

OKANAGAN TENNANT & WUW METHODS



Vaseux Creek

EFN conference
October 2018





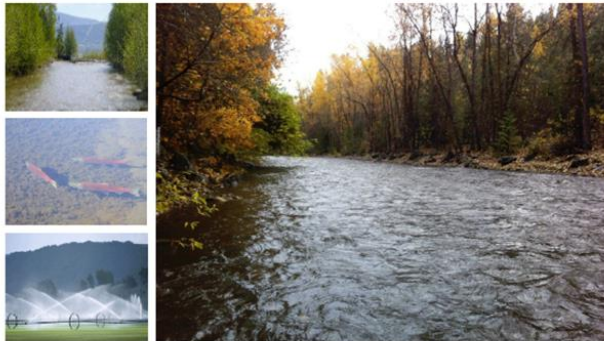
Study design plans in 2016



WORKING DOCUMENT VERSION 1

Okanagan Basin Water Board
Okanagan Nation Alliance
B.C. Ministry of Forests, Lands and Natural
Resource Operations

Collaborative Development of Methods to
Set Environmental Flow Needs in Okanagan Streams



May 2016

ISO 9001 and 14001 Certified | An Associated Engineering Company



- Phase 1 - AE developed the methods document
- All sampling and analysis is done following the methods set out in the 2016 AE methods document
- ONA gathered and developed HSI indices for WUW work with Ron Ptolemy
- Defensible, transparent and robust EFN values for Okanagan tributaries

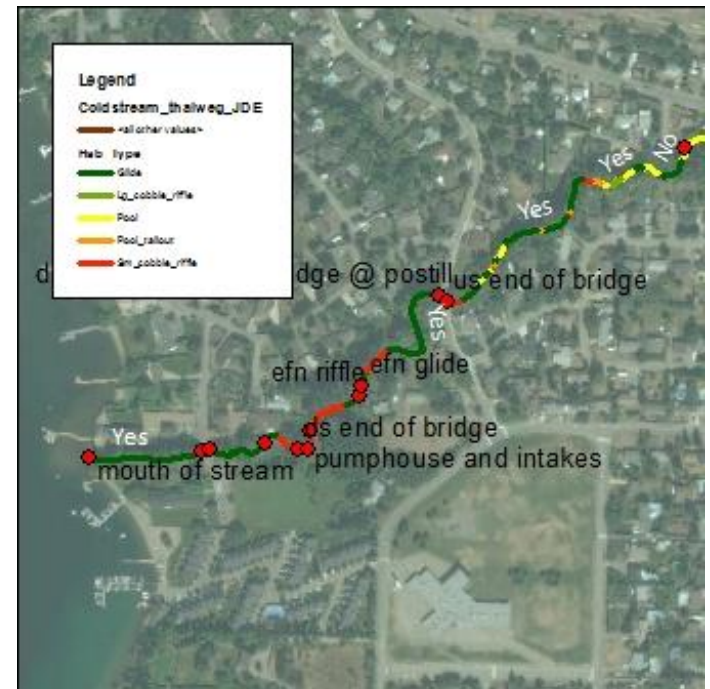


Okanagan Ecosystem Initiative



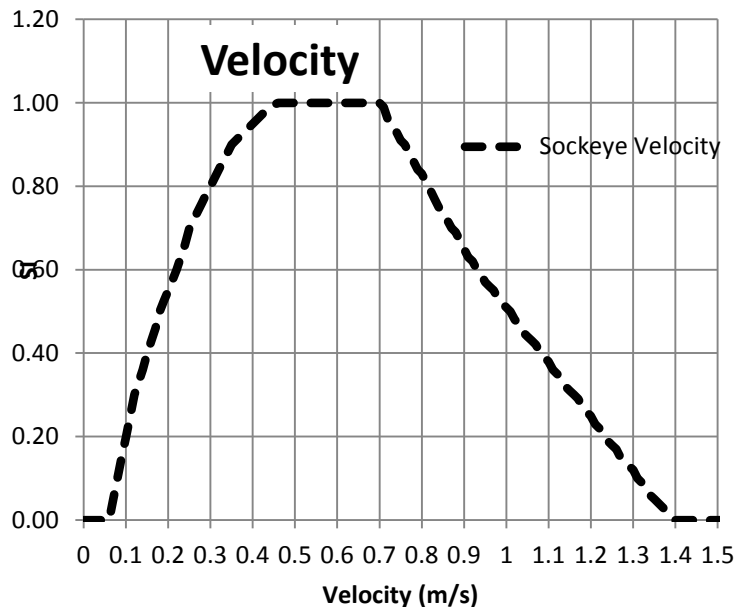
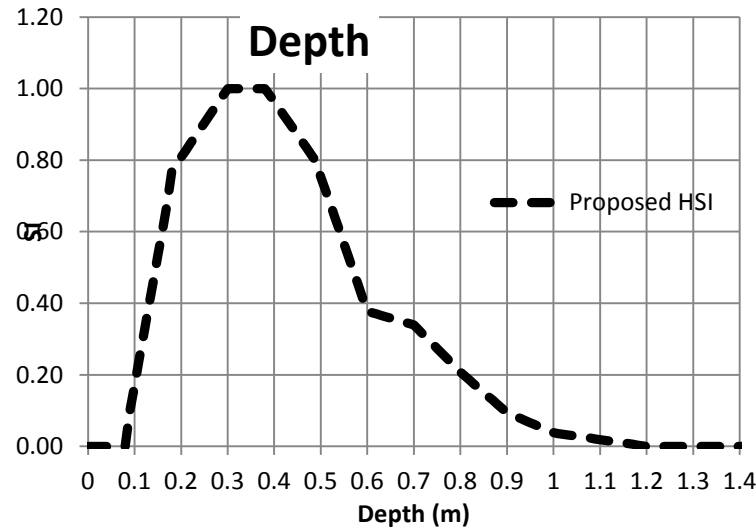
Environment and Climate Change Canada study

- Concurrently ONA studied biological response and EFN assessments by
- Comparing benthic macroinvertebrate communities to hydro-modification, riparian function and flow issues
- Includes habitat mapping of 6 north Okanagan streams and CABIN based assessments of reaches
- Outcomes could be an additional source of information for the EFN methods



EFN Study

Study implementation starting in 2017

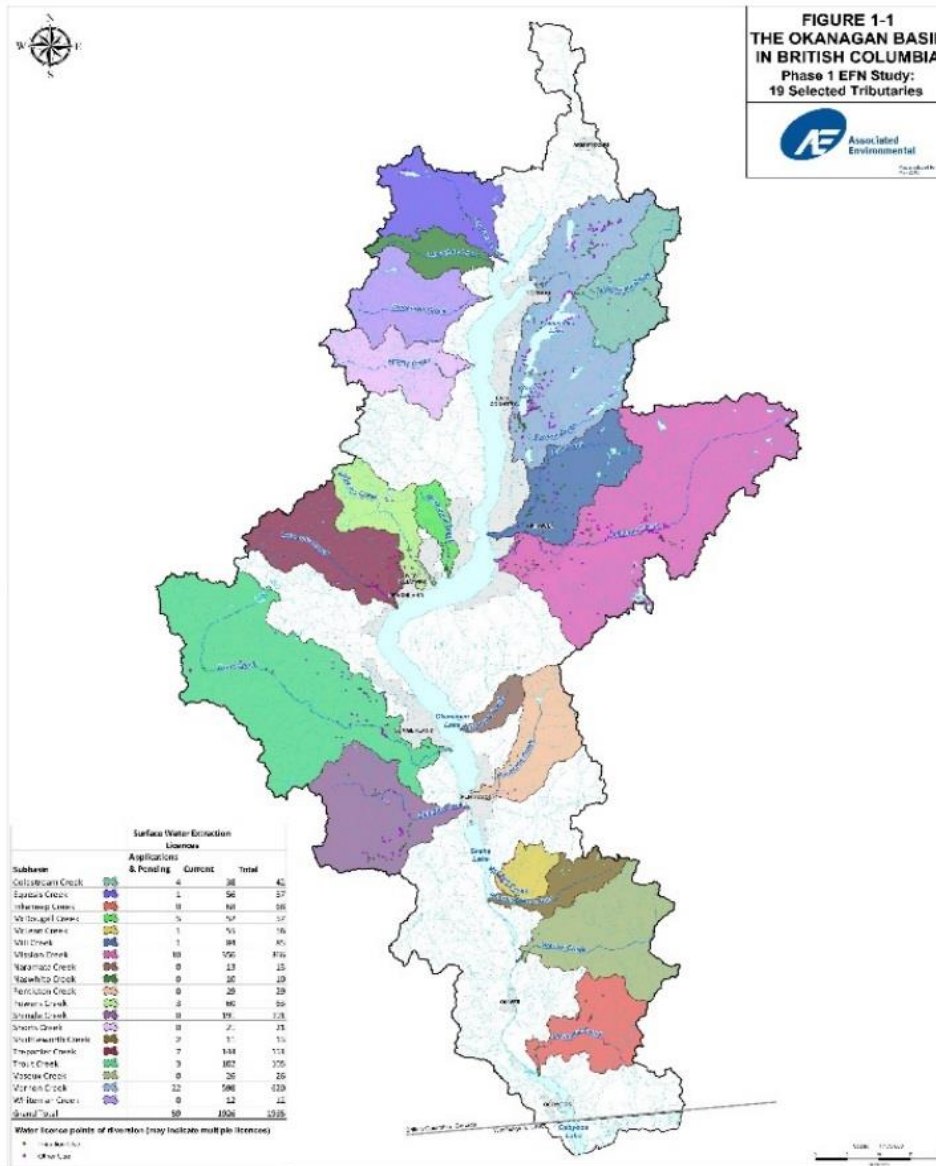


- ONA created the HSI curve for spawning Sockeye Salmon depth and velocity.
- Completed SEFA analyses for WUW work with Ryan Whitehouse (MoFLNRO) to test as a possible method

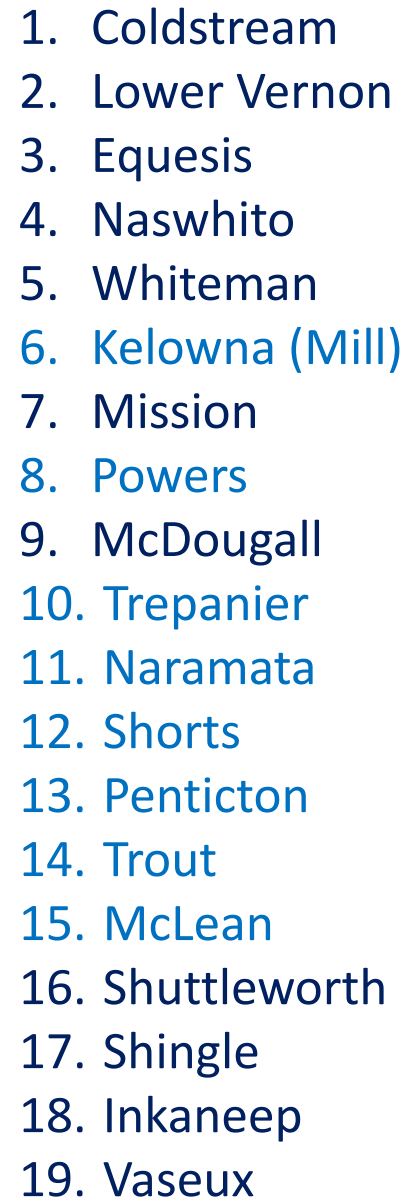
EFN Study



Study implementation starting in 2017



- **Study tributaries were selected based on criteria**
 - Low flow issues
 - No EFNs presently
 - # water license applications
 - Habitat value
 - Potential for restoration
 - Overlap with other projects



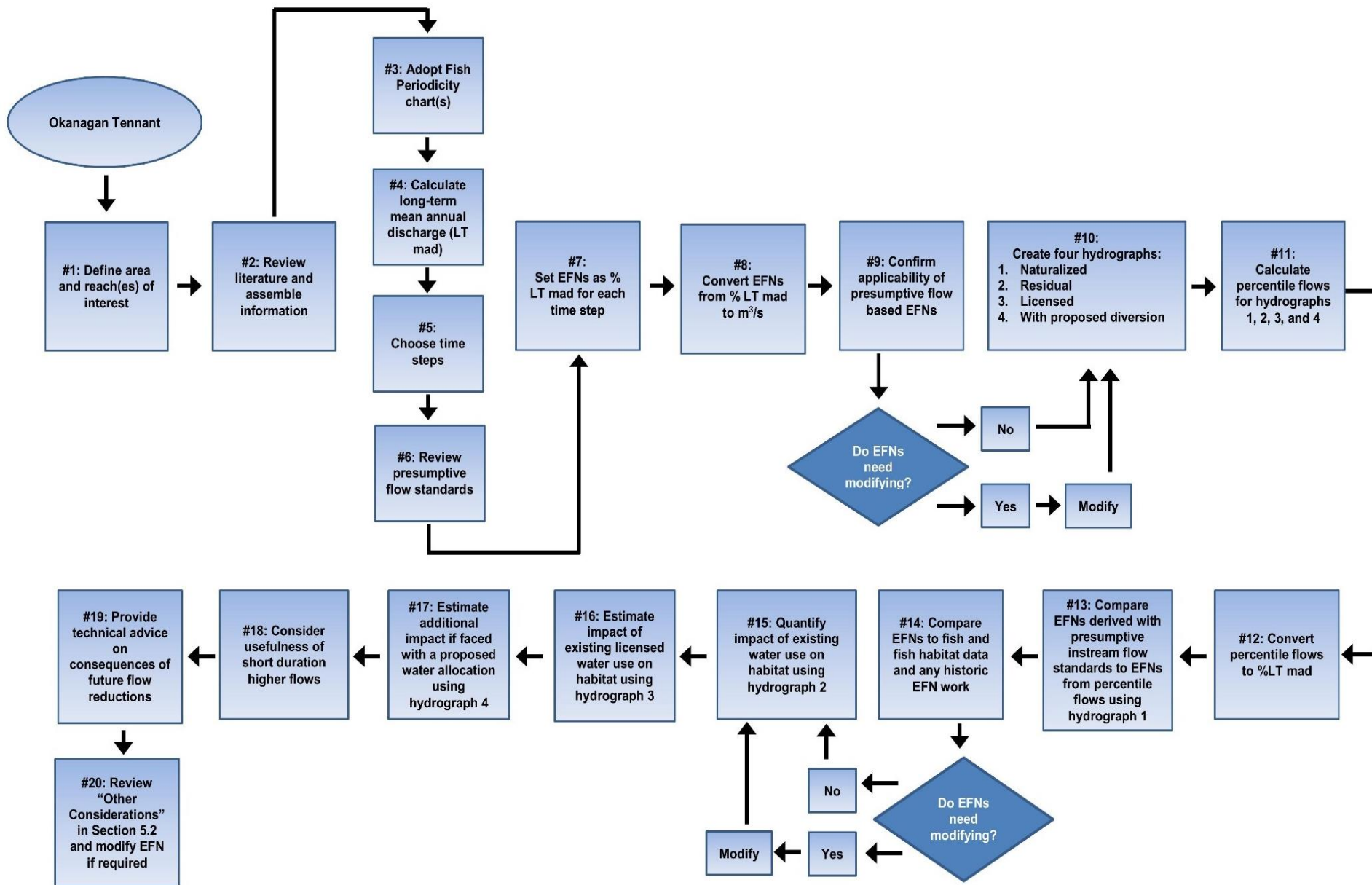


Methods Pilot Project

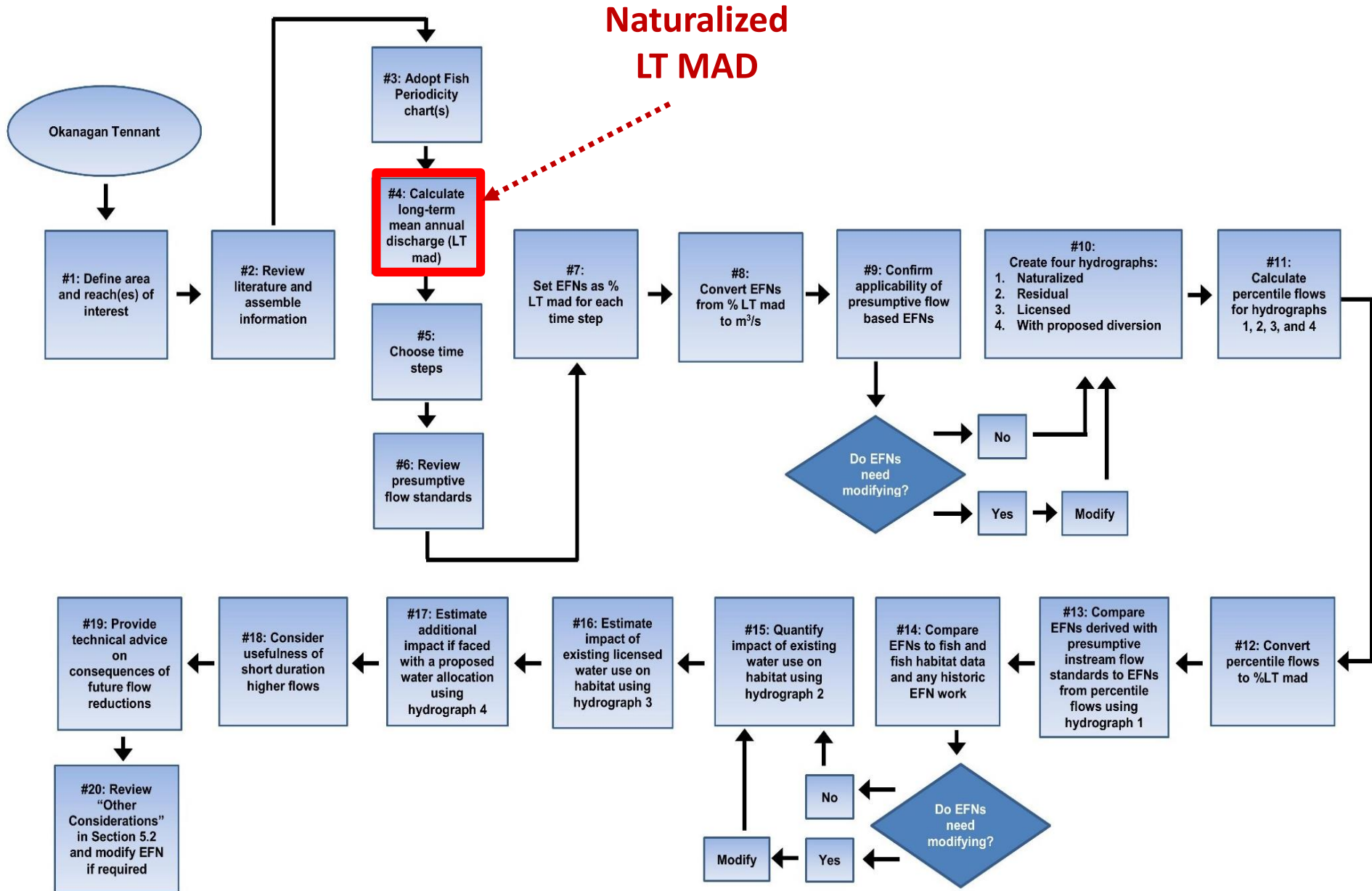


- **Phase I – methods selected include**
 - Okanagan Modified Tennant Method
 - Desktop method using available information
 - Low-risk systems
 - Okanagan Weighted Useable Width Method
 - Requires field measurements
 - Higher risk systems
- **Phase II - data collection and method test**
 - We are within this stage of the process to date
 - Applying both EFN methods to selected tributaries
 - Documenting the process to be able to make recommendations improvements
 - Timeline: due winter 2018

Okanagan Tennant method

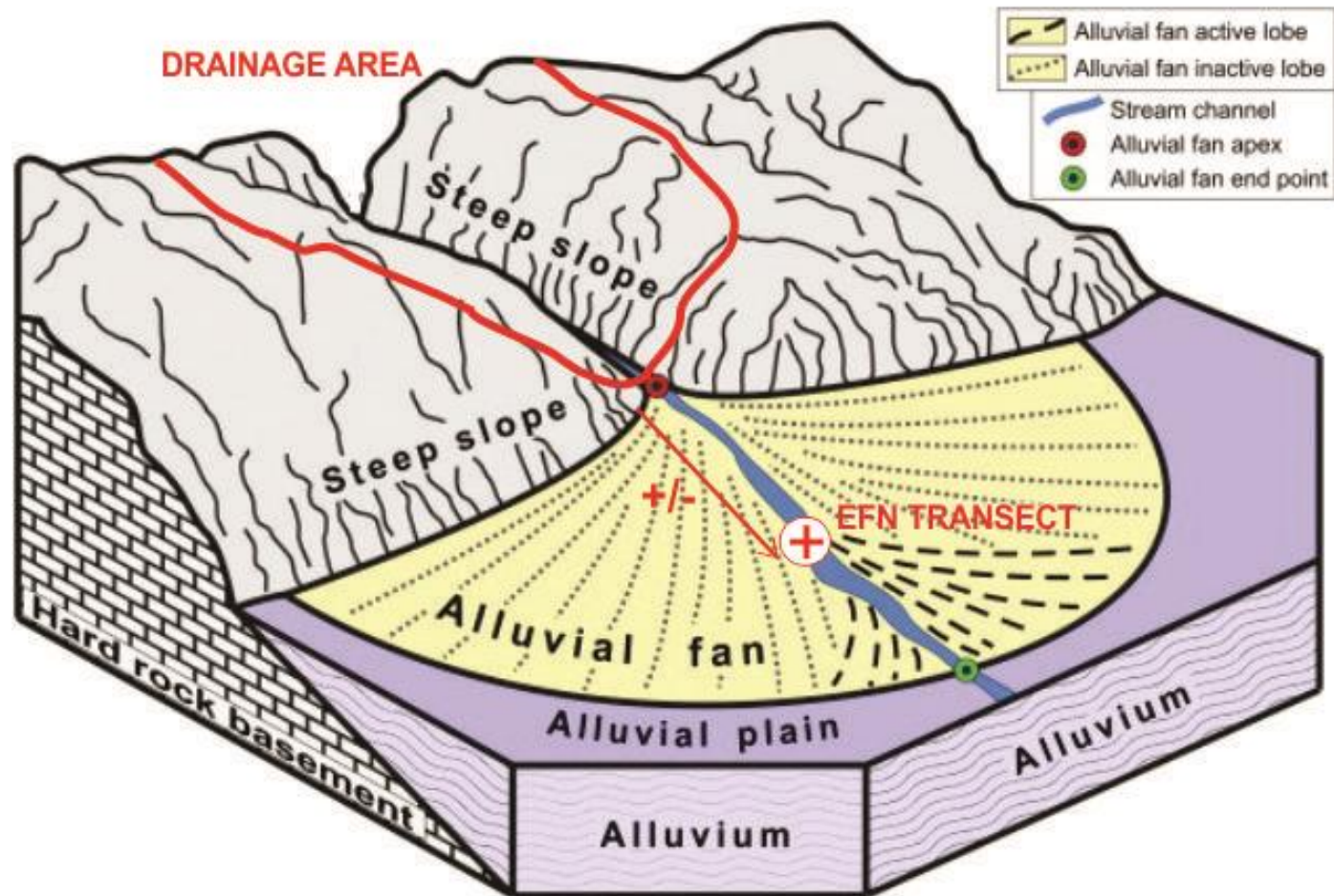


Okanagan Tennant method



Okanagan Tennant Method

EFN Point-of-Interest (Step1)





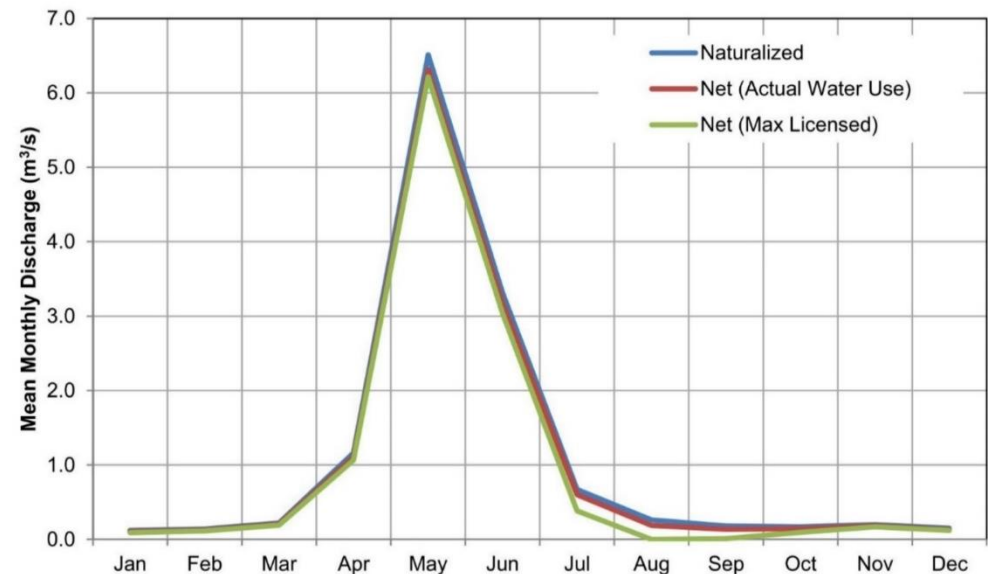
Okanagan Tennant Method



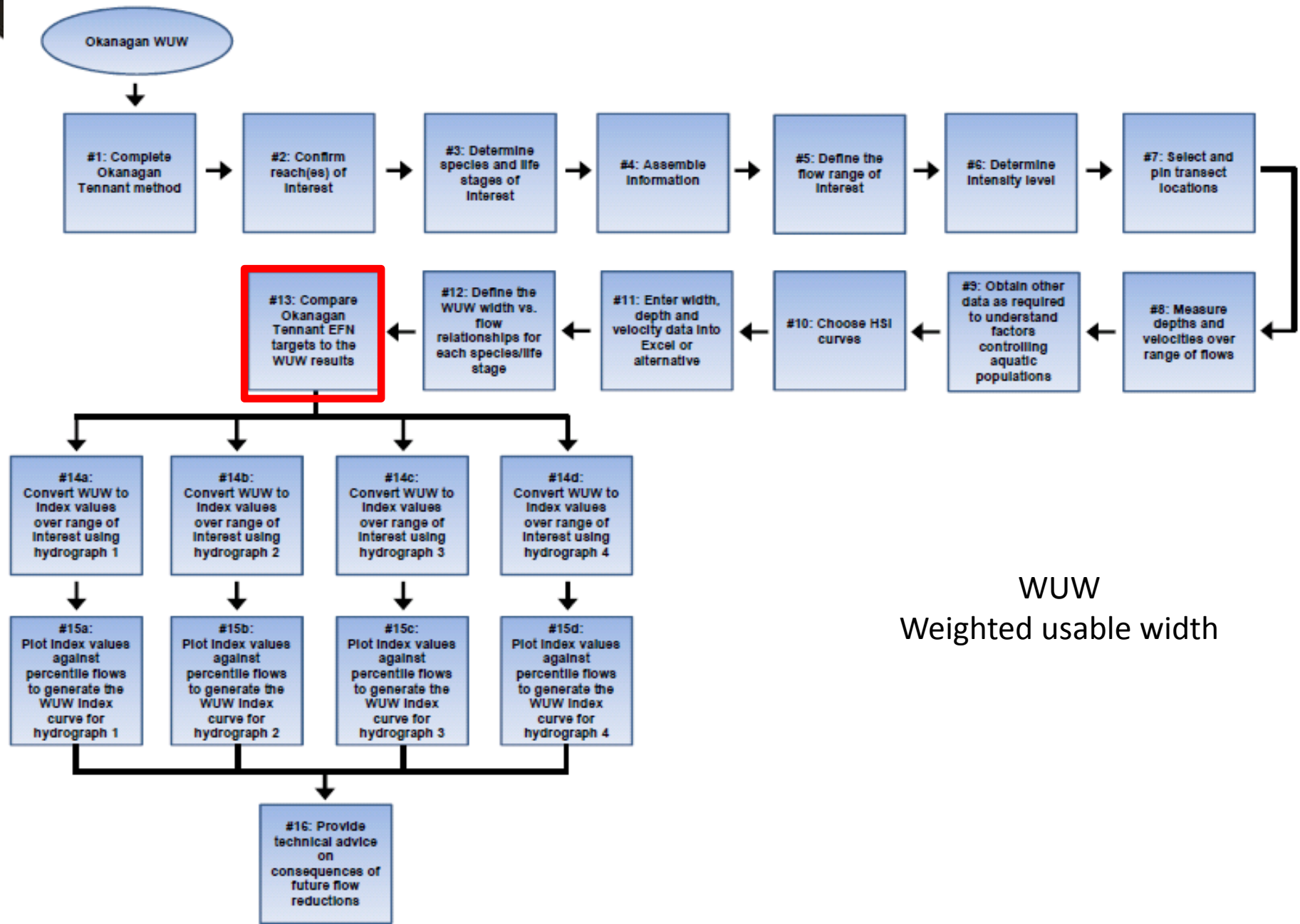
Progress to date

- We are at Step 4 - determining the naturalized flow (this is in progress with AE)
- Once we have these flows and can review them then we can complete the remaining steps

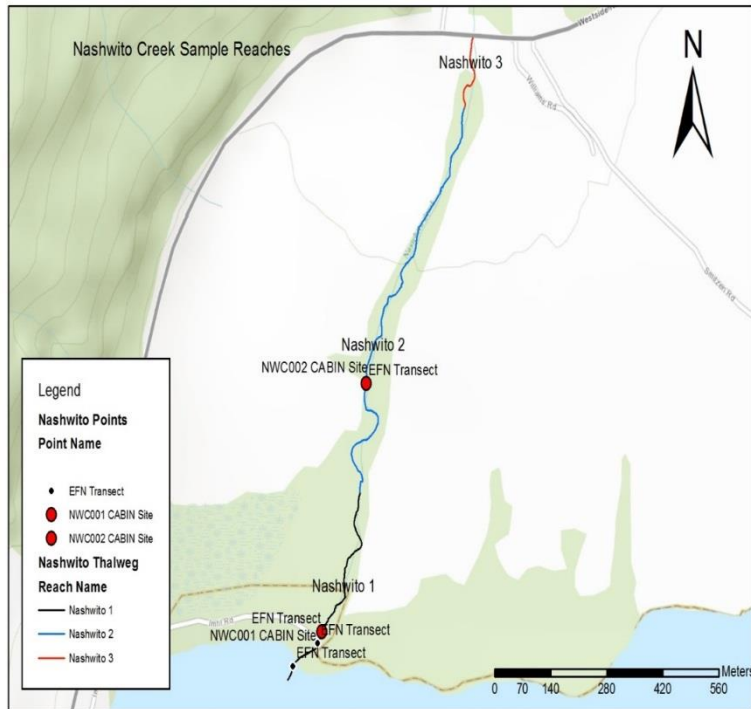
An possible example of
Tennant assessment



WUW method



WUW method



Step 2

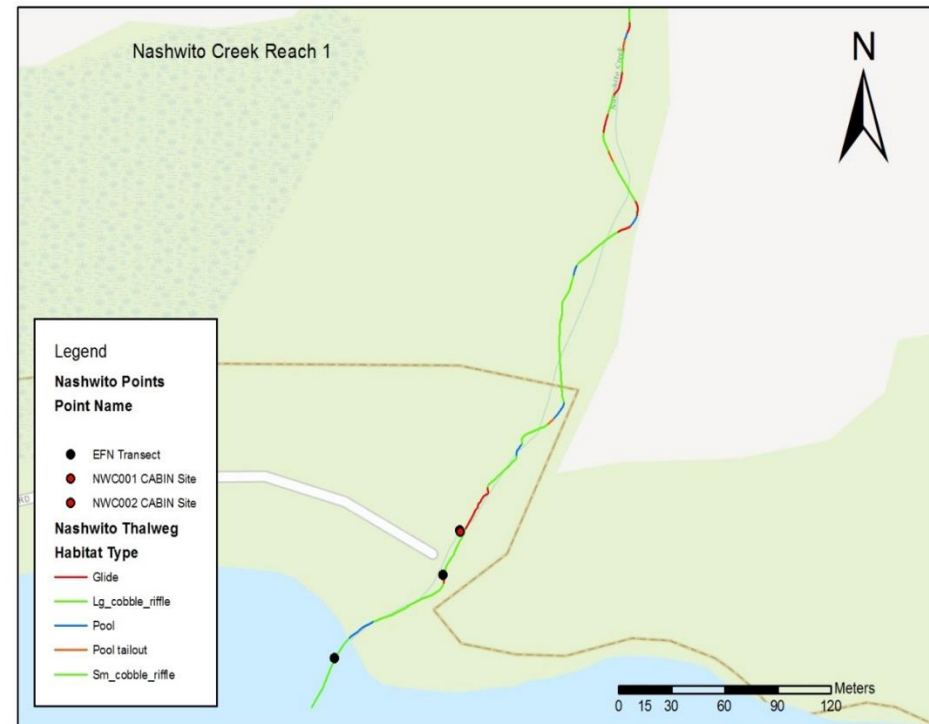
- Completed rapid assessments of stream habitat types
- Set EFN transect



Reach - Nashwito 1

Habitat Type (%)

Backwater Pool	0%
Beaver Pond	0%
Large Cobble/Boulder Riffle	0%
Pool Tailout	4%
Glide	17%
Primary Pool	11%
Small Cobble/Gravel Riffle	69%
Confinement - Hydro-modification (%)	65%
Riparian Function (%)	51%



WUW method



- Determine species and life stages of interest for each creek (step 3)
 - For example rainbow trout

Species	Life stage	# of weeks	Start date	End date	Reference
Rainbow trout (low elevation streams)	Adult migration	12	15-Apr	10-Jul	Wightman (1975)
	Spawning	7	20-May	10-Jul	Wightman (1975)
	Incubation	8	20-May	15-Jul	Ptolemy pers comm
	Rearing	26	23-Apr	20-Oct	Ptolemy pers comm
	Juvenile migration	6	1-May	15-Jun	Ptolemy pers comm
	Overwintering	26	20-Oct	22-Apr	Ptolemy pers comm



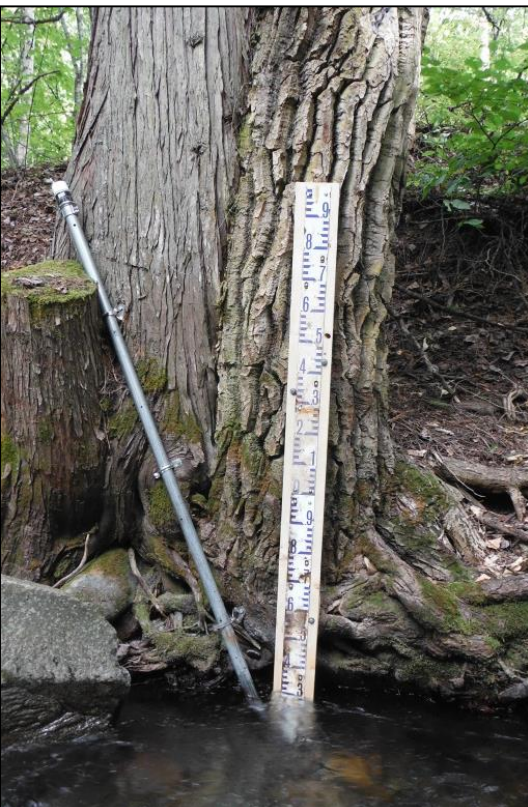
Also for consideration

Food Production	Invertebrate Drift
Ecological Flows	Flushing flows
	Icing
	Freshet rampdown
	Wetland/trib/side channel linkage
	Channel maintenance

WUW method



- Data collection (steps 4 – 9)
 - Installed 37 Glide transects and 39 riffle transects in 11 streams
 - Measure water depth and velocity (habitat)
 - Installed 20 hydrometric stations
 - Measure water level and discharge



WUW method

- E.g. Equis Creek
- Completed habitat mapping
- 4 Riffle and 4 Glide transects below migration barrier (dam)
- 3 hydrometric stations (1 real-time)





WUW method

- E.g. Vaseux Creek
- Completed habitat mapping
- 2 Riffle and 2 Glide transects installed
- 1 hydrometric station (real-time)





WUW method

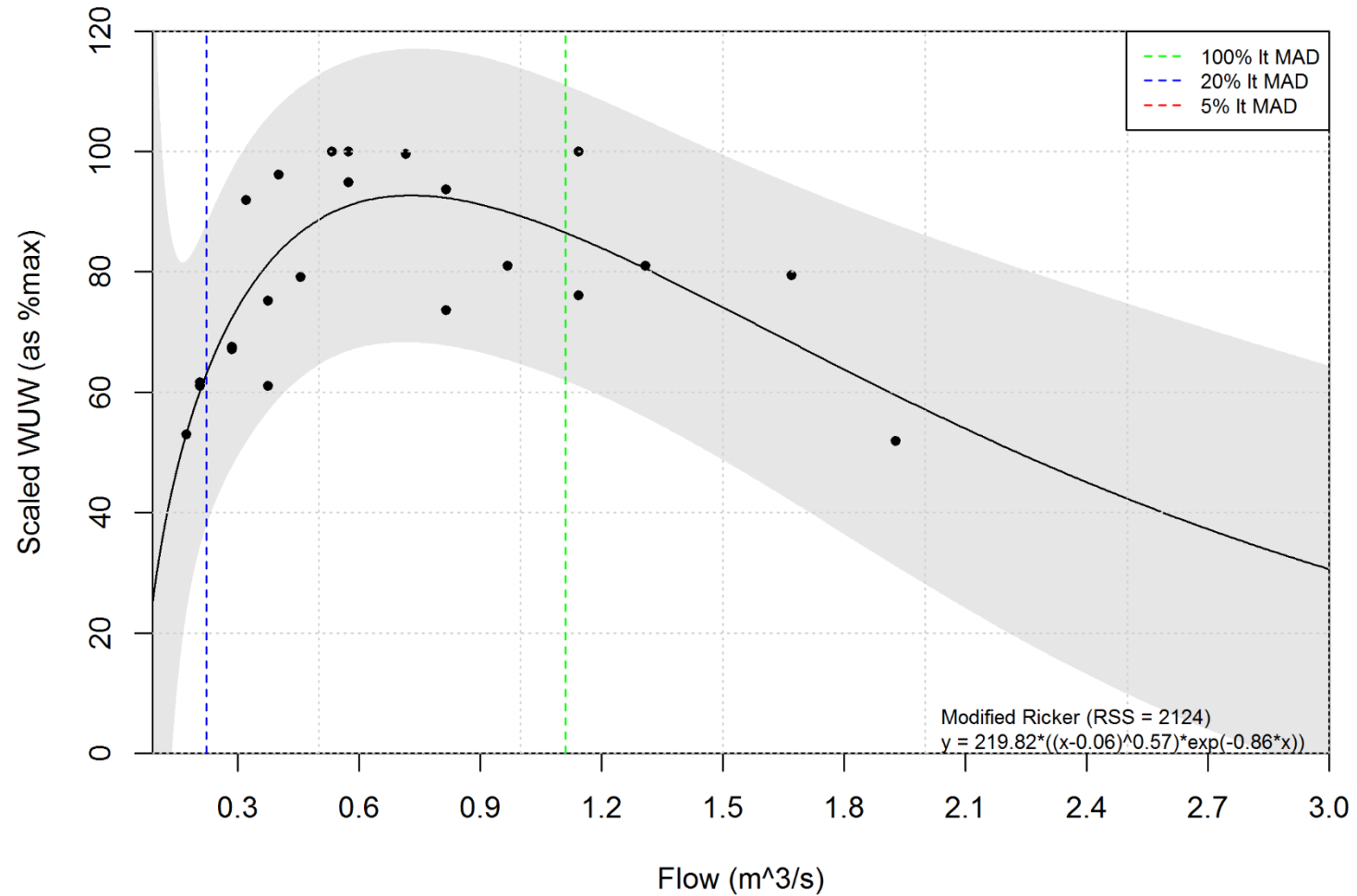
Progress to date

- Field work is complete
- Developing WUW curves (see next slides for Equesis Creek example)
- need AE Naturalized Flow analysis in order to complete analysis
- ONA working on developing Critical Low Flow analyses for 10 streams
- Median Naturalized Flows, Critical Low Flows, and WUW curves feed into developing Habitat Reduction Indices to be applied to water-use scenarios
- Analysis of data and comparison to Tennant method in progress (for discussions in winter 2019)

WUW method



Equesis Creek Rainbow Trout Parr WUW Curve

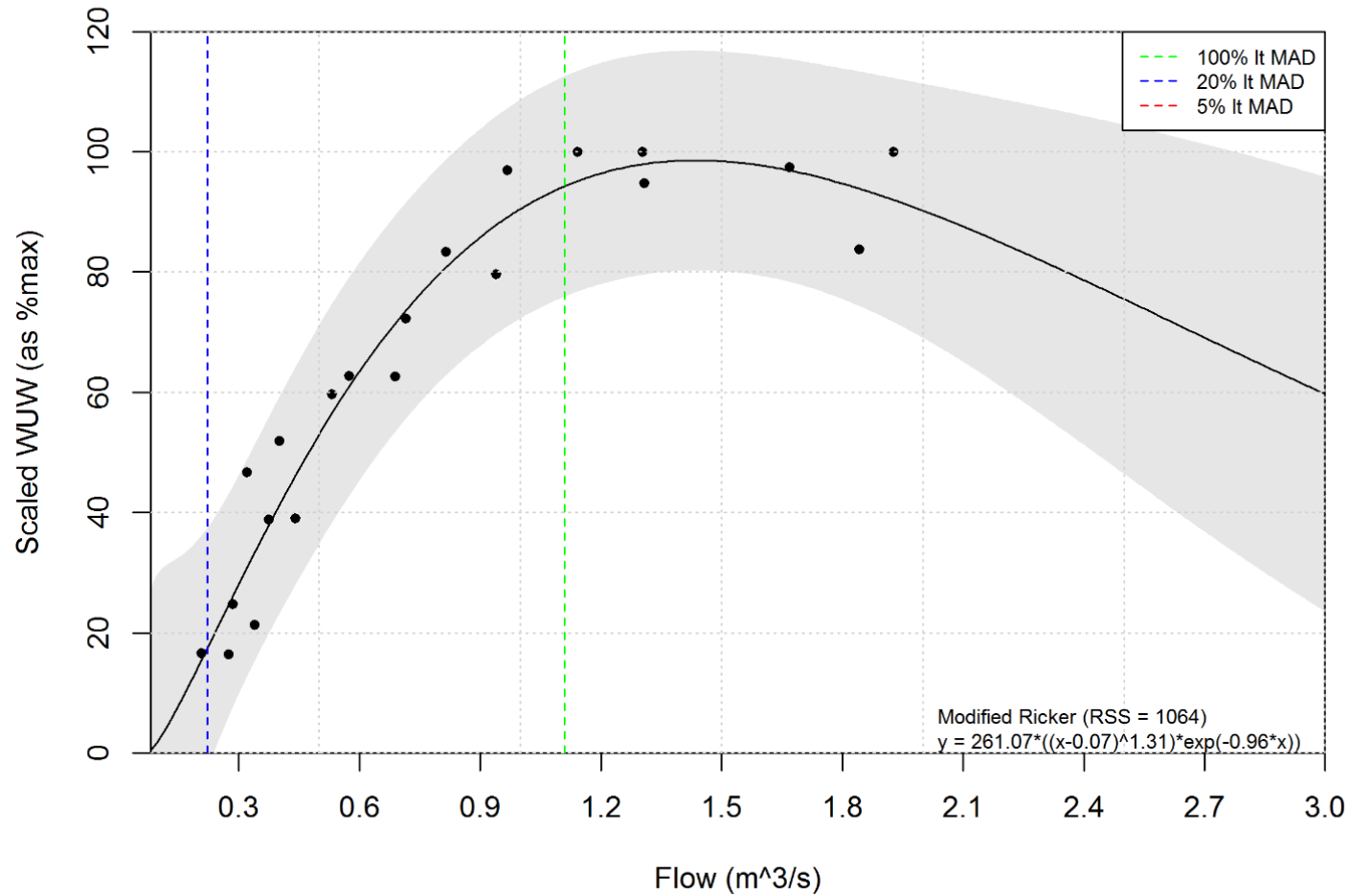


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WUW method



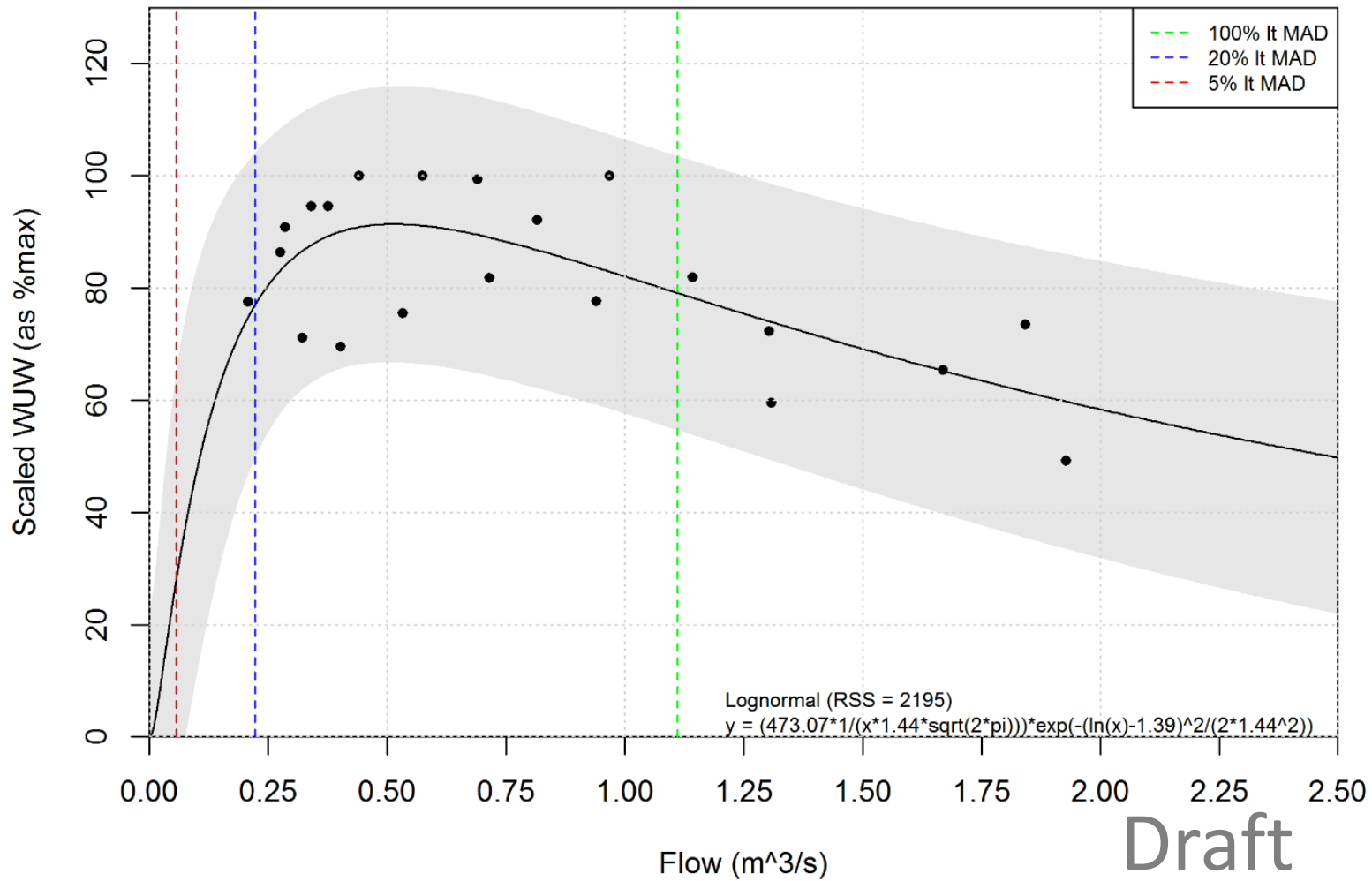
Equesis Creek Rainbow Trout Spawning WUW Curve



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WUW method

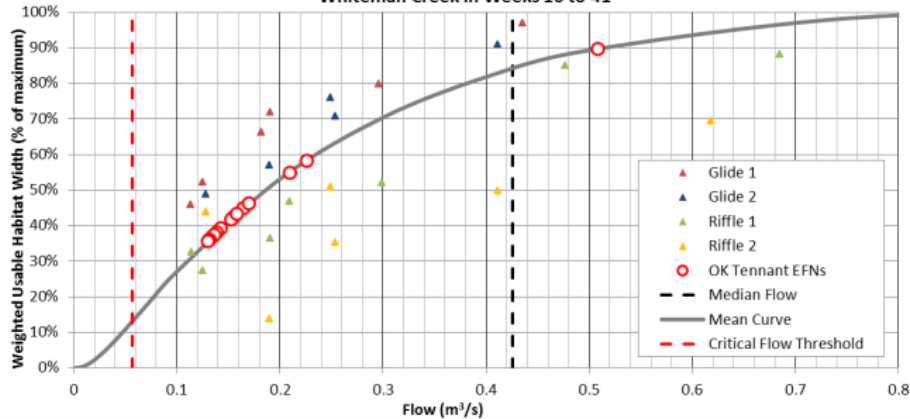
Equesis Creek Kokanee Spawning WUW Curve



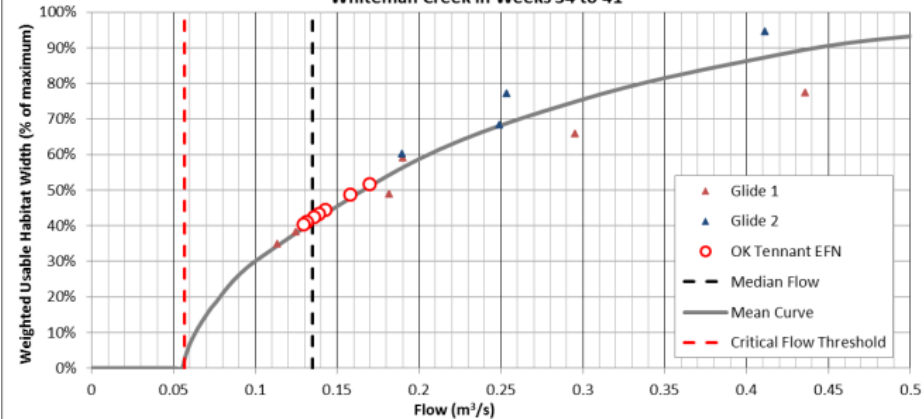
WUW method



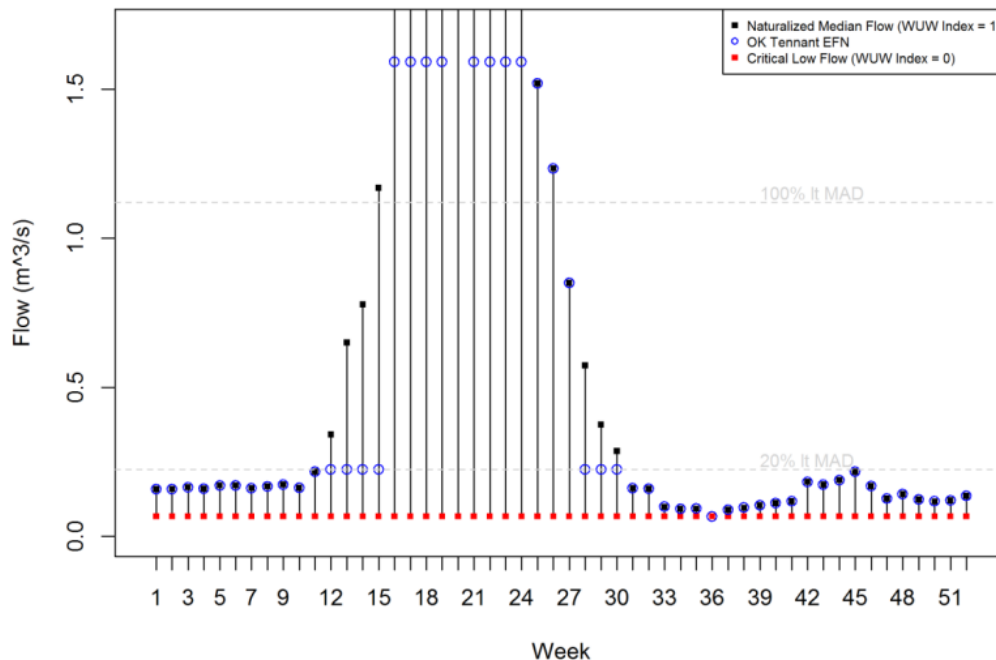
Rainbow Parr Rearing Weighted Usable Widths vs Flow for
Whiteman Creek in Weeks 16 to 41



Kokanee Spawning Weighted Usable Widths vs Flow for
Whiteman Creek in Weeks 34 to 41



Whiteman Creek WUW Index Chart By Week



- Tennant and flow scenarios are done on a weekly scale.
- Analysis will show streams that are over-allocated, and how much of a reduction in habitat that would account for.

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Setting EFNs



Vaseux Creek				
	VAS10SCR (cms)	VAS10SCR (lt MAD)	VAS30SCR (cms)	VAS30SCR (lt MAD)
Naturalized lt MAD	1.25	100	1.25	100
5% lt MAD	0.0625	5	0.0625	5
WW @ 100% ltMAD	9.69	100	10.41	100
Benthic Macroinvertebrate Production				
Flow: @ 60% of Max WW	0.0200	2	0.0367	3
Non-contiguous Depth (Fish Passage)				
Flow: Depth >0.24m is 25% of Max WW	1.2219	98	1.0074	81
Flow: Depth >0.18m is 25% of Max WW	0.5178	41	0.3263	26
Flow: Depth >0.12m is 25% of Max WW	0.3098	25	0.2253	18
Contiguous Depth (Fish Passage)				
Flow: Depth >0.24m is 10% of Max WW	0.5135	41	0.6321	51
Flow: Depth >0.18m is 10% of Max WW	0.1949	16	0.2514	20
Flow: Depth >0.12m is 10% of Max WW	0.1392	11	0.1085	9
Kokanee Spawning WUW (from Glides)				
Flow: Kokanee Spawning 0% of Max habitat	0.017	1	0.017	1
RBT Parr Rearing WUW (from Glides)				
Flow: RBT Parr Rearing 0% of Max habitat	0.0205	2	0.0205	2

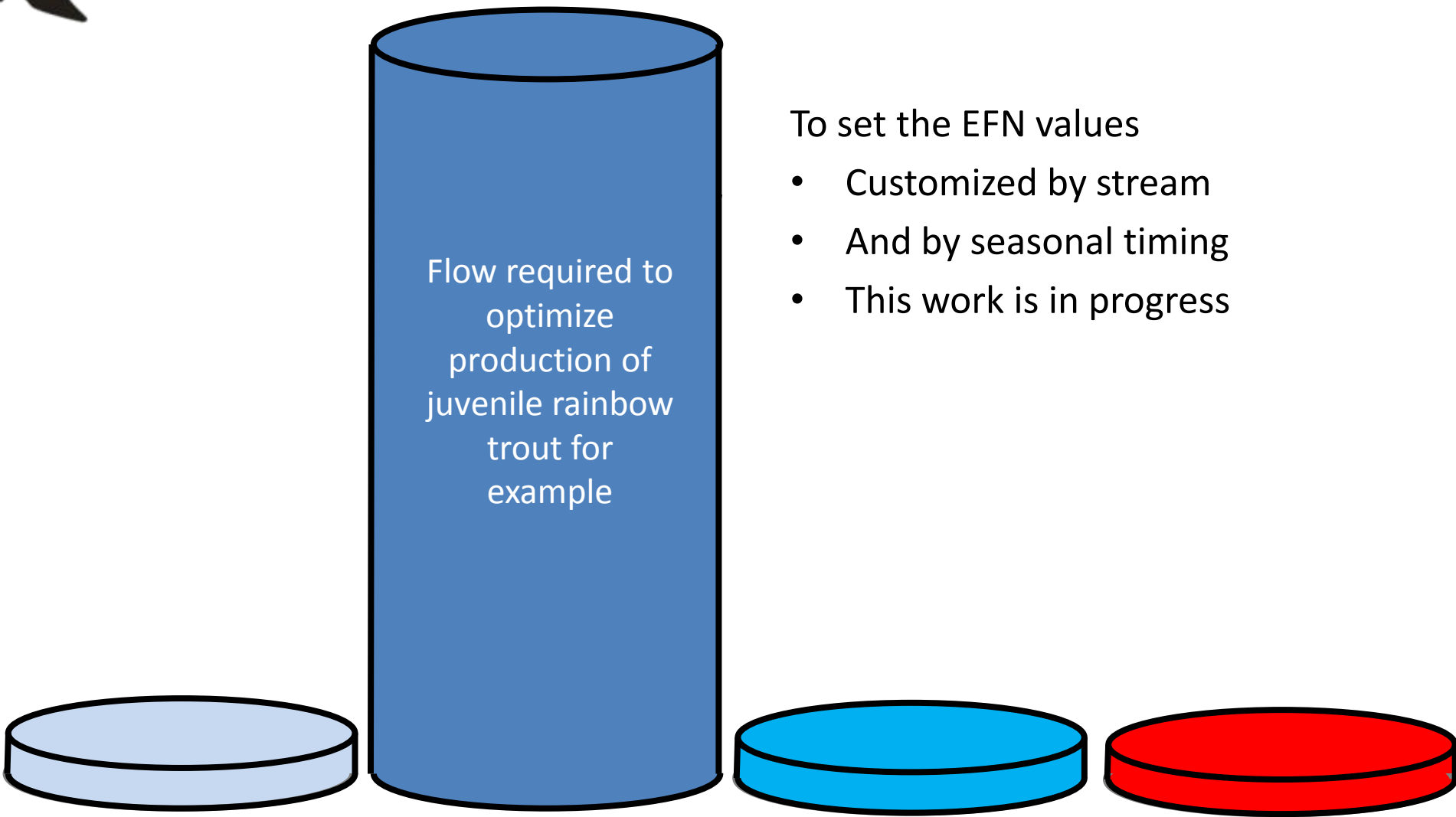
Critical low flows are set for:

- Fish passage
- Kokanee spawning
- Rainbow trout parr rearing

This became a new element not established in the 2016 methods

Draft

Setting EFNs



Flow required to
optimize
production of
juvenile rainbow
trout for
example

To set the EFN values

- Customized by stream
- And by seasonal timing
- This work is in progress

**Step 1: 1-in-2 Year
Naturalized flow**

**Step 2:
WUW Optimal EFN**

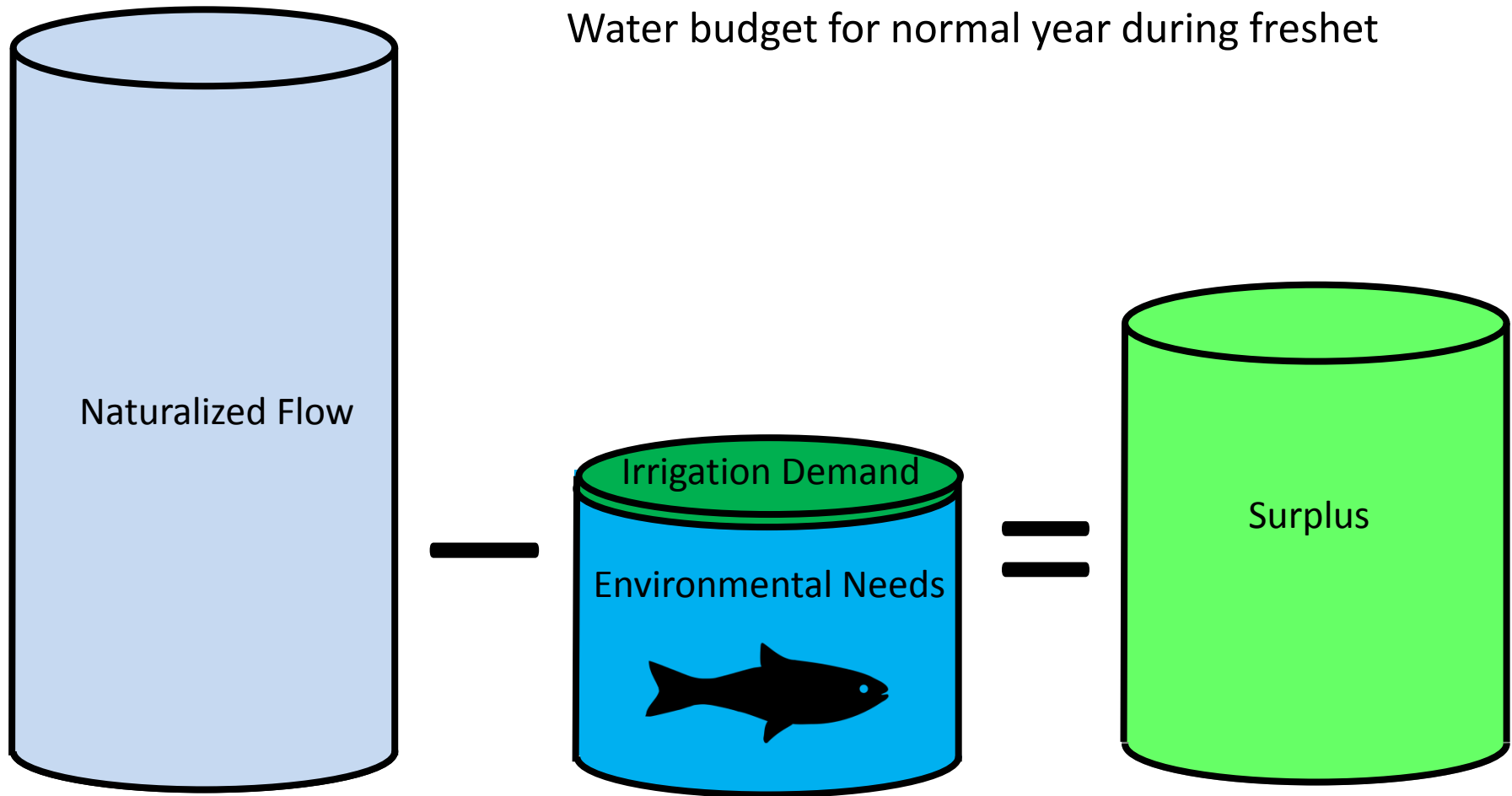
**Step 3:
Adjusted WUW EFN**

**Step 4:
Critical Flow Threshold**

Setting EFNs



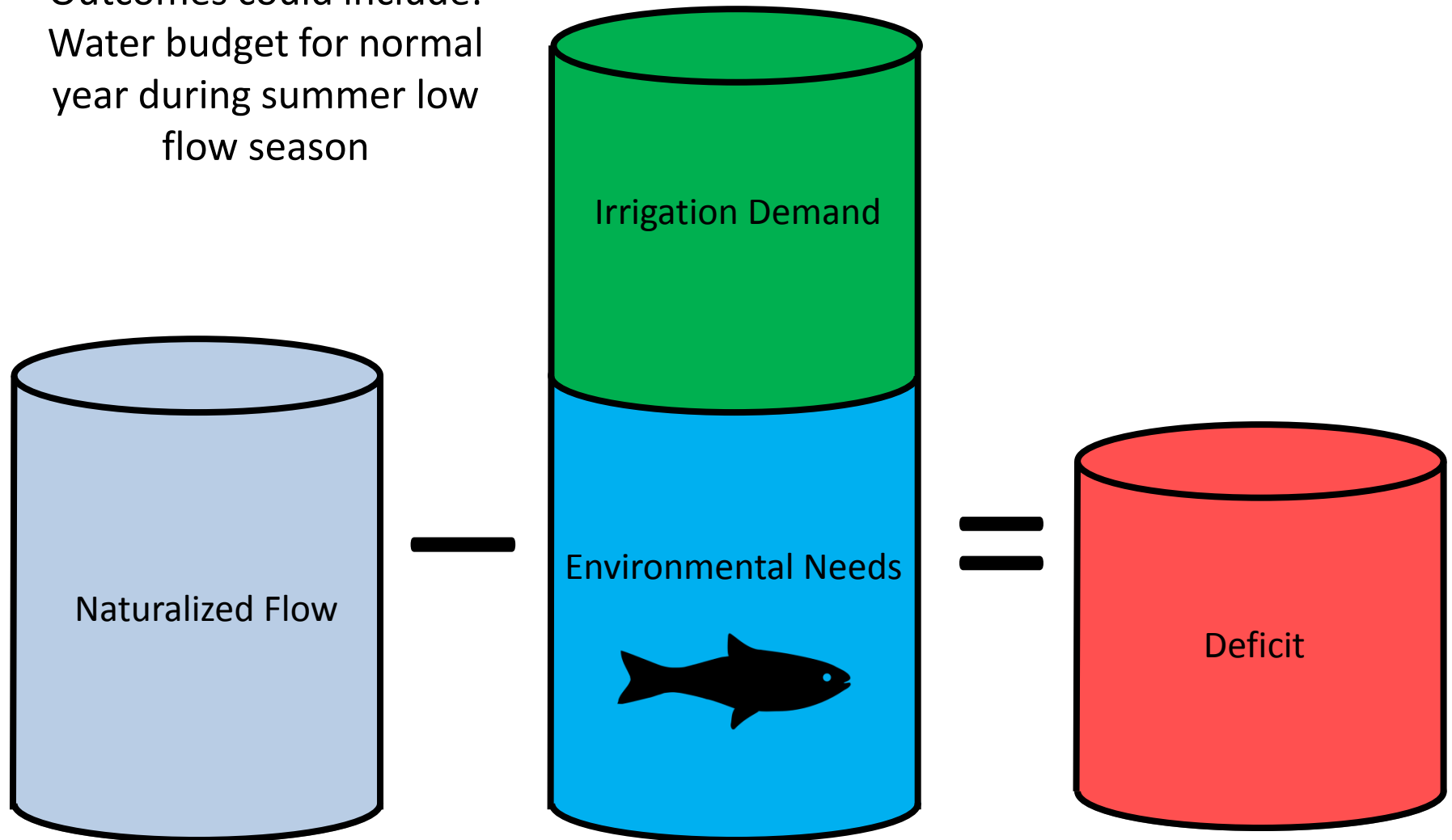
Outcomes could include:
Water budget for normal year during freshet



Setting EFNs



Outcomes could include:
Water budget for normal
year during summer low
flow season





Lim'limt

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