Flood Reduction Project Planning

Mitigation Assessment Status Update

Kleinschmidt Consulting Team

For

Chehalis River Basin Flood Control Zone District

April 2, 2020

Mitigation Process Overview

- SEPA DEIS – significant unavoidable impacts will require mitigation
- Hypothetically – can those impacts be mitigated? Proof of concept
- If the project advances, project design and permitting proceed concurrently
- Mitigation plan is developed and negotiated during permitting process
- Mitigation requirements are enforceable as permit conditions

Mitigation Opportunities Analysis

- Based on project impacts, make a preliminary estimate of mitigation needs
  - Types of mitigation
  - Locations
  - Quantities
  - Costs
- Identify and screen opportunities
- Is there sufficient mitigation opportunity available?

Ongoing Mitigation Analysis Activities

- Project Impacts
- Critical Mitigation Parameters
- Candidate Site List
- Mitigation Input to EDT Modeling
- Mitigation Input to BA
- Hyporheic Enhancement
- Example Conceptual Designs
- Mitigation Assessment Report

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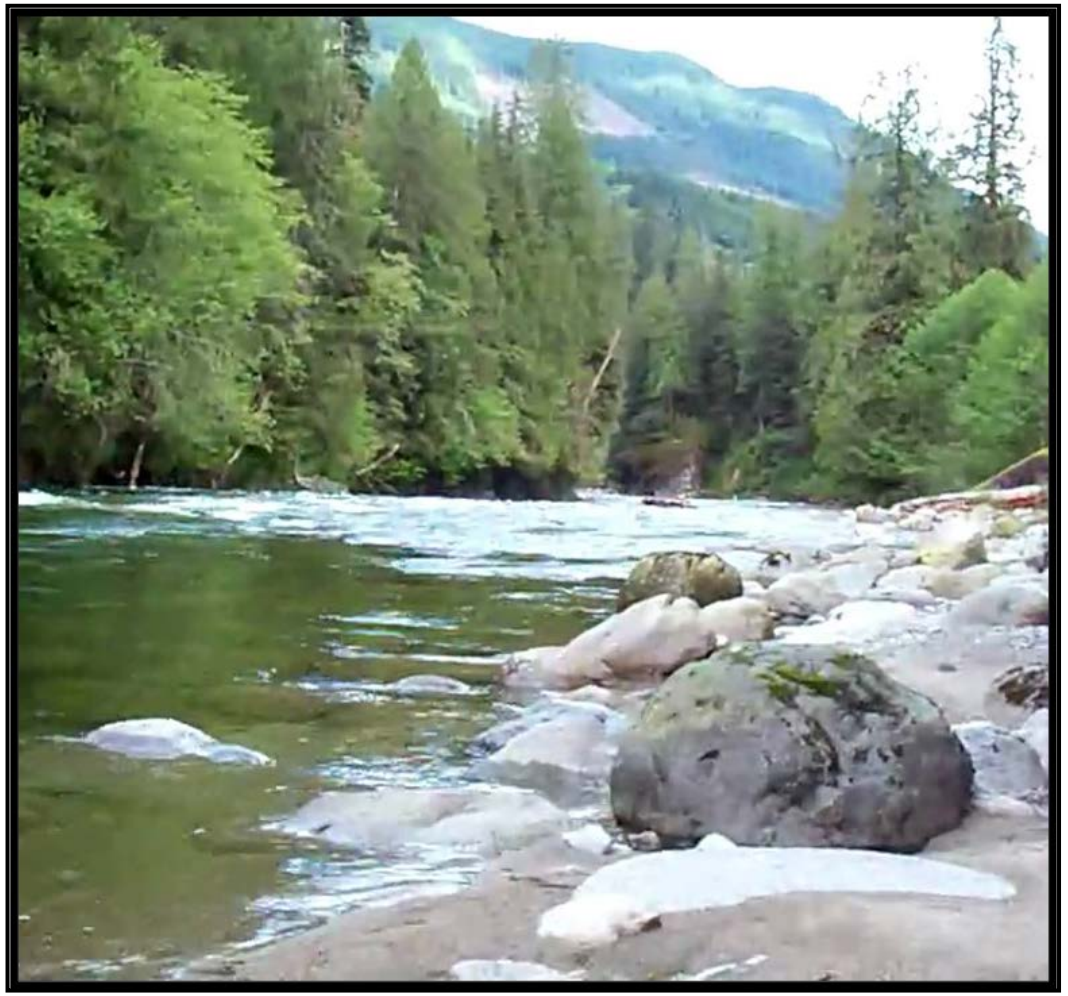
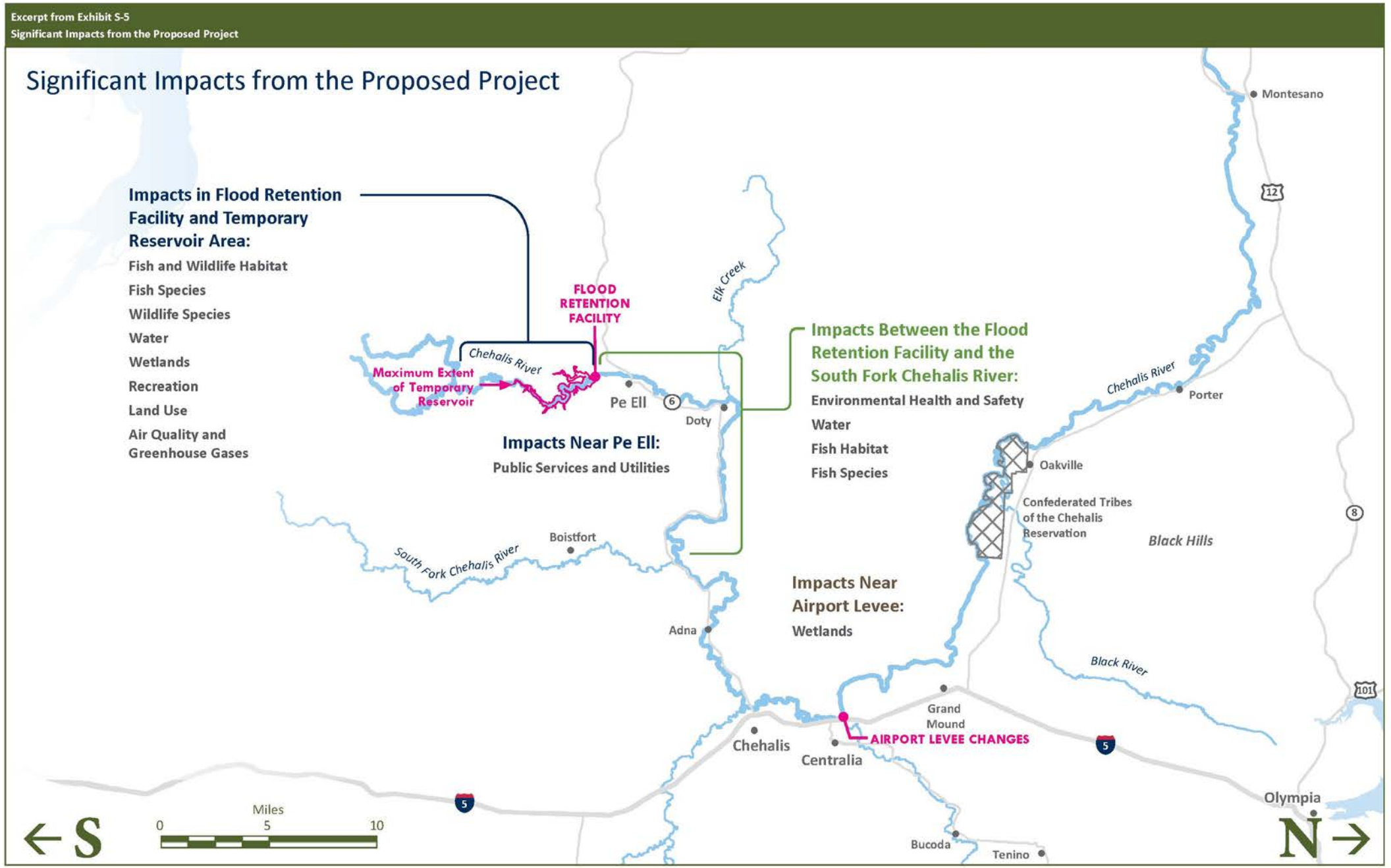
Major Aquatic Impacts that Require Mitigation

- Water Quality
  - Temperature
  - Turbidity
- Habitat Loss
  - Direct elimination
  - Altered natural processes
  - Fish Passage





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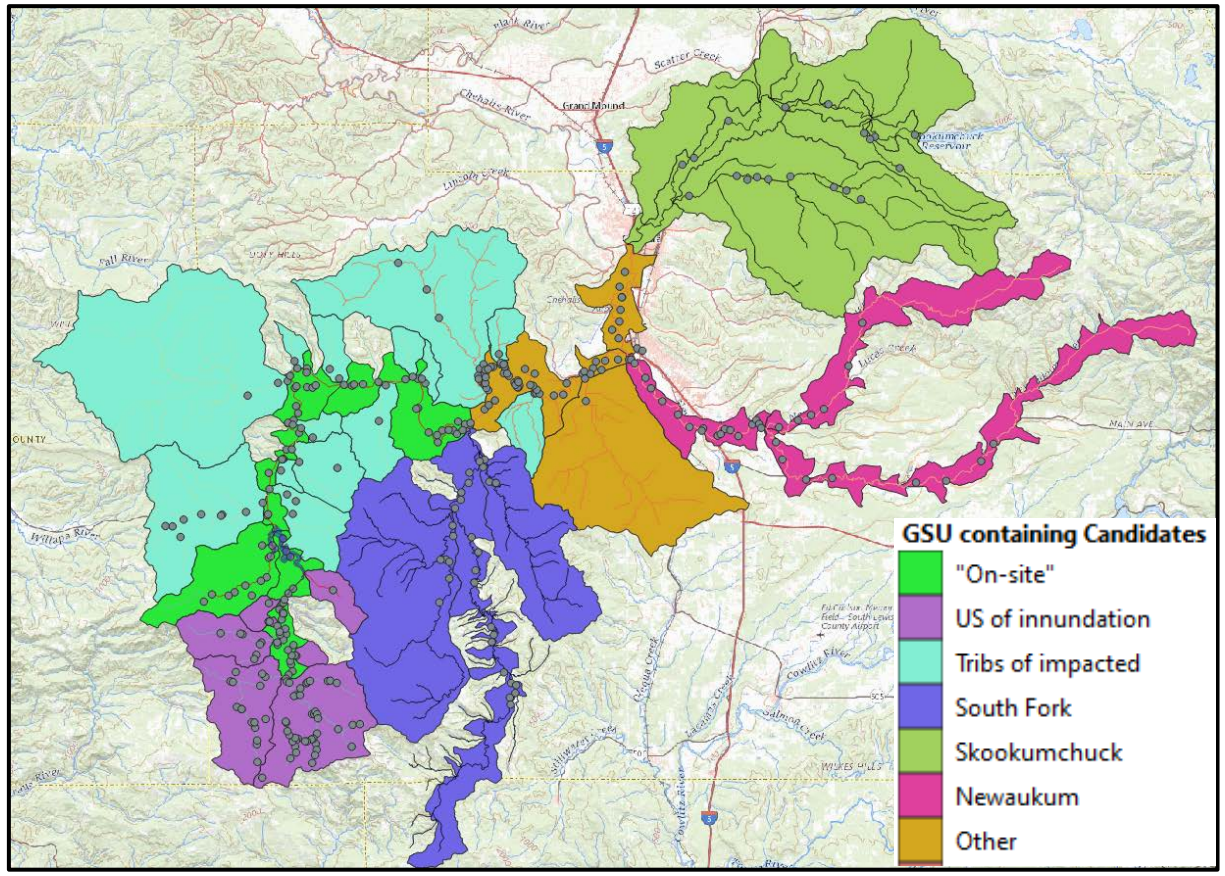
Process for Estimating Mitigation

What is the process for estimating the amount, types, and locations for mitigation?

- Describe and quantify impacts
  - Replace what is lost
  - Consider both form and process
- What is considered “on site”?
- Watershed and ecological context
- Compatibility with other factors
  - ASRP work
  - Land use and property ownership
  - Infrastructure



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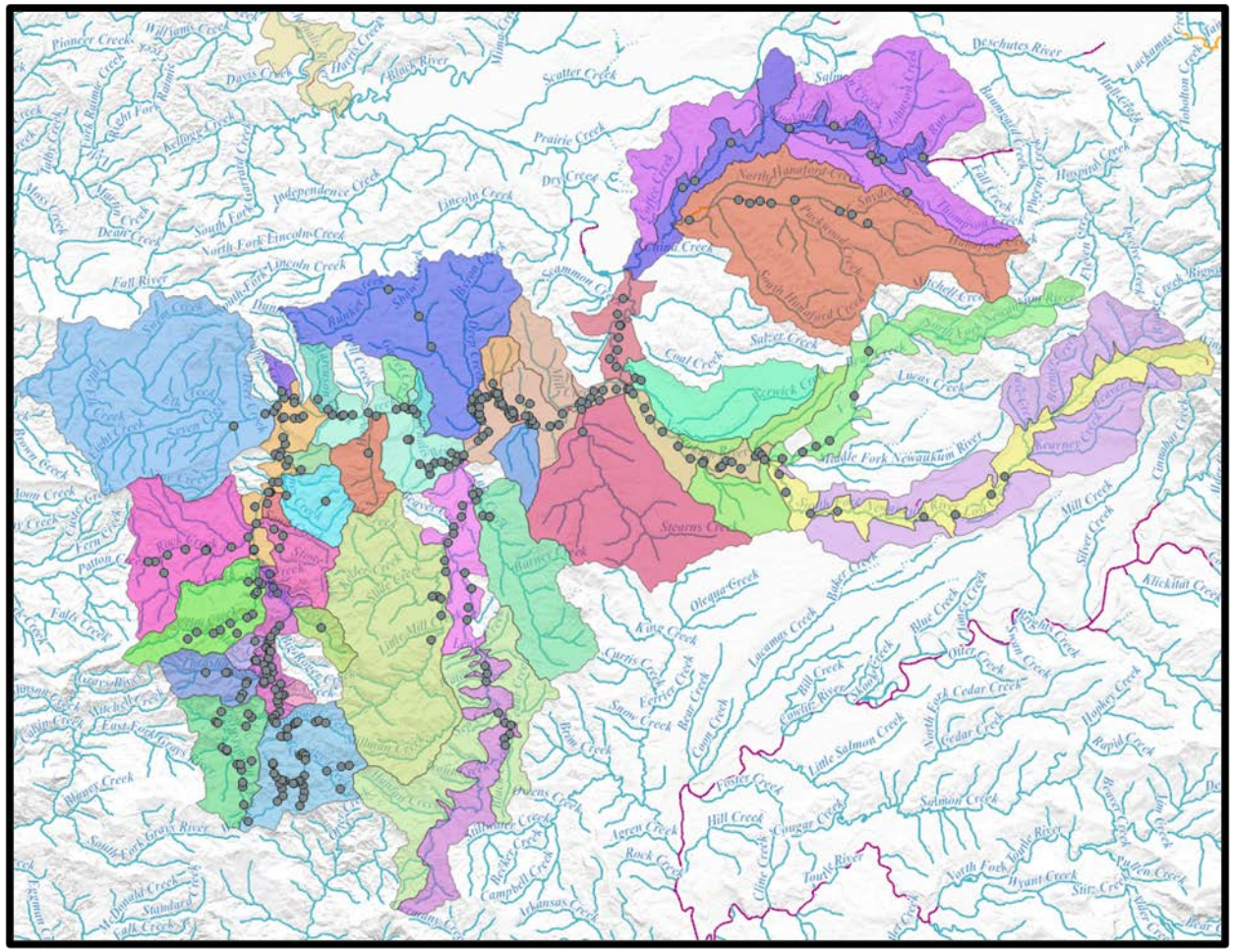
Over 300 Potential Candidate Sites



Mitigation Action Type	343 Sites with Opportunities
Riparian Buffer Expansion	102
Hyporheic Exchange and Coolwater Enhancements	167
Instream Modifications	83
Off-Channel Modifications	110
Gravel Retention Jams	8
Fish Passage	23
Wetland Enhancement	34
Upland Conservation/ Enhancement	10

Many sites support more than one action type.

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Climate Change Predictions

- Rainfall increases
- Larger flows occur more frequently
- Low flows decrease
- Wet season is wetter, dry season is drier
- Temperatures rise

Source: Mauger et al. 2016

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Climate Change Affects Mitigation

- Forward compatibility
  - Adaptive management
  - Durable habitat
- Impact ⇔ Mitigation
- Design flows for habitat
  - Peak flows
  - Low flows
  - Other ecologically significant flows
- Plant selection for restoration
- Site Selection
- Vertical and lateral extent of habitat elements

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Key Observations (So Far)

- Abundant opportunities for habitat enhancement and restoration
- Adaptive management and durable mitigation are needed
- Water temperature is biggest challenge
  - On-site vegetation management
  - Riparian shading
  - Thermal refugia
- Some habitats and ecological functions can’t be replaced on site
- Good coordination multiplies value

Next Steps

- Review purpose of ongoing mitigation opportunities assessment
  - Refine large pool of candidate mitigation opportunities
  - Develop and refine preliminary guidelines for eventual mitigation planning
  - Evaluate future opportunities to apply mitigation sequencing (avoid, minimize, mitigate)
- Prepare mitigation opportunities report