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2018 Salish Sea Ecosystem Conference
(Seattle, Wash.)

Apr 4th, 4:15 PM - 4:30 PM

Integrating watershed-scale and river-reach protection and restoration planning to promote climate resilience in the South Fork Nooksack River (SFNR)

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Grah, Oliver and Dickerson-Lange, Susan, "Integrating watershed-scale and river-reach protection and restoration planning to promote climate resilience in the South Fork Nooksack River (SFNR)" (2018). *Salish Sea Ecosystem Conference*. 95.

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Integrating Watershed-Scale and River-Reach Protection and Restoration Planning to Promote Climate Resilience in the South Fork Nooksack River, WA

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2018 Salish Sea Ecosystem Conference
Seattle, WA
April 4-6, 2018

SFNR Climate Change Watershed Project

Co-Investigators:

- Susan Dickerson–Lange, Restoration Hydrologist, Natural Systems Design
- Steve Klein, Research Scientist, EPA–ORD
- Jezra Beaulieu, Water Resources Specialist, Nooksack Indian Tribe
- Robert Mitchell, Professor of Geology, Western Washington University
- Christina Bandaragoda, Senior Research Scientist, University of Washington
- Michael Maudlin, Restoration Geomorphologist, Nooksack Indian Tribe
- Treva Coe, Habitat Program Manager, Nooksack Indian Tribe
- Holly O’Neil, Crossroads Consulting, Public Outreach/Stakeholder Engagement
- Ian Smith, Restoration Planner, Living Systems
- Jason Hatch, Washington Water Trust



Carrie

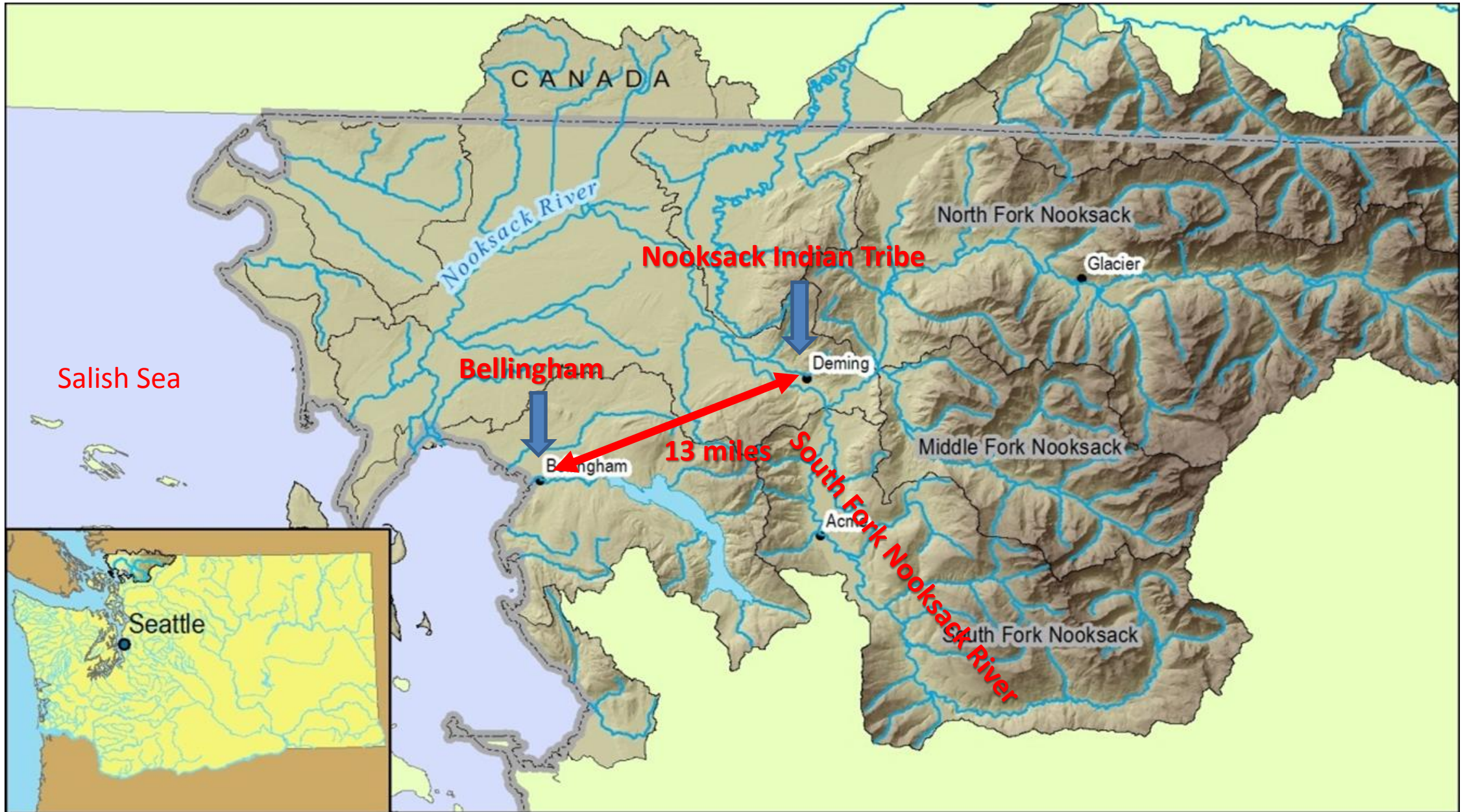
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Sources of Funding:

- EPA – PPG, NEP
- BIA
- NWIFC
- NPLCC and ATNI
- WA Dept. Ecology - NEP





Why the SFNR?

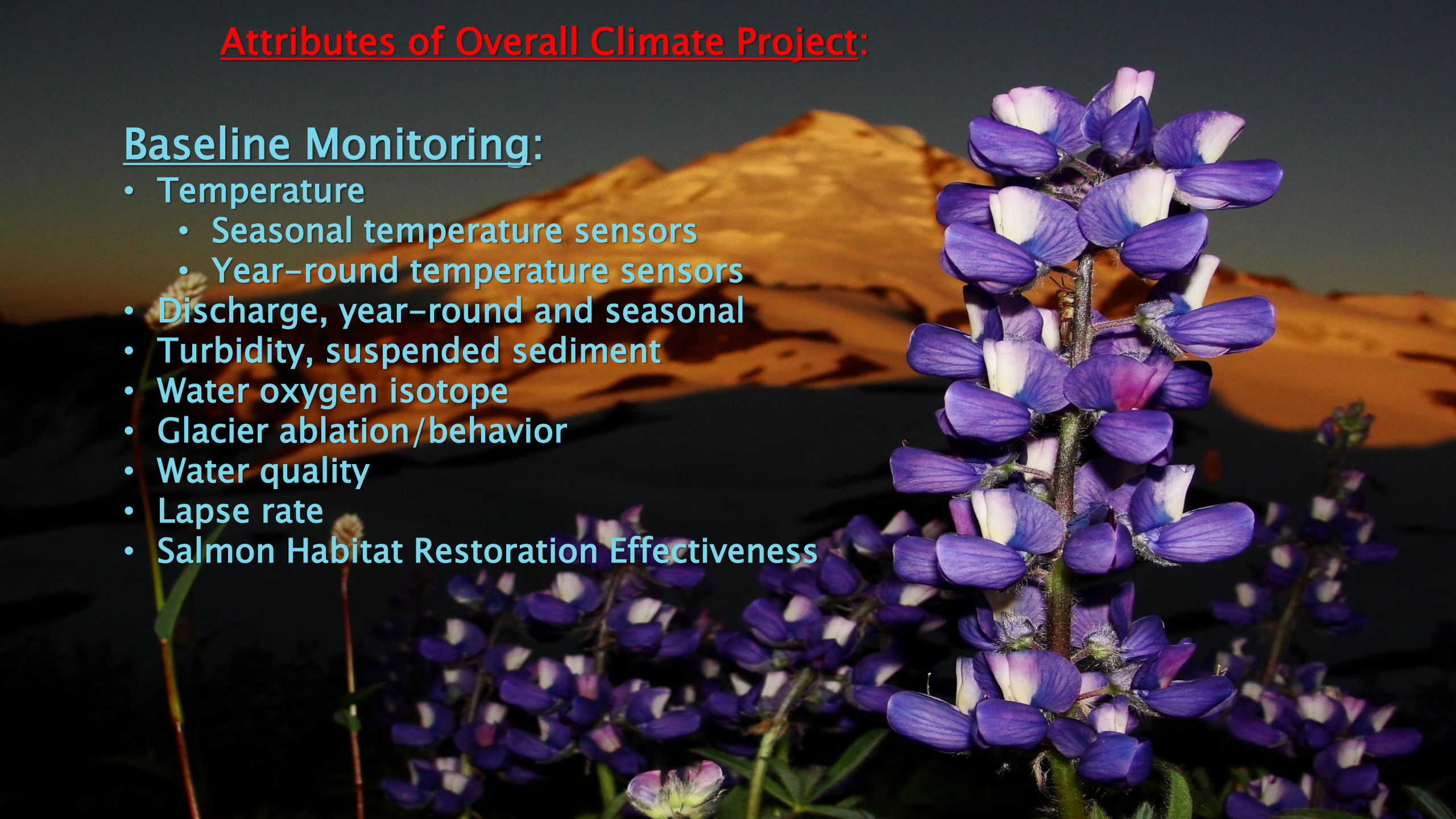
- Spring Chinook salmon ESA listing and other Pacific salmon
- Temperature impaired
- Excessive fine sediment
- Cultural importance to the Nooksack Indian Tribe
- WA Dept. Ecology/EPA Region 10 temperature TMDL
- EPA Region 10 climate change pilot research project
- Nooksack Tribe-lead watershed conservation planning effort



Attributes of Overall Climate Project:

Baseline Monitoring:

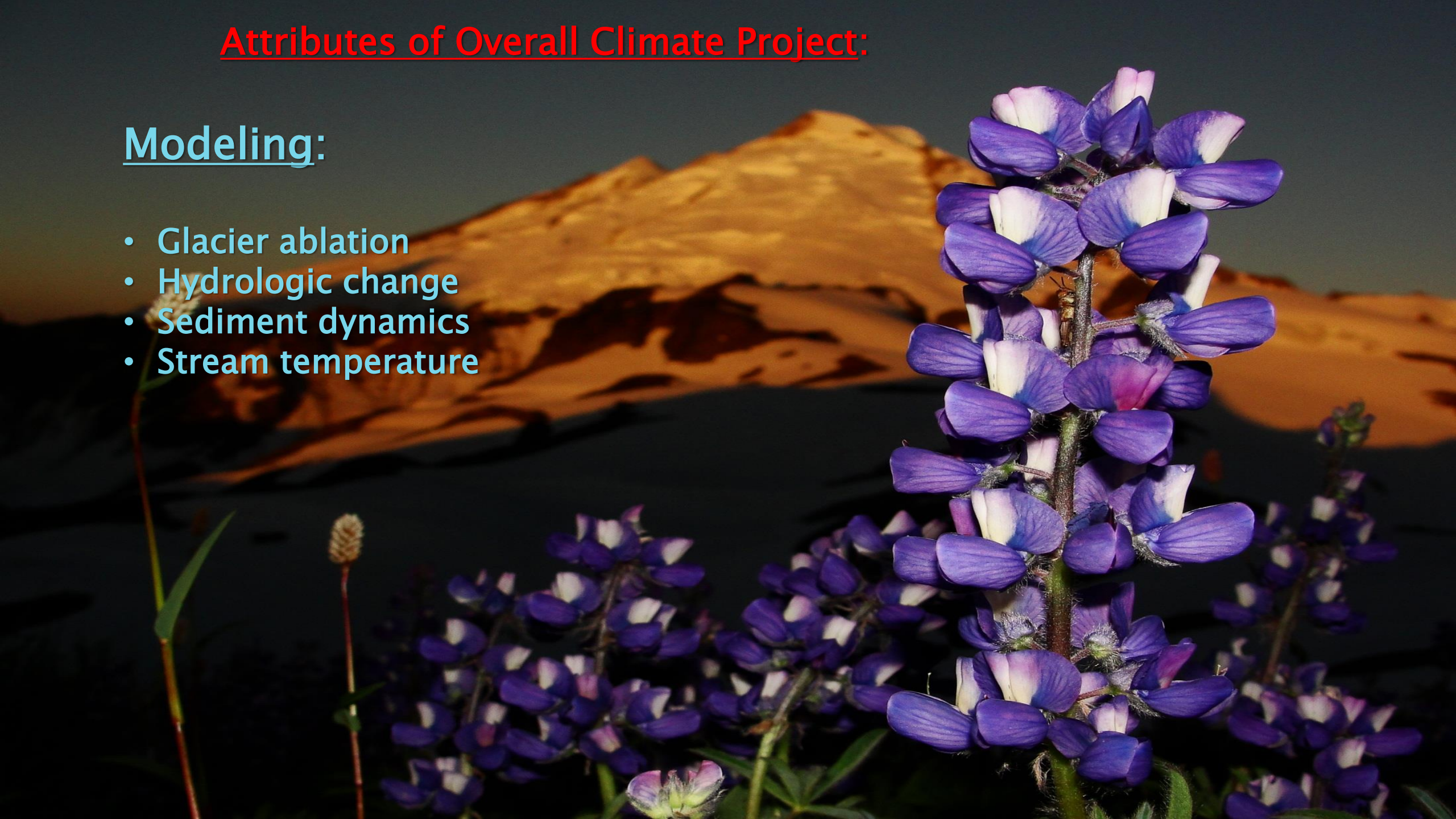
- Temperature
 - Seasonal temperature sensors
 - Year-round temperature sensors
- Discharge, year-round and seasonal
- Turbidity, suspended sediment
- Water oxygen isotope
- Glacier ablation/behavior
- Water quality
- Lapse rate
- Salmon Habitat Restoration Effectiveness



Attributes of Overall Climate Project:

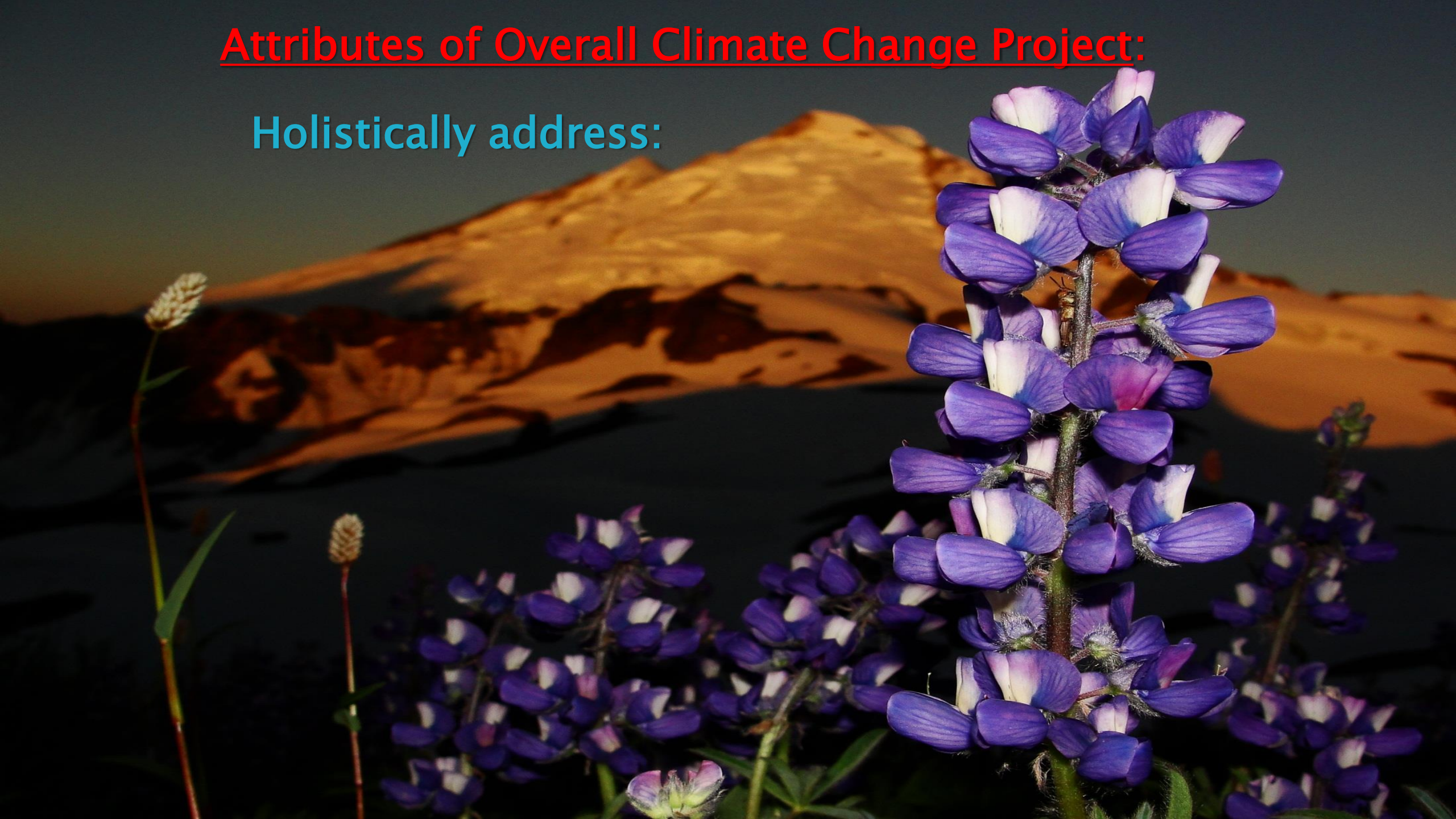
Modeling:

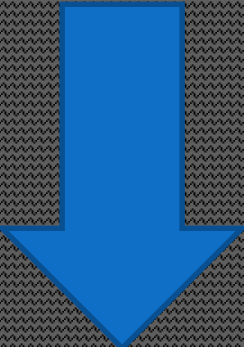
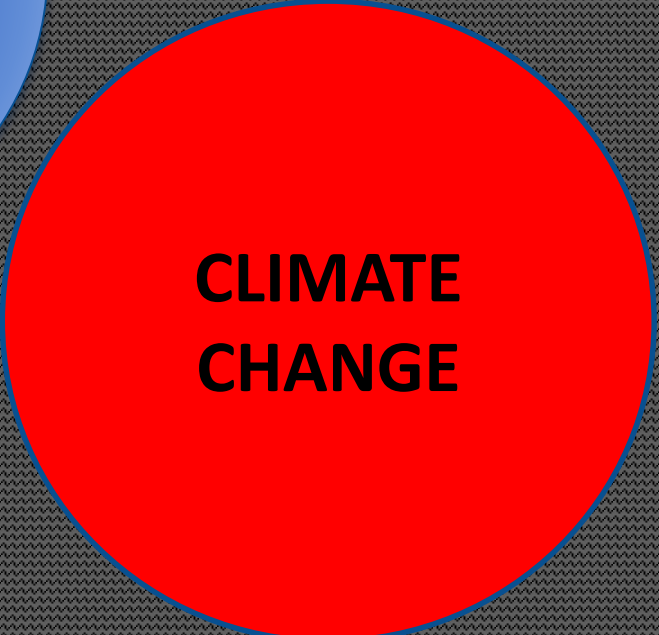
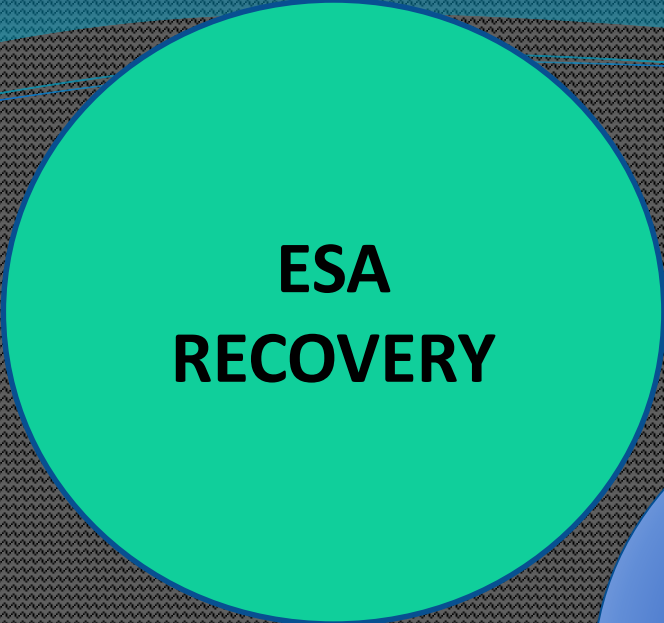
- Glacier ablation
- Hydrologic change
- Sediment dynamics
- Stream temperature



Attributes of Overall Climate Change Project:

Holistically address:





**LEGACY
IMPACTS**

**CWA
COMPLIANCE**

**ESA
RECOVERY**

**TREATY
RESOURCES**

**CLIMATE
CHANGE**

Climate Change Planning:

- Baseline conditions
- Cumulative impact of:
 - Legacy impacts
 - Climate change impacts
- Watershed processes



Climate Change Impacts



- **Vulnerability Assessment**
 - Species
 - Life Stage
 - Location
 - Timeframe
- **Adaptation Planning**
- **Fish**



EXAMPLE:

SOUTH FORK NOOKSACK RIVER CLIMATE CHANGE PROJECT

Collaboration between:

- EPA-ORD,
- EPA Region 10,
- Nooksack Indian Tribe,
- WA Dept of Ecology,
- Tetra Tech, Inc.



Not just a technical project, but also a story of:

- **Converging and integrating project pathways**
- **Voluntary collaboration**
- **Co-production of actionable climate change science**

:

Converging and Integrating Project Pathways

- In 2011, Nooksack Indian Tribe provided comment on SFNR temperature TMDL:
 - Climate change
 - Upland watershed processes
 - Among other comments

- Independently, EPA-ORD initiated a climate change pilot research project in 2012 to:
 - Demonstrate how climate change can be included in a temperature TMDL
 - Address climate change, ESA fish recovery, and CWA compliance in one research demonstration pilot project



“Circumstance meets opportunity” to yield the:



“EPA Region 10 Climate Change and TMDL Pilot Project”

Climate Change Risk Assessment

Consists of a Quantitative and Qualitative Assessment

Quantitative Assessment (Led by EPA-ORD and Tetra Tech, Inc.):

Qualitative Assessment (Led by the Nooksack Indian Tribe):

- Comprehensive analysis of restoration effectiveness in the SFNR with continued climate change.
- Resulted in a prioritized list of climate change adaption strategies that supports salmon restoration in the SFNR under climate change.
- **Protect CWA beneficial uses under continued climate change**
- **Support ESA recovery under climate change**



“Qualitative Assessment: Evaluating the Impacts of Climate Change on Endangered Species Act Recovery Actions for the South Fork Nooksack River, WA”






EPA/###/R-##/### | XXXXX 2015 | www.epa.gov/wed

Qualitative Assessment: Evaluating the Impacts of Climate Change on Endangered Species Act Recovery Actions for the South Fork Nooksack River, WA



Finally released!

ACTIONS TO PROMOTE RESILIENCE TO CLIMATE CHANGE:

- RECONNECT RIVER TO FLOODPLAIN
- RESTORE AND PROTECT RIPARIAN AREAS  NEP Grant
- CONTINUE INSTREAM REHABILITATION/RESTORATION
- RESTORE FLOW REGIMES  Watershed function restoration and enhancement
- PROMOTE LONGITUDINAL CONNECTIVITY
- REDUCE SEDIMENT DELIVERY 

None of these actions can individually ameliorate all legacy impacts and climate impacts.

ACTIONS TO PROMOTE RESILIENCE TO CLIMATE CHANGE:

• ADDITIONAL ACTIONS:

- ACKNOWLEDGE AND ADDRESS THE ROLE OF UPPER WATERSHED PROCESSES
- DEVELOP A WATERSHED CONSERVATION PLAN
- DESIGN AND IMPLEMENT WATERSHED RESTORATION TOOLS THAT SUPPORT AND SUPPLEMENT TRADITIONAL INSTREAM TOOLS
- VOLUNTARY ACTIONS THROUGHOUT THE WATERSHED
 - Forestry
 - Transportation
 - Agriculture
 - Development

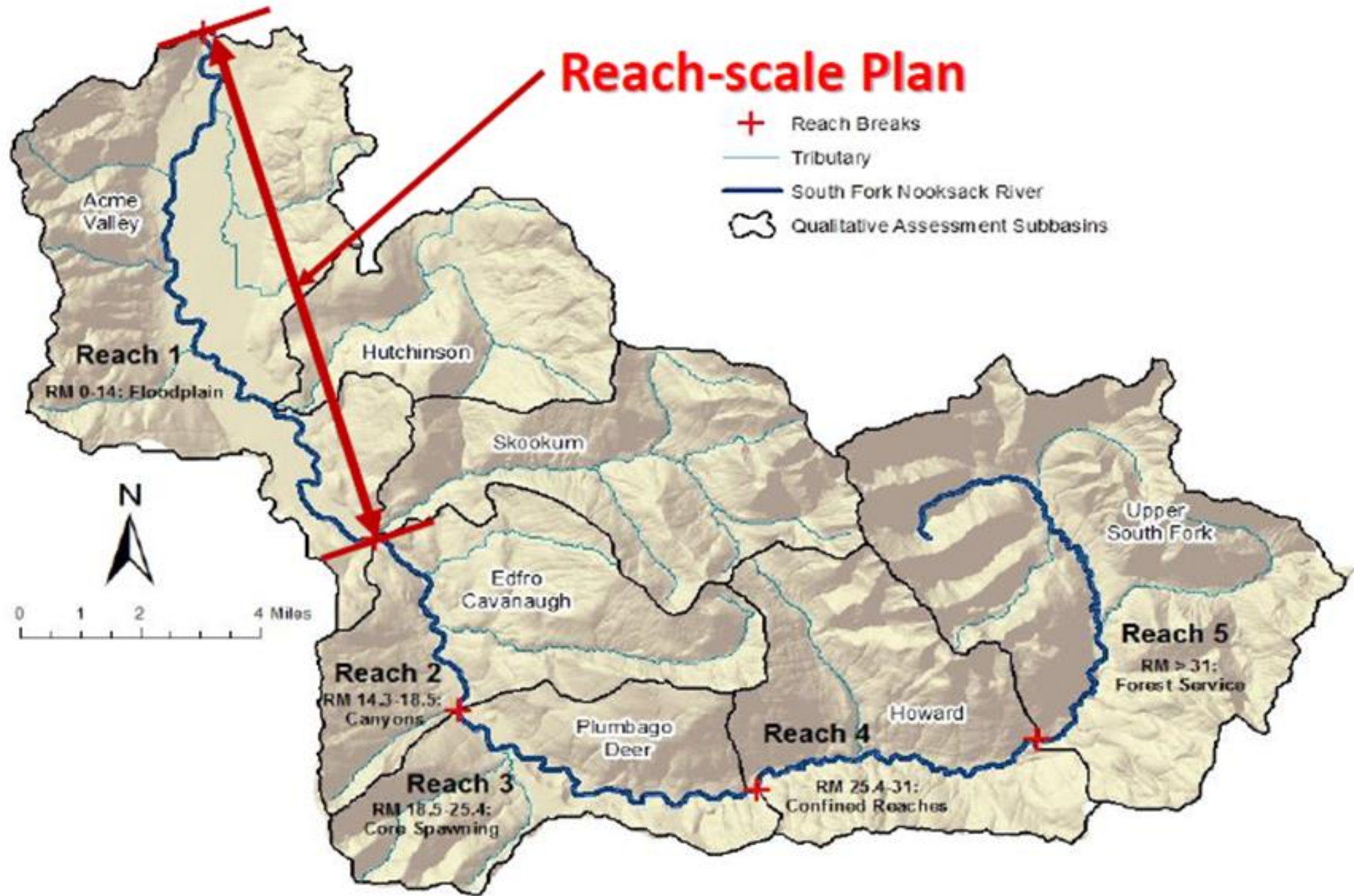


Nooksack Indian Tribe NEP Grant Project

Acts on the recommendations of:

- Draft Temperature TMDL
- EPA Region 10 Pilot Climate Change Project
- WRIA 1 - Nooksack River Salmon Recovery Plan
- WRIA 1 – Nooksack River Watershed Management Plan
- SFNR Watershed Conservation Plan

Reach-scale Plan



Our Project:

- **Developed a reach-scale plan**
- **Lower 14.3-mile reach of the SFNR**
- **Evaluated 345 individual parcels on the floodplain for:**
 - **Cover type**
 - **Condition**
 - **Quality**
 - **Opportunity for protection**
 - **Opportunity for restoration**

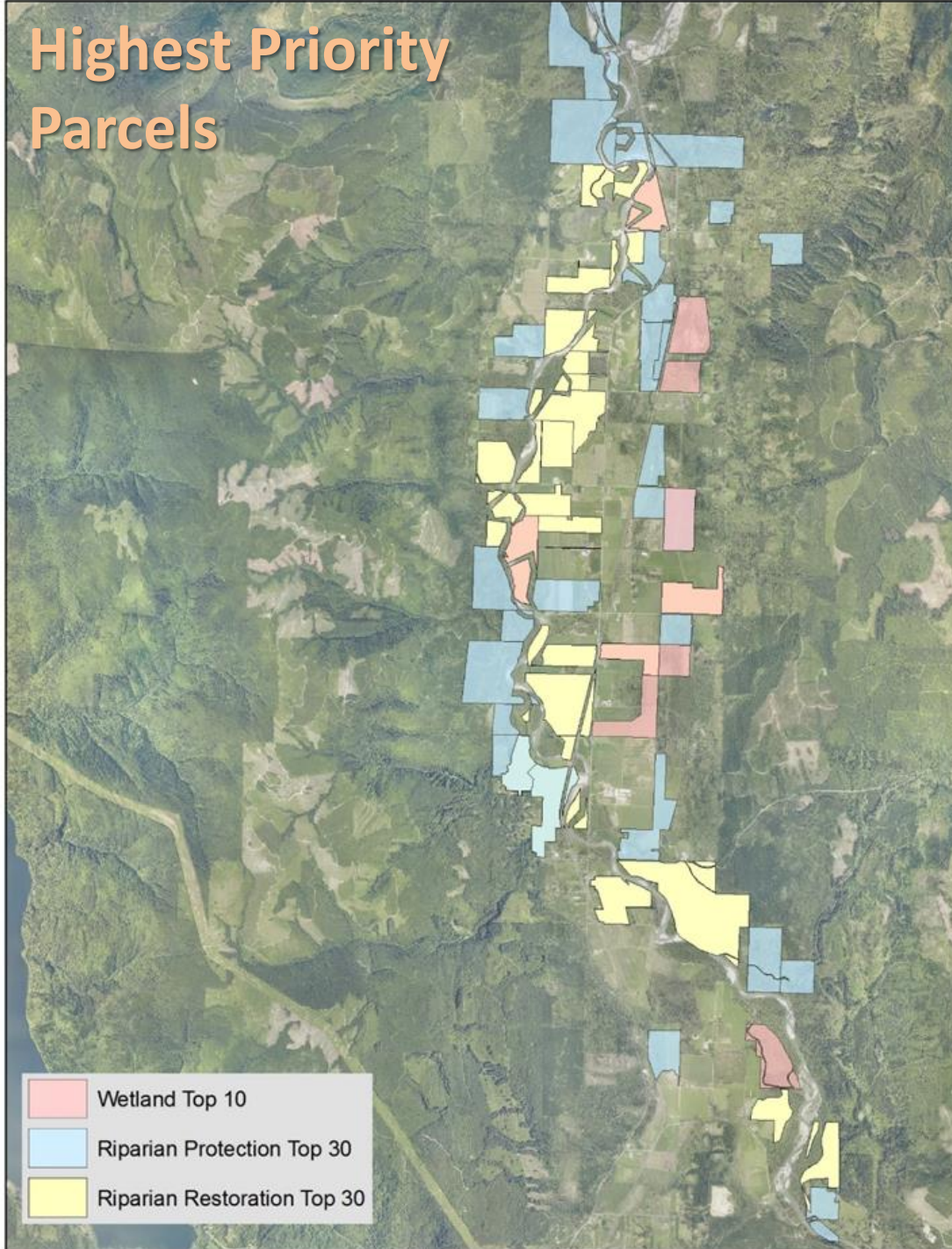


Our Project:

- **Contacted landowners with highest priority parcels to determine initial willingness to participate in NEP Phase 2 funding**



Highest Priority Parcels



Our Project:

- Fourteen parcels with willing landowners were identified
- Conceptual riparian protection and restoration profiles developed



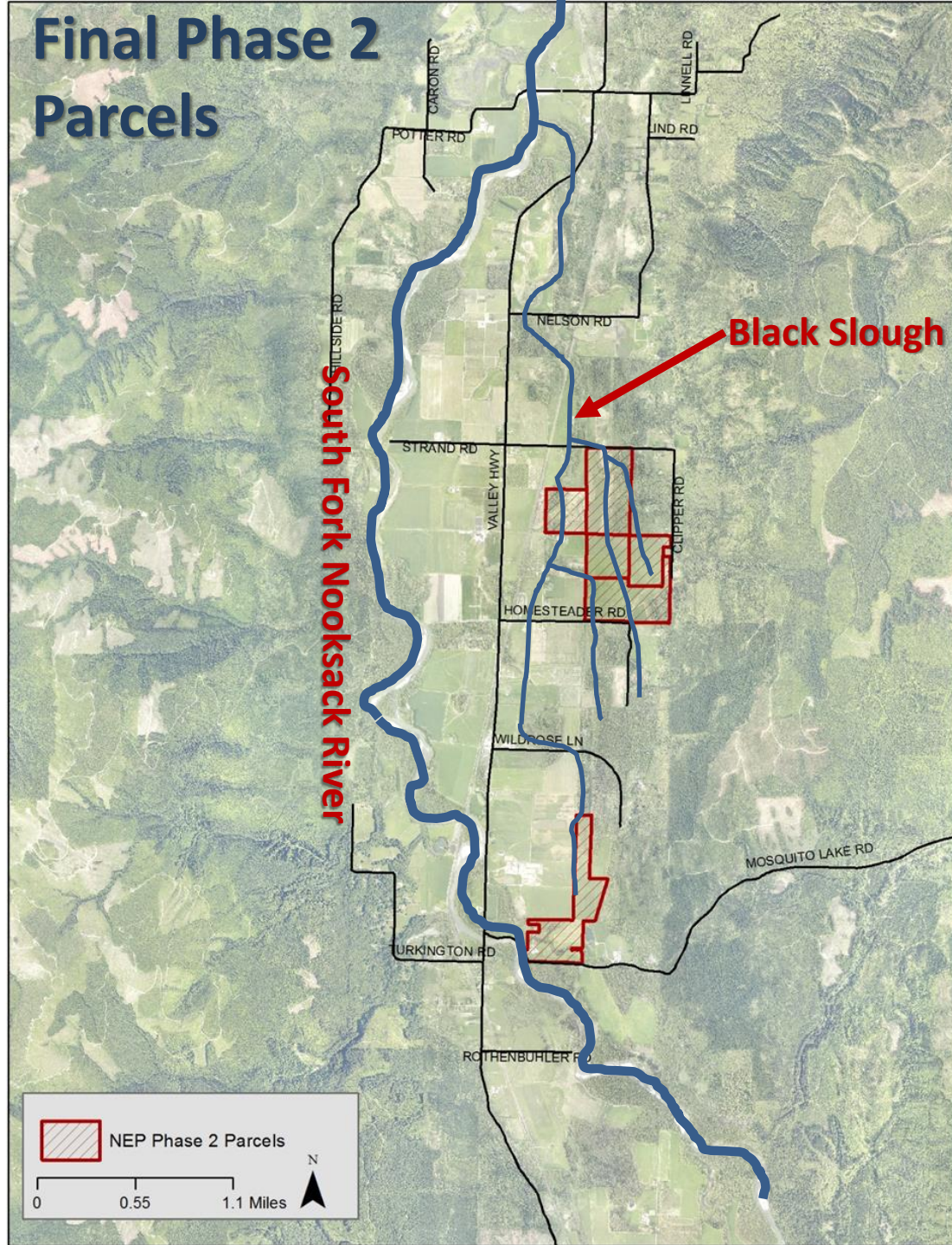
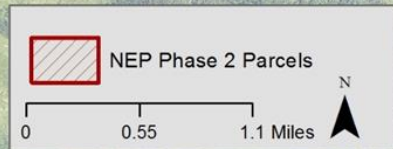
- **Eight parcels with four landowners were addressed in the Conceptual Scope of Work that serves to qualify protection and restoration actions for NEP Phase 2 funding**
- **We are pending formal comments from Ecology on our Conceptual SOW**
- **Phase 2 funding imminent**



Final Phase 2 Parcels

South Fork Nooksack River

Black Slough



TASK	LAND OWNER				
	Lallas	Hollinsworth	Acme Prop.	Jacoby	TOTAL
Appraisal/due diligence	\$10,000	\$10,000	\$10,000	\$0	\$30,000
Incidentals	16000	16000	16000	16000	64000
Protection	75000	185000	75000	50000	385000
Restoration	113100	112500	92000	37000	354600
BMPs	10000	10000	10000	10000	40000
Monitoring	21000	21000	21000	21000	84000
Maintenance	134000	140000	80000	40000	394000
TOTAL	\$379,100	\$494,500	\$304,000	\$174,000	\$1,351,600

\$1,351,600 ≠ \$430,000

**The missing piece of the
overall restoration puzzle:**

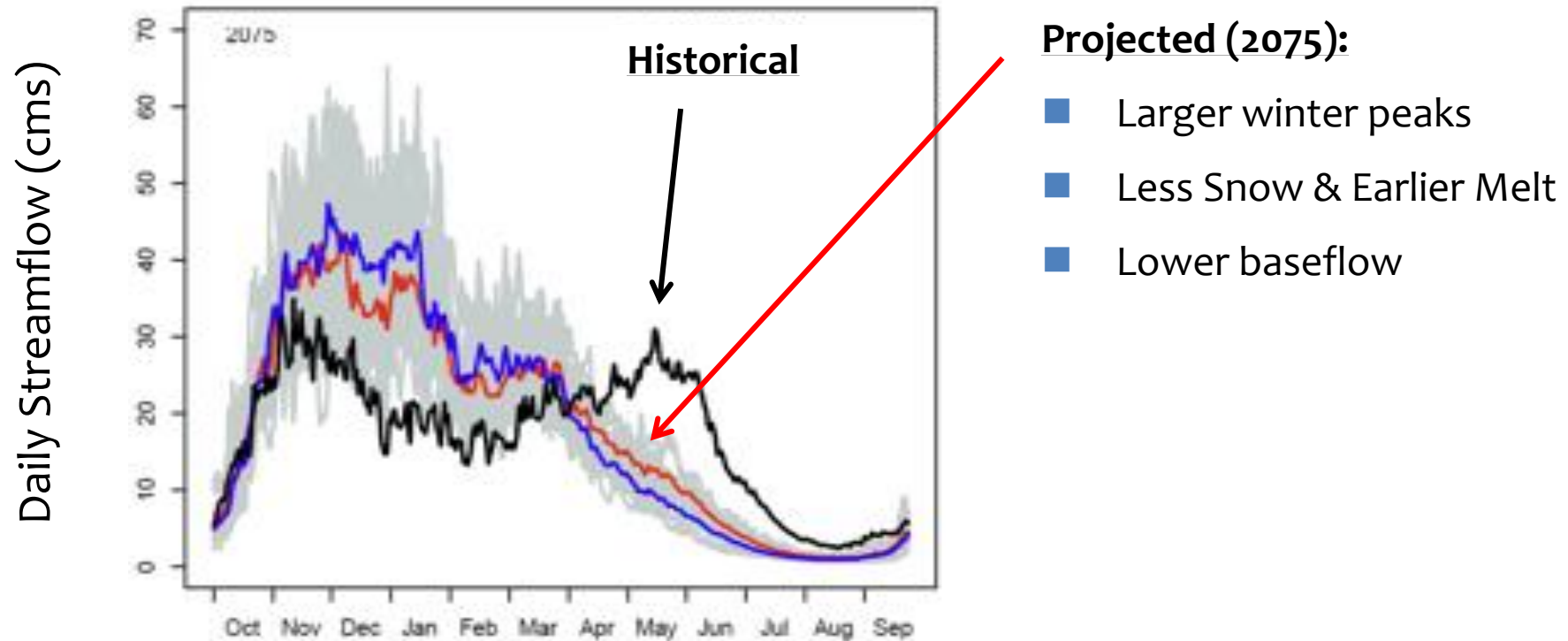


**Restore and enhance
watershed hydrologic function**



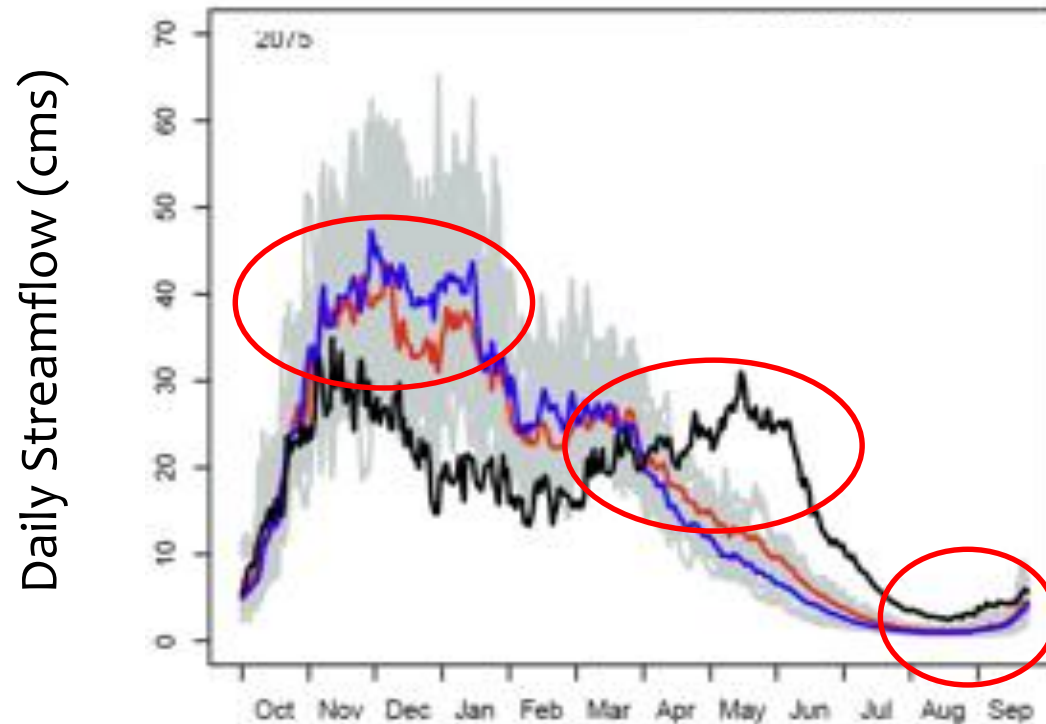
Climate Change Impacts Streamflow

South Fork Nooksack River
Historic and 2075s



Climate Change Impacts on Streamflow

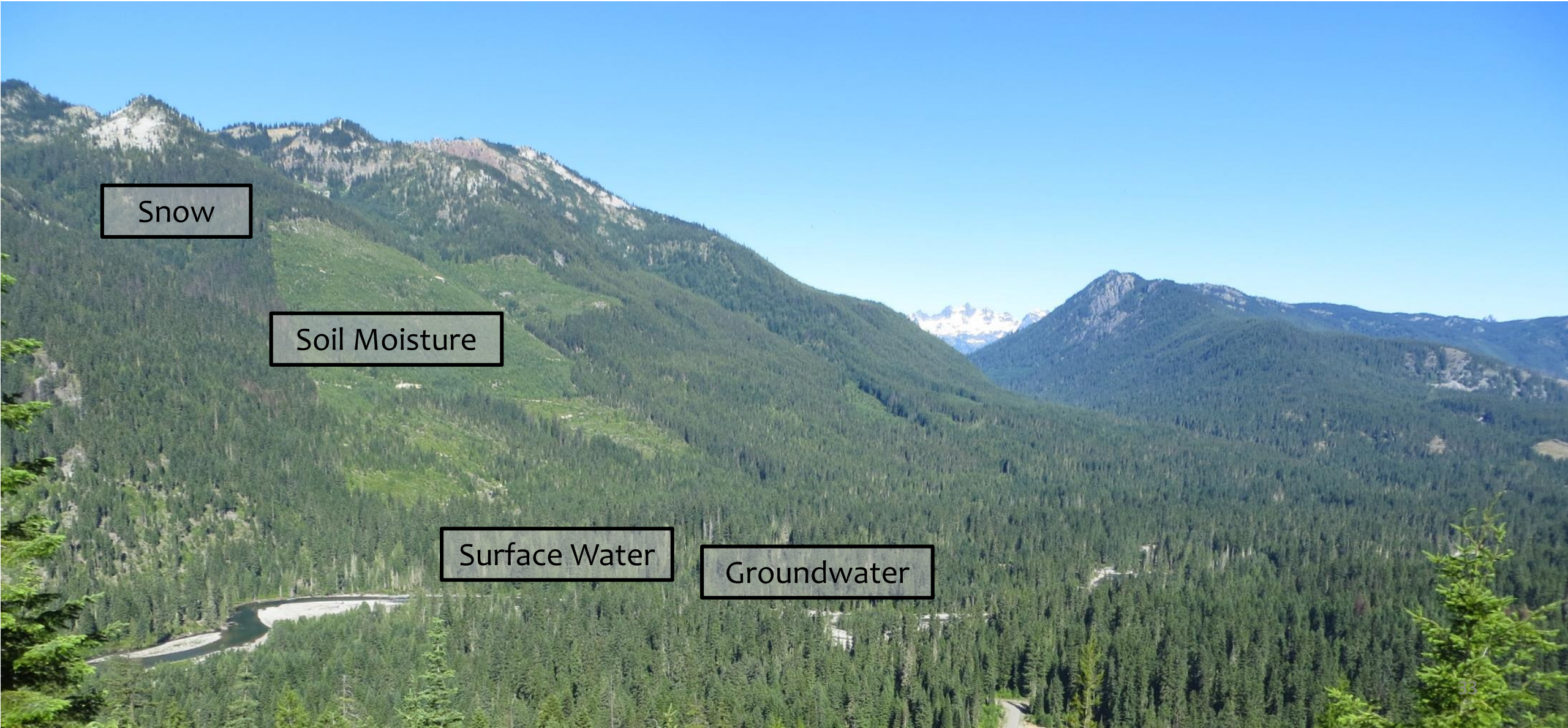
South Fork Nooksack River
Historic and 2075s



Shift in water storage functions affects water temperature:

- Reduced baseflows
- Timing of cold water inputs
- Channel widening

Watershed-Scale



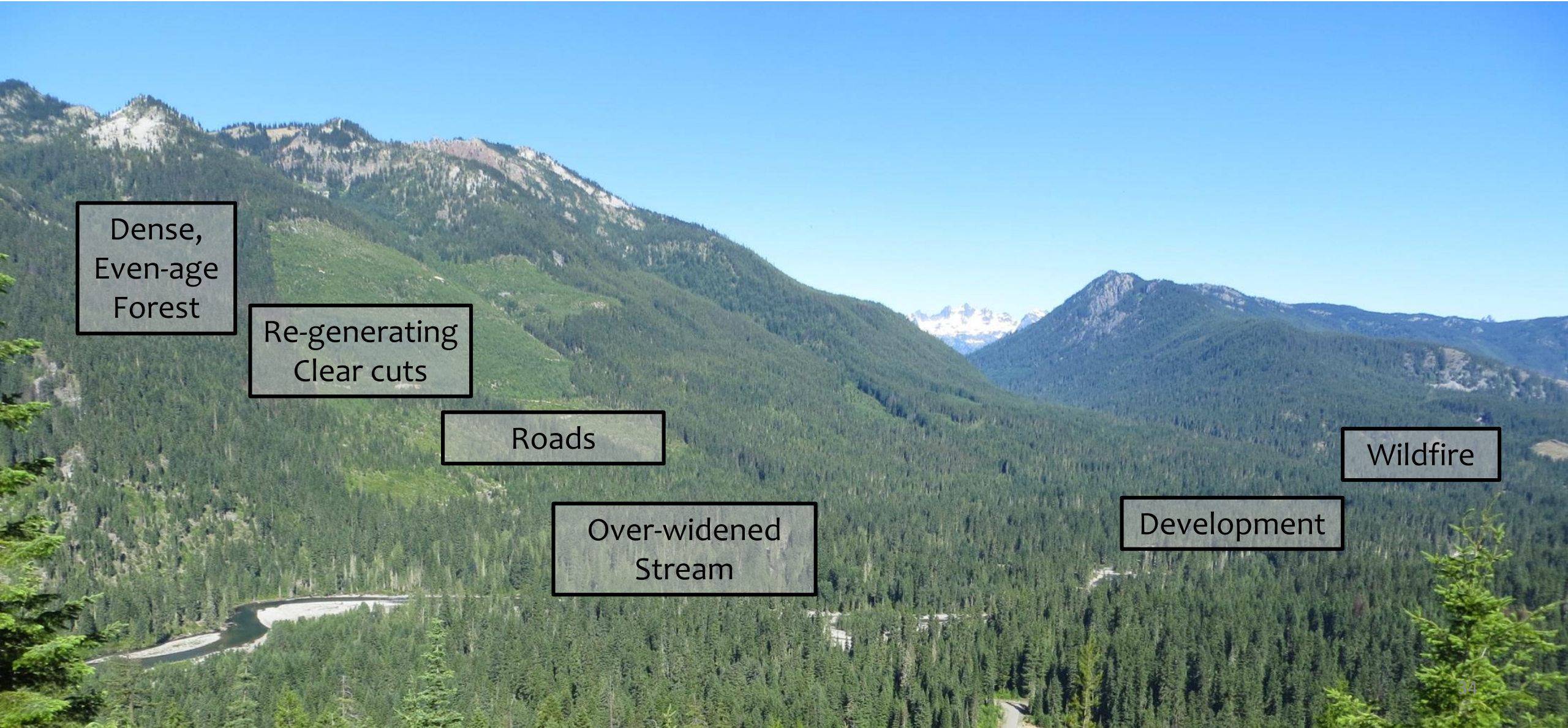
Snow

Soil Moisture

Surface Water

Groundwater

Legacy Impacts on Water Storage Functions



Dense,
Even-age
Forest

Re-generating
Clear cuts

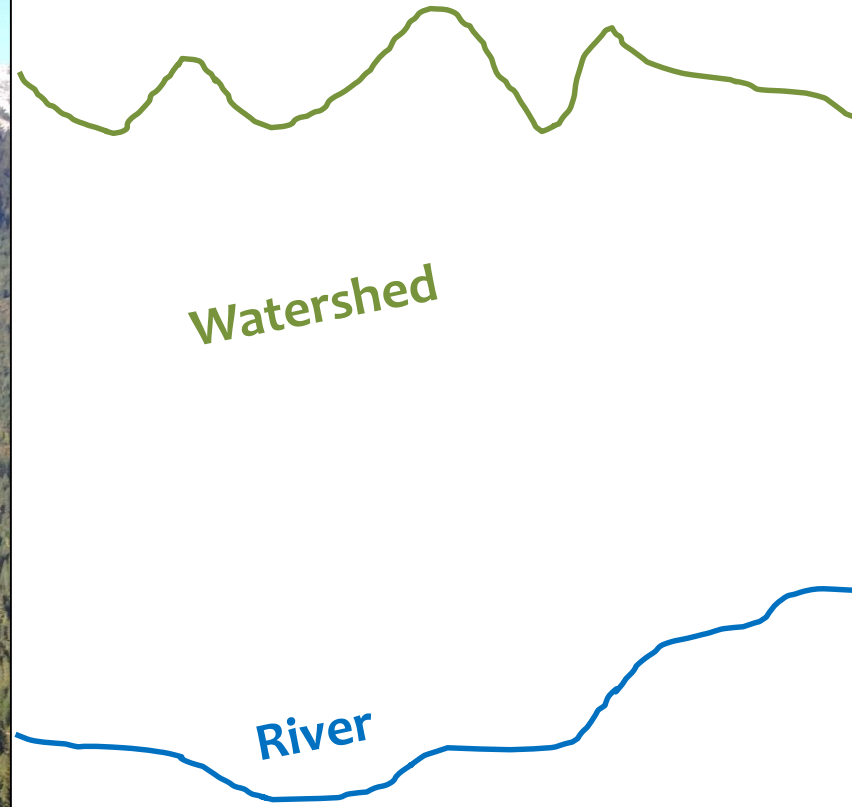
Roads

Over-widened
Stream

Development

Wildfire

Restoration Strategies in SF Nooksack



Snow Storage Varies with Forest Cover

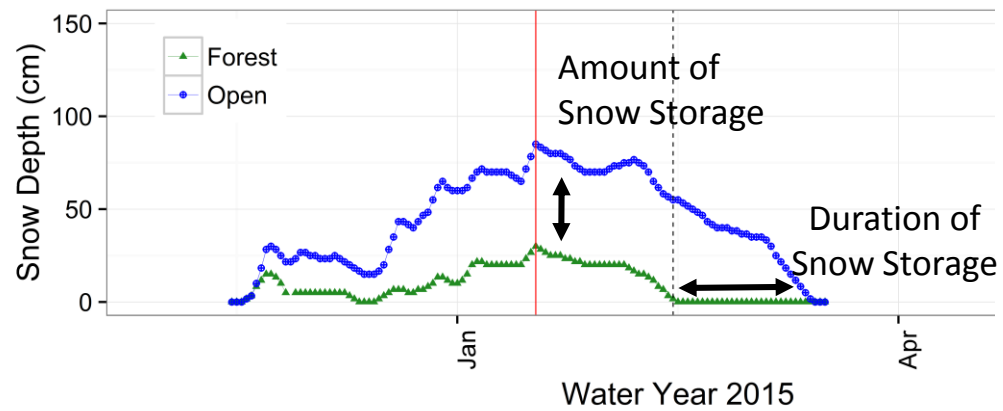
Snow: Longer in Gaps



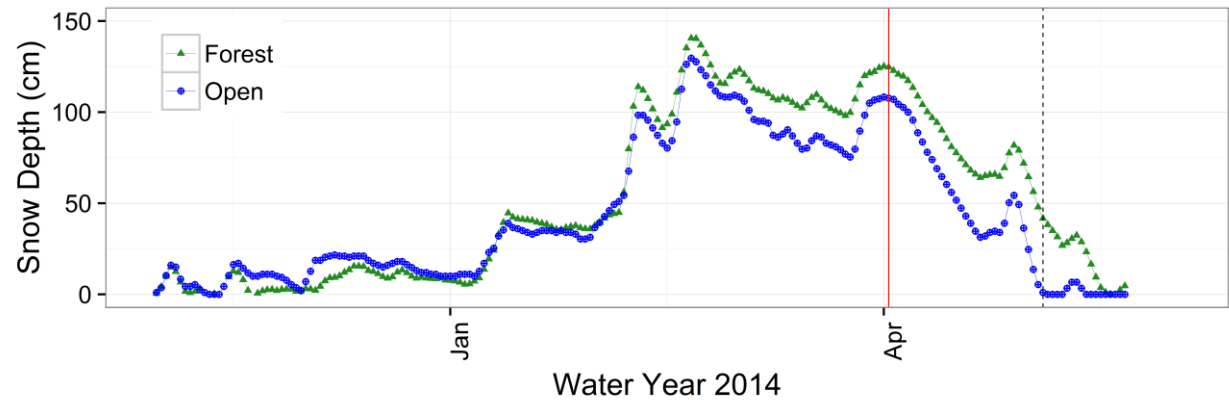
Snow: Longer in Forest



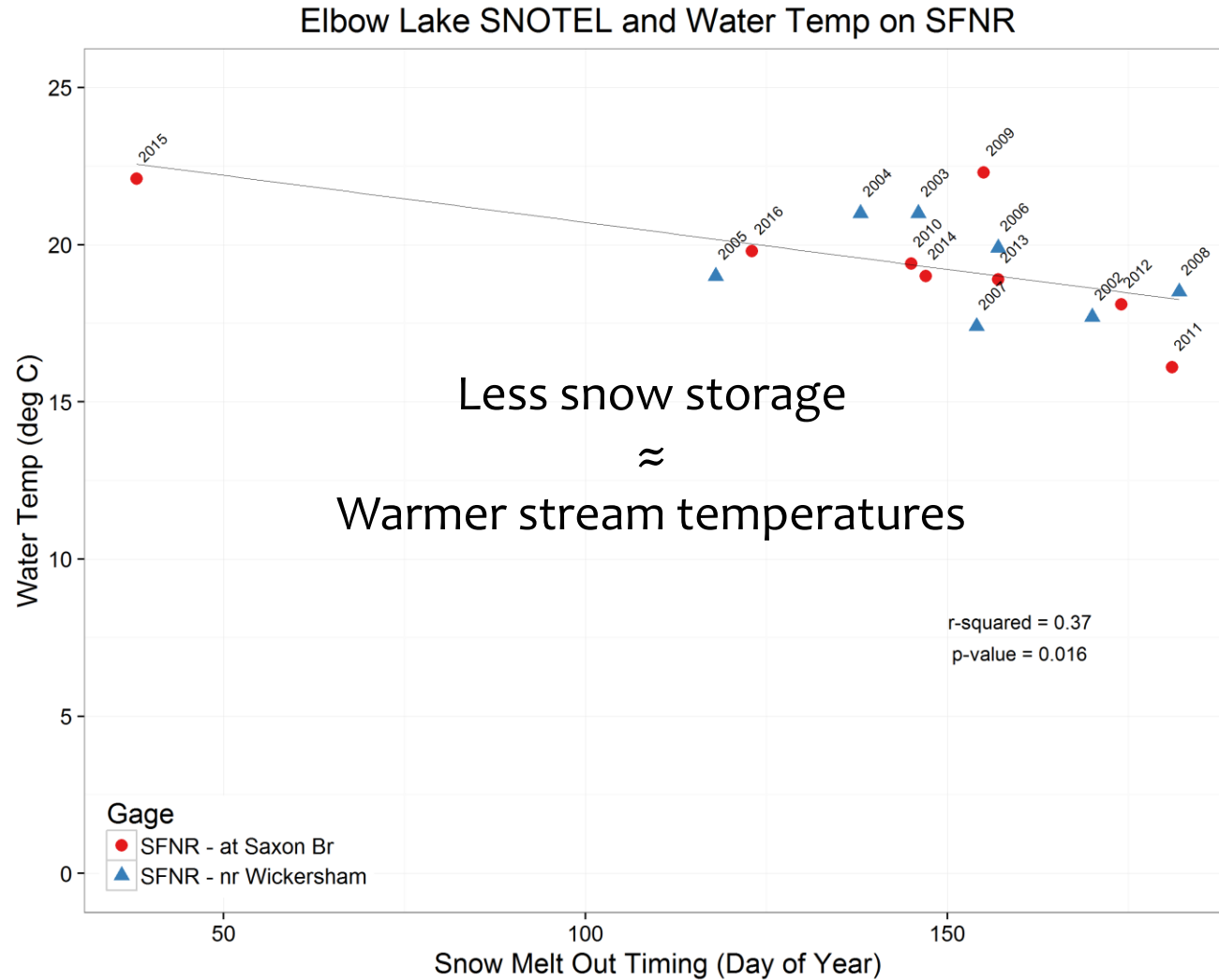
Snoqualmie Pass, WA



Hogg Pass, OR

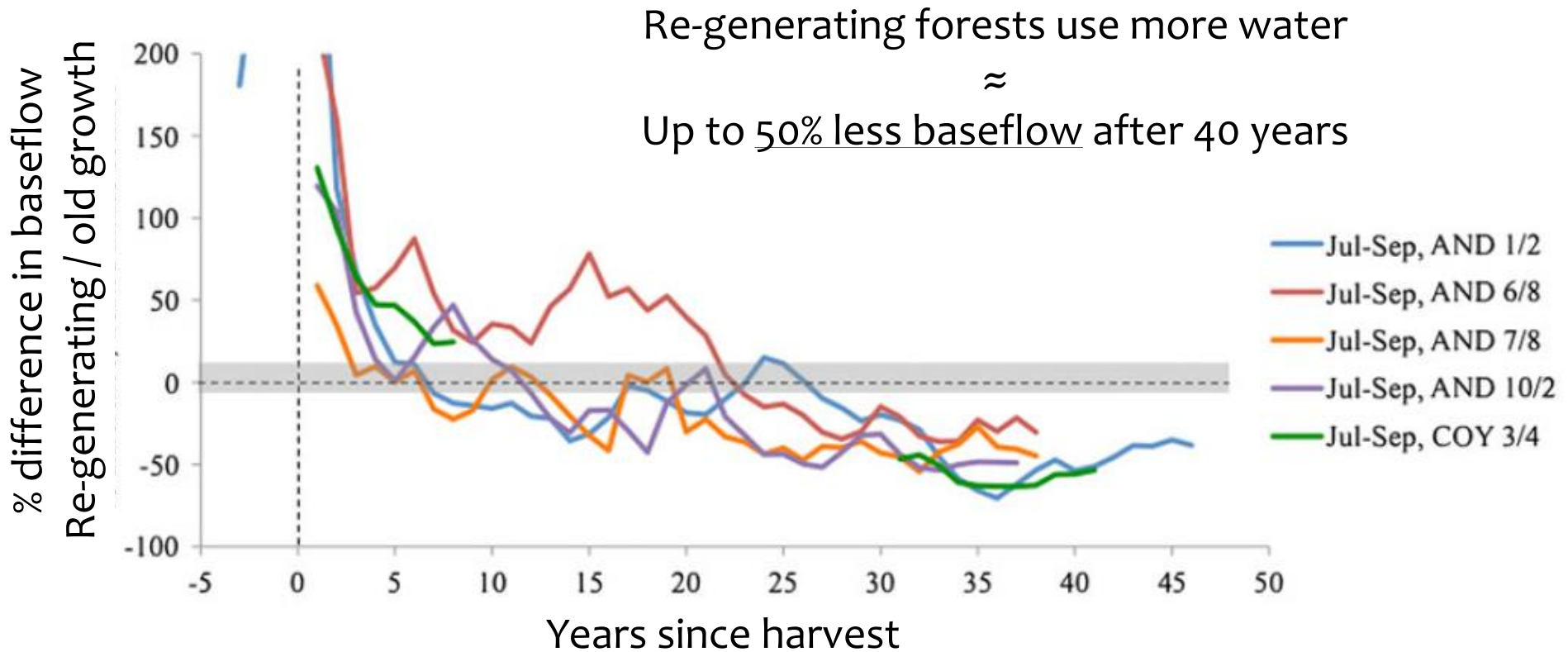


Snow Storage Duration and Stream Temperature



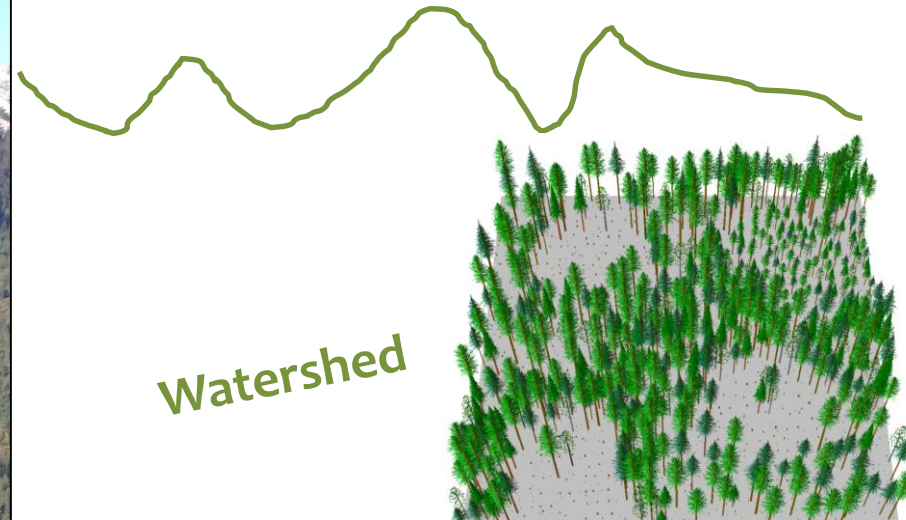
Snow data from Elbow Lake SNOTEL and Water temperature from USGS gages on the SFNR

Soil Moisture & Forest Stand Age



Perry and Jones (2016): Doug Fir Stands in HJ Andrews Exp. Forest, OR

Restoration Strategies in SF Nooksack



THANK YOU!



THANKS!

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