Spokane EDT Model

A Data Synthesis Tool to Support Salmonid Recovery

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A presentation to the Spokane River Salmon Reintroduction Lead Entity

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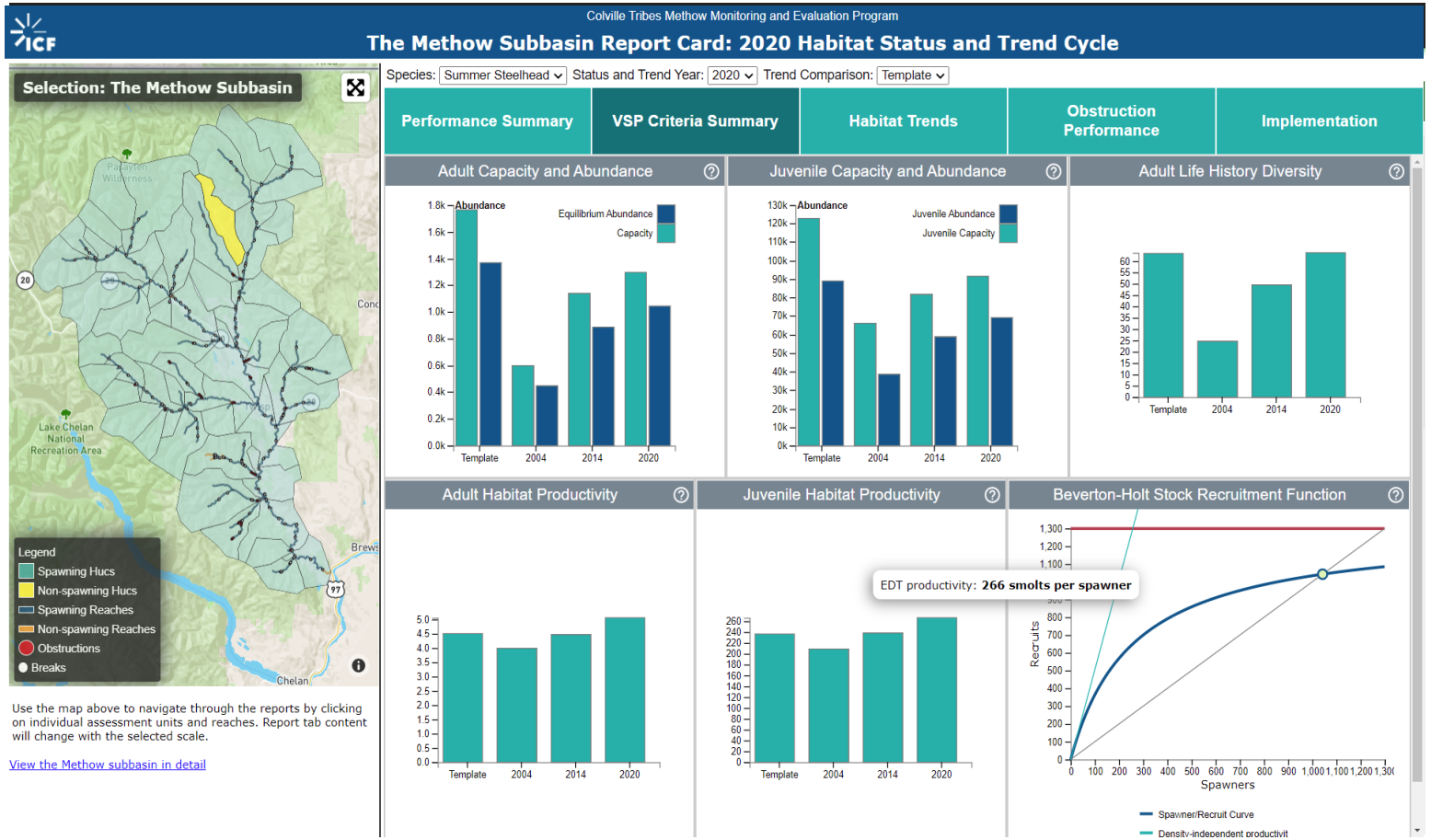
Why Spokane EDT?

- **Well Suited to Your Needs**
  - Powerful data synthesis tool
  - Purpose-built for data gap analysis and habitat prioritization
  - Flexible and adaptable
- **Mature Proof of Concept**
  - Okanogan EDT – A model for success
  - Multiple uses and applications
- **Builds on prior investments**
  - Phase I Anadromous Reintroduction Analysis
  - CTCR redband trout EDT
  - Other regional EDT projects



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Topics for Today

1. **Introduction to EDT**
2. **Okanogan EDT – Proof of Concept**
3. **Regional EDT Projects/Resources**
4. **The Spokane EDT Model**
   - Current status
   - Data gaps
5. **Next Steps**
   - Technical requirements
   - Your involvement
   - Analyses and deliverables

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A Brief History of EDT

- EDT1 (1995): Initial concept developed on MS Access platform
- EDT2 (2002): Web-based platform developed for regional applications
- EDT3 (2014): Third generation model built on SQL platform
  - Integrated with Excel
  - More powerful, flexible, transparent
  - New species capabilities
- All current applications in EDT3

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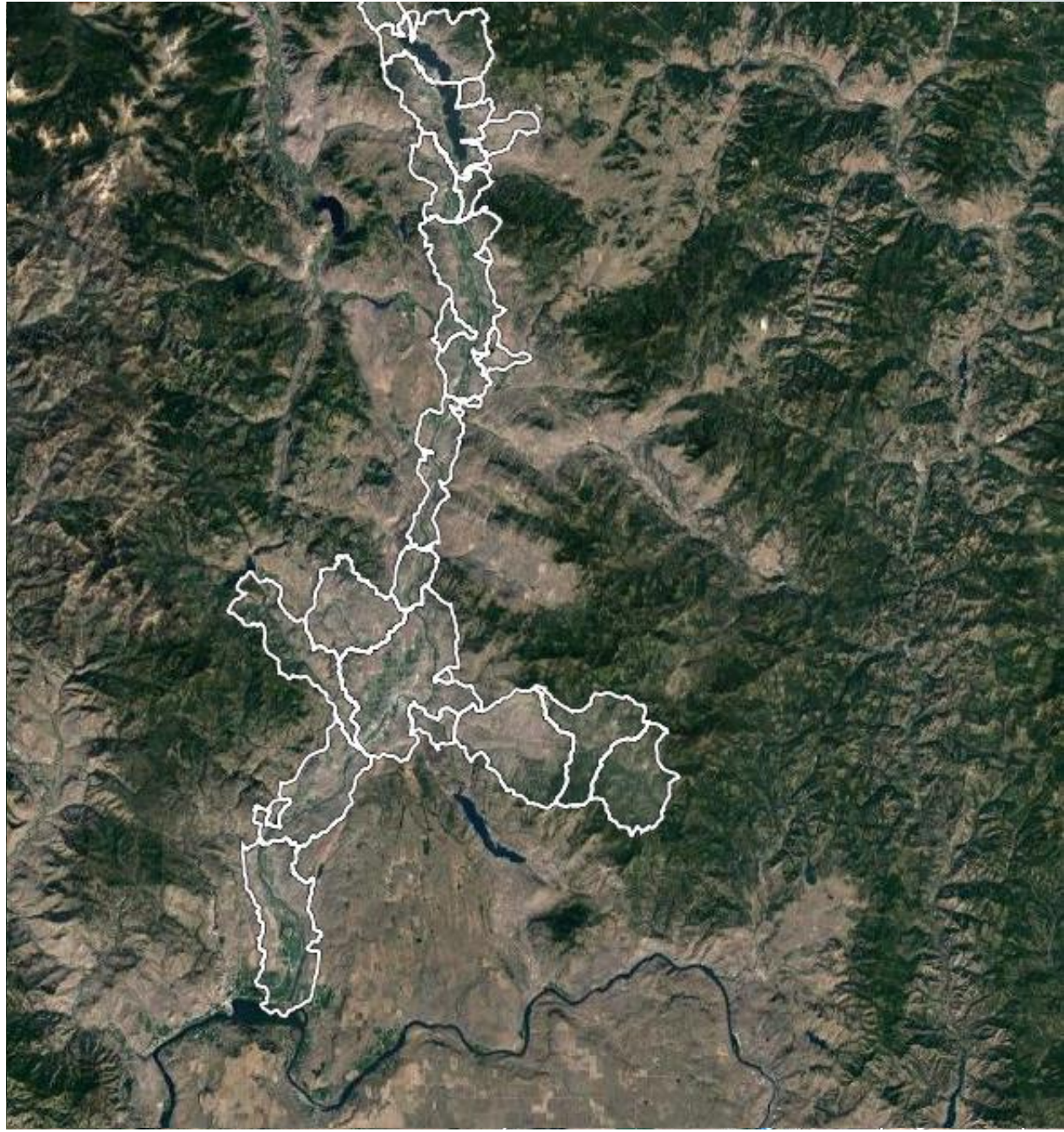
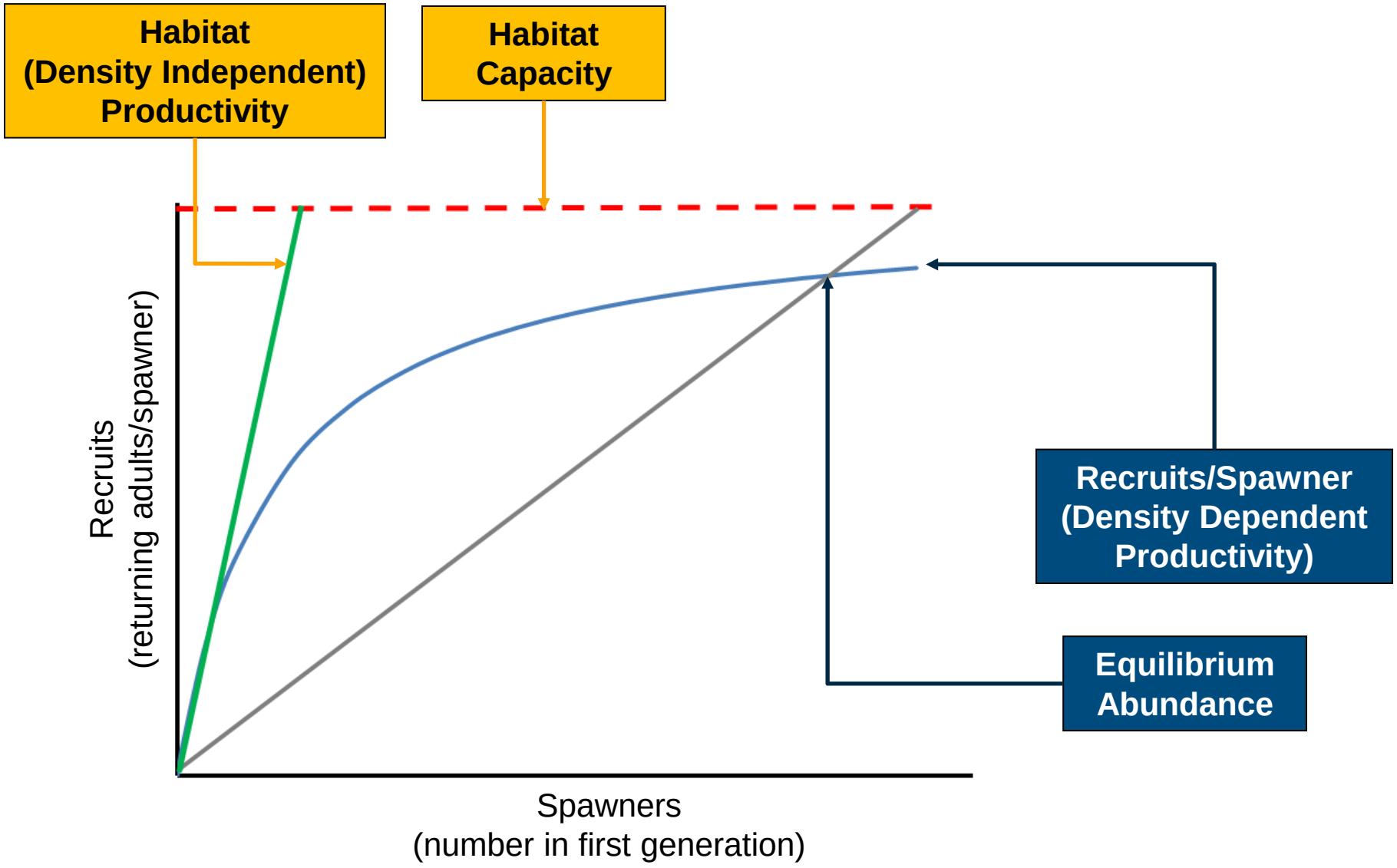
Model Geometry (Structure)

- **Reach – Base Spatial Unit**
  - Habitat reach: 1-4 km in length
  - Obstructions: Dams, culverts, weirs, waterfalls, etc.
  - All habitat data entered at reach scale
  - EDT rules operate at reach scale
- **Assessment (Diagnostic) Unit**
  - Any collection of reaches
  - Modified HUC12s in Upper Columbia
- **Population/Subbasin, examples:**
  - Okanogan U.S.
  - Okanogan Canada
  - Methow
  - Spokane Basin (historical anadromous)



The Beverton-Holt Function



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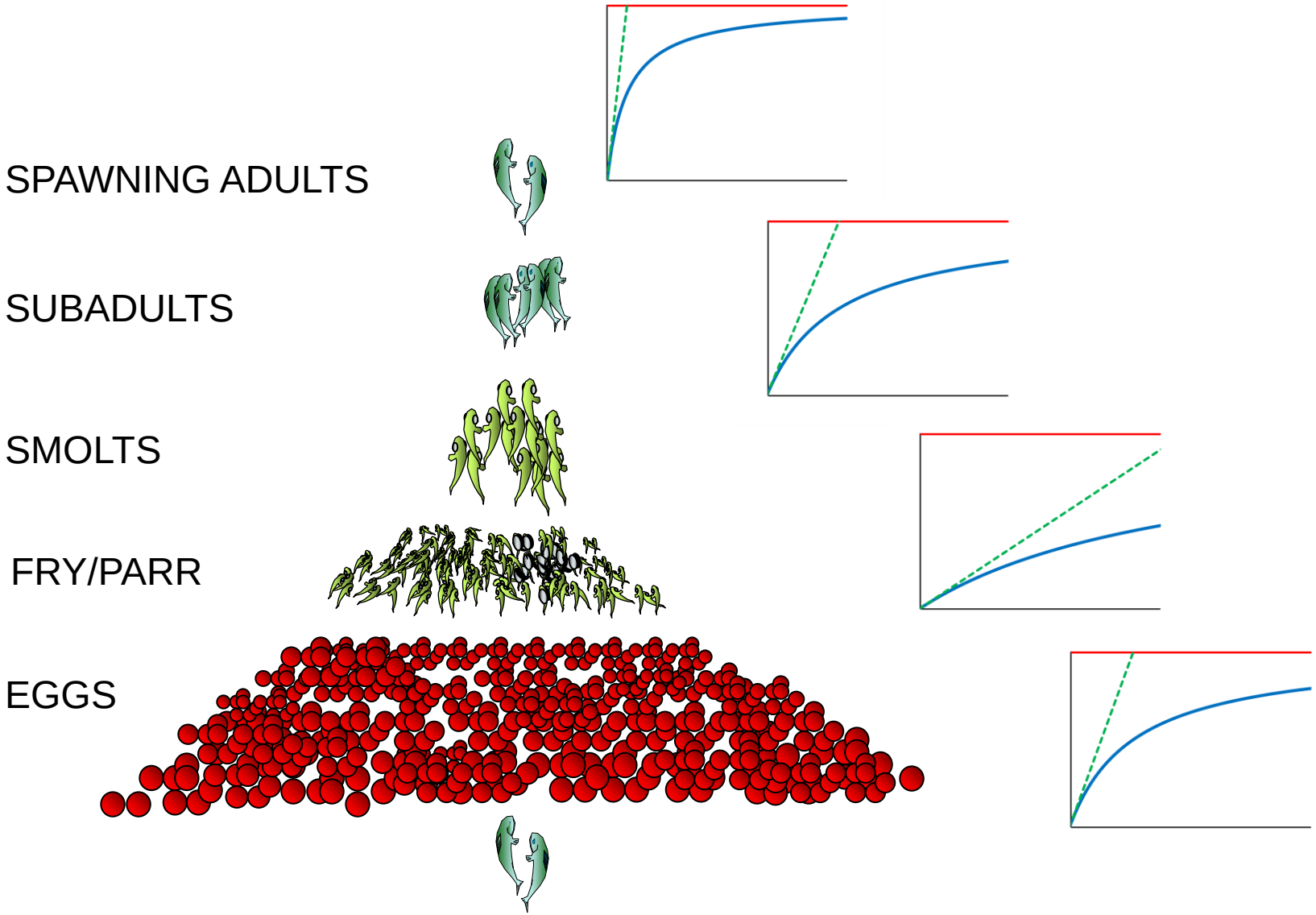
Aggregate Life Stage *P* = Population *P*



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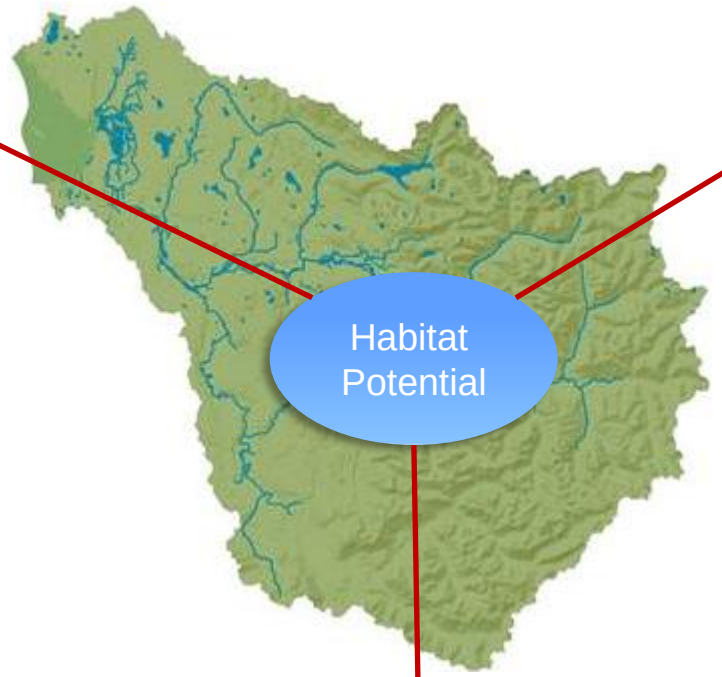
The EDT Cornerstones

HABITAT KNOWLEDGE
- Data
- Models
- Prof. judgment
- Hypotheses

SPECIES KNOWLEDGE
- Timing
- Location
- Movement



SPECIES/HABITAT RULES
- Life stage-specific
- Productivity/ capacity effects

VSP Parameters
- Habitat Capacity
- LS/Pop. Productivity
- Equilibrium Abundance
- Life History Diversity

Survival (limiting) factors

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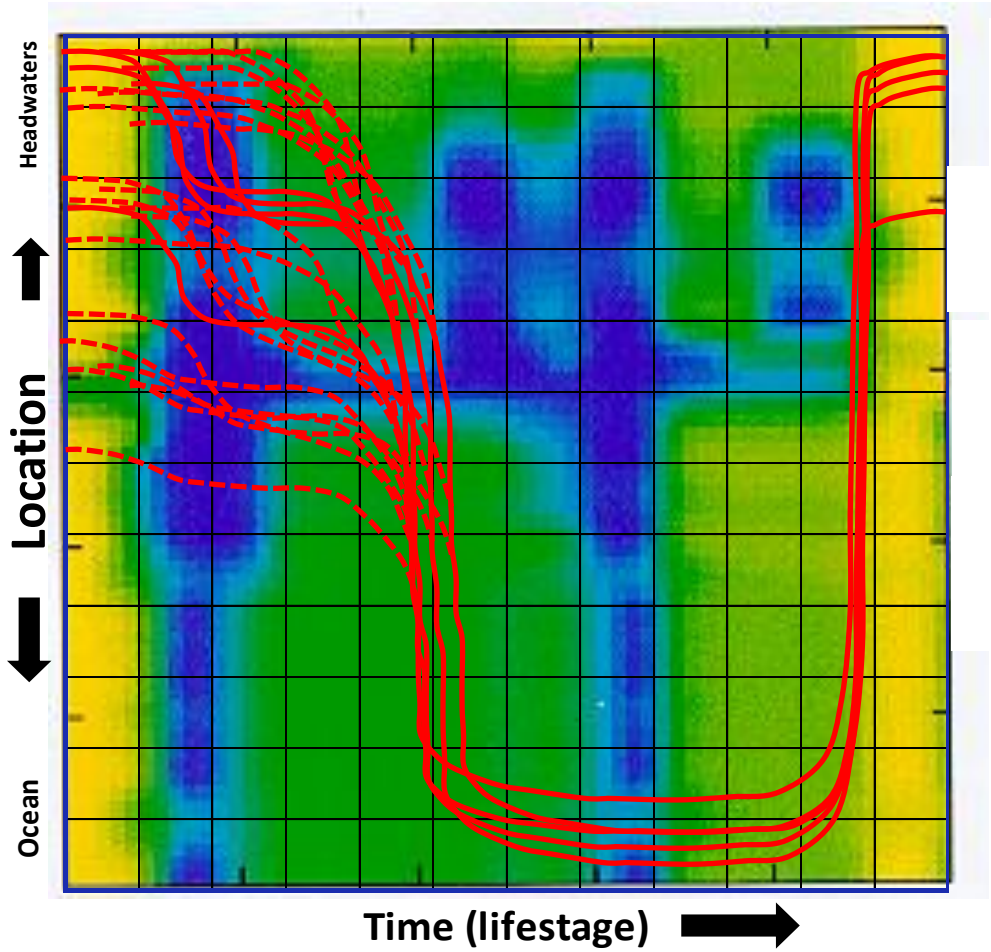
Trajectories Travel Through a Survival Landscape



- Trajectories = range of life history expression
- Survival (limiting) factor effect on LS productivity
- Different pathways have different survival rates
- Combined success rate = population performance

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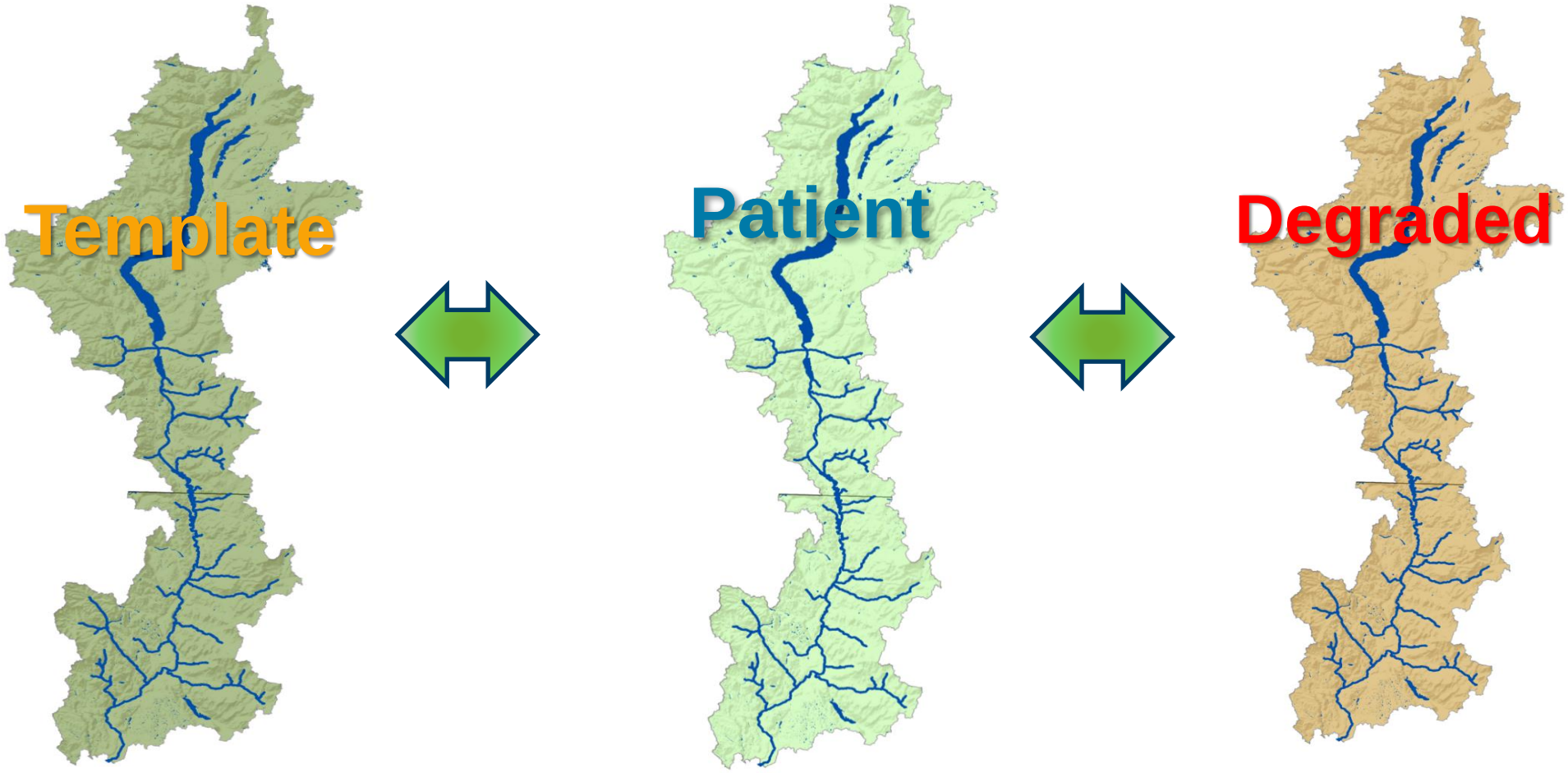
EDT Works by Comparing Scenarios

Where we were
or would like to be

- Current conditions
- Monitoring cycle conditions
- Restoration scenarios

- Degrade to NPF
- Climate change



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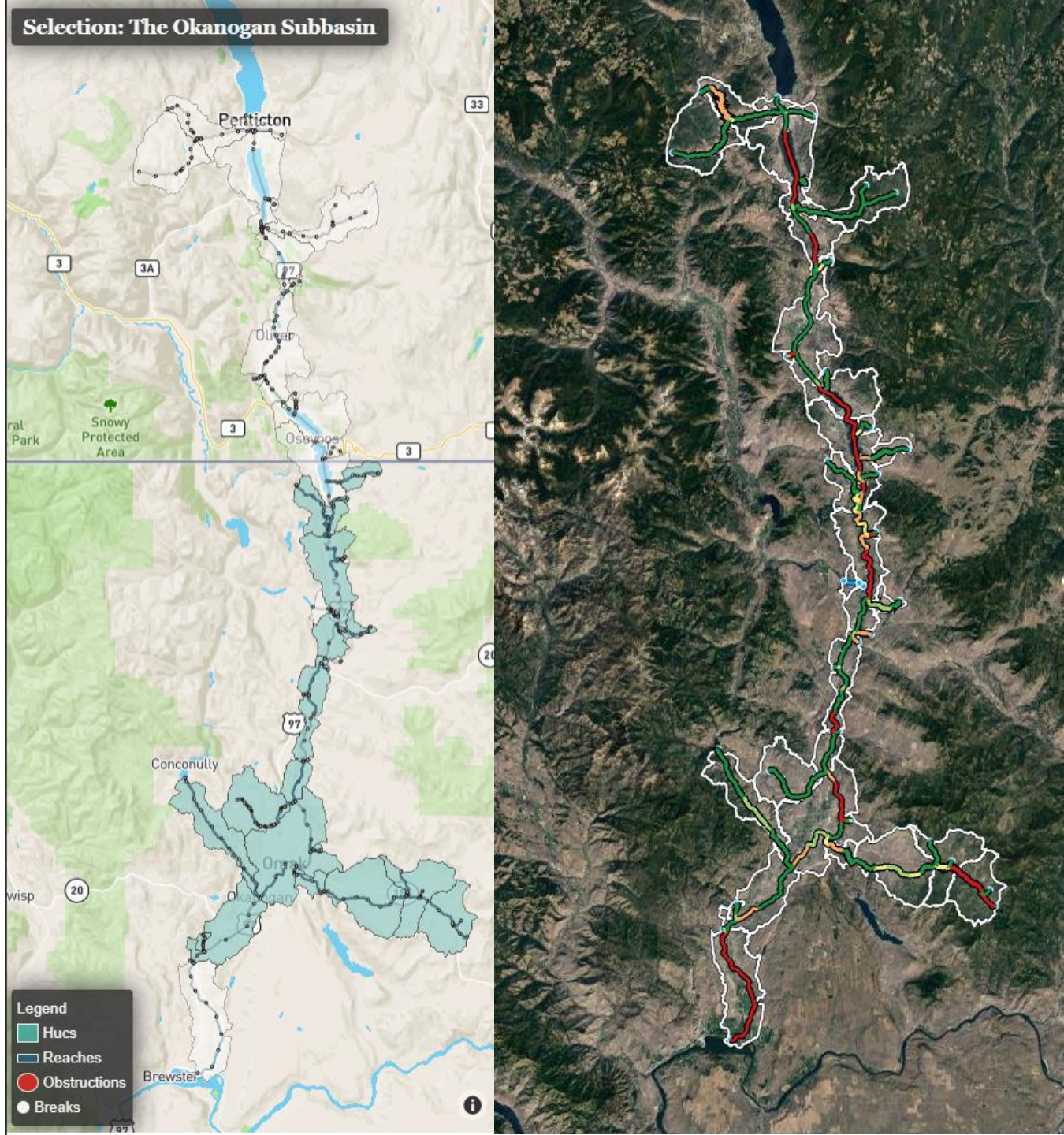
Okanogan EDT – The CTCR Proof of Concept

- **Integrates EDT with long-term monitoring**
  - EDT as data synthesis platform
  - Opportunity to challenge model with data
  - Lessons learned ► model & monitoring improvements
- **Status and trends reporting**
  - Three S&T reports completed (2009, 2013, 2017)
  - 2021 S&T report in development
  - 2040 climate change impacts
- **Customized reporting/planning tools**
  - Status and trends reporting
  - Restoration toolkit
- **Other applications**
  - Habitat and limiting factor prioritization
  - Restoration planning
  - WRIA 49 streamflow restoration (NEB analysis)



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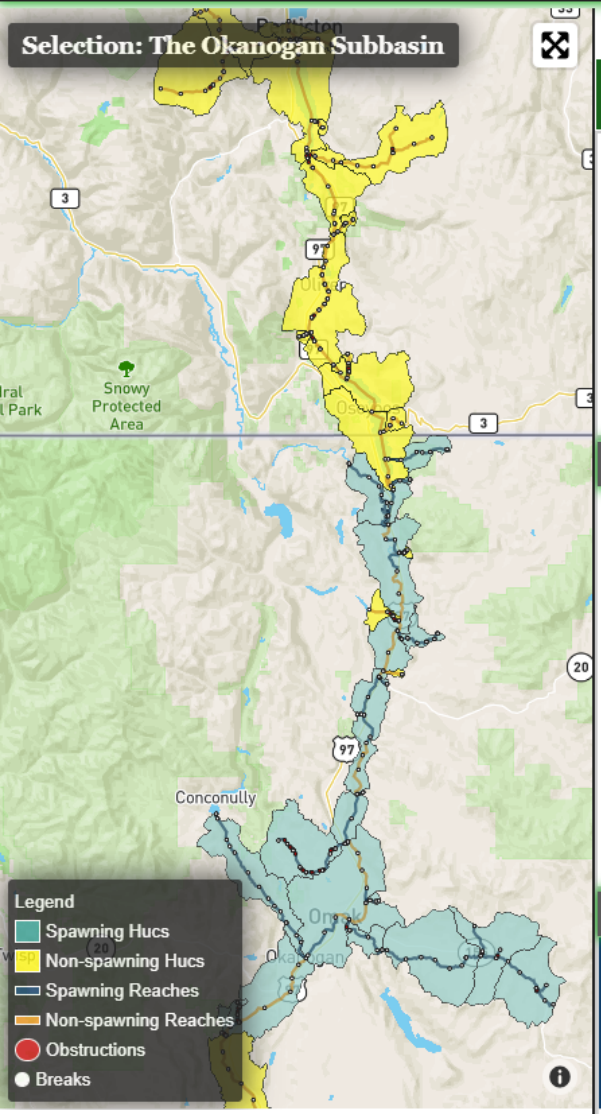
The Okanogan Subbasin Report Card: 2017 Habitat Status and Trend Cycle



Use the map above to navigate through the reports by clicking on individual assessment units and reaches. Report tab content will change with the selected scale.

View the Okanogan subbasin in detail

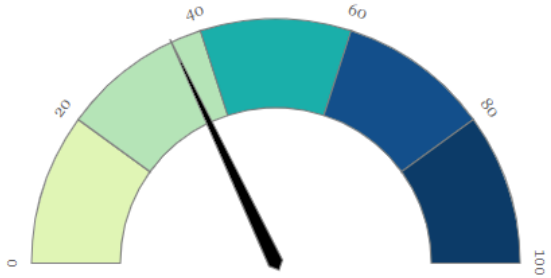
Country: United States | Species: Summer Steelhead | Status and Trend Year: 2017 | Trend Comparison: Template

Performance Summary | VSP Criteria Summary | Habitat Trends | Obstruction Performance | Implementation

Read me first! Welcome to the web-based Habitat Status and Trend Report Cards for the Okanogan Subbasin. The tabs directly above access different reporting metrics (hover on these for more info) and the filters found above the report tabs allow you to select the species, status and trend year, and trend comparison year. Note that the trend comparison filter selection will only affect results that are showing a trend, otherwise there will be no change to the data displayed. Hover over the "?" icons on each page for information about the associated features.

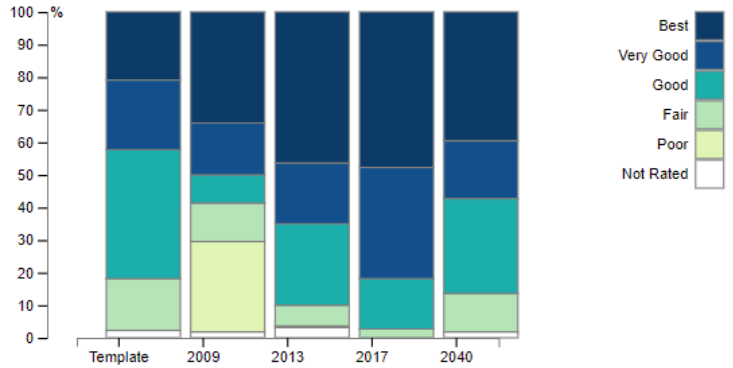
The first time you open the report cards and navigate to a new tab your browser will download all the associated data to your browser cache. Download time will vary depending on your internet connection speed. A progress-spinner will display over each report element until the download is complete. Once all the report card data are downloaded, they will remain available in your browser cache for instantaneous navigation as long as your viewing session remains open.

How is The Okanogan Subbasin Performing as Summer Steelhead Habitat?



In 2017 performed at **36%** of historic habitat potential.

How Good is the Information For The Okanogan Subbasin?

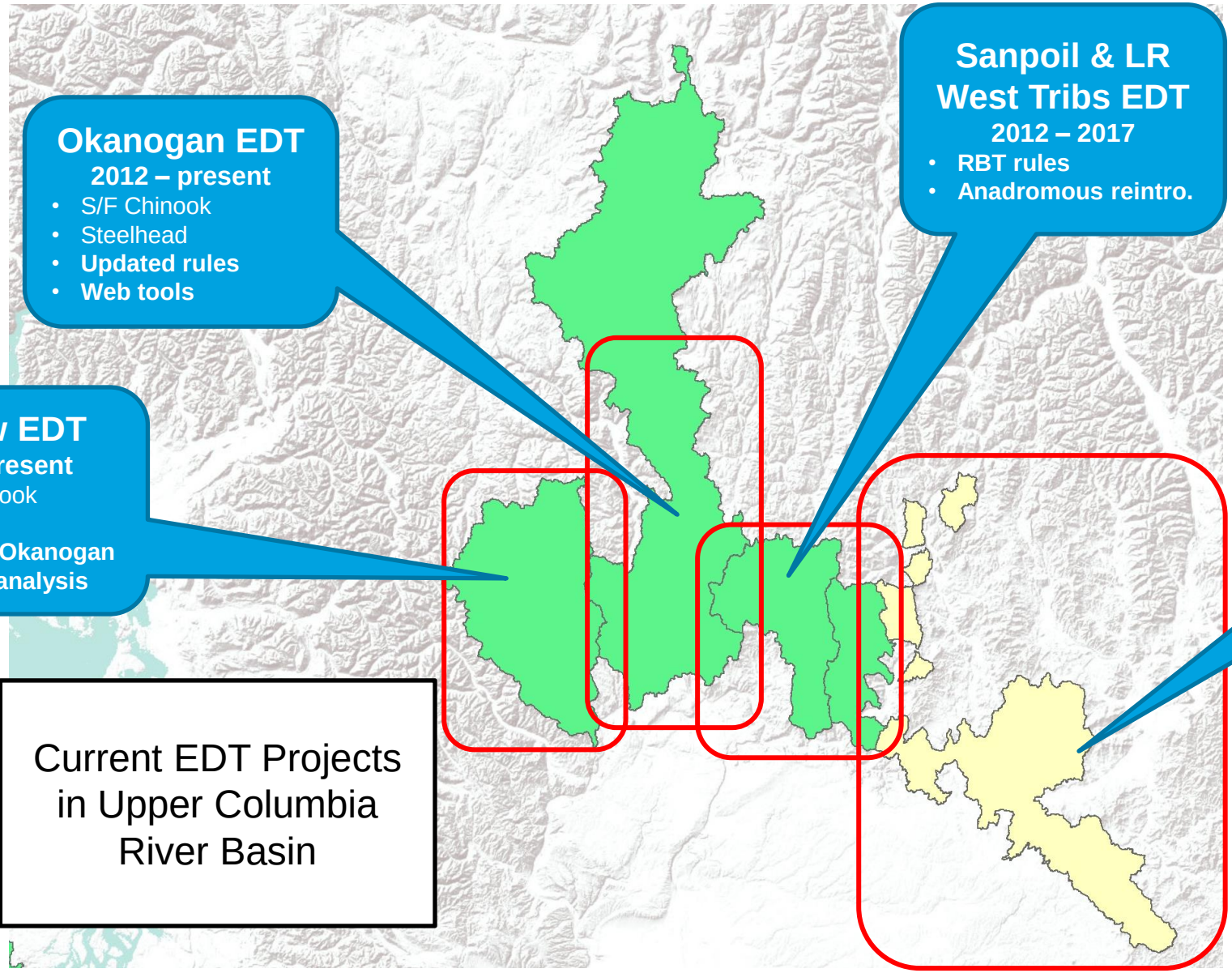


Population Performance Summary

Population Parameter	EDT Estimate	EDT Trend	Natural Origin Abundance ± 90% CI (range), Trend/year	Hatchery Origin Abundance ± 90% CI (range), Trend/year	Total Origin Abundance ± 90% CI (range), Trend/year	Data Source
Adult Abundance	334	−596	292 ± 18 (109-497), -46/year	945 ± 59 (825-1,066), -915/year	1273 ± 80 (1,027-1,411), -937/year	OBMEP 2014-2017 from redd surveys, and PIT-tag estimates.
Smolt Abundance	26,772	−31,632	No data	105,002 ± 551 (95,316-115,555), -2,967/year	Insufficient data	GPUD-BAM 2015-2018 hatchery releases only.

Scenario Assumptions: 2017

Regional EDT Projects and Available Resources



Okanogan EDT
2012 – present
- S/F Chinook
- Steelhead
- **Updated rules**
- **Web tools**

Sanpoil & LR West Tribs EDT
2012 – 2017
- **RBT rules**
- **Anadromous reintro.**

Spokane & LR East Tribs EDT
2017 – 2018
- Anadromous reintro.
- **Model geometry**
- **Prelim. patient scenario**
- **Dam passage**

Methow EDT
2017 – present
- Spring Chinook
- Steelhead
- **Leverages Okanogan**
- **Data gaps analysis**

Current EDT Projects in Upper Columbia River Basin

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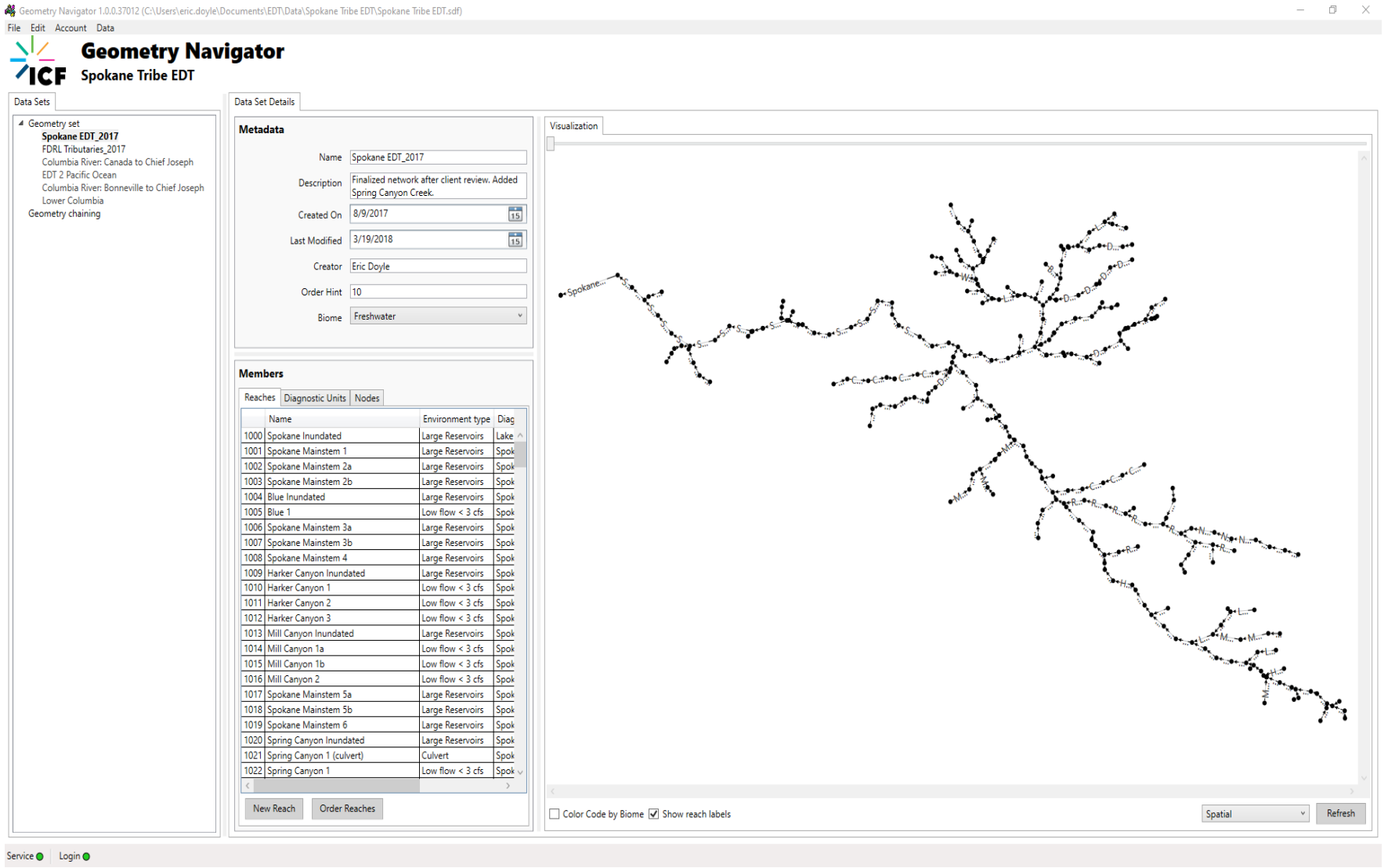
Spokane EDT – Phase I Anadromous Reintroduction

- **Reach and AU Network**
  - ‘Common spatial currency’
  - 51 Assessment Units
  - 271 habitat reaches
  - 786 stream & reservoir km
- **Three Populations**
  - Spring Chinook
  - Summer/fall Chinook
  - Summer steelhead
- **One Habitat Scenario**
  - Partial “2017” Patient



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Robust QA/QC and Data Documentation

- **All ratings have metadata:**
  - QA/QC record
  - Data Source
  - Researcher
  - Level of Proof

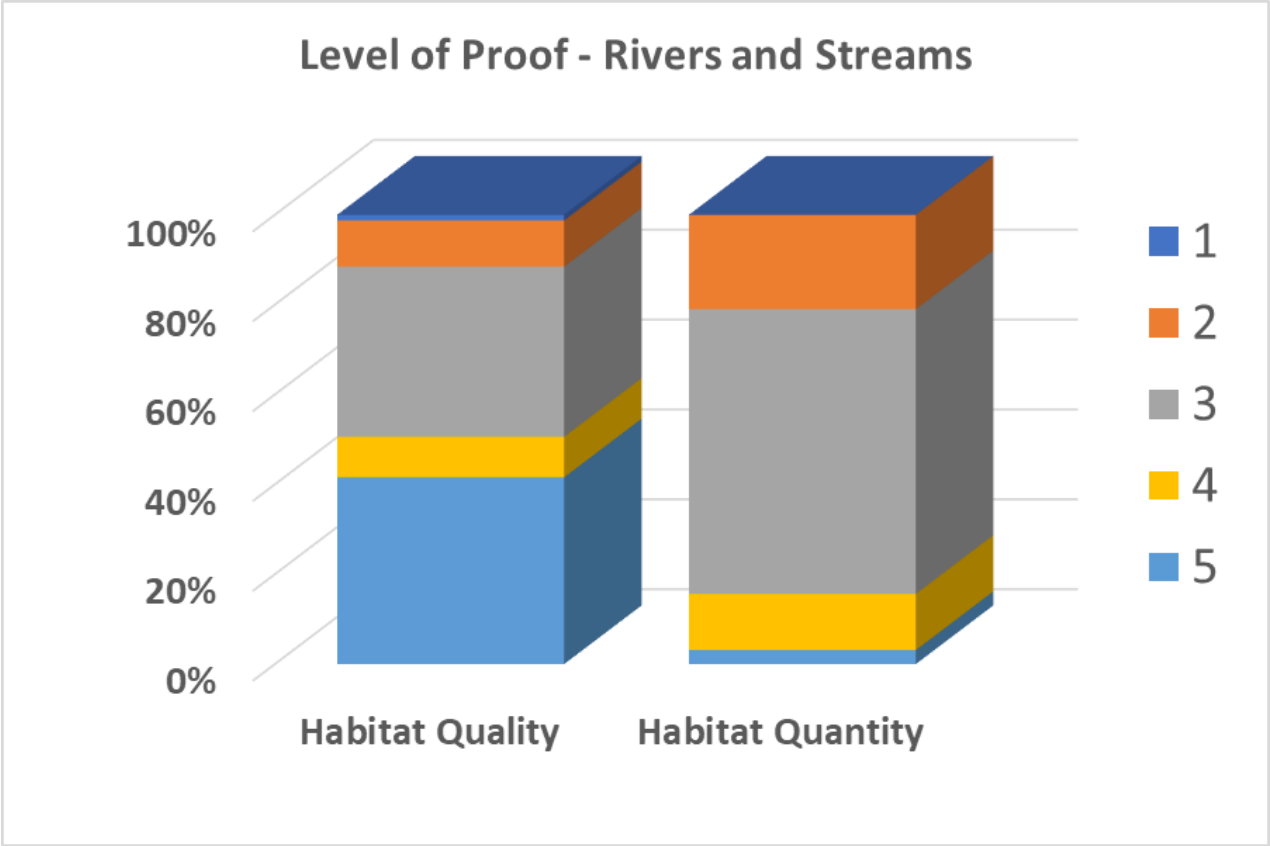
- **LOP rating scale**
  1. High confidence
  2. Moderate-high confidence
  3. Moderate confidence
  4. Lower confidence
  5. Hypothetical

Reach	Environment Attribute	Month	Environment Attribute Valu	Level of Proof	Description
Wells-Methow	Temperature: Daily Maximum	7	1	3	Estimated based on prior reservoir modeling
LM1	Temperature: Daily Maximum	7	3.1175	1	MRC monitoring station LM 01, 97 Bridge at Pateros
LM2					
LM3					
LM4					
LM5					
Black Canyon					
Black Canyon					
Black Canyon					
Black Canyon					
LM6					
SQW 1					
LM7					
LM8	Temperature: Daily Maximum	7	2.51766667	2	Extrapolated from LM7 AND LM12
LM9	Temperature: Daily Maximum	7	2.522	2	Extrapolated from LM7 AND LM12

Environment Attribute Value	Level of Proof	Description	Reporter
1	3	Estimated based on prior reservoir modeling	E. Doyle
3.1175	1	MRC monitoring station LM 01, 97 Bridge at Pateros	E. Doyle
3.041979167	2	Extrapolated from LM1 and LM7	E. Doyle
2.966458333	2	Extrapolated from LM1 and LM7	E. Doyle
2.8909375	2	Extrapolated from LM1 and LM7	E. Doyle
2.815416667	2	Extrapolated from LM1 and LM7	E. Doyle
1.7625	2	Extrapolated from Black Canyon 2	E. Doyle
1.7625	1	MRC monitoring station LM 04, Black Canyon Creek RM 1	E. Doyle
1.7625	2	Extrapolated from Black Canyon 2	E. Doyle

Data Gaps Analysis – First Cut at Streams

- **23 of 40 Habitat/Environmental Attributes**
  - 8 habitat quantity (composition)
  - 15 habitat quality (WQ, flow, temperature substrate, wood, etc.)
- **Data Sources**
  - WDFW/Ecology/CDAT habitat surveys
  - SCCD biomonitoring
  - USGS flow data
  - Remote sensing, GIS, spatial modeling
  - Interpolation from similar reaches
- **Key Missing Pieces**
  - Obstructions!!
  - Missing 10 key attributes (see Table 4-2 in anadromous reintroduction analysis)
  - Rules updates



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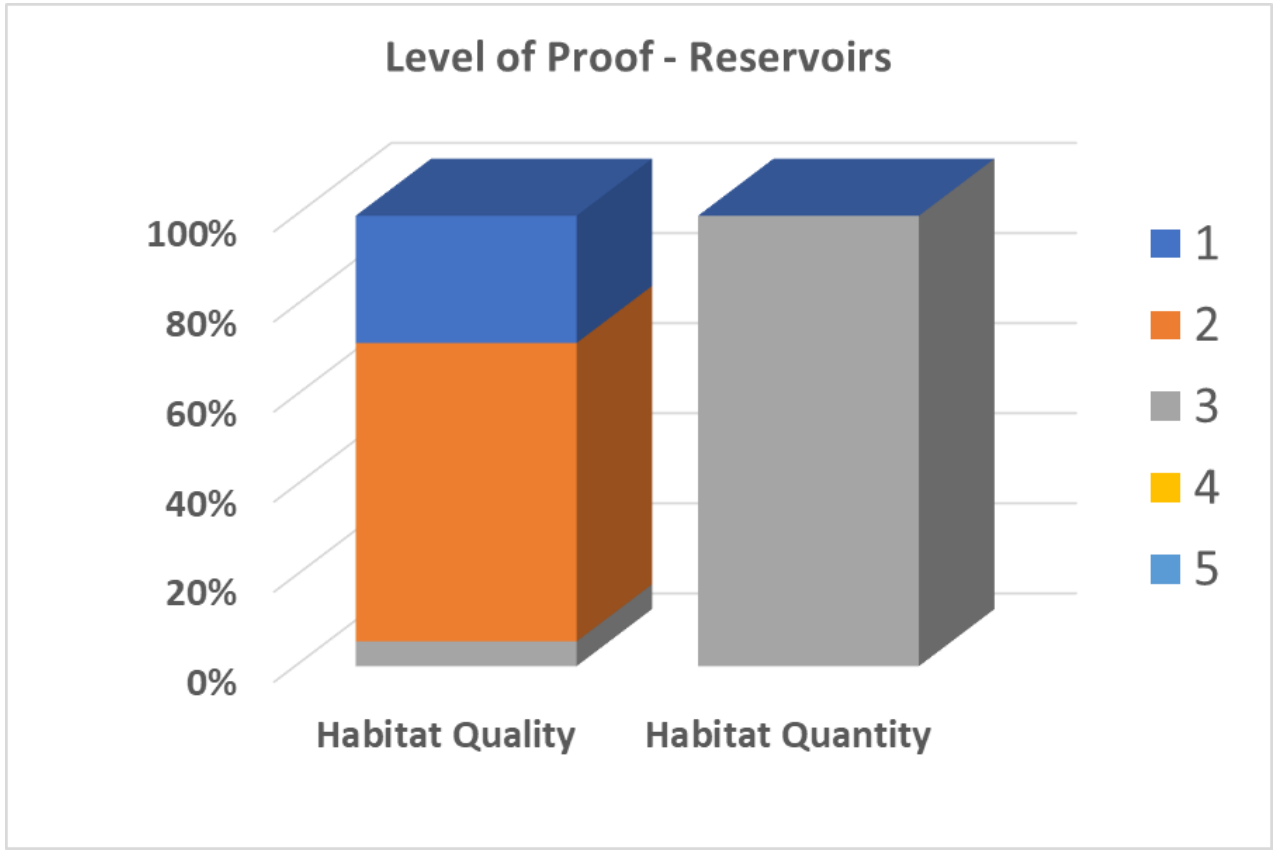
Data Gaps Analysis – First Cut at Reservoirs

- **Fewer EDT attributes required**
  - Littoral/limnetic composition
  - Temperature (by habitat type)
  - DO (by habitat type)
  - Predation
  - Littoral zone cover (woody debris/vegetation)
- **Data sources**
  - Observed predation rates (LR, Long Lake)
  - AVISTA WQAP monitoring data
  - STOI limnological data
  - GIS, aerial imagery interpretation
  - See Table 4-1 in anad reintro analysis
- **Reservoir management emphasis**
  - Parameterize for status and trends?
  - For example – parameterize using CE-QUAL



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Fish Passage/Obstructions

Consider Now for Redbands

- **In-basin obstructions – A missing link!**
  - Assumed full restoration for reintroduction analysis
  - Not included in current reach network
  - Necessary for prioritization
- **Little Falls, Long Lake, Nine Mile (each dam)**
  - 2008 FCRPS BiOp survival: 95% juvenile downstream, 98% adult upstream

Consider Later for Anadromous

- **Grand Coulee and Chief Joseph (each dam)**
  - 2008 FCRPS BiOp: 95% downstream, 98% upstream
  - Moderate: 90% downstream, 97% upstream
  - Low: 85% downstream, 95% upstream
- **Migratory corridor and ocean**
  - Calibrated to observed survival
  - EDT survival ≈ 2008-2015 observed mean
  - Parameters being revised for other projects

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Building Spokane EDT – What About Process?

- **Workshops**
  - Geometry
  - Populations
  - Patient scenario – New/updated data?
  - Template and degraded scenario
- **Points of Contact**
  - Project PM
  - POCs for data and information
  - QA/QC lead(s) – Review and approve EDT inputs
- **Deliverables**
  - EDT inputs & metadata with QA/QC record
  - Data gap analysis
  - Generate RBT habitat performance/prioritization results
  - RBT recovery strategy (EDT components)
  - Others?

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Building Spokane EDT –Technical Next Steps

1. **Review and update model geometry**
   - Expand to include resident habitat?
   - Review/update AU structure?
   - Obstructions!
2. **Revise/Complete Patient Scenario**
   - Incorporate new data
   - Address data gaps, QA/QC model inputs
3. **Template and Degraded Scenarios**
4. **Model Populations**
   - Build RBT populations
   - Anadromous populations good?
5. **Update RBT rules?**
6. **Generate EDT Results**
7. **Develop Recovery Plan**
   - EDT habitat priorities
   - Other management measures
8. **Define Long-term Objectives**

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Thanks for listening!

EDT Links:
https://ecosystems.azurewebsites.net/Applications/EDT/
https://ecosystems.azurewebsites.net/hstr-methow/
https://ecosystems.azurewebsites.net/hstr-okanogan/

Learn More About Okanogan EDT:
https://afspubs.onlinelibrary.wiley.com/doi/10.1002/fsh.10721

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What about access to EDT?

Question	Answer
Is EDT proprietary?	• Yes, it's IP but… • EDT modules available to everyone, for **FREE** • https://ecosystems.azurewebsites.net/Applications/EDT/ • Source code published on the web
Who keeps the information?	• Local version of DB on your desktop • Synchronized with EDT3 cloud server
Who gets access?	• **Anyone who wants it!** • Download EDT3 modules, create an account • Voila! Automatic public-level access • **You determine permissions**
How will data be available?	• Model inputs/results via direct download • Web-based results maps, report cards • Other methods as determined by you

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