

# BEYOND MANASTASH: HOW STREAM SUPPLEMENTATION IMPACTS UPPER KITTITAS VALLEY STREAMS



# Kittitas Reclamation District Stream Supplementation

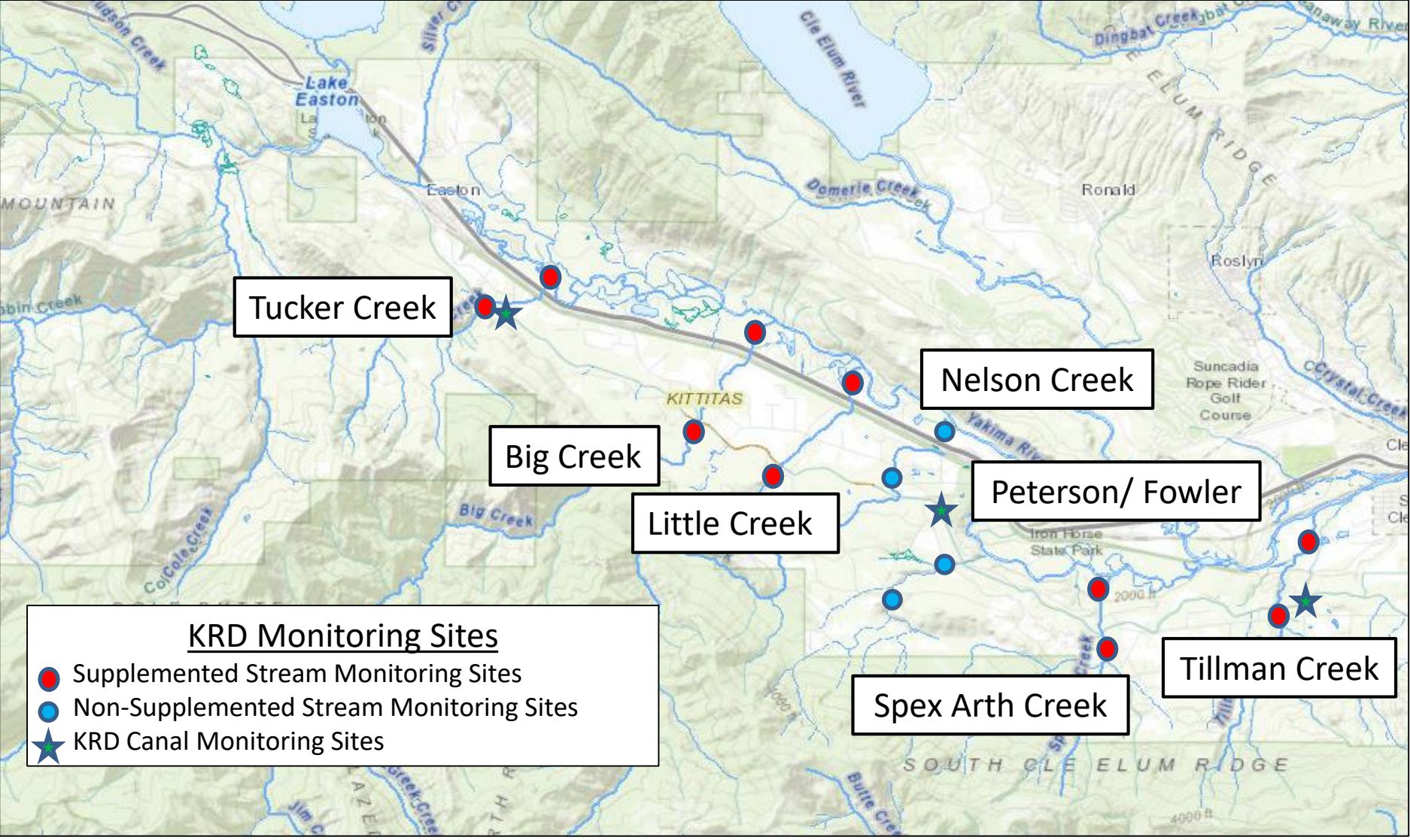
- KRD canals cross multiple streams throughout Kittitas County
- Agreements allow KRD to augment streamflow during low-water periods
  - *Agreement parties: KRD, Washington State Dept. of Ecology and the US Bureau of Reclamation;*
  - *WDFW and Yakama Nation are also consulted*
- Initial water delivery through irrigation season, roughly April-October, subject to canal operations and instream flow benefits

# KRD Stream Supplementation

- Prior to 2015
  - Manastash, Taneum, Badger Creeks
- Drought 2015
  - Tucker, Big, Little, Spex Arth, Tillman, and Dry Creeks
- Post 2015
  - Dropped Dry Creek from supplementation program.



Little Creek July 31, 2010



# Supplementation Amount/ Period

- Tucker Creek- 3 CFS (June thru December)
- Big Creek- 6-12 CFS (August and September)
- Little Creek- 12 CFS (June thru December)
- Spex Arth Creek- 3 CFS (June thru October)
- Tillman Creek- 3 CFS (June thru October)

# 2015- 2017 KRD Water Delivery



Tucker Creek



Little Creek



Spex Arth Creek

# New KRD Water Delivery

Little Creek- 6 CFS



New permanent water delivery structures installed on Big, Little, and Tillman creeks in 2017.



# Gaging Supplementation Needs: Trial and Error



July 21, 2015 Little Creek- 1.33CFS Natural/ 2.6CFS KR



# Little Creek - 4.9 CFS from KRD canal



July 23, 2015 near John Wayne Trail- 1.10CFS Above KRD Canal

# Little Creek - 9.2 CFS from KRD canal



July 25, 2015 near John Wayne Trail

## Little Creek Recharged Near I-90



July 24, 2015



July 27, 2015

# 2016 - 2017 Stream Recovery

- Flow Monitoring
  - May through October
- Water Chemistry
  - Temperature, Dissolved Oxygen, pH, Conductivity, Total Dissolved Solids, Salinity, Alkalinity, and Turbidity
- Macroinvertebrate Collection
  - 2016 July and August
  - 2017 June, July, August
  - 2018 June, July, August

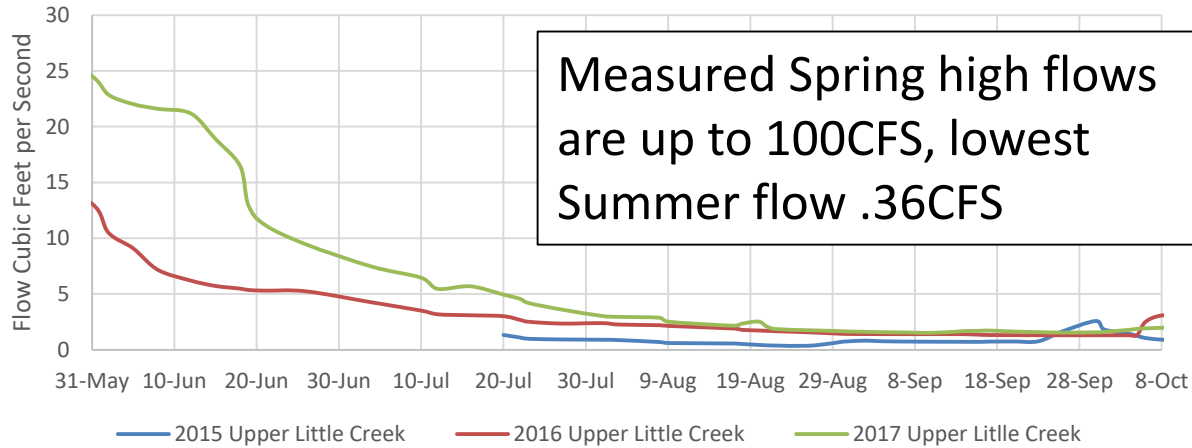


**Lower Tillman Creek May 2016**



# Irrigation Season Flows

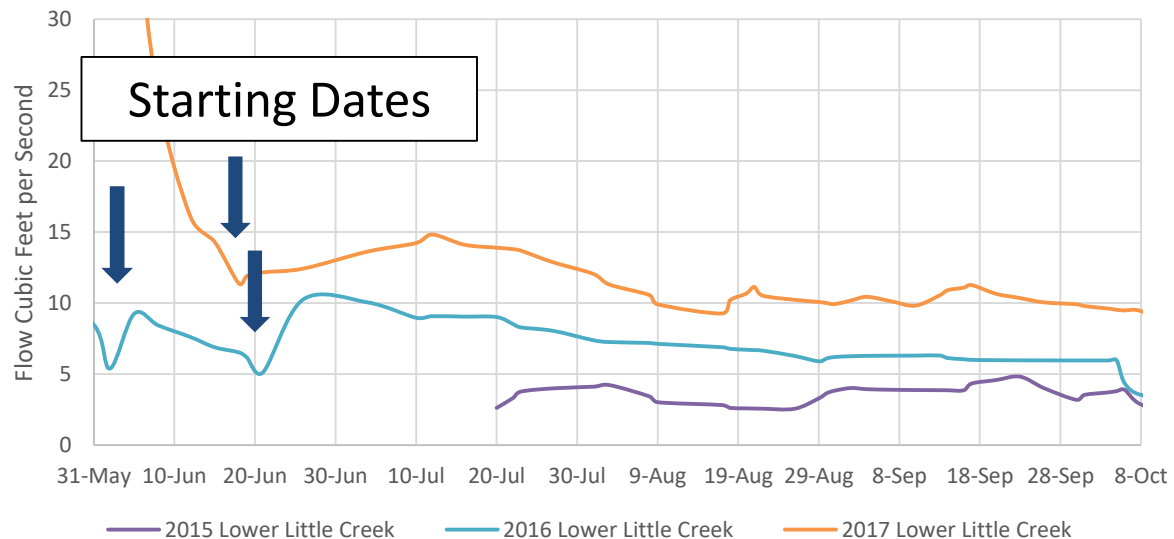
## Upper Little Creek Summer Flows



We lose between 3 to 4 CFS of Stream flow underneath I-90.



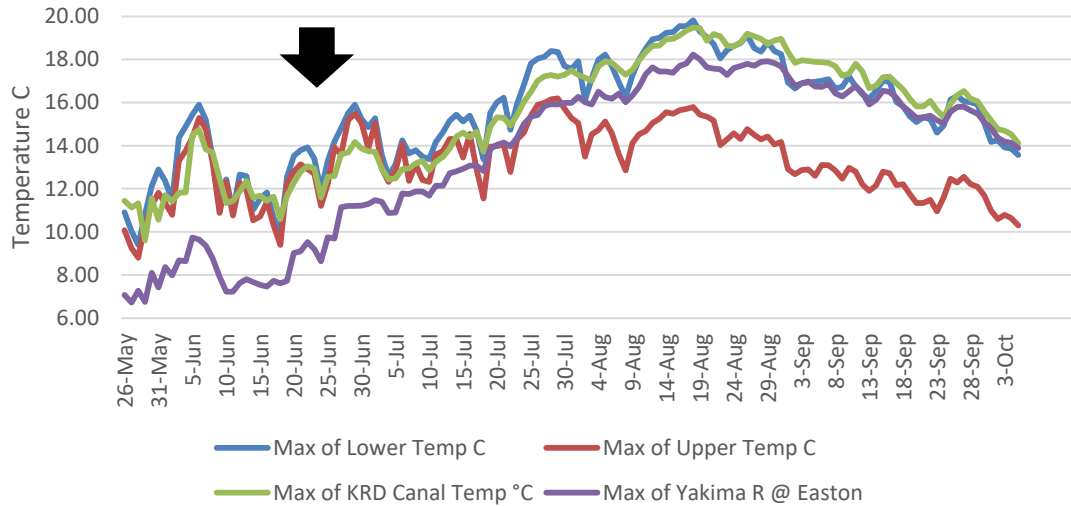
## Lower Little Creek Summer Flows



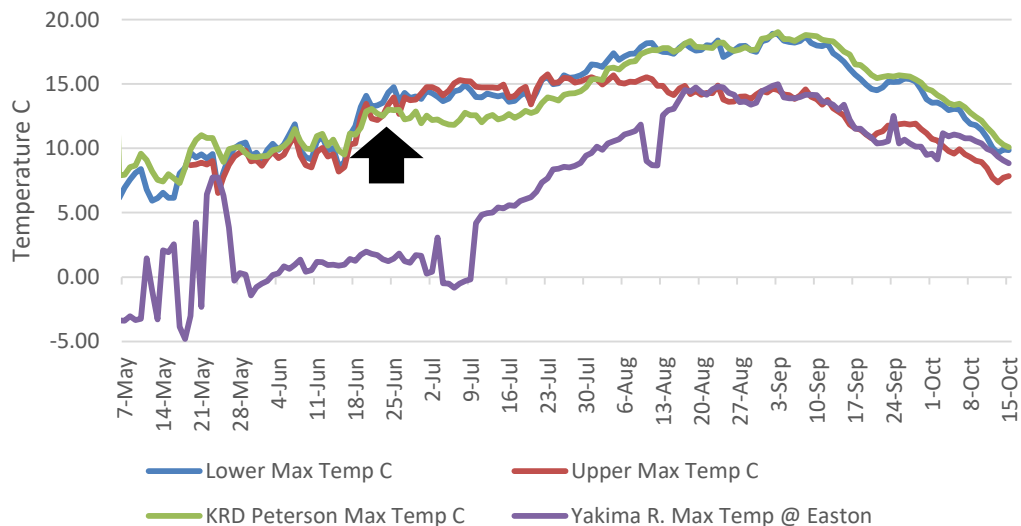
# Max Stream Temperatures



## 2016 Little Creek Max Temperature



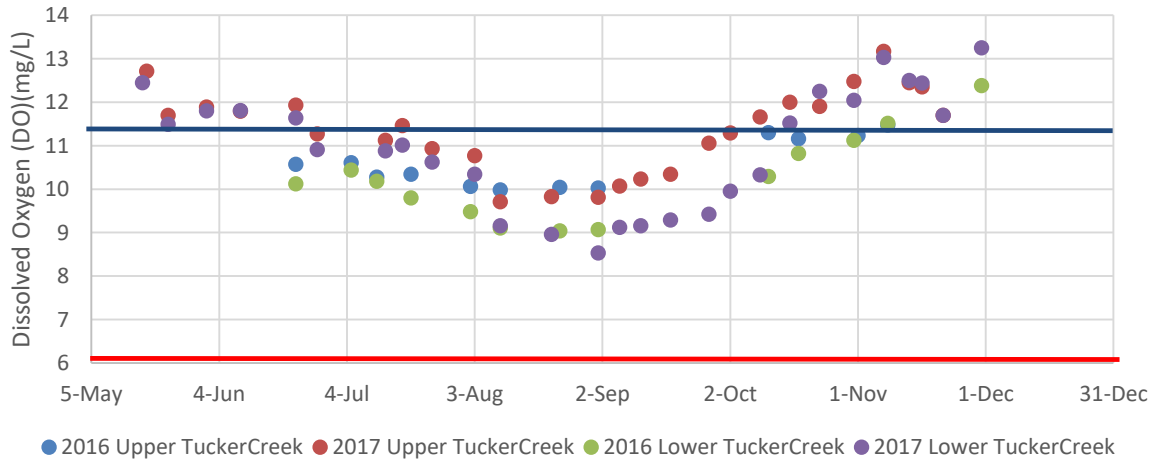
## 2017 Little Creek Max Temperature



Big Creek 2017

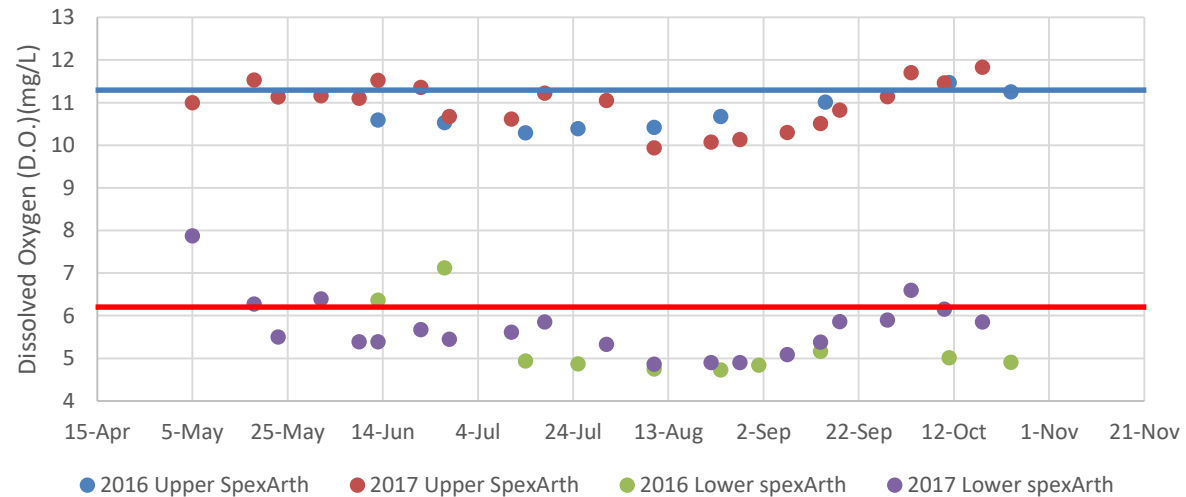
# Seasonal Dissolved Oxygen

## Tucker Creek Summer D.O. Levels



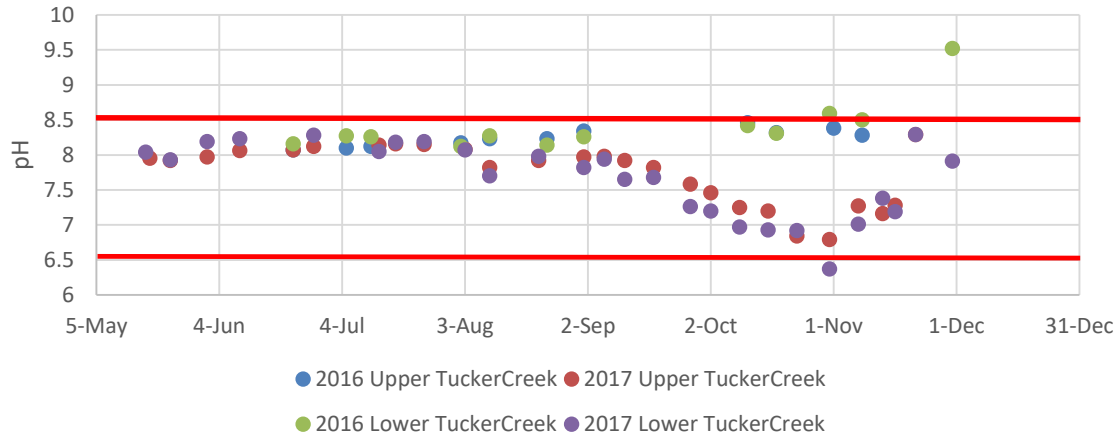
Complex stream systems have other challenges other than stream flow.

## Spex Arth Summer D.O. Levels

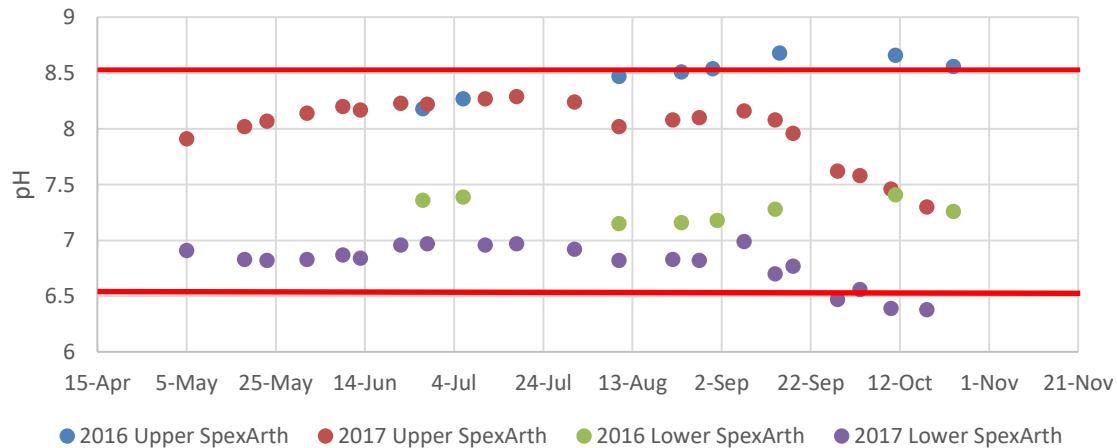


# Seasonal pH Levels

## Tucker Creek Summer pH Levels



## Spex Arth Creek Summer pH Levels

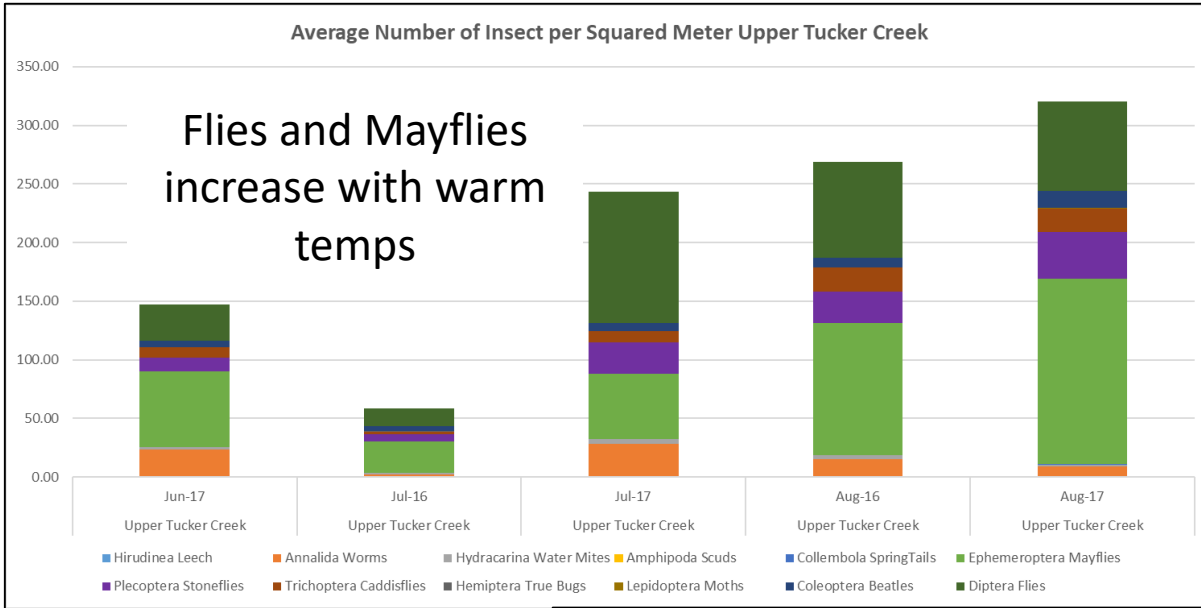




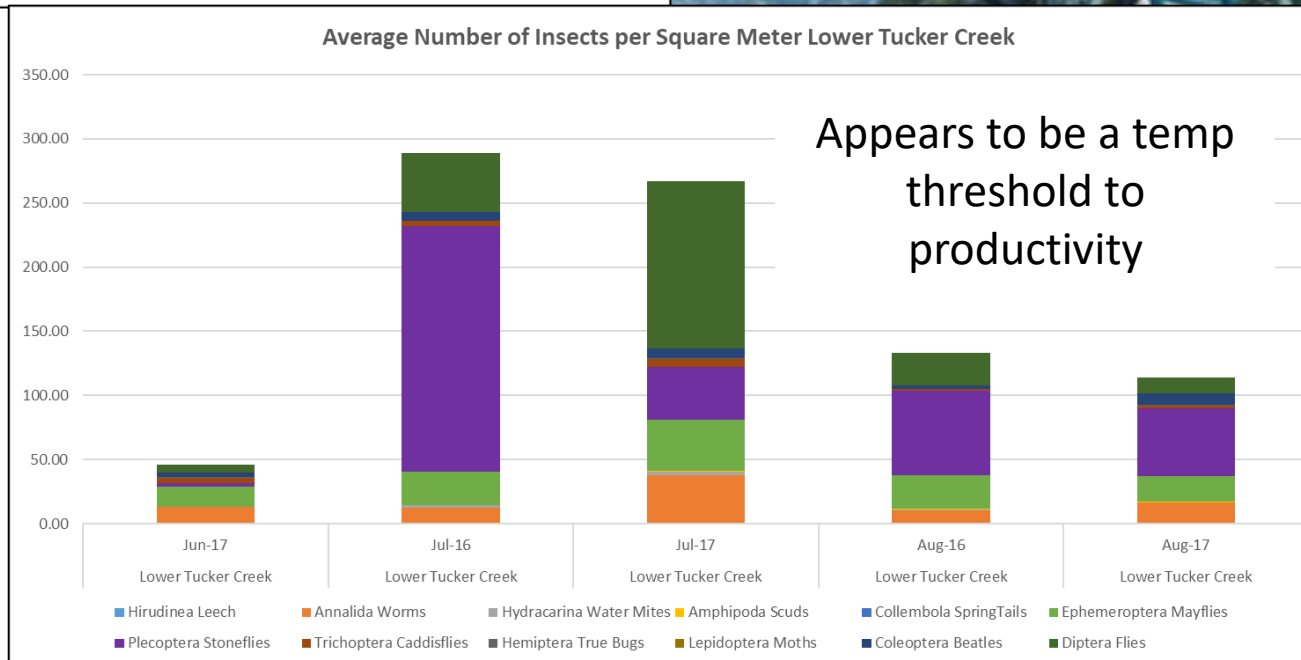
# Known Fish Presence

	<i>O. mykiss</i>	Coho	Cutthroat	Brook	Sculpin	Dace	Other
Tucker Creek	X	X	X	X	X		
Big Creek	X	X	X				
Little Creek	X	X	X	X		X	
Peterson /Fowler Ck	X			X	X		
Spex Arth Creek				X			
Tillman Creek	X	X		X	X	X	Lamprey

# Macroinvertebrates

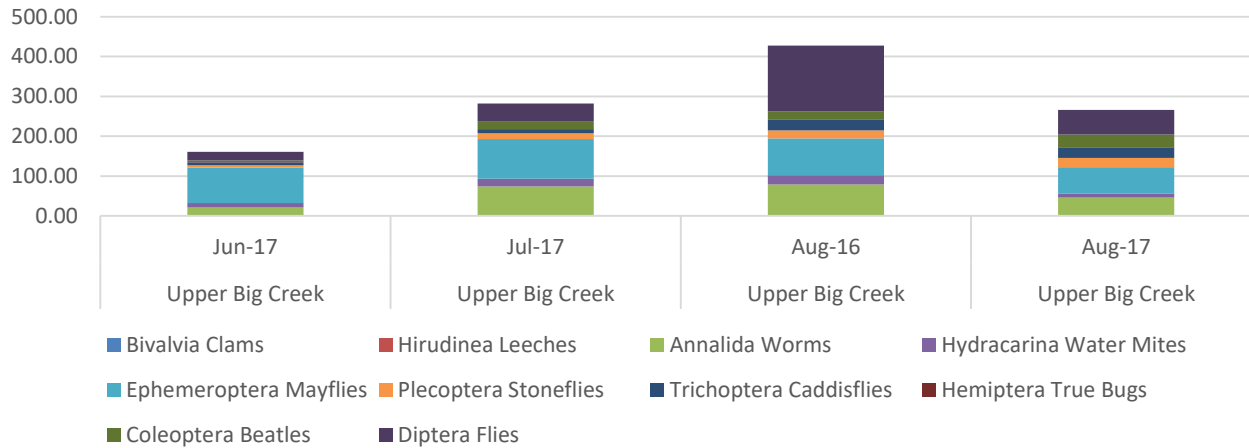


Appears to be a change in the timing of invertebrate abundance between Upper and Lower sites due to Temperature.



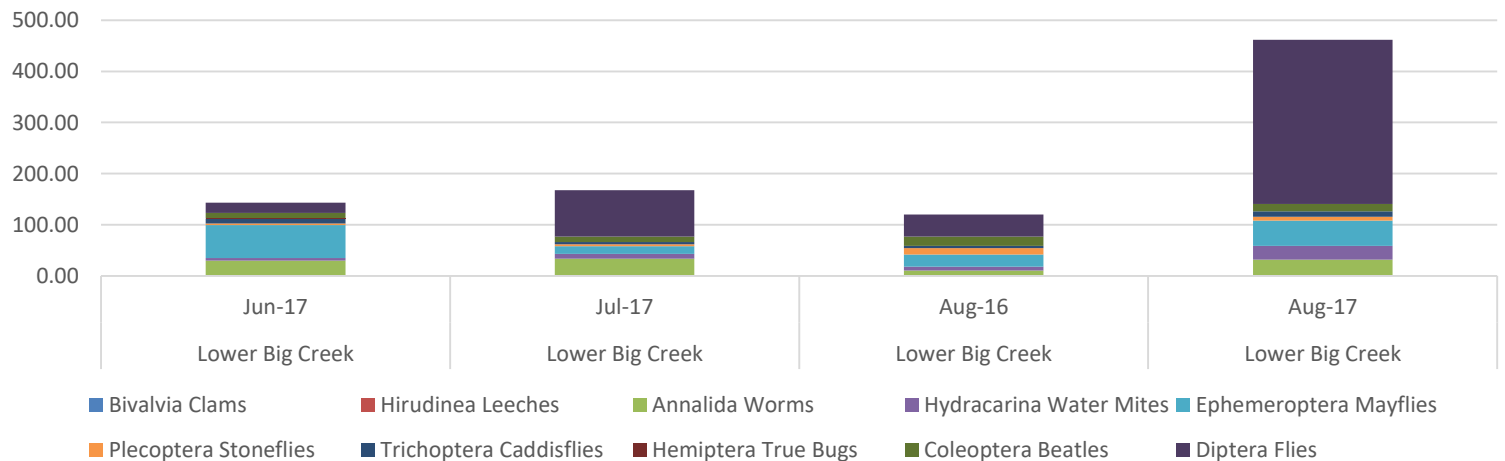
# Macroinvertebrates

## Average Number of Insects per Square Meter Upper Big Creek



Again, Flies increased with increased temps

## Average Number of Insects per Square Meter Lower Big Creek



# Current and Future Work

**Lower Nelson Creek  
June 5th**

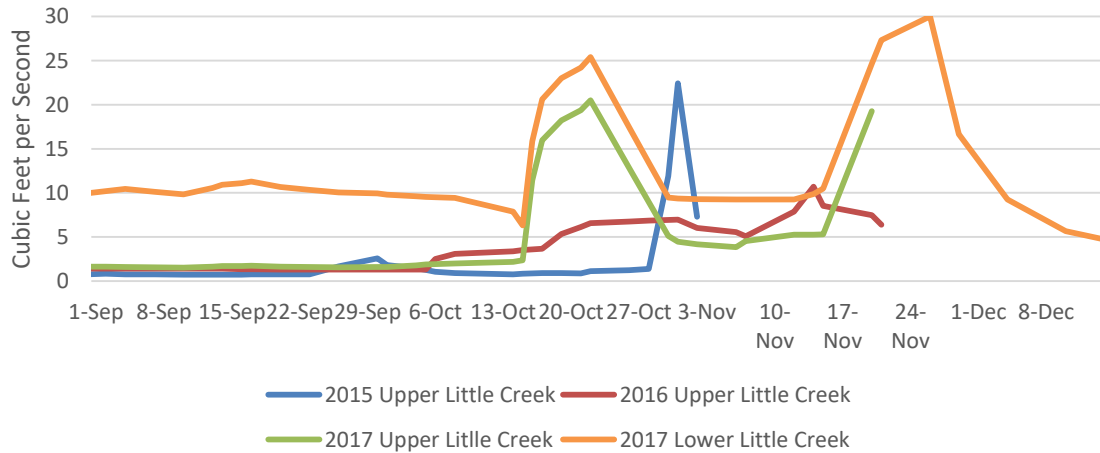


**Lower Tillman Creek  
June 5th**



# Continued Flow Monitoring

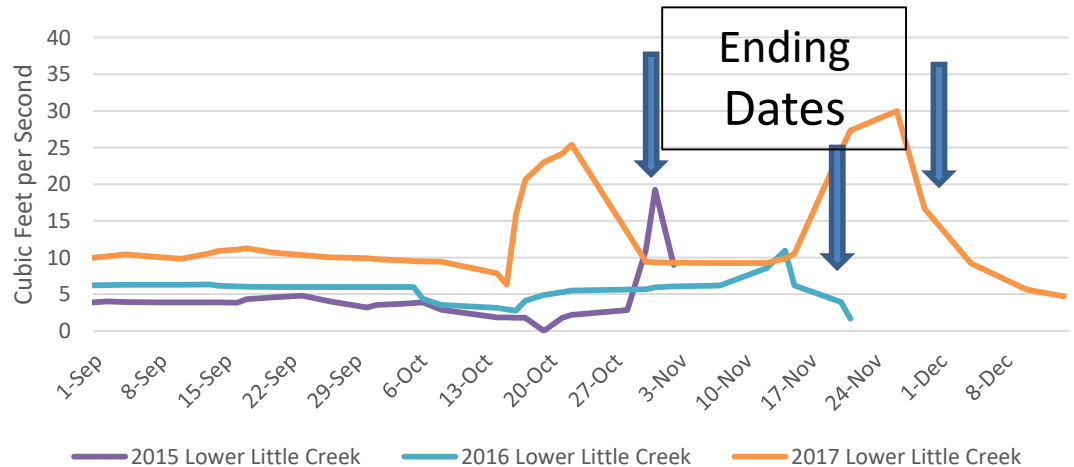
## Upper Little Creek Late Season Flows



The supplementation period has been extended through November.



## Lower Little Creek Late Season Flows



# Continued Macroinvertebrate Collection

- Collecting June, July, August samples to see seasonal changes.
- Looking at changes in community structure and biomass from supplemented and unsupplemented streams.



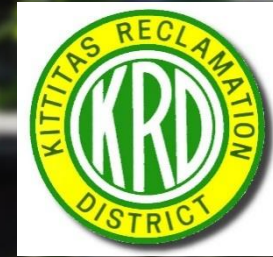
# Future Fish Passage Projects



Identifying structures  
that impede fish  
movements.

# Thanks

- Thank You Project Funders
- KRD Staff:
  - Urban Eberhart, Kevin Eslinger, Bob Main, Walt Larrick, Joel Hubble
- WDFW Staff:
  - Jon Kohr, Robert Granger, Steve Bosseow, Kiza Gates, Javan Bailey
- Ecology Staff





# Questions/ Comments

