Project area

- Puyallup River Basin – 900 square miles – area rugged mountains – low-relief floodplains / terraces of Puget Lowlands
- Three Sub-basins – Puyallup – White – Carbon
Levees - Revetments

1906 to 1965
Overtopping – Breaching – Flood Damage
Confinement resulted in usual impacts

- Straightened channel
- Increased gradient
- Reduced flood corridors
Floodplain Development
Setback levee to achieve:

- Floodplain reconnection
- Reboot channel forming processes

- Encourage aquatic habitat
Project Approach

Goals and Objectives:
1. Increase floodplain reconnection / storage
   • Objectives
2. Re-establish channel form / function
   • Objectives
3. Maximize aquatic habitat
   • Objectives
4. Conceptual cost
5. Property availability
Overview: Floodplain Reconnection

Objectives

• Maximize area of floodplain inundation
  – high frequency events
• Maximize storage volume
  – low frequency events
• Minimize remedial actions
• Improve / maintain existing flood protection
Methods

• Linked model for 3 river systems
• Estimated floodplain connectivity
  – Relative Surface Elevation Model developed from LiDAR and HEC-RAS model runs
• Estimated flood storage
  – Unsteady state model
HEC-RAS Model
HEC-RAS Model
Replaced Region of Cross Sections, White River

Explanation

Replace Region
Cross Sections
White River

0 250 500
Feet
±
Relative Flood Surface Elevation Model

- Developed using HEC-RAS and LiDAR processing
- Displays flood elevation relative to DEM
- Predicts extent of overtopping
HEC-Ras Integrated Method: 2yr

Elevation Relative to Surface:
High : 12.0 ft
Low : -12.0 ft
Elevation Relative to Surface:

- **High**: 12.0 ft
- **Low**: -12.0 ft

HEC-Ras Integrated Method: 1996
Modeled Output – No Levees
Modeled Output: Storage With Levees
Overview: Recover Channel Forming Processes

Objectives:

• Promote increased channel complexity
• Encourage multi-channel form / channel migration
• Promote sediment conveyance and storage processes
• Improve connectivity to existing off-channel habitat
• Anticipate potential downstream impacts
Fig. 12A - 1931
Aerial Photo

Fig. 12B - 1940
Aerial Photo

Fig. 12C - 1978
Aerial Photo

Fig. 12D - 1987
Aerial Photo
Methods

• Potential corridor width
• Channel length per site
• Sediment influx
• Changes in sediment transport capacity following setback
• Estimated channel response
Project Results and Deliverables

- Set back levees at 32 sites
- Prioritization strategy / tool
- Selected two sites
- 30% design for two sites
- 3D animation
- Relative Flood Surface Models
- Linked HEC-RAS Model
Project Challenges

Hydraulic analysis – reconciling changes in channel conditions including:
- Channel location (migration)
- Bathymetry from channel aggradation

Geomorphologic response
- Anticipating response to sediment loading
Pierce County
Levee Setback Feasibility Study

Thank You