Yakama Nation
Environmental Management Program

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Selecting the Tools For Use in Bioassessments

Outline

- Background
- Chemical Data
- Biological Data
- Data Summaries for Three Streams in The East Slope Cascades
- Chemical Data
- Biological Data
- Data Summaries for Three Steams in The Shrub/Steppe
- Questions and Concerns

Program Progress Since 2007

- 2007 Approved Monitoring Strategy and QAPP. Began Limited REMAP and RBP Surveys.
- 2008 Performed a Probabilistic Monitoring Survey.
- 2009 Wrote a Non-Point Source Assessment and Management Plan, Began Biological Monitoring, Achieved TAS for CWA 319.
- 2010 Began Operation of Non-Point Source Pollution Program, CAFO Inventory and Risk Assessment
- 2011 Awarded Competitive CWA 319 Grant to Implement Meadow Restoration Under Direction of Bill Zeedyke, Awarded Competitive WPDG for Developing a Wetland Program Plan

- Unique Pallet to Work With
- Reservation is ~ 1.4 Million Acres, Over Half is “Closed”
  - Open to Enrolled Members for Hunting, Fishing, Root Digging, and “The Arts of Civilization”, Timber and Grazing
- ~600,000 Acres Forested
- ~220,000 Acres “Primitive Area”
- Most Obvious Impacts are Unimproved Roads

Water Quality Standards

- Were developed using USEPA Guidance for numerical standards
- Approved by Yakama Nation Tribal Council in 2005
- Have never been submitted for approval by USEPA because of "boundary issues."
- Plan to rewrite them!

Study Basics

- Two Adjacent Ecoregions in Washington State Were Assessed
- Four Streams In Shrub/Steppe Habitat of The Columbia Basin Ecoregion
- Five Streams in The Forested Upper Elevations of The East Slope Cascades Ecoregion

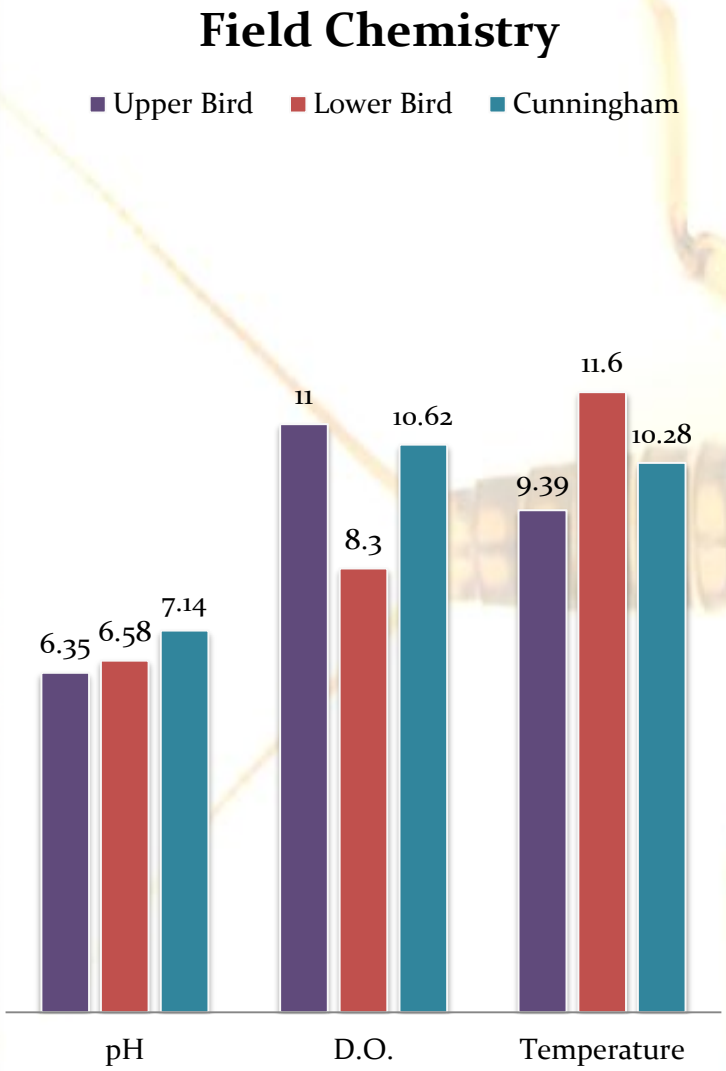
Lower Bird 7

Forested Habitat

Upper Bird 5

Cunningham Creek 12

Chemistry

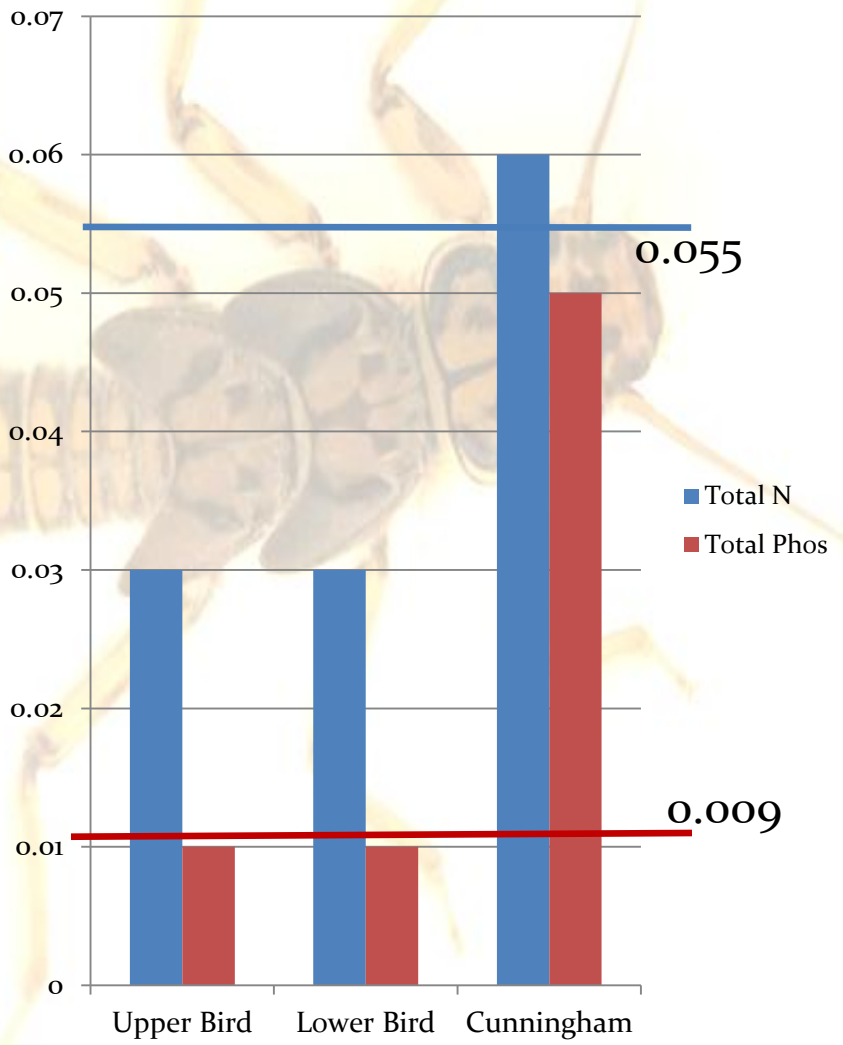


- All reaches had issues with temperature
- Lower Bird reach did not meet D.O. standards
- Upper reach fell slightly below minimum pH value
  - Believed to be from glacial melt

Nutrient Levels

- Both Bird Creek reaches were in compliance with nutrient standards
- Cunningham Creek was slightly high in total nitrogen, but magnitudes over the phosphorus standard
- *Is Bird Creek fine and Cunningham Creek nutrient impaired?*

- **Lab results for nutrients**



The First Big Question….

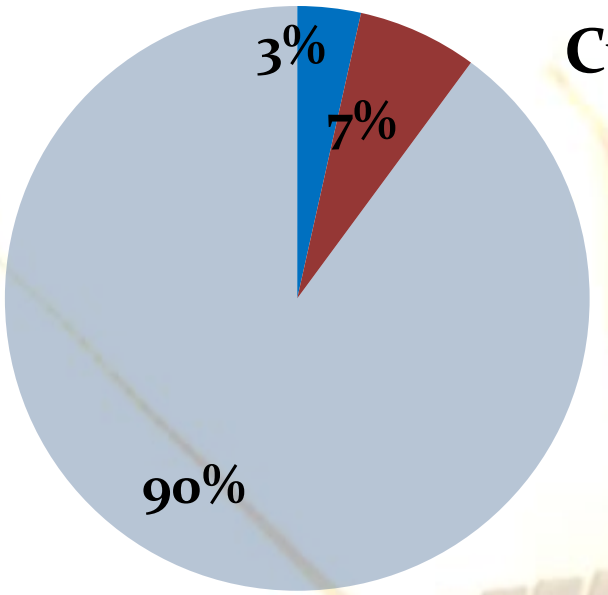
- **If we had stopped here (fundamental and intermediate tier programs) would it be fair to say that Cunningham Creek was impaired and should be 303 d listed?**

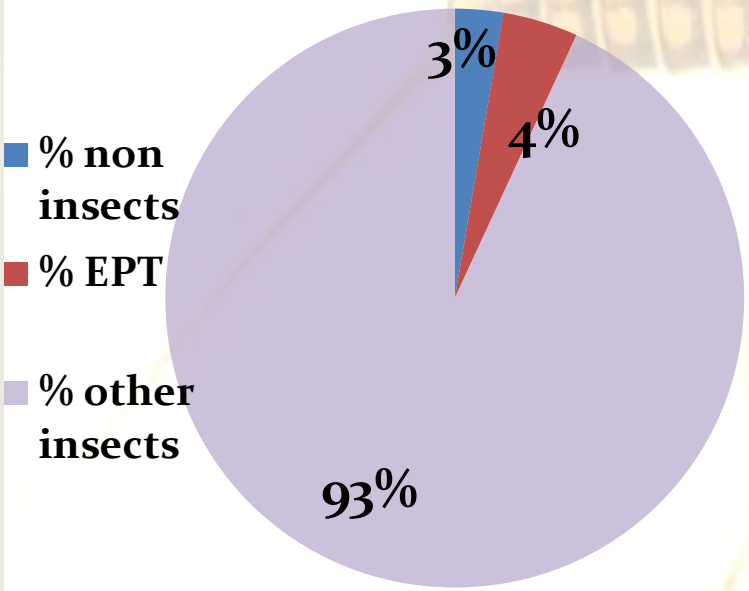
Cunningham Creek

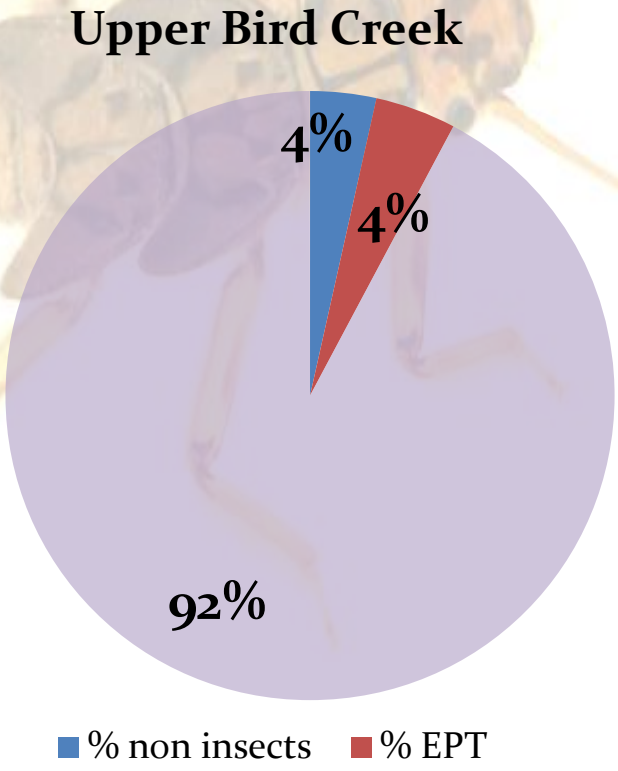
What could possibly be causing nutrient impacts to this mountain stream? The only activity in the area is tribal forestry and limited grazing. Both activities are at the same intensity as the Bird Creek sites.

SO LETS SEE WHAT THE BUGS TELL US

Benthic Macro-invertebrate Results







Initial Comparison

- All three sites were quite similar with respect to ratio of insects to non-insects
- But Cunningham Creek had nearly twice the number of EPT taxa!
- Hmmmm?

Confusion sets in!

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Summarize/Analysis

Cunningham Creek

- Exceed both total nitrogen and total phosphorus numeric standard
- Habitat scored excellent
- HBI score of 3.2
- Total richness 52
- 12 Taxon known to be sensitive to organic enrichment
- 18.9% dominance of species with HBI of 1

Summarize/Analysis Upper Bird Creek

- In compliance with nutrient standards
- Habitat scored excellent
- HBI score of 3.3
- Total richness of 39
- 5 Taxon known to be sensitive to organic enrichment
- 15% dominance by species with HBI of 1

Summarize/Analysis Lower Bird Creek

- In compliance with nutrient standards
- Habitat scored fair
- HBI score of 3.7
- Total richness of 40
- 7 Taxon known to be sensitive to organic enrichment
- 38.8% dominance by species with HBI of 5

Getting more clear yet?

- **Cunningham Creek had the highest number of sensitive species, and the dominant species was sensitive. (HBI of 1)**
- **The difference in the Bird Creek reaches are reflected in the percent dominance; The lower reach was nearly half (38.8%) more tolerant species.(HBI of 5)**

Do these two reaches look the same? Chemically, they were.

Different Story Here!

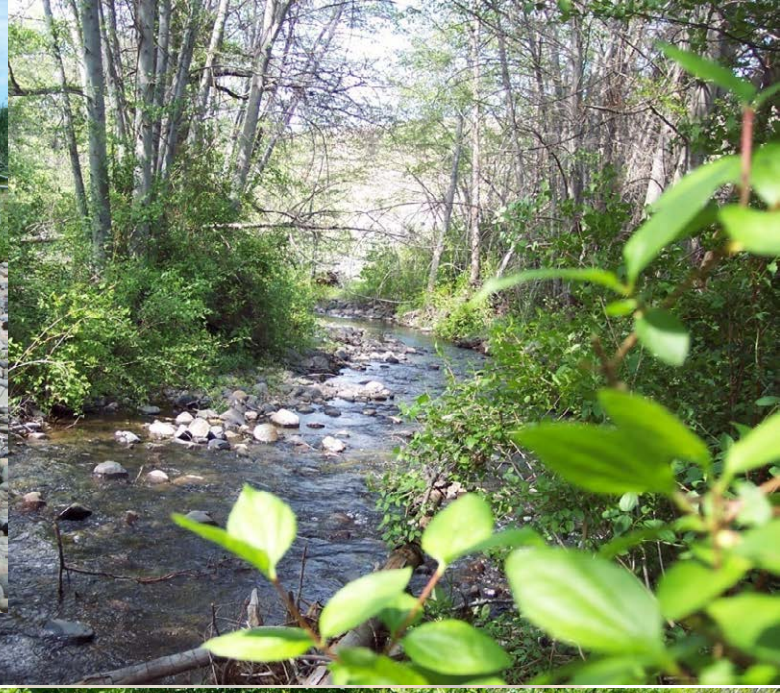
The Shrub/Steppe Habitat Type

Canyons and Ribbons of Green

Observations

- Lower elevation, decreased precipitation
- Extremely high grazing pressure from wild horses
- Increased fire frequency
- Increased dominance of invasive plant species
- Plant species shift from perennials to annuals
- Increased exposed soils
- Ineffective hydrologic and nutrient cycling
- Less stringent water quality standards


01/01/2007

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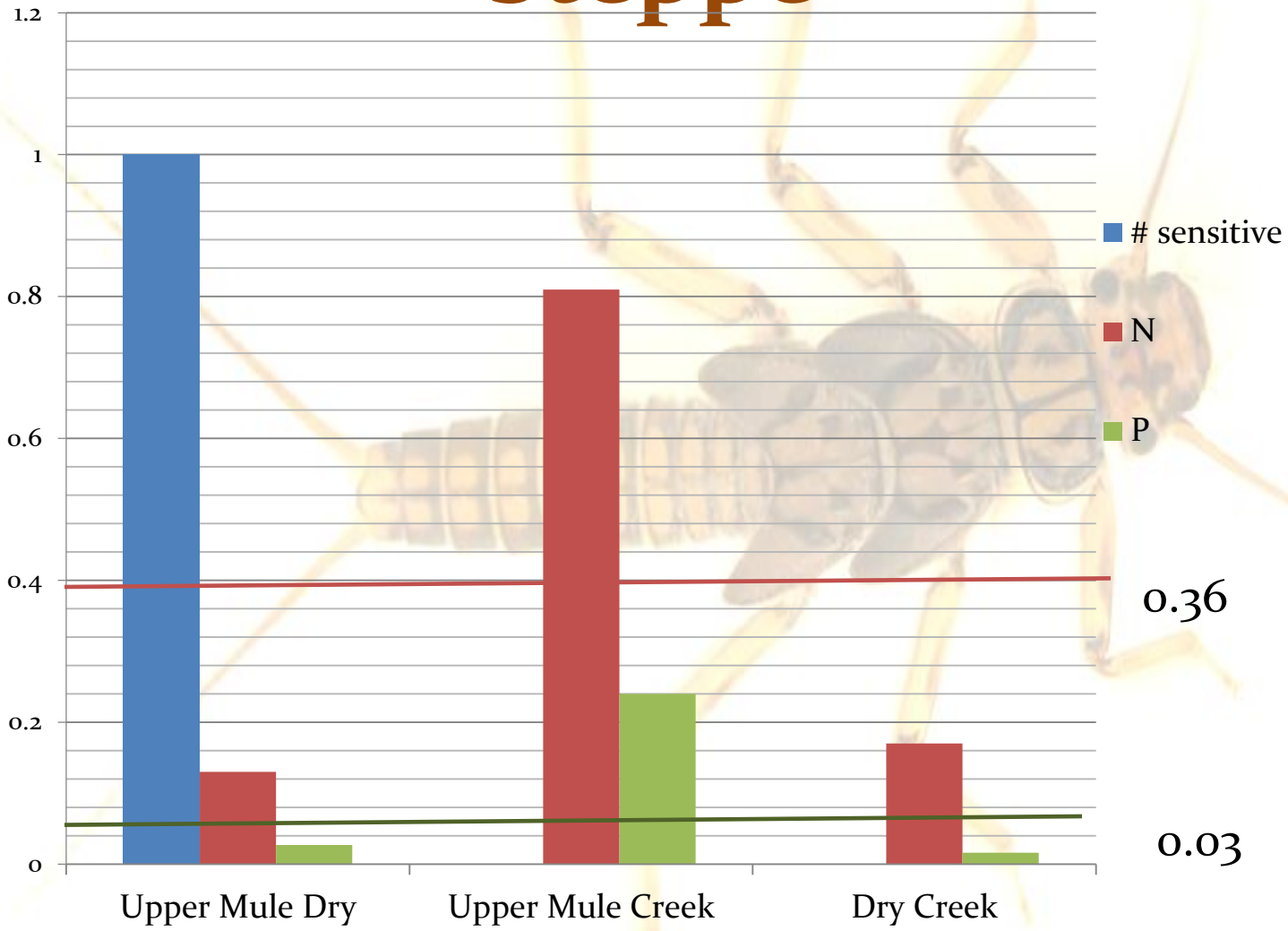
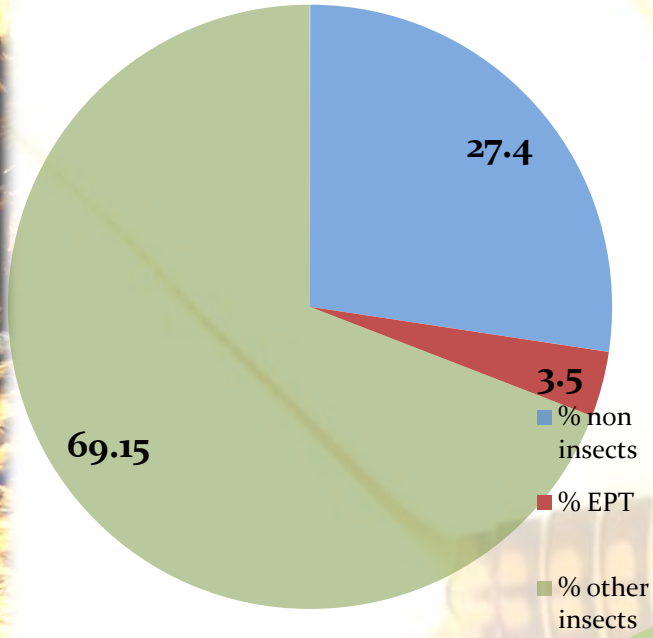
Nutrient Data for Shrub Steppe

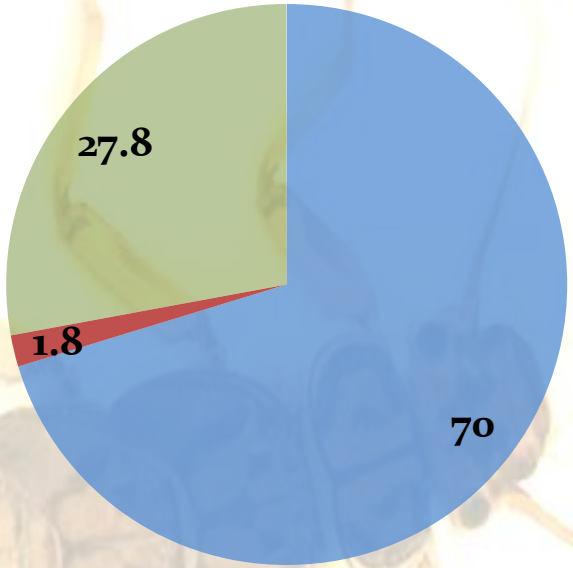


Shrub/Steppe Habitat

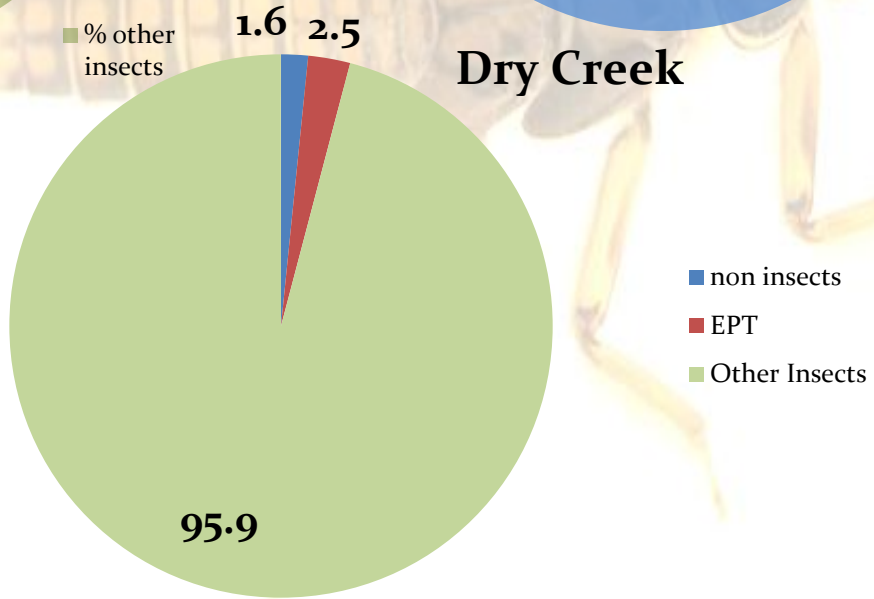
Upper Mule Dry

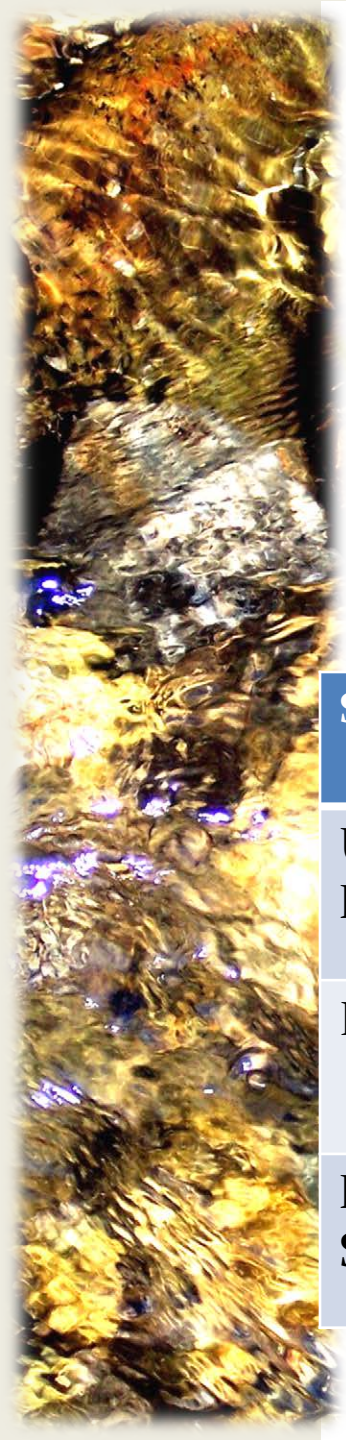


Upper Mule Creek



Dry Creek





Summary of Shrub/steppe

- 2 of 3 Met Nutrient Standards
  - Mule Spring had very high bacteria, nutrients and cattle present
  - All Class III Waters, less Stringent

Stream	HBI	Total Richness	# sensitive	% Dominance	
Upper Mule Dry	5.2	34	1	24.7	
Dry Creek	5.8	33	0	26.7	
Mule Spring	6.7	20	0	61.3	

Summary/Analysis

- The obvious difference here was that one site was dominated by non-insects. Nearly 2/3 of the sample was tolerant clams.
- The same site was found to have elevated nutrients and bacteria
- Here the biological findings supports the chemical data

It appears that the conflicting data seen in the forested habitat sites may reflect natural sources of phosphorus, potentially stemming from the basalt underlying the region. Cunningham Creek substrate was boulder/bedrock.

Chemical water quality parameters may be more precise on the more disturbed sites and less useful in the reference sites.

Would it be more valuable to evaluate biology first before spending the funds on chemical analysis?

The Big Question

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How Valid are Numerical Nutrient Standards?

- Should be Used as One Part of Weight of Evidence Approach
- Consider the Natural Background Levels for the Site
- Use of EPA Reference Based Values May Misclassify Many Un-impacted Waterbodies as Impaired
- Crucial that Streams be Classified Accurately (Compare Apples to Apples)

Continued

- Appears that False Positives of Impairment Might be Common in High Elevation Streams
- More Accurate for Depiction of Impairment in Lower Elevation Streams With Greater Occurrence of Impact
- There is a Need For Further Study and In-put Prior to Setting Numerical Standards

Conclusions

- EPA Recommendations for Nutrient Criterion May be Set to Protect Human Health Rather Than Biological Integrity
- Would We Come to the Same Water Quality Conclusions if We Only Performed a Biological Assessment?

RESULTS SUGEST:

Due to uniqueness of the conditions, typical water quality assessment tools such as chemistry and numerical water quality standards may not be appropriate indicators of condition for this resource and Bioassessments may be the best tool at our disposal!

Thank You;

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Water Quality Specialist

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