



After the north railroad ferry dock was removed, the creek quickly migrated (likely as an avulsion) to the north into the dredged area that had been behind the dock embankment, creating an abrupt grade drop from the channel into the dredged area. This resulted in a quickly propagating headcut up the creek channel as the creek adjusted to its new base elevation, which resulted in channel incision in Lower Goldsborough Creek. The exposure of two buried pipelines and the undercutting of infrastructure is evidence of the downcutting of the channel bed over time.

### **Habitat Goals**

Goldsborough Creek is a productive salmonid stream supporting coho, fall chum, and winter steelhead spawning, with fall Chinook listed as having a presence in the stream (WDFW 2013). The habitat goals for this confluence restoration project include:

- Provide habitat and hydraulic complexity
- Provide cover and refugia for juvenile salmonids
- Promote depositional areas adjacent to the mouth
- Promote aggradation in Lower Goldsborough Creek
- Develop distinct, complex flow paths for Goldsborough Creek as it enters the harbor
- Help restore estuary function of Shelton Harbor

### **PROPOSED ALTERNATIVE CONCEPTS**

A site reconnaissance was conducted on August 22, 2013, of the lower extent of Goldsborough Creek, delta, and estuary area in support of developing habitat restoration concepts. During the site visit, the weather was sunny and dry. A -0.2-foot low tide occurred at 2:24 pm. During the reconnaissance, most of the delta at the mouth was above this exiting tide level. Current conditions of the restoration area were documented with digital photographs.

Upon entry to Shelton Harbor, the low-flow channel veers to the north away from the railway loading area along the south (riprap embankment). Sediment deposition is occurring in the form of large bars throughout the delta. A north-south channel is located along the base of the rock retaining wall that defines the eastern extent of the timber operations north

---

of the mouth of Goldsborough Creek. During low tides, this channel conveys outfall drainage (via culverts) from the timber mill, and is inundated during high tides.

## **Alternatives Development**

The project proposes to place engineered log jams (ELJs) to improve habitat conditions at and near the mouth of Goldsborough Creek (Figure 1). The ELJs would add hydraulic and habitat complexity, which is currently lacking at and below the confluence of Lower Goldsborough Creek. ELJ placement would also slow water velocities and create localized backwater conditions. These conditions would promote localized deposition, resulting in bed aggradation at and in the vicinity of the structures. Upstream of the ELJs, in the lower reach of Goldsborough Creek, aggradation would also occur in the channel as deposition at the mouth progresses.

## **ELJ Design**

The proposed ELJs will consist of four logs with rootwads have a maximum length 40 feet, and four log poles (maximum length of 15 feet) (Figure 2). The structure design and shape are intended to capture and retain sediment and wood. Over the long term, the retained wood and sediment will help aggrade the mouth and lower section of Goldsborough Creek. The long-term intent is to help aggrade this area 2 to 3 feet to better emulate conditions prior to the removal of the north railroad ferry dock.

## ***Alternative 1***

Alternative 1 consists of four ELJs located immediately below the mouth of Goldsborough Creek in Shelton Harbor (Figure 1 – Alternative 1). Alternative 1 represents a low level of effort with a project footprint of 13,850 square feet. The structures would be placed immediately downstream of the confluence such that stream flows entering the harbor would flow around and between the structures encouraging multiple flow paths. This alternative could be considered the minimum action that would likely promote project objectives.

---

### ***Alternative 2***

Alternative 2 represents a larger level of effort and will consist of nine ELJs located below the mouth of Goldsborough Creek in Shelton Harbor (Figure 1 – Alternative 2). This alternative will promote aggradation and structure placement throughout 48,720 square feet of the estuary. The intent of the layout is to create a larger habitat area and a larger, more widespread depositional zone.

### ***Alternative 3***

Alternative 3 will consist of 14 ELJs and promote aggradation throughout a much greater area, approximately 85,350 square feet (Figure 1 – Alternative 3). This represents the largest implementation footprint and likely represents the greatest area that could likely be influenced by structure placement alone, at least in the near term. Implementing this alternative should be done in conjunction with longer term restoration plans for the harbor.

### **Preferred Alternative**

*[per Stakeholder input]*

---

## REFERENCES

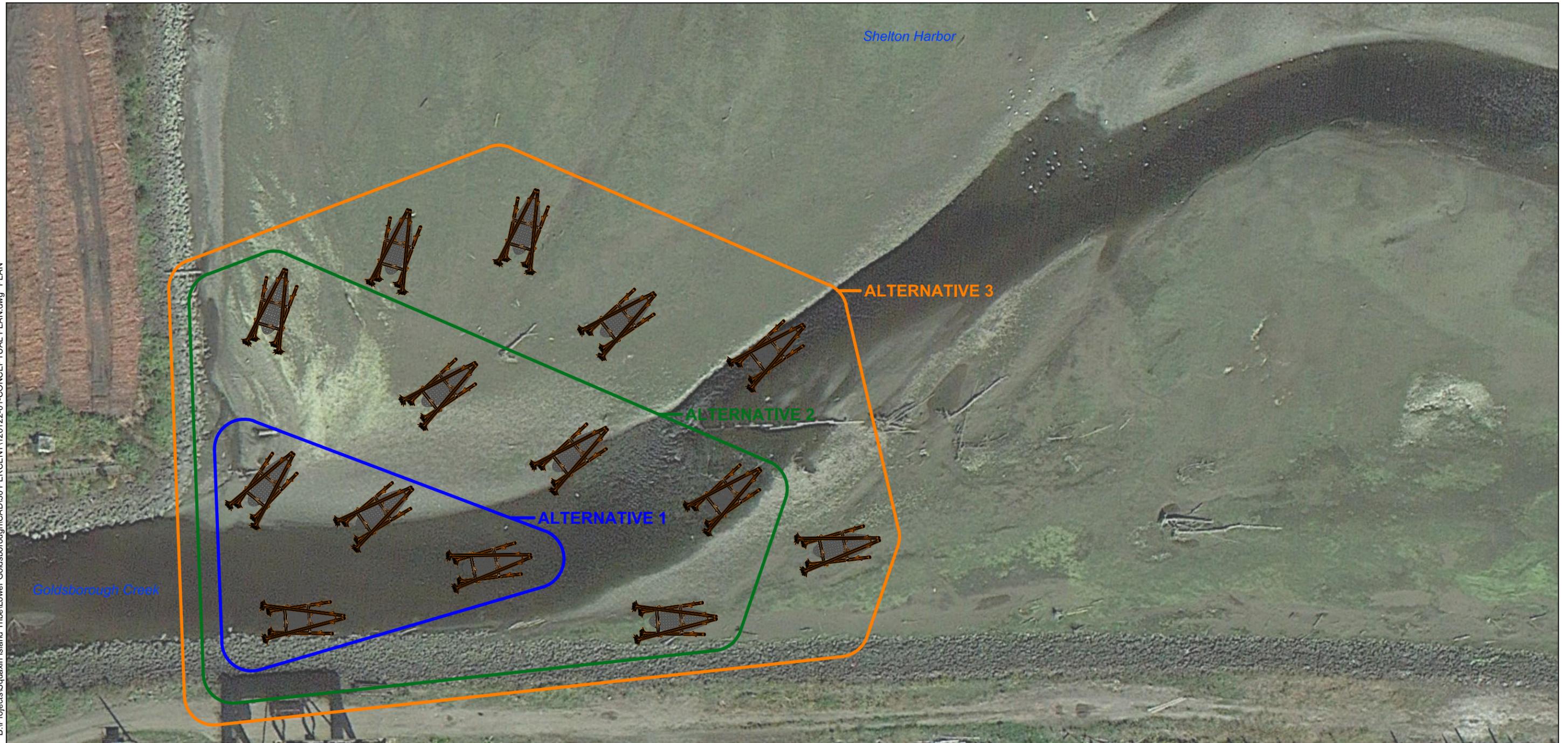
WDFW (Washington State Department of Fish and Wildlife), 2013. SalmonScape. Site accessed: September 25, 2013. Available at: <http://fortress.wa.gov/dfw/gispublic/apps/salmonscape/default.htm>

---

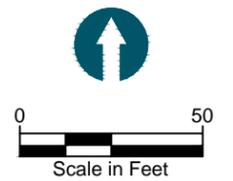
# FIGURES

---

B:\Projects\Squaxin Island\Tribe\Lower Goldsborough\CAD\30 PERCENT\120122-01-CONCEPTUAL PLAN.dwg PLAN



SOURCE: Aerial is Google Earth, August 25, 2011.  
 HORIZONTAL DATUM: Washington State Plane South, NAD83, U.S. Feet.



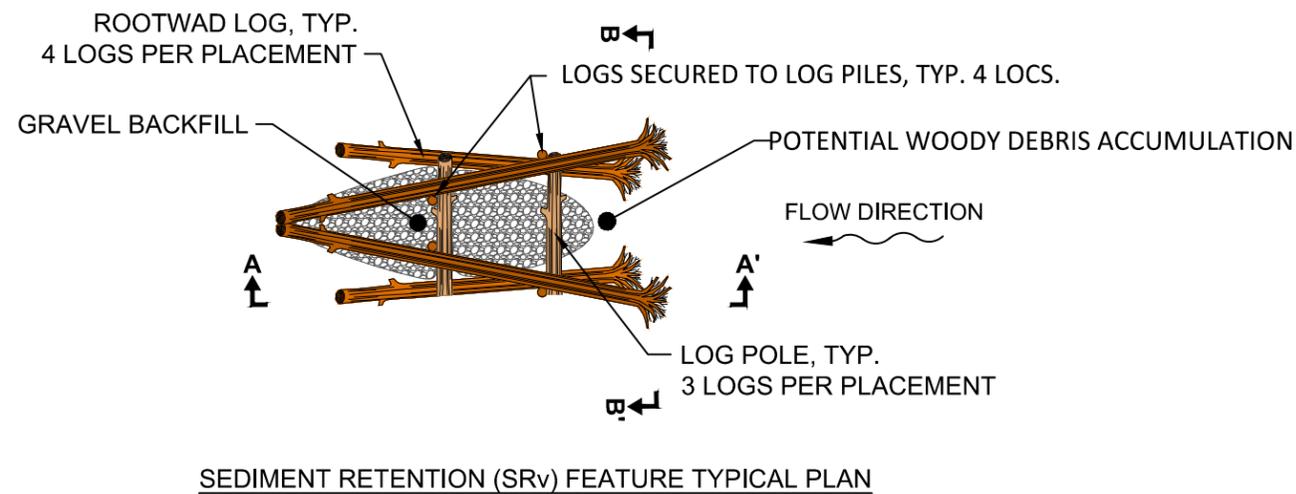
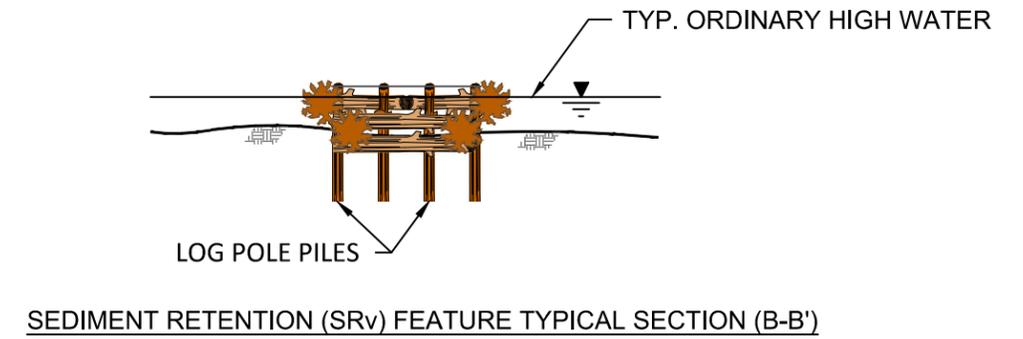
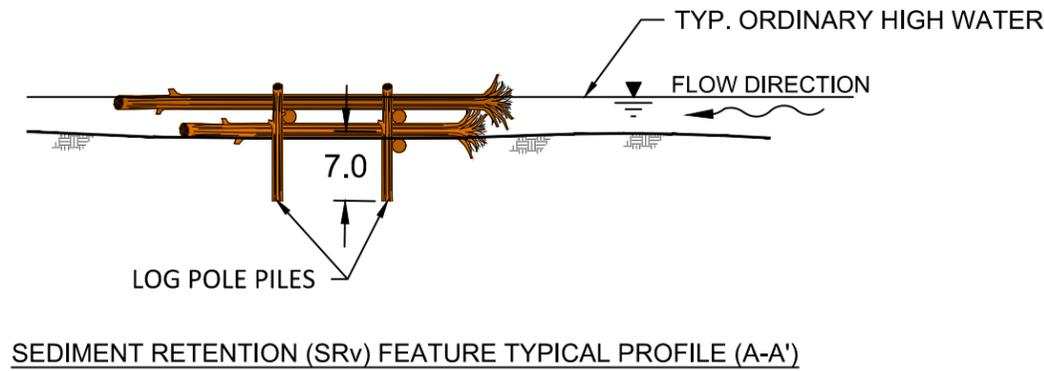
Sep 04, 2013 10:51 am epipkin

**DRAFT**



**Figure 1**  
 ELJ Concept Plan View  
 Conceptual Habitat Restoration Design  
 Squaxin Tribe

B:\Projects\Squaxin Island\Lower Goldsborough\CAD\30 PERCENT\120122-01-CONCEPTUAL PLAN.dwg DETAIL  
 Sep 04, 2013 10:52am epipkin



LOG SPECIFICATIONS				
DESCRIPTION	DBH (IN.)	MIN. LENGTH (FT.)	ROOTWAD DIA. (IN.)	SPECIES
ROOTWAD LOG	18	40	54	PONDEROSA PINE/ DOUGLAS FIR
ROOTWAD LOG	18	30	54	PONDEROSA PINE/ DOUGLAS FIR
LOG POLES	15	15	NONE	PONDEROSA PINE/ DOUGLAS FIR
LOG POLE PILES	12	15	NONE	PONDEROSA PINE/ DOUGLAS FIR

**GOALS AND OBJECTIVES:**

1. ACCUMULATE SEDIMENT AND WOODY DEBRIS IN FORMER MAIN CHANNEL
2. RAISE THE GRADE OF THE FORMER MAIN CHANNEL
3. PROVIDE CHANNEL ROUGHNESS AND HYDRAULIC COMPLEXITY
4. PROVIDE HYDRAULIC REFUGE FOR JUVENILE SALMONIDS AND OTHER FISH SPECIES DURING HIGH FLOWS.

**CONSTRUCTION NOTES:**

1. INSTALL THE LOG PILES IN THE LOCATIONS SHOWN
2. PLACE THE FIRST LAYER OF ROOTWAD LOGS FLUSH WITH THE EXISTING GRADE, EXCAVATING AS NECESSARY FOR THE ROOTWAD MASS
3. PLACE THE LOG POLES SPANNING BETWEEN THE LAYER 1 ROOTWAD LOGS
4. PLACE THE SECOND LAYER OF ROOTWAD LOGS
5. SECURE THE ROOTWAD LOGS AND LOG POLES TOGETHER AND TO THE LOG PILES USING A LIMITED AMOUNT OF MANILA FIBER ROPE ROUTED TO MINIMIZE VISIBILITY.

DRAFT



**Figure 2**  
 ELJ Concept Details  
 Conceptual Habitat Restoration Design  
 Squaxin Tribe