



# **Crayfish Kill 2015 at Tenmile Creek**

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December 2, 2015

**Natural Resources Assessment Section**  
**Washington State Department of Agriculture**  
<http://www.agr.wa.gov/PestFert/NatResources/>



### About NRAS

- Goal: Protect endangered species and water quality while maintaining agricultural productivity
- Activities: Research, collaboration, outreach, and policy
- Our main projects
  - Pesticide use data collection
  - Agricultural landuse mapping
  - Ambient water quality monitoring

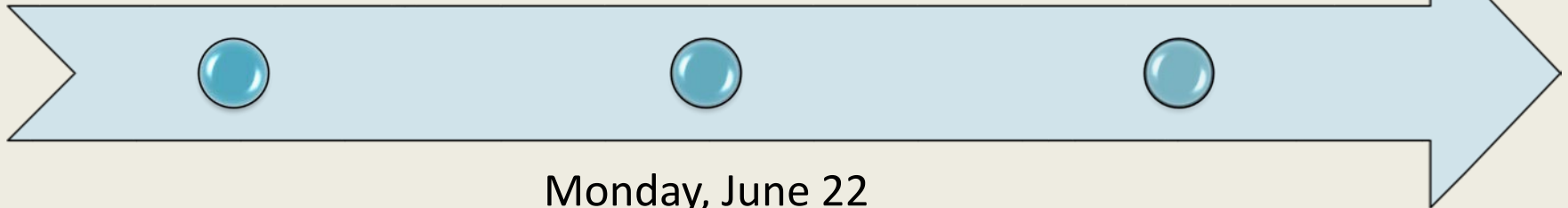


# Crayfish Kill in Tenmile Creek

June 20-21<sup>st</sup>  
Crayfish kill noticed

Wednesday, June 25<sup>th</sup>

WSDA collected  
sediment samples



Monday, June 22  
ERTS received by  
Dept of Ecology,  
crayfish collected



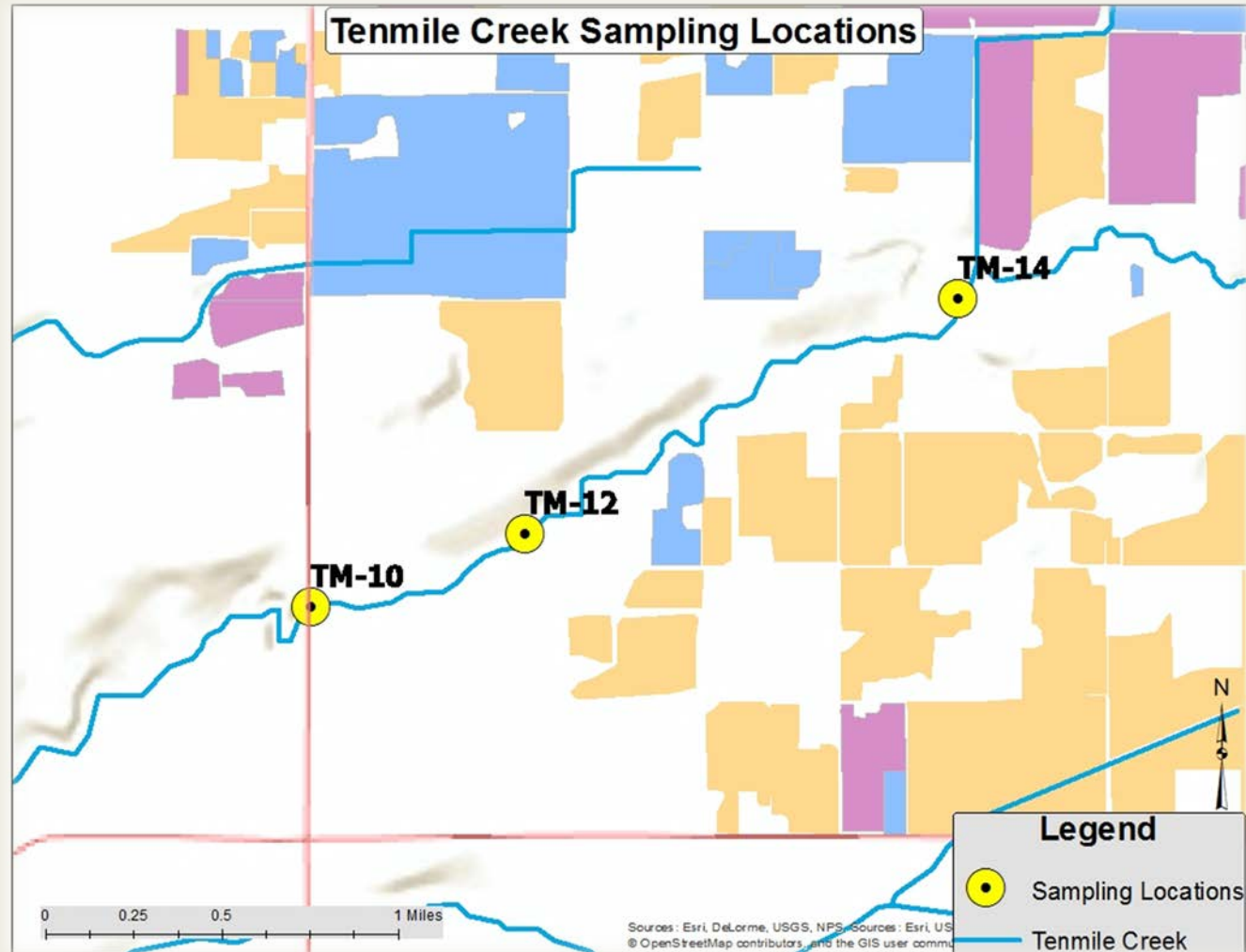
Photo Provided by Lee First



# Sampling Locations

Thursday June 25:

- NRAS staff sampled sediment at 3 sites for analysis
- Observed dead crayfish at all 3 sites

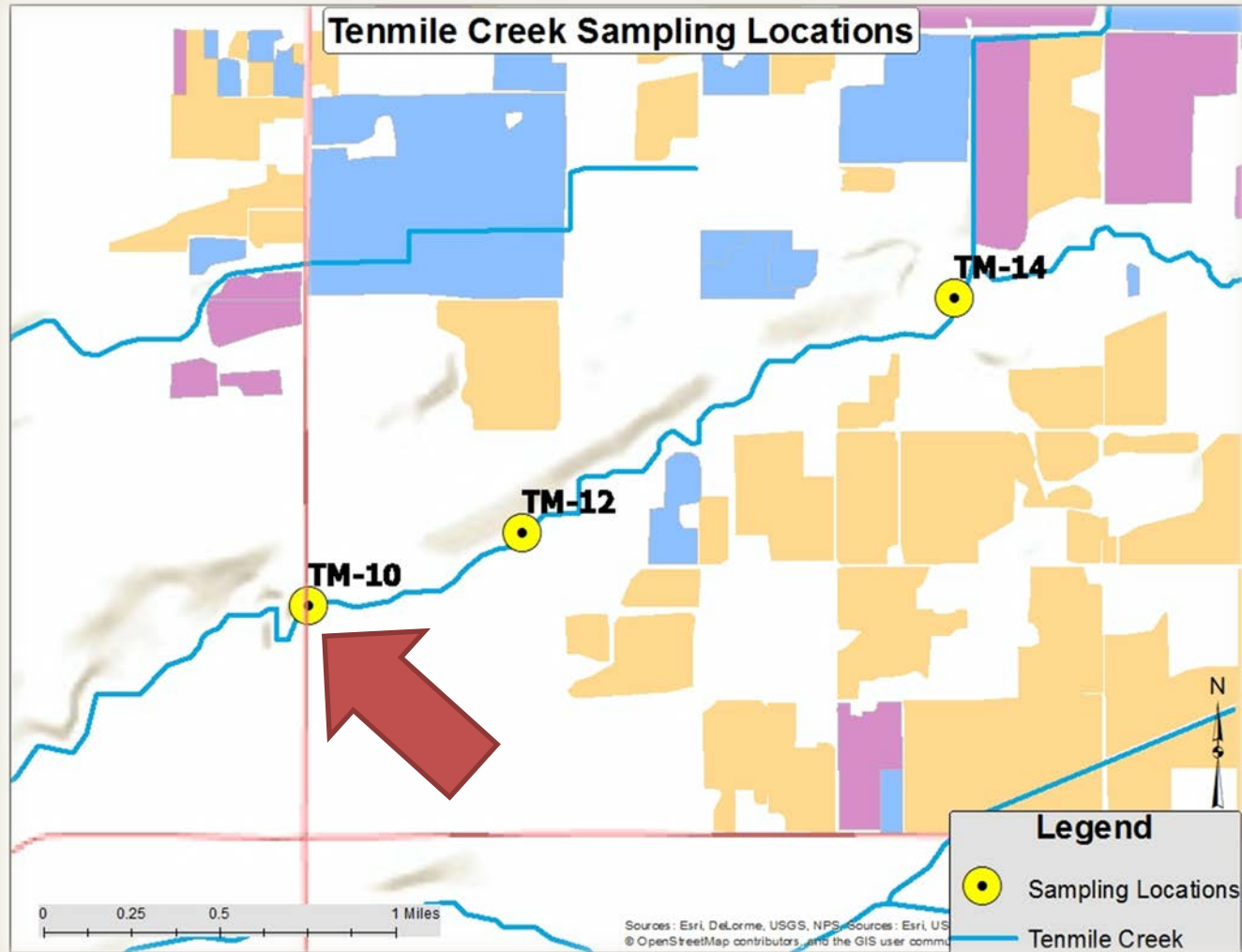




# Sampling Locations

Bridge crossing at Northwest Dr. (TM-10):

- Downstream extent of kill observed by ECY

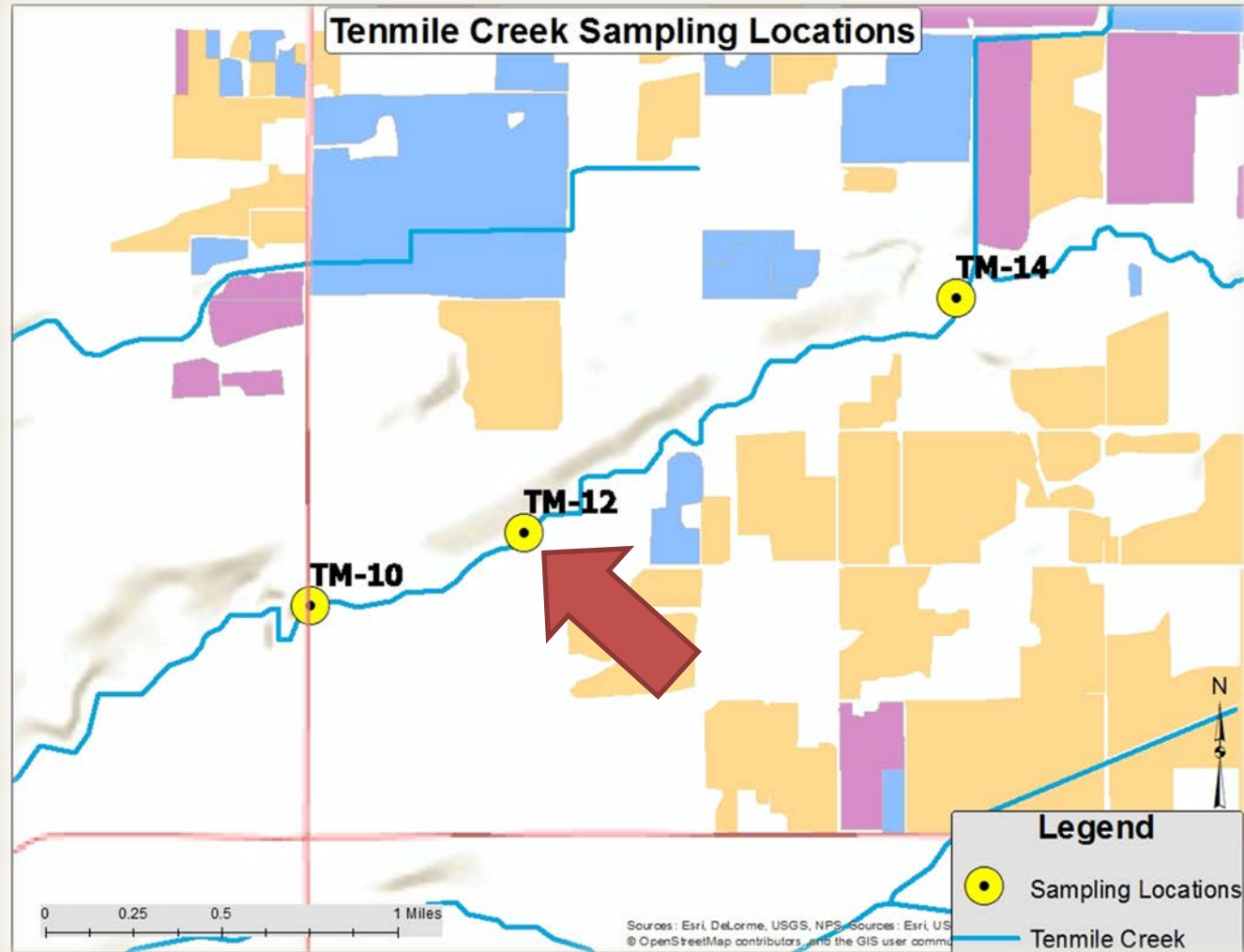




# Sampling Locations

Upstream of Laurel Rd. Crossing (TM-12):

- Near the site of the initial report

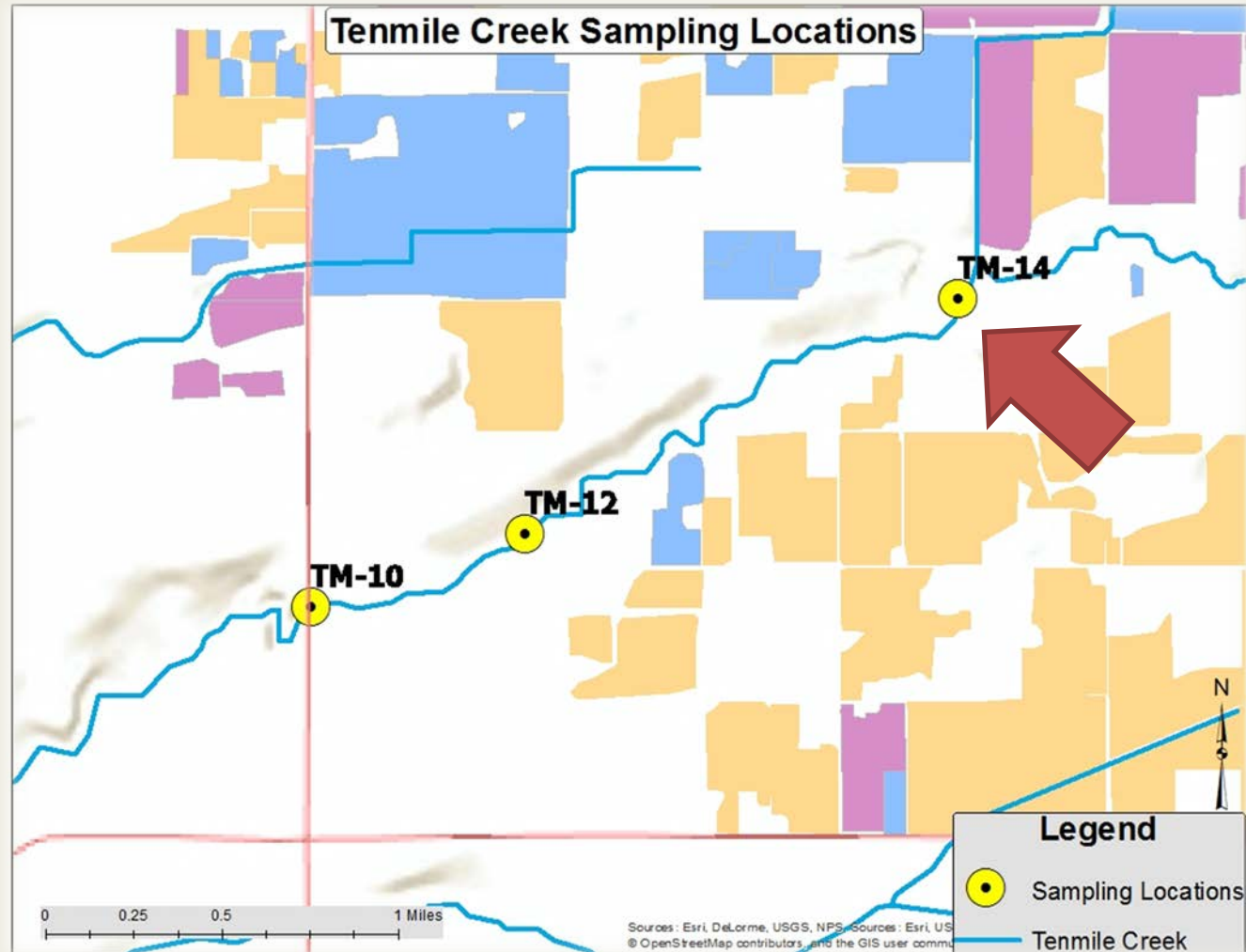




# Sampling Locations

West Hemmi Road Bridge Crossing (TM-14):

- Upstream extent of kill
- Location where the crayfish sample was collected





## Sediment Sampling Technique

- Collected 2 cm of sediment at three locations via scoop
- Composite samples from three locations into one jar
- Measure dissolved oxygen, conductivity, temperature, and pH



# Sample analysis

- Sediment went to Ecology's Manchester Environmental Laboratory (MEL) for pesticide residue and TOC analysis.
- Crayfish were shipped to WSDA's lab in Yakima for whole tissue analysis.



Photo Provided by Lee First



# Sediment Results for Tenmile Creek

Site Code	Bifenthrin ( $\mu\text{g}/\text{kg}$ DW)	Cypermethrin ( $\mu\text{g}/\text{kg}$ DW)
TM10	1282.1	1453.0 <sup>1</sup>
TM12	1123.1	1943.8 <sup>1</sup>
TM14	1967.2	14754.1

<sup>1</sup> The analysis indicates the presence of an analyte that has been “tentatively identified,” and the associated numerical value represents its approximate concentration.



# Crayfish Tissue Results

Crayfish tissue concentration  
at TM 14

**9**  $\mu\text{g}/\text{Kg}$  cypermethrin



**Cypermethrin and bifenthrin in the sediment,  
cypermethrin in the crayfish,  
what's next?**



**Determine if these concentrations could be harmful to crayfish by comparing our results to laboratory studies**



# Sediment Results for Tenmile Creek

Site Code	Bifenthrin (µg/kg DW)	Cypermethrin (µg/kg DW)
TM10	1282.1	1453.0*
TM12	1123.1	1943.8*
TM14	1967.2	14754.1

\* The analysis indicates the presence of an analyte that has been “tentatively identified,” and the associated numerical value represents its approximate concentration.



# Sediment Results for Tenmile Creek

Site Code	Bifenthrin (µg/kg DW)	Bifenthrin LC <sub>50</sub> (µg/kg DW) <sup>1</sup>	Cypermethrin (µg/kg DW)	Cypermethrin LC <sub>50</sub> (µg/kg DW) <sup>2</sup>
TM10	1282.1	1034.1	1453.0	360
TM12	1123.1	1034.1	1943.8	360
TM14	1967.2	1034.1	14754.1	360

<sup>1</sup> Anderson, B., Phillips, B., Voorhees, J., Petersen, M., Jennings, L., Fojut, T., . . . Tjeerdema, R. (2015). Relative toxicity of bifenthrin to *Hyalella azteca* in 10 day versus 28 day exposures. *Integr Environ Assess Manag Integrated Environmental Assessment and Management*, 319-328.

<sup>2</sup> Maund, S., Hamer, M., Lane, M., Farrelly, E., Rapley, J., Goggin, U., & Gentle, W. (2001). Partitioning, bioavailability, and toxicity of the pyrethroid insecticide cypermethrin in sediments. *Environmental Toxicology and Chemistry Environ Toxicol Chem*, 9-15.

LC<sub>50</sub>: The concentration at which 50% of the test animals died.

DW: Dry Weight



# Sediment Results for Tenmile Creek

Site Code	Bifenthrin ( $\mu\text{g}/\text{kg DW}$ )	Bifenthrin $\text{LC}_{50}$ ( $\mu\text{g}/\text{kg DW}$ )	Bifenthrin Times above $\text{LC}_{50}$	Cypermethrin ( $\mu\text{g}/\text{kg DW}$ )	Cypermethrin $\text{LC}_{50}$ ( $\mu\text{g}/\text{kg DW}$ )	Cypermethrin Times above $\text{LC}_{50}$
TM10	1282.1	1034.1	<b>1.2</b>	1453.0	360	<b>4.1</b>
TM12	1123.1	1034.1	<b>1.1</b>	1943.8	360	<b>5.4</b>
TM14	1967.2	1034.1	<b>1.9</b>	14754.1	360	<b>41.0</b>

$\text{LC}_{50}$ : The concentration at which 50% of the test animals died.

DW: Dry Weight





# Sediment Results for Tenmile Creek

Site Code	Bifenthrin (µg/kg DW)	Bifenthrin LOC (µg/kg DW)	Cypermethrin (µg/kg DW)	Cypermethrin LOC (µg/kg DW)
TM10	1282.1	517	1453.0	180
TM12	1123.1	517	1943.8	180
TM14	1967.2	517	14754.1	180

LOC: Level of Concern. Calculated using EPA's risk quotient method, the  $LC_{50}$  concentration and a safety factor



# Sediment Results for Tenmile Creek

Site Code	Bifenthrin (µg/kg DW)	Bifenthrin LOC (µg/kg DW)	Bifenthrin Times above LOC	Cypermethrin (µg/kg DW)	Cypermethrin LOC (µg/kg DW)	Cypermethrin Times above LOC
TM10	1282.1	517	<b>2.5</b>	1453.0	180	<b>8.1</b>
TM12	1123.1	517	<b>2.2</b>	1943.8	180	<b>10.8</b>
TM14	1967.2	517	<b>3.8</b>	14754.1	180	<b>82</b>

LOC: Level of Concern. Calculated using EPA's risk quotient method, the LC<sub>50</sub> concentration and a safety factor



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## Follow Up Sediment Results

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- On September 16<sup>th</sup> and 17<sup>th</sup> WSDA re-sampled the three sites
- There were no detections of cypermethrin and bifenthrin at all of the sites



## Sediment Results Summary

- Cypermethrin and bifenthrin found in sediment at concentrations that are likely toxic to crayfish.
- Cypermethrin and bifenthrin concentrations exceeded the LC<sub>50</sub> and Level of Concern for invertebrates at all sites.
- September follow up sampling indicated no bifenthrin or cypermethrin present in the sediment.



## Tenmile Creek Follow-Up

- Best management practices for producers and applicators include:
  - Following mandatory setbacks on the label for water bodies
  - Nozzle selection/calibration
  - Planting vegetation along water bodies
- Tomorrow's presentation: Evaluation of Streamside Vegetation and its Role in Reducing Pesticide Loading to Streams at **4:20 pm in the Fall Creek Nursery Room**



# Questions?





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# Washington State Department of Agriculture

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