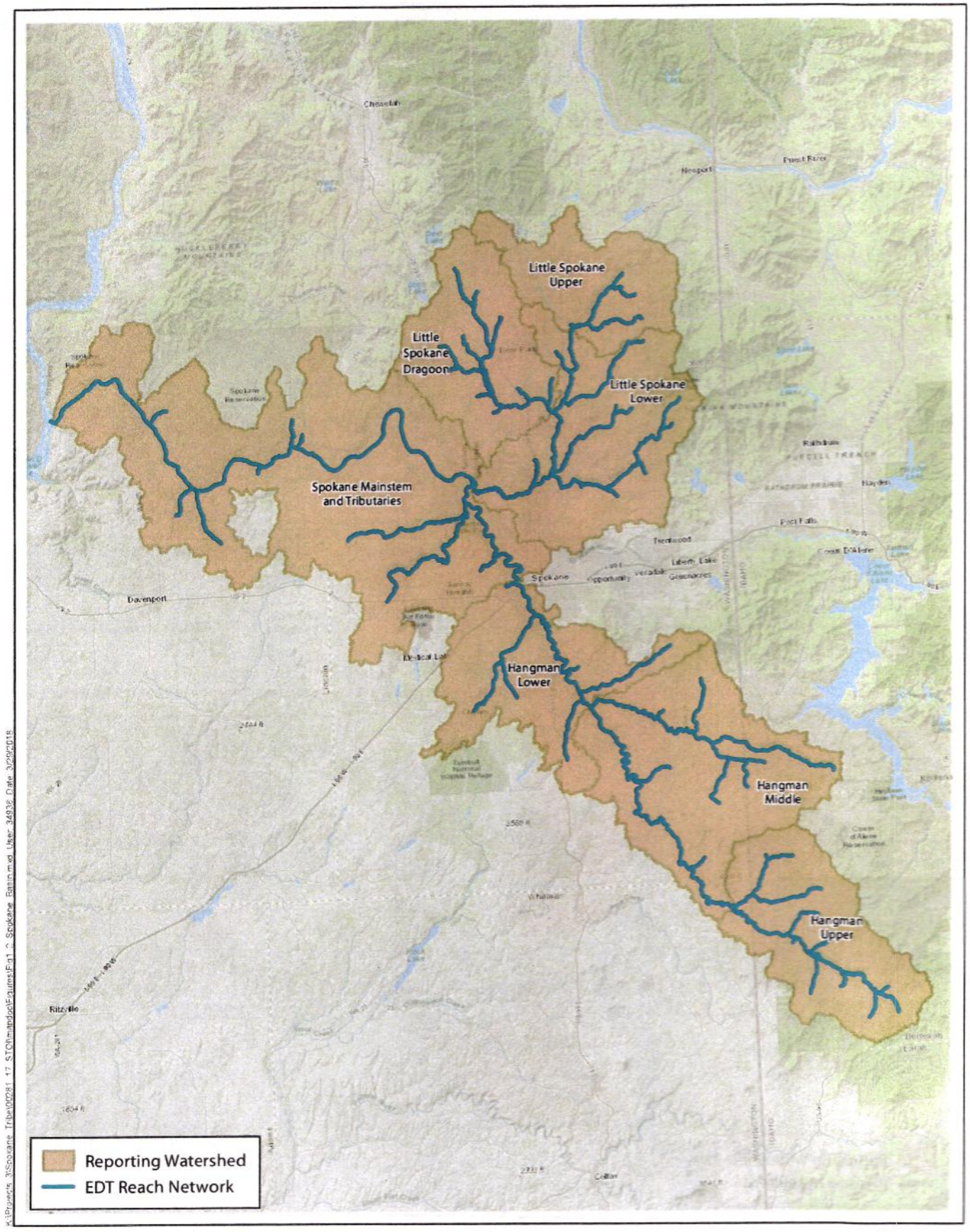


Figure 1-2
Spokane River Basin HUC 10 Analysis Watersheds

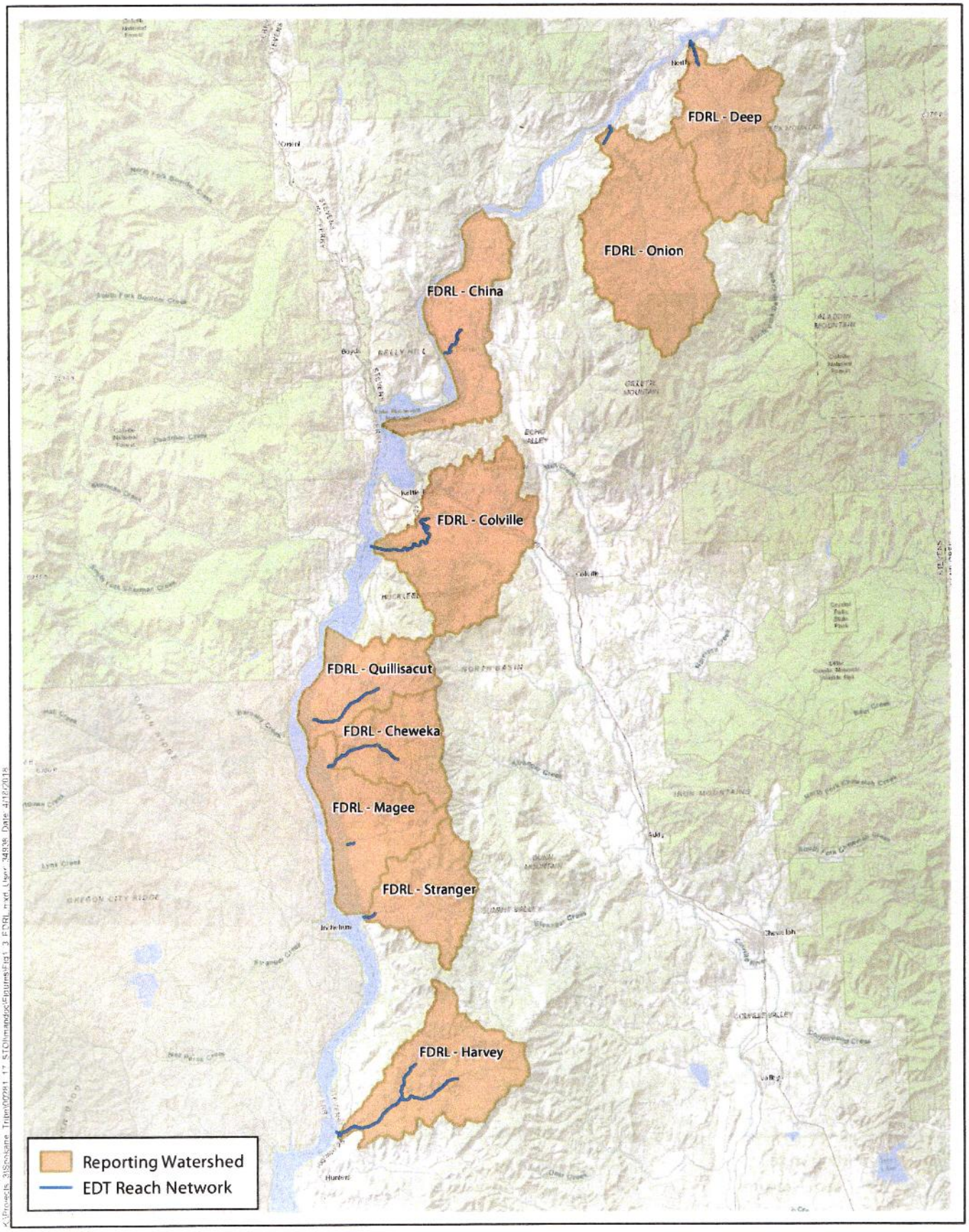
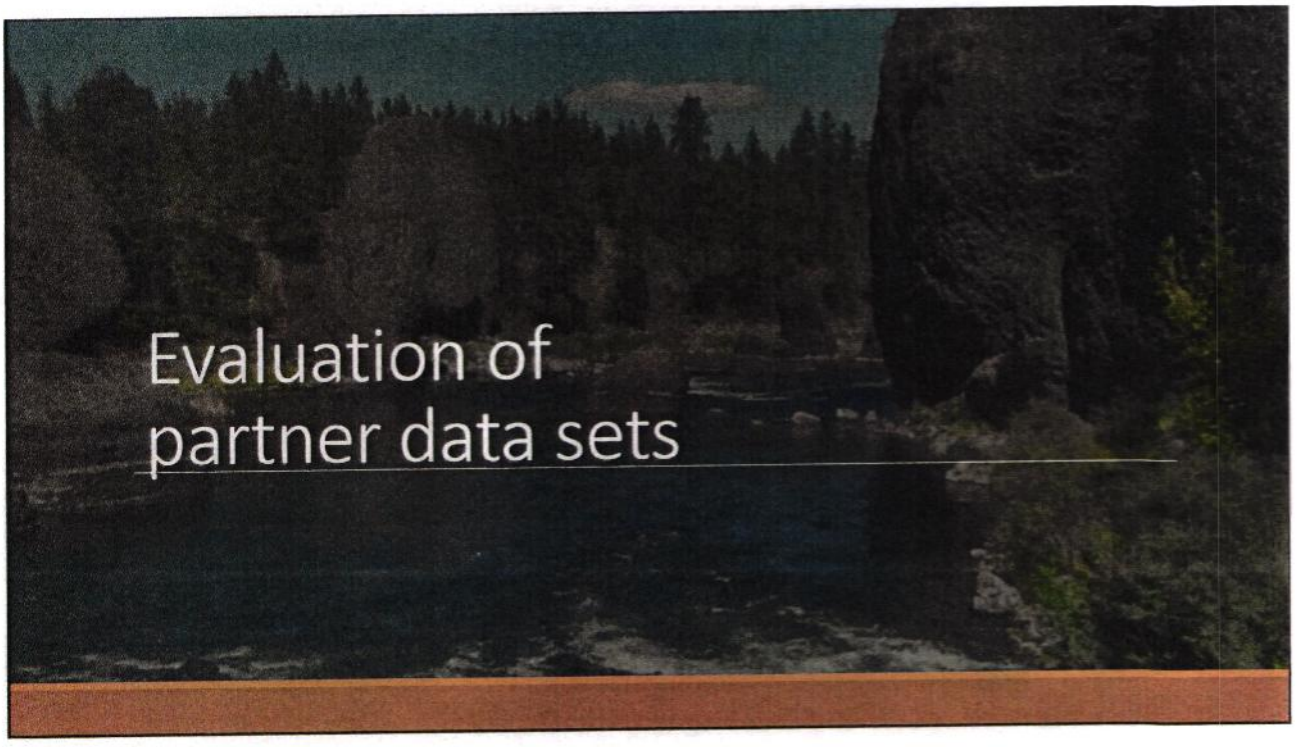


Figure 1-3
Select FDRL Tributaries HUC 12 Analysis Subwatersheds



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Discussion of partner data sets

Questions to guide discussion for each watershed

- Have you collected new data since 2018 that may address data gaps?
- Are you aware of previously omitted data?
- Can you think of other groups that may have data that were not previously considered?
- Is there field or remote sensing data that you expect will become available in the next year?

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Which EDT metrics can remote sensing address?

- Just a preview – more to come in Kai's talk later this afternoon.

#	Category	Habitat Attribute	Where Applied
1	Channel Morphometry	Gradient	Riverine
2	Confinement	Confinement: Artificial	Riverine
3		Confinement: Natural	Riverine
4	Sediment	Total Suspended Solids	Riverine
5		Embeddedness	Riverine
6		Fine Sediment	Riverine
7	Hydrologic	Flow: Inter-Annual High Flow Var.	Riverine
8		Flow: Inter-Annual Low Flow Var.	Riverine
9		Flow: Intra-Annual Variation	Riverine
10		Water Withdrawals	Riverine
11	Temperature	Temperature: Daily Maximum	Reservoir, Riverine
12		Temperature: Daily Minimum	Riverine
13		Temperature: Spatial Variation	Riverine
14	Chemistry	Dissolved Oxygen	Reservoir, Riverine
15		Alkalinity	Riverine
16		Nutrient Enrichment	Riverine
17	Riparian & channel integrity	Bed scour	Riverine
18		Riparian Function	Riverine
19		Woody Debris	Reservoir, Riverine

No, requires other data
Slight potential to inform, but as a proxy at best
Remote sensing can do this

#	Category	Habitat Attribute	Where Applied
20	Biological	Benthic Richness	Riverine
21		Fish Community Richness	Riverine
22		Fish Species Introductions	Riverine
23		Predation Risk	Reservoir, Riverine
24		Hatchery Fish Outplants	Riverine
25		Fish Pathogens	Riverine
26	Habitat type	Limnetic	Reservoir
27		Littoral	Reservoir
28		Backwater Pools	Riverine
29		Beaver Ponds	Riverine
30		Glides	Riverine
31		Large Cobble Riffles	Riverine
32		Off Channel Habitat Factor	Riverine
33		Pool Tails	Riverine
34		Scour Pools	Riverine
35		Small Cobble Riffles	Riverine

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Spokane Mainstem and Tributaries

Reporting watershed	Data sources	All attributes
Spokane Mainstem & Tribs	ICF-interpolated	42.40%
	Aerial imagery	29.20%
	NetMap	11.60%
	USFS	7.80%
	NetMap-LEMMA	5.80%
	Avista	1.20%
	STOI	0.80%
	USGS	0.80%
	ECY	0.30%
	NorWeST	0.20%
	SCCD	0.10%

- Have you collected new data since 2018?
- Are you aware of previously omitted data?
- Can you think of other groups that may have data that were not previously considered?
- Is there field or remote sensing data that you expect will become available in the next year?

Common riverine data gaps:

- **Major:** fish community richness, fish pathogens, fish species introductions, hatchery fish outplants, predation risk, nutrient enrichment, total suspended solids, water withdrawals, bed scour, confinement-artificial
- **Moderate:** Benthic Richness, DO, embeddedness, fine sediment, backwater pools
- **Minor:** Alkalinity, flow, temperature, riparian function, woody debris, habitat quantity attributes

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Little Spokane River

Common riverine data gaps:

- **Major:** fish community richness, fish pathogens, fish species introductions, hatchery fish outplants, predation risk, nutrient enrichment, total suspended solids, water withdrawals, bed scour, confinement-artificial
- **Moderate:** Benthic Richness, DO, embeddedness, fine sediment, backwater pools
- **Minor:** Alkalinity, flow, temperature, riparian function, woody debris, habitat quantity attributes

- Have you collected new data since 2018?
- Are you aware of previously omitted data?
- Can you think of other groups that may have data that were not previously considered?
- Is there field or remote sensing data that you expect will become available in the next year?

Reporting watershed	Data source	All attributes
Little Spokane Dragoon	ICF-interpolated	38.70%
	WDFW	25.90%
	USFS	13.20%
	NetMap	8.80%
	NetMap-LEMMA	5.90%
	Aerial Imagery	4.40%
	SCCD	1.80%
	WDFW & ECY	0.60%
	NorWeST	0.40%
	ECY	0.30%
Little Spokane Upper	WDFW	29.90%
	ICF-interpolated	28.90%
	USFS	13.40%
	NetMap	8.90%
	NetMap-LEMMA	7.20%
	Aerial Imagery	6.50%
	SCCD	4.60%
	NorWeST	0.30%
	Riverkeeper	0.10%
Little Spokane Lower	WDFW	33.50%
	ICF-interpolated	31.20%
	USFS	11.60%
	NetMap	8.80%
	NetMap-LEMMA	5.60%
	Aerial Imagery	4.40%
	SCCD	3.10%
	USGS	1.50%
	NorWeST	0.30%
	ECY	0.10%

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Hangman Creek

Common riverine data gaps:

- **Major:** fish community richness, fish pathogens, fish species introductions, hatchery fish outplants, predation risk, nutrient enrichment, total suspended solids, water withdrawals, bed scour, confinement-artificial
- **Moderate:** Benthic Richness, DO, embeddedness, fine sediment, backwater pools
- **Minor:** Alkalinity, flow, temperature, riparian function, woody debris, habitat quantity attributes

- Have you collected new data since 2018?
- Are you aware of previously omitted data?
- Can you think of other groups that may have data that were not previously considered?
- Is there field or remote sensing data that you expect will become available in the next year?

Reporting watershed	Data source	All attributes
Hangman Lower	ICF-interpolated	40.40%
	Aerial Imagery	16.30%
	WDFW	12.70%
	USFS	10.70%
	NetMap	8.70%
	NetMap-LEMMA	7.60%
	USGS	2.30%
	ECY	0.30%
	SCCD	0.30%
	Riverkeeper	0.20%
	STOI	0.20%
	WDFW & ECY	0.20%
	NorWeST	0.10%
Hangman Middle	ICF-interpolated	52.20%
	Aerial Imagery	14.00%
	USFS	13.00%
	NetMap	8.70%
	NetMap-LEMMA	8.40%
	WDFW	2.90%
	ECY	0.30%
	NorWeST	0.20%
	CDAT	0.10%
	Riverkeeper	0.10%
	SCCD	0.10%
Hangman Upper	ICF-interpolated	57.70%
	USFS	13.00%
	NetMap	8.70%
	NetMap-LEMMA	7.90%
	CDAT	6.70%
	Aerial Imagery	5.80%
	NorWeST	0.10%
	Riverkeeper	0.10%

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FDRL

Common riverine data gaps:

- **Major:** benthic richness, DO, fish community richness, fish pathogens, fish species introductions, flow: diel variation, hatchery fish outplants, nutrient enrichment, predation risk, temperature: daily minimum, total suspended solids, water withdrawals, bed scour, habitat quantity attributes, confinement-artificial,
- **Moderate:** embeddedness, fine sediment, temperature: spatial variation
- **Minor:** Alkalinity, flow, riparian function, temperature-daily maximum, woody debris

- Have you collected new data since 2018?
- Are you aware of previously omitted data?
- Can you think of other groups that may have data that were not previously considered?
- Is there field or remote sensing data that you expect will become available in the next year?

Reporting watershed	Data source	All attributes
FDRL-Harvey	ICF-interpolated	72.00%
	NetMap	13.90%
	USFS	8.30%
	NetMap-LEMMA	5.10%
	ECY	0.50%
	NorWeST	0.20%
FDRL-Stranger	ICF-interpolated	72.00%
	NetMap	13.90%
	NetMap-LEMMA	5.60%
	USFS	8.30%
	NorWeST	0.20%
FDLR-Magee	ICF-interpolated	72.00%
	NetMap	13.90%
	USFS	8.30%
	NetMap-LEMMA	5.60%
	NorWeST	0.20%
FDRL-Cheweka	ICF-interpolated	71.10%
	NetMap	13.90%
	USFS	8.30%
	NetMap-LEMMA	5.60%
	ECY	0.90%
	NorWeST	0.20%
FDRL-Quilisacut	ICF-interpolated	72.00%
	NetMap	13.90%
	USFS	8.30%
	NetMap-LEMMA	5.60%
	NorWeST	0.20%

Reporting watershed	Data source	All attributes
FDRL-Colville	Aerial Imagery	41.40%
	ICF-interpolated	30.70%
	NetMap	13.80%
	USGS	10.30%
	ECY	3.40%
	NorWeST	0.30%
FDRL-China	ICF-interpolated	72.00%
	NetMap	13.90%
	USFS	8.30%
	NetMap-LEMMA	5.60%
	NorWeST	0.20%
FDRL-Onion	ICF-interpolated	72.00%
	NetMap	13.90%
	USFS	8.30%
	NetMap-LEMMA	5.60%
	NorWeST	0.20%
FDRL-Deep	ICF-interpolated	72.00%
	NetMap	13.90%
	USFS	8.30%
	NetMap-LEMMA	5.60%
	NorWeST	0.20%

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Verify reach network

- Not presenting data today

Approach

- Will obtain most current barrier data
- Will obtain most up to date stream layers
- Use both to verify the EDT reach network

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Verify species rules

Past EDT modeling:

- Modified population rules developed by ICT and CCT (ICF 2018)
- Each EDT population is composed of a set of EDT life cycle models (LCMs) and designated spawning reaches
- Each has set of constraints used to define spawning, rearing, migratory timing and behavior of age classes.
- Each EDT population is composed of a proportional distribution of LCMs configured to represent the age structure and range of life history expression for the modeled species.

What's needed?

- Verify LCMs and population configuration for each species

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O. mykiss

Past EDT modeling:

- Summer steelhead, based on Okanogan EDT model with modifications to represent the broader range of life history diversity expressed by Upper Columbia DPS steelhead
- Probable spawning reaches from steelhead IP

Table 2-4. Summary of EDT summer steelhead age structure and rearing strategy composition used in the Spokane and FDRL Tributaries EDT models.

Parameter	Age or Rearing Strategy	Proportion of Population
Juvenile age at smolting	Age-1	42.25%
	Age-2	35.50%
	Age-3	22.25%
Adult age at migration	1 ocean year	34.75%
	2 ocean years	54.25%
	3 ocean years	11.00%
Rearing strategy	Mover (transient)	45.0%
	Stayer (resident)	45.0%
	Reservoir	10.0%

Table 2-5. EDT summer steelhead Life Cycle Models and population composition used in the Spokane and FDRL Tributaries EDT models.

Life Cycle Model	Juvenile Rearing Strategy	Juvenile Age at Migration	Ocean Age	Percent of Population
Age 1/1 Transient - Reservoir Rearing	Reservoir	1	1	4.5%
Age 1/2 Transient - Reservoir Rearing	Reservoir	1	2	5.0%
Age 1/3 Transient - Reservoir Rearing	Reservoir	1	3	0.5%
Age 1/1 Transient	Mover	1	1	4.8%
Age 1/2 Transient	Mover	1	2	8.5%
Age 1/3 Transient	Mover	1	3	1.8%
Age 2/1 Transient	Mover	2	1	7.0%
Age 2/2 Transient	Mover	2	2	11.0%
Age 2/3 Transient	Mover	2	3	2.0%
Age 3/1 Transient	Mover	3	1	3.5%
Age 3/2 Transient	Mover	3	2	5.0%
Age 3/3 Transient	Mover	3	3	1.5%
Age 1/1 Resident	Stayer	1	1	6.5%
Age 1/2 Resident	Stayer	1	2	9.0%
Age 1/3 Resident	Stayer	1	3	1.8%
Age 2/1 Resident	Stayer	2	1	4.5%
Age 2/2 Resident	Stayer	2	2	9.0%
Age 2/3 Resident	Stayer	2	3	2.0%
Age 3/1 Resident	Stayer	3	1	4.0%
Age 3/2 Resident	Stayer	3	2	6.8%
Age 3/3 Resident	Stayer	3	3	1.5%

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O. mykiss spawning reaches

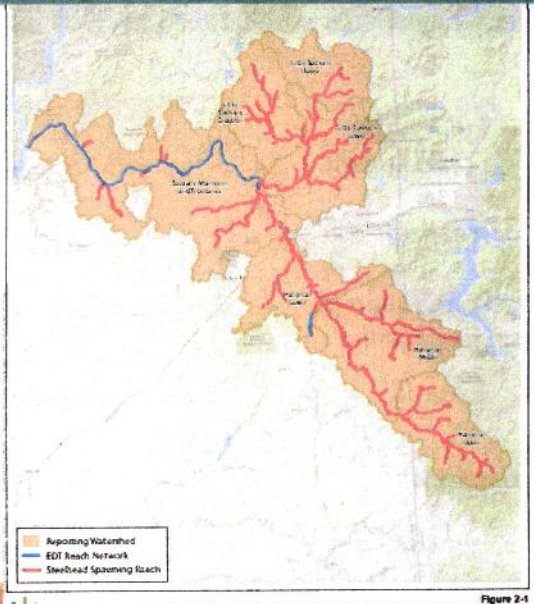

Figure 2-1
Distribution of steelhead spawning reaches used in the Spokane EDT model

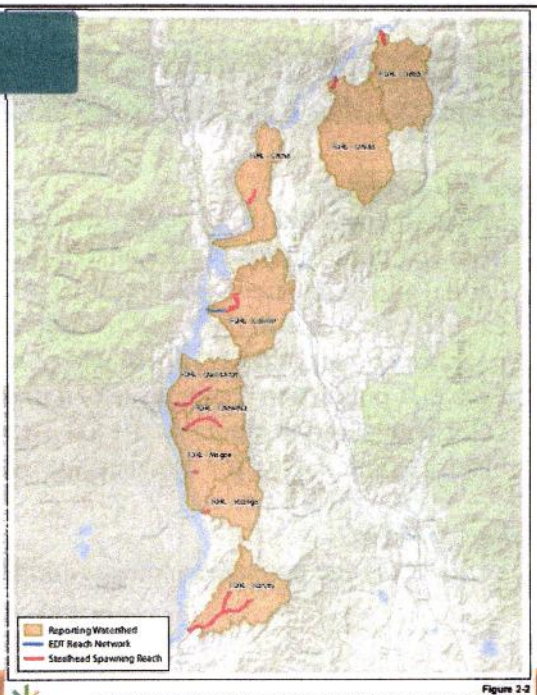

Figure 2-2
Distribution of steelhead spawning reaches used in the Select FDRL Tributaries EDT model

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Summer/Fall Chinook

Past EDT modeling:

- Based on existing population parameters for Okanogan River summer/fall Chinook
- Probable spawning reaches from IP, all reaches gradient <7% and BFW >3.8m

Table 2-7. Summary of EDT summer/fall Chinook age structure and behavioral-type composition used in the Spokane and FDRL Tributaries EDT models.

Parameter	Age or Behavioral Type	Proportion of Population
Juvenile rearing/ migration behavior type	Ocean-type	86.4%
	Stream-type	4.4%
	Reservoir	9.2%
Adult age at migration	1 ocean year (jacks)	5.0%
	2 ocean years	10.1%
	3 ocean years	49.9%
	4 ocean years	35.0%
Adult holding behavior	Watershed	54.4%
	Reservoir	45.6%

Table 2-8. EDT summer/fall Chinook Life Cycle Models and population composition used in the Spokane and FDRL Tributaries EDT models.

Life Cycle Model	Adult Holding	Juvenile Rearing	Ocean Age	Percent of Population
Summer Direct/Direct migrant age 0/1	Watershed	Ocean-type	1 (jack)	1.9%
Summer Direct/Direct migrant age 0/2	Watershed	Ocean-type	2	3.9%
Summer Direct/Direct migrant age 0/3	Watershed	Ocean-type	3	19.4%
Summer Direct/Direct migrant age 0/4	Watershed	Ocean-type	4	13.6%
Summer Direct/Delayed migrant age 1/1	Watershed	Reservoir	1 (jack)	0.2%
Summer Direct/Delayed migrant age 1/2	Watershed	Reservoir	2	0.5%
Summer Direct/Delayed migrant age 1/3	Watershed	Reservoir	3	2.3%
Summer Direct/Delayed migrant age 1/4	Watershed	Reservoir	4	1.6%
Summer Direct/Stream-type age 1/1	Watershed	Stream-type	1 (jack)	0.1%
Summer Direct/Stream-type age 1/2	Watershed	Stream-type	2	0.2%
Summer Direct/Stream-type age 1/3	Watershed	Stream-type	3	1.1%
Summer Direct/Stream-type age 1/4	Watershed	Stream-type	4	0.8%
Summer Delayed/Direct migrant age 0/1	Reservoir	Ocean-type	1 (jack)	1.9%
Summer Delayed/Direct migrant age 0/2	Reservoir	Ocean-type	2	3.9%
Summer Delayed/Direct migrant age 0/3	Reservoir	Ocean-type	3	19.4%
Summer Delayed/Direct migrant age 0/4	Reservoir	Ocean-type	4	13.6%
Summer Delayed/Delayed migrant age 1/1	Reservoir	Reservoir	1 (jack)	0.2%
Summer Delayed/Delayed migrant age 1/2	Reservoir	Reservoir	2	0.5%
Summer Delayed/Delayed migrant age 1/3	Reservoir	Reservoir	3	2.3%
Summer Delayed/Delayed migrant age 1/4	Reservoir	Reservoir	4	1.6%
Summer Delayed/stream-type age 1/1	Reservoir	Stream-type	1 (jack)	0.1%
Summer Delayed/stream-type age 1/2	Reservoir	Stream-type	2	0.2%
Summer Delayed/stream-type age 1/3	Reservoir	Stream-type	3	1.1%
Summer Delayed/stream-type age 1/4	Reservoir	Stream-type	4	0.8%
Fall Direct/Direct migrant age 0/1	Watershed	Ocean-type	1 (jack)	0.6%
Fall Direct/Direct migrant age 0/2	Watershed	Ocean-type	2	0.9%
Fall Direct/Direct migrant age 0/3	Watershed	Ocean-type	3	4.3%
Fall Direct/Direct migrant age 0/4	Watershed	Ocean-type	4	3.0%

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Spring Chinook

Past EDT modeling:

- Based on observed population composition in Methow, Wenatchee, and Entiat Rivers, with modifications to reflec assumed use of reservoir habitats for adult holding and juvenile rearing.
- Probable spawning reaches from IP, all reaches gradient <7% and BFW >3.8m

Table 2-10. Summary of EDT spring Chinook age structure and behavioral-type composition used in the Spokane and FDRL Tributaries EDT models.

Parameter	Age or Behavioral Type	Proportion of Population
Juvenile rearing/ migration behavior type	Stream-type	74.0%
	Reservoir	26.0%
Adult age at migration	1 ocean year (jacks)	4.0%
	2 ocean years	70.0%
	3 ocean years	21.0%
	4 ocean years	5.0%
Adult holding behavior	Watershed	50%
	Reservoir	50%

Table 2-11. EDT Spring Chinook Life Cycle Models and population composition used in the Spokane and FDRL Tributaries EDT models.

Life Cycle Model	Adult Holding	Juvenile Rearing	Ocean Age	Percent of Population
Age 1/1 - Reservoir Rearing	Watershed	Reservoir	1 (jack)	0.5%
Age 1/2 - Reservoir Rearing	Watershed	Reservoir	2	9.0%
Age 1/3 - Reservoir Rearing	Watershed	Reservoir	3	2.5%
Age 1/4 - Reservoir Rearing	Watershed	Reservoir	4	1.0%
Age 1/1 - Local Rearing	Watershed	Stream-type	1 (jack)	1.5%
Age 1/2 - Local Rearing	Watershed	Stream-type	2	26.0%
Age 1/3 - Local Rearing	Watershed	Stream-type	3	8.0%
Age 1/4 - Local Rearing	Watershed	Stream-type	4	1.5%
Age 1/1 - Reservoir Rearing and Holding	Reservoir	Reservoir	1 (jack)	0.5%
Age 1/2 - Reservoir Rearing and Holding	Reservoir	Reservoir	2	9.0%
Age 1/3 - Reservoir Rearing and Holding	Reservoir	Reservoir	3	2.5%
Age 1/4 - Reservoir Rearing and Holding	Reservoir	Reservoir	4	1.0%
Age 1/1 - Local Rearing, Reservoir Holding	Reservoir	Stream-type	1 (jack)	1.5%
Age 1/2 - Local Rearing, Reservoir Holding	Reservoir	Stream-type	2	26.0%
Age 1/3 - Local Rearing, Reservoir Holding	Reservoir	Stream-type	3	8.0%
Age 1/4 - Local Rearing, Reservoir Holding	Reservoir	Stream-type	4	1.5%

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Sum/Fall/Spring Chinook spawning reaches

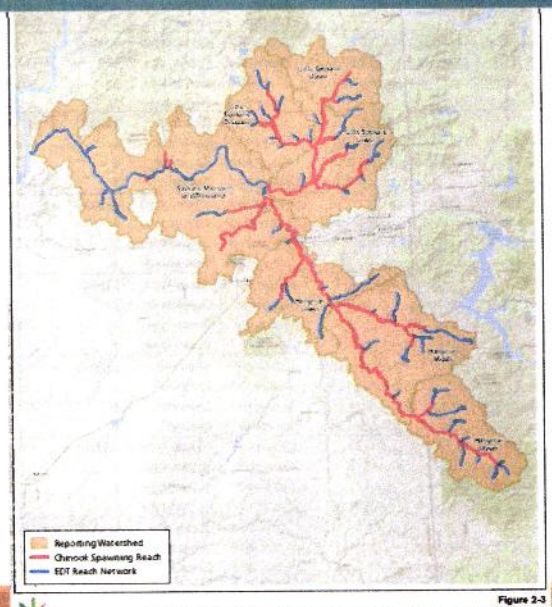

Figure 2-3
Distribution of Chinook salmon spawning reaches used in the Spokane EDT model

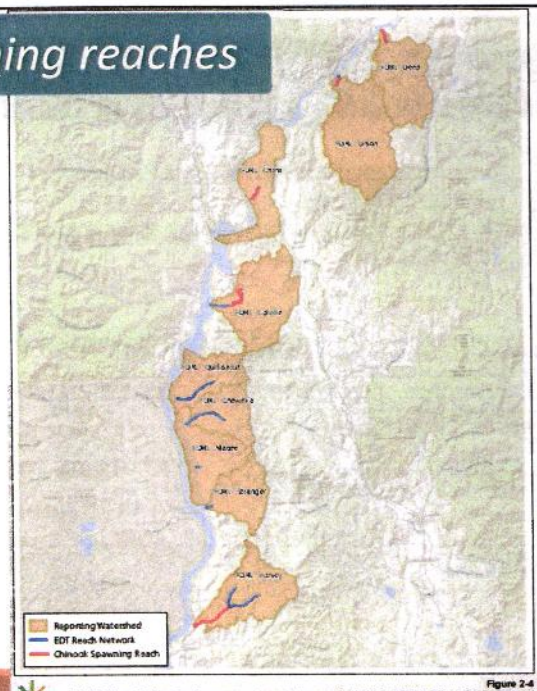

Figure 2-4
Distribution of Chinook salmon spawning reaches used in the Select FDRL Tributaries EDT model

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