

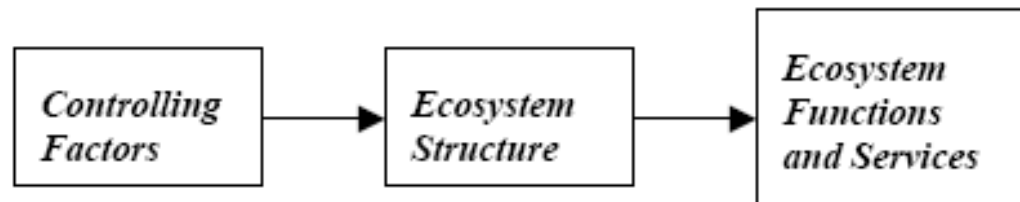
Effects of Estuarine Wetland Restoration on Flood Management: The Lower Grays River Experience



Ian Sinks
Columbia Land Trust

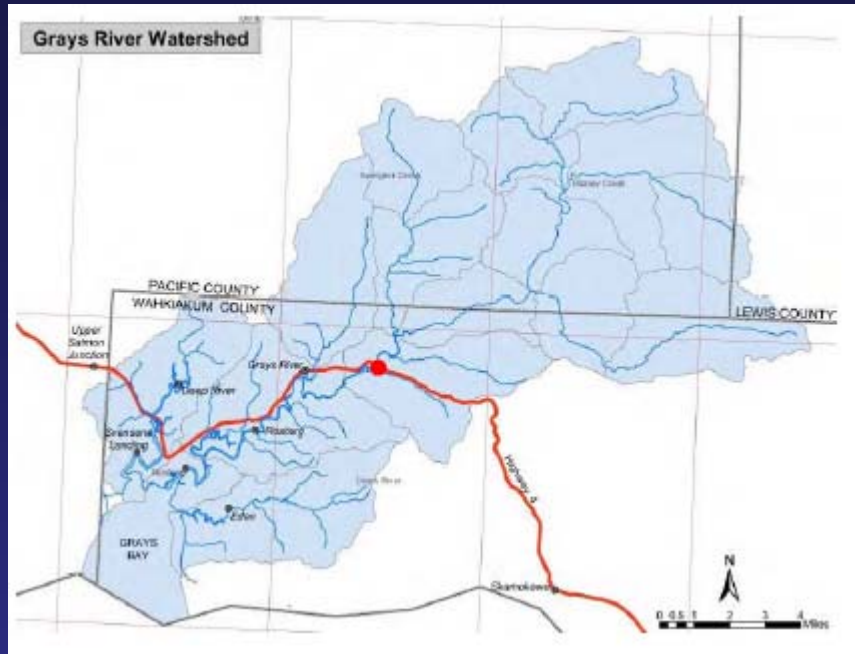
Effects of Estuarine Wetland Restoration on Flood Management: The Lower Grays River Experience

- Conservation/Community Issues within the Grays River Watershed
- Restoration Actions
- Kandoll Farm Restoration Project
 - Hydrology
 - Channel Morphology
 - Sediment Dynamics
 - Vegetation
 - Salmon Habitat
- Lessons Learned



Resources

- PNNL Kandoll Farm Restoration Model
- USACE Cumulative Effects Study Team
- PNNL Watershed and Biological Assessment
- CREST
- Ducks Unlimited
- Columbia Land Trust
- Heida Diefenderfer
- Mark Scott



From: May and Geist, 2006



Watershed Context

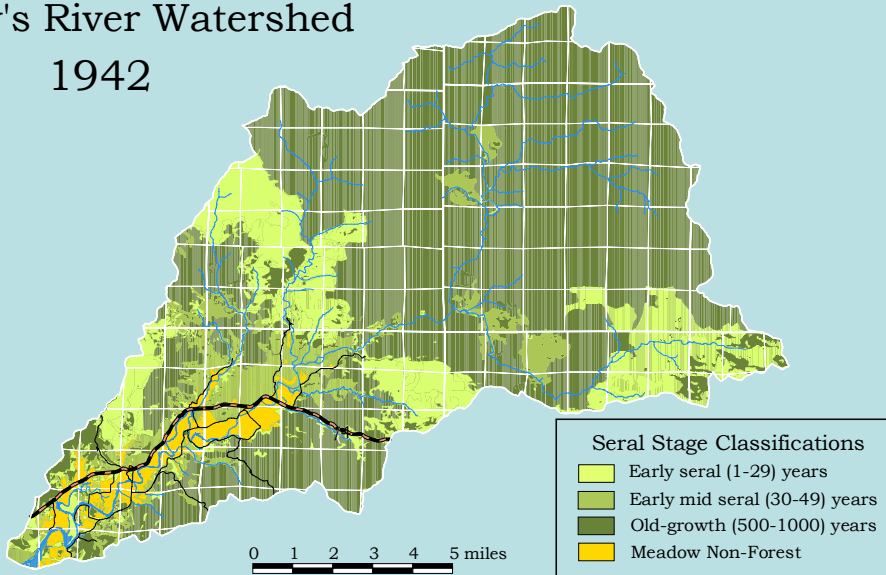
Community Concerns

- Declining agricultural economy
- Increased sedimentation
- Decreased channel management – Increased flooding
- Declining fish populations: economic and regulatory issues
- Inability to act within the river

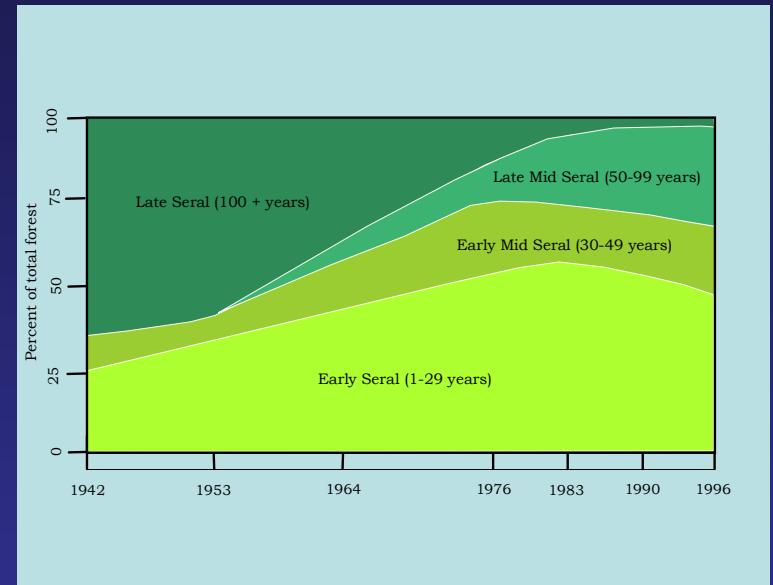
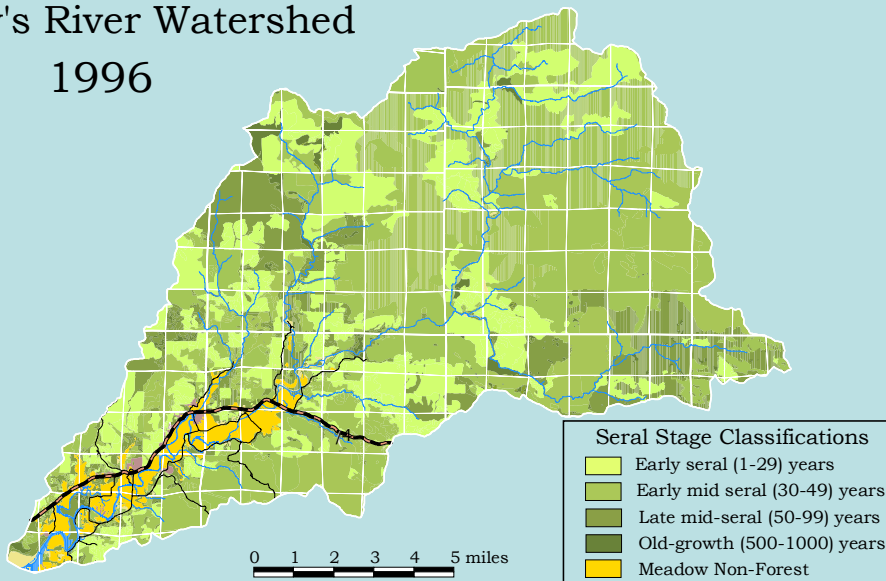
Resource Concerns

- Core salmon recovery populations: Chum and Fall Chinook
- Increased sedimentation rates with decreased storage capacity in upper watershed and 'competence' in lower watershed
- Loss of channel stability and salmonid habitat

Gray's River Watershed 1942

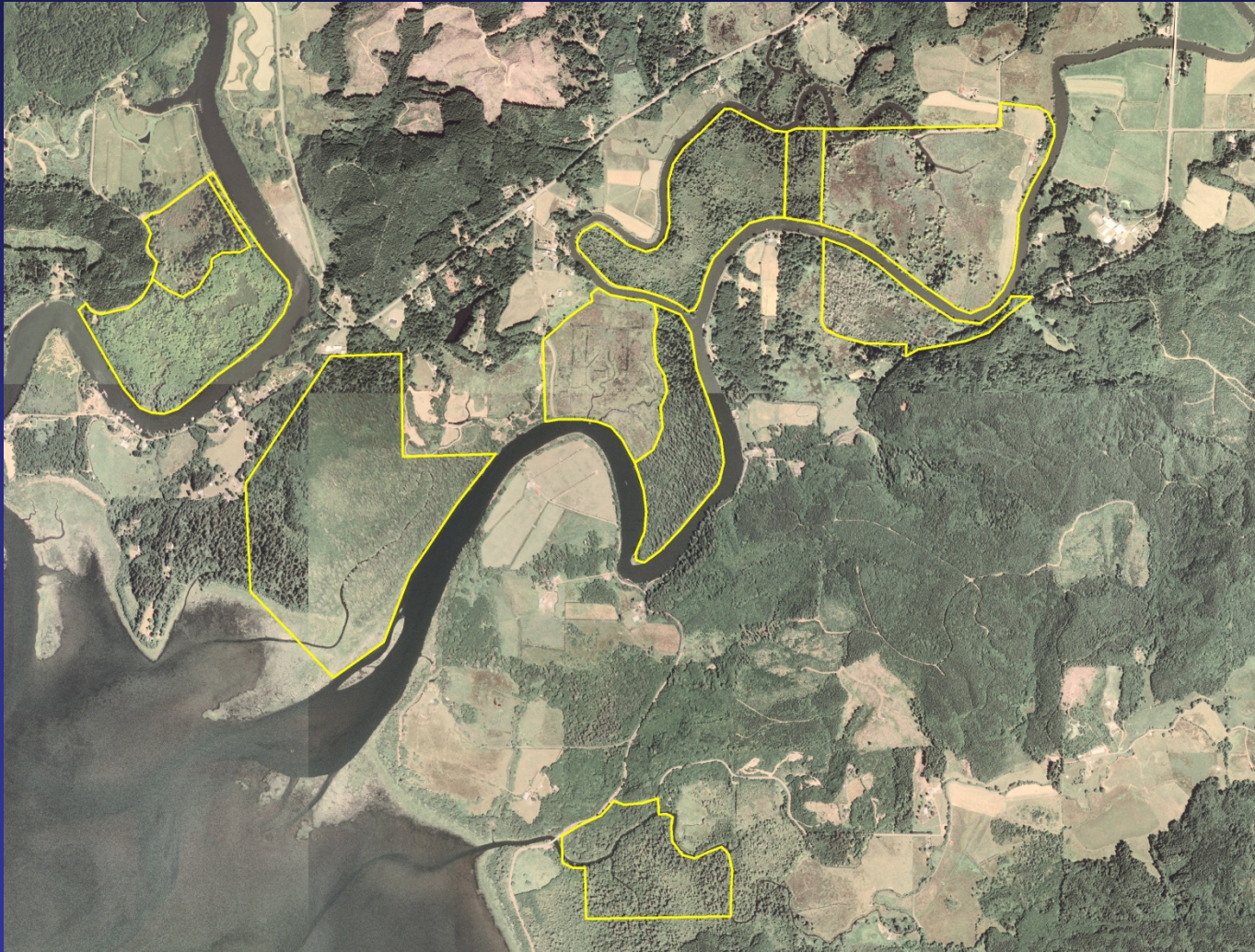


Gray's River Watershed 1996



Percent of Gray's River forest in early – late seral stages 1942-1996 (Mark Scott 2001).

Columbia Land Trust Conservation Properties, Grays Bay Watershed



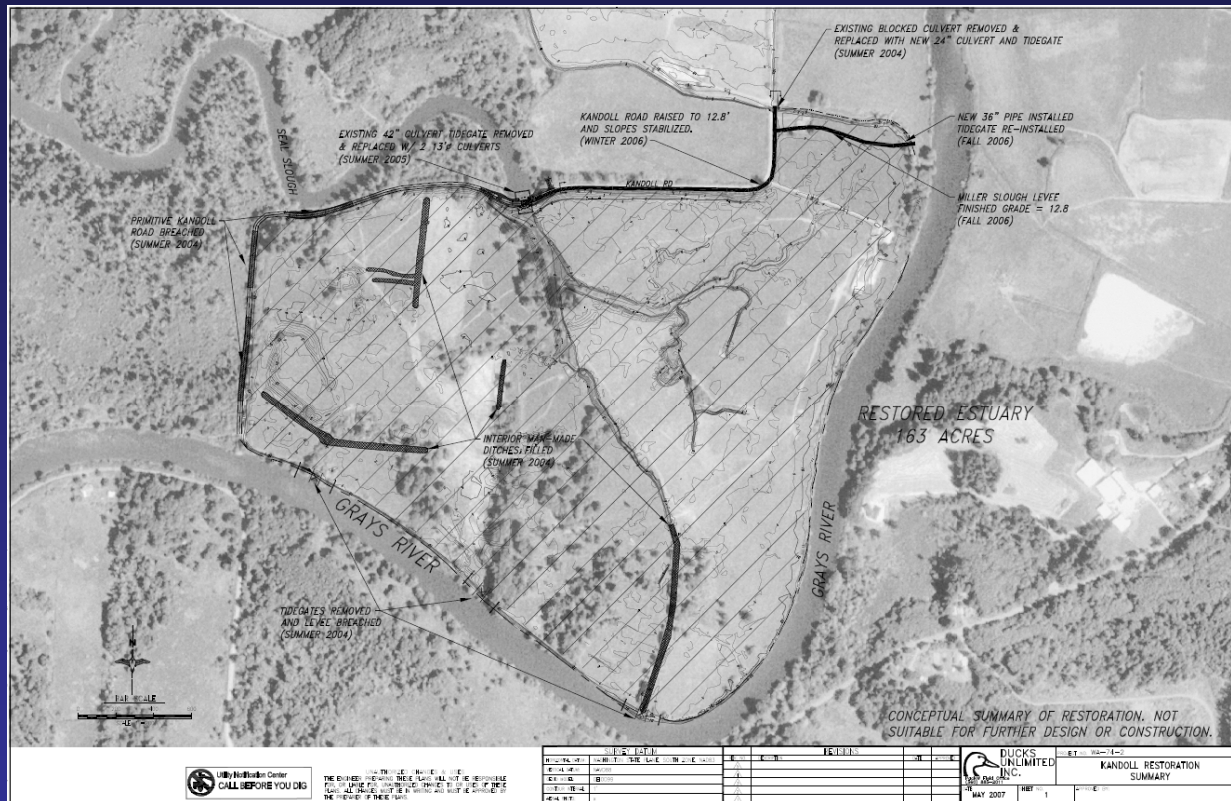
Grays Bay Conservation Project – Columbia Land Trust

Project Goals	Accomplishments
Permanently protect 850 acres of habitat lands	986 acres have been protected and will be stewarded by the Land Trust, including 95 acres from The Nature Conservancy transferred to CLT for stewardship
Restore floodplain connectivity to 520 acres of tidal habitat	544 acres have been restored with an additional 50 acres planned for the future
Restore over 300 acres of potential salmonid rearing habitat	Juvenile salmonids are able to access well over 300 acres of rearing habitat during different times of the year and water events.
Enhance approximately 3.0 miles of riparian shoreline	Nearly Complete – Planting and weed control was initiated in 2006 to enhance shoreline habitat conditions.
Protect three bald eagle nests and over 100 acres of potential marbled murrelet nesting habitat	Accomplished with the Secret River and Deep River acquisitions

Kandoll Farm Restoration Project

Project Summary

- Acquired in 2003
- Initial Restoration in 2005
- Tide and River Floods of Winter 2006
- Hydrodynamic Modeling and Analysis in 2006-2007
- Remediation implementation in Fall 2007
- November 2007 flood



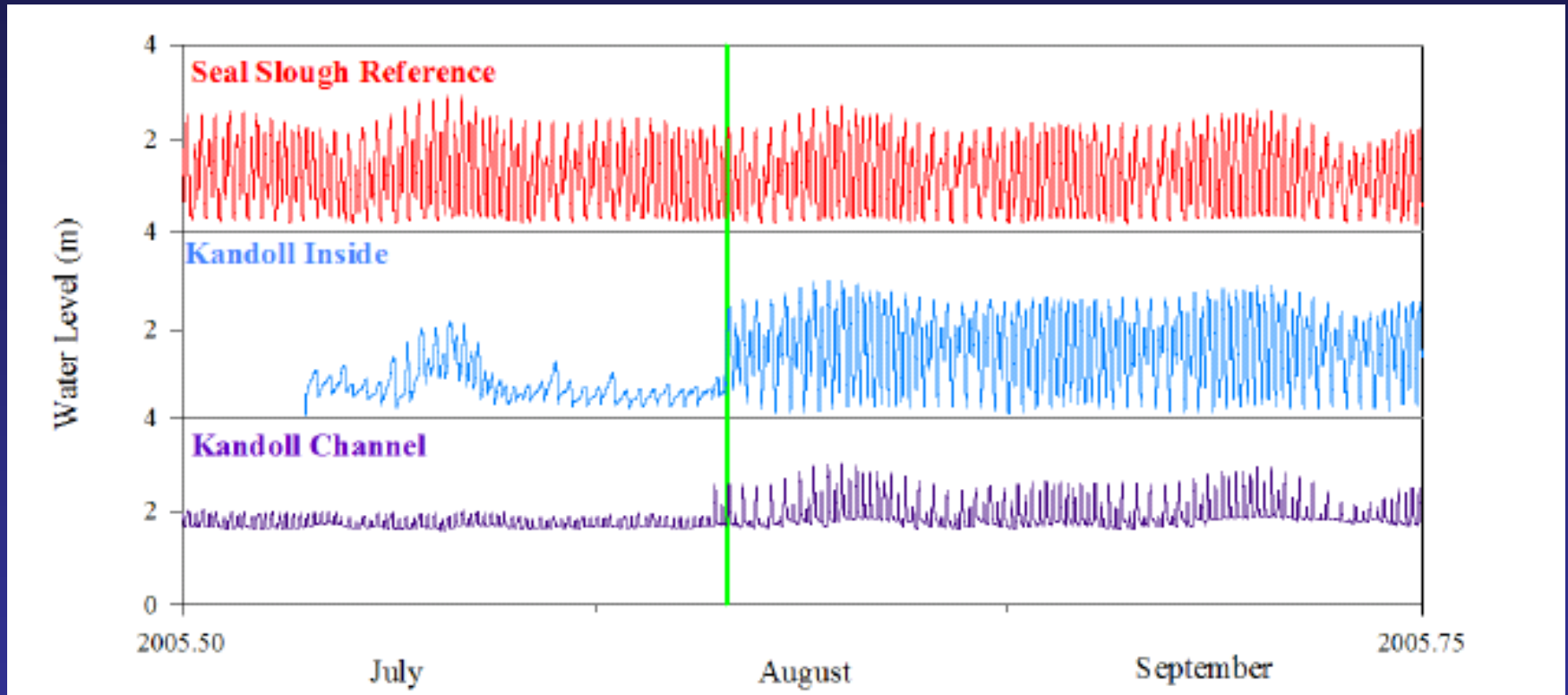
Monitoring is on-going through a variety of partnerships

2/10/2007 1:16 PM





Habitat Forming Process: Hydrology

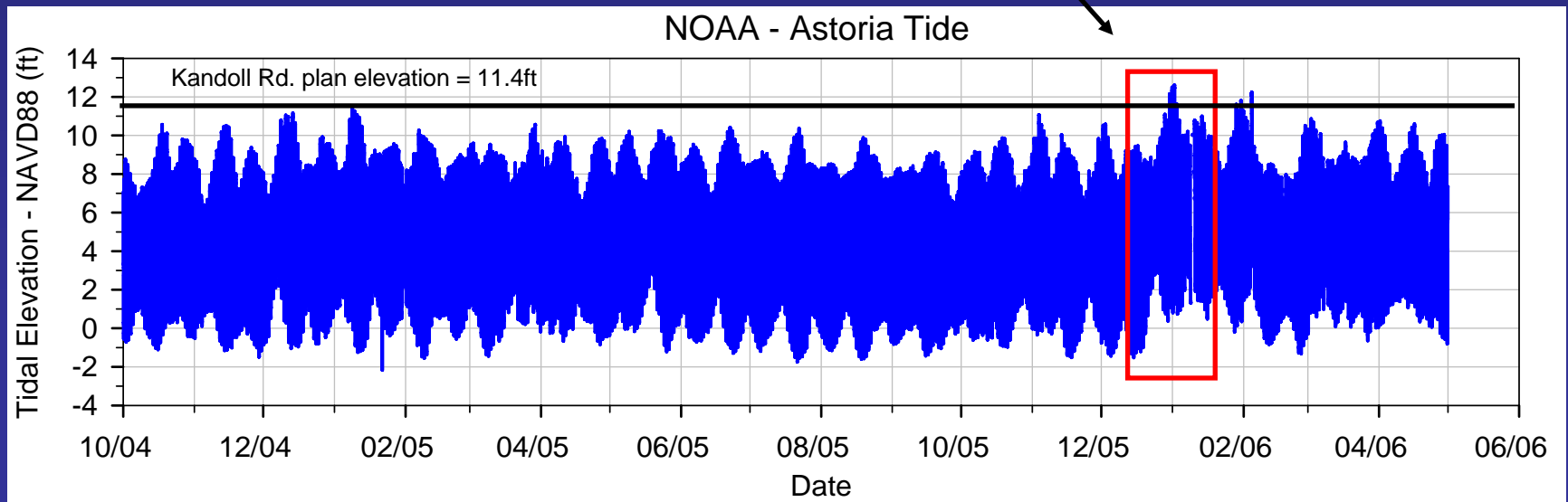
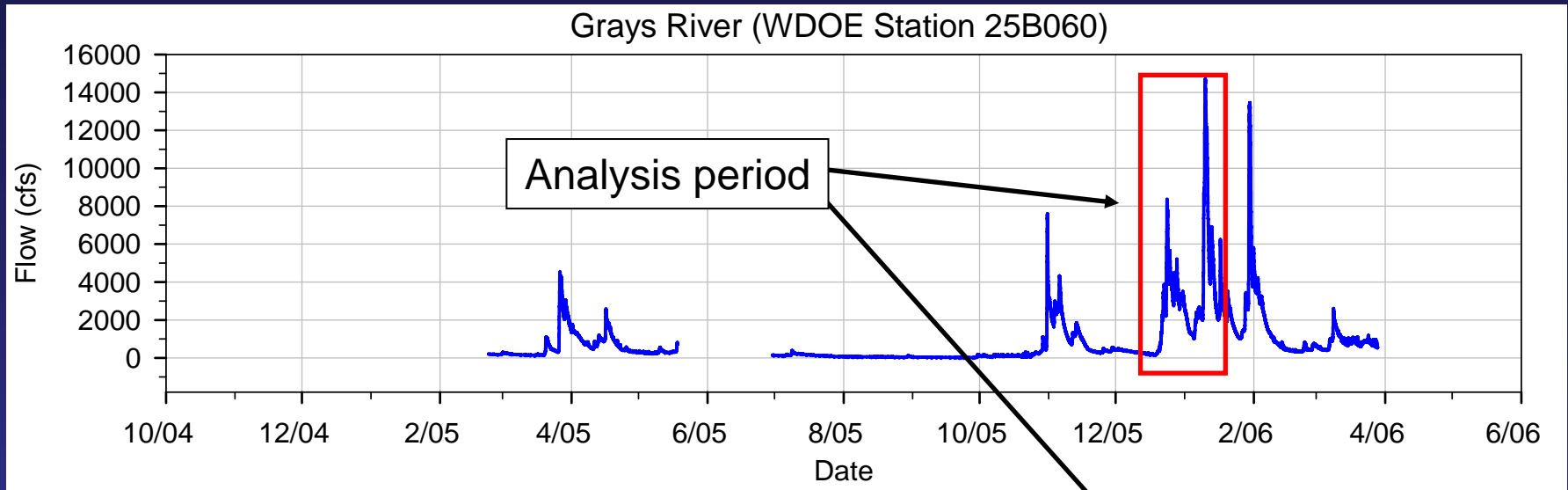


Source: PNNL Cumulative Effects Annual Report 2006

January and February 2006 Flood Events



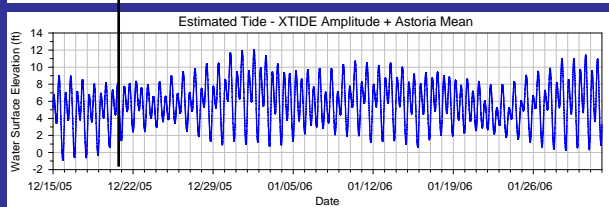
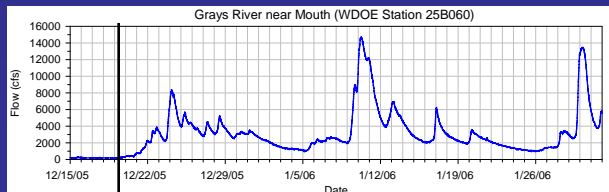
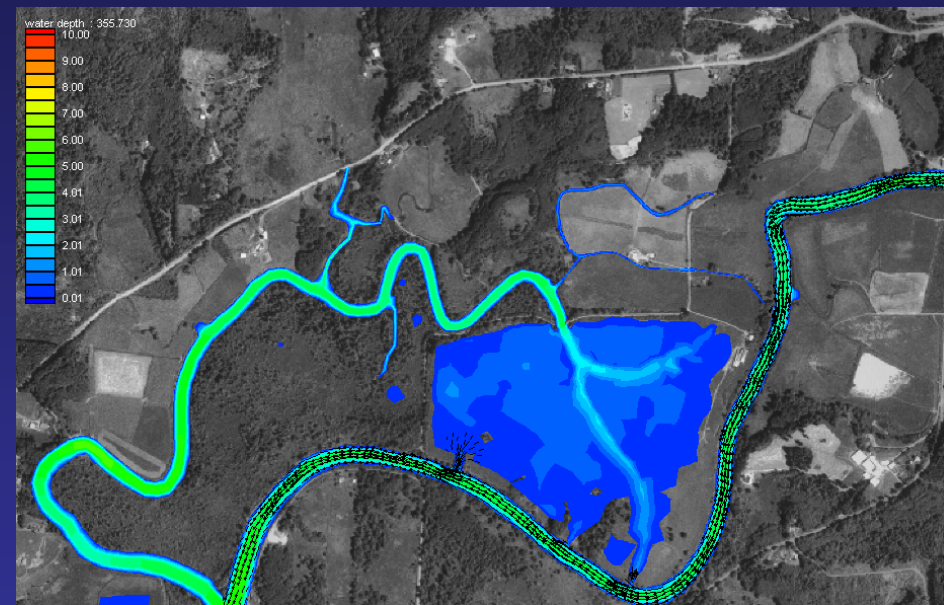
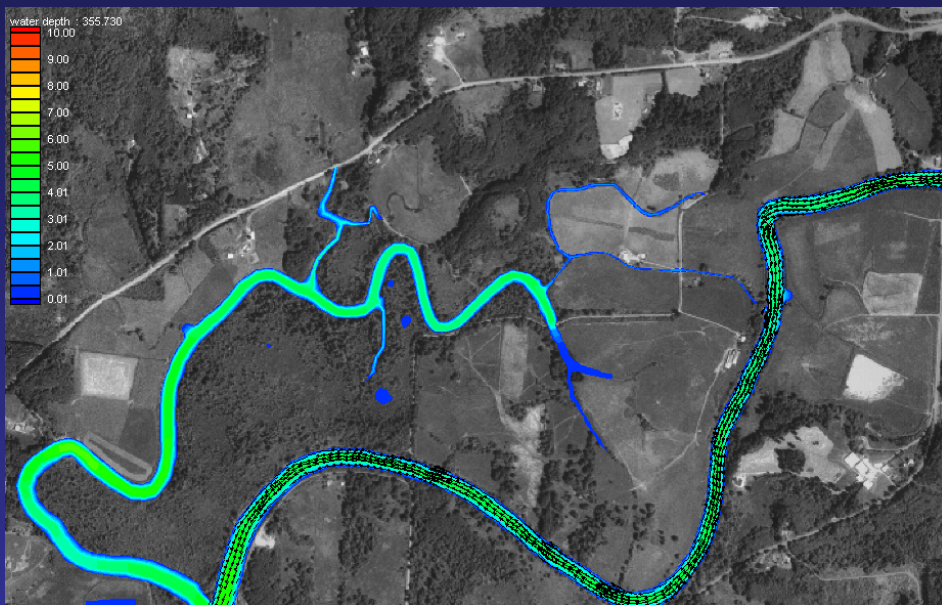
Hydrologic and Tidal Conditions



Normal Flow and Tide (High)

▶ Pre Construction

▶ Post Construction



Hydrodynamic Modeling: Local Off-Site Assessment, Wetted Area Indicator

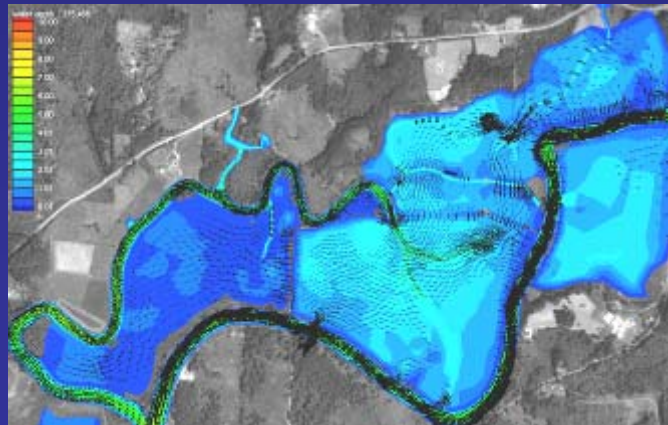
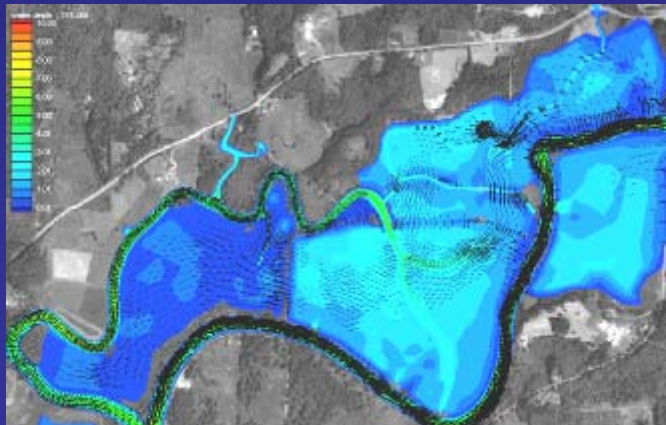
Pre Construction

Post Construction

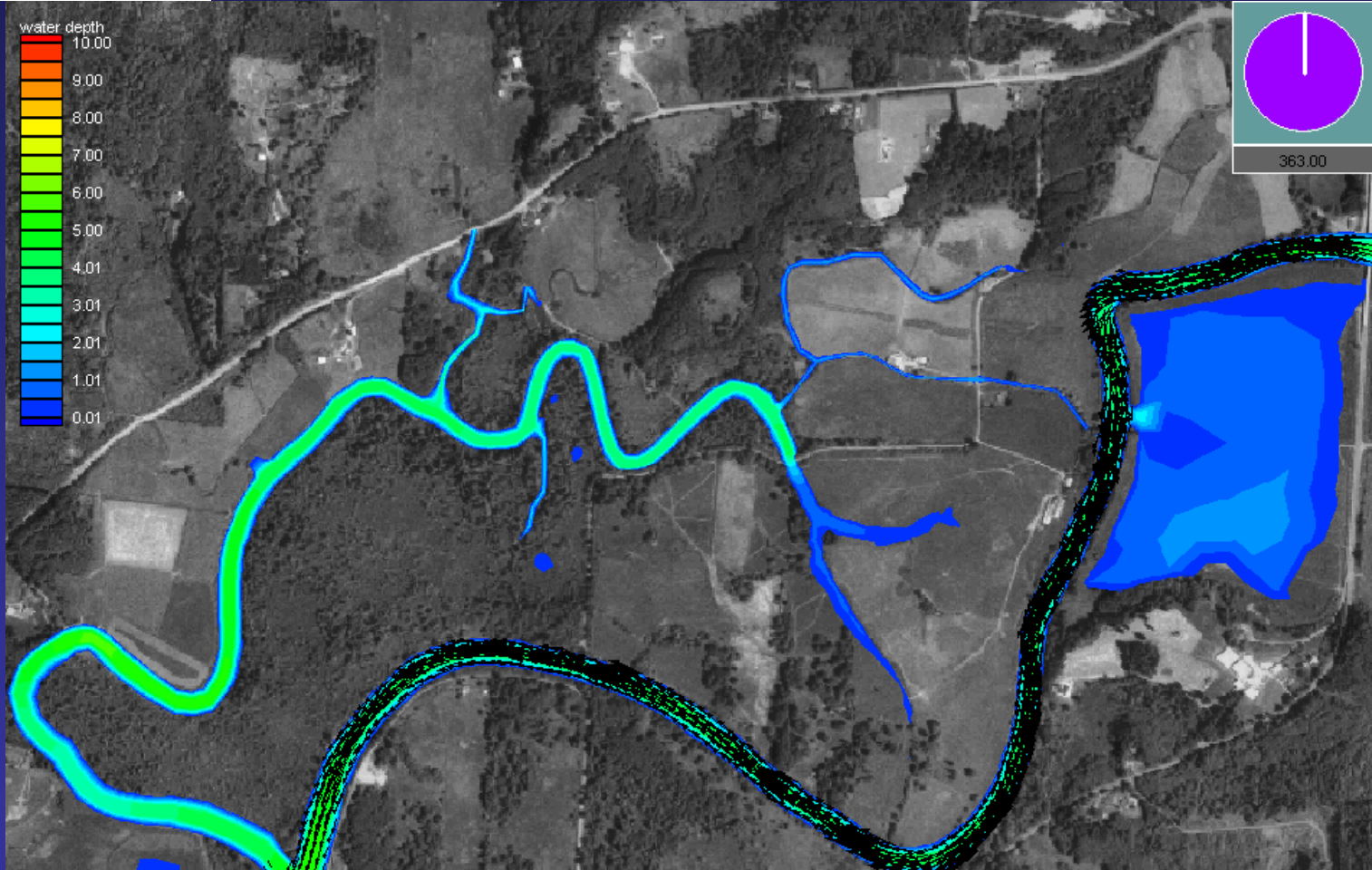
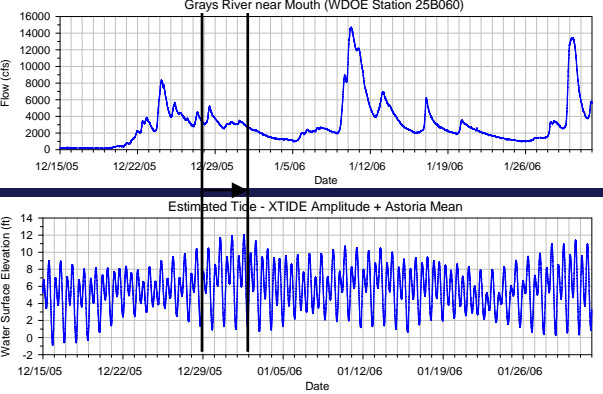
Tide



Flood

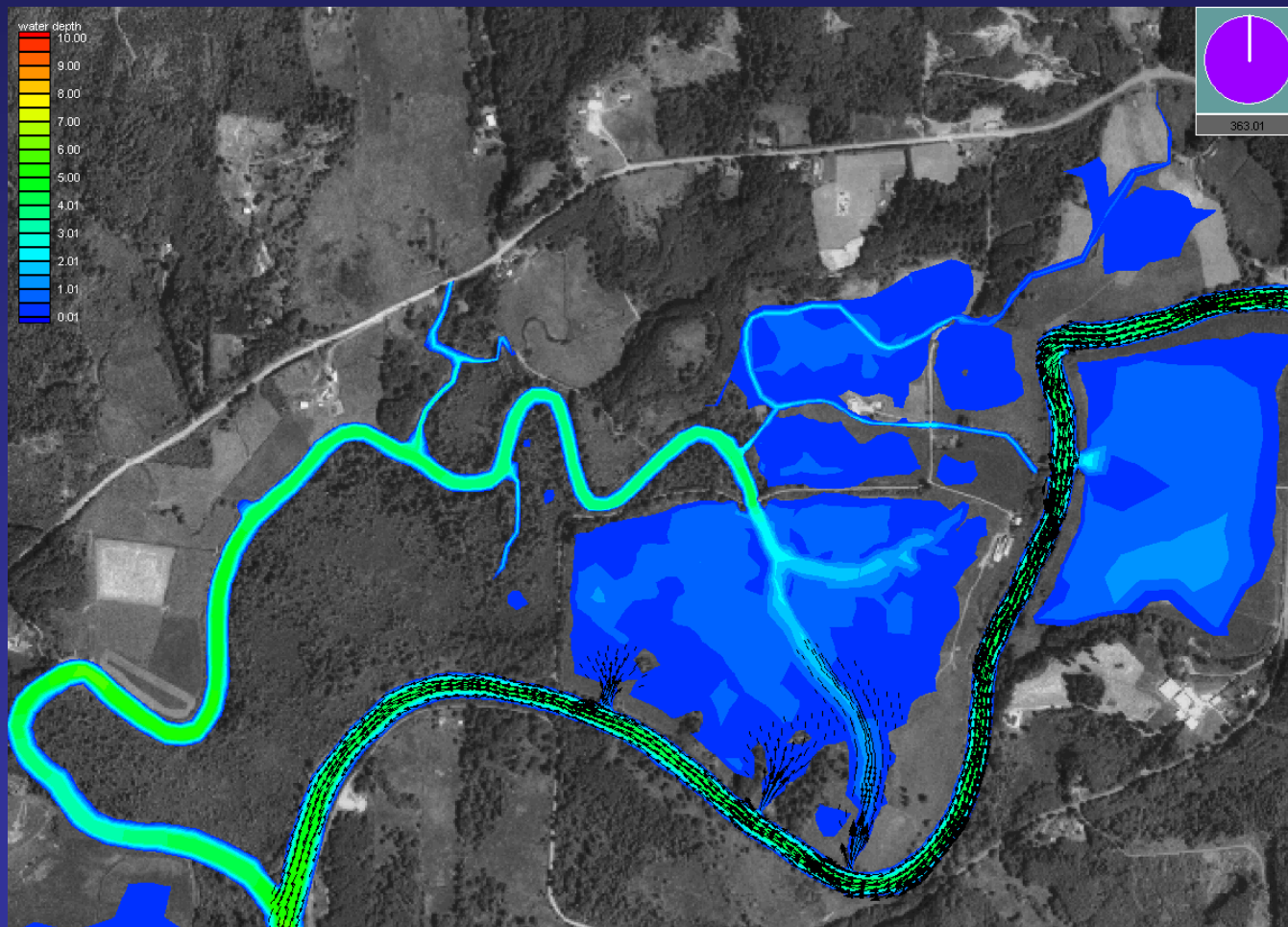
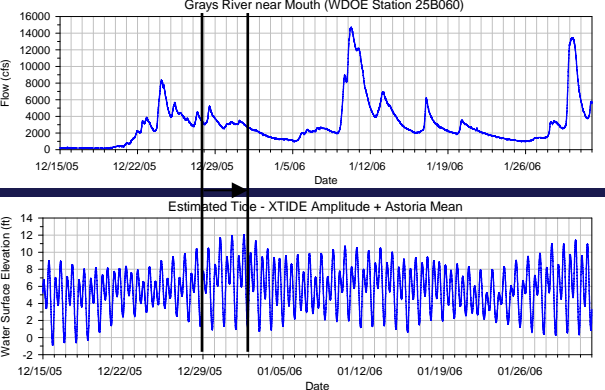


Pre-Construction 12/31/2005 - Tide



12/29/05- 1/2/06

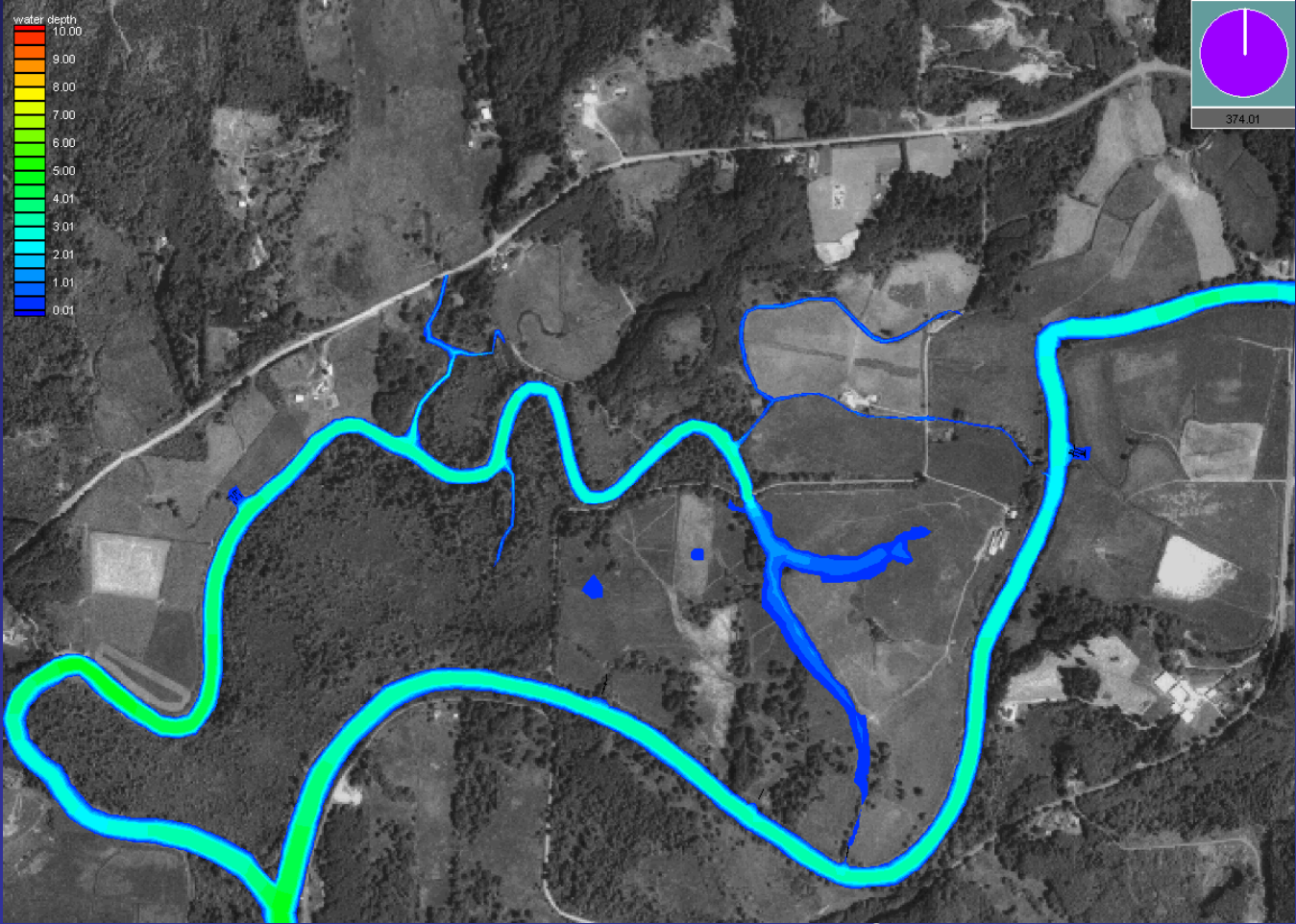
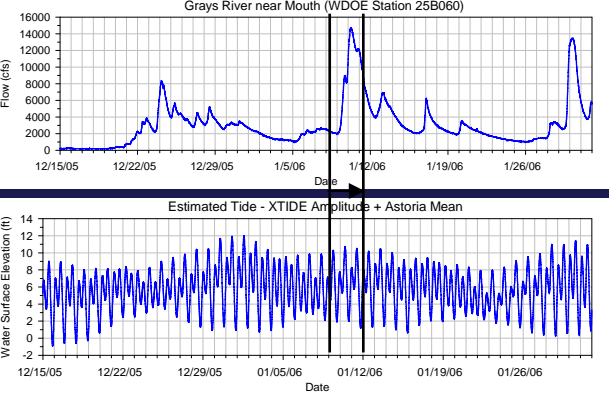
Post-Construction 12/31/2005 - Tide



12/29/05- 1/2/06

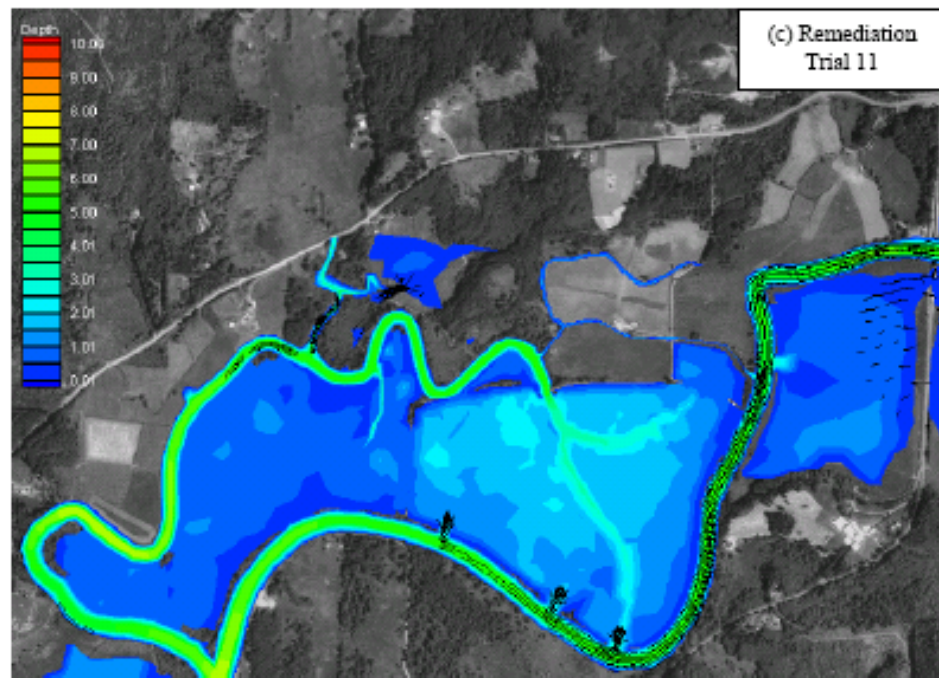
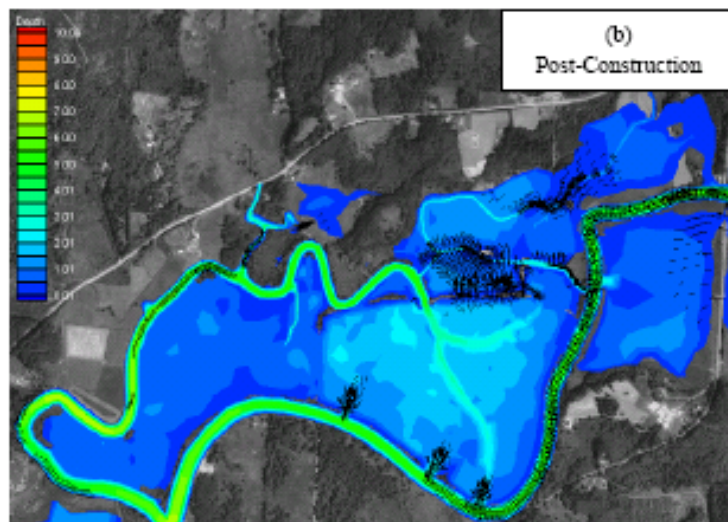
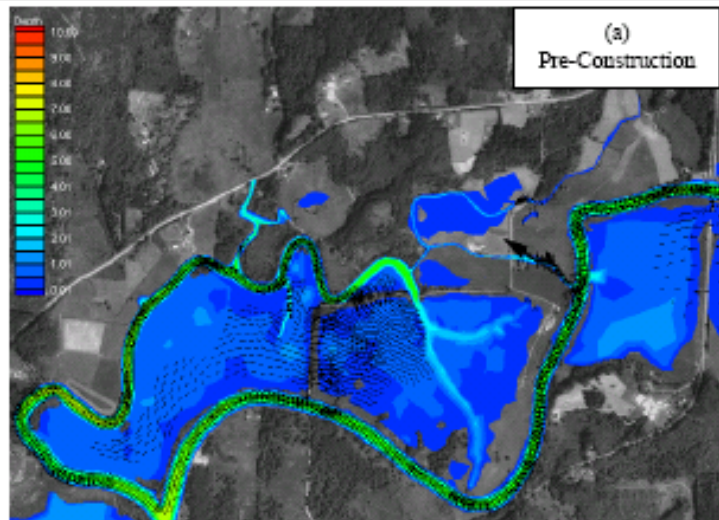
Source: PNNL 2008

Pre- and Post-Construction 1/10/2006 - Flood



1/8- 1/12/2006

Source: PNNL 2008



1000 ft
(305 m)

Note: The model results are from 1/1/06 14:04.

FIGURE 5.2
Comparisons of Inundated Areas for the Remediation
Condition to Pre- and Post-Construction Conditions

Fish Sampling

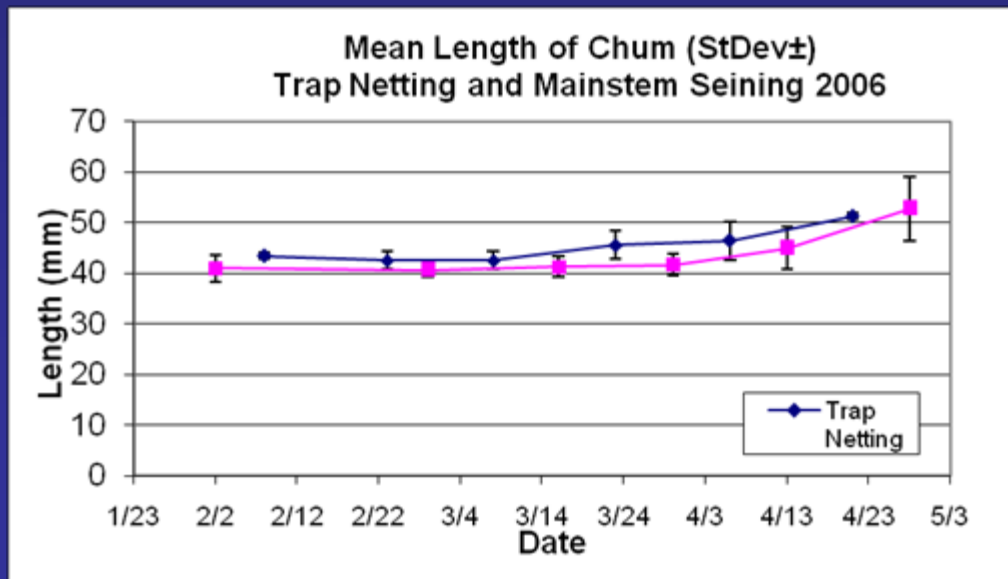
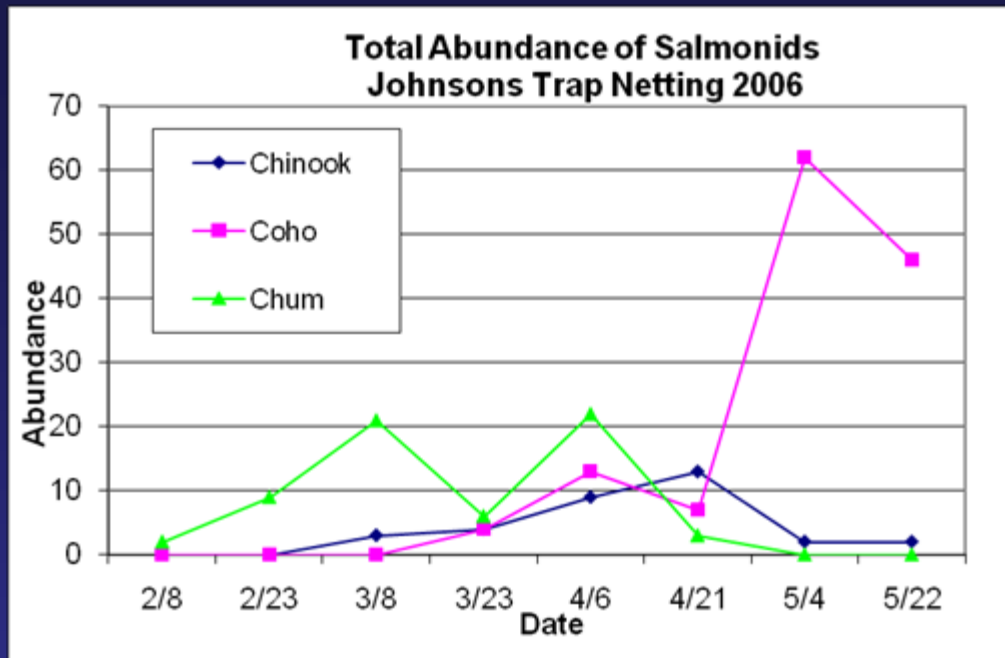
Trap Netting



Seine Netting



Salmonid Use



Lessons Learned

- Models are used for engineering/design purposes but can inform determination of habitat objectives and monitoring approaches
- Dike breaching in tidal tributaries does provide flood attenuation function under certain conditions
- Increased floodplain efficiency for more 'natural' river function: highs are not as high, lows are not as low (impacts to tidegate function)
- Fine sediments are captured on sites (between 1.3 and 3.5 cm/yr)
- Subsidence will take several decades to recover to historic conditions, trajectory will change over time
- Native vegetation re-establishment results are mixed, but encouraging
- Juvenile salmonids are found to be using restoration sites and appear to be feeding on invert production
- Restoration is a balancing act between active and passive efforts/needs
- The need for working with the local community and leadership can not be understated

