



ENVIRONMENTAL MANAGEMENT  
& CONSULTING

**Tod Creek Golden Willow Removal Project - Whitehead Park, Saanich, BC  
September 2010**



Prepared for:  
District of Saanich  
770 Vernon Avenue  
Victoria, BC V8X 2W7

Prepared by:  
TerraWest Environmental Inc.

Project File: DSWP10-01

10 November 2010

---

## EXECUTIVE SUMMARY

The District of Saanich had the opportunity to include streamside habitat enhancements on Tod Creek during a recent playground improvement project in Whitehead Park on Goward and Prospect Lake Roads. The habitat work involved removing invasive golden willow and English hawthorn trees in the upper and stream-side riparian zones of Tod Creek where the creek originates from Prospect Lake. Additional work included the removal of in-stream logs of sprouting golden willow that were likely restricting flows from Prospect Lake. TerraWest Environmental was engaged to provide the services of a qualified environmental professional to develop and implement Best Management Practices (BMPs) and perform environmental monitoring for the project. Saanich provided Notification of Changes In and About a Stream to the BC Ministry of Environment under Section 9 of the *Water Act* and Part 7 of the *Water Act Regulations*.

Due to the sensitive ecosystem of the creek, certain safeguards were employed to ensure the prevention of harm to creek or the release of deleterious substances to the creek. BMPs were followed based on the recommendations of *A User's Guide to Working In and Around Water*, *Environmental Monitoring for Construction Projects* (Malaspina), and the Department of Fisheries and Oceans Operational Statement *Aquatic Vegetation Removal in Lakes*.

Between September 9<sup>th</sup> and 30<sup>th</sup>, approximately sixty-one golden willow and two English hawthorn trees were removed, in addition to approximately 23-30 m<sup>3</sup> of in-stream willow material and stump grindings. Site restoration includes a detailed planting plan of site-appropriate native trees and shrubs. Planting and maintenance to control willow suckers from root stock will be done by volunteers from the Friends of Tod Creek Watershed, under the direction of Saanich Parks staff.

## TABLE OF CONTENTS

Executive Summary .....	i
1.0 Introduction .....	1
2.0 Project Location .....	1
3.0 Project Participants .....	1
4.0 Project Description .....	2
5.0 Notices and Permits .....	2
6.0 Site Description .....	3
6.1 Vegetation .....	3
6.2 Water Quality .....	4
7.0 Project Results .....	5
7.1 Timing and Fish Salvage .....	6
<b>Table 1:</b> Reduced Risk Work Windows for Fish and Wildlife.....	6
<b>Table 2:</b> Fish Salvage Results.....	7
7.2 Upland and Riparian Bank Tree Removal.....	7
7.3 In-Stream Tree and Vegetation Removal .....	8
7.4 Invasive Material Removed .....	9
7.5 Erosion and Sediment Control Monitoring .....	9
7.6 Site Restoration .....	10
8.0 Restoration Monitoring .....	10
8.1 Photo Point Station .....	10
8.2 Sediment Depth Stations .....	11
9.0 Recommendations .....	12
9.1 Site Specific Recommendations .....	12
9.2 Future Golden Willow Removal Recommendations .....	13
10.0 Conclusions .....	14

## **FIGURES**

Figure 1      Tod Creek Golden Willow Removal Project - Whitehead Park, Saanich, BC

## **APPENDICES**

- Appendix A   Golden Willow Management Strategies for Saanich Riparian Areas- Polster  
                         Environmental
- Appendix B   Government Permits and Correspondence
- Appendix C   Best Management Practices
- Appendix D   Fish Trapping Permits and Reports
- Appendix E   Saanich Planting Plan
- Appendix F   Project Photos

---

## 1.0 Introduction

In 2010, the District of Saanich had the opportunity to include streamside habitat enhancements on Tod Creek during a recent playground improvement project in Whitehead Park on Goward and Prospect Lake Roads. The habitat work involved removing invasive golden willow (*Salix alba* L. ssp. *vitellina* (L.) Arcang) and English hawthorn (*Crataegus monogyna*) trees in the upper and stream-side riparian zones of Tod Creek where the creek originates from Prospect Lake. Additional work included the removal of in-stream logs of sprouting golden willow that were likely restricting flows from Prospect Lake. Site restoration includes a detailed planting plan of site-appropriate native trees and shrubs and multi-year maintenance to control willow suckers from root stock. TerraWest Environmental was engaged to provide the services of a Qualified Environmental Professional (QEP) to develop, implement, and monitor Best Management Practices (BMPs) during the upland and in-stream tree removal, oversee the stabilization of the site following removals, perform interim site management, and review and revise the proposed planting plan (provided by Saanich) as necessary.

## 2.0 Project Location

Whitehead Park is located in the District of Saanich at the intersection of Goward and Prospect Lake Roads (Figure 1). The park is adjacent to Prospect Lake where the outflow constitutes the headwaters of Tod Creek, which flows into Saanich Inlet. The project site extends from in-stream vegetation at the head of the creek along the lake edge, to approximately 77 m downstream where the creek flows under Goward Road.

## 3.0 Project Participants

**District of Saanich Parks Department (Saanich)** – Proponent.

**TerraWest Environmental (TerraWest)** – QEP provided to develop, implement, and monitor BMPs for willow removal, oversee stabilization of site, perform interim site

management, and review and revise proposed planting plan (by Saanich) as necessary.

**Davey Tree Expert Co. of Canada Ltd. (Davey Tree)** – Tree felling, stump grinding, in-stream willow removal, and removal of all willow waste upon project completion.

**G&E Equipment Rentals Ltd. (G&E)** – Construction of upland playground area and gravel chip trails, assist in willow removal where needed.

**Friends of Tod Creek Watershed** – Ongoing volunteer invasive plant clearing, native species planting, and stream stewardship.

## 4.0 Project Description

- Streamside golden willow and English hawthorn to be felled with the stumps chipped down to ground level with the root system remaining in place for bank stability. Many of these trunks are at water level and are partially inundated. Repeated cutting of new shoots to deplete root energy will be a multi-year effort employing recommendations for controlling golden willow by Dave Polster in *Golden Willow Management Strategies* (Appendix A).
- Upland golden willows to the west of the creek to be felled and their root systems to be pulled up with heavy machinery already on site<sup>1</sup>.
- In-stream golden willow growing across head of creek to be removed where possible.
- Native trees and shrubs to be planted to provide shade for Tod Creek. Planting program to be completed by Friends of Tod Creek Watershed volunteers supervised by Saanich staff.

## 5.0 NOTICES AND PERMITS

The District of Saanich submitted Notification to the Ministry of Environment (MoE) for these works as per Section 9 of the *Water Act* and Part 7 of the *Water Act Regulations*

---

<sup>1</sup> Due to the extent of these root systems, these were left in-situ and the stumps chipped down to below ground level.

(case id: N1-3026 ~ Whitehead Park, 5079 Prospect Lake Rd, Tod Creek ATS 47746; Appendix B). The Department of Fisheries and Oceans Canada (DFO) Duncan, Vancouver Island was also notified.

Due to the strong likelihood of the proposed works to mobilize the thick sediment layer in the creek, fish collection permits for scientific purposes were obtained from MoE and DFO to salvage fish species prior to in-stream works (MoE: NA10-65766; DFO: XHAB-169-2010)(Appendix D).

Because of a delay in receiving fish collection permits, permission was given on September 8, 2010 by Kevin Telfer, MOE Ecosystem Biologist/Habitat Officer in Nanaimo, to work beyond the fisheries window of September 15<sup>th</sup>, with the caution that extra diligence would be required to avoid sedimentation to the stream (Appendix B).

## **6.0 Site Description**

### **6.1 Vegetation**

The site was visited on August 13 and 27, 2010. Four mature multi-trunked golden willows are located in the park on a level to gently sloped grassy area between 30-10 m from the west bank of Tod Creek. These trees are believed to have been planted in the 1920s and are likely the source of golden willow stock the length of Tod Creek, extending into Saanich Inlet. The west bank of the creek at the project site is made up almost entirely of mature golden willow and suckers, with clumps of native willows<sup>2</sup>. The east bank is mainly composed of red alder (*Alnus rubra*) with two English hawthorn and approximately ten golden willows of varying ages at the southern end. One Pacific willow (*Salix lucida* ssp. *lasiandra*) was noted mid-way along the east bank. The southernmost (upstream) 20 m of the creek immediately adjacent to the lake are choked with golden willow suckers growing in-stream from logs or roots (Appendix F -

---

<sup>2</sup> Likely Scouler's (*Salix scouleriana*) or Sitka (*Salix sitchensis*).

Photos). Other in-stream vegetation appears to be composed of native species including slough sedge (*Carex obnupta*), narrow-leaved bur-reed (*Sparganium angustifolium*), cattail (*Typha latifolia*), and cow lily (*Nuphar polysepalum*). Also present on the western riparian edge is the highly invasive yellow flag iris (*Iris pseudacorus*).

## **6.2 Water Quality**

Water chemistry measurements were taken on August 27, 2010 in four locations: (A) at the furthest downstream end of the proposed project works south of Goward Road; (B) midway along the proposed works approximately 30 m south of Goward Road; (C) approximately 5 m north of Prospect Lake in the golden willow suckers; and (D) at the southern edge of the proposed works on the lake side of the golden willow suckers. The results were as follows:

A – turbidity 1.3 NTU, pH 6.6, depth at centre 25 cm

B – dissolved oxygen  $\leq 3.5$  mg/L, temp 15.5 °C, specific conductivity 92  $\mu$ S

C – dissolved oxygen  $\leq 6.0$  mg/L, temp 17.8 °C, specific conductivity 97  $\mu$ S

D – dissolved oxygen  $\geq 12.8$  mg/L (142%), temp 21.3 °C, depth at centre 120 cm

The flow of the creek was not estimated as surface movement was barely detectable during the duration of the project, even in heavy rain. Discussions with residents in the area indicate that there is a water control structure in Tod Creek, immediately downstream of Goward Road. Residents indicated that lake levels had remained higher than normal throughout the summer (N. Penn, pers. comm., Sept 2010). The downstream water depth at Goward Road is approximately 25 cm and the water column itself remains shallow until immediately adjacent to the lake edge. However, accumulated organic debris has created a very thick, but highly unstable false bottom to the creek, making wading out from the western bank unsafe for the greater part of the proposed works reach. The true bottom at location B less than 0.5 m from shore was >60 cm deeper than the 25 cm free-flowing water depth. This was the case at numerous locations along the reach. Dissolved oxygen levels along the majority of the reach were below that expected to support healthy fish populations. No fish were noted at



locations A, B, or C. Supersaturated dissolved oxygen levels and high water temperature were measured in the thick willow suckers targeted for removal. This area was heavily populated with small or juvenile fish (unidentified).

The following fish species are listed in the Fisheries Information Summary System (FISS) database:

- Tod Creek: Bass/Sunfish (General), Brook Trout, Brown Catfish (formerly Brown Bullhead), Coho Salmon, Cutthroat Trout, Prickly Sculpin, Pumpkinseed, Rainbow Trout, Smallmouth Bass, Threespine Stickleback.
- Prospect Lake: Brown Catfish, Cutthroat Trout, Prickly Sculpin, Pumpkinseed, Rainbow Trout, Smallmouth Bass, Unidentifiable Trout - only fry <70mm in length, Westslope (Yellowstone) Cutthroat Trout.

## **7.0 Project Results**

Due to the sensitive ecosystem of the creek, certain safeguards were employed to ensure the prevention of harm to the creek or the release of deleterious substances to the creek. BMPs were followed based on the recommendations of A User's Guide to Working In and Around Water, Environmental Monitoring for Construction Projects (Malaspina), and the Department of Fisheries and Oceans Operational Statement Aquatic Vegetation Removal in Lakes.

BMPs were developed prior to project works proceeding and submitted to Saanich for distribution to MoE and the project contractors Davey Tree and G&E (Appendix C). BMPs were adapted by the QEP as needed due to work plan alterations and changes in vegetation removal methodology. The following list includes changes made as work proceeded.

## 7.1 Timing and Fish Salvage

The aquatic vegetation removal was initially timed to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows August 15<sup>th</sup> to September 15<sup>th</sup>, where possible, for species documented in Tod Creek and Prospect Lake according to the FISS database.

**Table 1.** Reduced Risk Work Windows for Fish and Wildlife for Vancouver Island

Location	Species	Start Date	Finish Date
Throughout	All Species	June 15	September 15
Throughout	Rainbow Trout	August 15	September 15
Throughout	Cutthroat Trout	August 15	September 15
Throughout	Coho	June 15	September 15

As noted in Notices and Permits – Section 5.0, permission was given to proceed beyond September 15<sup>th</sup>. In part, observations of fish presence and the low dissolved oxygen (DO) documented on site on August 27<sup>th</sup> were considered when requesting the fisheries window work extension. A water column DO of 8 mg/L O<sub>2</sub> is considered a minimum long-term threshold for fish health, particularly salmonids, with instantaneous thresholds of no less than 5 mg/L O<sub>2</sub><sup>3</sup>.

On September 14<sup>th</sup> and 16<sup>th</sup>, DFO and MoE fish collection permits were received to proceed with fish salvage activities. On September 14<sup>th</sup> and 15<sup>th</sup> TerraWest installed work site and fish sequestering barriers on the upper and lower extents of the work site. At the north end of the site a sandbag dam of 5 mm washed stone was installed with lengths of 4-inch perforated pvc covered in landscape cloth to allow stream flow. At the south end of the site a combination of a floating silt curtain, sandbags and silt barrier cloth was used to create a barrier between the furthest extent of in-stream willow and Prospect Lake (Photos 19-20).

---

<sup>3</sup> C. Barlow, pers. comm., 2010; British Columbia Ministry of Environment. 1997. Ambient Water Quality Criteria for Dissolved Oxygen. Envr. Prot. Div. website:  
[http://www.env.gov.bc.ca/wat/wq/BCguidelines/do/do\\_over.html](http://www.env.gov.bc.ca/wat/wq/BCguidelines/do/do_over.html).

During September 18<sup>th</sup> to 20<sup>th</sup> fish salvage was conducted with two days of ~ 24-hour G-trap sets of 15 traps each. Fish catch and release results are in Table 2.

**Table 2 – Fish Salvage Results**

Traps set September 18 <sup>th</sup> and emptied September 19 <sup>th</sup> :		
Pumpkinseed sunfish (juveniles)	<i>Lepomis gibbosus</i>	345 (+6 dead)
Brown catfish	<i>Ameiurus nebulosus</i>	12
Prickly sculpin	<i>Cottus asper</i>	4
Three-spine stickleback	<i>Gasterosteus aculeatus</i>	1
American bullfrog	<i>Rana catesbeiana</i>	1
Traps set September 19 <sup>th</sup> and emptied September 20 <sup>th</sup> :		
Pumpkinseed sunfish (juveniles)	<i>Lepomis gibbosus</i>	150 (+148 dead)
Brown catfish	<i>Ameiurus nebulosus</i>	2
Prickly sculpin	<i>Cottus asper</i>	1 (+1 dead)
Three-spine stickleback	<i>Gasterosteus aculeatus</i>	(1 dead)
Crayfish	<i>Pacifastacus leniusculus</i> (likely)	4

All living catches were released back into either Prospect Lake or downstream of Goward Road, depending on which site was closer in habitat characteristics to the original trap site. All Pumpkinseed sunfish were released due to the difficulty in distinguishing between juveniles of the invasive Pumpkinseed with the stocked (but non-native) Smallmouth bass (*Micropterus dolomieu*). Fish mortalities were likely the result of decreasing DO during overnight plant respiration. Indeed, Pumpkinseed sunfish and Three-spine stickleback are often indicator species of this condition and are frequently present in degraded water quality conditions (Barlow pers. com. 2010). No salmonids were trapped. Fish trapping results have been filed with MoE in their online database as per permit requirements and with DFO as a print report (Appendix D).

## **7.2 Upland and Riparian Bank Tree Removal**

The project works started on September 9, 2010 with the removal of the upslope willows and riparian willows with non-submergent trunks on the west side of the site by Davey

Tree services (see Photos). The decision to chip trunks to below ground level was made by Saanich staff on-site as a better alternative to root ball excavation for the four large, multi-trunked upslope willows, due to the size of these trees and the volume of the potential excavation.

Stump chipping at the water's edge created more debris than initially anticipated. While the machinery used for stump chipping generally directed the chip waste stream away from the stream edge, a large volume of waste was created on the water side of each stump. A combination of plywood and tarps with attached floats was used to prevent wood chips and sawdust from entering the creek (Photos 21-22). Accumulated sawdust was removed with rakes and by hand in order to avoid suspension of materials during winter high water levels and potential flooding. Davey Tree spent a total of 8 days felling, chipping and clearing debris from the upland and riparian tree control portion of the project.

### **7.3 In-Stream Tree and Vegetation Removal**

Removal of in-stream willow trees and suckers from submerged logs began on 20 September after the finish of fish salvaging. Disturbance was minimized by using an overhead crane (HIAB) to lift sprouting willow logs semi-vertically from the creek bottom and lake edge. Due to the thick organic layer in the stream bottom, much of the sprouted logs dislodged easily and a small rowboat combined with the HIAB was used for much of this work. However, because of this loose layer, large amounts of suspended sediments during the in-stream works were unavoidable. The lack of any current during this project (likely due to the control structure discussed in Water Quality - Section 6.2) allowed all sediment clouds to remain localized around the immediate work area and the majority of sediment re-settled within 24 hours.

At least one massive, semi-submerged root mat from 6-8 young trees sat relatively loosely on the sediment layer. Two attempts were made to lift this mat out, but the bank

side edge was firmly, though thinly, attached and the HIAB was unable to remove it. This mat remains in place. A small number of golden willow saplings rooted in a small, semi-submerged "island" to the east of the creek on the lake edge were left as they were well outside of the sediment containment area. In-stream work was completed in two days and site clean up ended on September 30<sup>th</sup>.

#### **7.4 Invasive Material Removed**

According to Davey Tree, two English hawthorn and approximately sixty-one golden willow trees were felled and removed from the site. The additional volume of in-stream sprouting willows was considerable and is roughly estimated at 23-30 m<sup>3</sup>.

#### **7.5 Erosion and Sediment Control Monitoring**

Turbid water from the parking lot was noted entering the creek adjacent to Goward Road on September 19<sup>th</sup>. Upon QEP recommendation Saanich immediately used a street sweeper to clear the roadway and parking lot of accumulated sediment from playground construction activities. Rainfall records were broken the previous day. September broke rainfall records in Victoria with 112.3 mm rainfall, while the norm is 30.4 mm (previous record 86.4 mm in 1959). Two records for individual dates in September were also broken on the 12<sup>th</sup> (11 mm, previous record 6.1 mm in 1940) and 18<sup>th</sup> (28.6 mm, previous record 16.4 mm in 1983)<sup>4</sup>. Both of these days occurred on weekends and no equipment was active on-site.

Tree removal work was halted on the following day, September 20<sup>th</sup>, due to this heavy rain and saturated conditions. An additional work day was halted on September 24<sup>th</sup> due to heavy rain and saturated conditions, in addition to mis-communication with an excavator crew conducting the removal of the in-stream vegetation pile at the west side of the creek (Photos 23-24). The remainder of the removal work was completed by

---

<sup>4</sup> Times-Colonist. 2010. September a month to remember for its rain. Oct 2.  
<http://www.timescolonist.com/September+month+remember+rain/3613873/story.html>

Davey Tree using a HIAB truck operating from the road edge where possible and in the previous excavator tracks where necessary.

## **7.6 Site Restoration**

The upstream silt curtain was removed on September 30, 2010, after allowing a week for any remaining suspended sediment to settle. The downstream dam and remaining upstream sandbags were removed on October 5<sup>th</sup>, after receiving permission from MoE to spread the 5 mm stone contents of the bags in-situ, as an amendment to the degraded stream substrate (K. Telfer, pers. comm. Oct 2010; Photo 27).

Patches of bare soil from tire marks on the west side of the creek were re-seeded on October 1, 2010 with a fast-sprouting fall grass mix. Much of this was sprouting as of October 5<sup>th</sup>. Planting with native species by volunteers began in November, as per District of Saanich Planting Plan specifications (Appendix E). Planting will be done by Saanich staff and volunteers using locally harvested native stock and monitored by Saanich staff and volunteers.

## **8.0 Restoration Monitoring**

### **8.1 Photo Point Stations**

Monitoring of restoration projects with long lifespans is facilitated by using established photo point stations where repeatable and consistent photo updates allow direct comparisons to be made of the ongoing stages of the project. Photo point monitoring stations are described by location, direction and frame of reference. Four stations with a total of six views were used for the willow removal activities and are suggested for the ongoing monitoring of this project on a twice yearly basis. Photo point stations are described below and marked on Figure 1. Station 4 was established after the extent of works was expanded to include a greater number of willows on the east bank and no

pre-project photos were taken. Additional stations and in-photo metre boards, or a similar equivalent, are recommended where they will best demonstrate the progress of native planting.

- Station 1a & 1b – From the north side of the Goward Road bridge. 1a: View southwest, including midline of creek (left). 1b: View southwest, edge of large alder (right).
- Station 2 – From the path at the edge of the Goward Road parking lot. View south-southwest, including large alder on left and weeping willow and tall conifer on right.
- Station 3a & b – From south edge of mowed park area next to lake and large weeping willow. 3A: View east, including aquatic vegetation on far shore on right and lakeside alder saplings on left. 3B: View northeast, including lakeside alder sampling (right) and path (left).
- Station 4 – From Goward Road, south of bridge approx. 60 m. View west across clearing from top of deer trail.

## **8.2 Sediment Depth Stations**

Water quality and fish presence at the site are greatly diminished by extremely thick and unconsolidated organic sediment, in many places 1 – 3 m (4 – 10 ft) deep. Two sediment depth monitoring stations have been established along the creek and should be periodically measured (at least twice annually) to record the rehabilitation of the stream bed as accumulated sediment decays or is mobilized during strong flows. The two monitoring stations are shown in Figure 1 and in Photos 25 and 26.

- Station S1 – 6 ft length of rebar solidly placed in stream bed, located off the west bank 30 m south of Goward Road bridge at edge of submerged willow root mats. Depth from top of rebar to sediment layer on 30 September 2010 measured 0.54 m (21 in.). Sediment layer here approximately 1 m (4 ft) deep.
- Station S2 – 10 ft length of rebar loosely in place in remaining willow trunk root structure, located off the east bank approximately 60 m south of Goward Road.

The depth of loose sediments in this location did not allow for the rebar to be firmly placed. A longer piece of rebar should be considered for this station. The bottom sediments in this location on September 30, 2010 were greater than 2.7 m (9 ft) in thickness [0.3 m (1 ft) from top of rebar to top of sediment layer]. For reference, the top of the rebar rested 0.3 m (1 ft) below the top of the willow stump adjacent.

## **9.0 Recommendations**

### **9.1 Site Specific Recommendations**

- Communicate with new operators of Tod Creek water control structure immediately downstream of Goward Road. This weir is currently holding back flows from Prospect Lake. The removal of control gates needs to be carefully monitored to ensure against a sudden great increase in flow through the work site. Flows may mobilize the considerable depth of unconsolidated sediment that is no longer retained by in-stream vegetation and root structures and has been disrupted by restoration activities.
- Continue to implement recommended BMPs during ongoing playground/park improvement construction activities (Appendix C).
- Continue street sweeping Goward Road and parking spaces adjacent to park at regular intervals during ongoing playground/park improvement construction activities. Silty water from this area was noted entering the creek on September 19, 2010.
- Monitor rebar sediment stations twice annually to record the rehabilitation of the stream bed as accumulated sediment decays or is mobilized throughout the year.
- Conduct a final sweep of the site to remove remaining willow twigs and branches from the riparian area. [Note: Very thorough volunteer activities as of November 1, 2010 have accomplished this on the west bank.]



- Consider requesting permission from MoE and DFO to allow volunteers to monitor the stream bed in the project area for willow twigs or branches and remove them before sprouting begins. A potato rake works well for this task. Care should be taken to avoid disturbing bottom sediments as much as possible, and fish spawning/nesting times should be avoided<sup>5</sup>.
- Continue to implement the strategies in Polster's *Golden Willow Management Strategies* including repeated efforts at cutting willow suckers, taking care that suckers do not enter the creek. "All new sprouts should be cut every two to three weeks, using hand tools, through the growing season and plants should be cut down to the ground as much as possible so the maximum amount of energy is used re-growing and no energy is gained from photosynthesis of the stems" (Appendix A).
- Additionally (from Polster), "Monitoring should focus on determining if the golden willows are re-growing. In addition, monitoring should be conducted to ensure the planted native species have established well and are providing the anticipated bank holding functions. Frequency of monitoring should be relatively high during the early years following treatment and reduced in future years as the project matures. Monitoring should consist of a visual inspection of project performance as well as photographic monitoring from some strategic location to document changes in the vegetation at the treatment sites" (Appendix A). Photopoint monitoring locations are shown in Figure 1.
- Continue to monitor planting success beyond the March 2011 fiscal year end.

## **9.2 Future Golden Willow Removal Recommendations**

- Devise a method during felling for preventing willow twigs and branches from entering into any waterbodies, if possible, as these will almost certainly sprout, re-creating the problem years into the future.

---

<sup>5</sup> MoE and DFO should be consulted further regarding this activity. However, water quality due to the biological oxygen demand of accumulated sediments is very poor and does not appear to support a healthy fish assemblage in the project area.

- Plan for the additional work to rake or net out willow twigs and branches on a daily basis as the project proceeds, in order to catch debris before it becomes waterlogged and sinks.
- Use tarps and plywood sheets during stump grinding to prevent organic debris from accumulating in the water and subsequently contributing to low dissolved oxygen levels in the water column.
- Plan for project starts earlier in fisheries window and retain environmental planning consultation earlier in process to avoid delays due to permitting requirements.

## 10.0 Conclusions

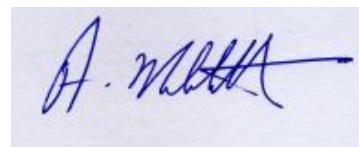
It is reasonable to expect that the removal of the willows along the riparian edge of Tod Creek will greatly enhance aquatic habitat and water quality in this section, due to the reduction in leaf litter produced by the golden willow. While the expected rate of accumulated sediment removal is unknown, this process should be assisted by the increase in channel flow with the removal of restrictive in-stream golden willow suckers. Careful on-going monitoring of this site should provide valuable information for guidance in future projects of this nature, as awareness of the negative impact of golden willow is increased across our region.

Prepared by:



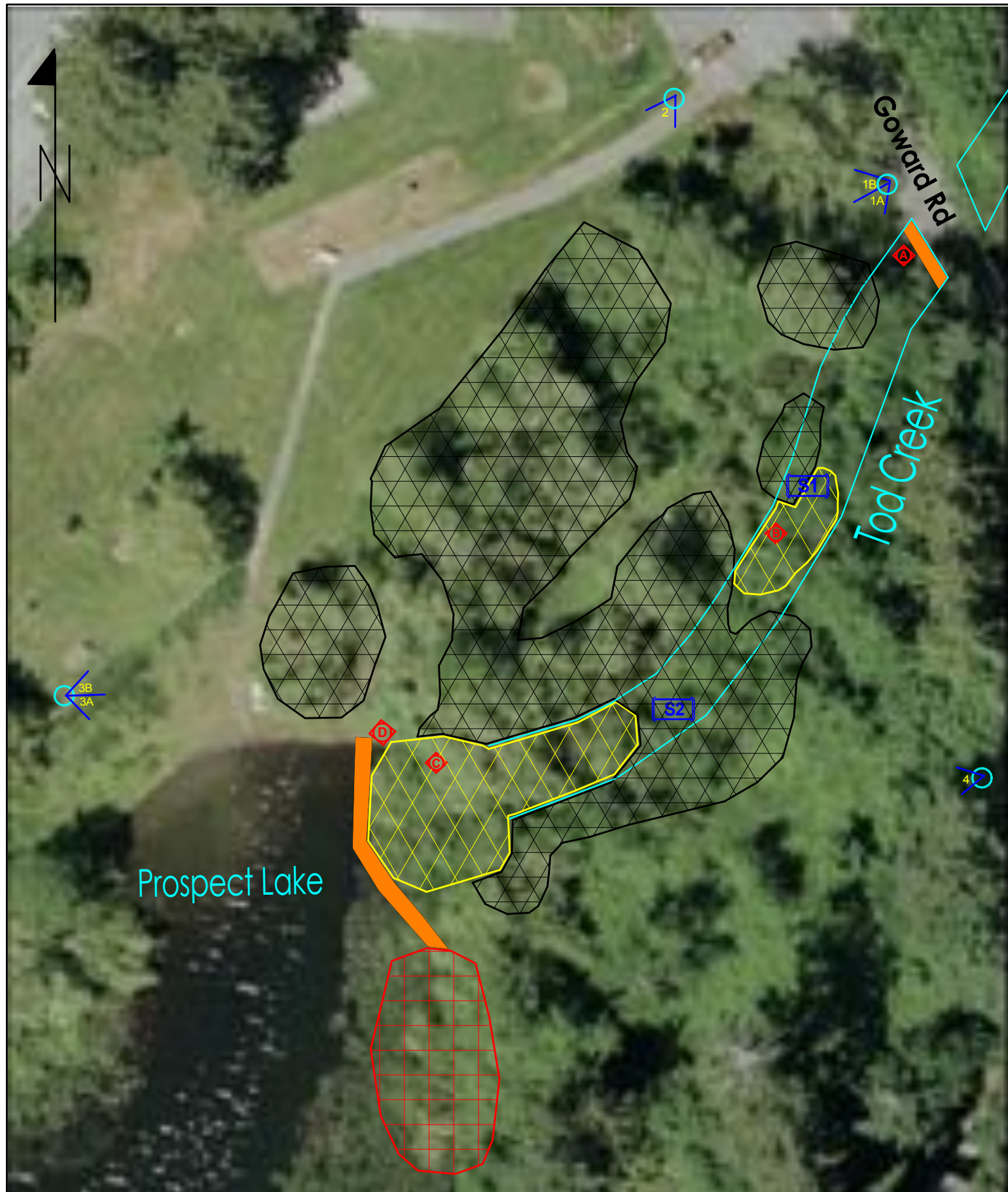
Sara Stallard, BSc., ASCT, Envr. Tech.  
Qualified Environmental Professional  
TerraWest Environmental Inc.

Reviewed by:



Adam Mabbott, P.Chem., ASCT, A.Ag.  
Environmental Scientist  
amabbott@terrawest.ca

## FIGURES



Tod Creek Golden Willow Removal Project - Whitehead Park, Saanich BC September 2010

Flow Control System  
 Photo Monitoring Stations  
 Water Quality  
 Assessment Stations  
 Sediment Monitoring Stations

Submerged Vegetative Island  
 Golden Willow Felled  
 Instream Vegetation Removed  
 Creek / Stream Area

**Figure  
# 1**

Date  
November 23, 2010  
 DWN BY: T.S



**APPENDIX A**  
**Golden Willow Management Strategies for Saanich Riparian Areas - Polster**  
**Environmental**



# **GOLDEN WILLOW MANAGEMENT STRATEGIES SAANICH RIPARIAN AREAS**

**PREPARED FOR:**

**DISTRICT OF SAANICH**  
770 Vernon Avenue  
Victoria, BC  
V8X 2W7



GOLDEN WILLOW HAS COLONIZED THE CHANNEL OF BOWKER CREEK IN THE AREA OF ST. PATRICK'S SCHOOL.

**PREPARED BY:**

**POLSTER ENVIRONMENTAL SERVICES LTD.**  
5953 DEUCHARS DRIVE  
DUNCAN, BC  
V9L 1L5

**APRIL, 2010**

## INTRODUCTION

Golden willow (*Salix alba* L.ssp. *vitellina* (L.) Arcang.) has been introduced to Victoria, BC as an ornamental species. Originally from Europe and Asia, *Salix alba* has been widely used throughout the world, including in Victoria. Unfortunately, it has adapted well to the local climate and has moved from the garden to streamsides and wetland areas in the area. It is closely related to and often confused with our native Pacific willow (*Salix lucida* Muhl. ssp. *lasiandra* (Benth.) A.E. Murray), however, golden willow, with limited local natural enemies, is much more aggressive and has become a pest in many areas. This report presents a strategy for the management of golden willow within the context of creek restoration with a focus on Bowker Creek in the area of St. Patrick's School. Although golden willow has created management problems, it also serves to hold the streambanks in place (in some locations) and provides habitat for a variety of small birds and insects. These ecological services must be replaced if the golden willow removal program is to be successful. For this reason and because removal of the offending species offers opportunities to enhance the existing riparian vegetation, this project is first and foremost a restoration project with one aspect of the restoration being the removal of a biotic element that is preventing the satisfactory recovery of the riparian ecosystems in which it occurs.

Restoration is defined by the Society for Ecological Restoration (SERI 2004) as the process of assisting the recovery of ecosystems that have been degraded, damaged, or destroyed. Bowker Creek flows from just south of Mount Douglas through the urban area of Greater Victoria until it empties into the ocean in Oak Bay. The creek is fed by numerous storm sewers and in many areas travels for large distances in underground pipes. The entire length of Bowker Creek is in heavily developed urban areas. However, in an effort to gain maximum advantage for every portion of this valuable urban land, the creek has been subjected to a variety of degrading changes. With these changes has come a loss in the natural capital that formerly flowed from the creek and its riparian area. Natural services once provided by the creek and its riparian area included flood control, bank erosion protection, water quality mitigation, harmful insect control, beneficial bird and insect provision and a host of fisheries values. These have been lost. Many of the goods and services once provided by the stream and its riparian area for free now costs thousands of dollars to provide artificially while other elements such as fisheries production, have been lost forever to the detriment of this resource. Restoration seeks to re-establish many of these values to the stream and its surroundings without compromising the utility of the urban environment in which it is located.

The urban area of Greater Victoria has a rich history of tectonic formation, glaciation, oceanic inundation and First Nations use (Yorath and Nasmith, 1995). Bowker Creek, a former salmon stream has been subjected to a wide variety of degrading assaults, including draining wetlands, filling riparian areas and the introduction of non-native species, including Golden willow. This

report presents a strategy for the restoration of the Bowker Creek riparian zone in the St. Patrick's School area as an example that can be applied in other areas. This strategy requires identification of the elements and processes that have led to the degradation of the riparian ecosystems. Treatments designed to ameliorate these degrading influences will be sought. Implementation strategies that are in accord with the operational constraints of the urban location are needed. In addition, management and maintenance requirements are suggested to ensure the restoration treatments are successful. The restoration strategy that is provided in this report is built on the concept that natural processes and systems for addressing the degrading elements will be the most cost effective and will provide the best system for returning the ecological goods and services that have been lost. Natural restoration systems have been repairing naturally damaged or degraded ecosystems for millennia. Re-establishing these natural restoration systems allows restoration to be conducted in conjunction with the natural processes, thus taking advantage of the naturally available ecosystem repair mechanisms. The following sections of this report present details of the restoration strategy, including the Golden willow management strategy that is proposed.

Golden willow may become a significant problem in watersheds in Greater Victoria in addition to the Bowker Creek watershed. For this reason a brief section on setting restoration priorities and management implications is provided. In addition, working within the natural growth cycles, management strategies that are based on natural patterns of plant energy cycles will be most effective. Once the problems have been identified and solutions prescribed, implementation, including funding and implementation issues need to be considered. A general discussion of implementation considerations is provided.

## **DEGRADING ELEMENTS**

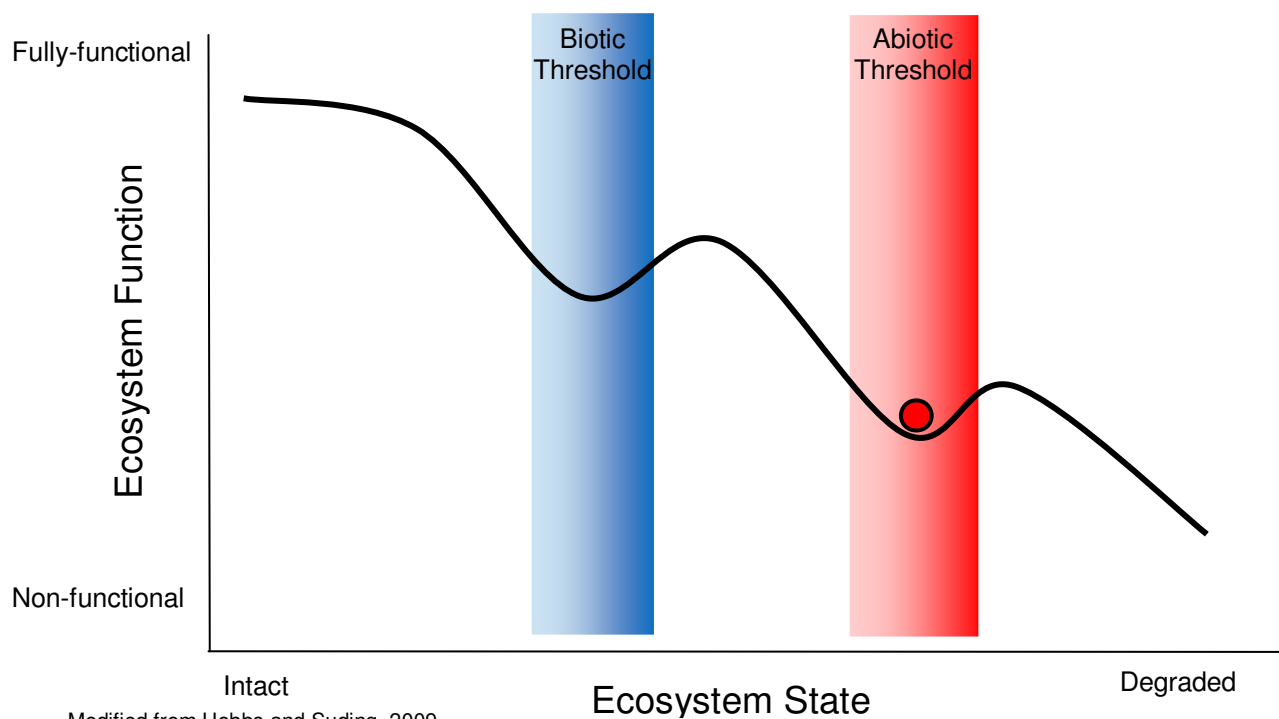
The first step in defining restoration strategies is to determine what is causing the degradation. Figure 1 provides a conceptual framework for looking at degraded landscapes. Ecosystems such as Bowker Creek can go from a fully functional state (intact) through thresholds (biotic and abiotic) to a non-functional state or degraded condition. Bowker Creek is currently in this degraded, non-functional state represented by the red ball. The pockets in the ecosystem state line at these thresholds are suggestive of the energy that might be needed to move the ecosystem out of this degraded state.

The abiotic threshold that Bowker Creek has lodged in is associated with the draining of wetlands, including the one on which St. Patrick's School is built, the channel straightening and in many locations the piping through which the creek runs, upland forest removal and changes in the hydrology of the stream through the addition of storm sewer drains, including draining water from adjacent watersheds. The biotic issues revolve around the invasive species, primarily



blackberry (*Rubus discolor* L.) and golden willow, which have become established. In addition to invasive species, human activities along the creek have caused and continue to cause significant degradation. Dealing with both the abiotic and biotic issues in a manner that is sensitive to the urban location of the creek will be needed to restore functionality to Bowker Creek.

It is clear that streambank erosion is one result of the loss of ecosystem functions. Golden willows have moved into the creek in a response to this erosion and now are helping to control erosion. However, returning the creek to some former state that includes wetlands and natural stream flow damping systems as a way of preventing streambank erosion is not a viable option. The high value of the urban lands precludes this as a restoration option. An alternative ecological endpoint, where Bowker Creek operates within this urban context as an alternative stable state (Temperton et al 2004), is required. In addition to the physical or abiotic changes that have occurred with Bowker Creek that have lead to erosion as an issue, biotic changes have also occurred. Invasive species such as blackberries cover the banks but do not provide strong root systems to hold the bank in place. In addition, blackberries shade out the seedlings of species such as black cottonwood and native willows that might provide the strong root systems needed to hold the streambanks together. The blackberries create a condition that has been termed successional stagnation by Kimmins (1987). Invasive species such as golden willow and blackberries can reduce or eliminate the natural services provided by native species. In addition, blackberries often harbour rats, another problem invasive species.



**Figure 1.** Changes in ecosystem state as a result of crossing biotic and abiotic thresholds cause changes in ecosystem functions.

## NATURAL SOLUTIONS

Holistic ecological restoration (Figure 2) has been defined by Clewell and Aronson (2007) as including both the subjective and objective components so that personal and cultural values are as important as the ecological and socio-economic values in a restoration program. In the context of managing golden willow, the social/cultural conditions where the management is to occur are as important as the ecological and socio-economic considerations. Working with neighbours is an important part of the restoration of riparian areas throughout Saanich.

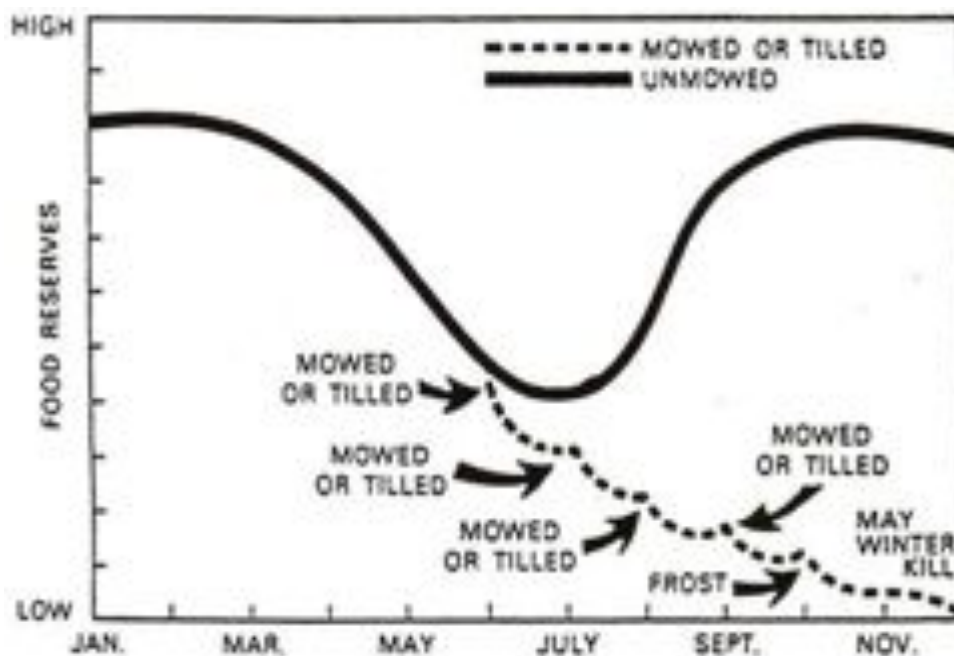
Management of invasive species such as golden willow will entail replacing the ecological functions that are currently performed by the golden willow as well as actually getting rid of the golden willow. Because the willow currently has extensive root systems in the creek banks that are holding things together, removal without replacement could lead to serious erosion. For this reason a strategy of slowly eliminating the golden willow while establishing beneficial riparian species such as we see in the CRD area downstream of the foot bridge at St. Patrick's School is suggested. Selective pruning can be used as these native species grow to allow sightlines to be maintained for safety.



**Figure 2.** Changes in ecosystem state as a result of crossing biotic and abiotic thresholds cause changes in ecosystem functions.

Golden willow will re-sprout readily from cut stumps so a single cutting is not an effective strategy for removal. However, this re-growth requires energy from the plant so continual cutting can be used as a means of depleting the energy reserves of the plant and eventually

killing it. Figure 2 shows a graph of plant energy (food) reserves through the seasons and the effects of repeated cutting.



**Figure 2.** Generalized graph of plant energy reserves follows a seasonal sine wave pattern. If plants are cut or otherwise disturbed repeatedly, then they will eventually die.

Creating a situation where the golden willow dies slowly will allow the extensive root systems to be replaced by the roots of beneficial plants. Many of the plants that now dominate the vegetation cover downstream of the foot bridge at St. Patrick's School can be established easily from dormant stem cuttings (Photograph 1). Planting dormant stem cuttings following the initial removal of the golden willow will allow the golden willow roots to remain effective as they are being replaced by beneficial root systems.

## IMPLEMENTATION STRATEGY

Golden willow has established in a number of locations on watercourses in Saanich. The current locations of golden willow should be mapped so that a reasonable priority ranking for treatment can be compiled. Although this work could be completed relatively easily using modern GPS equipment, this task is beyond the scope of this current study and thus is not included here. Once mapping of golden willow has been completed, areas that are outliers from the main population centres should be identified. In addition, plants and populations that are located in the upper part of the watersheds should be given priority over those located lower in the watershed. Treatment priorities should be given to the outlier sites as well as plants that are located in the upper parts of the watersheds.

The initial removal of the golden willow can be conducted in the fall during the low water period. Table 1 provides a summary of recommended treatment timing. In addition, dormant stem cuttings of native willows and cottonwood can be added once the golden willows have been removed and the locations where reinforcement can be identified. However, cutting the golden willow in the fall will allow the maximum amount of energy to be available for re-growth (see Figure 2). Therefore cutting the golden willow repeatedly over the next several years may be needed to eliminate it. All of the golden willow sprouts should be cut every two to three weeks through the growing season and plants should be cut down to the ground as much as possible so that the maximum amount of energy is used re-growing and no energy is gained from photosynthesis of the stems. The initial spring cutting should take place in late May or early June as it is at this point where the plants will have expended the most energy sending out new shoots and before they have recovered much by photosynthesis (see Figure 2). Re-growth of the offending plants will slow as the season progresses and the stored photosynthates are depleted. However, initially the second cutting should be planned for two weeks following the initial cutting. There may be a need to provide continued cuttings the following season although growth should be significantly diminished by year two.



**Photograph 1.** Excellent growth of native riparian species downstream of the bridge at St. Patrick's School provides significant riparian benefits. The small photograph inset here shows this site at the time of treatment. Only the top of the apartment building in the background can now be seen.

**Table 1**  
**Recommended Seasonality of Treatments**

Treatment	Spring	Summer	Fall	Winter
Mapping and Planning	■	■	■	■
Initial golden willow cutting			■	■
Installing live stakes			■	■
Repeated golden willow cutting	■	■	■	
Monitoring growth	■	■		
Monitoring flood performance				■
General project monitoring		■	■	

Establishment of pioneering vegetation from stem cuttings entails two phases; collection of the cuttings and planting the cuttings. Both of these activities should be conducted in the dormant season. The fall after the golden willows are cut is an ideal time for collection and planting of cuttings. Cuttings should be a minimum of 3 cm at the tip end and at least 2 m long. All branches and twigs that are not at least 3 cm in diameter should be discarded. Cuttings should be kept cool and moist before they are planted. Ideally the cuttings should be soaked in fresh running water for 10 days prior to planting. If possible, planting the cuttings immediately after soaking will provide the best results. Cuttings should be established at a density of at least 1 stem/m<sup>2</sup> of bank as this will provide a reasonably dense root system. Denser plantings (2.5 stems/m<sup>2</sup>) may be warranted where slowing flow velocities is desired.

Planting cuttings is simply a matter of sticking the cutting into the ground to the required depth. The problems arise when the ground is too stiff to be able to insert the cutting. Sharp pointed bars (Photograph 2) can be used to create holes into which the cuttings can be tapped. By using long cuttings (2 m) the water slowing effects that were provided by the golden willow can be replaced with the beneficial plants. The retention of the root systems of the golden willow will allow the replacement plants to be established over several seasons if needed. However, some cuttings establishment following the initial removal of the golden willow is recommended as the loss of this volume of biomass may have a significant impact on the hydrology of Bowker Creek.

Monitoring should be conducted as part of any work on the creeks in Saanich. Monitoring should focus on determining if the golden willows are re-growing. In addition, monitoring should be conducted to ensure the planted native species have established well and are providing the anticipated bank holding functions. Frequency of monitoring should be relatively high during the early years following treatment and reduced in future years as the project matures. Monitoring should consist of a visual inspection of project performance as well as photographic monitoring from some strategic location to document changes in the vegetation at the treatment sites. In many cases simple visual inspections early in the life of a restoration project can identify conditions where some simple remedial work would go a long way to ensuring the success of the project.

## COST ESTIMATES

The costs of treating golden willow and replacing the golden willow with native willows and balsam poplars within the St. Patrick's School area are provided in this section. Funding for these treatments from provincial flood control funds should be investigated as these treatments are designed to mitigate floods to some extent. Other sources of funding are unknown, although as a storm drainage system, funding from the normal storm sewer routes should be considered.

Estimated costs for restoration treatments are provided in Table 2. The costs are based treatment of the golden willow in the area of St. Patrick's School from the foot bridge up to the fence on the north side of the playground. Experience gained in this area should allow for more accurate estimates of treatment costs in the future. The initial cutting of the golden willow will entail a significant amount of work as there will be a massive amount of biomass to dispose of. Chipping the wood is suggested as the best way to deal with this material, but care will be needed to ensure chips are not left where they can float downstream and establish the golden willow elsewhere. Costs are based on a standard contractor crew of 3 people with chainsaws and one day of a suitable chipper and truck.

Repeated cutting of the golden willow is expected to be needed for about 20 times (2 times per month for 6 months in year one plus 8 (4 months) of additional cuttings in year two). The initial golden willow cutting will require chainsaws as well as a variety of hand tools. Once the initial cutting has been completed, it is expected that subsequent cuttings can be completed using hand held secateurs (hand pruners) or hand held loppers. Close cutting of the new shoots will be required to avoid photosynthetic activity. Native species cutting collection and planting costs are estimated at about \$10/stem and a total of 300 stems are estimated for this section of the creek. It is expected that the cuttings can be obtained from Rithet's Bog as they have in the past for bioengineering work in this part of the creek. Project supervision over the life of the project, including reporting is estimated at 10 days of professional time. In addition a lump sum of \$2,500 has been included in the cost estimate to cover unexpected contingencies.

**Table 2**  
**Estimated Cost of St. Patrick's School Stream Restoration**

<b>Restoration Element</b>	<b>Cost/Unit</b>	<b>No. of Units</b>	<b>Total Estimated Cost</b>
Initial golden willow cutting <sup>†</sup>	\$1,200/day	5 days	\$6,000
Subsequent re-growth cutting	\$600/time	20 times	\$12,000
Collection and planting cuttings	\$10/stem	300 stems	\$3,000
Project supervision and reporting	\$900/day	10 days	\$9,000
Contingencies	\$2,500	Lump Sum	\$2,500

<sup>†</sup> Includes cost of one day of a chipper truck to remove biomass.

## CONCLUSIONS

Restoration of Bowker Creek must overcome the limitations imposed by historic urban development. In addition the historic loss of riparian vegetation and replacement of the native vegetation by golden willows and blackberries creates additional problems for restoration. Replacement of the golden willow and blackberries using pioneering native species such as native willows, cottonwood and red-osier dogwood can help control the invasive species and can replace the dense root systems of the golden willow that will be removed. These pioneering native species can be established from direct planting of cuttings. Costs for treatment of the St. Patrick's School section of Bowker Creek are estimated at \$32,500 based on estimated contractor rates. Saanich crews may wish to conduct this work in house. Care should be taken to ensure that the continued cutting of the golden willow is carried out or the problems associated with this species will re-appear.



**Photograph 2.** These two planting bars have proven to be effective. The larger bar is about 1.5 m long and weighs about 10 kg. The marks on the large bar indicate 50 cm, 75 cm and 1 m from the tip of the pointed end to allow the depth of holes to be gauged.

## REFERENCES CITED

Hobbs, R.J. and K.N. Suding. ed. 2009. *New Models for Ecosystem Dynamics and Restoration*. Island Press. Washington, DC. 352 pp.

Kimmins, J.P. 1987. Forest Ecology. Macmillan Publishing Co. New York. 531 pp.

SERI, 2004. The SER Primer on Ecological Restoration. Version 2. October, 2004. Science and Policy Working Group, October, 2004. Society for Ecological Restoration International. Tucson AZ. [http://www.ser.org/content/ecological\\_restoration\\_primer.asp](http://www.ser.org/content/ecological_restoration_primer.asp) accessed March 25, 2007

Temperton, Vicky M., Richard J. Hobbs, Tim Nuttle and Stefan Halle editors. 2004. Assembly Rules and Restoration Ecology. Island Press. Washington, D.C. 439 pp.

Yorath, C.J. and H.W. Nasmith. 1995. The Geology of Southern Vancouver Island, A Field Guide. Pacific Section, Geological Association of Canada. Orca Book Publishers. Victoria, B.C. Canada. 172 pp.



## **APPENDIX B**

### **Government Permits and Correspondence**

# Approval Application or Notification for Changes In and About a Stream

## Under Section 9 of the *Water Act* and Part 7 of the *Water Act Regulations*

*Incomplete or inaccurate forms do not constitute **Notification** & will not be accepted.*

*Proceeding with works after submission of an incomplete or inaccurate form would be a violation of the Water Regulation*

☐ **APPROVAL APPLICATION**

☒ **NOTIFICATION<sup>1</sup> (see USERS' GUIDE)**

### 1. Applicant Information

Name: District of Saanich		
Address: 770 Vernon Avenue		
City: Victoria	Province: BC	Postal code: V8X 2W7
Phone: (250) 475-5494, ext 3418	e-mail: michael.roth@saanich.ca	

### 2. Location of Works

Street Address of Works (or nearest town): Whitehead Park - 5079 Prospect Lake Road		
Stream Name: Tod Creek	Flows Into: Prospect Lake	
Location on Stream: North end of lake		
Reference Landmarks: Goward Road & Prospect Lake Road	Amount of disturbance in m: 77m (linear)	
Multiple Sites: YES / NO: No	Number of sites: 1	
Latitude: 48°31'14.43"N	Longitude: 123°26'22.38W	Elevation: 47m
Legal description of property where work is proposed: N/A - Municipal Park		

### 3. Drawing, Plan and Site Map

1. Attach drawing showing lot boundaries, location of buildings and of proposed works, stream direction and flow.
2. Attach a key map at an appropriate scale showing the location of the site.
3. Attach engineering drawings (may be required for works identified with <sup>E</sup> under **Requires Approval** section below).

### 4. Proposed Timing for Work

Start (day/month/year): September 10, 2010	Finish (day/month/year): May 2011
--	-----------------------------------

### FOR OFFICE USE ONLY

Date Received:	Water File Number:
	Client Number:
	Application Number:
	Amount Received:
	Receipt Number:

## 5. Type of Works

### Requires Approval:

- ☐ Bank Erosion Protection <sup>E</sup>
- ☐ Bridge Installation/maintenance/removal (other than clear span) <sup>E</sup>
- ☐ Stream Diversion <sup>QP</sup> Diversion berm structure plan required
- ☐ Large Debris Removal – by machine <sup>QP</sup> plan required
- ☐ Gravel Removal <sup>QP</sup>
- ☐ Other: Provide details in space below

\*Provide culvert dimensions:

Length:

Width:

Diameter:

<sup>E</sup> Professional Engineer may be required

<sup>QP</sup> Qualified Professional may be required

### Requires Notification:

- ☐ Installation\*/maintenance/removal of road crossing **culvert** (\*follow Forest Practices Code Stream Crossing Guidebook)
- ☐ Construction/maintenance/removal of a **clear span bridge**
- ☐ Construction/maintenance of a **pipeline crossing**
- ☐ Construction/maintenance/removal of a **pier or wharf**
- ☐ Cutting of **annual vegetation** in a stream channel
- ☐ Repair/maintenance of existing **dike** or **erosion protection works**
- ☐ Construction/maintenance of **storm water outfalls**
- ☐ Control of **Eurasian Watermilfoil** or other **aquatic vegetation**
- ☐ Construction/maintenance of **ice bridge, winter ford or snowfall**
- ☐ Maintenance of minor and routine nature by a public utility
- ☐ Removal of a **beaver dam** (As authorized under the Wildlife Act)
- ☐ Small debris removal – by hand
- ☐ Construction of a **temporary ford**
- ☐ Construction of a **temporary diversion** around a worksite

The following require **Notification** and may only be undertaken by the Crown in right of either Canada or British Columbia, or their Agents:

#### Federal/Provincial

- ☐ Construction/maintenance/removal of a flow or water level **measuring device**
- ☐ Construction/removal of a **fish fence** or **screen, fish or game guard**
- ☐ Restoration/maintenance of **fish habitat**

The following require **Notification** and may only be undertaken by the Crown in right of either British Columbia, or a Municipality, or their Agents:

#### Provincial/Municipal

- ☐ Restoration/maintenance of a **stream channel**
- ☐ Clearing of an obstruction from a bridge or culvert during a flood emergency<sup>1</sup>
- ☐ Construction or placement of **erosion protection works** or **flood protection** works during a flood emergency<sup>2</sup>

<sup>1</sup> Some activities fitting the description for Notification may be reviewed by Ministry/Agency staff, who may decide that an Approval is required

<sup>2</sup> Must be completed under direction of the Crown. No notification is required prior to undertaking works, but a description of changes must be submitted to a habitat officer within 72 hours of the change

<sup>QP</sup> QP means a professional who through suitable education, experience, accreditation and knowledge may be reasonably relied on to provide advice within their area of expertise.

### Detailed Description of Work to be Performed (continue on next page):

Total area disturbed by proposed works (all sites): 77m (selective tree removal and replanting within noted area)

Cutting of Golden Willow, located along stream bank, down to ground level (root system to remain in place). Repeated cutting of new shoots to deplete root energy (several efforts). Planting of native vegetation to provide shade for Tod Creek.

Removal of Golden Willow upland of creek. Planting of native trees.

A QEP will be present during tree removal. QEP will prepare specific BMP's for work crews and will submit plan to Saanich environmental services for review.

--

## 6. Land Ownership

Please check one of the following:

X The applicant is the owner of the property.

☐ The property is Crown land. Tenure/licence number:

--

☐ The property is owned by the following Landowner (i.e. Landowner is different from applicant):

Landowner's Name: District of Saanich

Address: 770 Vernon Avenue

City: Victoria

Province: BC

Postal code: V8X 2W7

Phone: (250) 475-5494, ext 3418

e-mail: michael.roth@saanich.ca

Do you have the Landowner's written approval to enter the land(s) to complete the works? X Yes

☐ No

Note: a) Ownership of all parcels of land on which the proposed works will occur must be identified, b) do not attach the written approval with the application, but keep it for your files as you may be asked to produce it during an inspection or audit.

## 7. Who is doing the Work?

**Contact information for company designing and supervising construction of the work (if different from applicant):**

Company Name: Contractors working for District of Saanich

Contact Name: Becky Goodall, Park Planner & Designer,

Professional Affiliation: District of Saanich

Address: 1040 McKenzie Avenue

City: Victoria

Province: BC

Postal Code:  
V8P 2L4

Phone: 250 479-5535

e-mail: becky.goodall@saanich.ca

**Contact information for company undertaking the construction (if different from applicant):**

Company Name: To Be Determined

Contact Name:

Address:

City:

Province:

Postal Code:

Phone:

e-mail:

## 8. Statement of Intent

By submitting this application form, I declare that the information contained on this form is complete and accurate information. I have read, understood and will meet the requirements to construct works and changes in and about a stream in accordance with Section 9 of the *Water Act* and Part 7 Water Act Regulations including, for Notifications, **Terms and Conditions** as specified by a Habitat Officer of the Ministry of Environment.



Signed: \_\_\_\_\_

Application Date: 23/07/2010  
day/month/year

## 9. Submission Instructions

Send the completed form along with the following attachments to the local office in which the proposed works are located. Addresses for local offices are listed on the instruction sheet. **Please note that the Approval application fee of \$130 is non-refundable.** If the proposed works require an Approval, prior to proceeding further with this application please ensure that this project will be able to proceed under the Federal *Fisheries Act*.

X Sketch plan (mandatory)

☐ Engineering drawing (mandatory for works requiring approval noted with <sup>E</sup>)

X Key location map (mandatory)

☐ For works requiring an Approval, a cheque or money order for \$130 payable to: Minister of Finance. The fee is non-refundable.

## 10. Responsibilities

You are required to comply with all applicable federal, provincial and municipal laws and regulations. If you anticipate that the planned work may result in harmful alteration, disruption or destruction of fish habitat you should send a copy of your completed Notification/Approval Application directly to the nearest office of Fisheries and Oceans Canada. Review and comment by DFO may necessitate changes to the proposed works.

Has a copy of this notification/approval application been sent to Fisheries and Oceans Canada (check one)?  
YES x NO ☐

If YES, indicate the DFO office that the notification/approval application has been sent (for DFO offices, see Users' Guide):

Brad Rushton DFO - Duncan, Vancouver Island

**From:** Michael Roth  
**Sent:** 8-Sep-10 10:24 AM  
**To:** Becky Goodall  
**Cc:** Sara Stallard  
**Subject:** Fwd: RE: RE: Section 9 Notification ~ N1-3026 ~ Whitehead Park, 5079 Prospect Lake Rd., Tod Creek (ATS 47746)  
FYI

>>> "Telfer, Kevin ENV:EX" <> 9/8/2010 10:08 AM >>>  
Thanks Michael for dropping me a line this a.m.

As mentioned during our conversation, the autumn rains are about to begin in earnest any day now.

If Saanich wants to push beyond the Sept 15<sup>th</sup> window, they will have to be especially diligent to avoid sediment generation, and will be held responsible if things get out of hand.

If the monsoons arrive in force before the project gets under way, or is fully completed, Saaninch should consider postponing things a year, and resubmit in 2011.

As always, feel free to call if I can be of assistance.

*Kevin L. Telfer* C.D., R.P.F.

Ecosystem Biologist/Habitat Officer  
BC Ministry of Environment  
2080A-Labieux Road, Nanaimo, B.C. V9T 6J9  
tel. (250) 751-3222 fax (250) 751-3208  
<mailto:Kevin.Telfer@gov.bc.ca>  
<http://www.gov.bc.ca/env/>



**From:** Michael Roth  
**Sent:** Wednesday, September 8, 2010 9:44 AM  
**To:** Telfer, Kevin ENV:EX  
**Subject:** Fwd: RE: Section 9 Notification ~ N1-3026 ~ Whitehead Park, 5079 Prospect Lake Rd., Tod Creek (ATS 47746)

Hi Kevin; thanks for taking the time to talk with me this morning, as discussed.

Saanich has applied for a fish collection/salvage permit and is waiting for it to be issued before commencing the work for the noted project. As such, the project may have to extend beyond the recommended September 15 window for in stream works.

Saanich has retained the services of a QEP/Environmental Monitor and we will work closely with the QEP to ensure BMP's are in place to prevent sediment from being created and to work with the utmost care during the in-stream phase of the project.

If you have any questions please feel free to contact me.

Thank you

>>> "Barr, Brenda M ENV:EX" <> 8/10/2010 2:32 PM


Habitat Officer, Kevin Telfer has reviewed your application, and you may proceed with your proposed changes with the following conditions:

- No objection to habitat restoration and removal of exotic willows
- However, all work within 5 metres of Todd Creek needs to be done before September 15, 2010, and sediment isolated from stream
- Work beyond 5 meters from the stream may occur any time, however, avoid introduction of sediment to the stream during winter rains

Notifications received by this office will be used to plan and carry out on-site inspections and monitoring during and after the changes in and about a stream.

*Brenda Barr*

Ministry of Environment

 Please consider the environment  
before printing this email

**From:** Barr, Brenda M ENV:EX

**Sent:** Wednesday, July 28, 2010 3:26 PM

**To:** 'Michael Roth'

**Subject:** Section 9 Notification ~ N1-3026 ~ Whitehead Park, 5079 Prospect Lake Rd., Tod Creek (ATS 47746)

Our office has received your application for a Section 9 Notification, and has been assigned file number N1-3026 . Please quote this file number, if you should have any questions. It is the applicant's responsibility to ensure that all sections of the notification form are complete. Submission of an incomplete form does not constitute notification.

For your information, Section 9 of the *Water Act* regulates “changes in or about a stream.” Part 7 of the *Water Act* regulation— referred to as “the Regulation” – ensures that water quality, fish and wildlife habitat and the rights of licensed water users are not compromised. The Regulation allows for a review period of 45 days prior to commencing your work. This review is conducted by the Habitat Officer, who will usually confirm acceptance of the application or ask for clarification on details of the project within 10 working days.

All work must comply to the attached *Habitat Officer – Terms and Conditions*. We encourage you to read this information, as you are accepting the legal responsibility for the work.

Please read and adhere to the terms in *User's Guide to Working In and Around Water*, which you can access at [http://www.env.gov.bc.ca/wsd/water\\_rights/licence\\_application/section9/index.html](http://www.env.gov.bc.ca/wsd/water_rights/licence_application/section9/index.html)

**Brenda Barr**


Administrative Assistant

Ministry of Environment

2080A Labieux Rd., Nanaimo BC V9T 6J9

☎ 250 751-3120 📠 250 751-3103

✉ [Brenda.Barr@gov.bc.ca](mailto:Brenda.Barr@gov.bc.ca)

 Please consider the environment  
before printing this email

## **APPENDIX C**

### **Best Management Practices**





Head Office:  
P.O. Box 46003  
2642 Quadra St, Victoria, B.C.  
V8T 5G7  
Tel: 866-500-1553  
Fax: 250-361-9258

# TRANSMITTAL

To:	cc:	Company – Attention	Contact:	From: Sara Stallard
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<b>The District of Saanich</b>		File No.: DSWP10-01
<input type="checkbox"/>	<input type="checkbox"/>	<b>ATTN: Becky Goodall</b>	250-475 5535	Page(s): 2
<input type="checkbox"/>	<input checked="" type="checkbox"/>			Date: 1 September 2010

<input type="checkbox"/> Urgent	<input checked="" type="checkbox"/> For Review	<input type="checkbox"/> Please Comment	<input type="checkbox"/> Please Reply	<input checked="" type="checkbox"/> As Requested
---------------------------------	--	---	---------------------------------------	--

**Re:** Best Management Practices (BMPs) for contractors adjacent to Tod Creek (Whitehead Park), Saanich, BC

The contents of this transmittal are confidential. If you are not the intended recipient, please destroy this document and kindly advise us of your action. Any unauthorized use by you of the information contained in this transmittal is prohibited.

**Summary** – Davey Trees and G&E Construction will be completing playground/park improvements and removing invasive Golden Willow trees in the upper and stream-side riparian zones of Tod Creek in Whitehead Park on Goward and Prospect Lake Roads. Due to the sensitive ecosystem of the creek certain safeguards are needed to ensure the prevention of harm to creek by actions or the release of deleterious substances to the creek. These Best Management Practices (BMPs) are suggested based on the recommendations of the federal Department of Fisheries and Oceans (DFO) Operational Statement Aquatic Vegetation Removal in Lakes - Version 3.0.

**From: DFO Operational Statement Aquatic Vegetation Removal in Lakes. Version 3.0.**

**2.1. Removal techniques should avoid disturbing the bottom substrates of the lake. This means you should not create large clouds of suspended silt and muck when removing the aquatic vegetation.**

Disturbance will be minimised by using overhead crane to lift sprouting willow logs vertically from the lake/creek bottom.

**3.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks, invasive species and noxious weeds.**

Contractors to be notified in advance of specifications 3.1-3.3 by District of Saanich staff. If possible, biodegradable hydraulic fluid should be used in all equipment operating upslope of the creek/lake shoreline. Equipment to be inspected upon arrival at site and on a daily basis

during riparian work by Environmental Monitor (EM) and inspection record to be maintained by EM.

**3.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.**

Maintain equipment, re-fuel, and store fuels at least 30 metres from shoreline.

**3.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.**

Contractor responsible for providing and maintaining appropriate spill kit and for crew training in proper usage. All crew will be informed as to the location and proper use of spill kit contents. Spill kit will be available for EM inspection at all times. All spills or leaks regardless of scale to be reported immediately to EM without delay. Emergency spill kit contents list available upon request.

**4. Dispose of aquatic vegetation that is removed to prevent it from re-entering the water body. All storage of waste materials should be kept outside of the riparian area.**

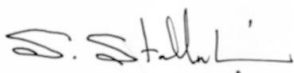
Appropriate containment for all wastes not immediately chipped on site will be used.

**Additionally:**

- Only necessary equipment for the completion of the vegetation removal will be driven through the immediate streamside area.
- Care will be taken to minimise disturbance and damage to the non-targeted riparian vegetation.
- The construction contractor will use appropriate surfaces (plywood, blast mats, etc.) to protect the saturated soils while using heavy equipment and treaded machinery in the riparian area to minimise damage to vegetation.
- Tarps will be used around streamside trees to prevent wood chips and sawdust from entering the creek.
- Personnel will avoid walking into the creek except where absolutely necessary to complete works.

Questions or concerns can be addressed to Sara Stallard at 250.885.7275.

Prepared by:



Sara Stallard, BSc., ASCT, QEP



Head Office:  
P.O. Box 46003  
2642 Quadra St, Victoria, B.C.  
V8T 5G7  
Tel: 866-500-1553  
Fax: 250-361-9258

# TRANSMITTAL

To:	cc:	Company – Attention	Contact:	From: Sara Stallard
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<b>The District of Saanich</b>		File No.: DSWP10-01
<input type="checkbox"/>	<input type="checkbox"/>	<b>ATTN: Becky Goodall</b>	250-475 5535	Page(s): 5
<input type="checkbox"/>	<input checked="" type="checkbox"/>			Date: 2 September 2010

☐ Urgent    ☒ For Review    ☐ Please Comment    ☐ Please Reply    ☒ As Requested

**Re:** Best Management Practices (BMPs) for vegetation removal - Tod Creek (Whitehead Park), Saanich, BC

The contents of this transmittal are confidential. If you are not the intended recipient, please destroy this document and kindly advise us of your action. Any unauthorized use by you of the information contained in this transmittal is prohibited.

**Summary** – The District of Saanich will be completing playground/park improvements and removing invasive golden willow and English hawthorn trees in the upper and stream-side riparian zones of Tod Creek in Whitehead Park on Goward and Prospect Lake Roads. Additional work includes the removal of in-stream logs of sprouting golden willow that may be restricting flows from Prospect Lake. The majority of in-stream vegetation targeted for removal is in the upstream 20 metres immediately adjacent to the lake. Due to the sensitive ecosystem of the creek, certain safeguards are needed to ensure the prevention of harm to creek or the release of deleterious substances to the creek. These Best Management Practices (BMPs) are suggested based on the recommendations of A User's Guide to Working In and Around Water, Environmental Monitoring for Construction Projects (Malaspina), and the Department of Fisheries and Oceans Operational Statement Aquatic Vegetation Removal in Lakes.

## Site Location:

Whitehead Park is located in the District of Saanich at the intersection of Goward and Prospect Lake Roads. The park is adjacent to Prospect Lake where the outflow constitutes the headwaters of Tod Creek, which flows into Saanich Inlet. The project site extends from in-stream vegetation at the head of the creek along the lake edge, to approximately 60 m downstream where the creek flows under Goward Road.

## Site Description:

The site was visited on 13 and 27 August, 2010. The west bank of the creek is made up almost entirely of mature golden willow (*Salix alba* L.ssp. *vitellina* (L.) Arcang) trees and suckers. The east

bank is mainly composed of red alder (*Alnus rubra*), with two English hawthorn (*Crataegus monogyna*) and two golden willows at the southern end. The southernmost (upstream) 20 m of the creek is choked with golden willows suckers growing in-stream from logs or roots. Other in-stream vegetation appears to be composed of native species including slough sedge (*Carex obnupta*), narrow-leaved bur-reed (*Sparganium angustifolium*), cattail (*Typha latifolia*), and cow lily (*Nuphar polysepalum*). Also present on the western riparian edge is the highly invasive yellow flag iris (*Iris pseudacorus*).

Water chemistry measurements were taken in four locations: (A) at the furthest downstream end of the proposed project works south of Goward Road; (B) midway along the proposed works approximately 30 m south of Goward Road; (C) approximately 5 m north of Prospect Lake in the golden willow suckers; and (D) at the southern edge of the proposed works on the lake side of the golden willow suckers. The results were as follows:

A – turbidity 1.3 NTU, pH 6.6, depth at centre 25 cm

B – dissolved oxygen  $\leq 3.5$  mg/L, temperature 15.5 °C, specific conductivity 92  $\mu$ S

C – dissolved oxygen  $\leq 6.0$  mg/L, temperature 17.8 °C, specific conductivity 97  $\mu$ S

D – dissolved oxygen  $\geq 12.8$  mg/L (142%), temperature 21.3 °C, depth at centre 120 cm

The flow of the creek was not estimated as surface movement was barely detectable at the time of both visits. The downstream water depth at Goward Road is approximately 25 cm and remains shallow “appearing” until immediately adjacent to the lake edge. Accumulated organic debris has created a very thick, but highly unstable false bottom to the creek, making wading out from the western bank unsafe for the greater part of the proposed works reach. The true bottom at location B was >60 cm deeper than the 25 cm estimated only 0.5 m from shore. This was the case at numerous locations along the reach. Dissolved oxygen levels along the majority of the reach were below that expected to support healthy fish populations. No fish were noted at locations A, B, or C. Supersaturated dissolved oxygen levels and high water temperature were measured in the thick willow suckers targeted for removal. This area was heavily populated with small or juvenile fish (unidentified).

The following fish species are listed in the Fisheries Information Summary System (FISS) database for Tod Creek: Bass/Sunfish (General), Brook Trout, Brown Catfish (formerly Brown Bullhead), Coho Salmon, Cutthroat Trout, Prickly Sculpin, Pumpkinseed, Rainbow Trout, Smallmouth Bass, Threespine Stickleback. Prospect Lake has listed: Brown Catfish (formerly Brown Bullhead), Cutthroat Trout, Prickly Sculpin, Pumpkinseed, Rainbow Trout, Smallmouth Bass, Unidentifiable Trout - only fry <70mm in length, Westslope (Yellowstone) Cutthroat Trout.

### **Proposed Works:**

The District of Saanich will be completing playground/park improvements and removing invasive golden willow trees in the upper and stream-side riparian zones of Tod Creek in Whitehead Park on Goward and Prospect Lake Roads. Four large, multi-trunked golden willows for removal are

located at least 10 m from the stream edge on a level to gently sloped grassy area. These trees are targeted for felling and their root systems will be pulled up with heavy machinery already on site. Multiple other golden willows and two English hawthorns to be removed are immediately adjacent to the creek and/or have trunks that are partially inundated. These streamside trees will be felled and the trunks will be chipped to the ground surface, leaving the root system in place for bank stability. A multi-year maintenance program of cutting suckers will ideally succeed in depleting the energy stores of these trees. A planting program of native species will be completed by volunteers supervised by Saanich staff.

Additional work includes the removal of in-stream logs of sprouting golden willow that may be restricting flows from Prospect Lake. The majority of in-stream vegetation targeted for removal is in the upstream 20 metres immediately adjacent to the lake. Saanich staff have received input from residents that this upper reach would be enjoyed by kayakers and canoeists if navigable.

The District of Saanich has submitted Notification to the Ministry of Environment for these works as per Section 9 of the Water Act and Part 7 of the Water Act Regulations. The Department of Fisheries and Oceans (DFO) has also been notified.

### **Best Management Practices (BMPs):**

**Timing** – The aquatic vegetation removal has been timed to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows. Work will proceed no earlier than August 15 and no later than September 15, to accommodate species documented in Tod Creek and Prospect Lake according to the Fisheries Information Summary System (FISS) database.

Reduced Risk Work Windows for Fish and Wildlife for Vancouver Island

<u>Location</u>	<u>Species</u>	<u>Start Date</u>	<u>Finish Date</u>
Throughout	All Species*	June 15	September 15
Throughout	Rainbow Trout	August 15	September 15
Throughout	Cutthroat Trout	August 15	September 15
Throughout	Coho	June 15	September 15

**Upland Tree Removal** – The topography of the riparian area to the immediate west of the creek, where four mature golden willows are to be felled and their root systems excavated, is level to gently sloping with thick grass and herb groundcover. The nearest tree to the creek is > 10 m from the top of bank. These excavation holes will be filled immediately following the works and replanted with native tree species and grass seed. Due to the location and slopes, erosion and sediment transfers to the creek are not anticipated.

**Stream-Side Tree Removal** – The east bank trees are in heavy growth and will be felled without heavy machinery access. The ground immediately adjacent to the stream-side trees marked for removal on the west bank of Tod Creek is moist to saturated. Most of the groundcover here is grass/herb with one significant patch of the invasive yellow flag iris. The machinery to be used for

stump chipping will direct the chip waste stream away from the stream edge and directly into a bin. Trees will be felled away from the water's edge. Additional BMPs include:

- Only necessary equipment for the completion of the vegetation removal will be driven through the immediate streamside area.
- Care will be taken to minimise disturbance and damage to the non-targeted riparian vegetation.
- The construction contractor will use appropriate surfaces (plywood, blast mats, etc.) to protect the saturated soils while using heavy equipment and treaded machinery in the riparian area to minimise damage to vegetation.
- Tarps will be used around streamside trees to prevent wood chips and sawdust from entering the creek.
- Personnel will avoid walking into the creek except where absolutely necessary to complete works.

**In-Stream Vegetation Removal** – All efforts will be made during in-stream vegetation removal to keep sediment movement to a minimum. Disturbance will be minimised by using an overhead crane to lift sprouting willow logs vertically from the lake/creek bottom. However, due to the thick organic layer in the stream bottom, large amounts of suspended sediments during the in-stream works proposed will be unavoidable. For this reason siltation control and wet workplace isolation will be necessary.

As the downstream end of the reach is both narrow and shallow, a sandbag dam with filter cloth covered pipes will be installed. This will be closely monitored for topping of the dam and clogging of the filter cloth. The lakeside end of the work site is much wider in order to fully encompass the in-stream willow suckers; therefore a floating silt curtain will be deployed. The dam and fence will be installed 2-3 days before commencement of in-stream work to allow for fish salvage (trapping and release). These measures are to remain up 1-3 days subsequent to work completion to allow for settling of suspended sediments. Upper (lakeside) barrier to be removed first. Downstream barrier to be removed when additional settling from upper barrier removal has occurred.

Baited minnow traps and dip nets will be used, as the unstable stream bottom and thick vegetation would make electrofishing or seining unworkable. Due to the low dissolved oxygen and high density of bullfrogs (as per Saanich staff), these traps will be floated near the surface and will be checked often.

Woody debris of invasive golden willow will be removed, to prevent re-sprouting. Additional CWD of native trees to be added if authorized by DFO/MOE, and if available, in order to add complexity and shelter for aquatic organisms, due to the removal of a large percentage of riparian canopy cover in this reach. Avoid using Lombardi poplar (invasive), or cottonwood if re-sprouting is to be avoided. Recommended species that will not sprout include all conifers, alder, big-leaf maple, and

Garry oak. Rocks will be left undisturbed. CWD placement will be design so as to avoid impeding kayakers and canoeists.

**Additional Construction BMPs –**

1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks, invasive species and noxious weeds. Contractors to be notified in advance of specifications 1-4 by District of Saanich staff. If possible, biodegradable hydraulic fluid should be used in all equipment operating upslope of the creek/lake shoreline. Equipment to be inspected upon arrival at site and on a daily basis during riparian work by Environmental Monitor (EM) and inspection record to be maintained by EM.
2. Wash, refuel and service machinery and store fuel and other materials for the machinery at least 30 metres from shoreline to prevent any deleterious substance from entering the water.
3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery. Contractor is responsible for providing and maintaining appropriate spill kit and for crew training in proper usage. All crew will be informed as to the location and proper use of spill kit contents. Spill kit will be available for EM inspection at all times. All spills or leaks regardless of scale to be reported immediately to EM without delay. Emergency spill kit contents list available upon request.
4. Dispose of aquatic vegetation that is removed to prevent it from re-entering the water body. All storage of waste materials should be kept outside of the riparian area. Appropriate containment for all wastes not immediately chipped on site will be used.

**Site Restoration** – Replanting with native species as per District of Saanich Planting Plan specifications by volunteers, to be monitored until March 2011. (Suggestions include red-osier dogwood, alder, native willow, red or yellow cedar.)

Please do not hesitate to call with any questions at 250.480.7272, or by cell 250.885.7275.

Prepared by:



Sara Stallard, BSc., ASCT, Envr. Tech.  
Qualified Environmental Professional

## **APPENDIX D**

### **Fish Trapping Permits and Reports**





Valid From: 02-Sep-2010

Expiry Date: 30-Sep-2010

This licence and/or permit is issued under the authority of SECTION 52 OF THE FISHERY (GENERAL) REGULATIONS.

This licence and/or permit authorizes the person(s) listed below, subject to the following terms and conditions, to collect the species and quantity of fish identified below for: release or transfer of the fish purposes. Non-compliance with any condition of this licence and/or permit may result in the cancellation of this licence and/or permit.

**Licence/Permit Activity Description:**

Fish salvage in Tod Creek and Prospect Lake, Victoria.

---

**Licence Holder:**

FIN: 125402  
Terrawest Environmental  
P.O. Box 46003, 2642 Quadra Street  
Victoria BC V8T 5G7  
Contact Number: 250-480-7272

**Contact Party:**

FIN: 125403                      Sara Stallard                      Contact Number: 250-885-7275

---

**Species, Quantity of Fish, Area(s) and Gear:**

<b>Species:</b>	Salmon, Trout (Brook, Cutthroat, Westslope Cutthroat, Rainbow), Brown Catfish, Pumpkinseed, Smallmouth Bass, Prickly Sculpin and Threespine Stickleback
<b>Licence Area:</b>	management area 19
<b>Gear:</b>	Net, Dip Trap
<b>Units:</b>	Individuals (live)
<b>Additional Descriptions:</b>	Baited traps

---

**Terms and Conditions:**

The DFO Office responsible for the area in which fishing shall take place, shall be notified on each occasion prior to fishing and collection of samples. Notification shall occur by telephone during normal business hours. If you are unable to notify the local office on evenings or weekends, advise the DFO Radio Room at 1-800-465-4336 prior to sampling.

Masset District (250) 626-3316, Fax 626-3253  
Queen Charlotte City District (250) 559-4413, Fax 559-4678  
Prince Rupert District (250) 627-3089, Fax 627-3497  
Bella Bella District (250) 957-2363, Fax 957-2767  
Port Hardy District (250) 949-6422, Fax 949-6755  
Campbell River District (250) 850-5701, Fax 286-5854  
Nanaimo District (250) 754-0235, Fax 754-0309  
Victoria District (250) 363-3252, Fax 363-0191  
Port Alberni District (250) 720-4440, Fax 724-2555  
Steveston District (604) 664-9250, Fax 664-9255



Prince George District (250) 627-3499, Fax 627-3427  
Kamloops District (250) 851-4950, Fax 851-4951  
Whitehorse District (867) 393-6722, Fax 393-6738

Copies of this licence must accompany the collecting personnel, be on board any collecting vessel and be carried with the transport vehicle at all times during collection and transport of samples. The licence must be produced upon the request of a Fishery Officer or Guardian.

This licence authorizes collections to be made by the licensee and employees, volunteers and students of the licensee provided that all persons, other than minors who are engaged in activities under the authority of this licence, are carrying suitable photo identification to be produced upon request of a Fishery Officer or Guardian.

All fish must be released into the water body or course from which they originated, and as near as possible to the location from which they were sampled. The only exception to this is where fish are retained for identification purposes.

Section 32 (1) of the federal Species at Risk Act prohibits killing, harming, harassing, capturing or taking an individual of a wildlife species which is listed on Schedule 1 as an extirpated species, an endangered species or a threatened species. Refer to the SARA Public Registry at <http://www.sararegistry.gc.ca> to determine if species at risk may be in your research area and to apply for a permit if required.

No sampling of non-anadromous fish species and steelhead is to be undertaken unless prior approval has been provided by the BC Ministry of Environment.

This licence may be revoked or amended by the Department prior to the expiry date as may be considered necessary by the Department.

---

Licence Holder - Print Name

Signature

Date

14 Sept 2010

Issued by: Don Radford, South Coast Area Director  
Fisheries and Oceans Canada

Date

Licence Printed: 13 September 2010

## **FISH COLLECTION PERMIT**

### **Fish Salvage**

File: 34770-20

Permit No.: NA10-65766

Permit Holder: Fish-Kissing Weasels Environmental – Sara S. Stallard  
1149 Mason Street, Victoria BC V8T 1A5

Client No.: 19089

Authorized Persons: Sara S. Stallard

Pursuant to section 19 of the *Wildlife Act*, RSBC 1996, Chap. 488, and section 18 of the Angling and Scientific Regulations, BC Reg. 125/90, the above named persons are hereby authorized to collect fish for scientific purposes from non-tidal waters subject to the conditions set forth in this Permit:

**Permitted Sampling Period:** September 16, 2010 to September 30, 2010

**Permitted Waterbodies:** West Coast – Tod Creek (920-195500); Prospect Lake (920-195500)

**Permitted Sampling Techniques:** MT, DN (subject to permit terms and conditions)

**Potential Species:** CCT, BNH, PMB, RB, SMB, CAS WCT, TSB (subject to permit terms and conditions)

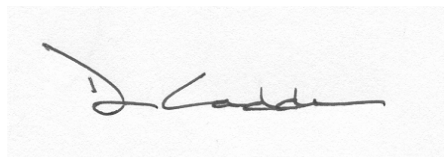
**Provincial Conditions:** (Permit holders must be aware of all terms and conditions):

See Appendix A.

**Specific Conditions:**

See Appendix A.

**Authorized by:**  
**Don Cadden**  
**Regional Manager**  
**Recreational Fisheries & Wildlife Programs**  
**West Coast**



Date: September 16, 2010

Permit Fee \$25

**Any contravention or failure to comply with the terms and conditions of this permit is an offense under the *Wildlife Act*, RSBC 1996, Chap. 488 and B.C. Reg. 125/90.**

## Appendix A: Fish Collection Permit Conditions

*Any Variation of the following terms and conditions will require explicit authorization by the appropriate regional Fish & Wildlife Section Head.*

### Provincial Conditions

1. This collecting permit is not valid
  - in national parks,
  - in provincial parks unless a Park Use Permit is also obtained,
  - in tidal waters,
  - for eulachon or for salmon\* other than kokanee, or
  - for collecting fish by angling unless the permit holder and crew members possess a valid angling licence.

This collecting permit is **only** valid for species listed as threatened, endangered or extirpated under the Species at Risk Act (SARA) **in conjunction with a permit issued under Section 73 of SARA from Fisheries and Oceans Canada.**

\*Contact the Department of Fisheries and Oceans for fish collecting permits for salmon, eulachon or SARA listed species (see Appendix B).

2. The permit holder (or the project supervisor) named on the application for a scientific collection permit will carry a copy of this permit while engaged in fish collecting and produce it upon request of a conservation officer, fisheries officer or constable.
3. Any specimens surplus to scientific requirements and any species not authorized for collection in this permit shall be immediately and carefully released at the point of capture.
4. Fish collected under authority of this permit shall not be used for food or any purpose other than the objectives set out in the approved application for a scientific collection permit. The permit holder shall not sell, barter, trade, or give away, or offer to sell, barter, trade or give away fish collected under authority of this permit. Dead fish shall be disposed of in a manner that will not constitute a health hazard, nuisance or a threat to wildlife.
5. No fish collected under authority of this permit shall be
  - transported alive unless authorized by this permit, or
  - transplanted unless separately authorized by the Federal/Provincial Fish Transplant Committee.
6. The permit holder shall, within 90 days of the expiry of this permit, submit a report of fish collection activities. Interim reports may also be required and shall be submitted as required by the permit issuer. All submissions must be filed electronically to: [http://www.env.gov.bc.ca/fish\\_data\\_sub/index.html](http://www.env.gov.bc.ca/fish_data_sub/index.html)

Reporting specifications, information and templates are available from this website and outline the mandatory information requirements. Prior notification of submission or questions regarding data report standards can be made to: [fishdatasub@gov.bc.ca](mailto:fishdatasub@gov.bc.ca)

7. This collecting permit is subject to cancellation at any time and shall be surrendered to a conservation officer on demand or to the issuer upon written notice of its cancellation.
8. This permit is valid only for the activities approved on the application form and in accordance with any restrictions set out therein.
9. This permit is valid only for trained, qualified staff named in the Application. The permit holder will comply with all Worker's Compensation Board requirements and other regulatory requirements. Permit holders are responsible for ensuring staff members listed on the permit are properly certified for specific sampling methods or activities (e.g. electroshocking).

## Appendix A: Fish Collection Permit Conditions Continued

10. All sampling equipment that has been previously used outside of B.C. must be cleaned of mud and dirt and disinfected with 100mg/L chlorine bleach before using in any water course to prevent the spread of fish pathogens (e.g. Whirling disease) and / or invasive plant species. Any washed off dirt or mud must be disposed of in a manner such that it cannot enter a watercourse untreated.
11. No electrofishing is to take place in waters below five degrees C.
12. Electrofishing may not be conducted in the vicinity of spawning gravel, redds, or spawning fish, or around gravels which are capable of supporting eggs or developing embryos of any species of salmonid at a time of year when such eggs or embryos may be present.
13. Angling must only occur in accordance with the regulations specified in the current BC Freshwater Fishing Regulations Synopsis.

### Specific Conditions

#### West Coast

- Within the boundaries of Management Units 1-1 through 1-13, there shall be no electrofishing in streams above 630 meters in elevation, in anadromous waters, or in lake tributaries from January 1 to June 30.
- All sampling gear follow Association of Professional Biologists' advisory practice bulletin #5. Practice Advisory – Didymo, see: <http://www.apbbc.bc.ca/files/Didymo.pdf>

## Appendix B: Table 1 - Species at Risk

The following are species at risk that have been listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as either endangered, threatened or a species of special concern. Species also listed under the Species at Risk Act (SARA) are identified with an asterisk, and are subject to additional permitting requirements through the Federal Department of Fisheries and Oceans (DFO).

Common Name	Scientific Name
Benthic Paxton Lake Stickleback	* <i>Gasterosteus sp.</i>
Benthic Vananda Creek Stickleback	* <i>Gasterosteus sp.</i>
Limnetic Paxton Lake Stickleback	* <i>Gasterosteus sp.</i>
Limnetic Vananda Creek Stickleback	* <i>Gasterosteus sp.</i>
Nooksack Dace	* <i>Rhinichthys sp.</i>
Morrison Creek Lamprey	* <i>Lampetra richardsoni</i>
Vancouver Lamprey (Cowichan Lake Lamprey)	* <i>Lampetra macrostoma</i>
Cultus Pygmy Sculpin	* <i>Cottus sp.</i>
Shorthead Sculpin	* <i>Cottus confusus</i>
Hotwater Physa	* <i>Physella wrighti</i>
Limnetic Enos Lake Stickleback	<i>Gasterosteus sp.</i>
Benthic Enos Lake Stickleback	<i>Gasterosteus sp.</i>
Salish Sucker	<i>Catostomus sp.</i>
Speckled Dace	<i>Rhinichthys osculus</i>
Charlotte Unarmoured Stickleback	<i>Gasterosteus aculeatus</i>
Columbia Mottled Sculpin	<i>Cottus bairdi hubbsi</i>
Giant Stickleback	<i>Gasterosteus sp.</i>
Green Sturgeon	<i>Acipenser medirostris</i>
Umatilla Dace	<i>Rhinichthys umatilla</i>
White Sturgeon	<i>Acipenser transmontanus</i>

Applications for permits to specifically collect and retain listed species must be reviewed by the appropriate Recovery Team, who will screen permits to ensure that any impacts on listed species are acceptable. For white sturgeon the contact is Steve McAdam ([steve.mcadam@gov.bc.ca](mailto:steve.mcadam@gov.bc.ca)). For listed non-game freshwater fish the contact is Jordan Rosenfeld ([jordan.rosenfeld@gov.bc.ca](mailto:jordan.rosenfeld@gov.bc.ca)), co-chair of the Non-Game Freshwater Fish Recovery Team.

<b>Permittee:</b>	Sara Stallard
<b>Title or Project Name:</b>	Whitehead Park Golden Willow Removal
<b>Material Type:</b>	Field Notes
	TerraWest Environmental
	Victoria, BC
<b>Purpose:</b>	Salvage
<b>PROVINCIAL PERMIT NUMBER:</b>	NA10-65766
<b>AGENCY:</b>	TerraWest Environmental
<b>DFO PERMIT NUMBER:</b>	XHAB-169-2010

Tod Creek and Prospect Lake Watershed Code: 920-195500

**Start Date (yyyy/mm/day)** 2010-09-18

**Finish Date (yyyy/mm/day)** 2010-09-18

**UTM Method** MAP

**UTM Zone** 10

**UTM Easting** 467543

**UTM Northing** 5374267

**Method** Minnow Trap

The following fish species are listed in the Fisheries Information Summary System (FISS) database for :

**Tod Creek:** Bass/Sunfish (General), Brook Trout, Brown Catfish (formerly Brown Bullhead), Coho Salmon, Cutthroat Trout, Prickly Sculpin, Pumpkinseed, Rainbow Trout, Smallmouth Bass, Threespine Stickleback.

**Prospect Lake:** Brown Catfish (formerly Brown Bullhead), Cutthroat Trout, Prickly Sculpin, Pumpkinseed, Rainbow Trout, Smallmouth Bass, Unidentifiable Trout - only fry <70mm in length , Westslope (Yellowstone) Cutthroat Trout.

On 14 and 16 September, DFO and MoE fish collection permits were received to proceed with fish salvage activities. On 14-15 September TerraWest installed work site and fish sequestering barriers on the upper and lower extents of the work site. At the north end of the site a sandbag dam of 5 mm washed stone was installed with 4" lengths of silt barrier-covered perforated pvc to allow stream flow. At the south end of the site a combination of a floating silt curtain, sandbags and silt barrier cloth was used to create a barrier between the furthest extent of in-stream willow and Prospect Lake.

On 18-20 September fish salvage was conducted with two days of ~ 24-hour G-trap sets of 15 traps each. Fish catch and release results are as follows:

Traps set 18 September and emptied 19 September:

Pumpkinseed sunfish	<i>Lepomis gibbosus</i>	345 (+6 dead) all juveniles
Brown catfish	<i>Ameiurus nebulosus</i>	12
Prickly sculpin	<i>Cottus asper</i>	4
Three-spine stickleback	<i>Gastrerosteus aculeatus</i>	1
American bullfrog	<i>Rana catesbeiana</i>	1

Traps set 19 September and emptied 20 September:

Pumpkinseed sunfish	<i>Lepomis gibbosus</i>	150 (+148 dead) all juveniles
Brown catfish	<i>Ameiurus nebulosus</i>	2
Prickly sculpin	<i>Cottus asper</i>	1 (+1 dead)
Three-spine stickleback	<i>Gastrerosteus aculeatus</i>	0 (+1 dead)
Crayfish	<i>Pacifastacus leniusculus</i> (likely)	4

All living catches were released back into either Prospect Lake or downstream of Goward Road, depending on which site was closer in habitat characteristics to the original trap site. All Pumpkinseed sunfish were released due to the difficulty in distinguishing between juveniles of the invasive Pumpkinseed with the stocked (but non-native) Smallmouth bass (*Micropterus dolomieu*). Fish mortalities were likely the result of decreasing DO during overnight plant respiration. Indeed, Pumpkinseed sunfish and Three-spine stickleback are often indicator species of this condition and are frequently present in degraded water quality conditions (Barlow pers. com. 2010). No salmonids were trapped.

For your interest:

#### Water Quality

The site was visited on 13 and 27 August, 2010. Water chemistry measurements were taken in four locations: (A) at the furthest downstream end of the proposed project works south of Goward Road; (B) midway along the proposed works approximately 30 m south of Goward Road; (C) approximately 5 m north of Prospect Lake in the golden willow suckers; and (D) at the southern edge of the proposed works on the lake side of the golden willow suckers. The results were as follows:

A – turbidity 1.3 NTU, pH 6.6, depth at centre 25 cm

B – dissolved oxygen  $\leq 3.5$  mg/L, temperature 15.5 °C, specific conductivity 92  $\mu$ S

C – dissolved oxygen  $\leq 6.0$  mg/L, temperature 17.8 °C, specific conductivity 97  $\mu$ S

D – dissolved oxygen  $\geq 12.8$  mg/L (142%), temperature 21.3 °C, depth at centre 120 cm

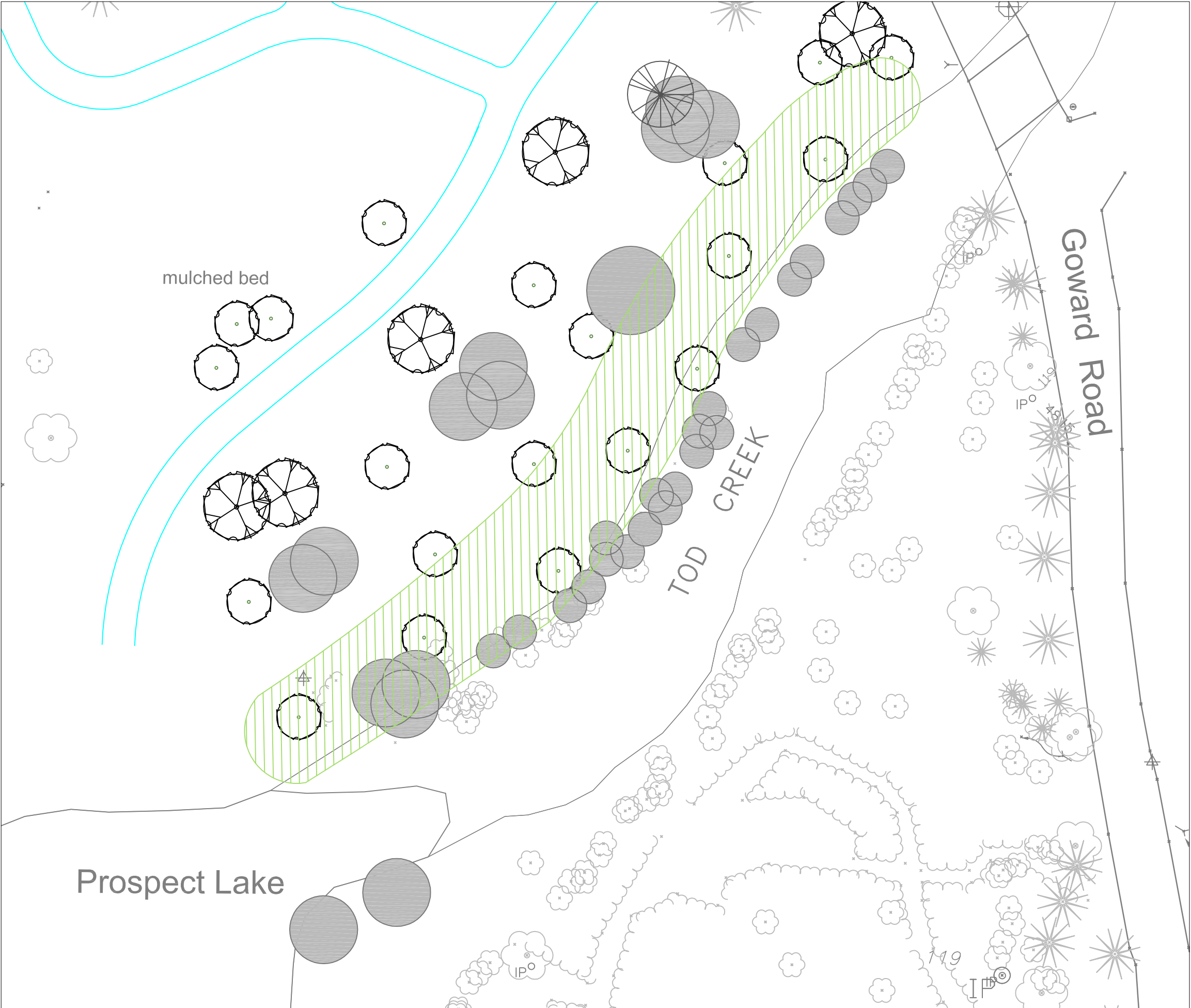
The flow of the creek was not estimated as surface movement was barely detectable during the duration of the project, even in heavy rain. The downstream water depth at Goward Road is approximately 25 cm and the water column itself remains shallow until immediately adjacent to the lake edge. However, accumulated organic debris has created a very thick, but highly unstable false bottom to the creek, making wading out from the western bank unsafe for the greater part of the proposed works reach. The true bottom at location B was >60 cm deeper than the 25 cm estimated only 0.5 m from shore. This was the case at numerous locations along the reach. Dissolved oxygen levels along the majority of the reach were below that expected to support healthy fish populations. No fish were noted at locations A, B, or C. Supersaturated dissolved oxygen levels and high water temperature were measured in the thick willow suckers targeted for removal. This area was heavily populated with small or juvenile fish (unidentified).

Permission was given to proceed beyond the fisheries timing window. In part, observations of fish presence and the low dissolved oxygen (DO) documented on site on 27 August were considered when requesting the fisheries window work extension. A water column DO of 8 mg/L O<sub>2</sub> is considered a minimum long-term threshold for fish health, particularly salmonids, with instantaneous thresholds of no less than 5 mg/L O<sub>2</sub> (MoE 2010; C.Barlow pers. comm. 2010).

## **APPENDIX E**

### **Saanich Planting Plan**





PLANT LIST:

TREES



acer macrophyllum – big leaf maple.  
Total 11 trees. Prefer caliper trees, min ht 2m.



chamaecyparis nootkatensis – yellow cedar, or  
thuja plicata – western red cedar



Total 20 trees, mix of the following, as available. 2 gal – 10 gal.:  
alnus rubra – red alder  
crataegus douglasii – black hawthorne  
populus tremuloides – trembling aspen  
rhamnus purshiana – cascara



Cuttings: mix of the following:

cornus stolonifera – redtwig dogwood  
populus tremuloides – trembling aspen  
salix scouleriana – scouler's willow  
salix lucida – Pacific willow

Source of cuttings to be identified by Saanich Parks



invasive willows to be removed, exact numbers and location  
to be confirmed on-site.



existing trees

PLANT NOTES:

Cutting species and extent of planting to be reviewed by QEP.  
Refer to planting spec and Description of Services provided for more details.

PLANTING PLAN:  
SCALE: 1: 300

## **APPENDIX F**

### **Project Photos**



**1. Photopoint 1a:** 27 Aug 2010 – Prior to clearing



**2. Photopoint 1b:** 27 Aug – Prior to clearing



**3. Photopoint 1a:** 9 Sept – Major tree felling



**4. Photopoint 1b:** 9 Sept – Major tree felling



**5. & 6. Photopoints 1a & b:** 2 Nov – Site completion with start of native cuttings planting





**7. Photopoint 3a: 27 Aug – Prior to clearing**



**8. Photopoint 2: 27 Aug – Prior to clearing**



**9. Photopoint 3a: 22 Sept – In-stream willow removal**



**10. 9 Sept – Major tree felling**



**11. Photopoint 3a: 5 Oct – Site completion**



**12. Photopoint 2: 2 Nov – 1 month post-completion**





**13.** Photopoint 4: 15 Sept – East bank during clearing



**14.** Golden willow root mats and suckers



**15.** Photopoint 4: 29 Sept – Eastbank site completion



**16.** Golden willow root mats and suckers



**17.** 2 Nov – Native cuttings planting



**18.** Golden willow in-stream logs and suckers





**19. BMPs – Downstream sandbag dam**



**20. BMPs – Upstream silt curtain and sandbags**



**21. BMPs – Stump grinding at water's edge**



**22. BMPs – Stump grinding without tarps**



**23. 23 Sept – End of day site condition**



**24. 26 Sept – Excavator incursion into riparian area**



**25.** Sediment Monitoring Station S1 – red float at right



**26.** Sediment Monitoring Station S2 – red float at centre



**27.** 5 mm sandbag stone (left); site substrate (right)