Chehalis Basin Strategy

Aquatic Species Restoration Plan (ASRP) - Next Steps and Updates

January 21, 2016

Agenda

- Part 1: Update
  - Chehalis Basin Strategy, ASRP Work to date, Restoration expert meeting, Conceptual Model, Salmon and other species
- Part II: Development of ASRP Strategies
  - Process overview, Role of Ecosystem Diagnosis and Treatment (EDT), Newaukum case study
- Part III: Next Steps
  - Process and timelines, New sources of information, Assistance from local experts

Chehalis Basin Strategy

Focused on:

- Reducing flood damage
- Restoring/protecting aquatic species habitat

Reducing Flood Damage

Structural Approaches

- Flood Retention Dam (Temporary reservoir)
- Flood Retention/Flow Augmentation Dam (Permanent reservoir)

Non-Structural Approaches

- Floodplain Retention
- Floodproofing

Protecting/Restoring Species and Habitat

Salmonids, Other Fish,

Protecting/Restoring Species and Habitat

Salmonids, Other Fish, Amphibians, Waterfowl

Research/Modeling

Research

- *Salmon* – telemetry, population structure, spawner abundance, diversity
- *Non-salmon* – presence, distribution
- *Amphibians* – egg mass (intensive, extensive), instream, stream associated, off-channel habitat mapping, invasive species
- *Waterfowl utilization*

Modeling

- *EDT* - salmon
- *PHABSIM* - fish
- *Watershed Assessment* - landscape change, restoration potential/site identification, incorporates fish and non-fish
- *Occupancy* – amphibians, non-salmon
- *Inundation* – historical, current

Milestones

2012-2014

Alternative development; Identified data gaps; Aquatic Species Enhancement Plan; Hydrology; Small projects/Floodproofing; Preliminary EDT runs

Fall/Winter 2015

Conceptual model; Restoration strategies; Compile data

Spring 2016

Finalize Restoration Strategies; Update EDT

Summer/Fall 2016

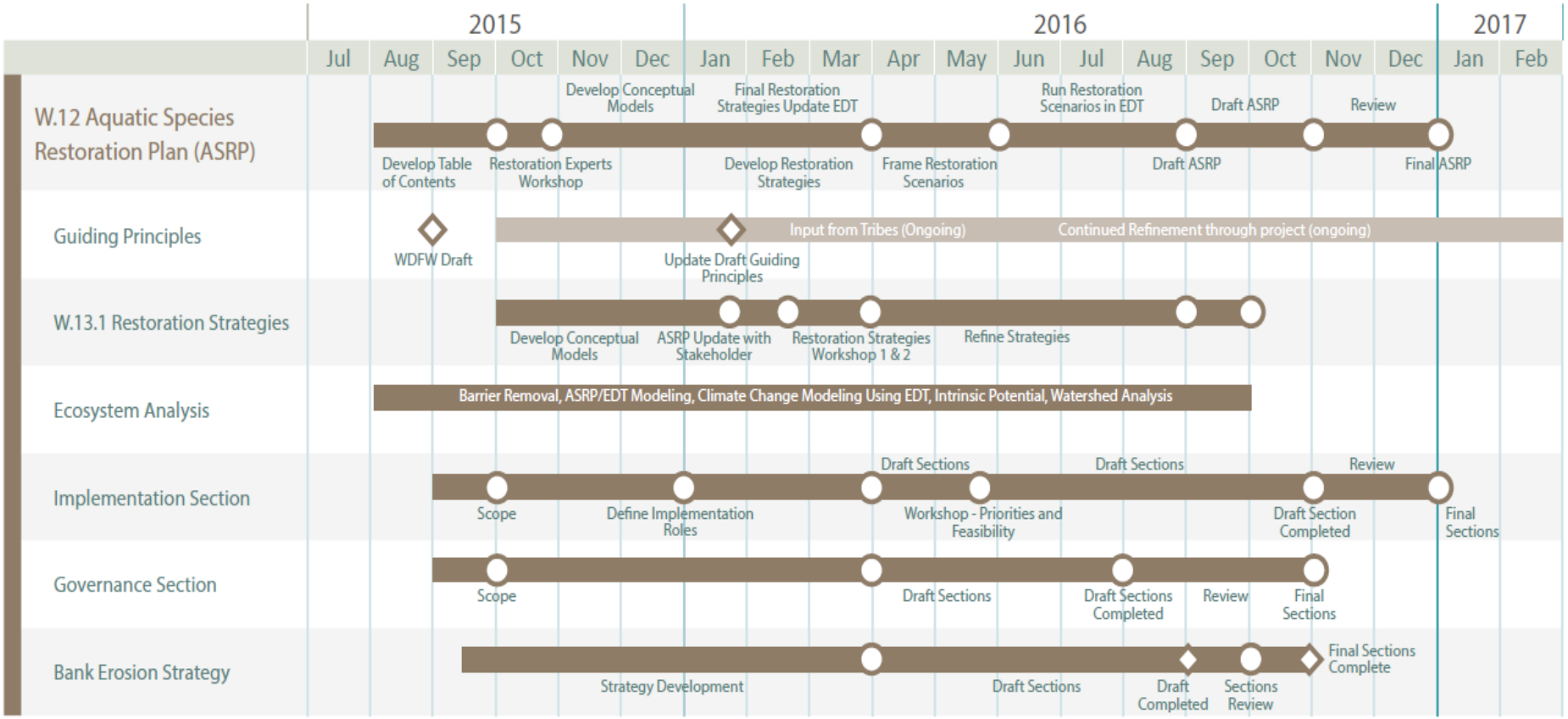
New EDT runs; Identify restoration priorities

Winter 2016

Final ASRP

ASRP Schedule

Draft Aquatic Species Restoration Plan



Science Visioning Workshop

Take Home Messages

- Protect first, restore second - factored by social, economic and political issues
- Start with conceptual model - work towards restoration blueprint
- Protection/restoration blueprint must be dynamic
- Restore impaired watershed processes linked to important places
- Go big or go home - large and long-term effort
- Protect most important areas first but represent all habitat diversity
- Learn by experimentation
- Build resilience into system provide latitude for system recovery

Science Visioning Workshop

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- Start with conceptual model - work towards restoration blueprint
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- Go big or go home - focus on long-term goals
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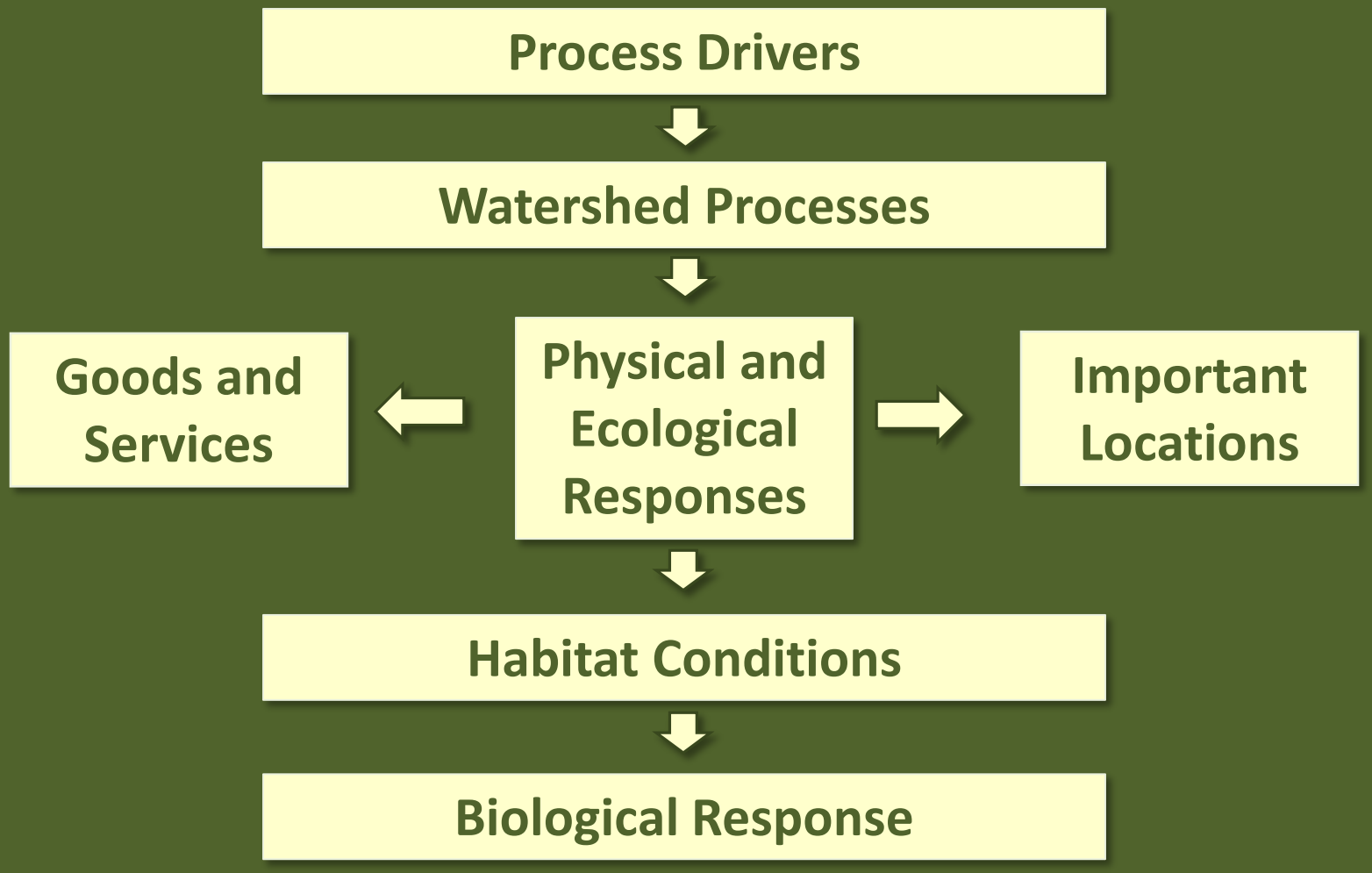
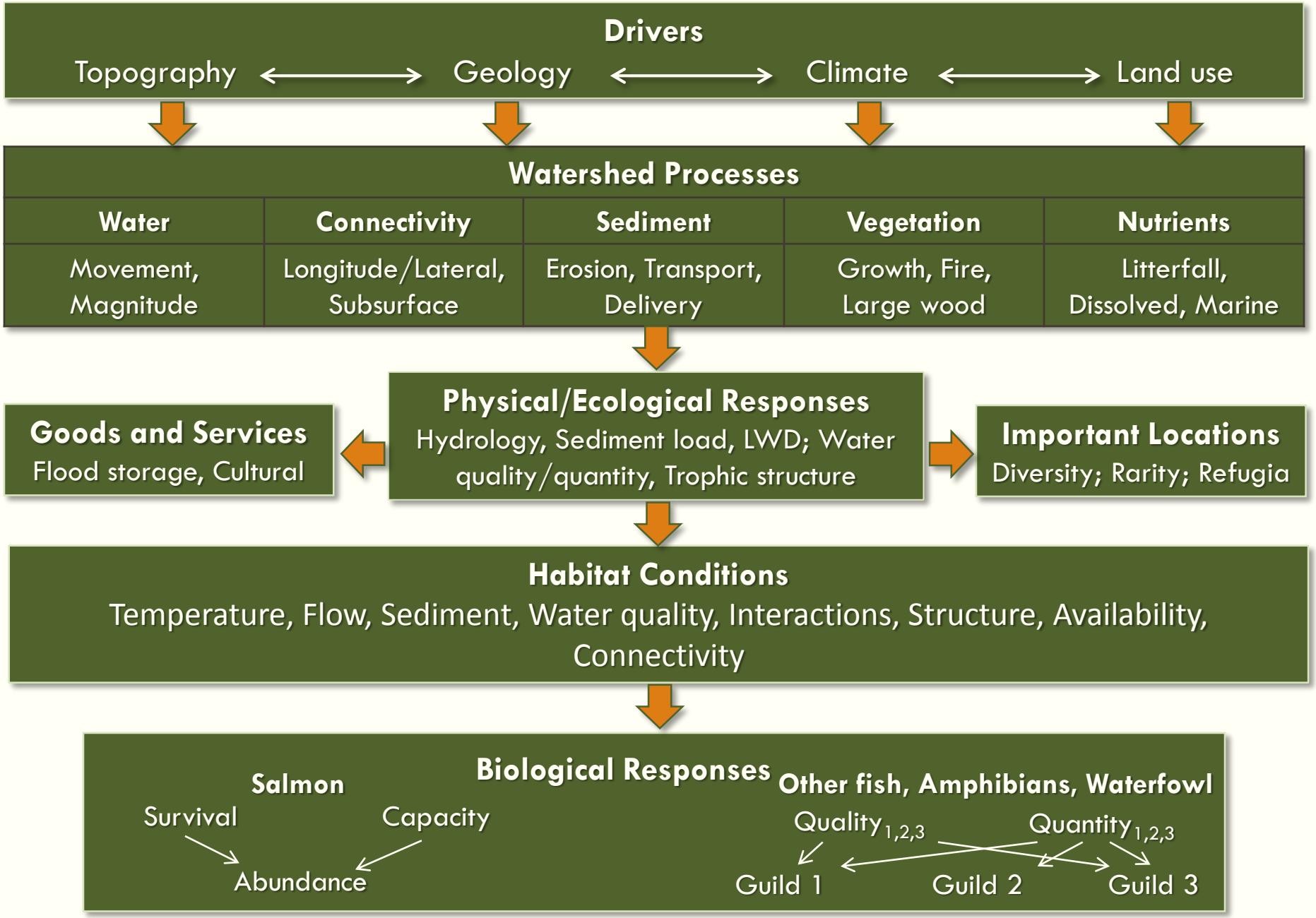
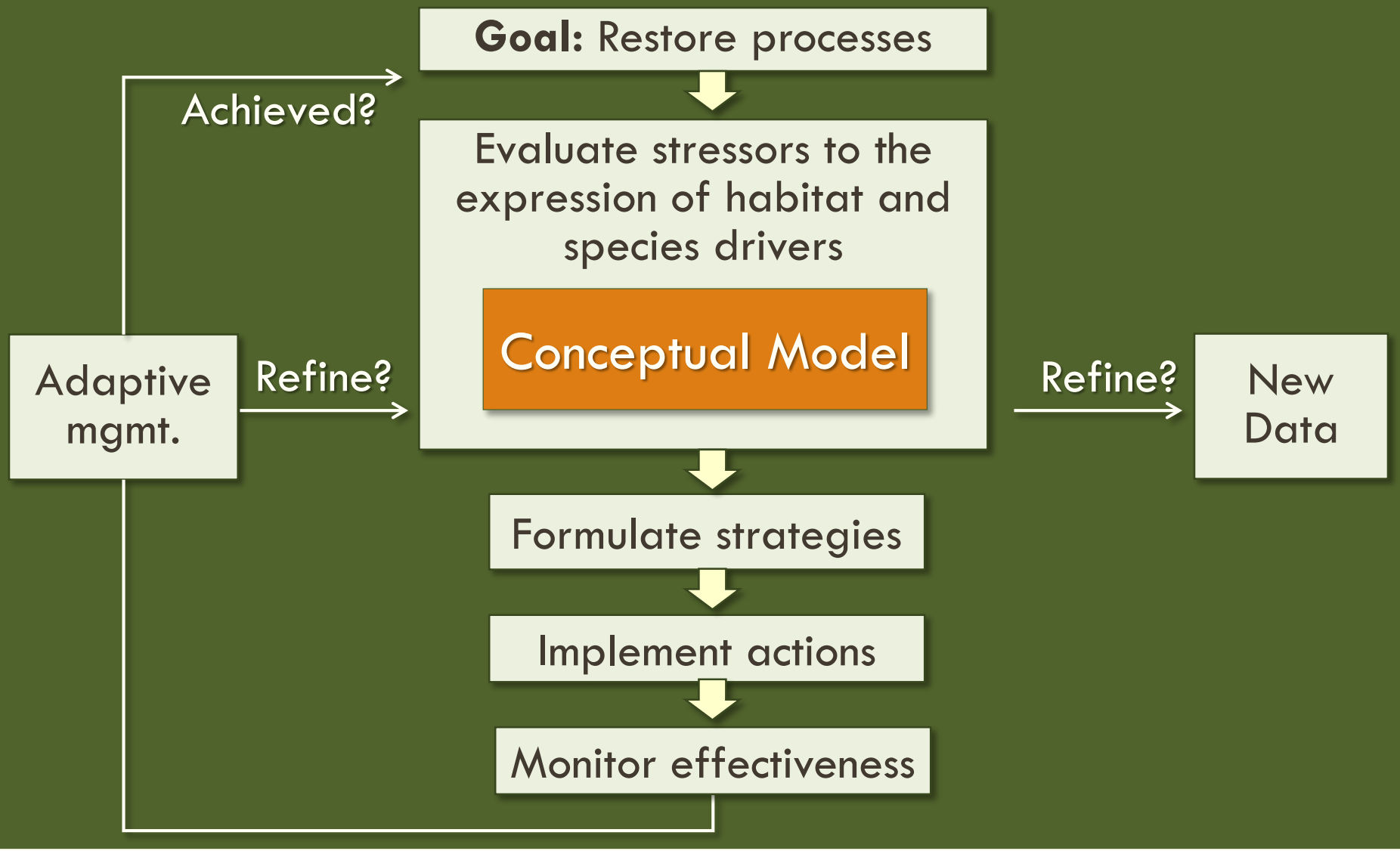
START WITH SIMPLE CONCEPTUAL MODEL TO DEFINE GUIDING HYPOTHESES

Simple Conceptual Model




Drivers
Topography
Geology
Climate
Land use
Watershed Processes
Water
Movement, Magnitude
Connectivity
Longitude/Lateral, Subsurface
Sediment
Erosion, Transport, Delivery
Vegetation
Growth, Fire, Large wood
Nutrients
Litterfall, Dissolved, Marine
Goods and Services
Flood storage, Cultural
Physical/Ecological Responses
Hydrology, Sediment load, LWD; Water quality/quantity, Trophic structure
Important Locations
Diversity; Rarity; Refugia
Habitat Conditions
Temperature, Flow, Sediment, Water quality, Interactions, Structure, Availability, Connectivity
Biological Responses
Salmon
Survival
Capacity
Abundance
Other fish, Amphibians, Waterfowl
Quality1,2,3
Quantity1,2,3
Guild 1
Guild 2
Guild 3

Location in Restoration Plan



Part II

Development of Restoration Strategies

Strategy Definitions

General:

"A careful plan or method for achieving a particular goal usually over a long period of time"

ASRP strategy template:

Restore/protect habitat processes to maintain or improve habitat conditions at important locations in order to achieve desired ecological response

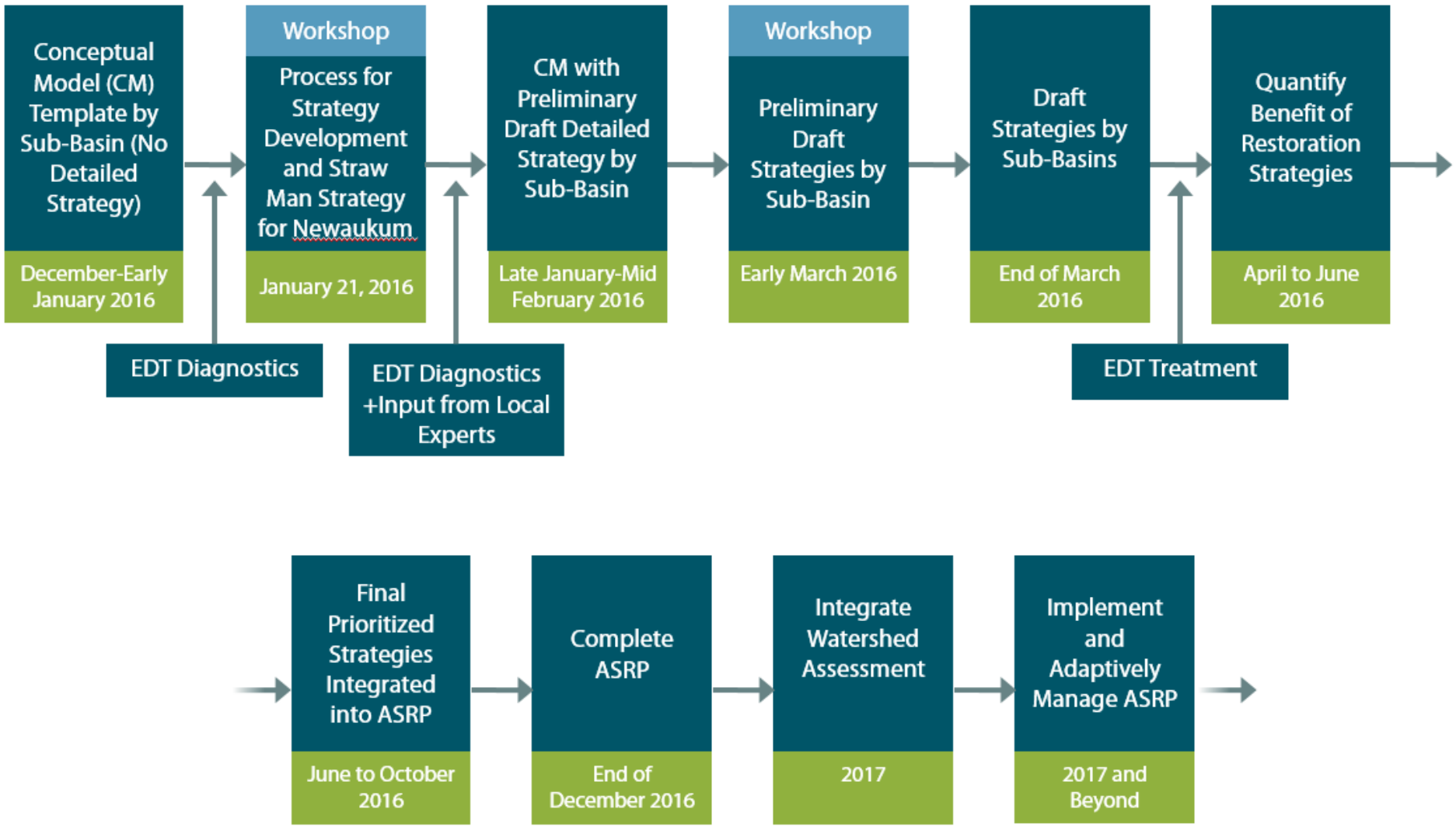
Overview of Strategy Development Process

- Focus on watershed habitat processes
- Strategies reflect current state of knowledge
- As new data are available strategies will evolve

What is different this time?

- Use of conceptual model (CM) to provide roadmap depicting how watershed processes affect habitat conditions and productivity
- The use of CM allows clearer focus on watershed processes for restoration and protection strategies
- New biological and physical data are available
- Spatial scale has increased
- More species are being considered
- Local knowledge will continue to contribute to CM and strategies
- Additional modeling tools will help confirm strategies

Proposed Strategy Development Process



Role of Ecosystem Diagnosis and Treatment (EDT)

- Developing restoration strategies
- Quantify benefits
- Prioritization of strategies

Role of EDT in the ASRP

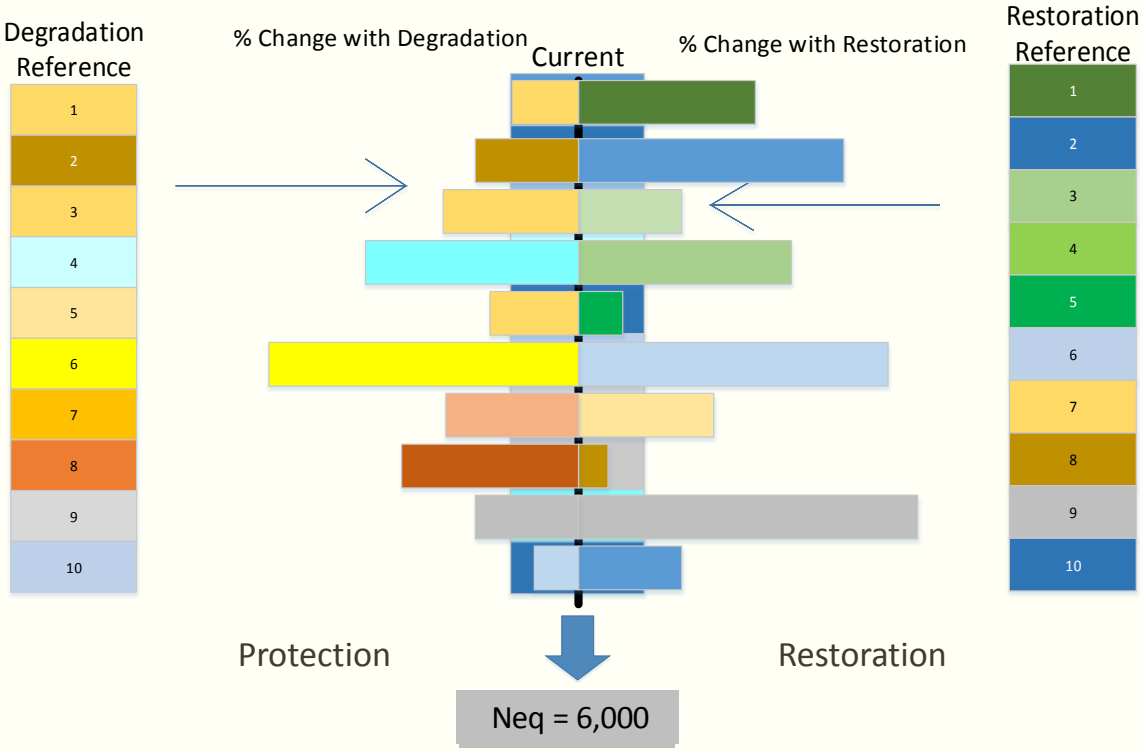
- Evaluate habitat potential for anadromous salmonids
  - Spring Chinook
  - Fall Chinook
  - Coho
  - Chum
  - Steelhead
- In regard to:
  - Abundance
  - Productivity
  - Biological diversity
  - Spatial diversity

  } Habitat Analogs to VSP metrics
- Based on conceptual models of species-habitat relationships and life history

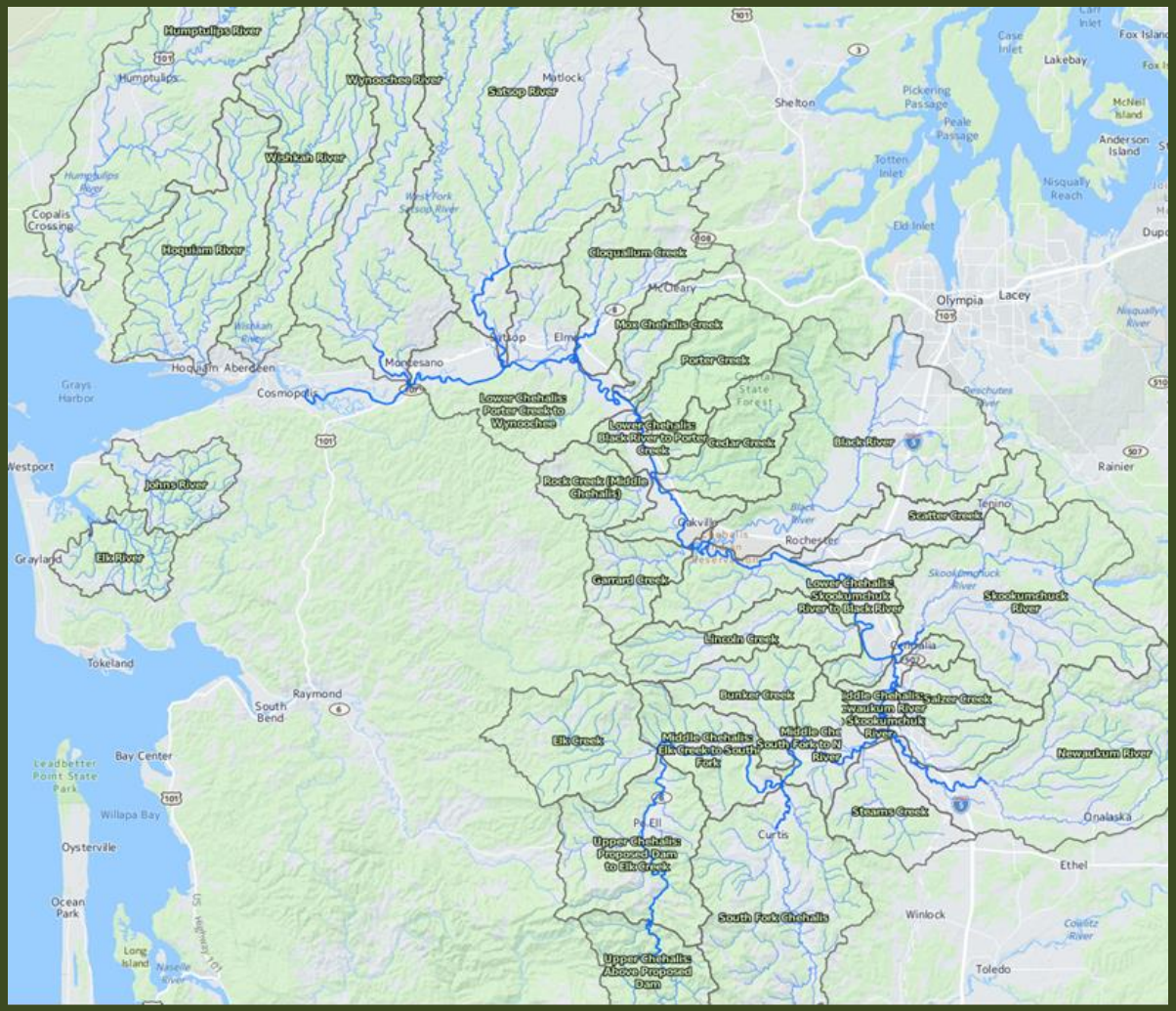
Products of the EDT Analysis

- Limiting habitat conditions (Diagnosis)
  - By species, by life stage
  - By reach
  - By sub-watershed ("populations")
- Restoration potential
- Prioritization of sub-watersheds and reaches
  - Protection of current habitat potential
  - Restoration of historic habitat potential
- Evaluation of habitat change (Treatment)
  - ASRP habitat restoration actions
  - Flood control alternatives
  - Climate change

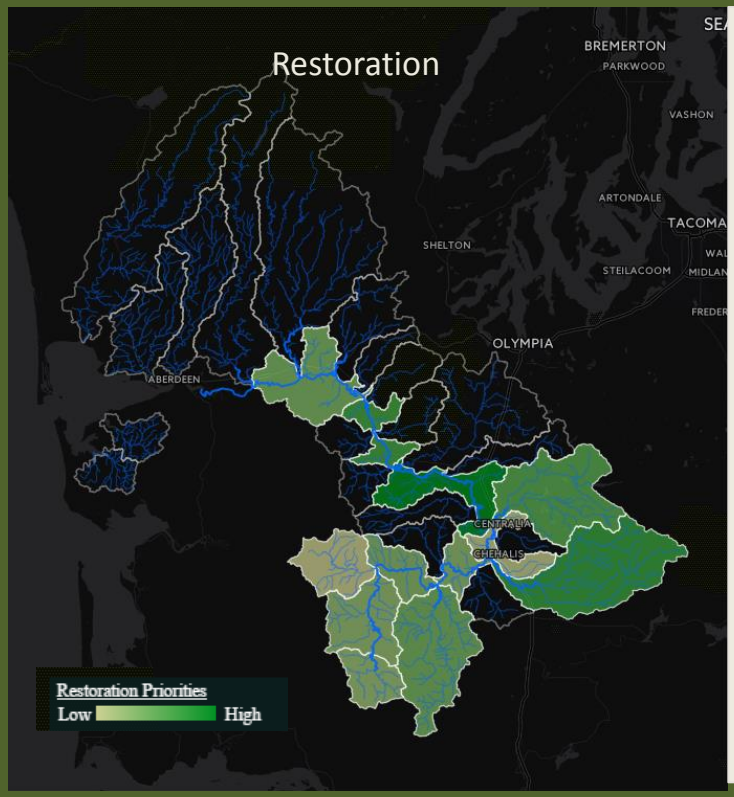
Evaluation of Restoration and Protection Opportunities using EDT

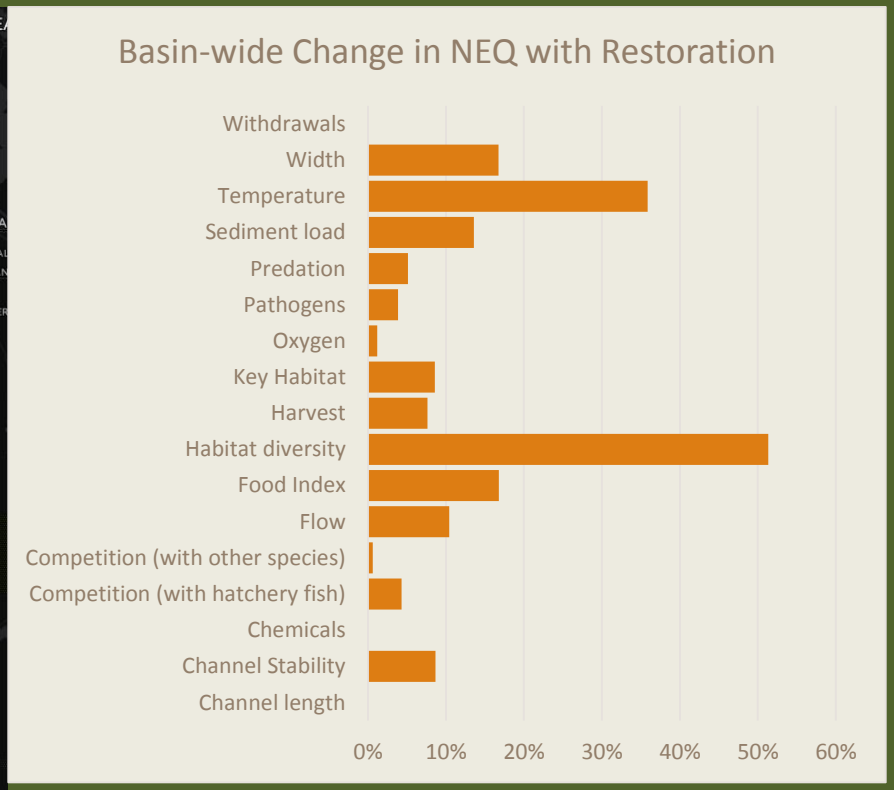


Spatial Scope of the Chehalis EDT Analysis

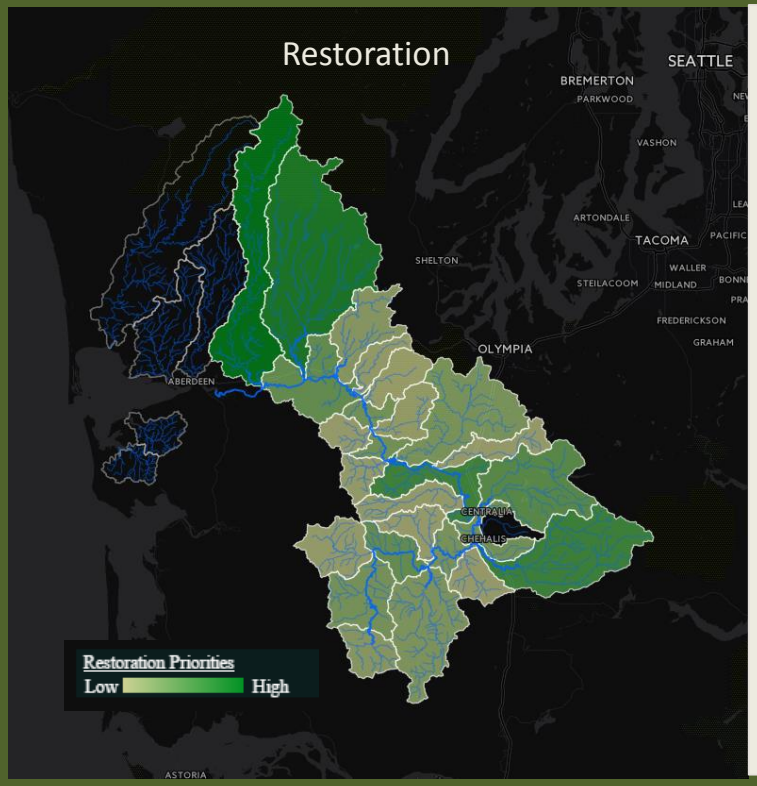


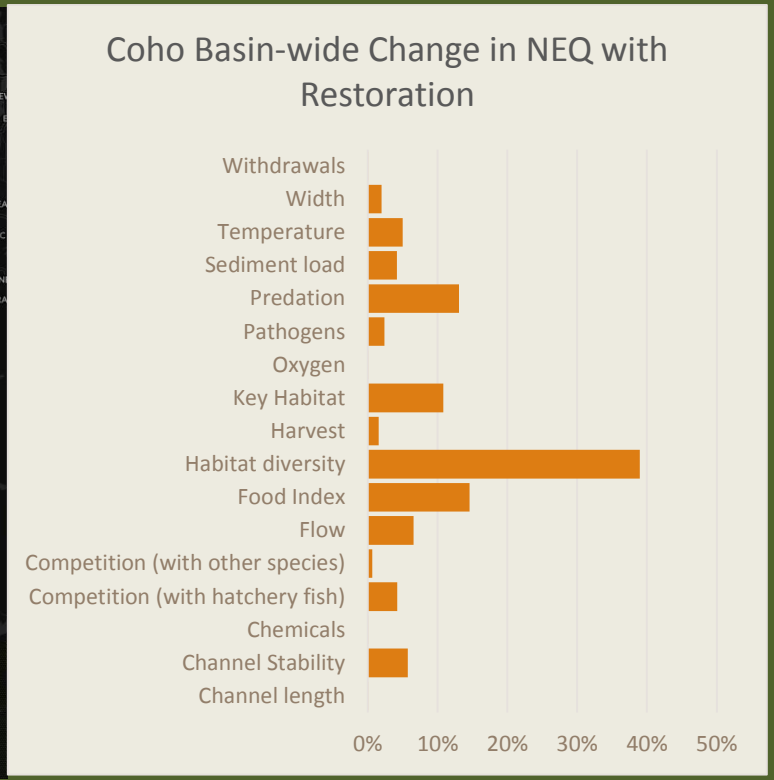
Basin Scale Restoration and Protection Ranking-Spring Chinook Salmon



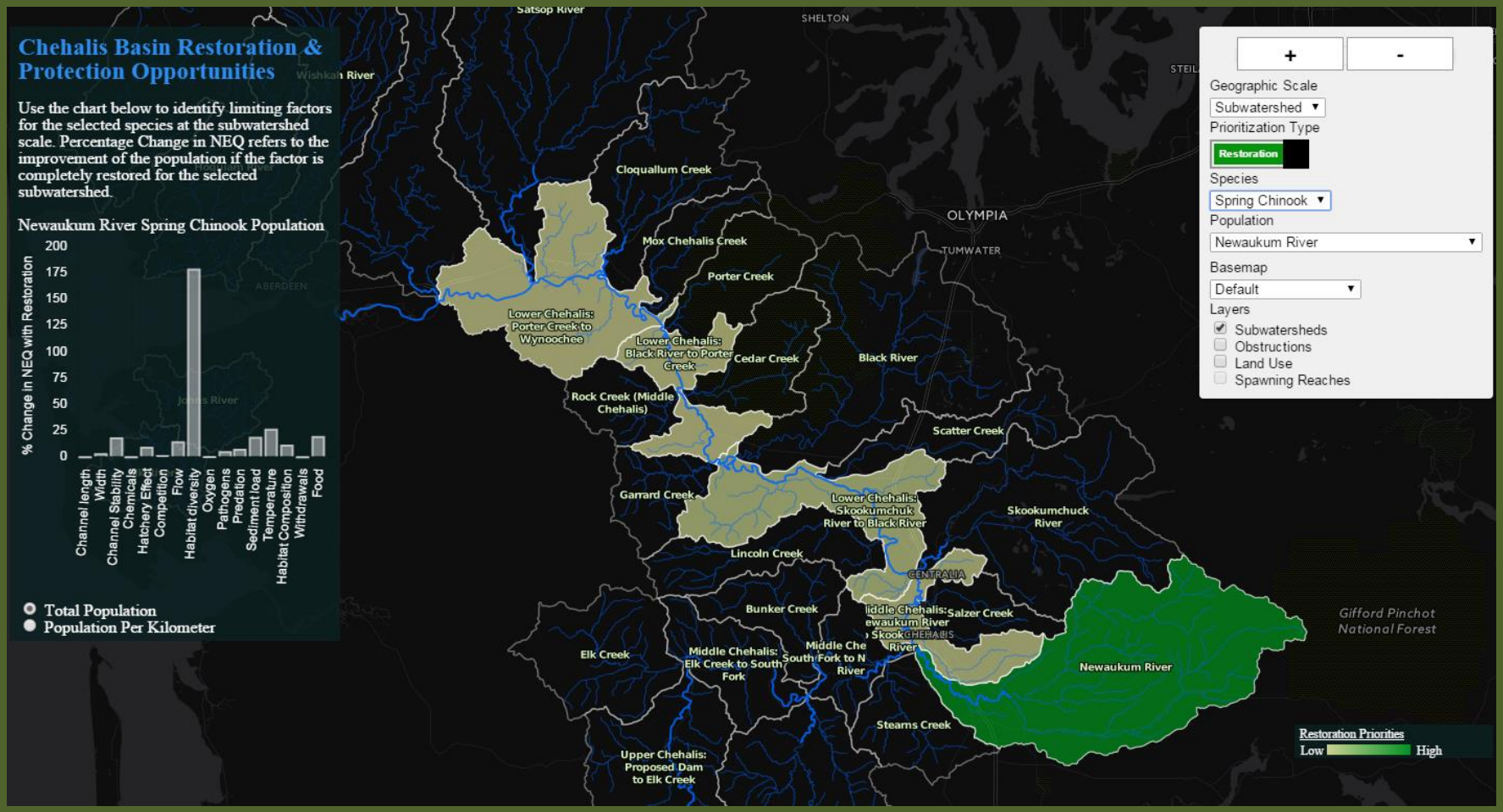


Basin Scale Restoration and Protection Ranking-Coho Salmon





Newaukum River – Subwatershed Scale Restoration/Protection Priorities-Spring Chinook Salmon



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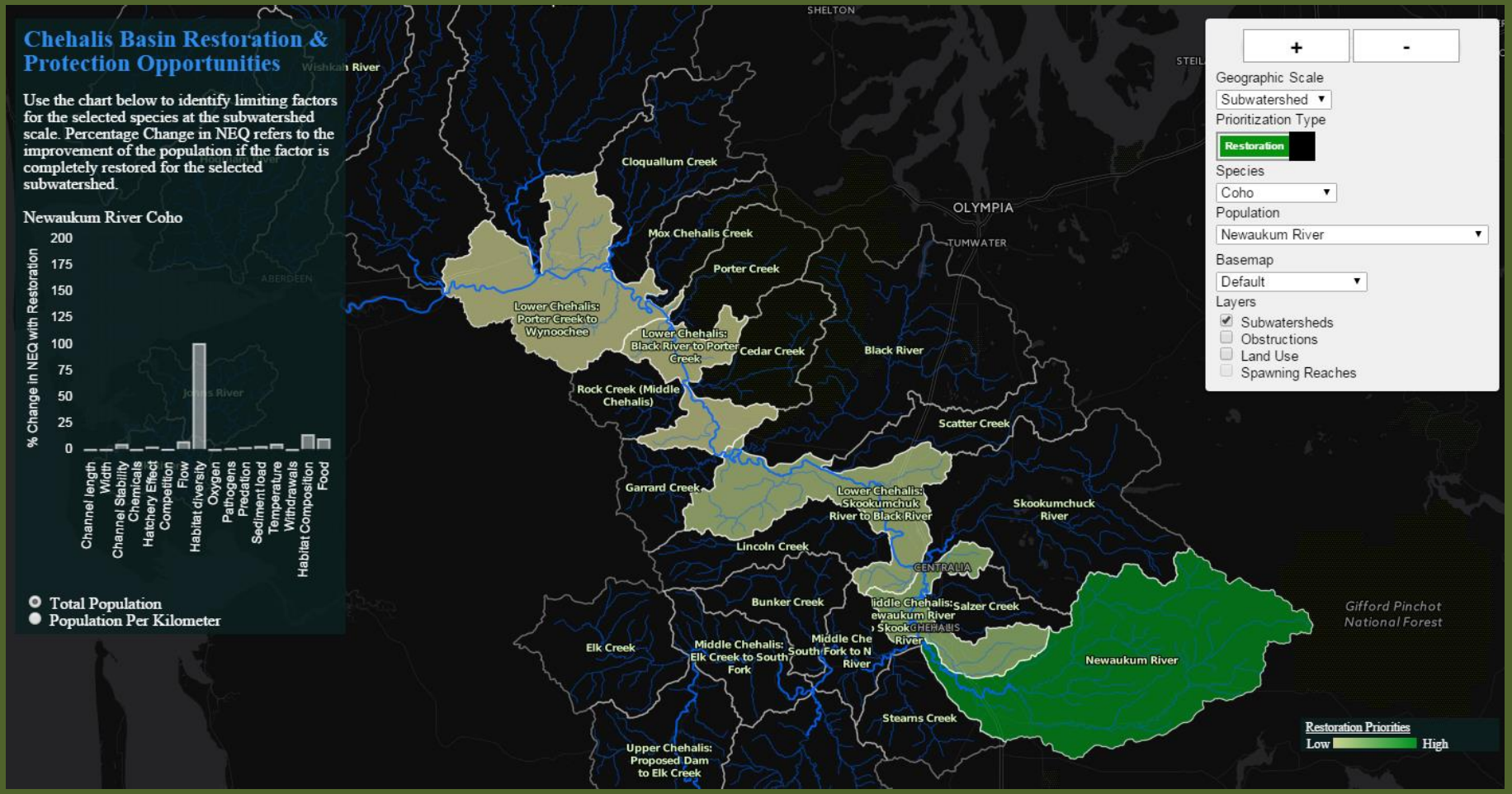
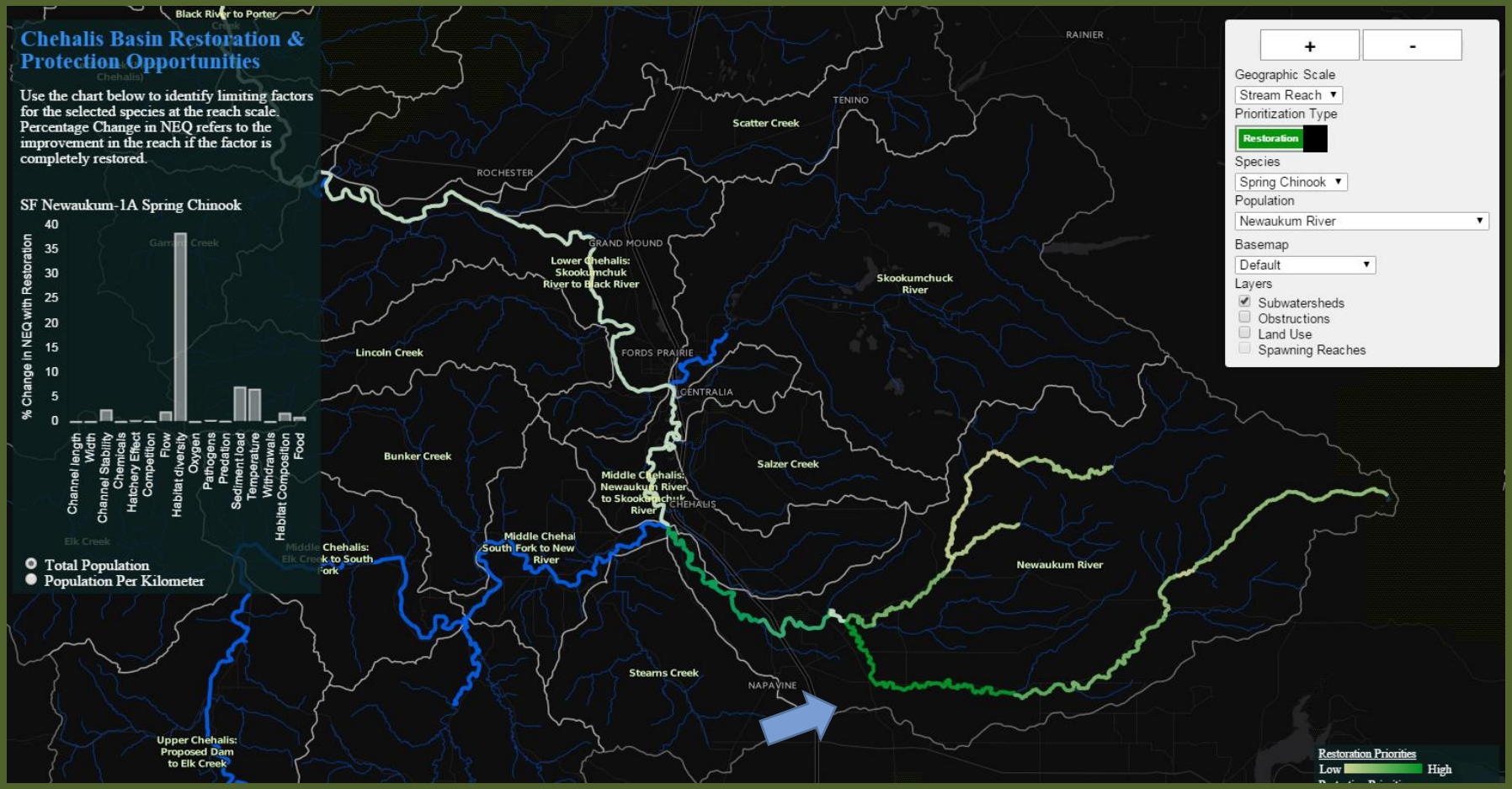
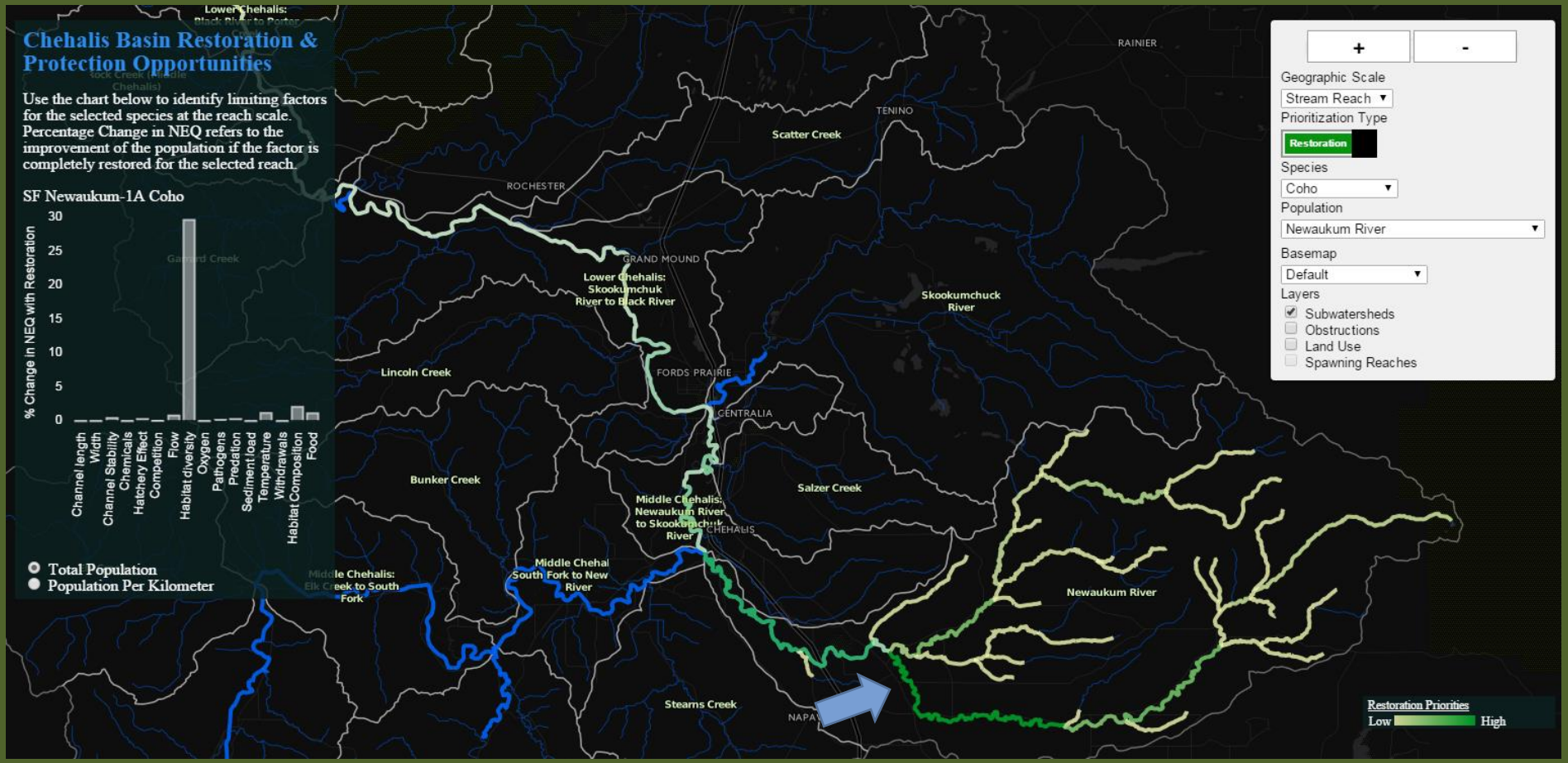


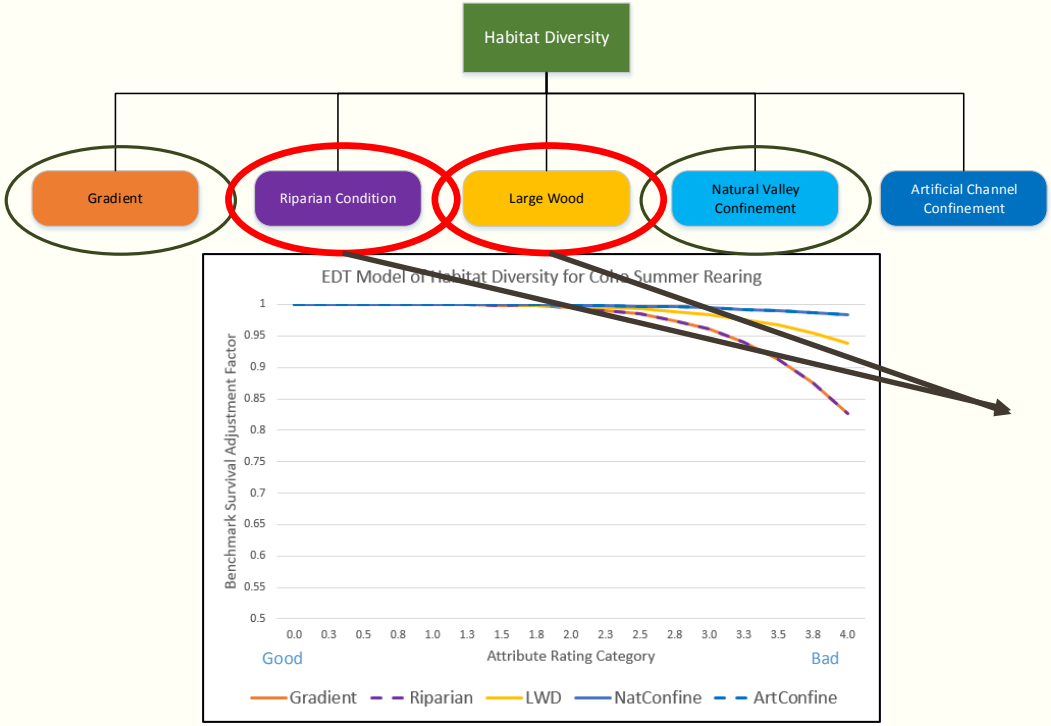
Newaukum Reach Scale, Restoration/Protection Priorities, Spring-run Chinook Salmon



Newaukum Reach Scale, Restoration/Protection Priorities, Coho Salmon



EDT Conceptual Model for Habitat Diversity: Coho Summer Rearing Life Stage



Potential Actions:

- Riparian Plantings
- Engineered Structures
- Both

Chehalis\Habitat Diversity.xls

Productivity = Life stage Benchmark X Factor Adjustment

EDT Next Steps

- Extend analysis to all species and populations
- Link to processes controlling habitat conditions
- Link to strategies for addressing limiting conditions
- Identify spatial priorities for restoration and protection
- Create public sites for mapping products

Break

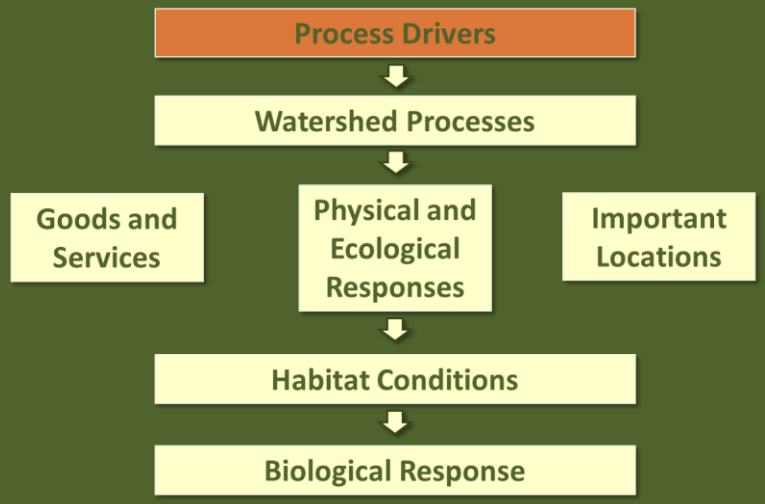
Newaukum River Case Study

- Watershed process drivers
- What we know about habitat conditions/processes and biological responses
- Hypothesized pathways to impaired habitat conditions
- Preliminary strategies

Google Earth Tour of Newaukum River

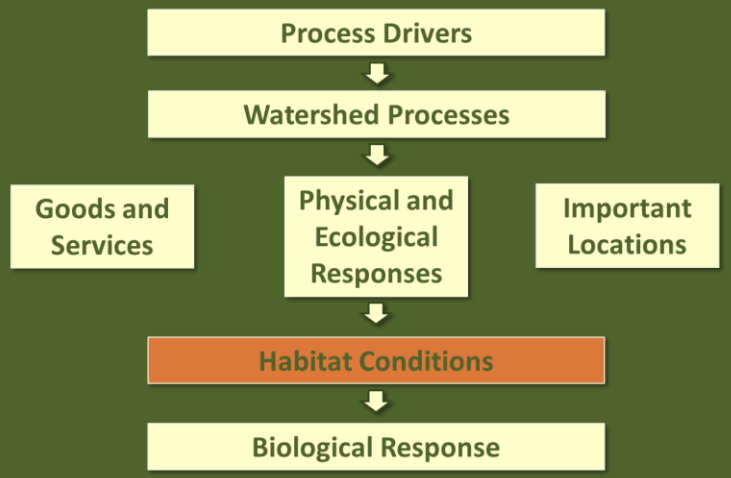
Watershed Process Drivers

- Topography
- Geology
- Climate
- Land use



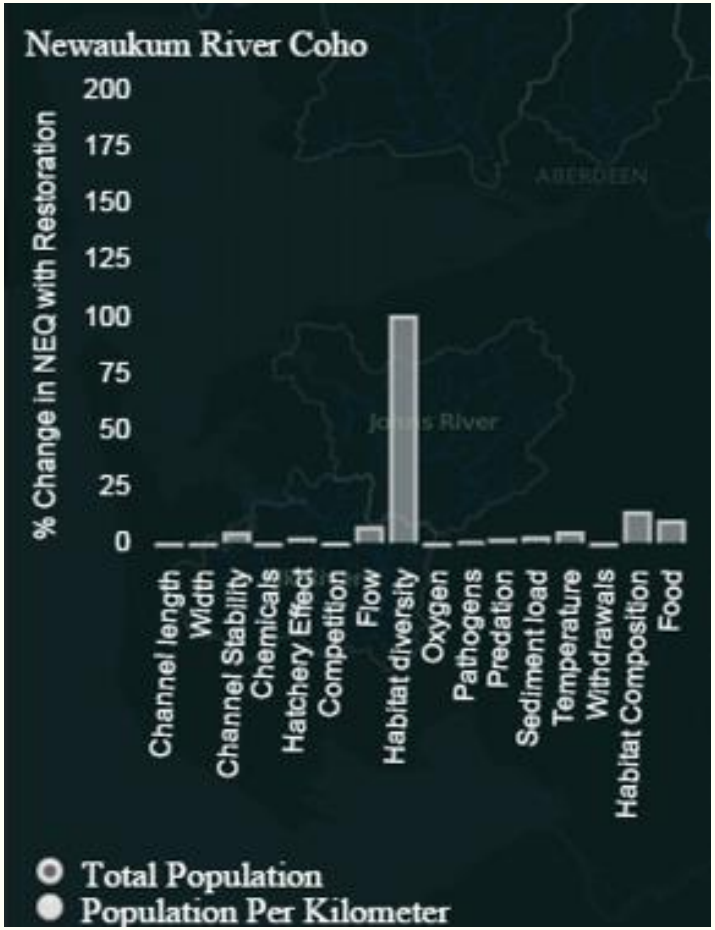
Knowledge of Impaired Habitat Conditions from Literature and other Data Sources

- Lack of large wood
- Poor riparian function
- High temperatures
- Low flows
- Large quantities of fine sediments
- Channel confinement
- Barriers

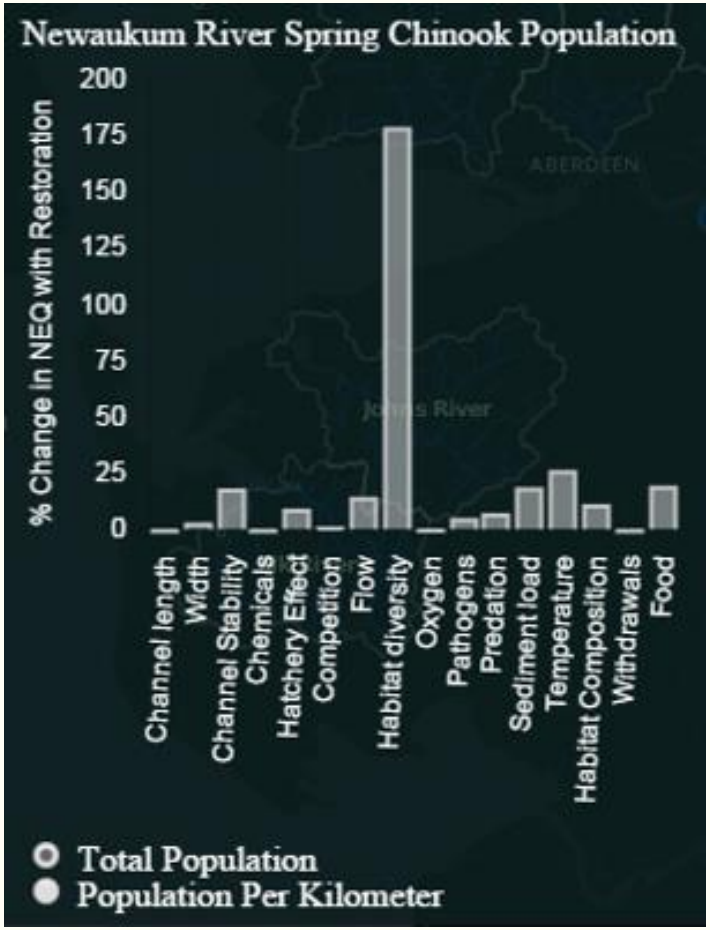


Newaukum River Limiting Habitat Conditions

Coho



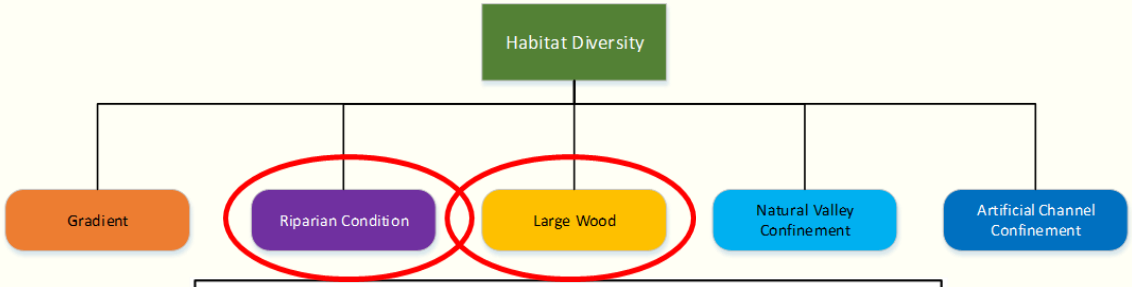
Spring Chinook

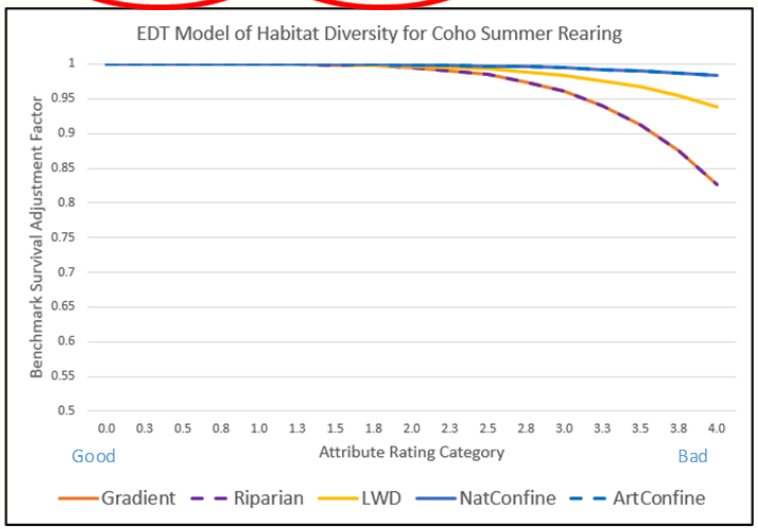


Habitat Diversity has Largest Limiting Effect

Driven by

- Riparian function
- Large wood





Chehalis\Habitat Diversity.xls

Newaukum River: Large Wood

Process Drivers

- Land use that removes or displaces riparian vegetation

Impaired Watershed Process

- Disturbed forest growth and succession
- Impaired recruitment or delivery of large wood

Physical and Ecological Responses

- Reduced large wood loading
- Loss of subordinate habitat forming processes

→ Important Locations (TBD)

Habitat Condition

Lack of large wood reduces habitat diversity which reduces salmonid habitat quality (survival) and quantity (capacity)

Biological Response

Reduced salmonid abundance and productivity

Strategy: Restore riparian forest growth, succession, and recruitment processes to increase quantity of large wood and improve Coho and Spring-run Chinook salmon abundance in Newaukum River

Newaukum River: High Water Temperatures

Process Drivers

- Water withdrawals
- Land use that removes riparian vegetation

Impaired Watershed Process

- Low flows
- Disturbed forest growth and succession
- Reduced shading

Physical and Ecological Responses

- Increased solar heating
- Higher summer temperatures

→ Important Locations (TBD)

Habitat Condition

High water temperatures reduce salmonid habitat quality (survival) and quantity (capacity)

Biological Response

Reduced salmonid abundance and productivity

Strategy: Restore instream flows and riparian vegetation to reduce summer water temperatures and improve Coho and Spring-run Chinook salmon abundance in Newauakum River

Summary of Preliminary Strategies

1. Restore/protect riparian forest succession and recruitment processes to increase quantity of large wood
2. Restore/protect riparian forest growth and shading to improve riparian function
3. Restore/protect instream flows and riparian vegetation to reduce summer water temperatures

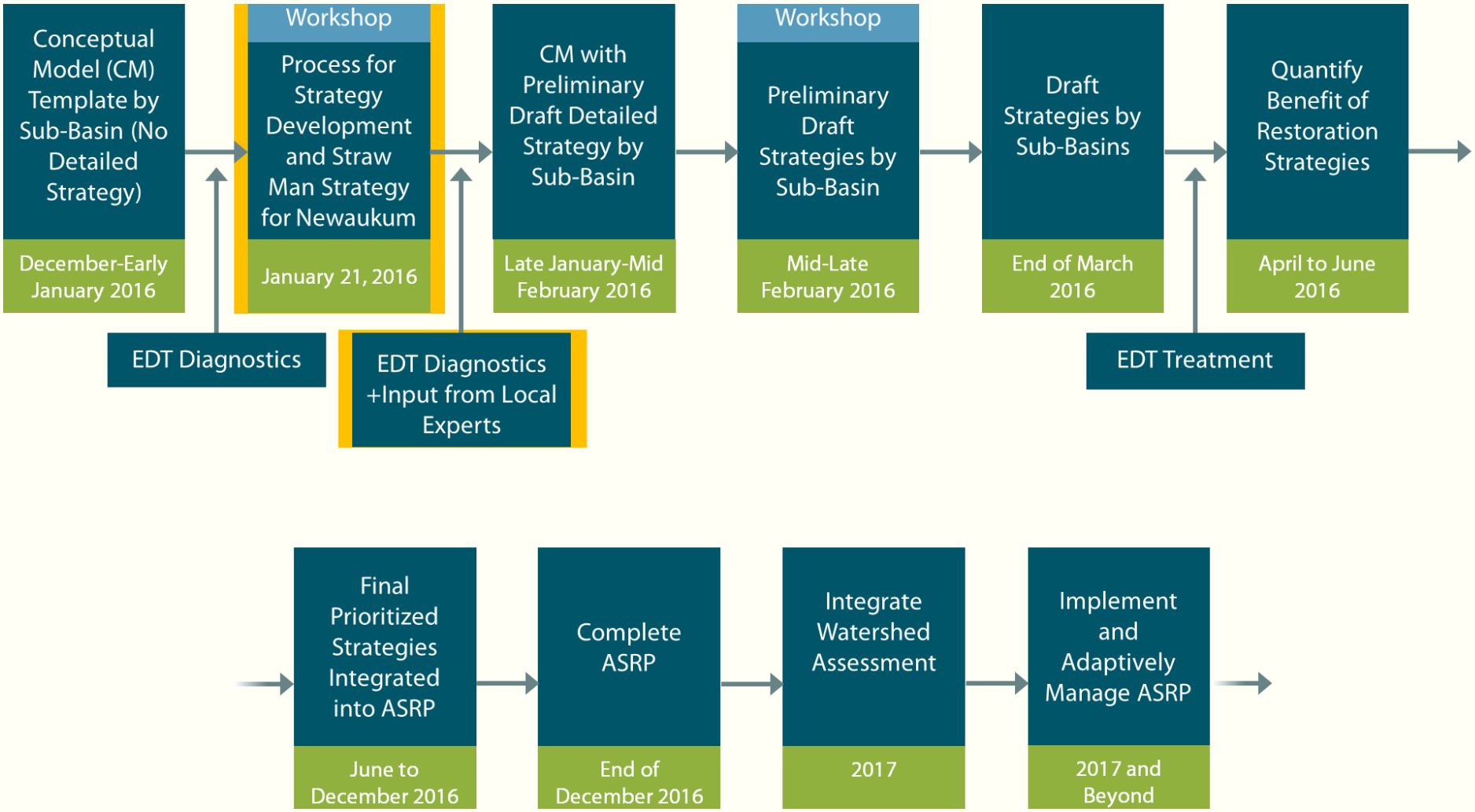
Summary of Preliminary Strategies

4. Restore altered hydrograph to increase summer flows
5. Restore vegetation and exposed soils in disturbed upland and riparian areas to reduce the deposition of fine sediments in aquatic habitats
6. Restore/protect connections between the river and CMZ to reduce channel confinement
7. Restore/protect longitudinal connectivity in stream habitats to reduce barriers to fish passage

Part III: Next Steps

- Incorporate new information from on-going/current research and assessments
- Update EDT diagnoses
- Run EDT on all sub-basins
- Overlay EDT, amphibian and waterfowl occupancy
- Evaluate and prioritize restoration strategies
- Input from stakeholders

Next Steps


Conceptual Model (CM) Template by Sub-Basin (No Detailed Strategy)
December-Early January 2016
Workshop
Process for Strategy Development and Straw Man Strategy for Newaukum
January 21, 2016
CM with Preliminary Draft Detailed Strategy by Sub-Basin
Late January-Mid February 2016
Workshop
Preliminary Draft Strategies by Sub-Basin
Mid-Late February 2016
Draft Strategies by Sub-Basins
End of March 2016
Quantify Benefit of Restoration Strategies
April to June 2016
EDT Diagnostics
EDT Diagnostics +Input from Local Experts
EDT Treatment
Final Prioritized Strategies Integrated into ASRP
June to December 2016
Complete ASRP
End of December 2016
Integrate Watershed Assessment
2017
Implement and Adaptively Manage ASRP
2017 and Beyond

Information to Refine Strategies

Near-term

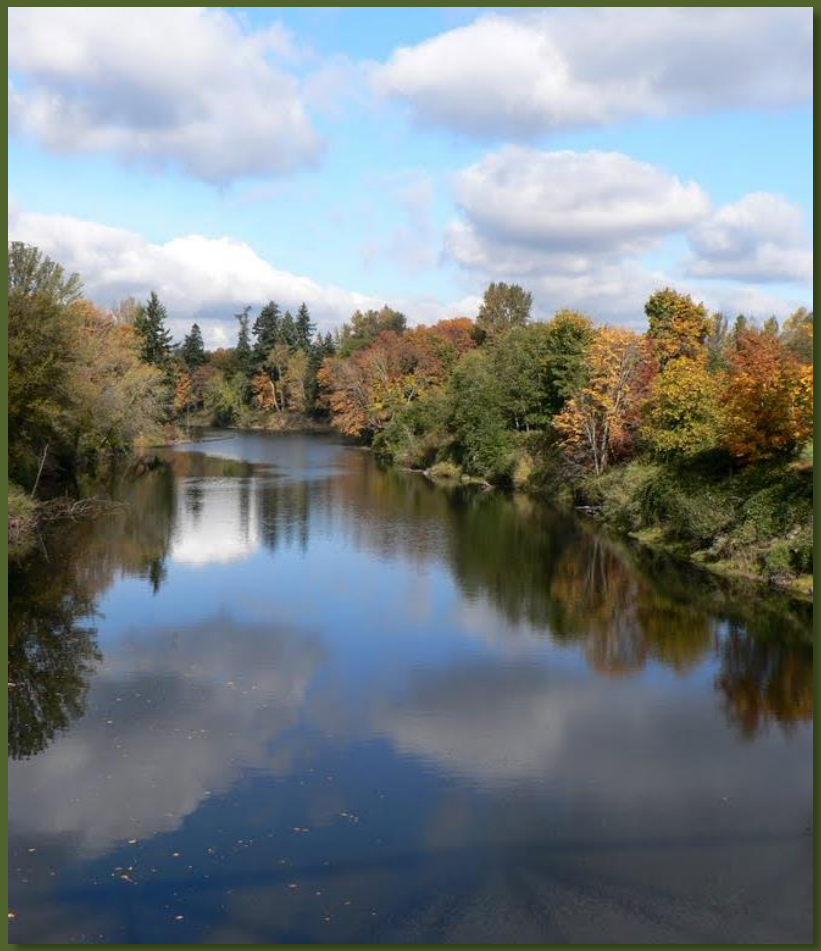
- Floodplain habitat conditions – NOAA Watershed Assessment
- Culvert barriers – WDFW, Fish Passage Board
- Refined temperature - WDFW
- Chum spawning distributions - WDFW
- Spring Chinook holding and spawning locations - WDFW
- Biological response to near-term restoration- NOAA Watershed Assessment, EDT
- Identification of important locations, goods and services

Information to Refine Strategies

Long-term

- Climate change - CIG
- Sediment supply, routing - geotechnical support at identified restoration sites
- Biological response to restoration - Watershed Assessment, EDT
- Juvenile salmon summer rearing habitat and run-timing - WDFW
- Chinook population level spawn-timing - WDFW
- Steelhead population structure - WDFW
- Geomorphology – subbasin large wood, sediment input/transport

Unknowns



- Precise impact of climate change
- How/if/where land use patterns will change
- Habitat interactions under different restoration scenarios and need for adaptive management

What We Need From You

- Developing sub-basin specific strategies, restoration actions
- Identifying important locations – rare habitat, thermal refugia, cultural
- Identifying and acquiring new sources of information/data for habitat and species
- Continuous involvement

Sub-basins

- Humptulips
- Hoquium
- Wishkah
- Elk River
- Elk Creek
- Johns
- Wynoochee
- Satsop
- Skookumchuck - to South Fork
- Newaukum
- Black
- Lower Chehalis – mainstem <u>and</u> tributaries
- Middle Chehalis - tributaries
- Scatter Creek
- South Fork Chehalis - to Pe Ell
- Upper Chehalis

How to Help

- Provide information today using flipcharts
- Contact Carol Cloen at WDFW by February 12

  Email: carol.cloen@dfw.wa.gov

  Phone: 360-902-2603
- Review outputs from EDT online: http://ecosystems.azurewebsites.net/Maps/Chehalis_Salmon_Priorities/

A habitat assessment approach for restoration planning

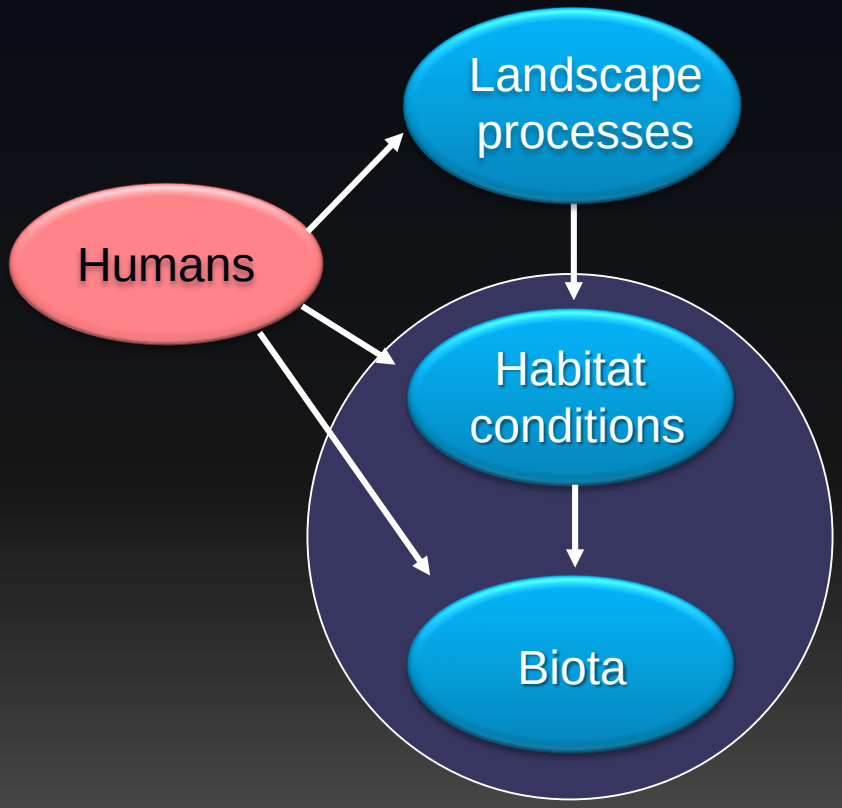
Tim Beechie
NOAA Fisheries, Seattle

Two main objectives

- Identify habitats that limit salmon population recovery
- Identify restoration scenarios that provide the largest benefit to salmon populations

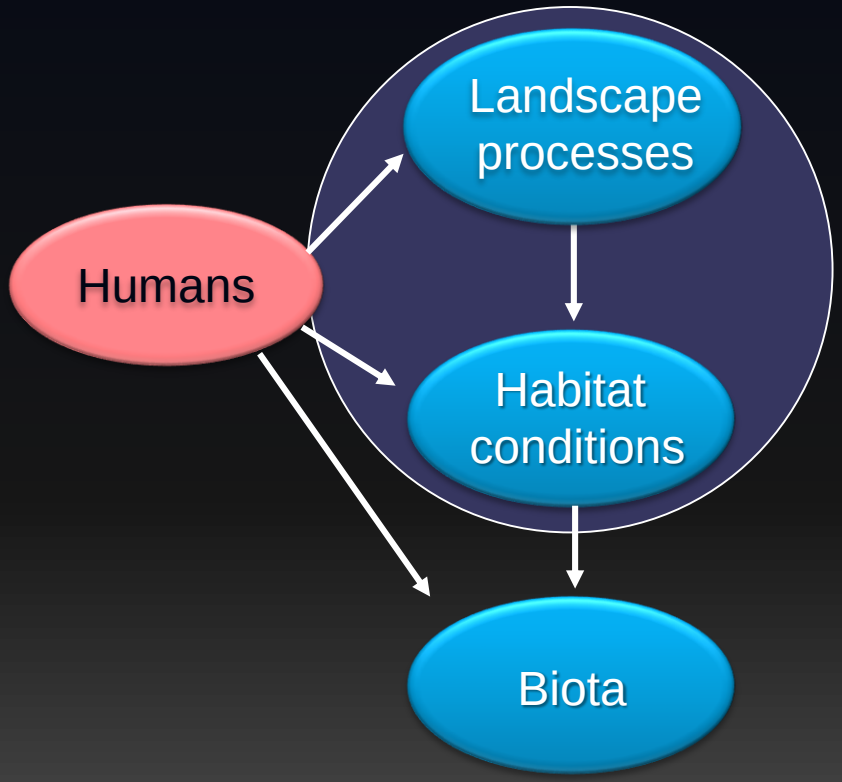
What do we need to know?

- Q1: How have habitats changed and altered biota?



What do we need to know?

- Q2: What are the root causes of habitat and biological change?



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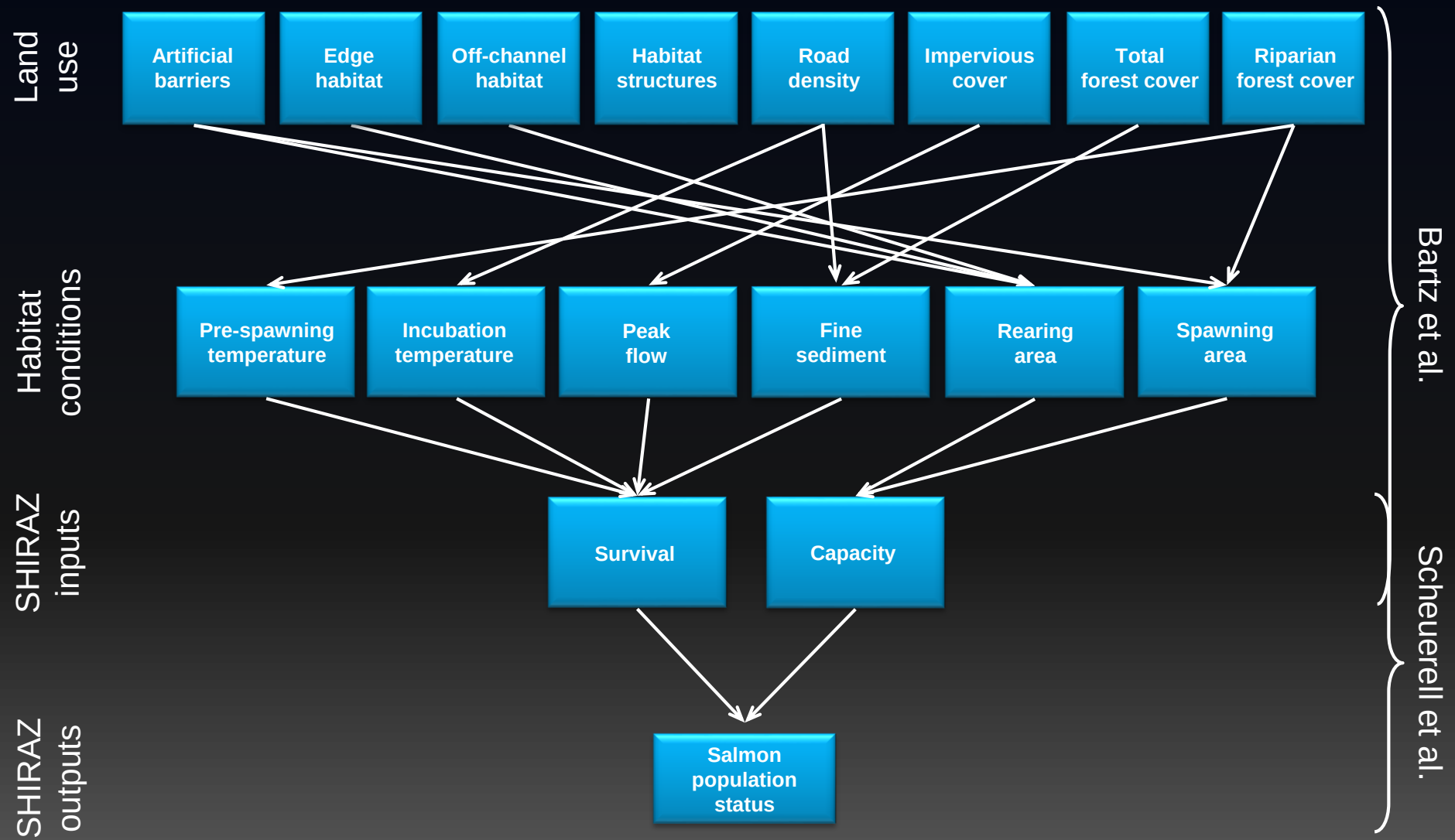
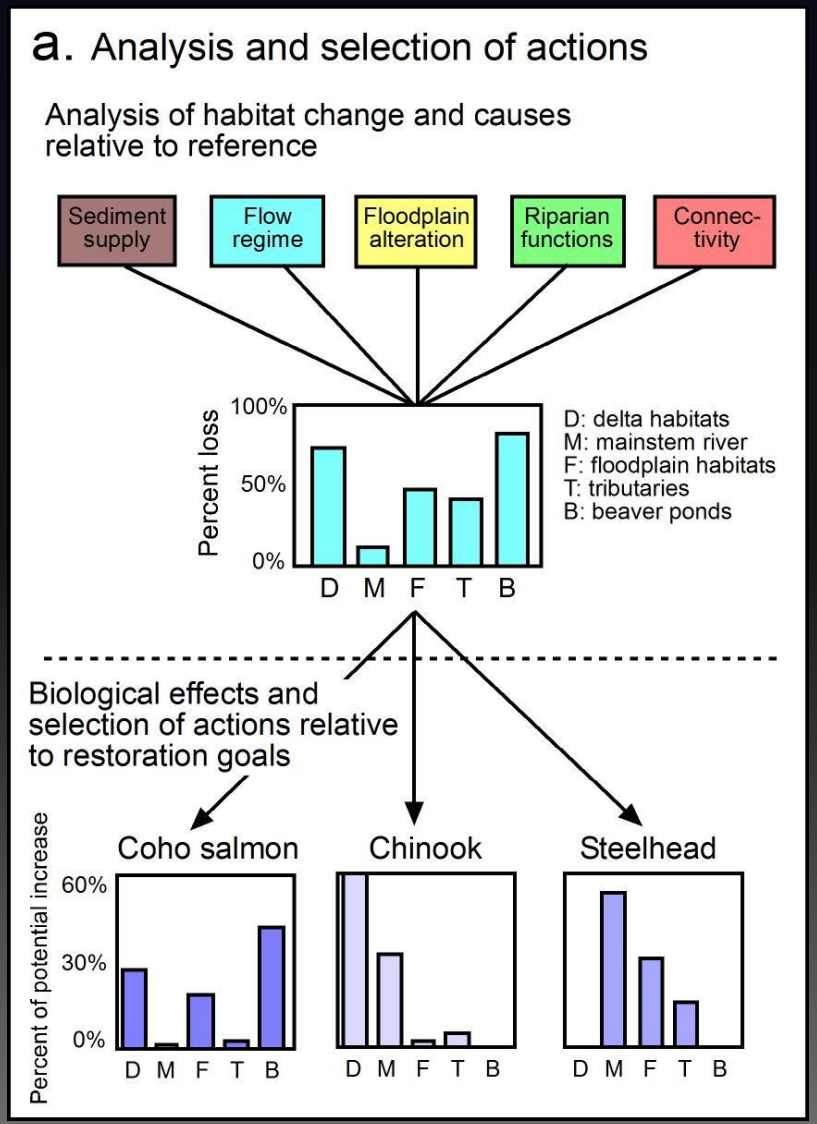

Land use
Habitat conditions
SHIRAZ inputs
SHIRAZ outputs
Artificial barriers
Edge habitat
Off-channel habitat
Habitat structures
Road density
Impervious cover
Total forest cover
Riparian forest cover
Pre-spawning temperature
Incubation temperature
Peak flow
Fine sediment
Rearing area
Spawning area
Survival
Capacity
Salmon population status
Bartz et al.
Scheuerell et al.

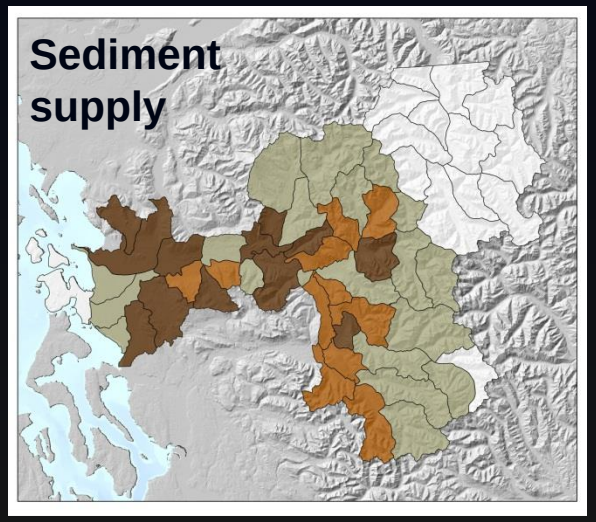
Q1: habitat and species changes

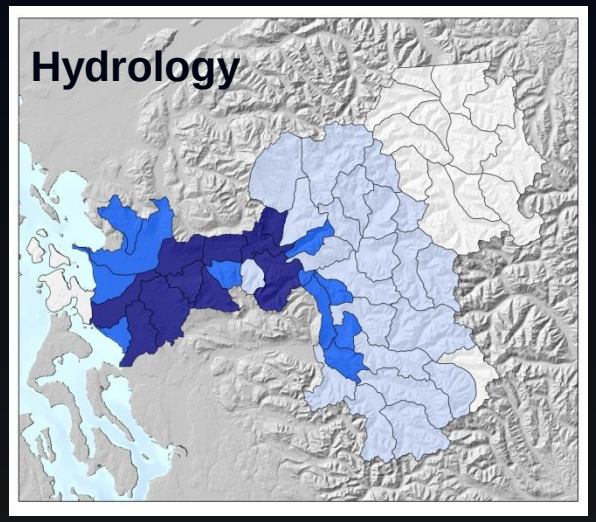
- Summarize habitat changes across the restoration area
- Quantify importance of each habitat loss to species of interest

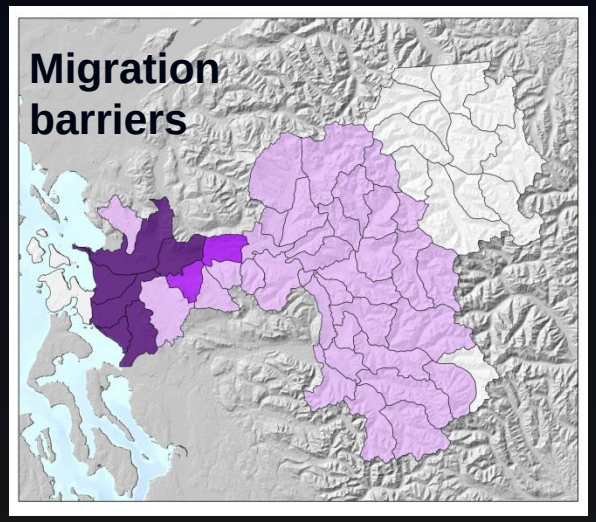


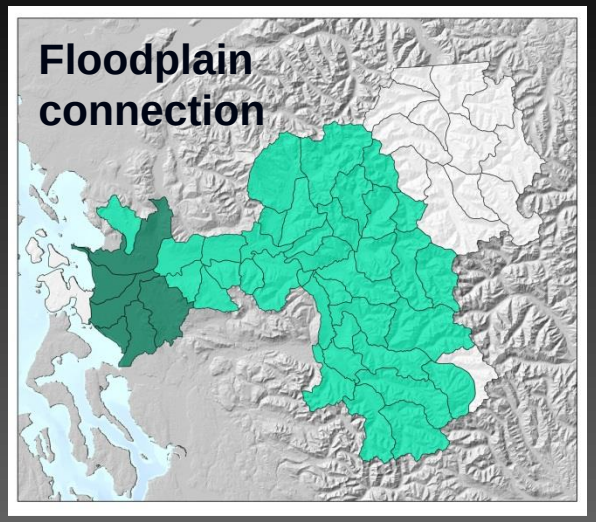
Beechie et al. (2010)

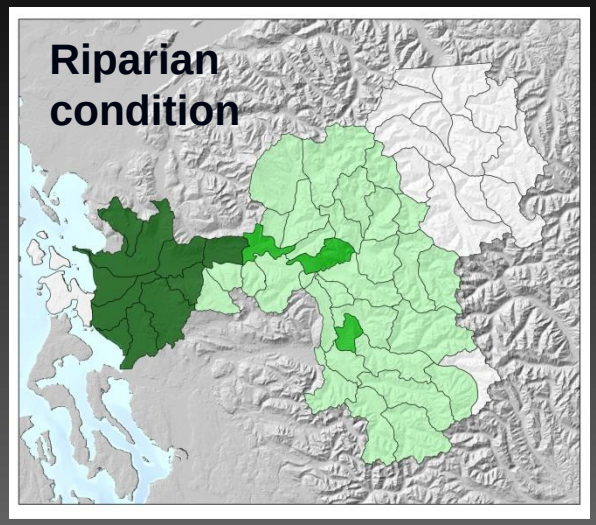
Q2: Root causes of habitat change

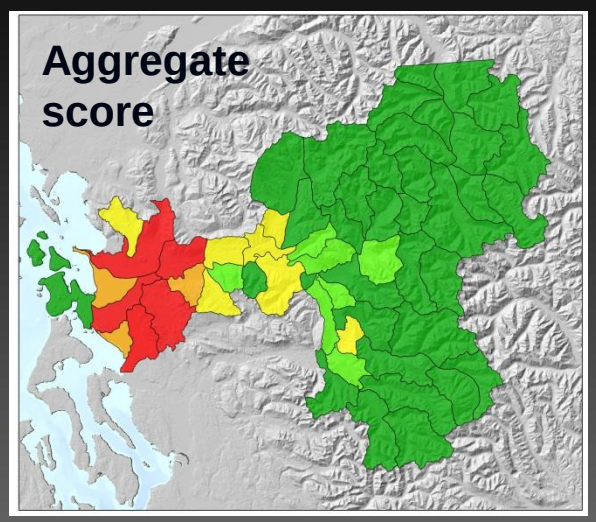






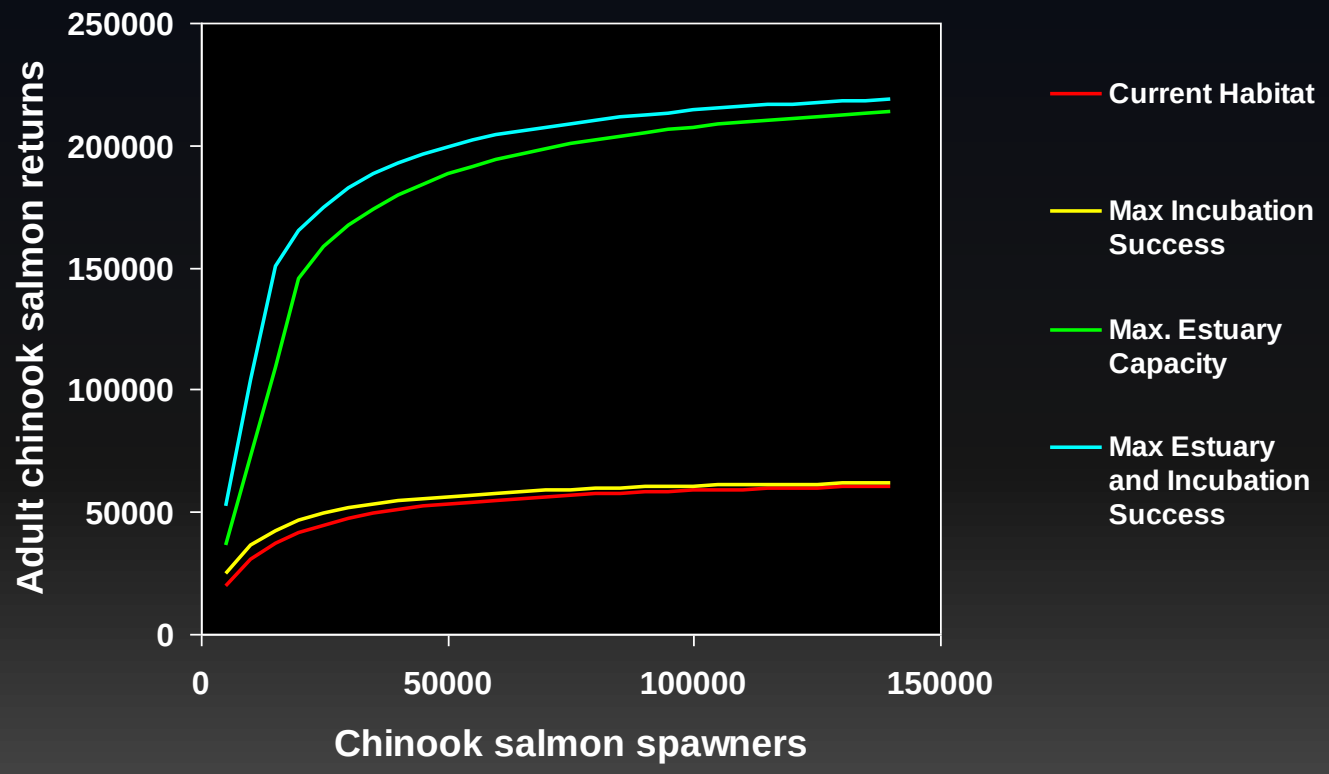






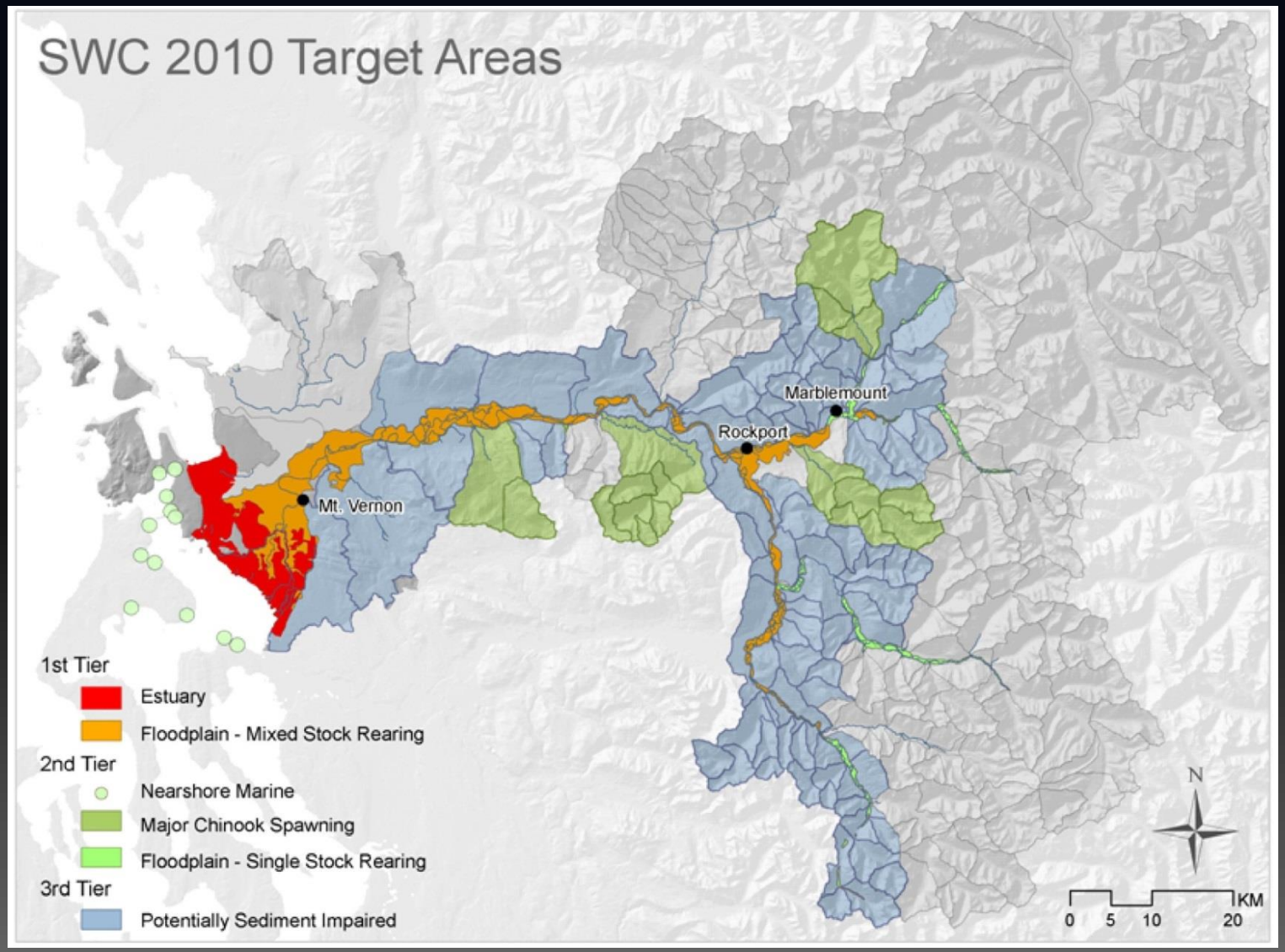
Beechie et al. (2013)

Evaluate restoration alternatives



From Beamer et al, 2000

Develop a strategy



Beechie et al. (2013)

Data needs

- Historical and current habitat areas by habitat type for tributary, large river, beaver pond, delta, lakes
- Fish density and survival data by habitat type or condition
- Natural and current watershed processes rates or conditions (e.g., sediment supply, riparian function, connectivity)

Species and scales

- The model can be used to evaluate restoration alternatives for any species for which sufficient density and survival data exist

- Source data are habitat unit scale, but life-cycle model is run on areas no smaller than sub-watersheds (and preferably population scale)

Model outputs

- Question 1:
  - Change in smolt or adult population size resulting from past land use effects
  - Change in smolt or adult population size resulting from future restoration alternatives
- Question 2:
  - Changes in watershed process rates or functions by process

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Questions/Discussion