

Integrating Salmon Recovery, Clean Water Act Compliance, Restoration, and Climate Change Impacts in the South Fork Nooksack River

**Presentation to: Salish Sea Ecosystem Conference
2016**

Vancouver BC – April 15, 2016

Oliver J. Grah

Nooksack Indian Tribe

Steven L. Klein

EPA Office of Research and Development



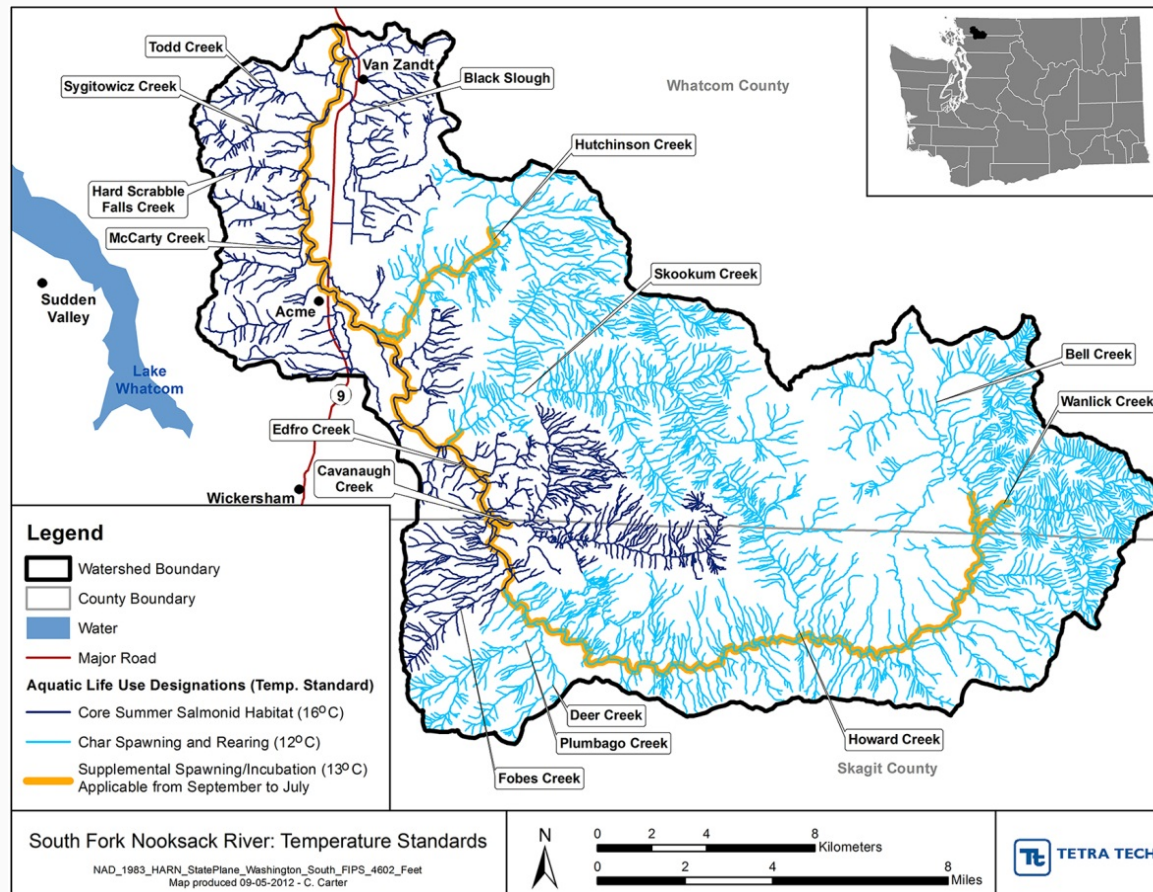
Converging and Integrating Project Pathways

- Nooksack Indian Tribe provided comment on SFNR temperature TMDL:
 - Climate change
 - Upland watershed processes
 - Realistic natural conditions
 - Impacts on fish the designated use
 - Not just the CWA numeric standards
- EPA-ORD initiated a climate change pilot research project
 - 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



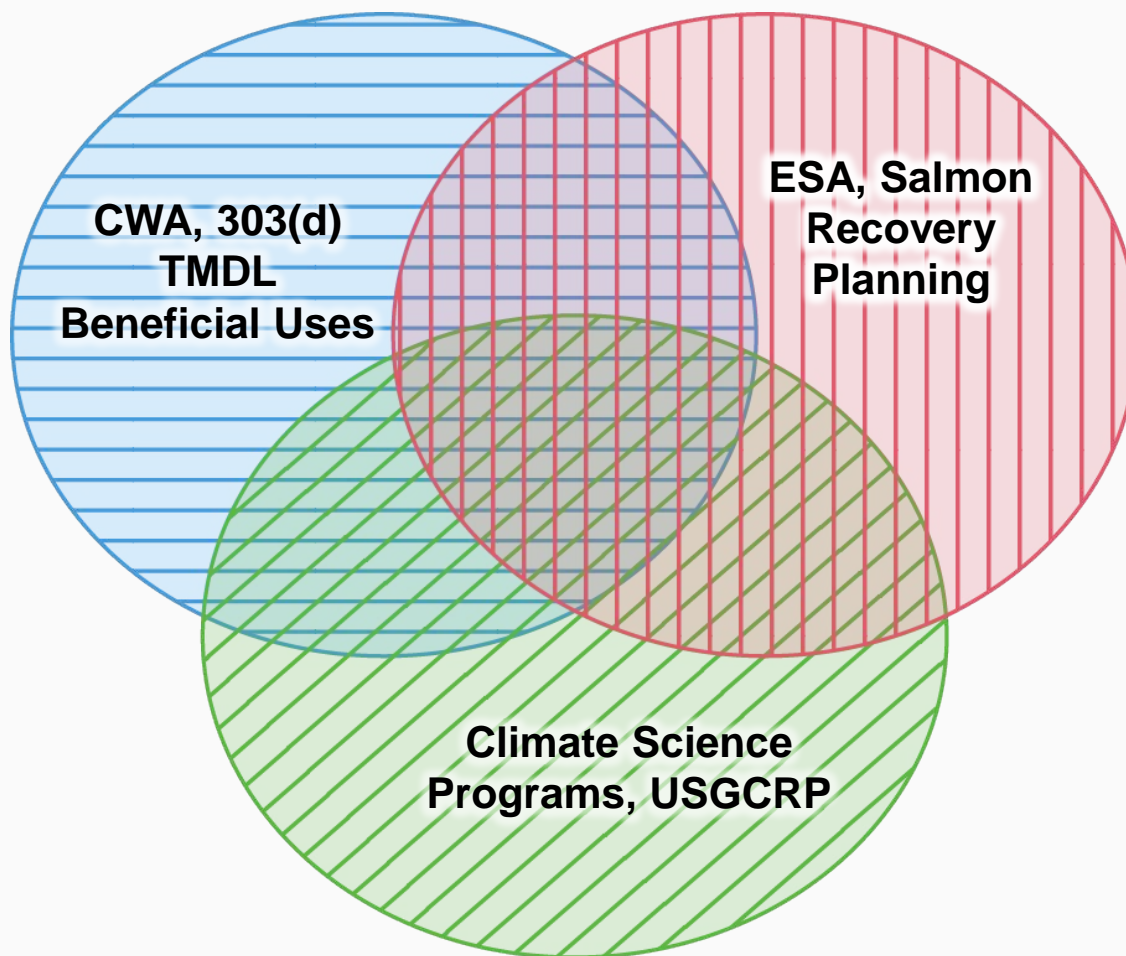
SFNR Climate Change Pilot Research Demonstration Project

South Fork Nooksack River, WA: Aquatic Life Use Designations - Temperature Standards



Source: Quantitative Assessment of Temperature Sensitivity of the South Fork Nooksack River under Future Climates using QUAL2Kw, Figure 2-1 In Press EPA/ORD Report 2016 - Tetra Tech (Butcher et al.)

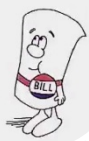
Science/Policy Integration



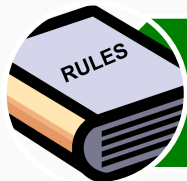
Guiding Principles

- This project is structured as a stakeholder-centric process. That means EPA is here to support and facilitate stakeholder (Federal, Tribal, State, Local & NGO) actions to plan and implement Climate Change Adaptation.
- The EPA Region 10 Climate Change TMDL Pilot is all about demonstrating how cutting-edge science can be applied in a real-world problem-solving context (actionable science) with the participation (co-production) of scientists, environmental practitioners and stakeholders.

Legal Framework for U.S. Federal Environmental Regulation



Laws: Laws written by Congress provide the authority for Federal Agencies to write regulations (Clean Water Act, Endangered Species Act).



Regulations: Regulations explain the technical, operational and legal details necessary to implement laws.



Policy & Guidance: Federal Agencies issues policy and guidance documents to assist the public and regulated entities.



Compliance & Enforcement: Federal Agencies helps regulated entities meet federal requirements, and holds entities legally accountable for environmental violations.

Incorporating Climate Change in Regulatory Frameworks and Conservation Planning: A Work in Progress

- Key Challenges:
 - Most regulatory frameworks and conservation planning approaches were developed under the assumptions (explicit or implied) of stationarity, so non-stationarity (climate change) is new.
 - Risk and uncertainty are unavoidable attributes of climate change.
 - Scenario-based risk assessments where a range of outcomes are considered are uncommon.
 - The representation of time as an explicit variable of scenarios is uncommon.
 - Application of climate change adaptation into decision making requires judgement and discretion by decision makers.

Climate Change Risk Assessment

Consists of a Quantitative and Qualitative Assessment

Quantitative Assessment:

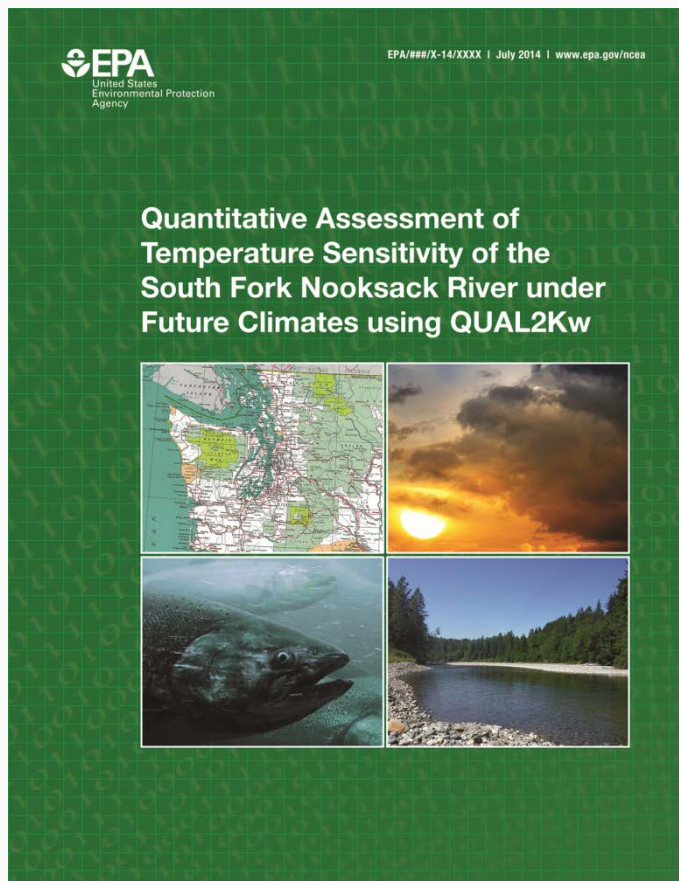
- Comparison of QUAL2Kw modeled stream temperatures, including riparian shading, with and without climate change for the 2020s, 2040s and 2080s.
- Responsive to the CWA TMDL Numeric Cold-Water Temperature WQS.

Qualitative Assessment (Led by the Nooksack Indian Tribe):

- Comprehensive analysis of freshwater habitat for ESA salmon restoration in the SFNR under climate change.
- Will result in a prioritized list of climate change adaption strategies that supports salmon restoration in the SFNR under climate change.

Together, the Assessments represent robust and comprehensive actions to protect the CWA beneficial uses (salmon habitat) and ESA recovery goals under climate change.

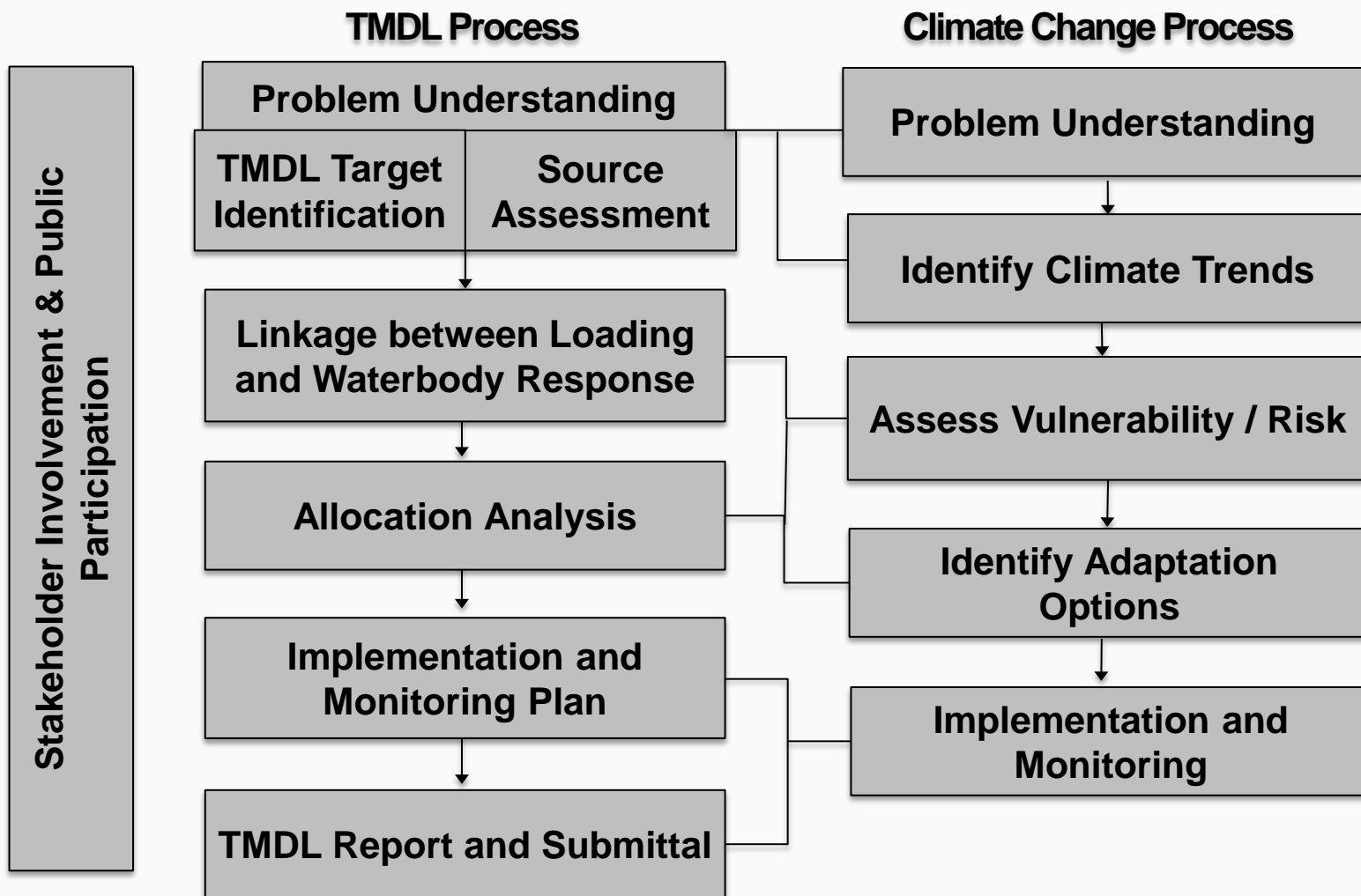
Quantitative Assessment of Temperature Sensitivity of the SFNR under Future Climates using QUAL2Kw



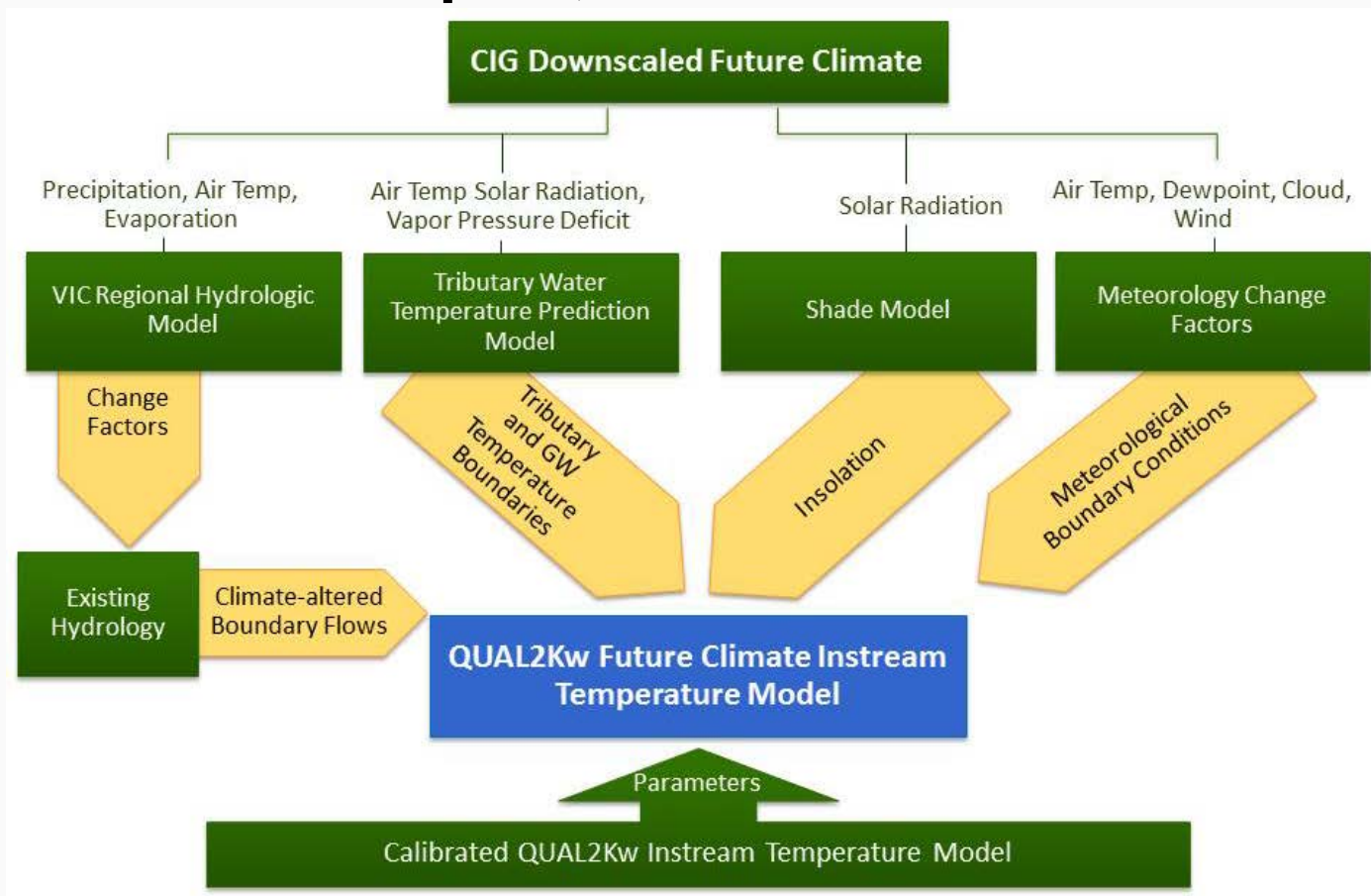
Key Messages (In Press):

- Comparison of QUAL2Kw modeled stream temperatures, including riparian shading, with and without climate change for the 2020s, 2040s, and 2080s.
- Responsive to the CWA TMDL Numeric Cold-Water Temperature WQS.
- A Technical Transfer Webinar is planned for Spring 2016 to present the methods and findings to an audience of EPA Regional, Office of Water, State DEQs, Tribal Environmental Organizations and TMDL Practitioners.

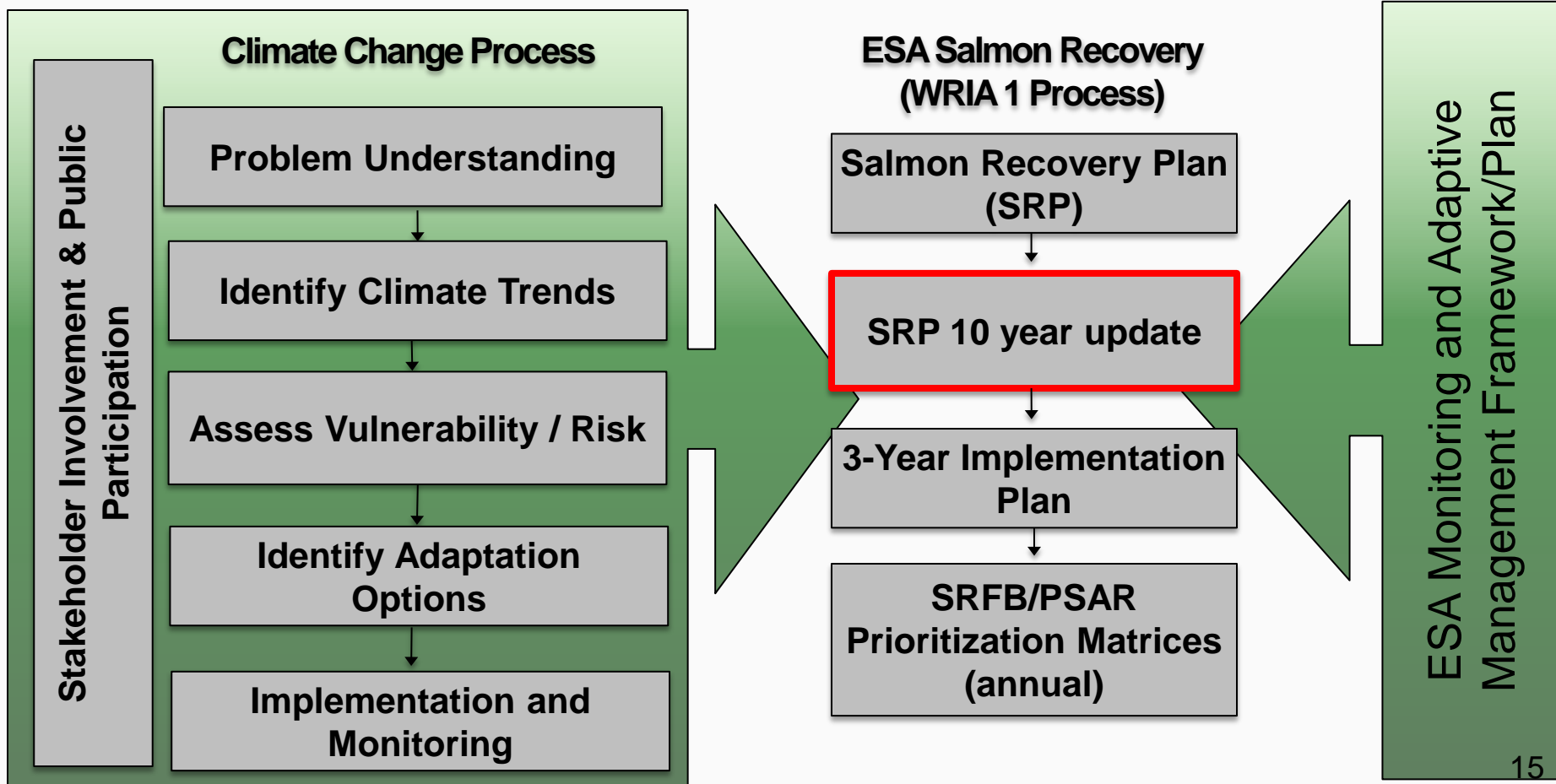
TMDL and Climate Change Process Linkages



Quantitative Assessment: Modeling Integration, Inputs, Outputs, and Uncertainties



ESA Salmon Recovery and Climate Change Process Linkages



Tribal Climate Change Adaptation Context: Self Determination, Sovereignty & Treaty Rights

People



Place



Cultural/Natural Resources





Nooksack Indian Tribe Climate Change Project

- The Nooksack Indian Tribe has developed and initiated a comprehensive climate change project aimed at addressing Pacific salmon impacts and development of effective restoration tools.
- The Tribe's project doesn't just address climate change, but:

**ESA
RECOVERY**

**CWA
COMPLIANCE**

**LEGACY
IMPACTS**

**TREATY
RESOURCES**

**CLIMATE
CHANGE**

**ESA
RECOVERY**

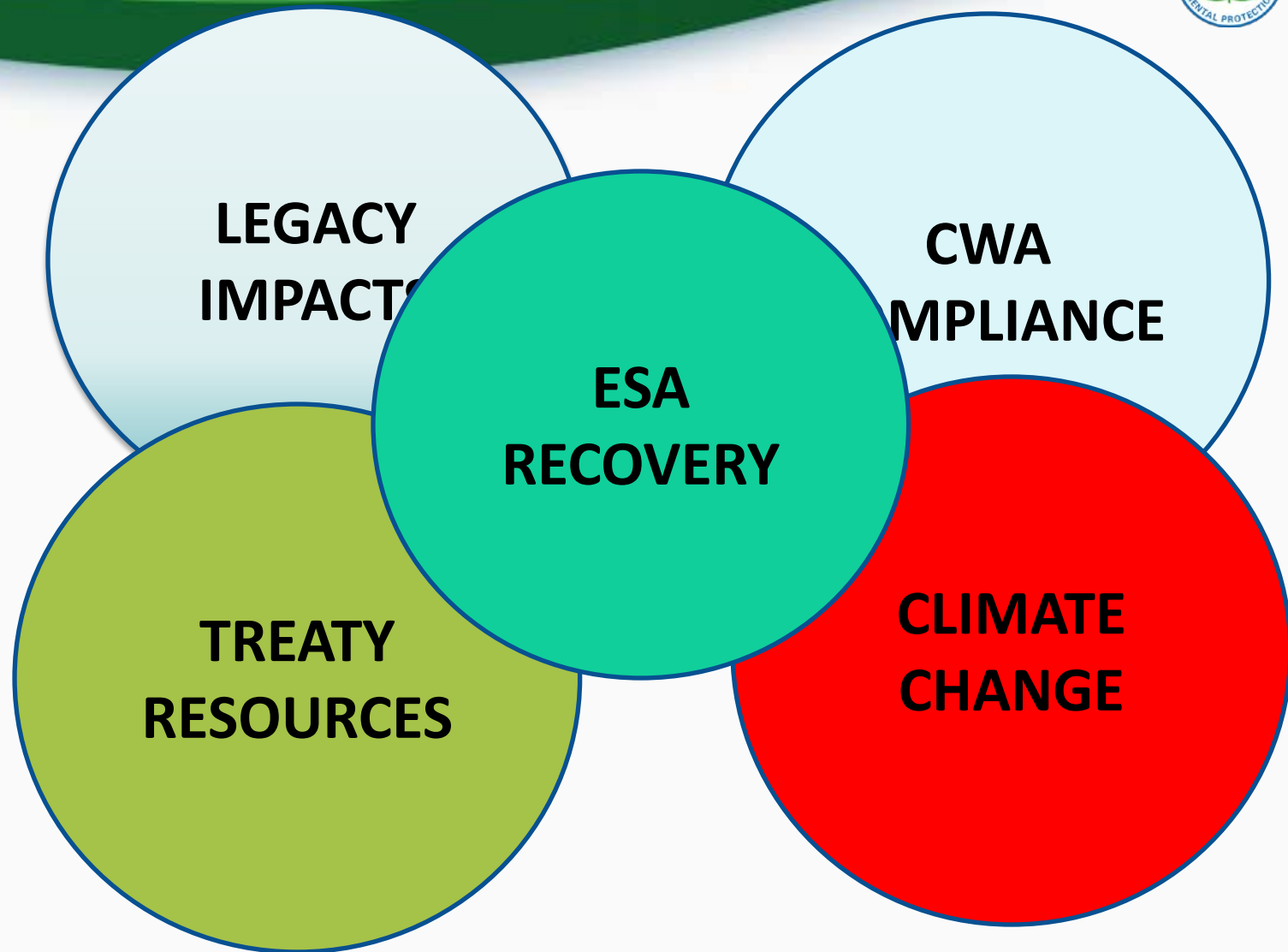
**CWA
COMPLIANCE**

**LEGACY
IMPACTS**

**TREATY
RESOURCES**

**CLIMATE
CHANGE**

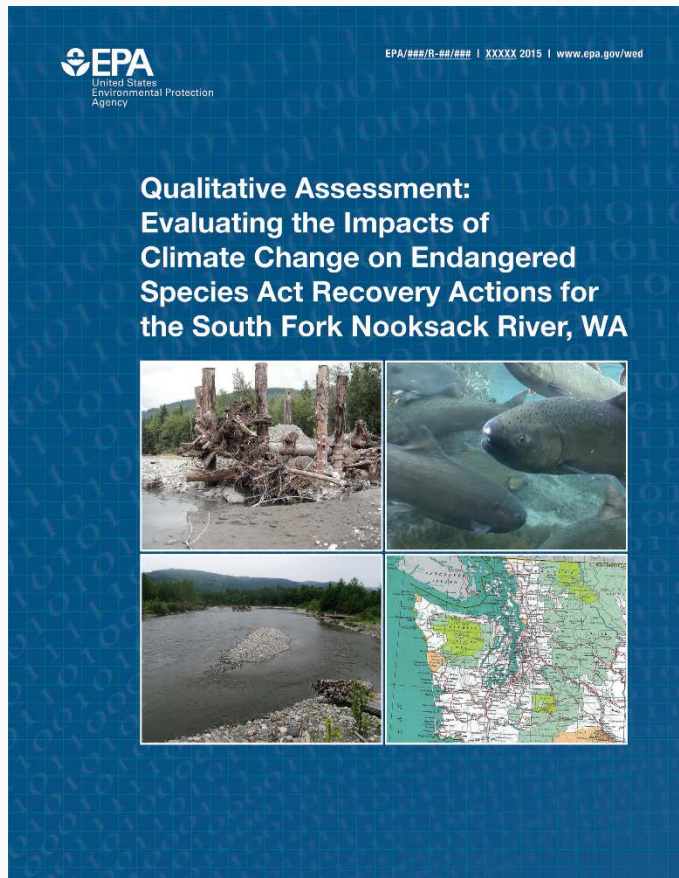




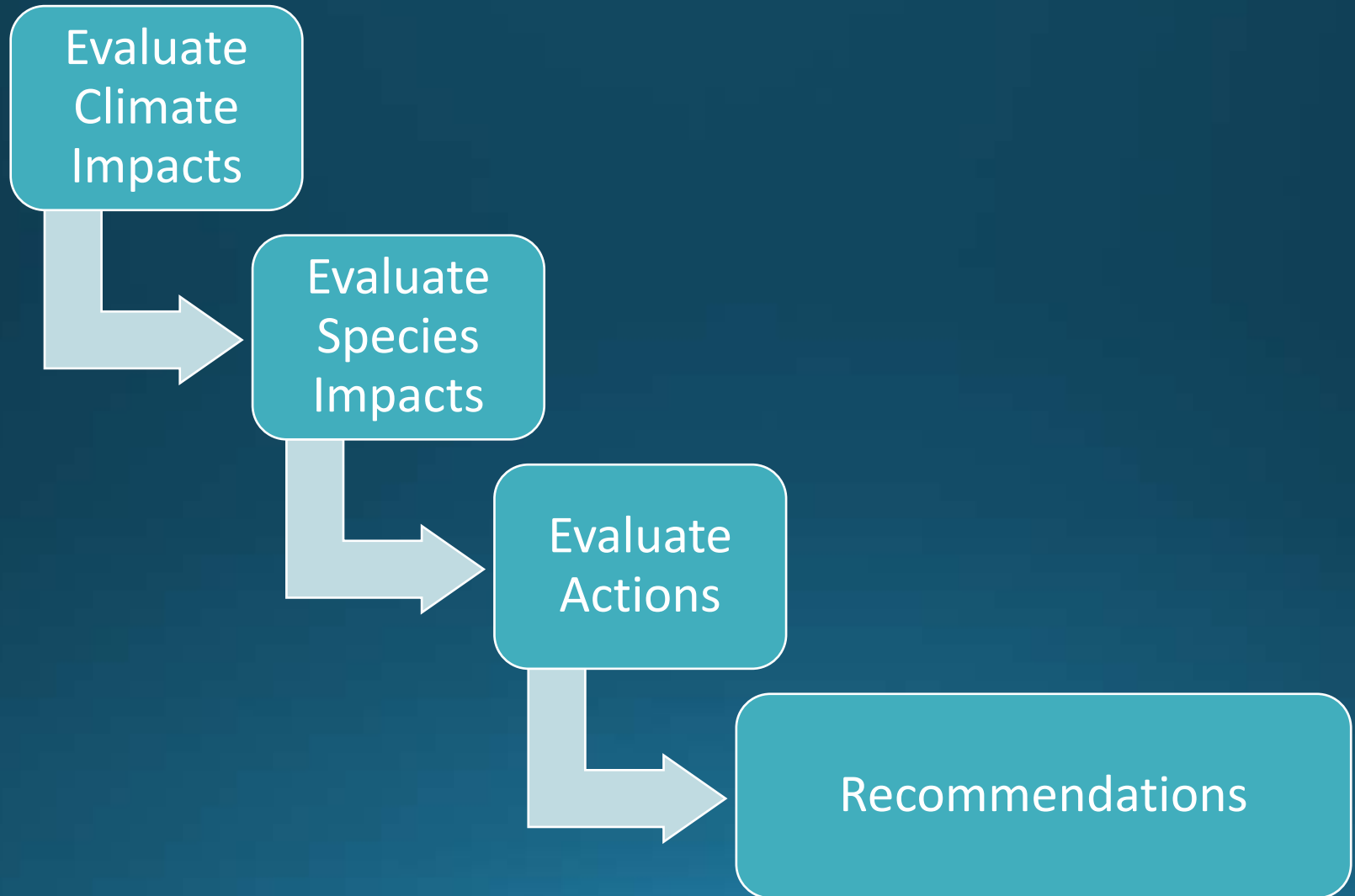
Qualitative Assessment: Evaluating the Impacts of Climate Change on Endangered Species Act Recovery Actions for the South Fork Nooksack River, WA

Key Messages (In Review):

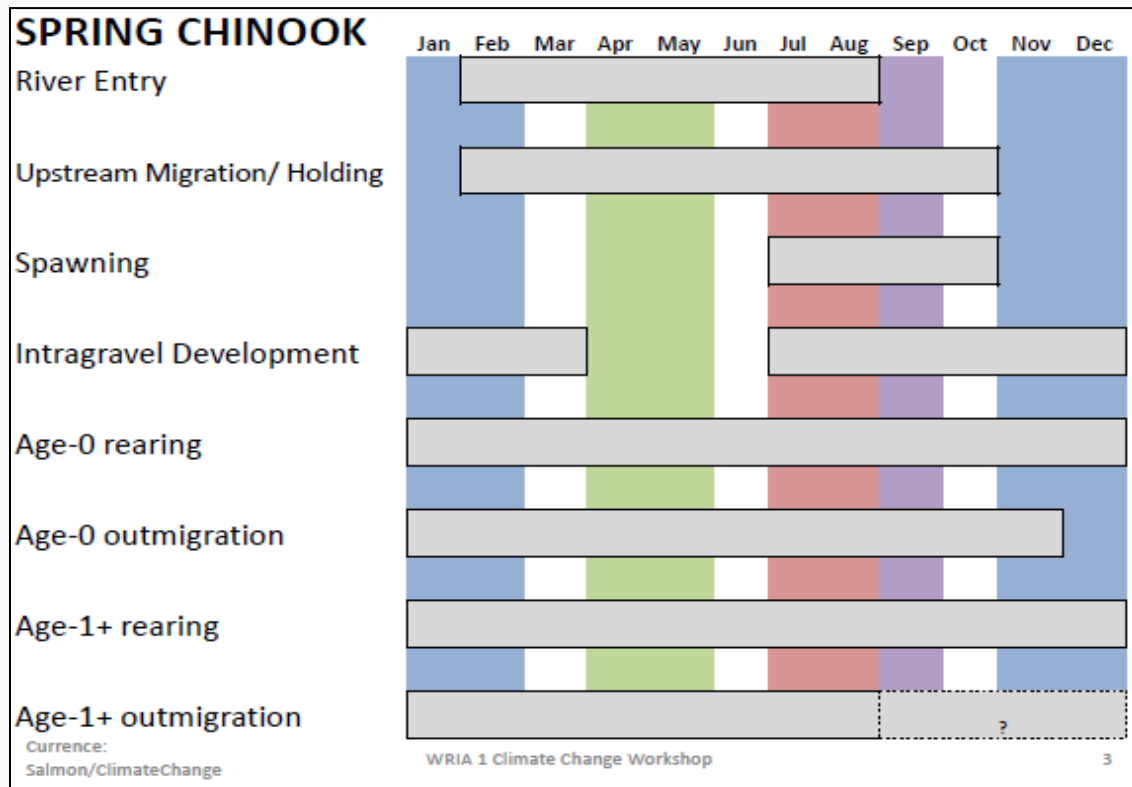
- Identify and prioritize ESA climate change adaptation strategies or recovery actions for the SFNR that explicitly include climate change as a risk.
- Methodology based on Scientific Literature - *Restoring Salmon Habitat for a Changing Climate* (Beechie et al. 2012).
- Utilized Interdisciplinary Teams (Federal, Tribal, State, Local, WRIA 1) to develop research pilot demonstration and complete the assessment.



QUALITATIVE ASSESSMENT



Qualitative Assessment: Timing of Climate Change Effects of Stream Flow and Temperature on Spring Chinook by Life History Periodicities



- – Increased Winter Peak Flows
- – Loss of Spring Snowmelt Reducing Discharge
- – Increased Summer Temperatures
- – Decreased Summer Low Flows and Increased Temperatures
- – Respective Life Stage Periodicities

Qualitative Assessment: Summary of Major Categories of Restoration Action Types

Ability To Ameliorate Climate Change Effects

Expected climate change effect	Longitudinal connectivity	Floodplain connectivity	Restore incised channel	Restore stream flow	Restore riparian functions	Reduce sediment supply	Construct instream habitat
Increased temperature	Y	Y	Y	Y	Y	N	N
Decreased low flow	Y	N	Y	Y	Y/N	N	N
Increased peak flow	N	Y	Y	N	N	N	N
Reduced diversity	Y	Y	Y	Y/N	N	N	N



Positive Effect



No Effect



Context-dependent Effect

Source: Workshop Summary, Final Draft Report, May 14, 2013, Restoring Salmon Habitat for a Changing Climate In the SFNR, Washington. Adapted from Beechie et al 2012.



Next Steps for “Climate-Ready” ESA Salmonid Recovery in the Puget Sound

Develop a SFNR Watershed Conservation Plan

- Public Outreach and Stakeholder Engagement in the Development of the Plan
- Act on Recommendations of the Qualitative Assessment

Inform the Update of the ESA WRIA 1 Salmonid Recovery Plan

- PSP Salmon Recovery Council
- NOAA Fisheries
- WRIA 1 Salmon Recovery Team

Scale and Refine the Qualitative Assessment Methodology to other Watersheds

- Middle Fork, North Fork and Lower Mainstem of the Nooksack River Basin
- Stillaguamish River Watershed

Scale and Replicate the Qualitative Assessment Methodology for ESU-Wide Implementation

- Connect and Coordinate with Other Puget Sound Entities: Puget Sound Partnership (PSP), PSP Salmon Recovery Council, Lead Entities (WRIAs), EPA National Estuaries Program (NEP), NOAA Fisheries

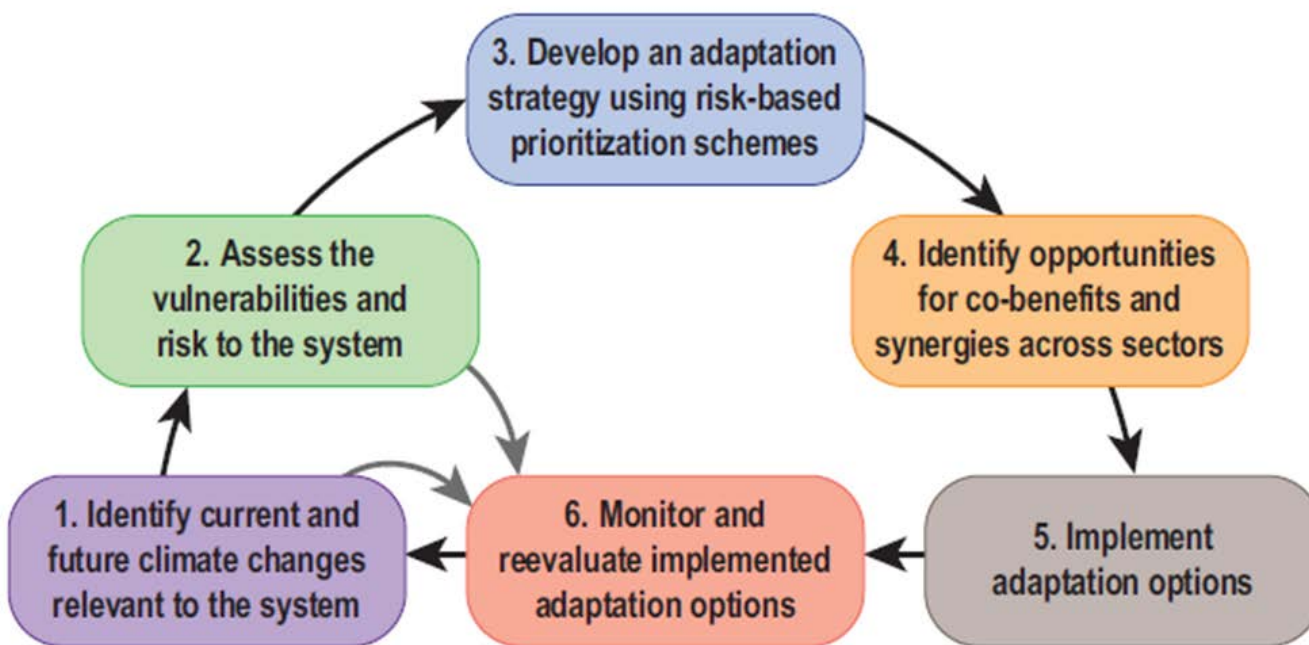
Planning Team

WRIA 1 Update



Climate Change Adaptation

Iterative Risk Assessment



Adaptive Management Framework



Source: *Incorporating (Iterative) Risk Management into the National Climate Assessment*; Gary Yohe Vice-Chair of the NCADAC, July 12, 2011 Regional Working Group Background Document; National Climate Assessment

For more information contact:

Oliver J. Grah, Water Resources
Program Manager
Nooksack Indian Tribe
PO Box 157
Deming, WA 98244
Voice: (360) 592-5176
Email: ograh@nooksack-nsn.gov

Steven L. Klein, Research Forester
U.S. Environmental Protection Agency
200 SW 35th Street
Corvallis, Oregon 97333
Voice: (541) 754-4858
Email: klein.steve@epa.gov

