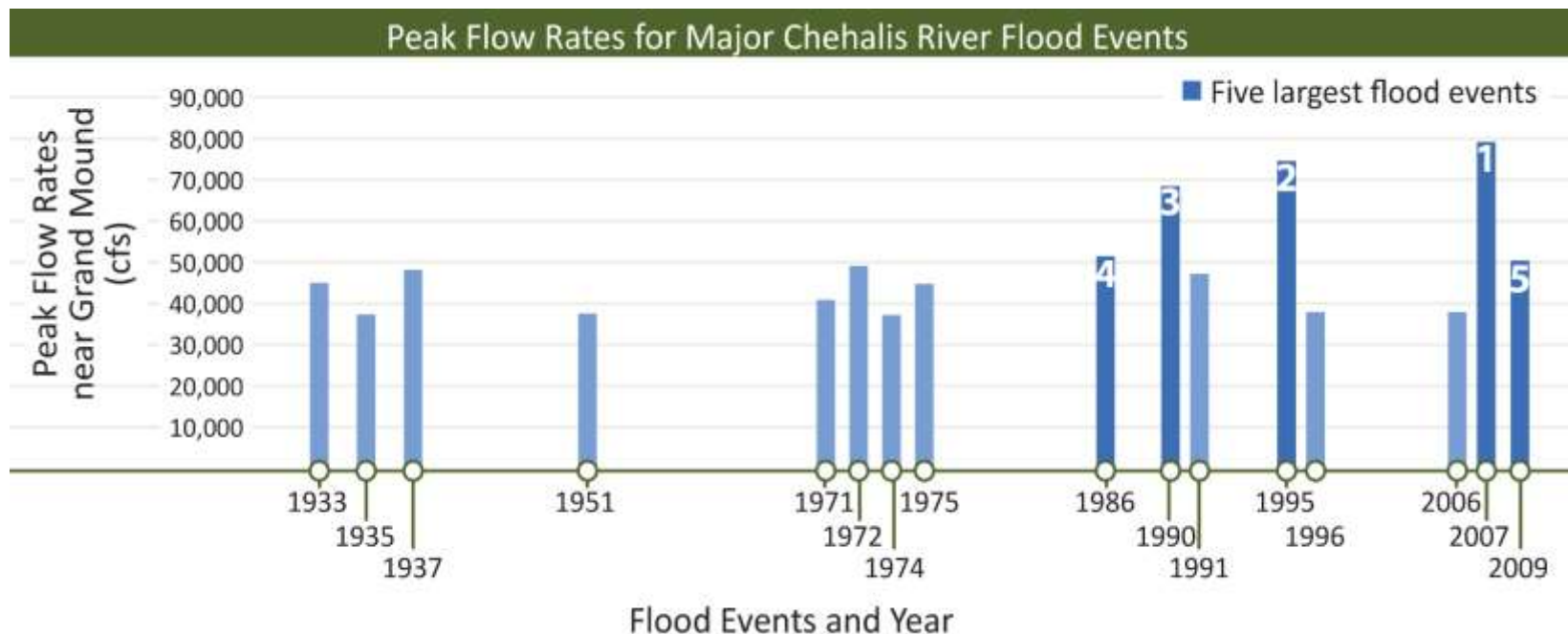


The background image is a landscape photograph showing a wide river valley. In the distance, a large dam structure is visible, partially obscured by trees. The river flows through the valley, with several small islands and banks. On one of the banks, there is a small cluster of buildings, possibly a farm or a small village. The surrounding area is covered with trees, some of which are bare, suggesting a cooler season. The overall scene is peaceful and natural.

# Chehalis Basin Strategy Programmatic SEPA Draft EIS

# History of Flooding

- I-5 closed in 1990, 1996, 2007, 2009
- Five largest flood events occurred since 1986



# History of Habitat Degradation

- Harvest has been limited by poor runs over the last 30 years
- Habitat productivity has been degraded by up to 87%



# Evaluating Options

- Programmatic Environmental Impact Statement (EIS)
- Evaluates potential effects – positive and negative
- Programmatic EIS differs from project level EIS





# Purpose and Need



*The Chehalis Basin suffers from both flooding and degradation of aquatic species.*

*The Chehalis Basin Strategy will provide a long-term, integrated approach to substantially reduce damages from major floods and restore degraded aquatic species habitat in the Basin.*

# Objectives

Reduce the following conditions caused by a major flood:

1. Threats to human health and safety, including access to critical medical facilities
2. Flood damage to commercial and residential properties
3. Flood damage to agricultural properties, livestock and crops
4. Disruption in transportation systems, including closures of Interstate 5 and local and regional transportation systems
5. Disruption to industry, commercial businesses, and public services

Protect and restore aquatic species habitat function to:

1. Improve resiliency of natural floodplain processes and ecosystems from the effects of climate change, including warming stream temperatures, low flows, and other effects
2. Increase abundance of native aquatic species, including increased populations of healthy and harvestable salmon and steelhead
3. Reduce the potential for future Endangered Species Act listings
4. Enhance tribal and non-tribal fisheries

# Actions Being Considered

- Flood Damage Reduction
- Habitat Restoration





# Local-scale Flood Damage Reduction Actions

- Raising structures, building walls
- Farm Pads
- Local Projects





# Local-scale Flood Damage Reduction Actions



- Land use management improvements
- Early warning system improvements

# Large-scale Actions

- I-5 projects
- Walls and Levees



# Large-scale Actions

## Restorative Flood Protection -

- Re-establish the natural flood storage capacity by reversing landscape changes that contribute to downstream flooding and erosion





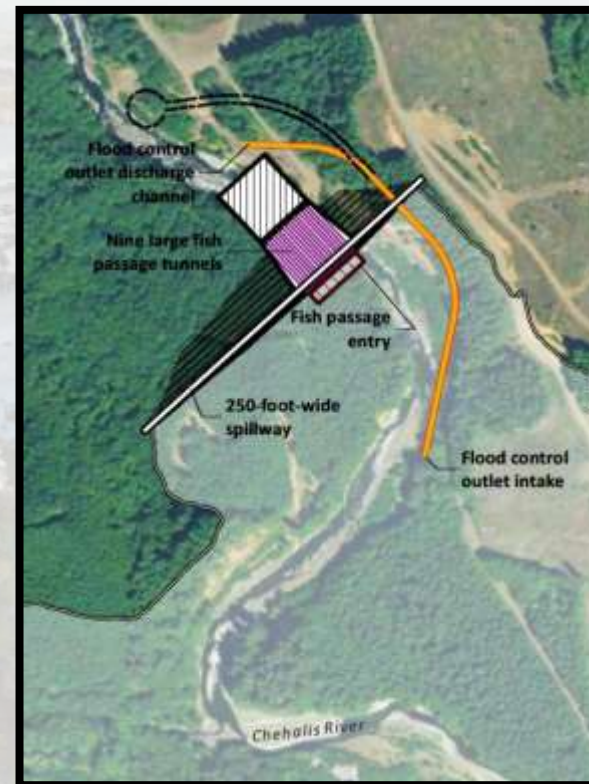
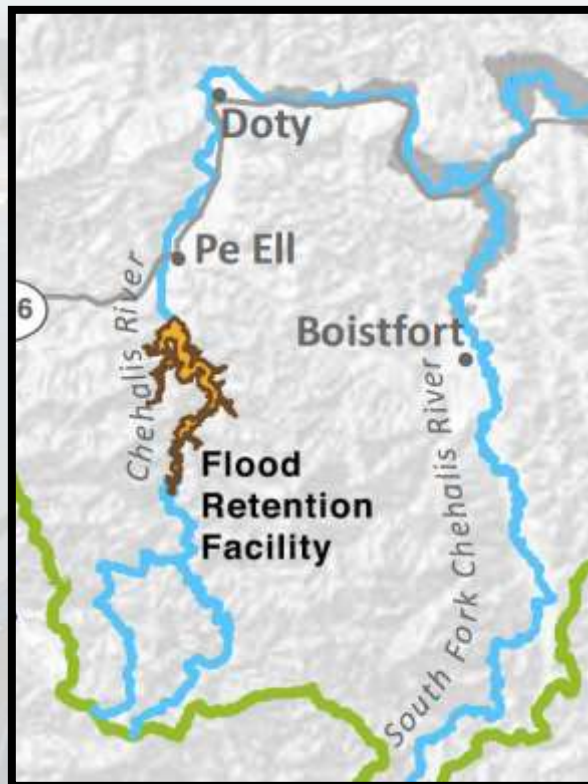
# Restorative Flood Protection



67.00 To bottom land of Chehalis river, this bottom  
Is subject to inundation from 3 to 5 feet in depth  
In the winter season

# Large-scale Actions

- Flood Retention Only (FRO)
- Flood Retention and Flow Augmentation (FRFA)



# Dam and Reservoir Design and Operations Objectives

- Reduce flood damages
- Maintain stream processes
- Maintain slope stability in reservoir
- Provide winter storage for summer flow augmentation and temperature moderation (FRFA)
- Design for debris management in reservoir
- Maintain fish passage to the extent possible

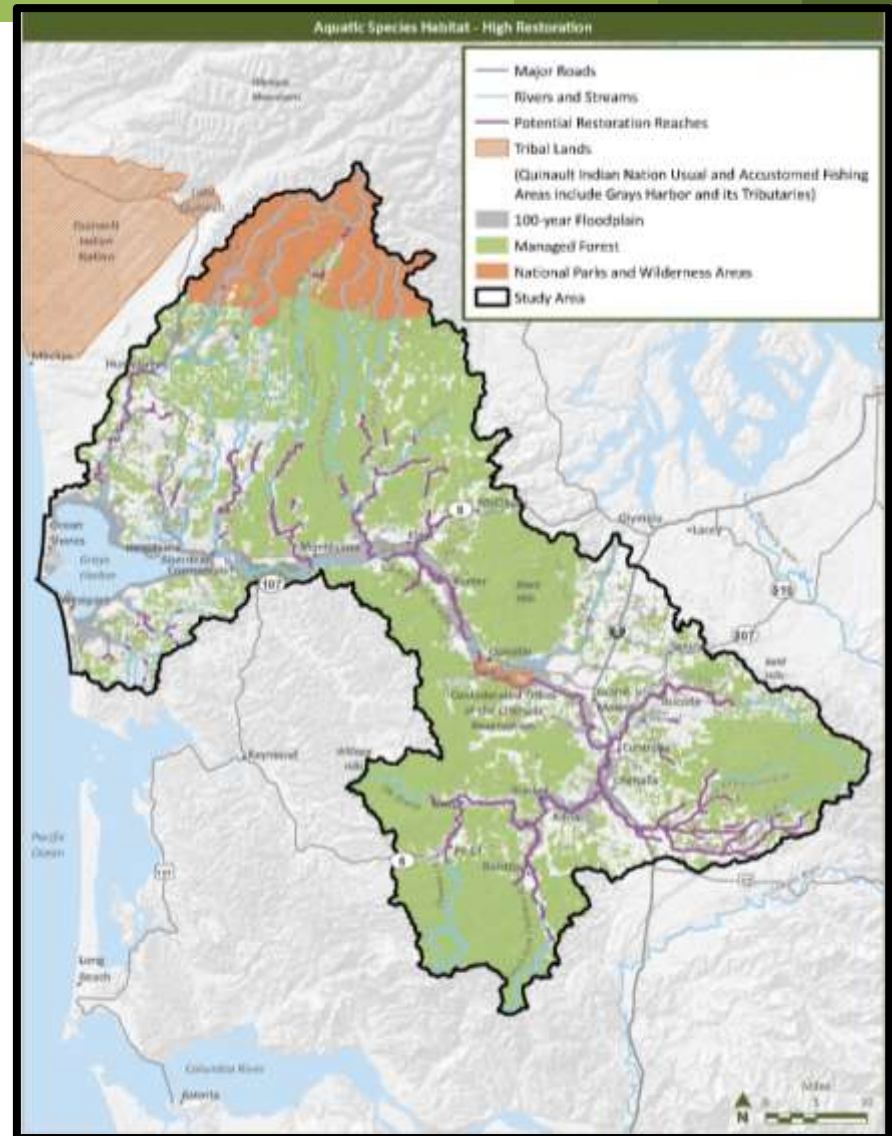
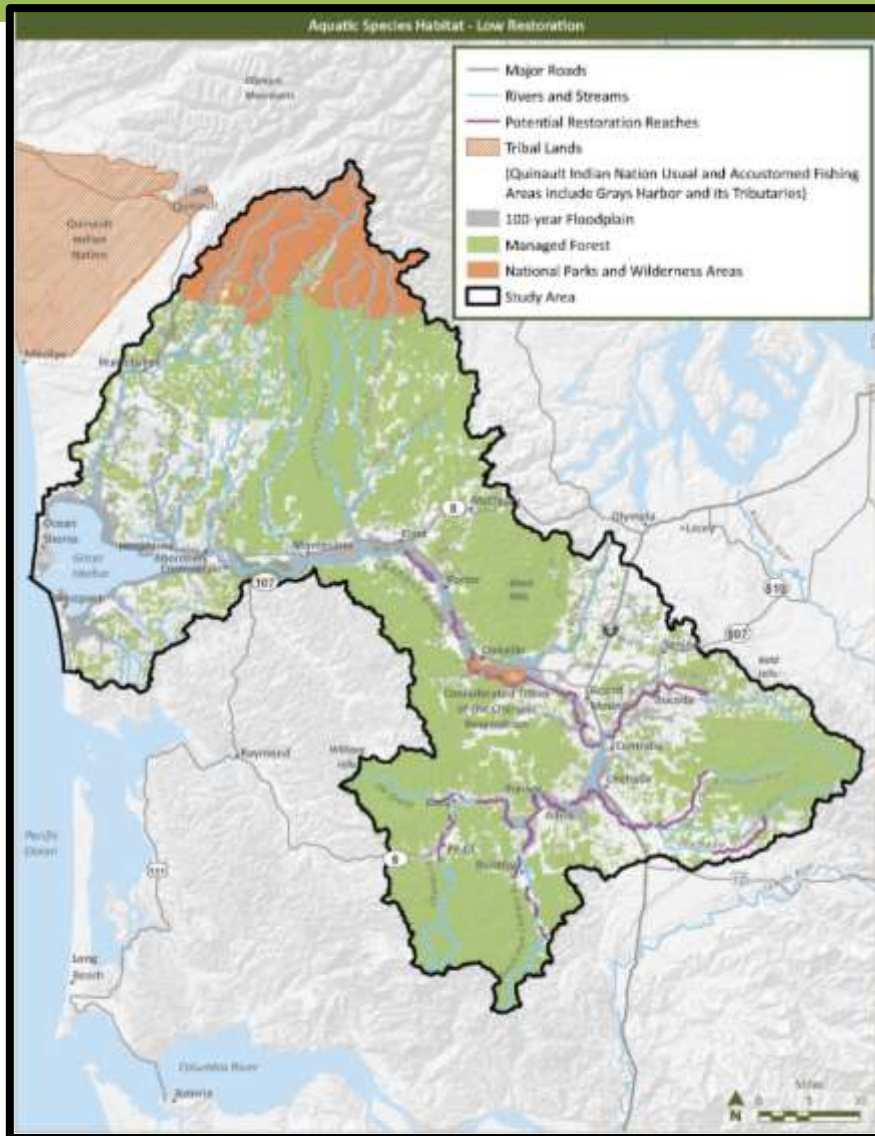


# Aquatic Species Habitat Actions

- Basin-wide scale: Unprecedented Level of Effort



# Range of Actions Evaluated





An aerial photograph of a rural landscape. The scene features large, vibrant green agricultural fields, some of which are divided by small, irregular ponds or water features. A winding river or stream flows through the landscape, particularly visible on the right side. In the background, there are clusters of buildings, likely a small village or farmstead, surrounded by dense forests. The overall tone is peaceful and scenic. The image is framed by a green header at the top and a blue footer at the bottom.

# Overview of Significant Adverse Impacts



# No Action Alternative

- Increased peak flows and frequency of winter storms = more frequent and greater flood damage
- Sea level rise = increased flooding in lower basin
- Built Environment:
  - Land Use
  - Recreation
  - Transportation
  - Public Services and Utilities
  - Environmental Health and Safety
- Historic, Cultural, and Tribal Resources

# No Action Alternative

## Potential Response in Salmon Abundance in the Chehalis Basin to Climate Change

SPECIES (CURRENT HABITAT POTENTIAL)	CHANGE FROM CURRENT CONDITION (PERCENT)
Coho salmon (40,642)	-55%
Fall-run Chinook salmon (25,844)	-27%
Winter/fall-run chum salmon (190,550)	-4%
Spring-run Chinook salmon (2,146)	-87%
Winter-run steelhead (6,800)	-55%

# Alternative 1

- Water Quality
  - Within the reservoir
  - Downstream of the dam
- Geology and Geomorphology
- Wetlands and Vegetation
- Fish and Wildlife
- Historic, Cultural, and Tribal Resources



# Summary of Long-term Significant Adverse Impacts

- Conversion of the Chehalis River from a free-flowing river to a permanent reservoir impoundment (FRFA facility only)
- Increase in temperature and decrease in DO
- Landslide potential around the reservoir footprint
- Damage to the dam if an earthquake were to occur on the CSZ to the west of the Flood Retention Facility or Doty Fault Zone to the north
- Geomorphic impacts on the Chehalis River and its floodplain downstream of the dam due to changes in sediment and wood transport processes

# Summary of Long-term Significant Adverse Impacts

- Permanent loss of approximately 68 acres (FRO facility) and 98 acres (FRFA facility) of wetlands
- Permanent loss of vegetation: 6 acres for the FRO facility (in the dam footprint) and 720 acres for the FRFA facility (9 acres in the dam footprint, 711 acres in the reservoir area)
- Reduced fish passage for adult and juvenile salmon and trout
- Reduced habitat for fish and wildlife species, including instream and off-channel habitat in the reservoir area
- Change in visual quality of the area due to clearing of vegetation

# Water Quality Impacts (FRO Reservoir)

- Up to a nearly 4°C increase in summer water temperatures (over existing conditions) could occur along the mainstem at the dam site
- Up to a 5°C increase was predicted in the Crim Creek tributary (upstream of the dam)
- Lower DO concentrations



# Water Quality Impacts FRFA Reservoir

- Temperature (Reservoir pool would have varying water temperatures depending on the season and depth within the reservoir)
- Dissolved Oxygen

# Fish Impacts

- Loss of habitat function within the reach of the Chehalis River inundated upstream of the dam for cool, swift-water associated fish species, including loss of salmon spawning habitat
- Partial reduction in fish survival and potential interruptions to migration due to passage impediments, including salmon and lamprey spawning migrations
- Changes to fish habitat-forming processes and water quality downstream of the dam
- Exposure of juvenile salmonids that use the FRFA reservoir for rearing to predators that may thrive in the reservoir

# Avoidance and Minimization for Water Quality Impacts

- Managing FRFA facility operations to optimize cool temperatures and flow benefit for aquatic species (in the Chehalis River) and maintain DO conditions that are compliant with state water quality criterion of  $> 9.5$  mg/L.
- To address losses of riparian shade within the reservoir and downstream of the dam, plant riparian vegetation that is more flood tolerant within the FRO or FRFA reservoir footprint.
- A Flood Retention Facility may cause adverse impacts that cannot be fully mitigated by compensatory actions

# Alternative 1

## Potential Mitigation

- Reservoir Operations and Management Plan
  - Wood and sediment management
  - Water quality and flow moderation
- Reservoir drawdown rates that avoid or minimize landslide occurrences
- Design to withstand the effects of earthquakes and shaking on the CSZ and other nearby faults
- Compensatory wetland mitigation
- Pre-and Post-construction Vegetation Management Plan
- Fisheries Management Plan (fish passage)



An aerial photograph of a rural landscape. The scene features large, vibrant green agricultural fields, some of which are divided by small, dark ponds or water features. A winding river or stream flows through the landscape, particularly on the right side. In the center-left, there is a small farmstead with several buildings, including a large barn and smaller houses. The background shows a mix of forested areas and more distant buildings. The overall tone is peaceful and scenic. The text "Overview of Benefits" is overlaid in the center in a large, black, sans-serif font.

# Overview of Benefits

# Summary of Long-term Beneficial Effects

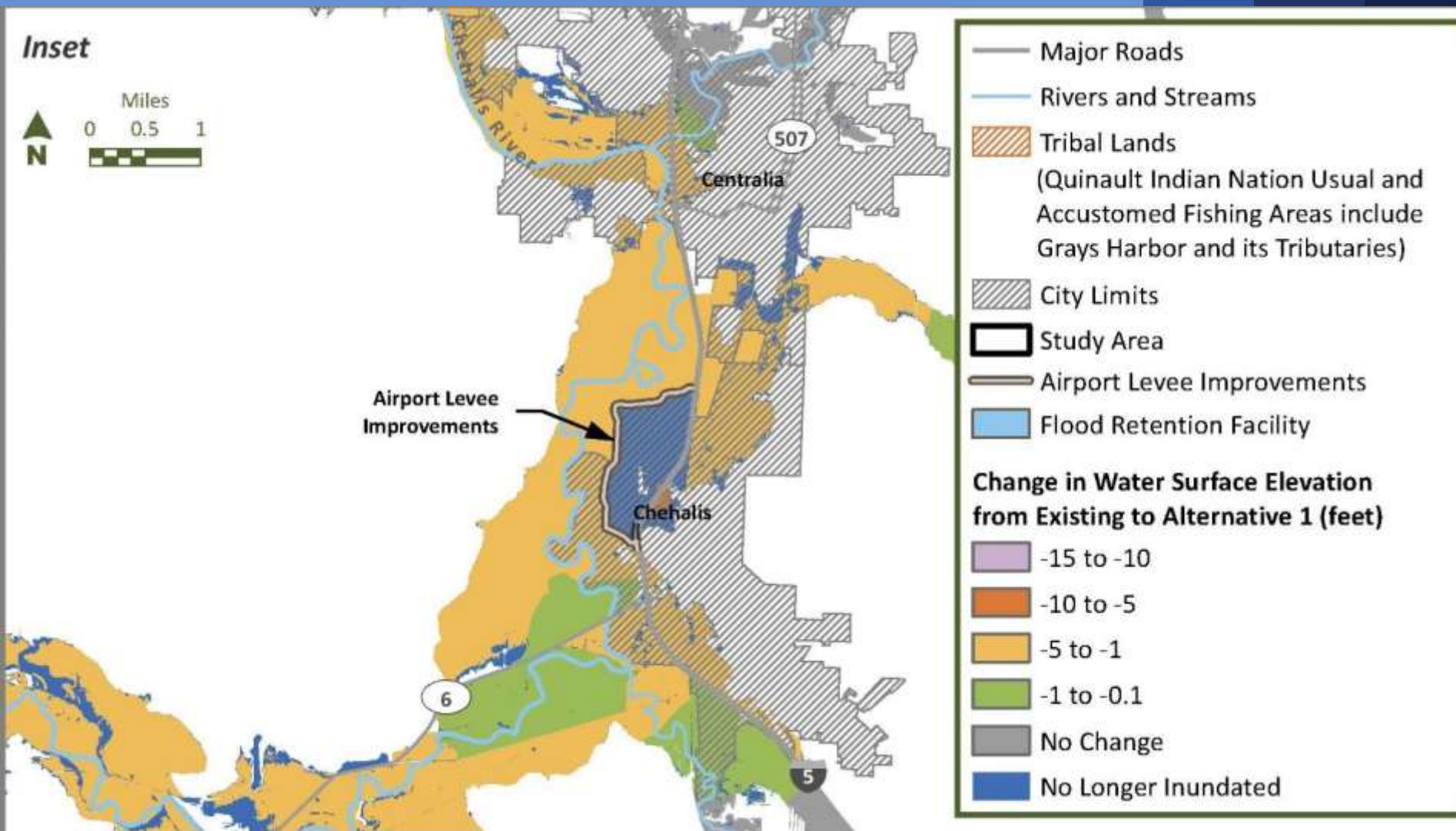
- Substantial flood damage reduction in downstream areas
  - Flood level reduced during 100-year flood
  - Number of flooded high value structures reduced substantially
  - Corresponding beneficial effects to land use, recreation, transportation, public services and utilities, and environmental health and safety
- For FRFA, temperature reduction in Chehalis River downstream of the dam to confluence of the Skookumchuk River

# Reduction in Peak Elevation

## Peak Flood Elevation Comparison of the Chehalis River (100-year flood)

LOCATION	EXISTING PEAK ELEVATION (FT)	PEAK ELEVATION WITH FLOOD RETENTION (FT)	DIFFERENCE IN PEAK ELEVATION (FT)
Near Doty	319.2	308.1	-11.1
Downstream of South Fork	222.2	217.1	-5.1
Along Airport Levee	180.5	179.0	-1.5
Behind Airport Levee	180.3	173.3	-7.0
Mellen Street	177.7	176.0	-1.7
Galvin Road	168.2	166.5	-1.7
Grand Mound	147.5	146.6	-0.9
Near Rochester	124.4	123.4	-1.0
Montesano	18.6	17.9	-0.7
Near Doty	319.2	308.1	-11.1

# Alternative 1 – Upper Chehalis Basin (100-year Flood)





# Alternative 2

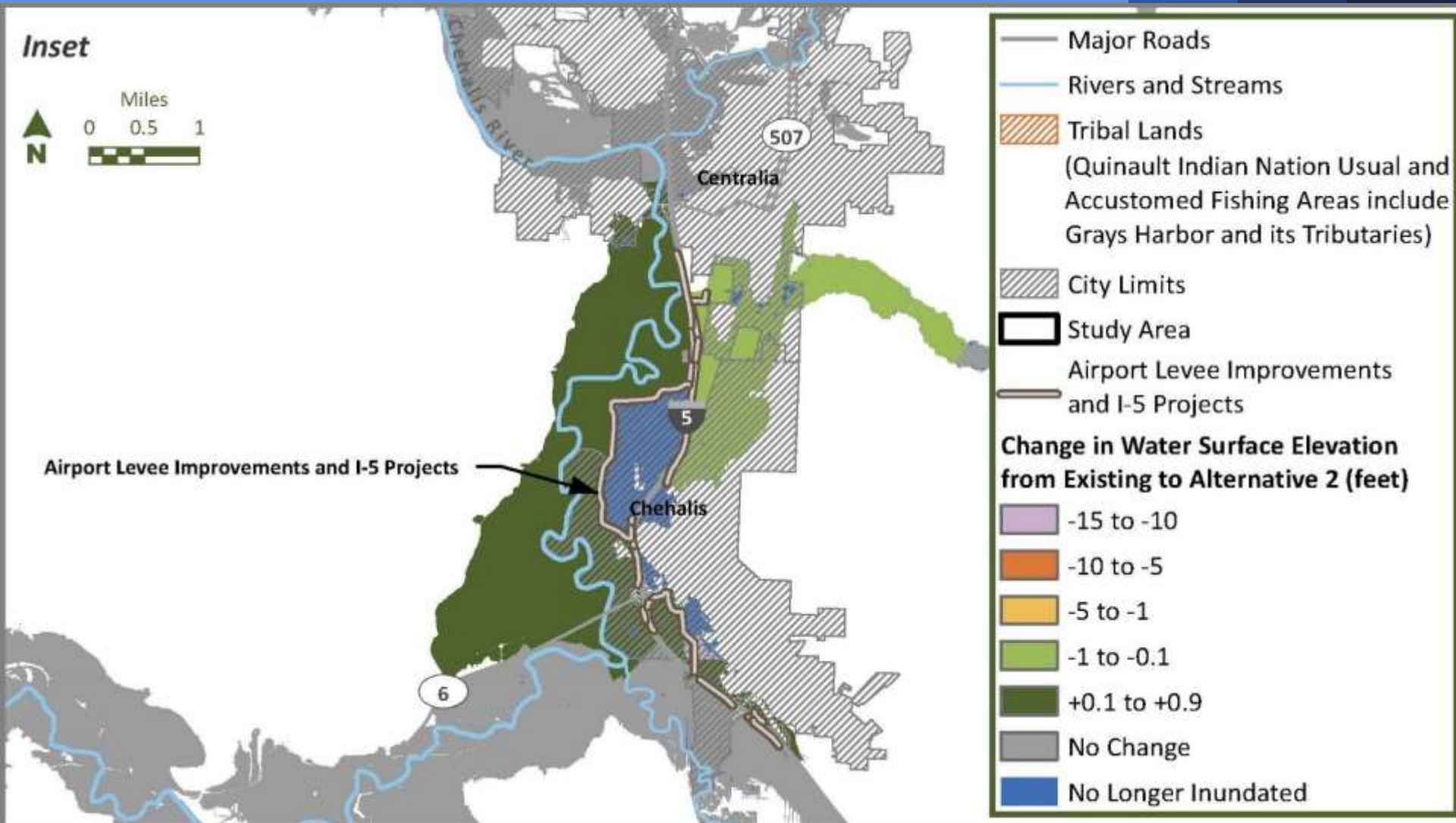
## Impacts

- Water quantity
- Geology and Geomorphology
- Wetlands and Vegetation
- Historic, Cultural, and Tribal Resources

## Potential Mitigation

- Compensatory wetland mitigation

# Alternative 2 – Upper Chehalis Basin (100-year Flood)

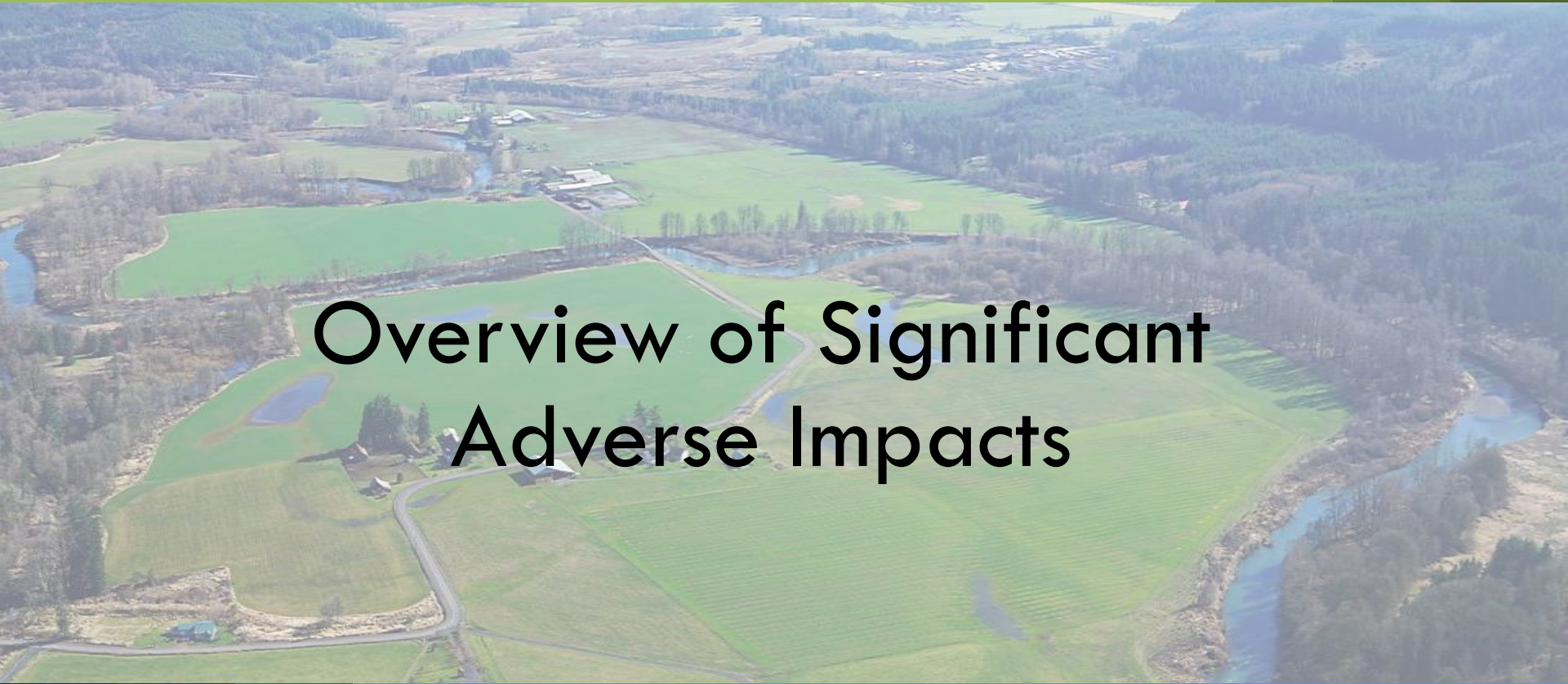


# Alternative 3

- No significant adverse impacts
- Historic, Cultural, and Tribal Resources

# Alternative 4

## Overview of Significant Adverse Impacts





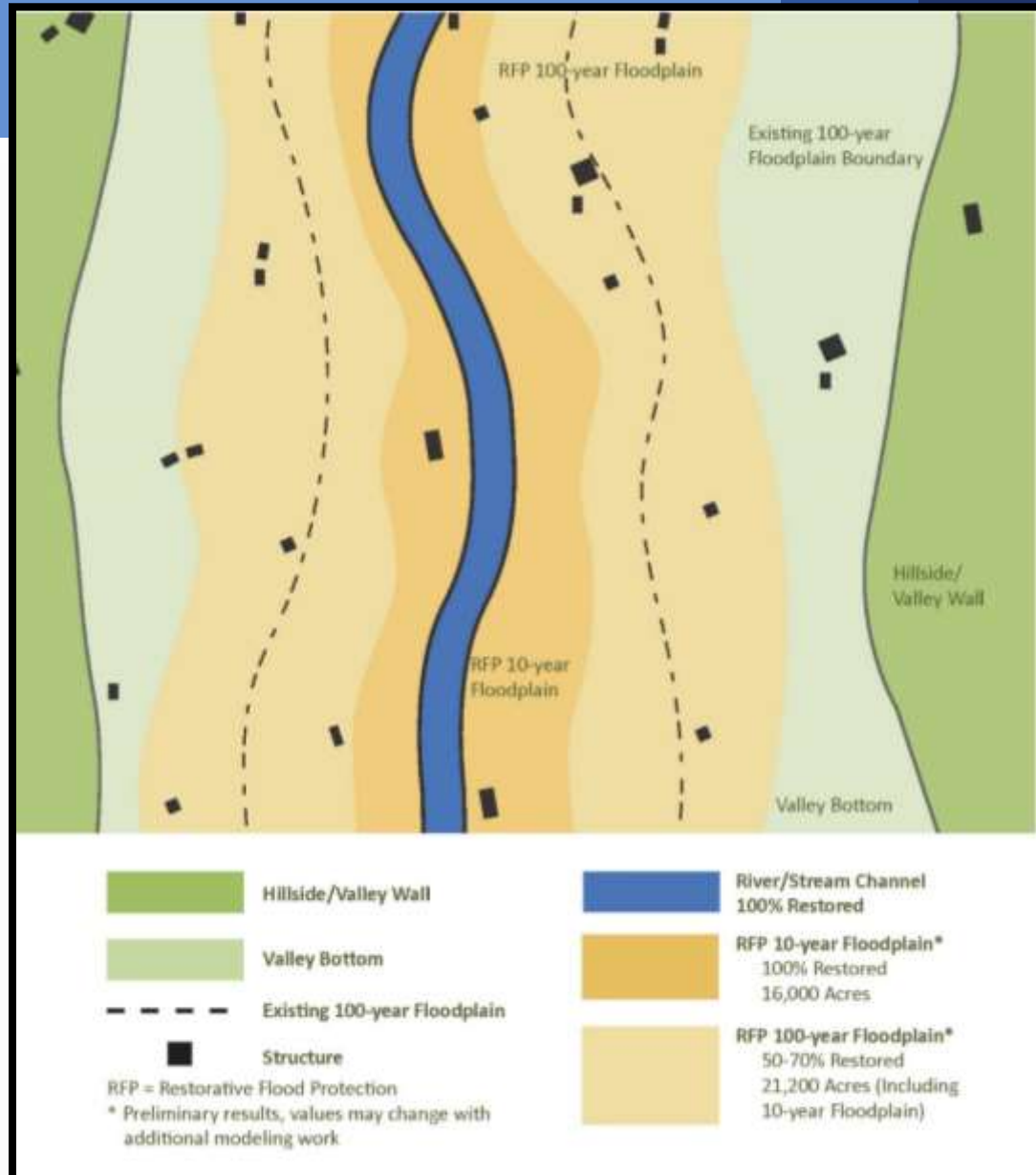
# Alternative 4

- Water quantity
- Wetlands and Vegetation
- Fish and Wildlife
- Visual Quality
- Land Use
- Transportation
- Environmental Health and Safety
- Public Services and Utilities
- Historic, Cultural, and Tribal Resources

# Restorative Flood Protection Treatment Areas



# Restorative Flood Protection Floodplain



# Conceptual Image of Typical Floodplain





# Conceptual Image Following Restoration Flood Protection Implementation



# Land Use Impacts

- Increase flooding on up to 21,000 acres
- Convert up to 16,000 acres of managed forest land to agriculture, rural residential, public services, and commercial uses
- Approximately 462 high value structures would experience more flooding

# Transportation Impacts

- Increase the closure of:
  - SR 6
  - SR 506
  - SR 508
- Closures of I-5 and flooding of local roads and the Chehalis-Centralia Airport would continue during 100-year flood
- Roads in some locations not currently flooded under current 100 year flood conditions would be flooded

# Environmental Health and Safety Impacts

- **Higher flood levels could close roads for longer periods** in the RFP treatment area, and may prevent access for emergency response
- **Access to some of the rural areas within the RFP treatment area is already limited under existing conditions** (increased flood event frequency)
- **Impacts would vary** within the RFP treatment area depending on how well emergency response could be maintained



# Public Services and Utilities Impacts

- Relocation of agricultural, residential, and commercial land uses out of the 10-year floodplain would require **disconnection and decommissioning of existing public utilities** in these areas
- No direct increased demand for public services and utilities is expected, but **relocation of those services and utilities could require extension of utilities** including electricity, water supplies, and sewer services

# Land Use Mitigation

- This action includes:
  - Stay-in-place mitigation – flood proofing, elevation of structures, farm pads, drainage improvements, or relocation of homes and structures to more upland portions of the same parcel.
  - Relocation support - move floodplain land uses to upland areas.
  - Buy-outs –buy-out options for property.
  - Permanent conservation easements - to compensate property owners for lost use of land.

# Alternative 4

## Potential Mitigation

- Avoid treatments where most significant impacts would occur and in areas with little downstream benefit
- Avoid and minimize wetland and vegetation impacts in conversion areas
- Decommission and floodproof

An aerial photograph of a rural landscape. The scene features a large, vibrant green field in the center, which appears to be a golf course or a large agricultural field. A winding river or stream flows through the landscape, particularly on the right side. There are several small ponds or water features scattered throughout the green areas. In the background, there are clusters of buildings, possibly a farmstead or a small village, and more green fields. The landscape is bordered by dense forests on the left and right sides. The overall color palette is dominated by greens and blues, with some brownish tones in the background suggesting a mix of vegetation and possibly some bare trees.

# Overview of Benefits



# Summary of Benefits

- Flooding would be reduced in the Chehalis and Centralia areas where flooding would be **reduced by up to 1 foot**
- By design, the RFP treatment actions aim to **restore geomorphic processes** to a condition representative of the Chehalis Basin prior to floodplain development and channel modification
- **Increased diversity and extent of riparian and floodplain vegetation communities**
- **Increase well-distributed high quality key habitats** such as wetlands, off-channel habitats, and side channel networks used heavily by coho salmon but also by spring-run Chinook salmon and steelhead
- **Stream temperatures could generally be expected to be lowered** compared to existing conditions

# Q100 Flood Level Reduction Near Centralia/Chehalis

LOCATION	RIVER MILE CROSS SECTION	100-YEAR FLOOD		
		EXISTING CONDITIONS WSE (FT)	RESTORATIVE ACTIONS WSE (FT)	CHANGE IN WSE (FT)
Labree Road (Newaukum)	RM 4.11	206.4	206.1	-0.3
Newaukum Confluence	RM 75.2	185.2	184.1	-1.0
Along Airport Levee	RM 71.49	180.5	180.1	-0.4

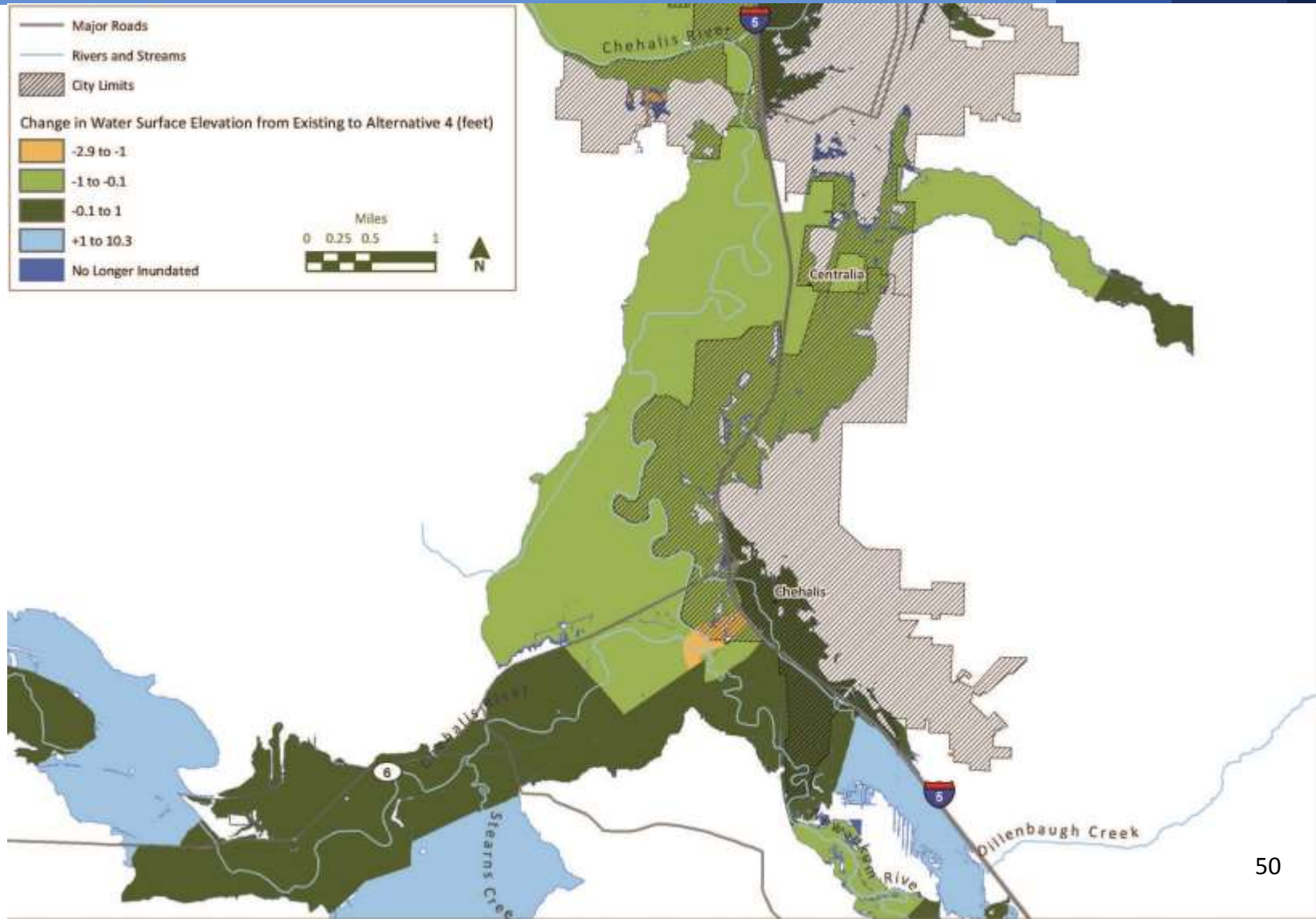
Vertical datum = North American Vertical Datum of 1988 (NAVD88)

ft = foot

RM = river mile

WSE = water surface elevation

# Alternative 4 – Upper/Middle Chehalis Basin (100-year Flood)



# Next Steps

- Draft Programmatic EIS released September 29, 2016
- 30-day public comment period, closes October 31, 2016
- Open House & Hearings, other outreach
- Governor Inslee and legislature will recommend actions to move forward at the end of the year
- Final EIS in 2017