Spokane River Watershed EDT data gaps and collection protocols

Spokane Tribe of Indians

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PROGRESS & NEXT STEPS

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Project Purpose

Today: Recap of the project, accomplishments so far, and next steps

- **Objective**: Assess data gaps and recommend data collection protocols needed to update existing Ecosystem Diagnosis and Treatment (EDT) modeling for the Spokane River Watershed

- **Goal**: Enable a habitat limiting factors analysis for spring and summer/fall Chinook and all life history strategies of *Oncorhynchus mykiss*.

  - Ultimately, the habitat limiting factors analysis will be used to develop a habitat restoration strategy and will aid recovery planning.

Ecosystem Diagnosis & Treatment (EDT)

What is EDT?

- Ecosystem Diagnosis & Treatment model (Lestelle et al. 2004)
- The EDT model relates habitat conditions to species performance (productivity, abundance, and life history diversity) via a set of biological rules.
- The biological rules are mathematical relationships between habitat variables and the performance of the focal species
- Biological rules are primarily from relationships found in peer-reviewed literature.

Why use EDT?

- Can be used to identify and prioritize restoration actions and to develop a watershed restoration strategy.

Past EDT Modeling

- EDT modeling was conducted for the Spokane basin (ICF 2018a)

- Produced an analysis of current habitat suitability for anadromous summer steelhead, summer/fall Chinook, and spring Chinook

- Modeled the patient/current condition scenario only (not template/historical)

- ICF reported lack of data and spatially extensive data gaps for several key habitat attributes

- Some attributes could not be parameterized, others were parameterized through watershed modeling, spatial analysis, aerial imagery interpolation and extrapolation between reaches of similar watershed conditions.

"This habitat scenario is considered preliminary and only partially complete due to a lack of suitable data and information for parameterizing several important habitat attributes." (ICF 2018a)
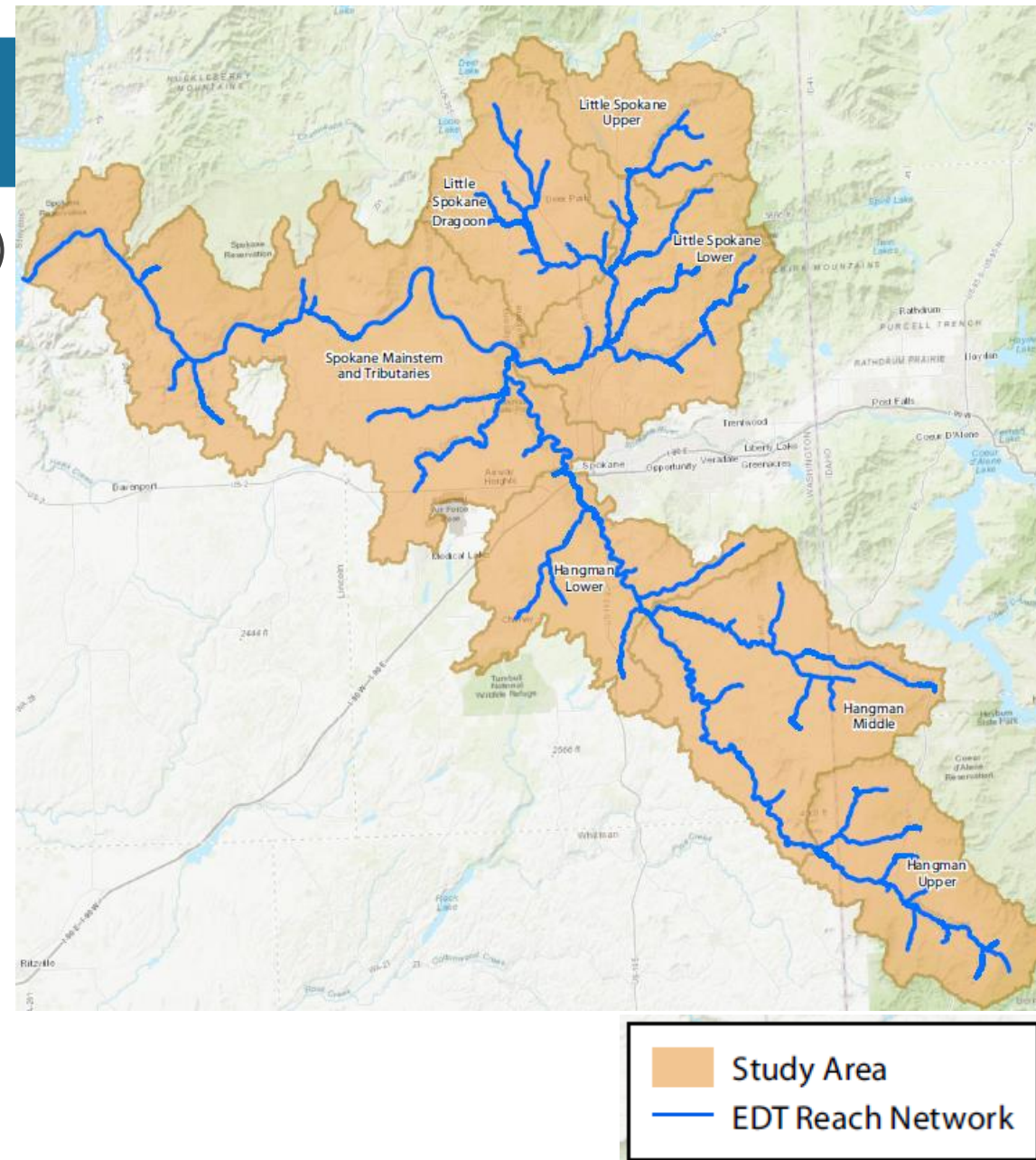
Scope of work

Communication & collaboration with Lead Entity Technical Team

Task 1.
Identify data gaps from previous EDT modeling

Task 2.
Evaluate partner data

Task 3.
Propose data collection protocols

Task 4.
Reporting

Communication & Collaboration with Tech Team

Communication & collaboration

Kickoff Workshop
- Held a half day kickoff workshop on April 27th during the Spokane River Forum to introduce the project, establish contacts and begin brainstorming sources of partner data

Biweekly meetings with Lead Entity Technical Team
- For the project duration, we've held biweekly meetings with the Lead Entity Technical Team
- Progress updates
- Technical assistance, input and feedback on analysis

Task 1 - Methods

Task 1.

Identify data gaps from previous EDT modeling

1.1 Inventory previous model assumptions and identified data gaps
- Reviewed ICF 2018 report and prior model inputs and outputs
- Assessed Level of Proof scores, quality and spatial coverage of input data, attributes not previously parameterized due to insufficient data

1.2 Conduct a sensitivity analysis to identify the most critical data gaps
- Assessed the variability of each model attribute and sensitivity of model output to each attribute based on EDT species-habitat rules (ICF 2018b)

1.3 Rank data gaps by priority level
- Ranked based on level of proof scores and model sensitivity

EDT Habitat Attributes

- Parameterized at the EDT reach level by month, different attributes for reservoir vs riverine habitat. Attribute sensitivity 1=highest, 5 = lowest (ICF 2018b). *New attribute or not previously parameterized

#	Category	EDT Habitat Attribute	Habitat Where Applied	Attribute Sensitivity	#	Category	EDT Habitat Attribute	Habitat Where Applied	Attribute Sensitivity
1	Channel Morphometry	Channel length	Reservoir, Riverine	1	21	Riparian & channel integrity	Bed scour*	Riverine	2
2		Channel width*	Reservoir, Riverine	1	22		Riparian/stream interface*	Riverine	4
3		Gradient	Riverine	1	23		Woody Debris	Reservoir, Riverine	3
4	Confinement	Confinement: Artificial*	Riverine	4	24	Sediment	Fine Sediment	Riverine	1
5		Confinement: Natural	Riverine	5	25		Embeddedness	Riverine	1
6	Withdrawals	Water withdrawals*	Reservoir, Riverine	2	26		Total Suspended Solids*	Riverine	3
7	Habitat composition	Habitat type - Limnetic	Reservoir	1	27	Hydrologic	Flow: Inter-Annual High Flow Var.	Riverine	2
8		Littoral	Reservoir	1	28		Flow: Inter-Annual Low Flow Var.	Riverine	2
9		Backwater Pools	Riverine	1	29		Flow: Intra-Annual Variation	Riverine	2
10		Beaver Ponds	Riverine	1	30	Temperature	Temperature: Daily Maximum	Reservoir, Riverine	1
11		Glides	Riverine	1	31		Temperature: Daily Minimum	Riverine	1
12		Large Cobble Riffles	Riverine	1	32		Temperature: Spatial Variation	Riverine	2
13		Pool Tails	Riverine	1	33		Temperature - Food Effect*	Riverine	2
14		Scour Pools	Riverine	1	34	Chemistry	Dissolved Oxygen	Reservoir, Riverine	2
15		Small Cobble Riffles	Riverine	1	35		Alkalinity	Riverine	2
16		Side Channel*	Riverine	1	36	Biological	Benthic Richness	Riverine	5
17		Thermal refugia*	Riverine	1	37		Fish Community Richness*	Riverine	3
18		Seasonally indundated floodplain*	Riverine	1	38		Fish Species Introductions*	Riverine	3
19		Floodplain ponds*	Riverine	1	39		Predation Risk	Reservoir, Riverine	2
20		Groundwater channels*	Riverine	1	40		Hatchery Fish Outplants*	Riverine	2
					41		Interspecific competition - adult*	Riverine	3
					42		Introductions - competitors*	Riverine	3
					43		Fish Pathogens	Riverine	3

ICF Level of Proof Scores (LOP)

- Assigned by ICF to describe level of confidence in underlying data

- When combined with the attribute sensitivity score, can be used to rank the most impactful data gaps

Table 2-3. EDT Level of Proof rating definitions.

Rating	Definition	Example
1	Thoroughly established, generally accepted, supported by peer-reviewed empirical evidence and/or data with representative geographic coverage	Current, high-quality empirical data that is representative of reach-level habitat conditions
2	Strong weight of evidence in support but not fully conclusive	Empirical data more than 10 years old Aerial imagery interpretation High-certainty model-derived attributes (e.g. gradient, valley confinement)
3	Theoretical support with some evidence from experiments or direct observations	Current professional knowledge Extrapolation from empirical data in similar reaches
4	Speculative, little empirical support or limited observation	Low-certainty model-derived attributes Extrapolation from general regional monitoring (e.g. EMAP)
5	Presumptive, not based on empirical data or direct observation	Hypothetical rating based on general watershed characteristics No attribute rating

Inundated reservoir habitats

- Reservoir data gaps (before filling with partner data) ranked by weighted LOP score (attribute sensitivity x LOP)
- No highest priority gaps (better data and fewer attributes to parameterize than riverine habitats)

	Percent of reaches				
	Highest Priority	Moderate to high priority	Moderate priority	Moderate to low priority	Low priority
Dissolved Oxygen	0.0%	0.0%	18.6%	81.4%	0.0%
Limnetic	0.0%	100.0%	0.0%	0.0%	0.0%
Littoral	0.0%	100.0%	0.0%	0.0%	0.0%
Predation Risk	0.0%	0.0%	100.0%	0.0%	0.0%
Temperature: Daily Maximum	0.0%	0.0%	10.8%	50.8%	38.5%
Woody Debris	0.0%	0.0%	100.0%	0.0%	0.0%

Note: Draft priority ranks to be finalized

Riverine habitat: before filling with partner data

	Percent of reaches				
	Highest Priority	Moderate to high priority	Moderate priority	Moderate to low priority	Low priority
Channel width	100%	0%	0%	0%	0%
Gradient	0%	0%	0%	0%	100%
Confinement: Artificial	0%	0%	100%	0%	0%
Confinement: Natural	0%	0%	0%	0%	100%
Water Withdrawals	0%	100%	0%	0%	0%
Beaver Ponds	0%	94%	6%	0%	0%
Backwater Pools	0%	100%	0%	0%	0%
Glides	0%	0%	61%	39%	0%
floodplain ponds	100%	0%	0%	0%	0%
groundwater channels	100%	0%	0%	0%	0%
seasonally inundated floodplain	100%	0%	0%	0%	0%
side channel	100%	0%	0%	0%	0%
thermal refugia	100%	0%	0%	0%	0%
Large Cobble Riffles	0%	61%	39%	0%	0%
Pool Tails	0%	100%	0%	0%	0%
Scour pools	0%	55%	45%	0%	0%
Small Cobble Riffles	0%	61%	39%	0%	0%
Bed Scour	0%	100%	0%	0%	0%
Embeddedness	0%	69%	28%	0%	2%
Fine Sediment	0%	69%	31%	0%	0%

	Percent of reaches				
	Highest Priority	Moderate to high priority	Moderate priority	Moderate to low priority	Low priority
Total Suspended Solids	0%	100%	0%	0%	0%
Flow: Inter-Annual High Flow Variation	0%	0%	94%	6%	0%
Flow: Inter-Annual Low Flow Variation	0%	0%	94%	6%	0%
Flow: Intra-Annual Variation	0%	0%	94%	6%	0%
Temperature - food effect	0%	100%	0%	0%	0%
Temperature: Daily Maximum	0%	0%	53%	47%	0%
Temperature: Daily Minimum	0%	0%	86%	7%	7%
Temperature: Spatial Variation	0%	0%	100%	0%	0%
Riparian/stream interface	0%	0%	100%	0%	0%
Woody Debris	0%	0%	97%	3%	0%
Benthic Richness	0%	0%	0%	100%	0%
Fish Community Richness	0%	100%	0%	0%	0%
Fish Pathogens	0%	100%	0%	0%	0%
Fish Species Introductions	0%	100%	0%	0%	0%
Hatchery Fish Outplants	0%	100%	0%	0%	0%
Predation Risk	0%	100%	0%	0%	0%
Interspecific competition - adult	0%	100%	0%	0%	0%
Introductions - competitors	0%	100%	0%	0%	0%
Dissolved Oxygen	0%	58%	40%	2%	0%
Alkalinity	0%	0%	100%	0%	0%

Note: Draft priority ranks to be finalized

Task 2 - Methods

Task 2.
Evaluate partner data

### 2.1 Identify previously omitted or new data to address gaps

- Summarized EDT attributes and gaps for Technical Team

- Circulated an online data survey to identify data types and monitoring available from partners

- Followed up with those with relevant new or omitted data to get more information

- Produced an inventory of partner data available (to be included with report)

- **In progress**: Filling data gaps using partner data

  - Highlights so far:

    - New data for several mainstem tributaries

    - Updated temp, flow and water quality for mainstem

    - New/omitted habitat, sediment and water quality for Hangman and Little Spokane

2.2 Expand the reach network be include redband trout

- Held virtual workshop with Technical Team to expand the reach network based on expert opinion, existing redband trout distribution layers and intrinsic potential
- Created new reaches of 1-5 km length based on uniformity of gradient, confinement, locations of confluences, changes in land cover/veg and for overly long reaches we used landmarks (e.g. roads).
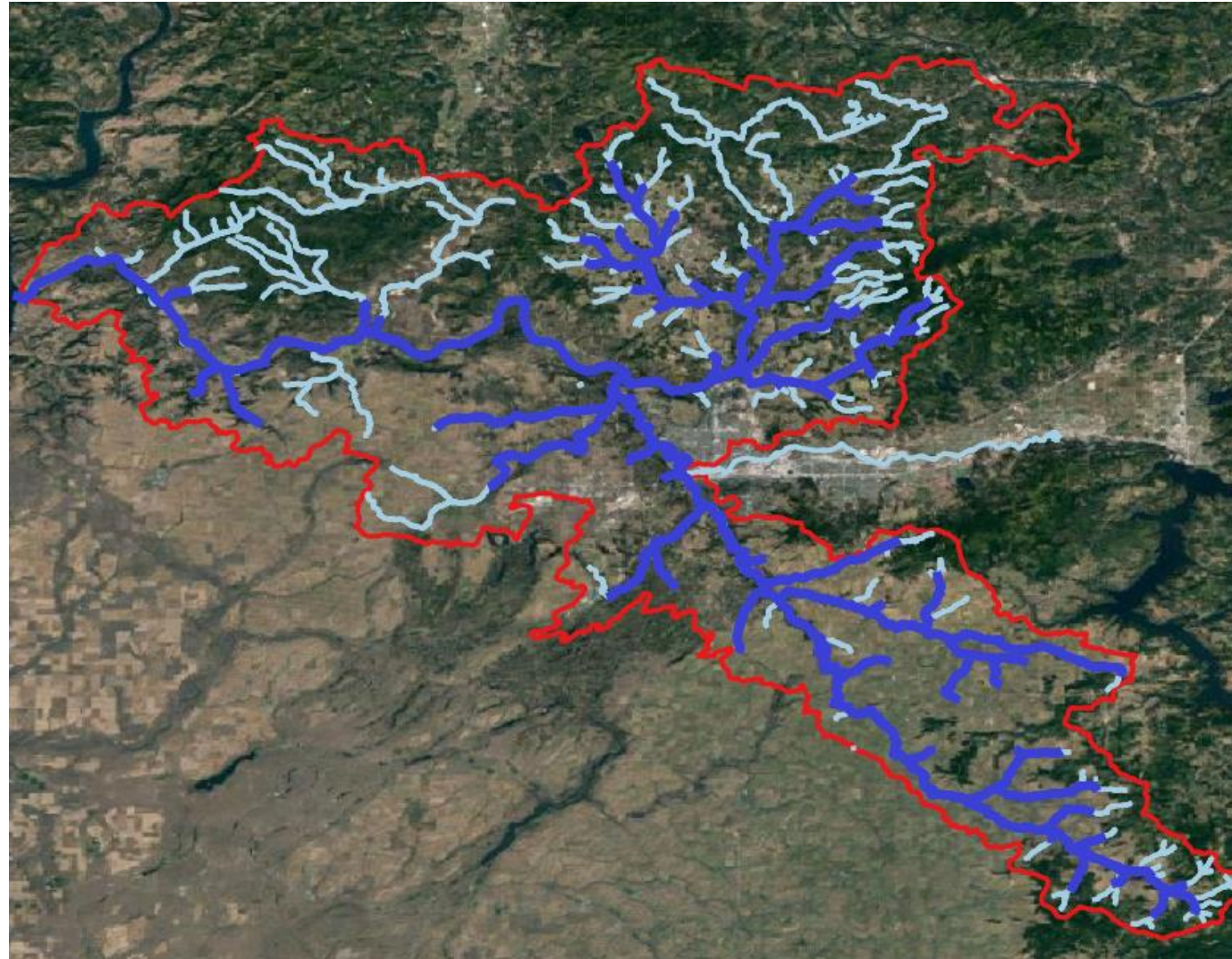
Task 2 - Methods

Task 2.

Evaluate partner data

2.3 Finalize data gaps analysis, ranked by influence and confidence

- **In progress**: Identifying gaps that can and cannot be filled with partner or to be available remote sensing data.
- Updating the ranks from Task 1
- Results will be presented as summary tables for reporting watersheds and reach reports

Task 3 - Methods

Task 3.
Propose data collection protocols

3.1 Evaluate feasible protocols and provide recommendations
- **In progress**: providing both field and remote sensing protocols
- Okanogan Basin Monitoring & Evaluation Program (OBMEP) has been a helpful resource for protocols

3.2 Provide specific protocols to derive EDT modeling parameters from specific types of remote sensing data.
- **In progress**: Providing protocols to derive EDT inputs from remote sensing, ground truthing field protocols, level of ground truthing effort needed

3.3 Update the data inventory to reflect the gaps that would be filled using recommended protocols, and remaining gaps

- **In progress:** to be completed after finished with protocols and partner data evaluation

Task 4

Task 4.
Reporting

4.1 Draft Report
- **In progress**
- EDT data gaps and ranks
- Inventory of partner and remote sensing data, with rationale for if the data was not used
- Specific protocols to derive EDT parameters from remote sensing data and field data collection protocols to fill remaining gaps
- Additional products: spatial layer for updated reach network

4.2 Final Report
- Will share the draft report with the group and incorporate feedback.

Next steps

- Currently working on wrapping up filling data gaps with partner data, particularly for new reaches added for redband trout. When completed, will finalize the data gaps analysis.

- Finishing up compilation of field sampling protocols, developing remote sensing protocols with recommended ground truth effort

- Working on reporting

Questions & Feedback

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