

## River Restoration Northwest – 2010 Symposium

# Long-Term Monitoring of Engineered Log Jams in an Urbanized Creek

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**Pete Sturtevant**  
**Randy Whitman**

CH2M HILL  
Bellevue WA

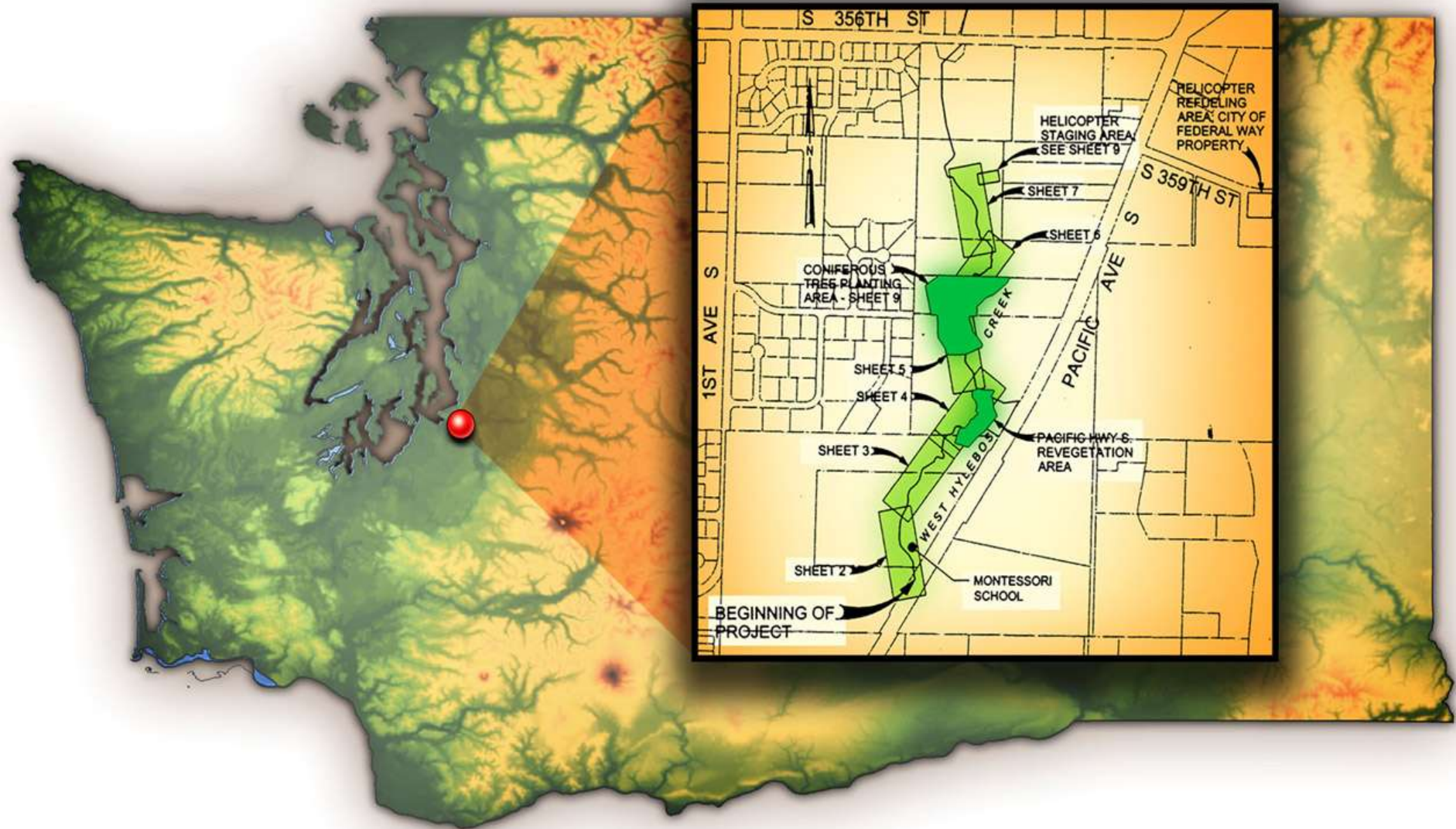


**Fei Tang**

City of Federal Way WA



# Project location



# West Fork - Hylebos Study Reach



# Stream Erosion and Sedimentation Problems

- **Steep, narrow ravine south of 356th St.**
- **Modest stream slope: less than 3%**
- **Highly erosive channel banks**
  - **Outwash material**
- **Numerous landslides**
- **High sediment load**
  - **Prominent gravel bars**
  - **Downstream sedimentation**
- **Danger of major debris flow**



## Recommended Solution:

**Intercept sediment, retain within the channel**

**Emphasis on halting major debris flow**

- **Minimize disturbance of unstable areas**
- **Improve stream habitat**
- **Far less costly than attempting to stabilize hillsides**



## Instream Measures

- **3 Log Revetments - Streambank Erosion**
- **2 Log Weirs – Sediment Retention**
- **5 Log Weirs – Fish Passage/Habitat**
- **3 Augmented Log Jams - Sediment Retention/Habitat**
- **7 Engineered Log Jams - Sediment Retention/Habitat**



## Augmented Log Jams

- Take advantage of existing LWD
- Selectively add logs to trap sediment



# Engineered Log Jams





## Other Helicopter Delivery Features

- **Helicopter staging area near delivery sites**
  - No flyovers of homes or roads
- **HiLine Helicopter Service**
  - Darrington, WA



## 5-Year Monitoring Program: 2005-2009

- Annual photographic inspection of log jams each June
- Channel X-section survey\* up- and downstream of logjams: Years 0, 2, and 5
- Vegetation Monitoring: Years 0, 2, and 5

\*Hand level and tape measure.



## Annual Rainfall and Peak Flows in the West Fork Basin

Water Year	Annual Rainfall (inches)	Peak Flow (cfs)
2005	26	42
2006	39	71
2007	45	170 (est.)
2008	26	94
2009	33	65

## West Fork Hylebos Creek Flood Frequency (cfs)

Return Period	Pacific Highway South	S. 373 <sup>rd</sup> Street
1-year	55	83
2-year	122	178
5-year	169	243
10-year	201	289
25-year	245	348
50-year	279	394
100-year	314	443

# Log Jam 1



2005



2009

# Log Jam 4



2005



2009

# Augmented Log Jam 2



2005



2009

# Log Jam 7



2005



2009

## Channel X-Section Changes Between November 2004 and June 2009

Log Jam #	10-foot Downstream		10-foot Upstream	
	ft <sup>2</sup>	Notes	ft <sup>2</sup>	Notes
1	-5	Minor channel erosion near left and right banks	-11	Minor channel erosion near left and right banks
Aug. 2	+15	One to two feet of depositing on right bank	- - -	See Note 2. Considerable gravel deposition observed
6	-7	Minor channel widening	+8	Deposition along both stream banks
Aug. 3	-13	Original channel near left bank filled up to two feet; one foot of scour produced a new channel near right bank	+23	Average of one foot of gravel deposition across entire channel
7	+19	Formation of a major gravel bar in center of channel; deposition along right bank	+27	Two feet of gravel deposition in center of wide channel; minor scour near right bank

Notes: 1. Net Change; Positive Number: Net deposition; Negative Number: Net channel erosion.  
2. Unable to obtain a reasonable alignment of the two cross-sections for comparison.



# Conclusions/Recommendations

- **Highly dynamic movement of material through the system**
- **Large accumulation in 2004-2005**
- **Some gravel losses recent years**
- **Net accumulation of material in streambed**
- **Pools formed at logjams provide useful habitat**



# Conclusions/Recommendations Continued

- **No logjam movement**
  - **Smaller logs could be used**
  - **Flexible (cable) log fasteners**
- **Bury footer log to reduce chance of underflow**
- **Formal survey of stream cross sections**
  - **More costly**
  - **Greater accuracy**



# Revegetation Site - 2005



# Revegetation Site - 2009



# Revegetation Site - 2009

