1800	2.4E+06	1.0E+07	7.9E+06	3.9E+06	100%	3.9E+06

## Shade-a-Lator Input and Output Spreadsheets

### 2345-Metro-Carpenter Creek S: Input and Output Data for Baseline Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- code only vegetation that CWS is responsible for										RIPARIAN CODES -- RIGHT BANK-- code only vegetation that CWS is responsible for									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2345 - Metro - Carpenter Creek S	11.6%	8.9E+04	100	188	16	17	3	1125	1100	1100	1100	1100	1100	1100	1100	1000	1100	1125	1000	1000	1000	1000	1000	1000	1000	1000	
2345 - Metro - Carpenter Creek S	19.3%	1.5E+05	100	195	16	17	3	1100	1100	1100	1100	1100	1100	1100	1100	1000	1125	1125	1150	1125	1125	1125	1000	1000	1000	1000	
2345 - Metro - Carpenter Creek S	25.9%	2.0E+05	100	190	16	17	3	1125	1125	1125	1125	1100	1100	1100	1100	1100	1100	1100	1125	1150	1175	1175	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	21.4%	1.6E+05	100	171	16	17	3	1125	1125	1150	1150	1100	1100	1100	1100	1100	1100	1100	1125	1125	1125	1125	1125	1125	1125	1125	
2345 - Metro - Carpenter Creek S	50.2%	3.9E+05	100	165	16	17	3	1150	1150	1125	1125	1100	1100	1100	1100	1100	1125	1125	1125	1150	1125	1125	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	61.9%	4.8E+05	100	168	16	17	3	1175	1150	1125	1100	1100	1100	1100	1100	1000	1150	1100	1100	1125	1100	1150	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	22.4%	1.7E+05	100	179	16	17	3	1150	1125	1100	1100	1100	1100	1100	1100	1000	1100	1100	1100	1100	1100	1125	1150	1175	1175	1175	
2345 - Metro - Carpenter Creek S	51.7%	4.0E+05	100	205	16	17	3	1175	1150	1150	1100	1100	1100	1100	1100	1100	1125	1100	1100	1125	1150	1175	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	31.7%	2.4E+05	100	159	16	17	3	1150	1125	1150	1125	1100	1100	1100	1100	1100	1100	1100	1125	1175	1175	1175	1175	1175	1175	1125	
2345 - Metro - Carpenter Creek S	6.0%	4.6E+04	100	151	16	17	3	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1125	1125	1125	1100	1125	1100	1100	1100	
2345 - Metro - Carpenter Creek S	0.0%	0.0E+00	100	189	16	17	3	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	
2345 - Metro - Carpenter Creek S	14.9%	1.1E+05	100	186	16	17	3	1100	1125	1175	1150	1100	1100	1100	1100	1100	1100	1100	1300	1300	1300	1300	1300	1300	1300	1300	
2345 - Metro - Carpenter Creek S	0.0%	0.0E+00	100	144	16	17	3	1100	1100	1100	1100	1100	1100	1100	1100	1100	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	
2345 - Metro - Carpenter Creek S	0.0%	0.0E+00	100	108	16	17	3	1100	1100	1100	1100	1100	1100	1100	1100	1100	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	
2345 - Metro - Carpenter Creek S	0.0%	0.0E+00	100	116	16	17	3	1100	1100	1100	1100	1100	1100	1100	1100	1100	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	
2345 - Metro - Carpenter Creek S	0.0%	0.0E+00	100	117	16	17	3	1100	1100	1100	1100	1100	1100	1100	1100	1100	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	
2345 - Metro - Carpenter Creek S	0.0%	0.0E+00	100	104	16	17	3	1100	1100	1100	1100	1100	1100	1100	1100	1000	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	
2345 - Metro - Carpenter Creek S	0.0%	0.0E+00	100	127	16	17	3	1100	1100	1100	1100	1000	1000	1000	1000	1000	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	



## 2345-Metro-Carpenter Creek S: Input and Output Data for Enhanced Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- code only vegetation that CWS is responsible for										RIPARIAN CODES -- RIGHT BANK-- code only vegetation that CWS is responsible for									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2345 - Metro - Carpenter Creek S	71.8%	5.5E+05	100	188	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1000	1175	1175	1000	1000	1000	1000	1000	1000	1000	1000	
2345 - Metro - Carpenter Creek S	74.2%	5.7E+05	100	195	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1000	1175	1175	1175	1175	1175	1175	1175	1000	1000	1000	
2345 - Metro - Carpenter Creek S	75.9%	5.8E+05	100	190	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	85.3%	6.5E+05	100	171	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	86.9%	6.7E+05	100	165	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	86.2%	6.6E+05	100	168	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	81.3%	6.2E+05	100	179	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1000	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	74.3%	5.7E+05	100	205	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	87.4%	6.7E+05	100	159	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	86.4%	6.6E+05	100	151	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	76.3%	5.9E+05	100	189	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	
2345 - Metro - Carpenter Creek S	75.8%	5.8E+05	100	186	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1175	1375	1375	1375	1375	1375	1375	1375	
2345 - Metro - Carpenter Creek S	72.7%	5.6E+05	100	144	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	
2345 - Metro - Carpenter Creek S	57.7%	4.4E+05	100	108	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	
2345 - Metro - Carpenter Creek S	64.6%	5.0E+05	100	116	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	
2345 - Metro - Carpenter Creek S	65.4%	5.0E+05	100	117	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1175	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	
2345 - Metro - Carpenter Creek S	54.0%	4.1E+05	100	104	16	17	3	1175	1175	1175	1175	1175	1175	1175	1175	1000	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	
2345 - Metro - Carpenter Creek S	68.8%	5.3E+05	100	127	16	17	3	1175	1175	1175	1175	1000	1000	1000	1000	1000	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	

## 2346 – Metro – Carpenter Creek N

### Project Summary

<b>Project ID</b>	<b>Acres</b>
2346	16.57
<b>Location</b>	
Public property in Washington County, OR, traversed by Carpenter Creek, located just south of Tualatin Valley Highway.	
<b>Lat/Long</b>	<b>Number of Plants Installed</b>
-123.112969, 45.503571	38,235
<b>Stream Length</b>	<b>Average Stream Width</b>
382	16
<b>Initial Planting Year/Credit Year</b>	<b>CWS Thermal Benefits/Credits</b>
2015/2017	0.90 million kcal/day
<b>Plant Communities</b>	
Scrub-shrub (refer to the Site Assessment Report for additional information)	
<b>Partners</b>	
Metro	
<b>Riparian Planting Activities</b>	
Site preparation, targeted invasive species treatment, and riparian plantings	
<b>Stream Enhancement Activities</b>	
None	

## Site Assessment Report

Project Number: 2346      Project Name: Metro - Carpenter Creek N

Project Acres: 16.57      Initial Planting Year: 2015      Initial Credit Year: 2017      Length of Stream: 382 ft

### Summary of Current Conditions by Plant Community Type

#### Plant Community: Scrub-Shrub

Stems per Acre: 711

Phase: Implementation

Native Tree	Native Shrub	Native Herbaceous	Invasives
black cottonwood	hardhack spirea	American bird's-foot trefoil	bittersweet nightshade
black hawthorn	native wild rose	American sloughgrass	Canada thistle
Oregon ash	nootka rose	American water horehound	common teasel
	Pacific ninebark	annual hairgrass	Himalayan blackberry
	Pacific Willow	common beggarticks	morning-glory
	Piper's willow	common cattail	reed canary grass
	red-osier dogwood	common horsetail	
	Sitka Willow	common spikerush	
	thimbleberry	curlytop knotweed	
		Cusick's popcornflower	
		denseflower willowherb	
		elegant calicoflower	
		fragrant popcornflower	
		hairy crabgrass	
		horseweed	
		largeleaf sandwort	
		marsh seedbox	
		meadow barley	
		mild waterpepper	
		needle spikerush	
		northern water plantain	
		rice cutgrass	
		rush	
		sedge	
		slender hairgrass	
		small-fruited bulrush	
		softstem bulrush	
		spike bentgrass	
		spikerush	
		spotted sandmat	
		tarweed	
		toad rush	
		water foxtail	
		western marsh cudweed	
		western pearly everlasting	
		western yellow cress	
		willowherb	
		woolyheads	
		yellowcress	
		yellowseed false pimpernel	

**Management Actions**

Completed: 2017	Recommended: 2018
<input checked="" type="checkbox"/> Interplant	<input checked="" type="checkbox"/> Interplant
<input checked="" type="checkbox"/> Invasive weed treatment	<input checked="" type="checkbox"/> Invasive weed treatment
<input checked="" type="checkbox"/> Seeding	<input checked="" type="checkbox"/> Seeding
<input type="checkbox"/> Herbivore Control	<input type="checkbox"/> Herbivore Control
<input type="checkbox"/> Other	<input type="checkbox"/> Other
<input checked="" type="checkbox"/> Monitoring for Adaptive Management	<input checked="" type="checkbox"/> Monitoring for Adaptive Management

## Thermal Credit for Shade Enhancement

Project	District Program	Stream Length (ft)	Thermal Load Blocked (Baseline Conditions) (kcal/d)	Thermal Load Blocked (Enhanced Conditions) (kcal/d)	Thermal Load Reduction (Environmental Benefits) <sup>a</sup> (kcal/d)	Thermal Credits Available <sup>b</sup> (kcal/d)	CWS Contribution to Credit-Generating Activities	CWS Thermal Credits <sup>c</sup> (kcal/d)
2346 - Metro - Carpenter Creek N	Capital	382	1.9E+04	1.8E+06	1.8E+06	9.0E+05	100%	9.0E+05

## Shade-a-Lator Input and Output Spreadsheets

### 2346-Metro-Carpenter Creek N: Input and Output Data for Baseline Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>										RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2346 - Metro - Carpenter Creek N	0.0%	0.0E+00	100	199	16	17	3	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	1000	1000	1000	1000	1000	1000	1000	1000	
2346 - Metro - Carpenter Creek N	0.0%	2.7E+02	100	206	16	17	3	1300	1300	1300	1300	1300	1300	1300	1325	1350	1300	1300	1000	1000	1000	1000	1000	1000	1000	1000	
2346 - Metro - Carpenter Creek N	1.2%	9.5E+03	100	182	16	17	3	1300	1300	1300	1300	1325	1325	1350	1350	1325	1300	1300	1300	1300	1300	1300	1300	1300	1300	1000	
2346 - Metro - Carpenter Creek N	1.5%	9.4E+03	82	183	16	17	3	1300	1300	1325	1000	1000	1000	1000	1000	1000	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300	

### 2346-Metro-Carpenter Creek N: Input and Output Data for Enhanced Shade Conditions

PROJECT	SHADE & HEAT		STREAM INFORMATION					RIPARIAN CODES -- LEFT BANK-- <i>code only vegetation that CWS is responsible for</i>										RIPARIAN CODES -- RIGHT BANK-- <i>code only vegetation that CWS is responsible for</i>									
	Effective Shade (%)	Thermal Load Blocked (kcal/d)	Segment Length (ft)	Orientation (0 deg=N)	Wetted Width (ft)	NSDZ Width (ft)	Channel Incision (ft)	LB 0-15 ft	LB 15-30 ft	LB 30-45ft	LB 45-60 ft	LB 60-75 ft	LB 75-90 ft	LB 90-105 ft	LB 105-120 ft	LB 120-135 ft	RB 0-15 ft	RB 15-30 ft	RB 30-45ft	RB 45-60 ft	RB 60-75 ft	RB 75-90 ft	RB 90-105 ft	RB 105-120 ft	RB 120-135 ft		
2346 - Metro - Carpenter Creek N	60.6%	4.7E+05	100	199	16	17	3	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	1000	1000	1000	1000	1000	1000	1000	
2346 - Metro - Carpenter Creek N	59.9%	4.6E+05	100	206	16	17	3	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	1000	1000	1000	1000	1000	1000	1000	
2346 - Metro - Carpenter Creek N	64.1%	4.9E+05	100	182	16	17	3	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1000	
2346 - Metro - Carpenter Creek N	63.8%	4.0E+05	82	183	16	17	3	1375	1375	1375	1000	1000	1000	1000	1000	1000	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	

## **Appendix B**

### **Documenting the Use of Public Conservation Funds**

## Appendix B: Documenting the Use of Public Conservation Funds

For riparian planting projects conducted in the agricultural areas through the Enhanced Conservation Reserve Enhancement Program (ECREP), Public Conservation Funds (PCFs) are used and the District takes credit based on its contribution to credit-generating activities. The percentage of credits available for District use is determined on a programmatic basis and accounts for the initial cost to implement the project, which includes site preparation and initial planting costs, and annual costs for monitoring and maintenance. The following methodology was used to determine the percentage of thermal credits available for District use.

At the time of project enrollment, each riparian planting project has typically undergone two to three years of site preparation and initial planting activities. As a result, the District's contribution and the amount of PCFs used to fund those initial activities are already known for each project. After enrollment, monitoring and maintenance activities are conducted for each project, including invasive species management, inter-planting, seeding and herbivore control.

Monitoring and maintenance costs are estimated based on more than 10 years of experience. The District estimated costs based on a 20-year monitoring and maintenance period. For the first five years after project enrollment when more significant maintenance would be required for plant establishment, the District estimated the annual cost for monitoring and maintenance would be \$2,500 per acre. For the next 10 years of the project (years 5-15), the District anticipated the annual cost for monitoring and maintenance will decrease to \$2,000 per acre. For the last five years of the 20-year period (years 15-20), the annual monitoring and maintenance cost is expected to further decrease to \$1,500 per acre.

Based on the District's ongoing experience with the ECREP program, the District conservatively estimated the amount of PCFs that would be available for monitoring and maintenance. For the first five years of the project, the District estimated a cost share of 80/20 between the District and the partner agencies would be available (i.e., 20 percent of the annual \$2,500/acre monitoring and maintenance cost would be funded using PCFs). For the next 10 years of the project (years 5-15), a 90/10 cost share is assumed (i.e. 10 percent of the annual \$2,000/acre monitoring and maintenance cost would be funded using PCFs). And for the last five years of the project, the District anticipates PCFs would not be available for monitoring and maintenance.

The assumptions made regarding the annual costs and the use of PCFs by project year are summarized in Table B-1.

**Table B-1. Annual Costs and Use of PCFs by Project Year**

<b>Project Year</b>	<b>Total Cost</b>	<b>Cost Share</b>	<b>Activities Conducted</b>
Pre-enrollment (2-3 years)	Project-specific	Project-specific	Site preparation, initial planting
Year 0-5	\$2,500 per acre	20 percent PCFs	Monitoring and maintenance
Year 5-15	\$2,000 per acre	10 percent PCFs	Monitoring and maintenance
Year 15-20	\$1,500 per acre	No PCFs used	Monitoring and maintenance, re-enrollment, stewardship

A present value of project costs is determined using a 3 percent inflation rate. The actual costs of the two to three years of initial planting and site preparation work are then added to the present-valued annual costs for the 20-year monitoring and maintenance period. The percentage

of the total cost that is the District's contribution is then determined for each project. The percentages for each project are then averaged to get a programmatic-percentage of the District's contribution toward credit-generating activities. This average percentage is then applied to each ECREP project to determine the amount of thermal credit available for District use.

The District implemented this methodology for the ECREP projects that have been enrolled in the trading program since the Permit was reissued in 2016. The District determined that 86 percent of the thermal credits are available on a programmatic basis for District use based on the District's current and anticipated future contributions toward credit-generating activities.



## **Appendix C**

### **Riparian Shade Planting Projects (2004-2017)**

## Appendix C: Riparian Shade Planting Projects (2004-2017)

Appendix C presents a summary of the 128 riparian shade projects currently enrolled in the District’s water quality trading program. The project name, credit year and project characteristics (wetted width and stream length) along with the thermal credit claimed by the District are presented in the table. The District takes thermal credits for those projects for which a valid contract or agreement is in place; all projects identified in Appendix C as being “active” are enrolled in the District’s water quality trading program.

**Table C-1: Riparian Shade Planting Projects (2004-2017)**

Project ID	Project Name	Project Status	Credit Year	Average Wetted Width (ft)	Segment Length (ft)*	CWS Thermal Credits (million kcal/d)
8	Butternut Creek - Bales Pond	Active	2004	4	300	0.29
121	Tualatin River - Thomas Dairy	Active	2004	210	500	3.16
122	Summer Creek - Fowler	Active	2004	10	1,600	1.55
123	Fanno Creek - Englewood	Active	2004	9	4,400	6.77
126	Rock Creek - Evergreen to Cornell	Active	2004	20	2,500	4.41
131	Rock Creek - WWTP	Active	2004	22	700	0.84
136	Johnson Creek South - Summercrest	Active	2004	2	1,800	0.60
138	Bronson Creek - W Union to Laidlaw	Active	2004	5	5,400	3.15
1166	Fanno Creek - OES Marsh	Active	2004	9	1,300	2.04
1767	Cedar Creek - Stella Olsen	Active	2004	15	1,500	4.08
10	Council Creek - Beal Pond	Active	2005	156	700	10.40
21	Rock Creek - Amberwood Natural Area	Active	2005	18	900	0.19
25	Dawson Creek - Evergreen Blvd	Active	2005	8	1,800	1.36
27	Rock Creek - Trail - Evergreen to Hwy 26	Active	2005	20	800	3.07
36	Beaverton Creek - Transit Center	Active	2005	12	1,500	2.70
78	North Johnson Creek - Cedar Mill Wetlands	Active	2005	13	800	0.08
95	95 - TSWCD - McFee Creek Tributary	Active	2005	2	2,700	0.97
124	Willow Creek - Bronson Rd	Active	2005	5	800	0.04
129	Sylvan Creek - Raleighwood Marsh	Active	2005	7	2,100	3.14
141	Fanno Creek - Hall Blvd to Ash Ave	Active	2005	21	2,100	6.45
142	Gales Creek - Tualatin River to Hwy 47	Active	2005	26	4,000	14.60
1040	Rock Creek - Golf Course to Bethany Pond	Active	2005	14	2,900	7.62
1421	Hedges Creek - Upper Marsh	Active	2005	13	900	1.69
138	Bronson Creek - W Union to Laidlaw	Active	2005	5	900	1.06
126	Rock Creek Evergreen to Cornell	Active	2005	20	3,400	8.69
131	Rock Creek - WWTP	Active	2005	22	2,300	4.27
18	Banks Elementary	Active	2006	2	600	0.19
65	Fanno Creek tributary - Downing to 125th	Active	2006	1	600	0.11
94	94 - TSWCD - East Fork Dairy Creek	Active	2006	12	5,300	4.12
96	96 - TSWCD - Tualatin River	Active	2006	47	6,300	25.30
97	97 - TSWCD - West Fork Dairy Creek	Active	2006	20	2,400	4.13
102	102 - TSWCD - West Fork Dairy Creek	Active	2006	8	1,300	0.21
114	114 - TSWCD - Tualatin River	Active	2006	45	1,800	7.30

**Table C-1: Riparian Shade Planting Projects (2004-2017) (Continued)**

Project ID	Project Name	Project Status	Credit Year	Average Wetted Width (ft)	Segment Length (ft)*	CWS Thermal Credits (million kcal/d)
137	Willow Creek - Beaverton Creek Confluence	Active	2006	12	1,300	1.43
1020	Dairy Creek - Davis Tool	Active	2006	42	4,900	4.76
1160	Johnson Creek - Lowami Hart Woods	Active	2006	6	500	0.52
1181	1181 - TSWCD - Tualatin River	Active	2006	30	10,700	14.90
1422	Beaverton Creek - 153rd to St Marys	Active	2006	9	4,900	9.36
10	Council Creek - Beal Pond	Active	2006	156	500	0.11
1767	Cedar Creek - Stella Olsen	Active	2006	15	700	1.12
123	Fanno Creek - Englewood	Active	2006	9	2,500	1.50
1141	1141 - TSWCD - Council Creek Tributary	Active	2007	4	6,300	4.64
104	104 - TSWCD - McFee Creek	Active	2007	8	1,500	0.73
105	105 - TSWCD - Tualatin River	Active	2007	33	1,800	5.81
109	109 - TSWCD - West Fork Dairy Creek	Active	2007	20	1,600	2.55
110	110 - TSWCD - Chicken Creek Tributary	Active	2007	3	800	0.40
112	112 - TSWCD - Tualatin River	Active	2007	43	8,200	31.30
125	Beaverton Creek - Quatama - 205th Ave to 231st Ave	Active	2007	23	7,300	13.90
132	Tualatin River - Gales Creek to Fernhill Rd	Active	2007	45	4,300	9.79
1140	1140 - TSWCD - Council Creek Tributary	Active	2007	9	1,100	2.18
1522	1522 - TSWCD - Abbey Creek	Active	2007	6	1,500	1.58
1524	1524 - TSWCD - Rock Creek	Active	2007	10	1,600	2.57
1767	Cedar Creek - Stella Olsen	Active	2007	15	700	0.34
12	Tualatin River - Metro King	Active	2008	57	800	3.61
117	Metro - Lovejoy	Active	2008	44	8,100	21.80
128	Bronson Creek - Tanasbrook Ponds	Active	2008	7	2,700	3.04
143	Gales Creek - B St to Hwy 47	Active	2008	23	3,300	4.49
1080	Fanno Creek - Greenway Park	Active	2008	11	6,000	9.15
1886	1886 - TSWCD - Abbey Creek Tributary	Active	2008	3	700	0.22
1907	1907 - TSWCD - West Fork Dairy Creek	Active	2008	10	600	0.01
1910	1910 - TSWCD - Tualatin River	Inactive	2008	13	6,300	4.97
1930	1930 - TSWCD - Bledsoe Creek	Active	2008	5	1,100	1.00
103	103 - TSWCD - East Fork Dairy Creek	Active	2009	11	3,100	0.81
107	107 - TSWCD - Tualatin River Tributary	Active	2009	5	600	0.03
108	108 - TSWCD - Tualatin River	Active	2009	50	3,600	5.19
113	113 - TSWCD - Chicken Creek	Active	2009	5	500	0.26
100	TRNWR - Dennis	Active	2009	120	4,700	3.48
115	Metro - Munger	Active	2009	120	2,100	0.69
2007	2007 - TSWCD - West Fork Dairy Creek	Active	2009	15	2,800	0.70
1080	Fanno Creek - Greenway Park	Active	2009	11	1,100	0.71
130	Tualatin River - Eagle Woods at Fern Hill	Active	2010	23	1,100	0.69
116	116 - TSWCD - East Fork Dairy Creek	Active	2010	36	2,900	5.38
1906	1906 - TSWCD - McKay Creek	Active	2010	20	5,900	8.74

**Table C-1: Riparian Shade Planting Projects (2004-2017) (Continued)**

Project ID	Project Name	Project Status	Credit Year	Average Wetted Width (ft)	Segment Length (ft)*	CWS Thermal Credits (million kcal/d)
2049	Rock Creek - Noble Woods	Active	2010	19	1,200	2.39
2051	2051 - TSWCD - Bledsoe Creek	Active	2010	5	2,700	2.36
2087	Gales Creek - Half Mile Lane	Active	2011	27	1,300	2.62
2097	2097 - TSWCD - Gales Creek	Active	2011	75	3,800	15.70
131	Rock Creek - WWTP	Active	2011	8	3,000	2.15
135	Willow Creek Enhancement	Active	2012	8	1,200	1.55
2106	2106 - TSWCD - Tualatin River	Active	2012	30	2,000	2.31
2122	2122 - TSWCD - Gales Creek	Active	2012	8	2,800	1.03
1181	1181 - TSWCD - Tualatin River	Active	2012	6	3,300	3.20
2100	2100 - TSWCD - Tualatin River	Active	2013	12	4,300	2.76
2101	2101 - TSWCD - Christensen Creek	Active	2013	3	1,700	1.07
2102	2102 - TSWCD - Christensen Creek	Active	2013	3	1,700	0.91
2103	2103 - TSWCD - Tualatin River	Active	2013	17	4,100	9.78
2126	2126 - TSWCD - Cedar Creek Tributary	Active	2013	2	600	0.17
2128	2128 - TSWCD - Jackson Creek	Active	2013	5	700	0.28
2129	2129 - TSWCD - Jackson Creek	Active	2013	5	700	0.45
124	Willow Creek - Bronson Rd	Active	2013	7	500	0.29
17	Durham City Park	Active	2014	20	4,200	3.48
2093	Barrows Meadows	Active	2014	6	800	0.16
2130	2130 - TSWCD - Gales Creek	Active	2014	35	5,100	11.30
2131	2131 - TSWCD - McKay Creek	Active	2014	30	4,200	5.74
2135	Bronson Creek Greenway	Active	2015	6	4,600	0.08
2137	2137 - TSWCD - Gales Creek	Active	2015	25	2,300	2.63
2138	2138 - TSWCD - Little Beaver Creek	Active	2015	8	600	0.71
2139	2139 - TSWCD - Carpenter Creek	Active	2015	6	4,000	1.74
2142	2142 - TSWCD - Little Beaver Creek	Active	2015	12	5,200	3.30
2168	Tualatin River Farm	Active	2015	66	2,800	0.89
1767	Cedar Creek - Stella Olsen	Active	2015	16	2,000	2.29
2099	2099 - TSWCD - Tualatin River	Active	2016	55	3,700	1.60
2199	TRNWR - Naujock	Active	2016	118	6,400	5.90
2163	2163 - TSWCD - Little Beaver Creek	Active	2016	4	1,400	0.98
2164	2164 - TSWCD - Gales Creek Tributary	Active	2016	25	2,100	0.15
2165	2165 - TSWCD - McKay Creek	Active	2016	12	3,700	0.05
2166	2166 - TSWCD - Dairy Creek	Active	2016	19	1,400	0.06
2184	Metro - Maroon Ponds Natural Area	Active	2016	45	2,700	3.30
2201	2201 - TSWCD - Tualatin River	Active	2016	52	2,300	2.80
2202	2202 - TSWCD - East Fork Dairy Creek	Active	2016	33	3,400	3.20
2203	2203 - TSWCD - Council Creek	Active	2016	7	1,100	0.10
2204	2204 - TSWCD - McKay Creek	Active	2016	30	2,500	3.20

**Table C-1: Riparian Shade Planting Projects (2004-2017) (Continued)**

Project ID	Project Name	Project Status	Credit Year	Average Wetted Width (ft)	Segment Length (ft)*	CWS Thermal Credits (million kcal/d)
2205	2205 - TSWCD - Tualatin River	Active	2016	64	3,000	0.31
2206	2206 - TSWCD - McFee Creek	Active	2016	11	600	0.27
2207	2207 - TSWCD - Tualatin River	Active	2016	50	500	0.26
2208	2208 - TSWCD - McKay Creek Tributary	Active	2016	9	2,100	2.20
2209	2209 - TSWCD - McKay Creek	Active	2016	28	1,100	0.32
2216	Beaverton Creek - Quatama - 197th Ave	Active	2016	32	1,700	1.30
2186	Metro - Woodard Natural Area	Active	2017	32	800	22.0
2190	Metro - Farmington Natural Area	Active	2017	123	600	0.83
2213	2213 - TSWCD - West Fork Dairy Creek	Active	2017	14	7,900	9.00
2218	Beaverton Creek - Quatama - 185th Ave	Active	2017	18	1,500	1.04
2260	2260 - TSWCD - McFee Creek	Active	2017	15	800	0.22
2261	2261 - TSWCD - Davis Creek	Active	2017	4	1,400	0.91
2262	2262 - TSWCD - Abbey Creek	Active	2017	4	1,500	0.19
2263	Fanno Creek - Crawford Reach	Active	2017	28	800	1.09
2265	Wapato View	Active	2017	2	5,000	1.41
2345	Metro - Carpenter Creek S	Active	2017	16	1,800	3.95
2346	Metro - Carpenter Creek N	Active	2017	16	400	0.90

\* Segment Length: Some projects were enrolled over multiple years. The Segment Length planted each year is specified for these projects, therefore the total stream length is greater than the mapped stream length.

\*\* CWS Thermal Credits are reported in this table as rounded values.

**Appendix D**  
**Additional Management Actions**

## Appendix D: Additional Management Actions

The following is a summary of actions at sites that did not provide anticipated shade as noted in previous annual reports. These sites will continue to be monitored for invasive species and plant survival. Completed and recommended management actions, as well as detailed monitoring data for these sites including recent stem density, cover and observed species can be found in the District's site assessment reports, which are available upon request.

- **Project 105 - TSWCD - Tualatin River:**

This project was planted with 7,550 native trees and shrubs in 2007 and has significant beaver activity. This site has had focused attention including invasive weed treatment and inter-planting as shown below:

- 2008: 2,700 plants
- 2009: 3,500 plants
- 2010: 2,400 plants
- 2013: 5,000 plants
- 2014: 3,000 plants
- 2016: 4,650 plants

Targeted invasive species treatment was completed in 2017 and is planned for 2018. Fifty established trees were caged in 2017 to prevent beaver herbivory. Seeding is planned for 2018.

- **Project 1907 - TSWCD - West Fork Dairy Creek:**

This project was planted with 3,542 native shrubs and trees in 2008 and has extensive wetland complexes, significant beaver and nutria activity and ongoing challenges with invasive grasses. Attention has been focused on this site including invasive weed treatment and inter-planting as shown below:

- 2009: 3,300 plants
- 2013: 4,000 plants
- 2015: 1,100 plants
- 2017: 700 plants

There is a planned inter-planting of 500 plants in 2018. Targeted invasive species treatment was completed in 2017 and is planned for 2018.

- **Project 1910 - TSWCD - Tualatin River:**

This project was planted with 15,180 native trees and shrubs in 2008 and has beaver activity. Attention has been focused on this site including invasive weed treatment and inter-planting as shown below:

- 2009: 7,000 plants
- 2010: 5,500 plants
- 2013: 5,700 plants

This site is currently between contracts with the landowner. Contract renewal is a priority and is being pursued as the District works to develop longer-term options and incentivize renewal.

- **Project 1421 - Hedges Creek – Upper Marsh:**

This project was planted with 750 native shrubs and trees in 2005 and has extensive wetland complexes, significant beaver activity and ongoing challenges with invasive reed canary grass. The site has had focused attention including invasive weed treatment and inter-planting as shown below:

- 2006: 2,092 plants
- 2009: 770 plants
- 2010: 1,450 plants
- 2012: 1,400 plants
- 2013: 1,500 plants
- 2015: 1,450 plants

There is a planned inter-planting during 2018 of 20,756 plants. Targeted invasive species treatment was completed in 2017 and is planned for 2018. Seeding is planned for 2018.

- **Project 97 - TSWCD - West Fork Dairy Creek:**

This project was planted with native trees and shrubs in 2006 and has significant beaver activity and ongoing challenges with invasive grasses. Attention has been focused on this site including invasive weed treatment and inter-planting as shown below:

- 2007: 6,700 plants
- 2008: 2,950 plants
- 2009: 3,490 plants
- 2010: 4,950 plants
- 2013: 19,900 plants
- 2015: 16,300 plants
- 2016: 10,185 plants
- 2017: 2,000 plants

Targeted invasive species treatment was completed in 2017 and is planned for 2018.

- **Project 129 - Sylvan Creek – Raleighwood Marsh:**

This project was planted with 3,630 native shrubs and trees in 2007 and has extensive wetland complexes, significant beaver activity and ongoing challenges with invasive reed canary grass. Attention has been focused on this site including invasive weed treatment and inter-planting as shown below:

- 2008: 120 plants
- 2010: 2,175 plants
- 2011: 4,500 plants
- 2012: 6,600 plants
- 2013: 2,000 plants
- 2014: 3,200 plants
- 2015: 4,265 plants
- 2017: 4,900 plants

There is a planned inter-planting during 2018 of 5,000 plants. Targeted invasive species treatment was completed in 2017 and is planned for 2018.



- **Project 135 - Willow Creek Enhancement:**

This project was planted with 700 native shrubs and trees in 2006 and has extensive wetland complexes, significant beaver activity and ongoing challenges with invasive yellow flag iris. Attention has been focused on this site including invasive weed treatment and inter-planting as shown below:

- 2007: 75 plants
- 2008: 2,100 plants
- 2011: 300 plants
- 2017: 300 plants

There is a planned inter-planting during 2018 of 2,000 plants. Targeted invasive species treatment was completed in 2017 and is planned for 2018.

## **Appendix E**

### **Identification of Trading Baselines for Flow Enhancement**

## Appendix E: Identification of Trading Baselines for Flow Enhancement

The following tables present daily average effluent flow and daily maximum effluent temperature from the Rock Creek WWTF, Durham WWTF and Forest Grove WWTF and NTS; daily average Tualatin River flow at the Farmington Bridge (River Mile 33); and daily average flow enhancement rate from Hagg Lake and Barney Reservoir for July and August 2017. This information is used to calculate the allowable thermal loads, the excess thermal loads discharged and flow enhancement credit for the Rock Creek WWTF, Durham WWTF and Forest Grove WWTF and NTS.

**Table E-1: Trading Baseline for Flow Enhancement for July 2017**

Date	Durham WWTF Effluent Flow (MGD)	Durham WWTF Effluent Temperature (C)	Rock Creek WWTF Effluent Flow (MGD)	Rock Creek WWTF Effluent Temperature (C)	Forest Grove WWTF Effluent Flow (MGD)	Forest Grove NTS Effluent Temperature (C)	Farmington Flow (cfs)	Farmington - Rock Creek WWTF Flow (cfs)	CWS Hagg Release (cfs)	CWS Barney Release (cfs)	Total Flow Enhancement Rate (cfs)
7/1/2017	16.4	21.7	31.7	22.1	1.7	23.9	242	192.9	20	0	20
7/2/2017	16.9	21.9	32.7	22.2	1.6	22.8	240	189.4	20	0	20
7/3/2017	16.8	21.9	32.0	22.0	1.6	23.3	239	189.5	20	0	20
7/4/2017	16.5	22.0	31.7	22.2	1.5	23.9	227	178.0	20	0	20
7/5/2017	17.0	22.2	31.9	22.3	1.6	22.8	232	182.7	20	0	20
7/6/2017	17.4	22.2	33.8	22.4	1.6	24.4	229	176.7	20	0	20
7/7/2017	17.2	21.8	32.0	22.1	1.6	23.3	224	174.6	20	0	20
7/8/2017	17.6	22.2	31.8	22.4	1.6	23.9	222	172.8	20	0	20
7/9/2017	18.1	22.4	32.5	22.5	1.7	23.9	223	172.8	20	0	20
7/10/2017	17.1	22.3	28.7	22.5	2.3	24.4	213	168.6	20	0	20
7/11/2017	17.4	22.3	31.3	22.5	1.8	23.9	199	150.5	20	0	20
7/12/2017	17.4	22.4	31.3	22.7	2.3	23.9	193	144.6	30	0	30
7/13/2017	17.2	22.3	30.4	22.5	2.2	23.3	196	149.0	30	0	30
7/14/2017	17.0	22.6	30.3	22.8	2.5	23.3	197	150.2	30	0	30
7/15/2017	16.9	22.7	29.8	22.9	2.5	23.3	197	150.9	50	0	50
7/16/2017	17.4	22.4	30.8	22.6	2.5	22.8	211	163.4	50	0	50
7/17/2017	17.4	22.5	30.3	22.7	3.1	22.8	218	171.2	50	0	50
7/18/2017	17.2	22.7	30.2	22.9	3.3	24.4	210	163.2	50	0	50
7/19/2017	17.3	22.8	29.6	23.0	3.2	23.3	201	155.2	50	0	50
7/20/2017	17.0	22.5	29.8	22.7	3.5	22.2	205	158.9	50	0	50
7/21/2017	17.1	22.9	29.4	23.1	3.7	23.9	200	154.5	50	0	50
7/22/2017	16.9	23.3	29.8	23.4	3.6	23.3	210	163.9	50	0	50
7/23/2017	17.6	23.3	29.6	23.4	3.5	24.4	209	163.3	50	0	50
7/24/2017	17.2	23.1	30.0	23.3	3.7	23.9	202	155.6	50	0	50
7/25/2017	17.4	23.2	29.3	23.4	3.7	24.4	197	151.8	50	0	50
7/26/2017	17.2	23.3	29.4	23.5	3.6	23.9	183	137.6	50	0	50
7/27/2017	17.1	23.0	30.3	23.4	2.9	23.9	183	136.1	50	0	50
7/28/2017	17.2	23.1	30.5	23.3	2.6	23.9	189	141.8	50	0	50
7/29/2017	16.6	23.2	29.8	23.2	2.6	23.9	188	142.0	50	0	50
7/30/2017	17.5	23.3	30.6	23.4	2.8	23.9	188	140.7	50	0	50
7/31/2017	17.1	23.4	33.0	23.4	0.0	20.0	191	139.9	50	0	50

**Table E-2: Trading Baseline for Flow Enhancement for August 2017**

Date	Durham WWTF Effluent Flow (MGD)	Durham WWTF Effluent Temperature (C)	Rock Creek WWTF Effluent Flow (MGD)	Rock Creek WWTF Effluent Temperature (C)	Forest Grove WWTF Effluent Flow (MGD)	Forest Grove NTS Effluent Temperature (C)	Farmington Flow (cfs)	Farmington - Rock Creek WWTF Flow (cfs)	CWS Hagg Release (cfs)	CWS Barney Release (cfs)	Total Flow Enhancement Rate (cfs)
8/1/2017	16.6	23.4	32.2	23.5	0	0	177.0	127.1	50	0.0	50
8/2/2017	17.4	23.7	32.6	23.6	0	0	167.0	116.6	50	0.0	50
8/3/2017	16.4	23.8	31.9	23.7	0	0	167.0	117.6	50	0.0	50
8/4/2017	16.8	23.9	32.0	23.9	0	0	176.0	126.5	50	0.0	50
8/5/2017	16.9	23.8	31.8	23.9	0	0	182.0	132.8	50	0.0	50
8/6/2017	17.6	23.8	33.2	23.7	0	0	193.0	141.6	50	0.0	50
8/7/2017	18.1	23.9	33.8	23.9	0	0	205.0	152.7	50	0.0	50
8/8/2017	17.3	23.9	33.4	23.9	0	0	195.0	143.4	50	0.0	50
8/9/2017	17.4	24.1	33.8	24.0	0	0	173.0	120.8	50	0.0	50
8/10/2017	16.4	24.2	33.2	24.1	0	0	166.0	114.6	50	0.0	50
8/11/2017	16.4	24.0	32.5	24.1	0	0	166.0	115.7	50	0.0	50
8/12/2017	16.5	23.7	32.4	23.8	0	0	169.0	118.8	50	0.0	50
8/13/2017	17.5	23.3	33.8	23.4	0	0	173.0	120.7	50	0.0	50
8/14/2017	17.5	23.2	33.2	23.2	0	0	196.0	144.7	50	0.0	50
8/15/2017	17.4	23.3	33.3	23.4	0	0	194.0	142.5	50	0.0	50
8/16/2017	16.5	23.5	34.4	23.5	0	0	167.0	113.8	50	0.0	50
8/17/2017	16.1	23.6	33.2	23.6	0	0	158.0	106.7	50	0.0	50
8/18/2017	16.2	23.8	33.0	23.6	0	0	154.0	102.9	50	0.0	50
8/19/2017	16.2	23.6	32.2	23.5	0	0	159.0	109.2	60	0.0	60
8/20/2017	16.1	23.4	33.0	23.3	0	0	164.0	113.0	60	0.0	60
8/21/2017	16.2	23.6	32.8	23.5	0	0	171.0	120.3	60	0.0	60
8/22/2017	23.7	23.7	33.7	23.8	0	0	167.0	114.9	60	0.0	60
8/23/2017	18.0	23.6	35.8	23.8	0	0	161.0	105.6	60	0.0	60
8/24/2017	16.8	23.6	32.4	23.7	0	0	155.0	104.8	60	0.0	60
8/25/2017	16.9	23.5	31.8	23.6	0	0	162.0	112.9	60	0.0	60
8/26/2017	16.4	23.6	31.8	23.7	0	0	162.0	112.8	65	0.0	65
8/27/2017	17.0	23.7	32.5	23.8	0	0	168.0	117.8	65	0.0	65
8/28/2017	16.9	23.9	30.8	24.0	0	0	178.0	130.3	65	0.0	65
8/29/2017	17.1	23.9	30.5	24.0	0	0	167.0	119.9	65	0.0	65
8/30/2017	16.9	23.8	30.3	23.9	0	0	159.0	112.1	65	0.0	65
8/31/2017	16.7	23.9	34.5	24.0	0	0	160.0	106.6	65	0.0	65

## **Appendix F**

### **Riparian Codes for Shade-a-Lator**

## Appendix F: Riparian Codes for Shade-a-Lator

			Height	Density	OH
Code	Source	Description	(m)	(%)	(m)
1000	CWS	Not in project	0.0	0%	0.0
1175	CWS	Forest fully vegetated	18.3	75%	3.0
1150	CWS	Forest partially vegetated	18.3	50%	3.0
1125	CWS	Forest partially vegetated	18.3	25%	3.0
1100	CWS	No existing forest vegetation	0.0	0%	0.0
1375	CWS	Wetland fully vegetated	6.1	75%	0.6
1350	CWS	Wetland partially vegetated	6.1	50%	0.6
1325	CWS	Wetland partially vegetated	6.1	25%	0.6
1300	CWS	No existing wetland vegetation	0.0	0%	0.0