Okanagan Environmental Flow Needs Project Update

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Okanagan Basin WATER BOARD

syilx Okanagan Nation Alliance

Associated Environmental

Water Stewardship Council

7 September 2017

Outline

1. Introduction and Project Objectives
2. Site Details
3. Okanagan Tennant Method
   - Streamflow Dataset Development
4. Okanagan Weighted Useable Width Method
   - Field Data Collection
   - Data Management
5. Next Steps

BC Water Sustainability Act

Environmental Flow Needs (EFN): volume and timing of stream flow required for proper functioning of the aquatic ecosystem.

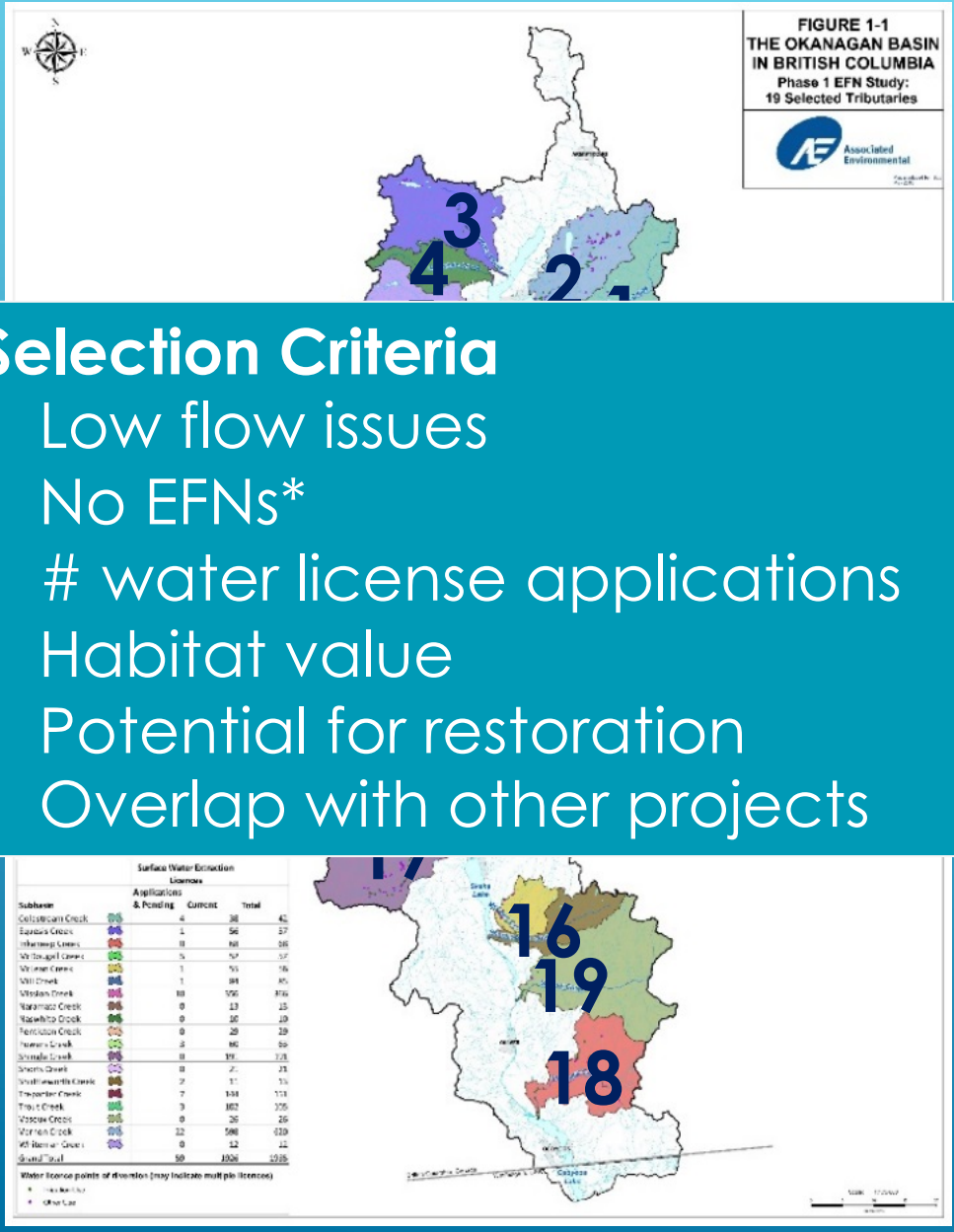
Critical Environmental Flow Threshold: volume of stream flow below which significant or irreversible harm to the aquatic ecosystem is likely to occur.

Okanagan EFN Project

- Defensible, transparent and robust EFN values for Okanagan tributaries
- Methods selected in Phase I
  - 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

Selected Tributaries

Selected Tributaries (11)



Selection Criteria

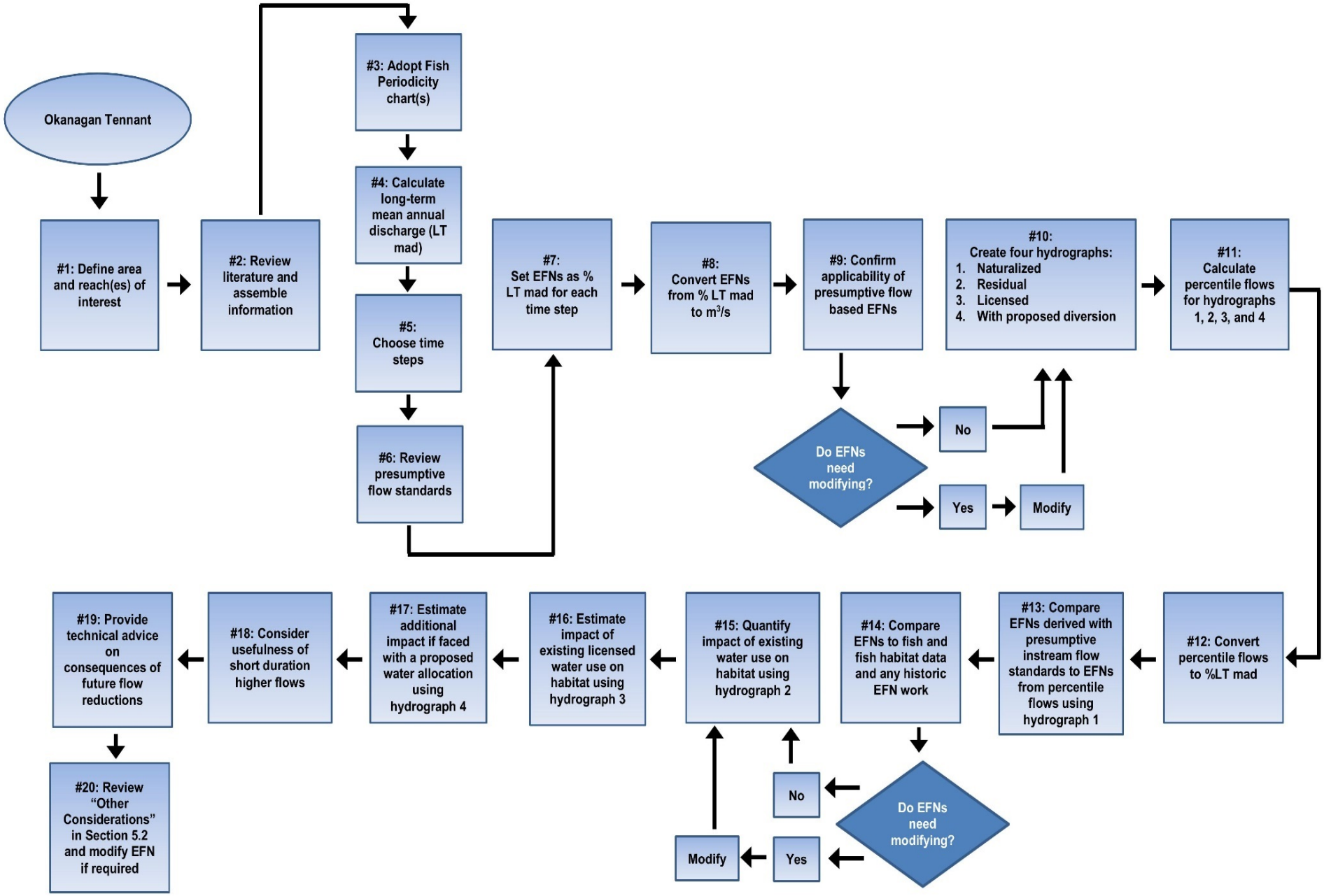
- Low flow issues
- No EFNs*
- # water license applications
- Habitat value
- Potential for restoration
- Overlap with other projects

1. Coldstream
2. Lower Vernon
3. Equesis
4. Naswhito
5. Whiteman
6. Kelowna (Mill)
7. Mission
8. Powers
9. McDougall
10. Trepanier
11. Naramata
12. Shorts
13. Penticton
14. Trout
15. McLean
16. Shuttleworth
17. Shingle
18. Inkaneep
19. Vaseux

Okanagan Tennant Method
Streamflow dataset development

Associated Environmental

POLAR GEOSCIENCE LTD.


Okanagan Tennant
#1: Define area and reach(es) of interest
#2: Review literature and assemble information
#3: Adopt Fish Periodicity chart(s)
#4: Calculate long-term mean annual discharge (LT mad)
#5: Choose time steps
#6: Review presumptive flow standards
#7: Set EFNs as % LT mad for each time step
#8: Convert EFNs from % LT mad to m3/s
#9: Confirm applicability of presumptive flow based EFNs
Do EFNs need modifying?
No
Yes
Modify
#10: Create four hydrographs:
1. Naturalized
2. Residual
3. Licensed
4. With proposed diversion
#11: Calculate percentile flows for hydrographs 1, 2, 3, and 4
#12: Convert percentile flows to %LT mad
#13: Compare EFNs derived with presumptive instream flow standards to EFNs from percentile flows using hydrograph 1
#14: Compare EFNs to fish and fish habitat data and any historic EFN work
Do EFNs need modifying?
No
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#15: Quantify impact of existing water use on habitat using hydrograph 2
#16: Estimate impact of existing licensed water use on habitat using hydrograph 3
#17: Estimate additional impact if faced with a proposed water allocation using hydrograph 4
#18: Consider usefulness of short duration higher flows
#19: Provide technical advice on consequences of future flow reductions
#20: Review "Other Considerations" in Section 5.2 and modify EFN if required

Okanagan Tennant Method

Naturalized Streamflow

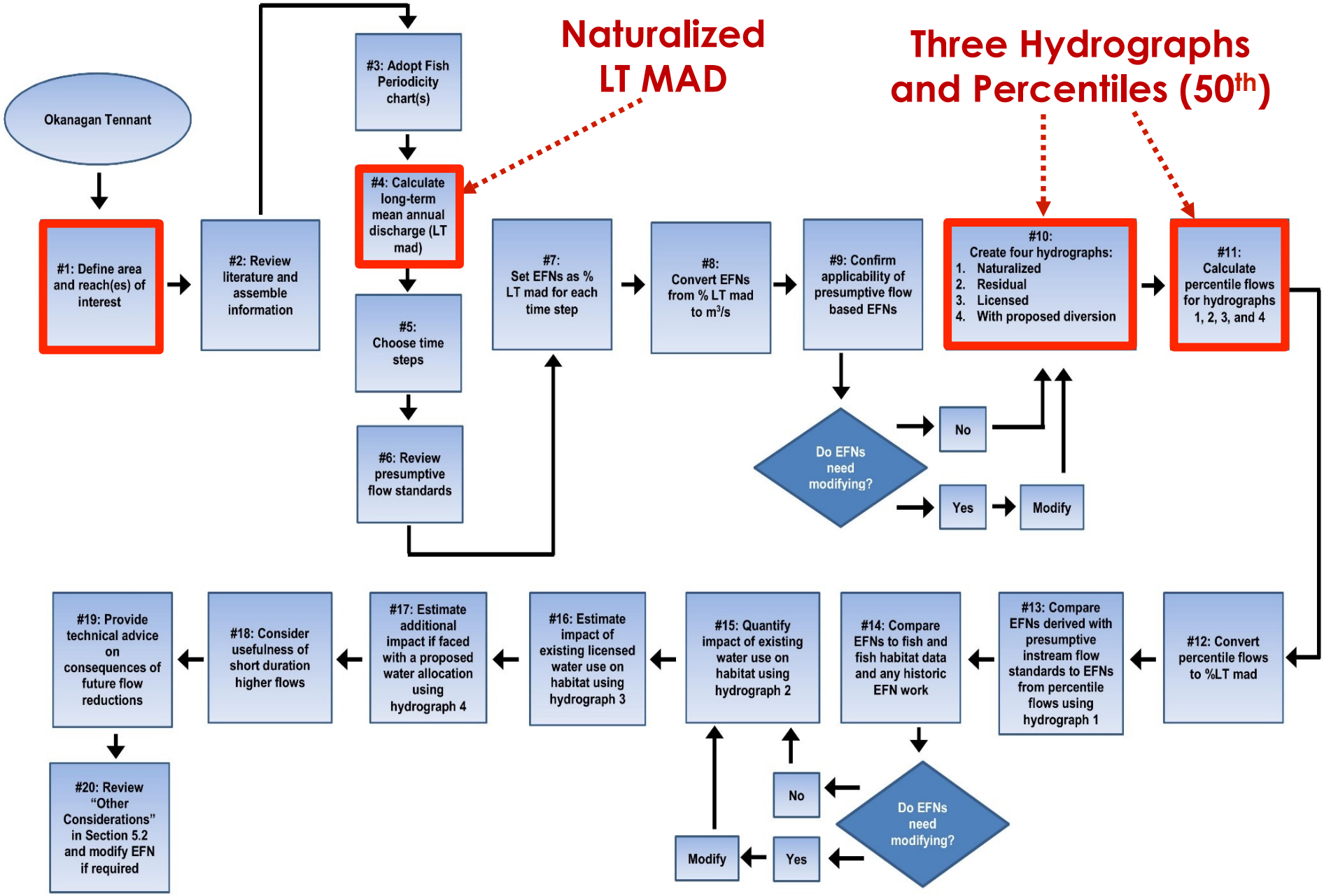
- Streamflow that would occur in a stream in the absence of flow regulation

Residual (Net) Streamflow

- Streamflow that remains after current water use and management (this is reality)

Maximum Licensed Streamflow

- Residual streamflow assuming maximum use of existing water licences


Naturalized LT MAD
Three Hydrographs and Percentiles (50th)
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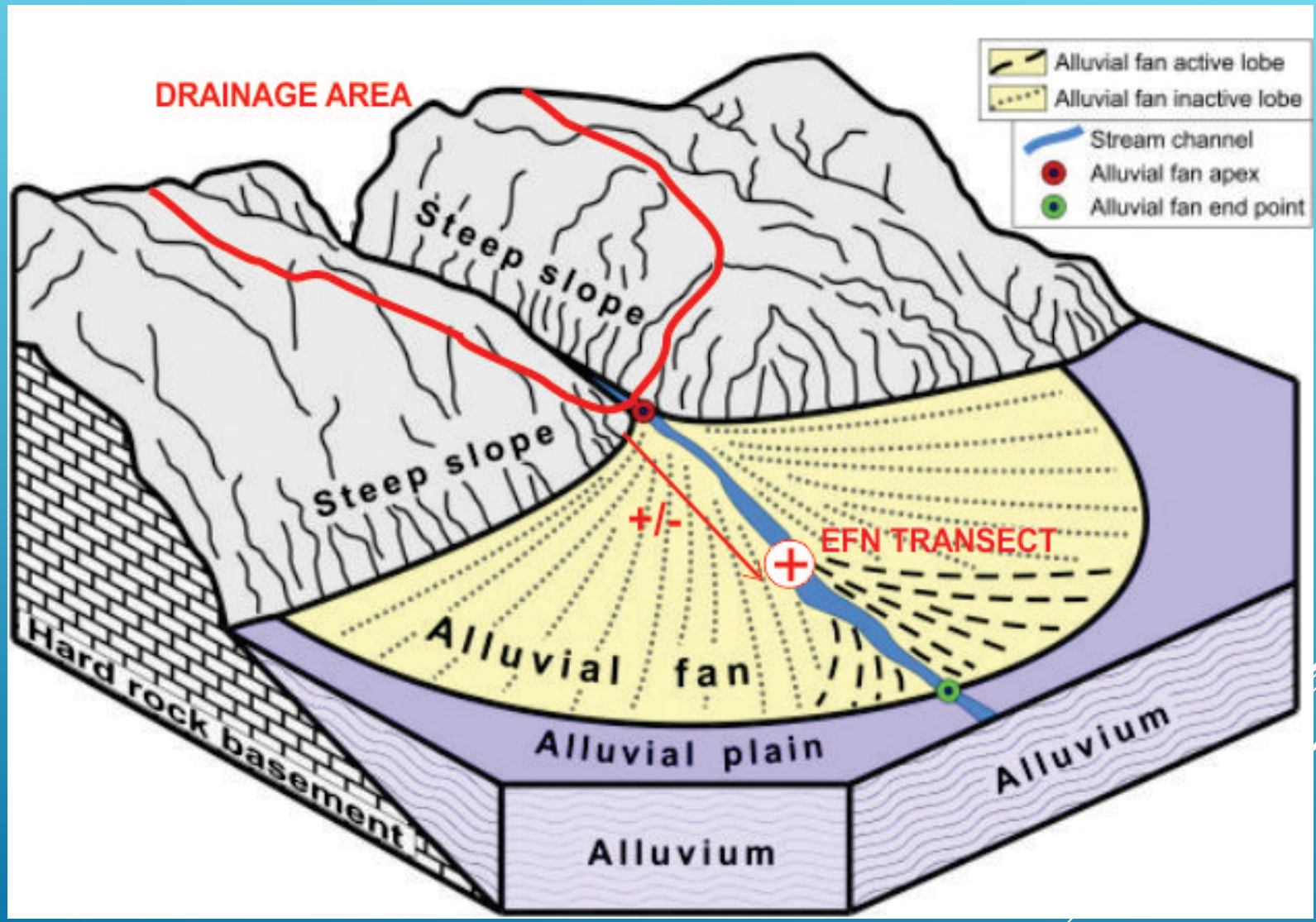
EFN Point-of-Interest (Step1)



Okanagan Tennant Method

Streamflow Information Needs:

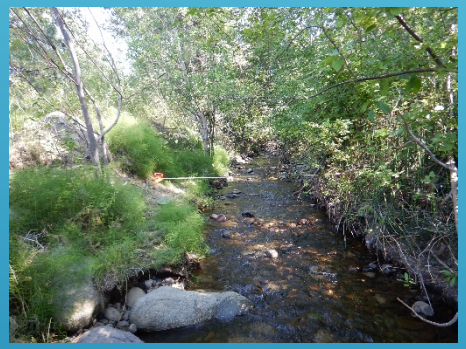
- Natural and/or residual streamflow records
- Water withdrawal records
- Reservoir management information
- Inter / Intra-basin transfer records
- Water licenses by purpose
- Groundwater – surface water interaction information

Natural WSC records available

- Scaled to point-of-interest
- Consider SW/GW interactions on fan

Residual WSC records available

- Add water use records (actual or modelled)
- Remove upland reservoir management (Q_R)
- Scaled to point-of-interest
- Consider SW/GW interactions on fan



Naturalized Streamflows (and LT MAD)

Nearby natural WSC records available

- Review watershed hypsometry
- Scaled to point-of-interest
- Consider SW/GW interactions on fan

No WSC records available

- Use regional runoff relations
- Scale annual runoff using representative nearby WSC station(s)
- Consider SW/GW interactions on fan

Residual Streamflows

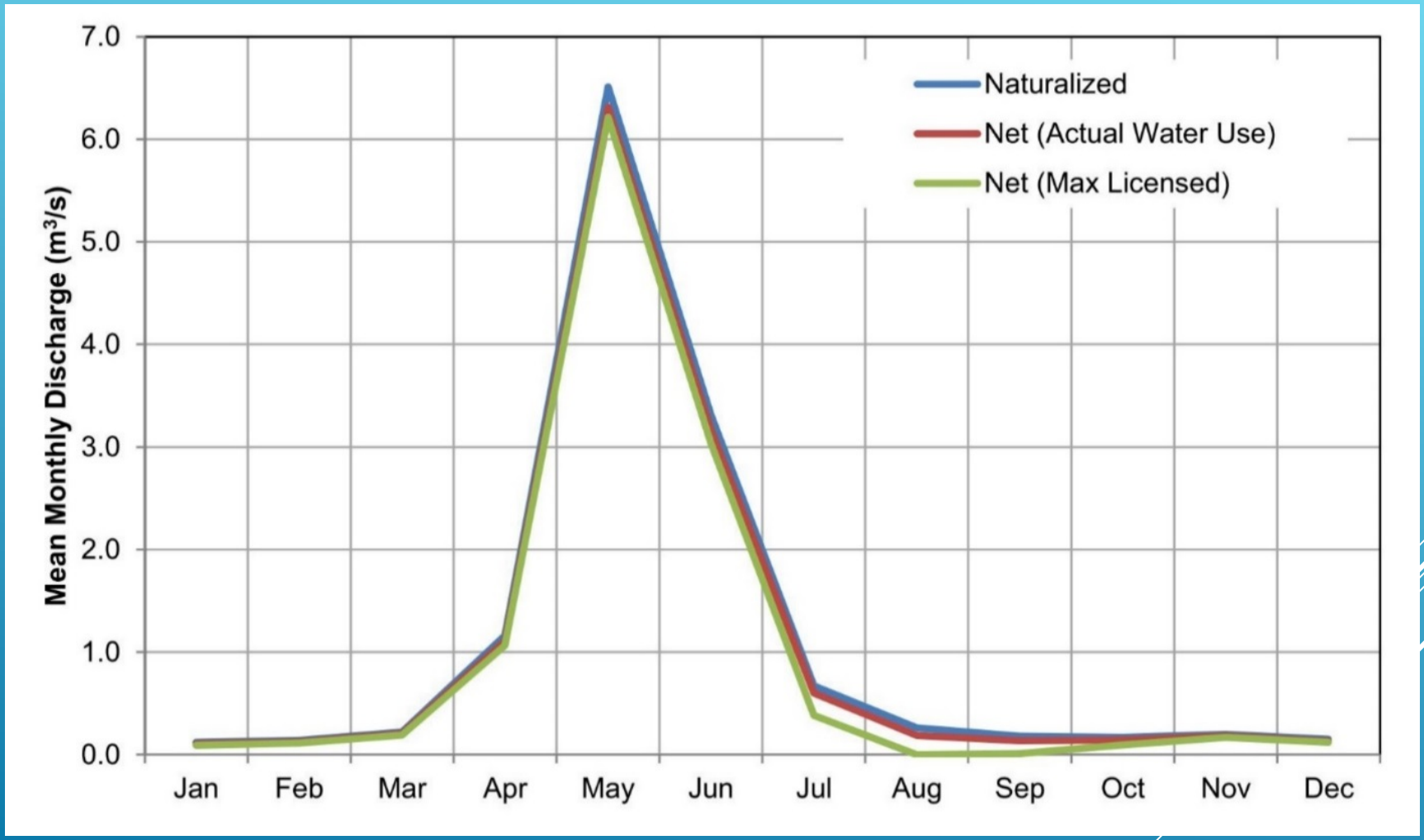
Residual WSC records available
- Scaled to point-of-interest
- Consider SW/GW interactions on fan

Naturalized estimates available
- Subtract water use records (actual or modelled)
- Add upland reservoir management (Q_R)

Naturalized estimates available
- Subtract total licensed water withdrawals using assumed distribution by water use purpose
- Add upland reservoir management (Q_R)

Maximum Licensed Streamflows

Okanagan Tennant Method (Step 10)



Okanagan Tennant Method

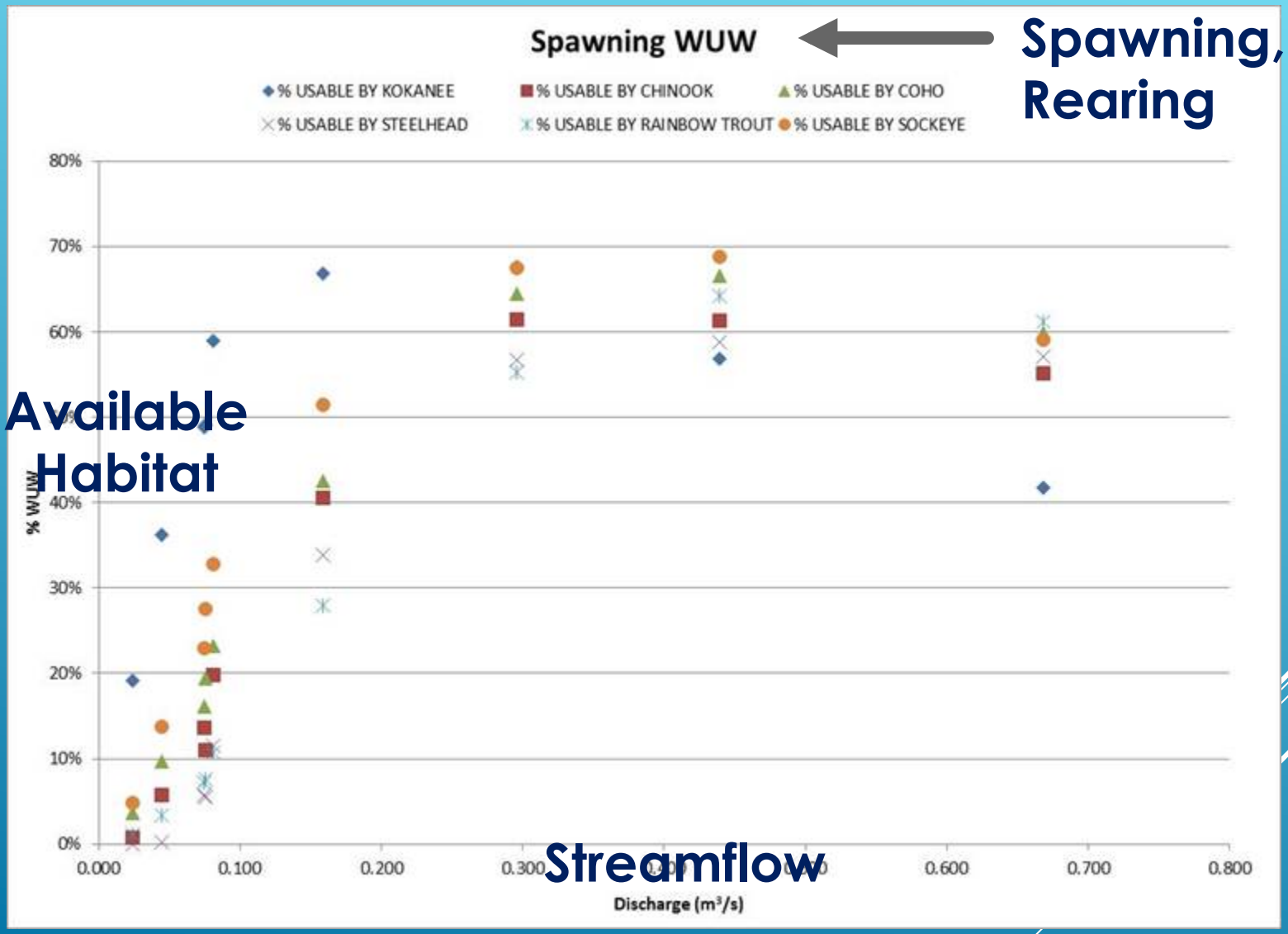
Deliverable:

- Report outlining the recommended methods to develop the streamflow datasets to apply the Okanagan Tennant Method
  - Standard period 1996-2010

- Report reviewed by ONA and MFLNRORD/MOE
  - September 2017

Okanagan Weighted Useable Width (WUW) Method

2. WUW Method

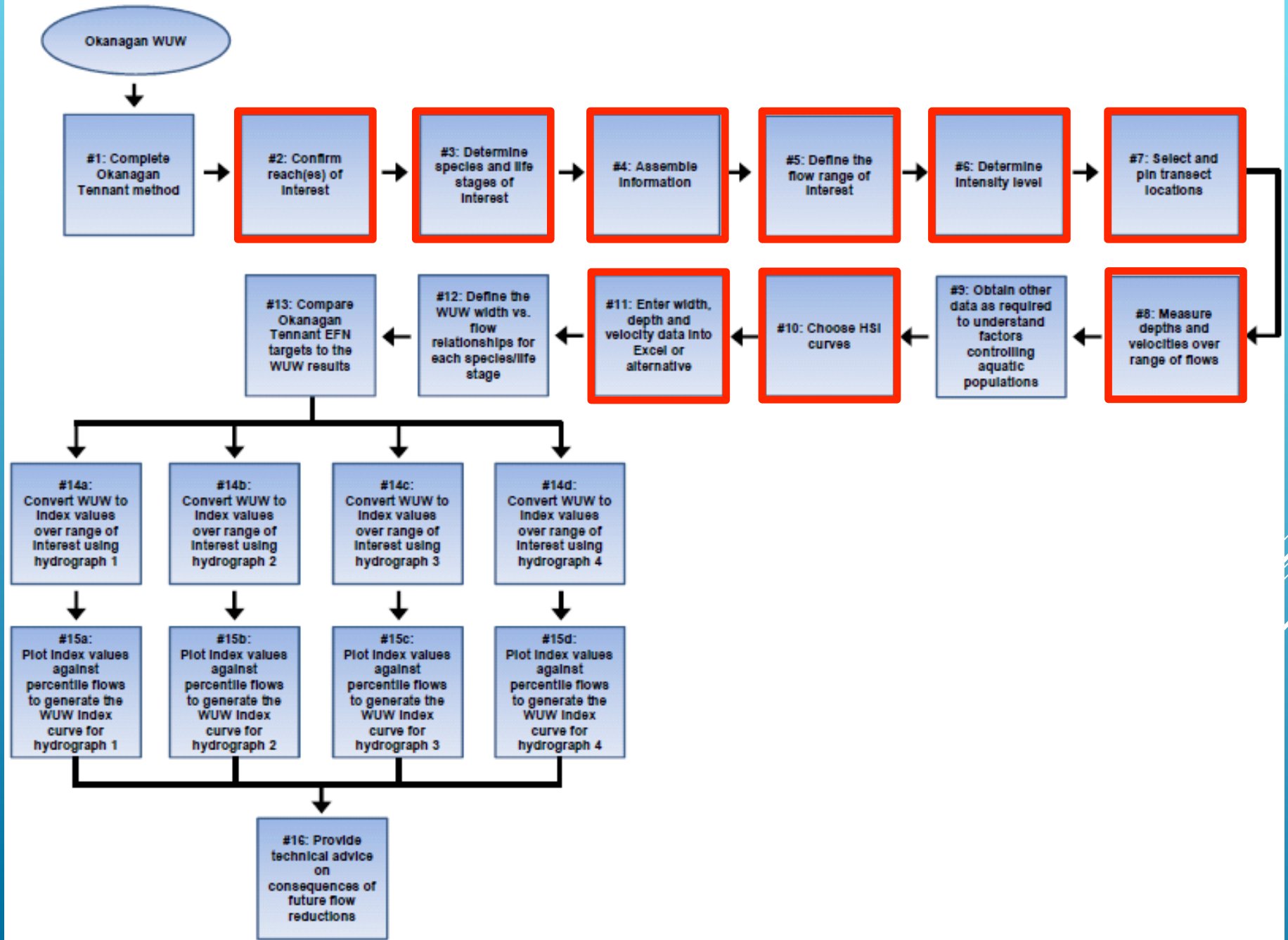


Spawning, Rearing

Available Habitat

Streamflow

2. WUW Method


Okanagan WUW
#1: Complete Okanagan Tennant method
#2: Confirm reach(es) of interest
#3: Determine species and life stages of interest
#4: Assemble information
#5: Define the flow range of interest
#6: Determine intensity level
#7: Select and pin transect locations
#8: Measure depths and velocities over range of flows
#9: Obtain other data as required to understand factors controlling aquatic populations
#10: Choose HSI curves
#11: Enter width, depth and velocity data into Excel or alternative
#12: Define the WUW width vs. flow relationships for each species/life stage
#13: Compare Okanagan Tennant EFN targets to the WUW results
#14a: Convert WUW to Index values over range of interest using hydrograph 1
#14b: Convert WUW to Index values over range of interest using hydrograph 2
#14c: Convert WUW to Index values over range of interest using hydrograph 3
#14d: Convert WUW to Index values over range of interest using hydrograph 4
#15a: Plot Index values against percentile flows to generate the WUW Index curve for hydrograph 1
#15b: Plot Index values against percentile flows to generate the WUW Index curve for hydrograph 2
#15c: Plot Index values against percentile flows to generate the WUW Index curve for hydrograph 3
#15d: Plot Index values against percentile flows to generate the WUW Index curve for hydrograph 4
#16: Provide technical advice on consequences of future flow reductions

Data Collection

- 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

E.g. Equesis Creek

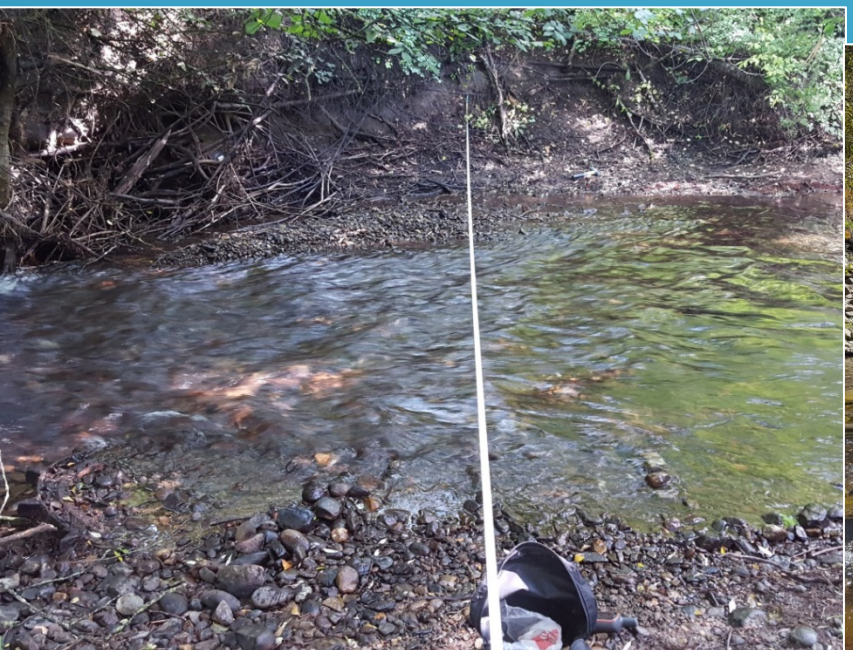
- Completed habitat mapping
- 4 Riffle and 4 Glide transects below migration barrier (dam)
- 3 hydrometric stations (1 real-time)

E.g. Vaseux Creek

- Completed habitat mapping
- 2 Riffle and 2 Glide transects installed
- 1 hydrometric station (real-time)

Field Challenges

- Logger stolen or malfunctioned
- Hydrometric station caps removed
- Cross-section markers removed
  - <8 out of original 76 habitat sites moved
- Freshet damage and channel changes
  - Few hydromet stations damaged



Data Sets

- Measurements at full range of flows for:
  - Naswhito, Whiteman, McDougall
  - Coldstream, Equesis almost completed
- Collecting more data for:
  - Mission, Shingle, Shuttleworth, Vaseux, Inkaneep
  - Lower Vernon Creek (high flows in 2017)

Data Correction and Management

- Robust and defensible data requires good data collection and management
- Standardized field sampling protocols
- Adopted data correction and management protocols
- Field data uploaded, corrected and graded in Aquarius (ongoing)
  - Build rating curves

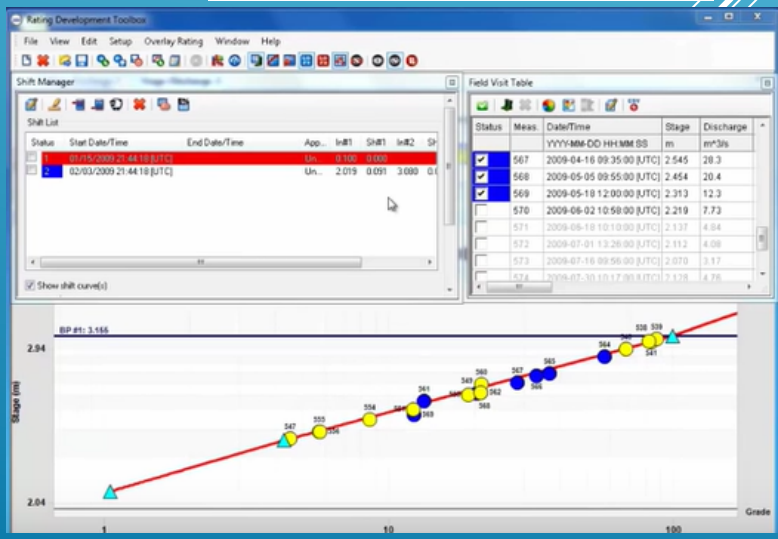
HYDROMETRIC (SURFACE WATER) FIELD DATA FORM	
Stream/Reach:	Crew:
Date:	Page: _____ of _____
Transect Name:	
Start time:	End time:
Staff Gauge Start:	Staff Gauge End:
Velocity meter:	Camera:
Offset from RB Headpin:	
Photo u/s:	Photo d/s:

Weather Conditions:

FLOWTRACKER 2	
Filename	
Total Discharge (Q), m^3/s	
# stations across width	
Mean velocity, m/s	
Max velocity, m/s	
Width, m	
Cross-sectional area, m^2	
Max depth, m	

CHANNEL CONDITIONS AFFECTING DISCHARGE MSMT / CROSS SECTION	
Aquatic vegetation affecting flow	
Floating or lodged debris affecting flow	
Signs of recent human or animal activity	
Changes to channel bed (scour or aggradation)	
Within-channel obstructions affecting flow	
Recent bank erosion	
Turbulent flow conditions	
Flow angle not primarily perpendicular to tape	
Has channel shifted since last survey?	
Other changes or concerns	

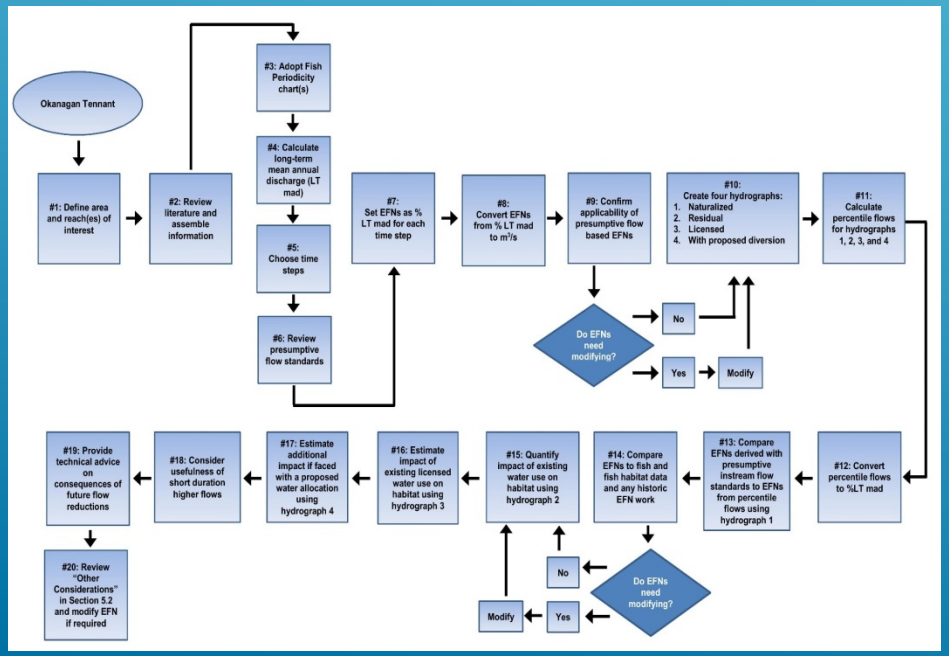
*Use comments section ON NEXT PAGE to explain/describe conditions.

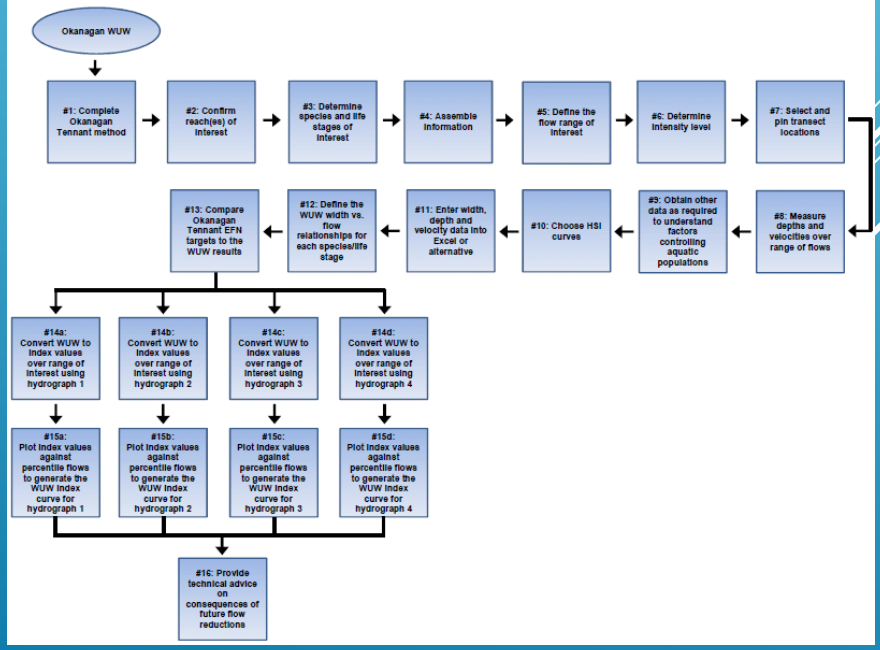


Next Steps

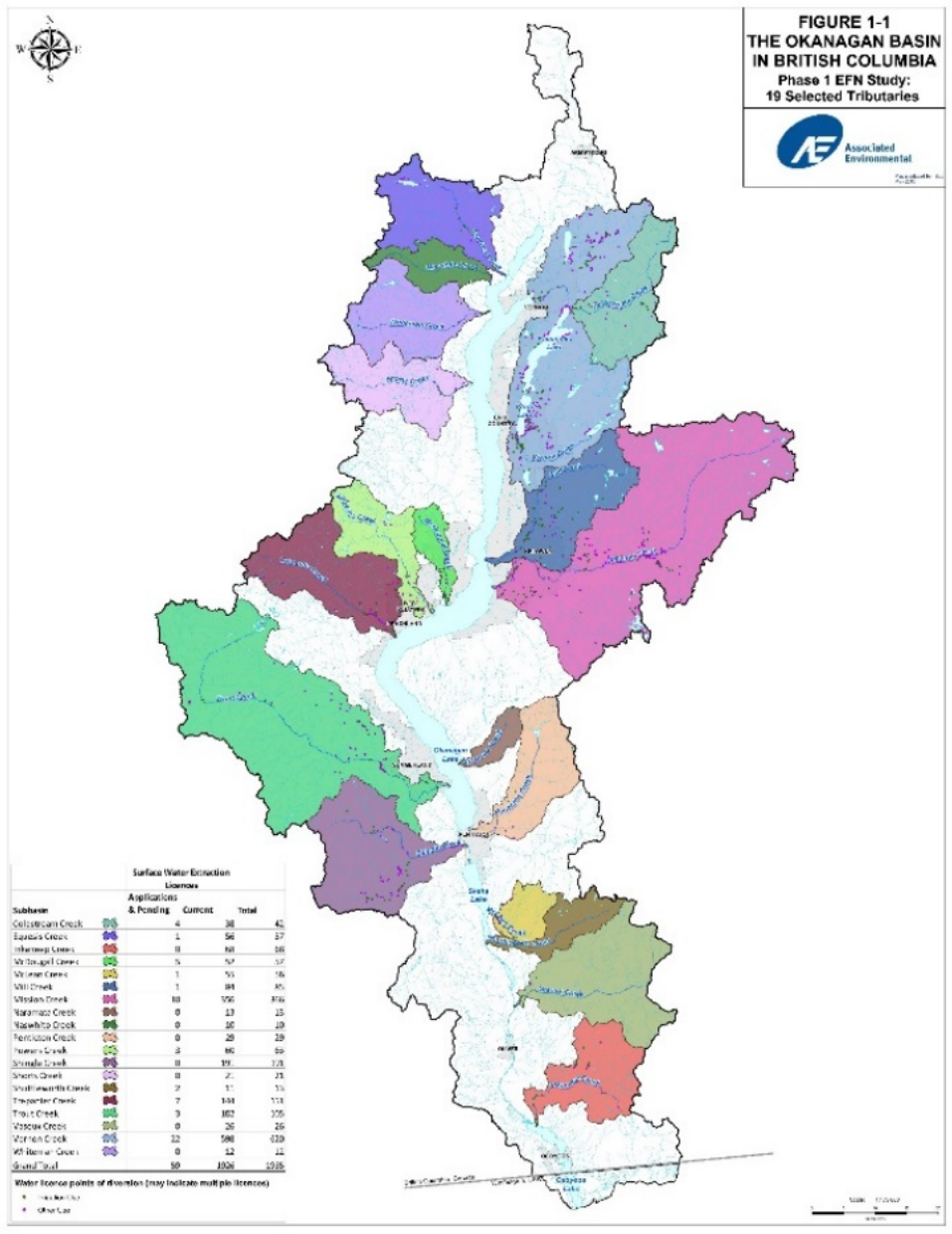
Methods Pilot Project

- Apply both EFN methods to two tributaries
  - Document processes
  - Recommend improvements/ considerations
  - Timeline: Fall 2017





Key Tributaries (19)



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