



## INTRODUCTION

Benson Creek Falls Regional Park has become an increasingly popular day hiking destination for outdoor enthusiasts of all ages. Unfortunately, the increased level of foot traffic has contributed to the erosion of slopes and banks adjacent to both Ammonite Falls and the Benson Creek Crossing. This memo presents strategies to stabilize eroded slopes and to discourage the continued use of makeshift trails.





## BANK STABILIZATION STRATEGY 1 (SLOPES > 1:1)

### Recommended Bank Stabilization Technique: Live Staking

Live staking consists of placing live, vegetative cuttings into the ground so that they take root and grow. It is a simple and cost effective technique that is widely used to stabilize and re-vegetate eroded banks.

### Application

Live stakes are recommended for very steep slopes including the eroded banks and trail closure areas at Ammonite Falls and Benson Creek Crossing.

### Plant Material

Scouler's Willow (*Salix scouleriana*)

### Harvesting

- All Willow cuttings should be harvested from a low lying area within the floodplain, but not immediately adjacent to a watercourse or forming any part of the riparian area immediately adjacent to fish bearing waters.
- All cuttings should be harvested during the dormant stage (late fall to early spring).
- Willow cuttings should be taken from straight, live wood that is at least 2 years old and should be a minimum of 1.0 m in length and 10 mm in diameter. The butt end of the cutting should be cut at a 45 degree angle and the top end should be cut square.
- Cuttings must not be allowed to dry out and should be pre-soaked a minimum of 10 days prior to installation.

### Installation

- Installation of Willow cuttings should take place November - February.
- Use an iron stake or bar to make a pilot hole at a 90 degree angle to the soil surface. On vertical banks plant the stakes so that they are pointed slightly upward.
- Place the stakes into the ground so that at least two live buds and/or bud scars are above the ground after planting
- Do not damage the buds, strip the bark, or split the stake during installation.
- Tamp the soil around the cutting once installed.

### Costs

The installed cost of Live Stakes is dependent on local labour rates, proximity of harvest area to site, site accessibility, and other site variables. Typical installed costs range between \$10 - \$25/m<sup>2</sup>.

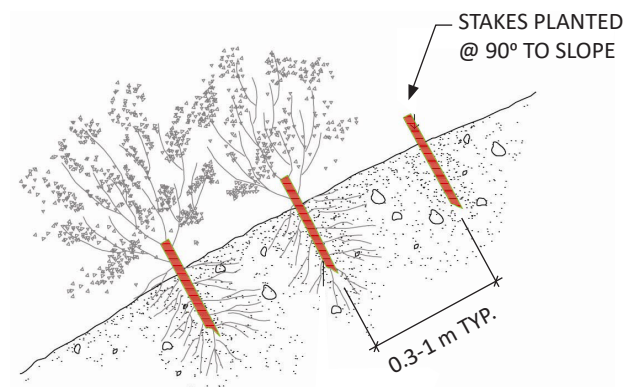


Figure 1. Live Staking Section

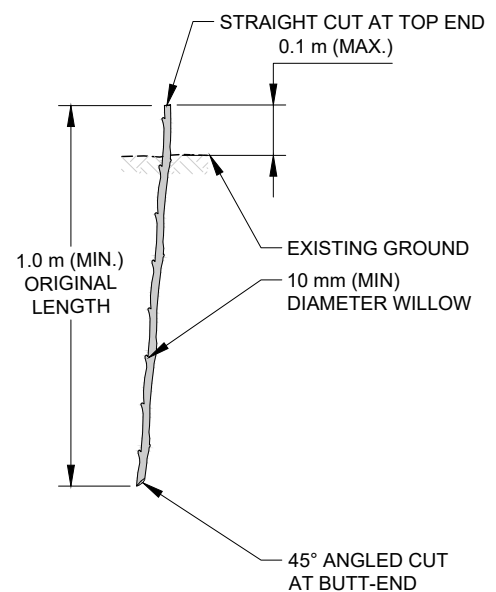


Figure 2. Live Staking Detail

### Maintenance

Regular inspections should be conducted during the first two years of establishment. Any damaged or missing plant materials should be replaced as soon as possible. Survival rates tend to be fairly good, but are influenced by seasonal conditions and human impacts.





## BANK STABILIZATION STRATEGY 2 (SLOPES < 1:1)

### Recommended Bank Stabilization Technique: Wattles (Live Fascines) with Live Stakes

Wattles, or live fascines, are live branch cuttings that are bound together into long bundles and staked into the ground to mitigate erosion. Wattles should be used in conjunction with live stakes to further stabilize slopes.

### Application

Wattles can be used to supplement live staking in an effort to increase potential success rates and help stabilize eroded banks. Wattles are not suitable on embankments with slopes steeper than 1:1.

### Plant Material for Wattles

Scouler's Willow (*Salix scouleriana*)

Black Cottonwood (*Populus balsamifera*)

### Wattle Construction

- Cuttings for wattles should be harvested in the same manner as live stakes. See Strategy 1 for harvesting information.
- Tightly compress bundles and tie with rope or twine.
- Wattles must not be allowed to dry out and should be pre-soaked for a minimum of 10 days prior to installation.

### Wattle Installation

- Installation of wattles should take place November-February.
- Perform slope repairs prior to wattle installation.
- Work should progress from the bottom to the top of the slope.
- Install wattles into trenches dug perpendicularly to the slope. The trench depth should be 1/2 the diameter of the wattle.
- Place the wattles immediately after trenching.
- Wattles should be staked firmly in place with one row of construction stakes on the downhill side of the wattles, not more than 1m apart. A second row of stakes should be placed through the wattles near the ties, not more than 1.5 m apart.
- Live stakes should be installed on the downslope side of the bundle between the previously installed construction stakes.
- If more than a single wattle is required to run the length of the slope, overlap the tapered ends of adjacent wattles so the overall wattle thickness is uniform. Two stakes should be used at each bundle overlap.
- Backfill wattle with soil from the slope. The backfill should be worked into the wattle and compacted behind and below the bundle.
- Place moist soil along the side of the live bundle. The top of the bundle should be slightly visible after installation.
- Repeat the preceding steps to the top of the slope.

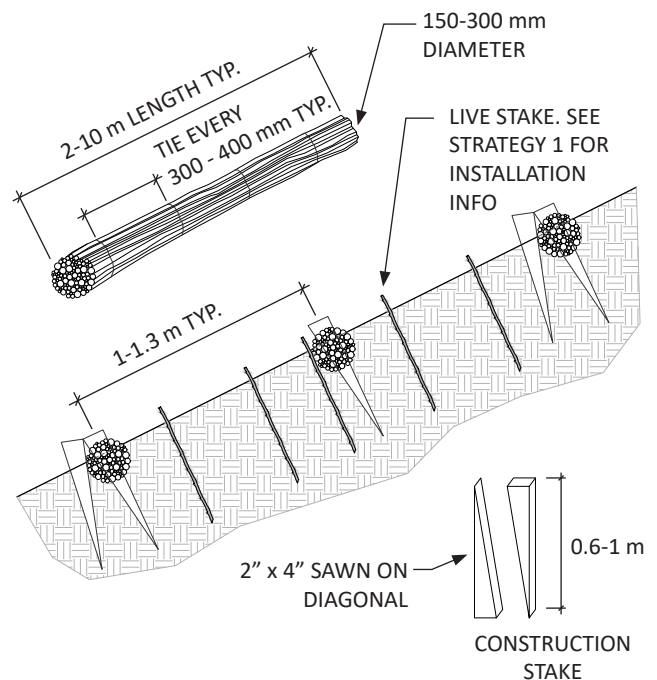


Figure 1. Wattle Detail

### Costs

The installed cost of wattles is dependent on local labour rates, proximity of harvest area to site, site accessibility, and other site variables. Typical installed costs range between \$30 - \$80 per linear meter.

### Maintenance

Regular inspections should be conducted during the first year. Stakes that loosen over time should be re-installed. Rills and gullies around or under wattles should be repaired as necessary.



## BANK STABILIZATION STRATEGY 3 (SLOPES < 2:1)

### Recommended Bank Stabilization Technique: Plug/Shrub Planting

Planting vegetation is the simplest and most commonly used strategy to mitigate soil erosion. Once installed, plants establish roots systems that stabilize soil and reduce future erosion.

### Application

Plugs/shrubs could be used to supplement strategies 1 and 2 in locations where faster understory recovery, plant diversity, and/or enhanced visual benefits may be desired. Plugs/shrubs are recommended for locations where slopes are 2:1 or less.

### Plant Materials for Plugs/Shrubs

Snowberry (*Symphoricarpos albus*)  
Red-Osier Dogwood (*Cornus sericea*)  
Thimbleberry (*Rubus parviflorus*)  
Red Flowering Current (*Ribes sanguineum*)  
Salal (*Gaultheria shallon*)  
Sword Fern (*Polystichum munitum*)  
Deer Fern (*Blechnum spicant*)

### Plug/Shrub Installation

- Plugs/shrubs should not be installed on slopes greater than 2:1.
- Installation of plugs/shrubs should take place November-February.
- Perform slope repairs prior to plug/shrub installation.
- Plants should be located between live stakes (where applicable) and spaced 0.5-1.0m on center.
- Composted wood mulch should be applied to planted areas to help retain moisture.

### Maintenance

Regular inspections should be conducted during the first two years of establishment. Any damaged or dead plants should be replaced as soon as possible.

### Costs

The installed cost of plugs/shrubs is dependent on local nursery rates, growing medium requirements, site accessibility, and other site variables. Typical installed costs range between \$20 - \$50/m<sup>2</sup>.

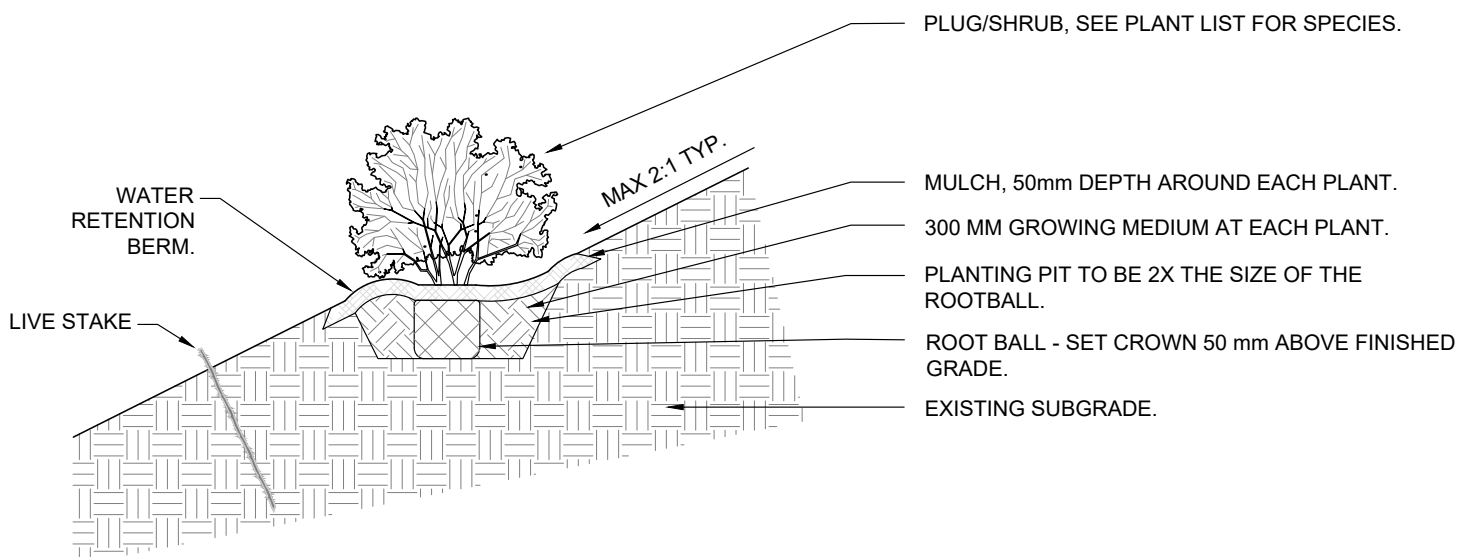


Figure 1. Plug/Shrub Detail



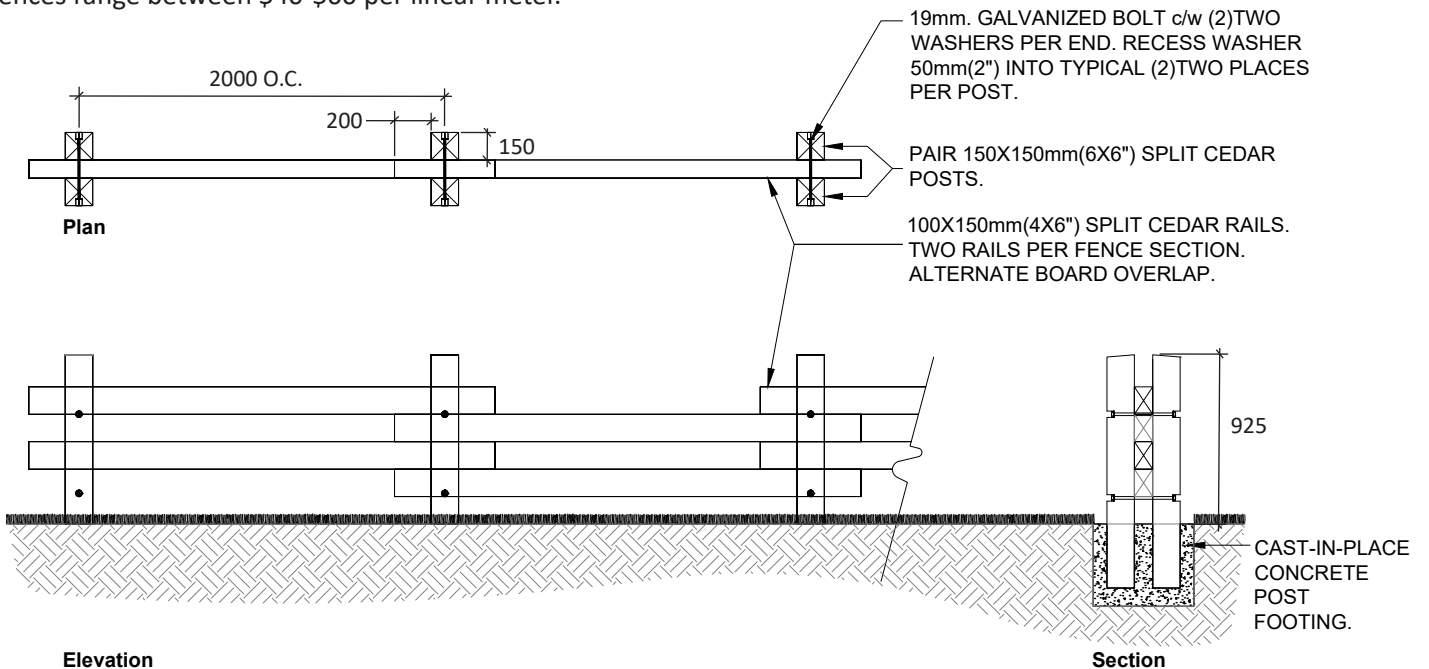
## FENCING OPTIONS

### Application

In high traffic areas, fencing is recommended to deter access to previous trails or side trails as the natural recovery process occurs. A rustic-style fence such as a cedar split-rail fence is recommended. In areas that experience less foot traffic, downed logs can be used as an inexpensive alternative to constructed fencing, and be strategically placed to keep pedestrians on designated trails.

### Costs

Installed costs for fencing is dependent on fence style, materials, and site accessibility. Typically costs for split-rail cedar fences range between \$40-\$60 per linear meter.







## SIGNAGE OPTIONS

### Application

Where trail closures are undertaken, a signage strategy should be developed to educate park users about the closures and encourage use of the new access points.

### Costs

Installed costs for signage depend on style, material, and mounting type, but typically range between \$800-\$1,200 per sign.

