

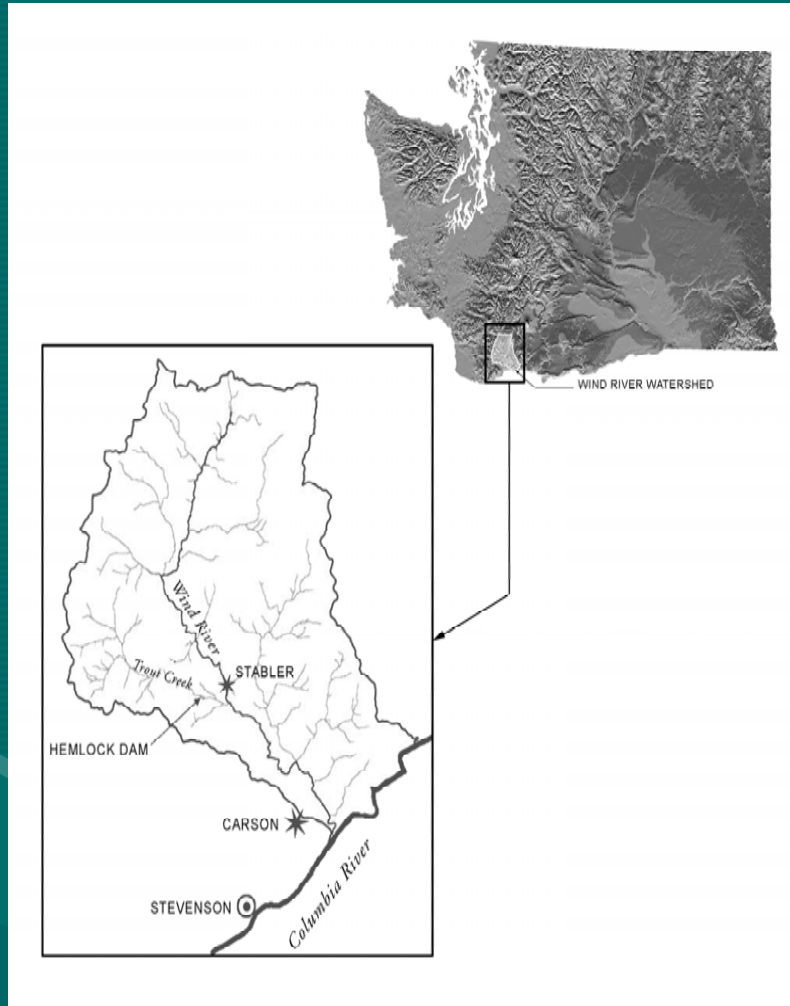
Fish Passage and Aquatic Habitat Restoration at Hemlock Dam



Presentation Overview

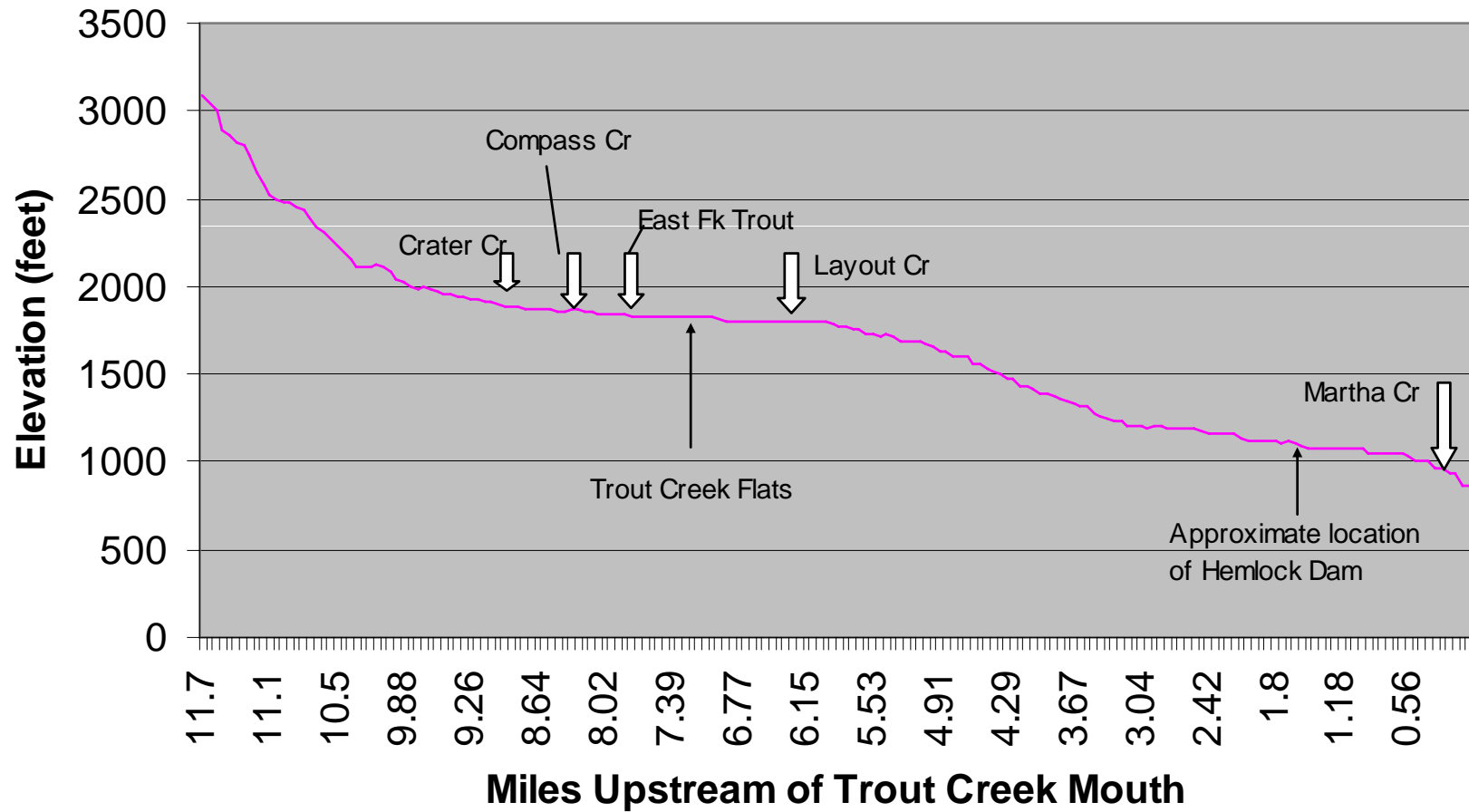
- Background
 - Project location
 - Restoration Context
- Project History and Purpose
 - Goals and objectives
 - Project summary
- Project Details
 - Approach and Design Elements
 - Dam removal and channel reconstruction
 - Data collected to date
 - Monitoring
 - Schedule

Project Location



- Wind River Tier I Key Watershed
- LCR Steelhead native
- Intensively monitored
- Carson National Fish Hatchery
- Municipal watershed, Carson
- Historic FS Research Station and Ranger Training Center
- Canopy Crane, Future Center(?) for NEON
- ~90% of the watershed on GPNF

Profile of Trout Creek

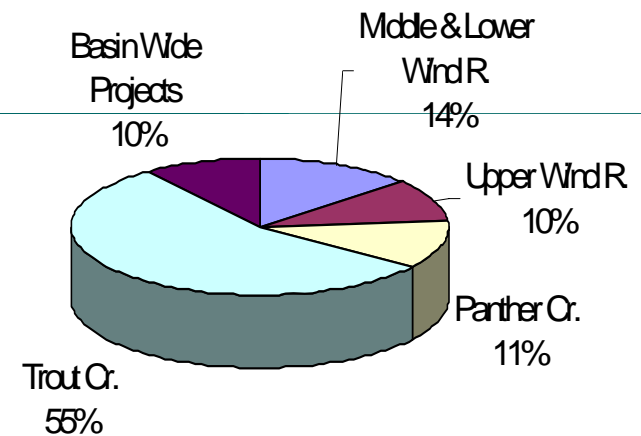


Watershed Context

- USFS began restoration efforts in the early 1990's with watershed analysis, partnership development and restoration strategy development
- Restoration strategy highlights:
 - Start restoration on the upslopes, addressing watershed-scale processes
 - Gradually shift focus to riparian and instream habitat work
 - Habitat work guided by stream surveys, watershed analysis, recovery plans
 - Emphasize development of partnerships to leverage available funds
- Partners include BPA, USFWS, WDFW, UCD, USGS BRD, SRFB, Skamania County (Title II), Mid Columbia Fisheries Enhancement Group, Trout Unlimited

Wind River Restoration (1995-present)

- ❖ Over \$6 million invested:
- ❖ 81 miles road decommissioned
- ❖ Over 600 acres of riparian forest planted, underplanted or thinned
- ❖ 14 miles instream habitat restoration
- ❖ >4,000 pieces LWD placed
- ❖ 4 barrier culverts replaced with bridges



Hemlock Lake and Wind River Nursery



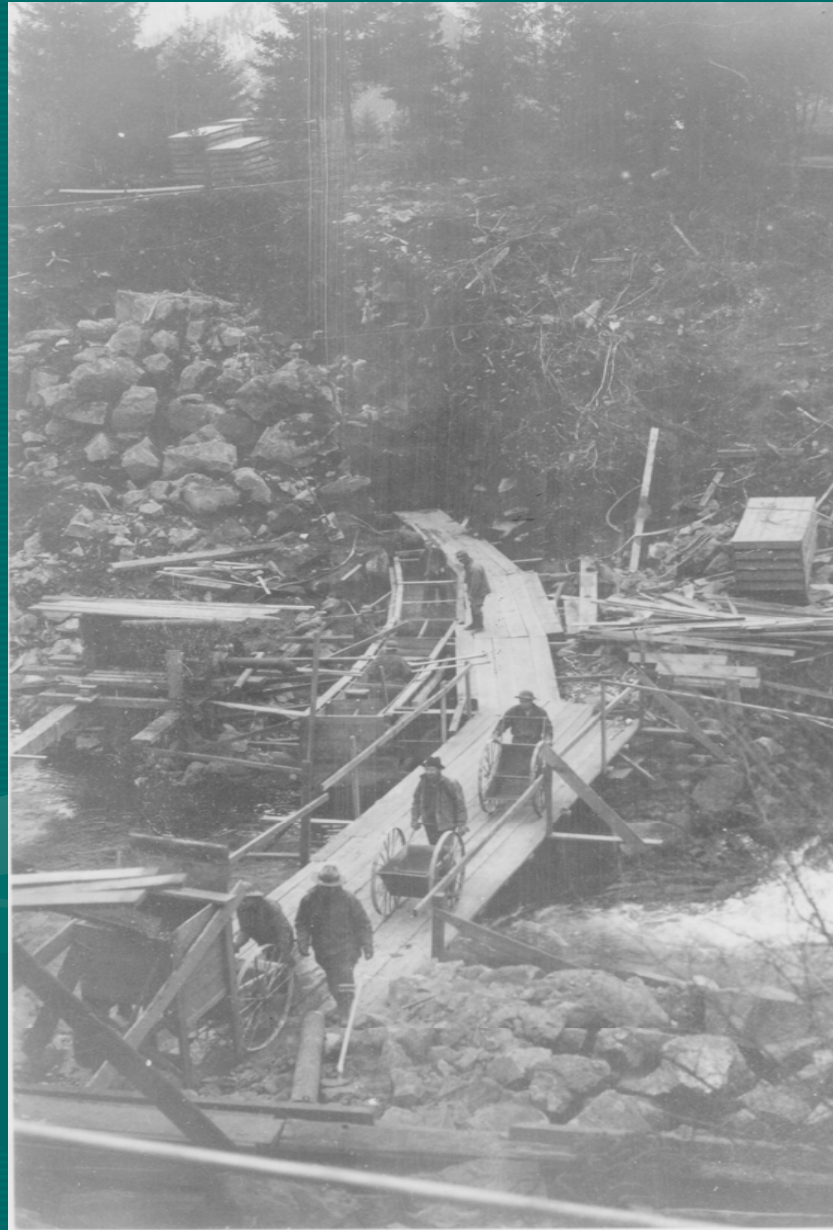
Splash Dam at the Hemlock Site--1902



Wind River Logging Camp--1909



Dam construction--wheeling concrete..



Dam completion—1935

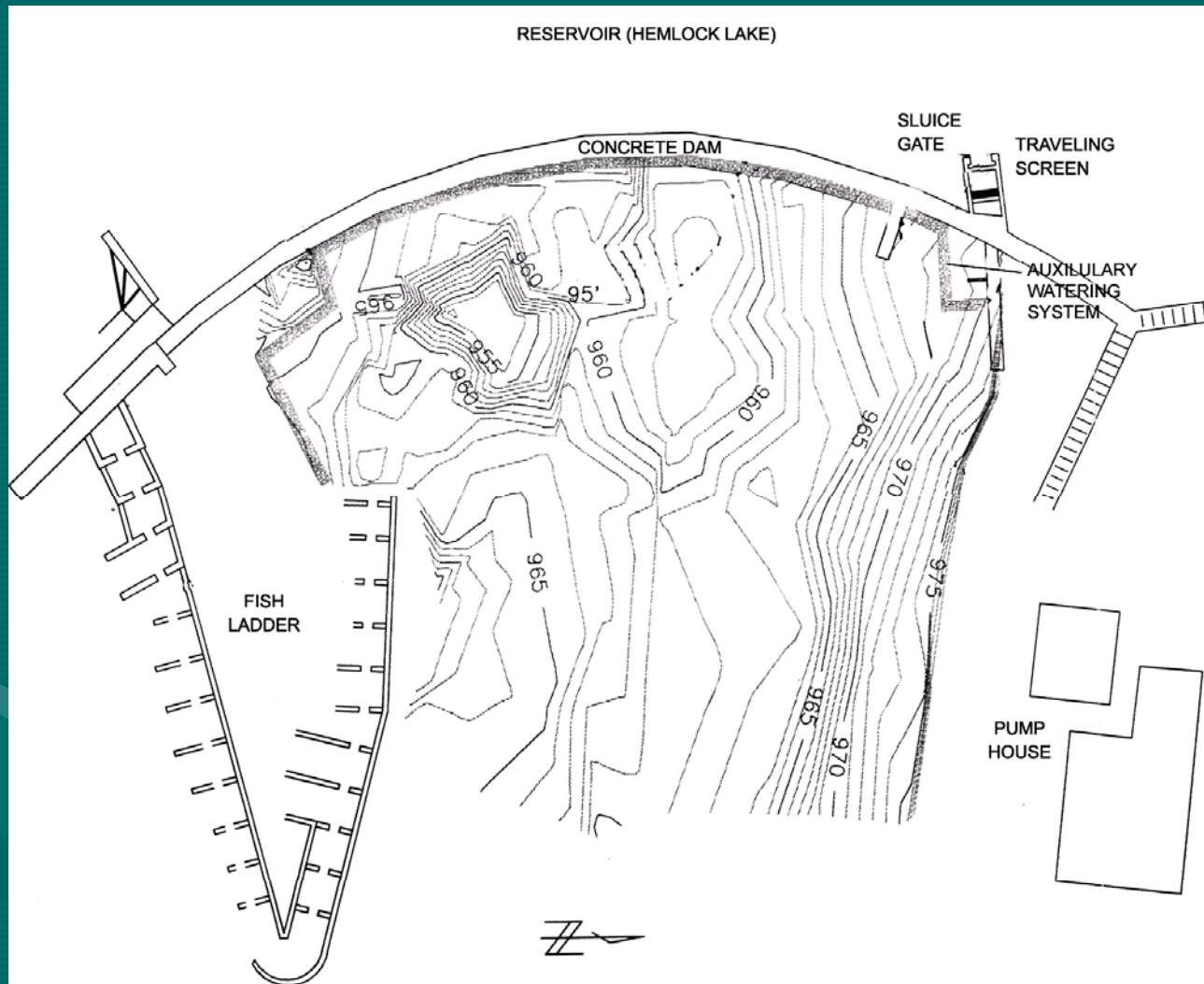
- 26 feet high; 183 feet long
- Originally constructed for hydropower
- Retrofitted for irrigation in 1958



Fish Ladder Construction--1936



Hemlock Dam--Plan View



Hemlock Dam at Spring Flow



Hemlock at 5-yr Flood Stage



Reservoir at Low Flow—1975



Reservoir at Low Flow--2003



Project Goals and Objectives

Project Goal:

Increase productivity and viability of Lower Columbia River steelhead in the Wind River watershed

Aquatic Objectives:

- 1) **Improve upstream and downstream migration** of Lower Columbia River steelhead and other aquatic organisms in lower Trout Creek;
- 2) **Reduce peak water temperatures**, as well as the duration and frequency of temperatures that exceed lethal levels for steelhead in lower Trout Creek;
- 3) **Restore channel processes**, substrate composition, movement of sediment, woody debris and other watershed products in lower Trout Creek;
- 4) **Increase instream and riparian habitat diversity and complexity** throughout the project reach.

Project Description

- Remove the dam and haul dam materials to approved waste site
- Remove sediments from behind the dam and haul to disposal site
- Reconstruct channel through the reservoir reach to mimic historic channel
- Revegetate the areas surrounding the dam and reservoir
- Followup work at recreation site to fit the new channel

General Approach

- A&E firm to conduct field surveys and design channel and dam removal based on best available information (Aug 07-Feb 08)
- A&E to remain on contract through construction phase to assist with implementation and to adjust designs as necessary to fit exhumed landscape
- Construction firm to remove sediments, dam and associated facilities, and to construct channel

Assumptions

- Sediment to be removed is composed largely of sands and silts with volumes estimated at 25,000-80,000 cubic yards
- Sediment quality does not constrain disposal/re-use options
- Actual sediment volumes dependent on bedrock structure underlying reservoir sediments
- Old splash dam remnants may be exhumed during construction
- Fish passage existed at the site and is recoverable
- Existing wetlands fed by non-Trout Creek sources may be retained in construction
- Some existing wetlands fed by Trout Creek may be retained, relocated

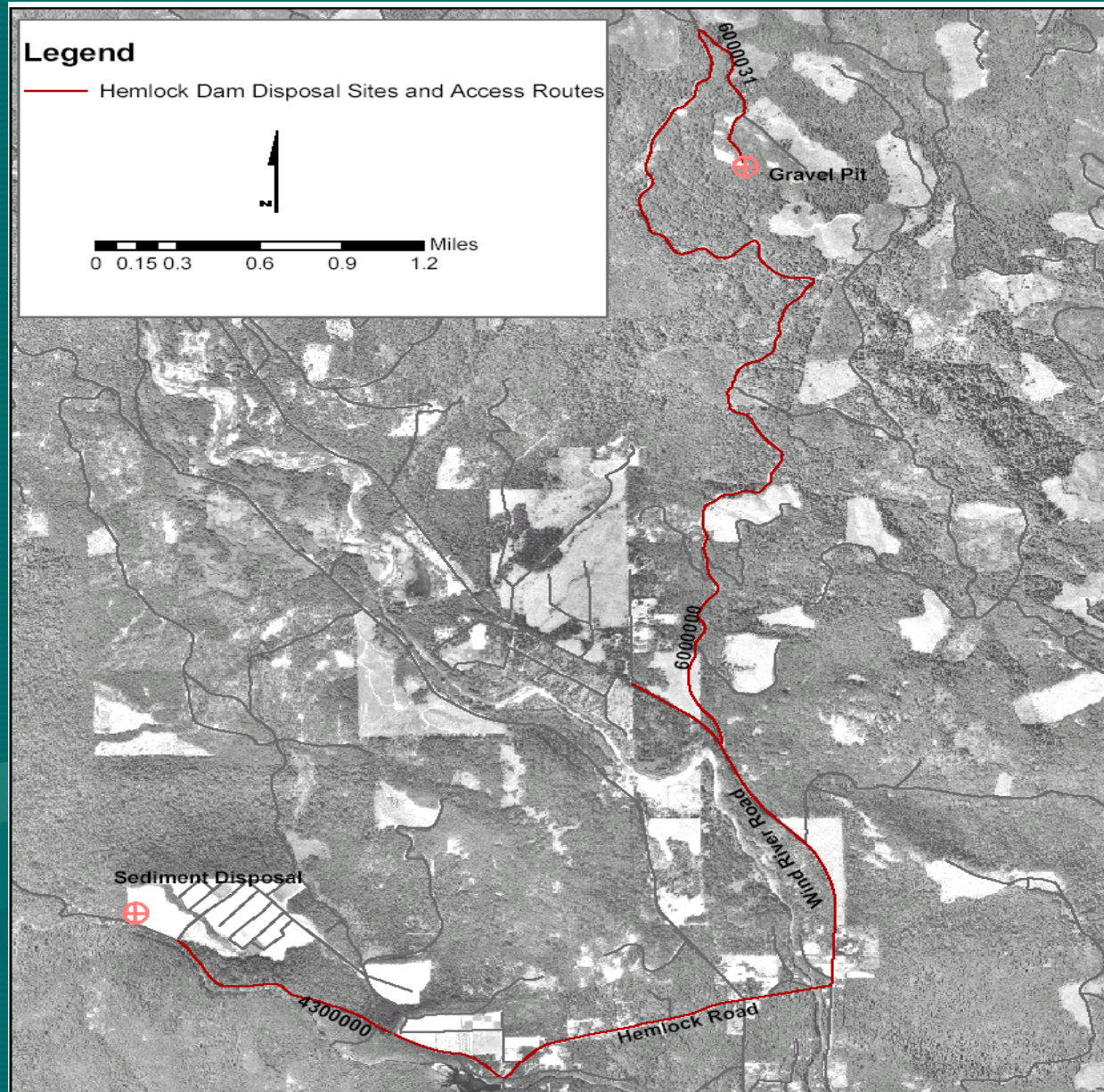
Design Objectives

- To the extent practical, channel will be designed and located on historic pre-dam alignment and grade
- It is expected that the design will provide for stream characteristics in the constructed reach that mimic those of the stream upstream and downstream of the project site as appropriate, and that the stream geometry, slope and planform are designed to allow for, but minimize post-construction adjustment.

Design Elements

- Banks and bed elevations to remain relatively stable through a range of flow conditions with overbank areas designed to accommodate flows in excess of bankfull (estimated at 2-year recurrence interval flood).
- Use of native materials and particularly use of existing bedrock and consolidated materials for vertical and lateral control
- Construction of appropriate channel controls to limit vertical and lateral erosion at the site and in adjacent reaches.
- Account for local inputs of surface and subsurface water and minimize loss of existing wetlands where feasible
- Incorporation of LWD for channel control, habitat formation and complexity
- Channel that is stable upon completion of construction and that develops increasing stability over time from natural channel and riparian processes
- Channel and surroundings shall be designed to restore historic fish passage, to permit natural stream processes, including floods, sediment movement and deposition, and to retain the capability for channel adjustment in response to disturbance

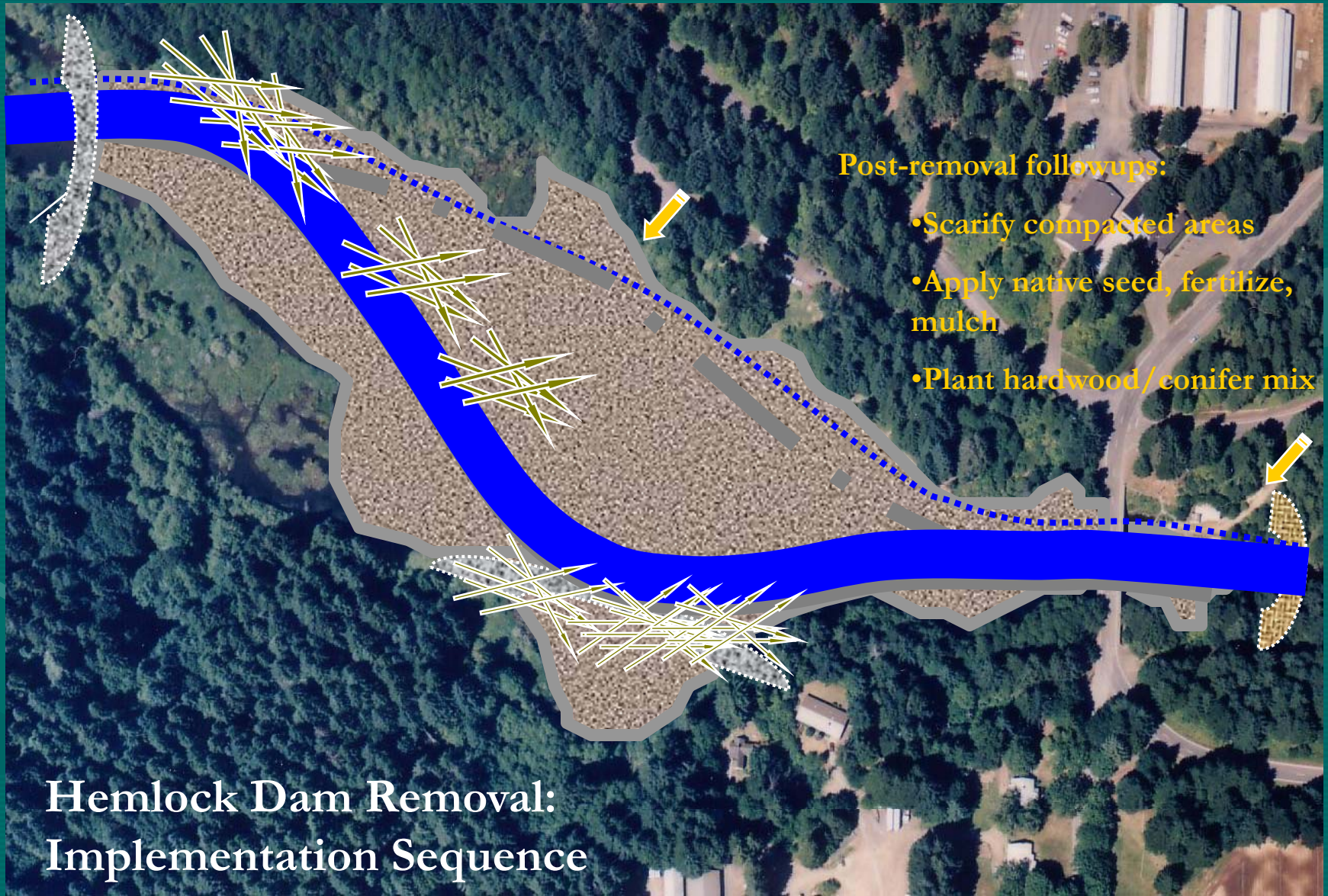
Map of Project Areas



Sediment Disposal Site



Hemlock Dam Removal: Implementation Sequence



Post-removal followups:

- Scarify compacted areas
- Apply native seed, fertilize, mulch
- Plant hardwood/conifer mix

Preliminary Monitoring Items

- *Water quality*
 - Turbidity upstream and downstream of the project
 - Water temperature upstream and downstream of the project
- *Geomorphic/Habitat*
 - Channel cross sections upstream and downstream of the dam site
 - Substrate surveys upstream and downstream of the dam site
 - Longitudinal profiles
 - Habitat surveys upstream and downstream of the dam site (pool spacing, size, lwd, cover)
- *Biological*
 - Fish counts/redd surveys
 - Macroinvertebrates

Project Status

- Total project cost estimated at \$2.7 million
- Target date is summer 2009
- Funding partners:
 - USFS
 - BPA
 - Salmon Recovery Funding Board
 - US Fish & Wildlife Service
 - Ecotrust
 - Yakima Indian Nation
 - Mid Columbia Fish Enhancement Group
 - NOAA/American Rivers

Project Work in 2007

- Complete financial package
- Award design contract
- Initiate permits
- Identify alternative uses for sediment
- Develop monitoring plan
- Begin pre-project monitoring

Project Work in 2008

- Complete financial package
- Award construction contract
- Finalize permits
- Identify alternative uses for sediment
- Implement the project and complete rehab
- Conduct project monitoring

Project Work in 2009

- Followup work on channel, reveg if needed
- Followup wetlands work if needed
- Continue monitoring in years 1,2,3,5,10 post-project