



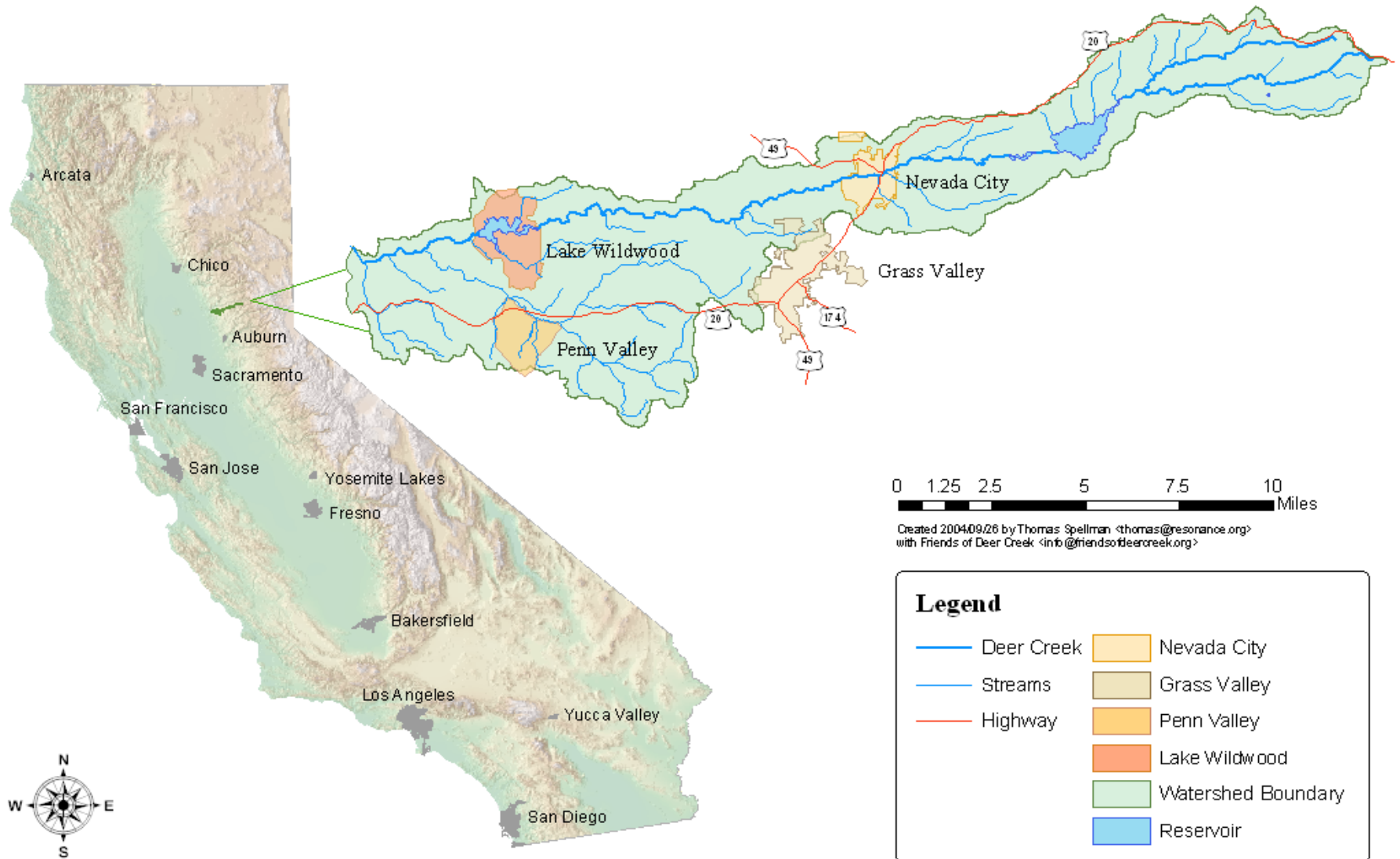
# **Friends of Deer Creek Citizen Monitoring**

**Linking Water, Science, and People**

**Joanne Hild,  
Executive Director  
Biologist**



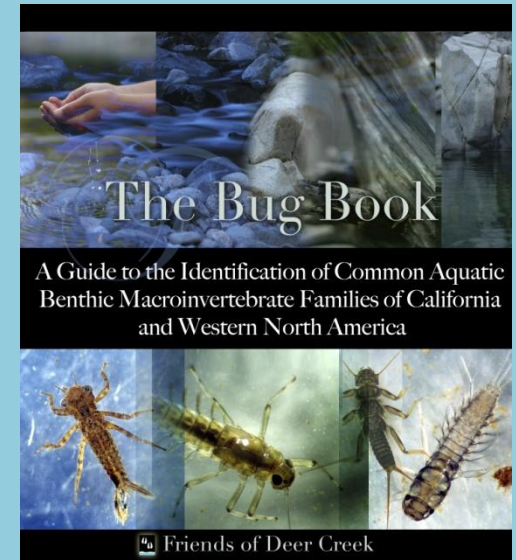
# Deer Creek Watershed



# Major Accomplishments



- SWAMP - 10 years of WQ and BMI data
- Writing and publishing the Bug Book
- 5 years bacteria data
- Deer Creek Watershed Mercury Survey
- EPA Brownfields Assessments
- Little Deer Creek Restoration Project
- Deer Creek Tribute Trail and Restoration Project
- Deer Creek CRMP and QAPP
- Collaborations and Project Partners





# Challenges

- Mining Legacy
- Water Management and Diversions
- Invasive Species
- Land Development
- Wastewater Treatment Plants
- Forest Management and Logging
- Excessive Nutrient Loading
- Bacteria Contamination
- Private Landowner Issues



# Citizen Based Water Quality Monitoring

temperature

dissolved oxygen

conductivity

bacteria

nitrates

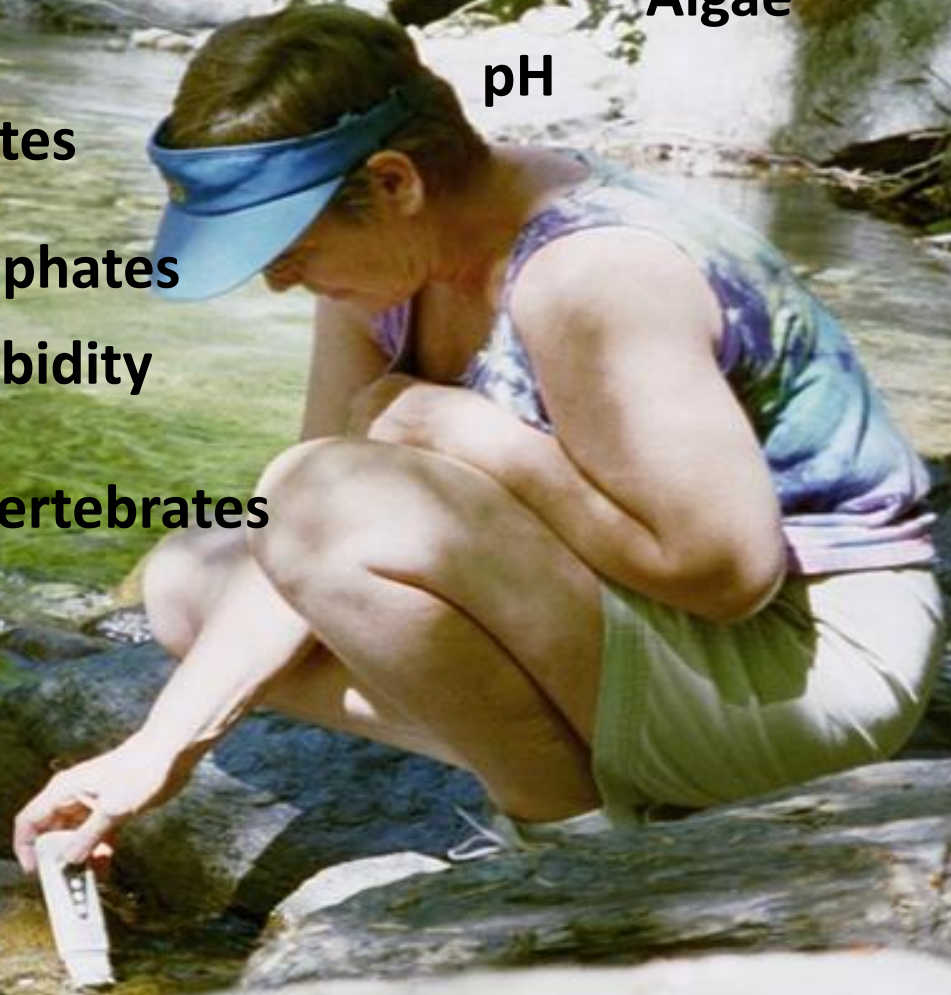
phosphates

turbidity

Macroinvertebrates

pH

Algae

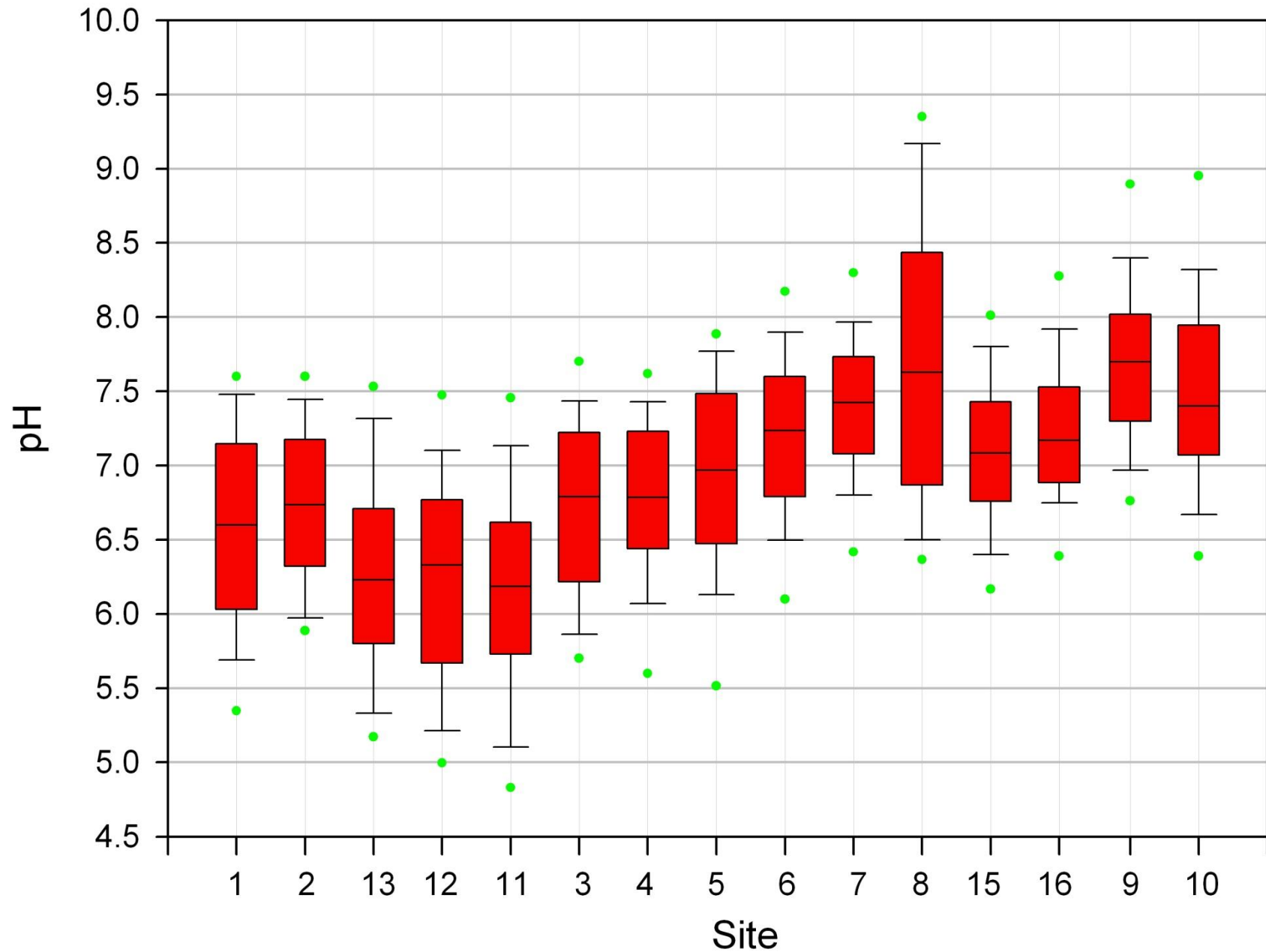


**FRIENDS OF  
DEER CREEK**

Linking Water, Science and People

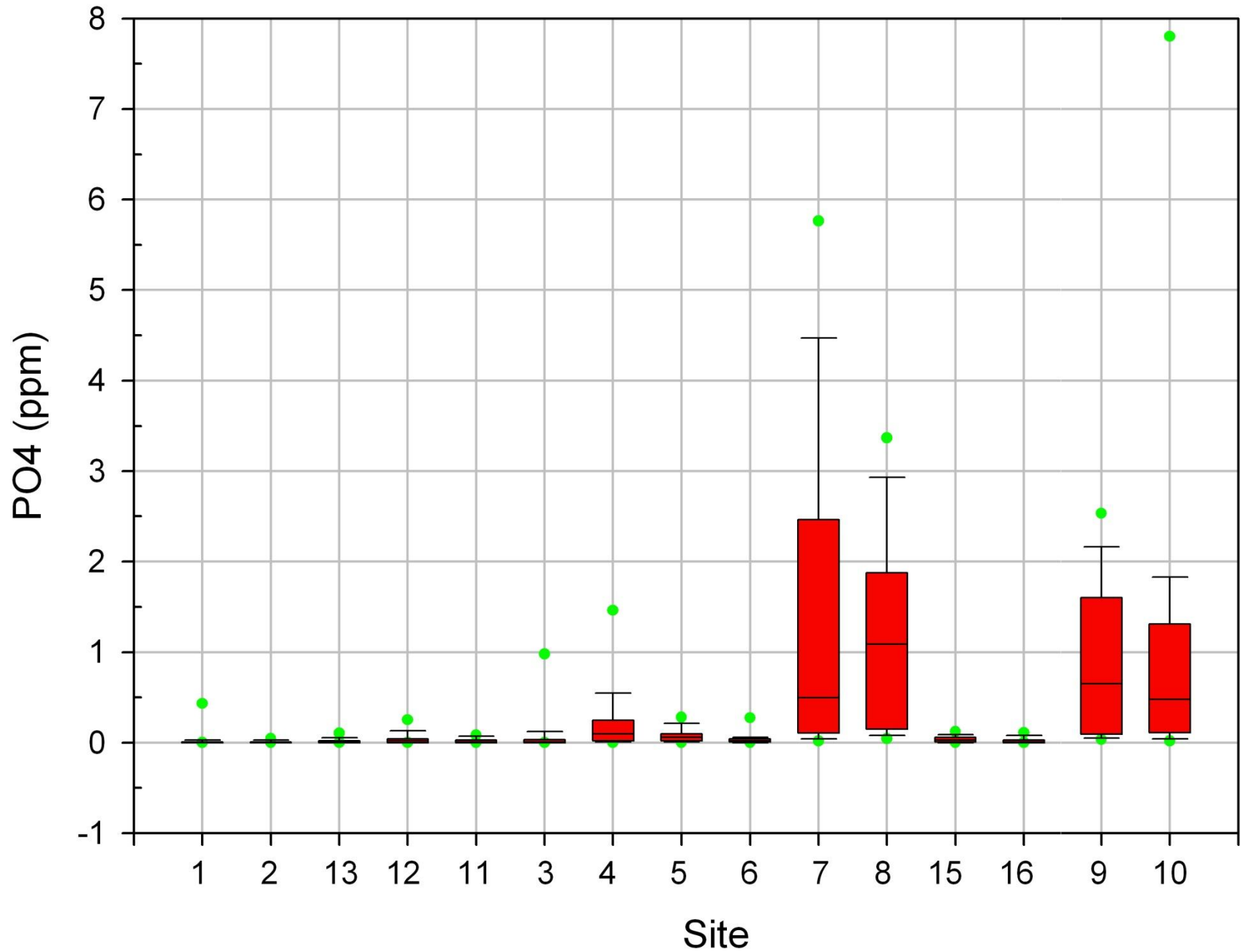


# pH at Friends of Deer Creek Monitoring Sites



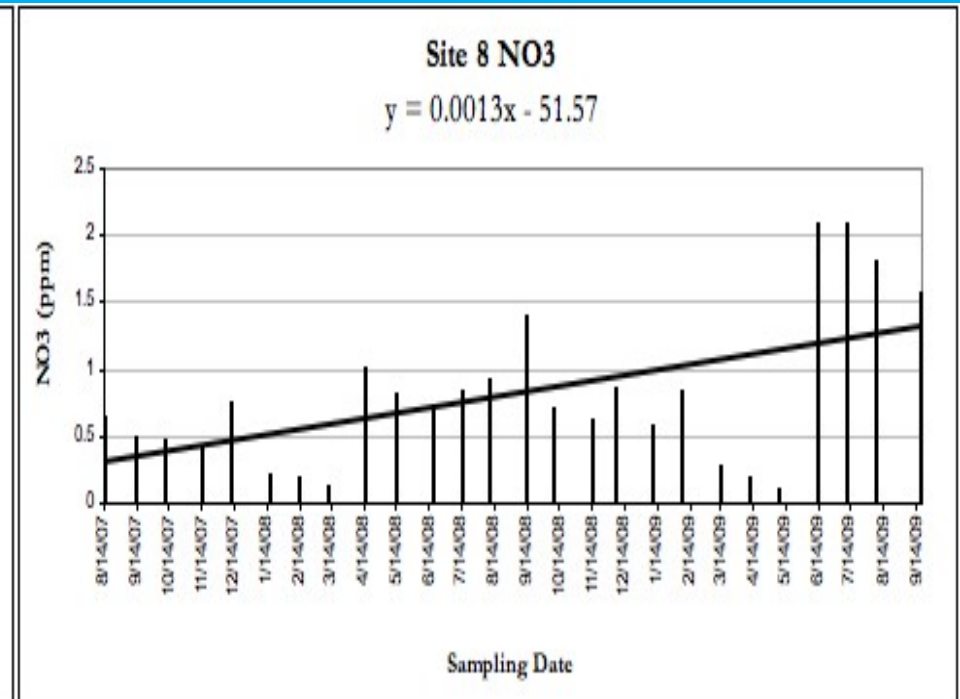
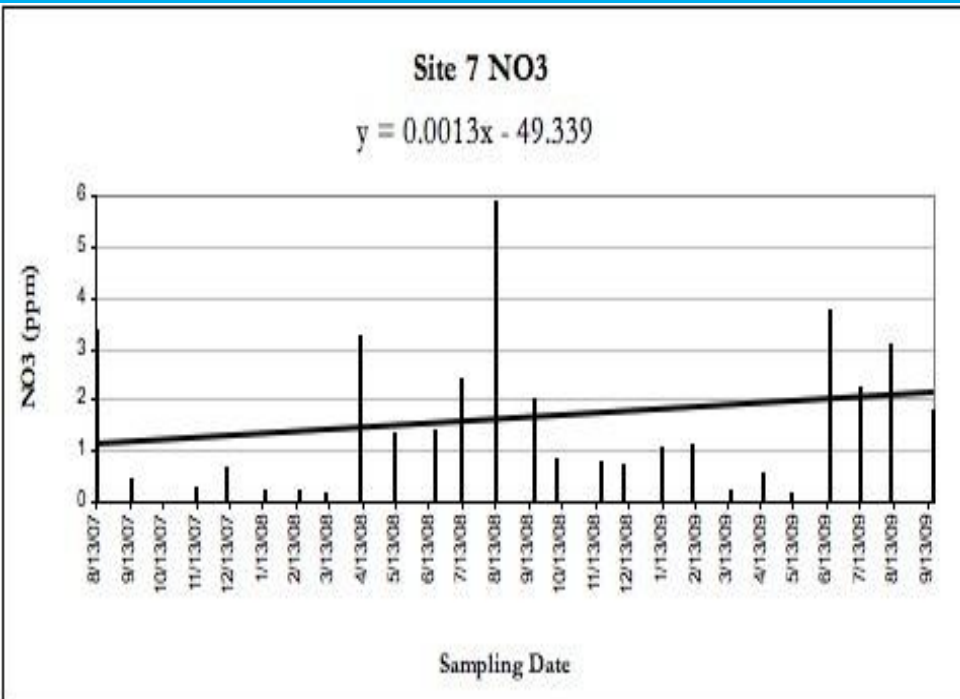


# PO4 at Friends of Deer Creek Monitoring Sites





# Prior to and after update of Lake Wildwood wastewater treatment plant





**Macroinvertebrate  
Studies**



**For the past 10 years, in Oct and June, 10 sites on Deer Creek are monitored for macroinvertebrate numbers and diversity.**







Notes + Observations

Gene Proposals

STARTS



# The 2<sup>nd</sup> edition of THE BUG BOOK is now on sale.

## Order by calling 530 265-6090

### Order Summary

Match your sample to the images and descriptions below.

#### COLEOPTERA Chapter 1



- a.
- Segmented legs
  - Leathery plates on entire body

#### COLEOPTERA Adults Chapter 1



- b.
- Hard, oval shaped body
  - Maxillary palps and antenna extending from head

#### DIPTERA Chapter 2



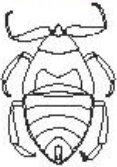
- c.
- Soft, fleshy body with prolegs

#### EPHEMEROPTERA Chapter 3



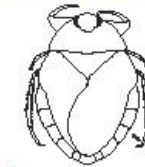
- d.
- 1 set of wingpads
  - Segmented legs with 1 claw on each
  - 2 or 3 tails

#### HEMIPTERA Chapter 4



- e.
- Head prominent with large eyes
  - Wingpads
  - Segmented legs

#### HEMIPTERA Adults Chapter 4



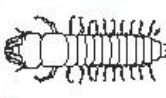
- f.
- Ends of wings membranous

#### LEPIDOPTERA Chapter 5



- g.
- Prominent head
  - Short, stubby thoracic legs fused to body
  - Prolegs on abdomen

#### MEGALOPTERA Chapter 6



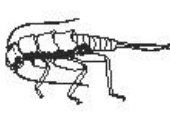
- h.
- Body slightly flattened with big mouthparts
  - Segmented legs, various tails and appendages

#### ODONATA Chapter 7



- i.
- 2 pairs of wingpads
  - Large head with segmented antenna, large eyes
  - Segmented legs with 2 claws
  - Abdomen ends in short spikes or flat, thin gills

#### PLECOPTERA Chapter 8



- j.
- Long antennae
  - 2 long, thin tails
  - 2 pairs of wingpads
  - Segmented legs with 2 claws

#### TRICHOPTERA Chapter 9



- k.
- May be in a case
  - Segmented legs
  - 2 hooks on prolegs on end of abdomen

#### NON-INSECTS Chapter 10



- l. With hard shell
- m. Worm-like



- n. With 4 or more pairs of jointed legs

a. McCormick; b. CDFG ABL; c. McCormick; d. Cutter, L.; e-f. Elder; g. McCormick; h. Elder; i. McCormick; j. Elder; k-l. McCormick; m-n. Elder



Friends of Deer Creek  
Nevada City, California  
www.friendsofdeercreek.org

Order:  
Suborder:  
Family:  
# Genera/Species:  
Common Name:

Odonata  
Zygoptera  
**COENAGRIONIDAE**  
NA: 14 gen, 116 spp; CA: 8 gen  
Narrow-winged or Pond Damselflies

#### Taxonomic Characteristics:

- Body length 13–25 mm
- All segments of **antennae** about the same length (b)
- Labium** (lower lip) stout and somewhat trapezoidal without medial notch (d)
- 3 inflated, leaf-like **gills** similar in length, ending in a point, and with small, highly branched veins joining main vein diagonally (a, c)

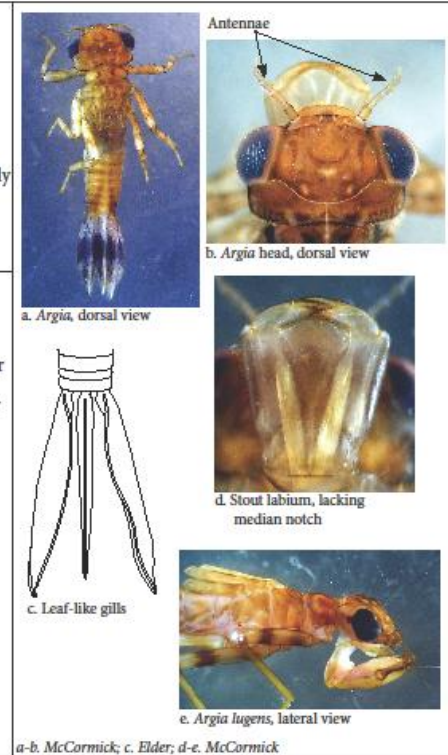
#### Biological Information:

Coenagrionidae are the largest family of damselflies in North America. Most prefer the slow, quiet water of ponds and stream edges where the larvae climb on vegetation or sprawl on soft bottom sediment, while a few species favor pool or riffle areas in streams or rivers.

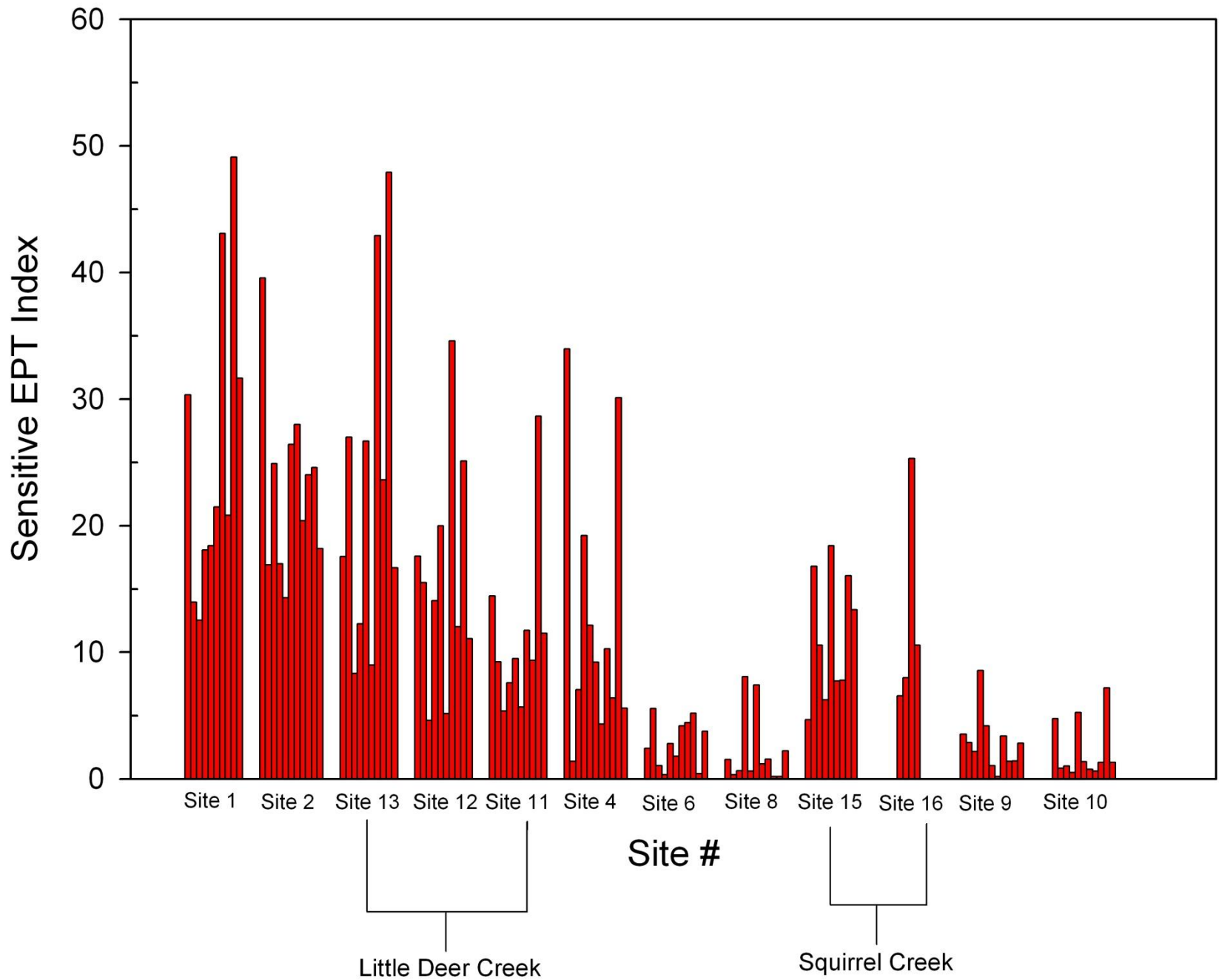
Tolerance Value: 9  
Functional Feeding Group: p

**Taxa Tips!** Easily identified by ruling out other families. Calopterygidae have large basal antennal segments that are longer than all the others combined, and Lestidae have an extremely long, narrow labium.

#### Notes:

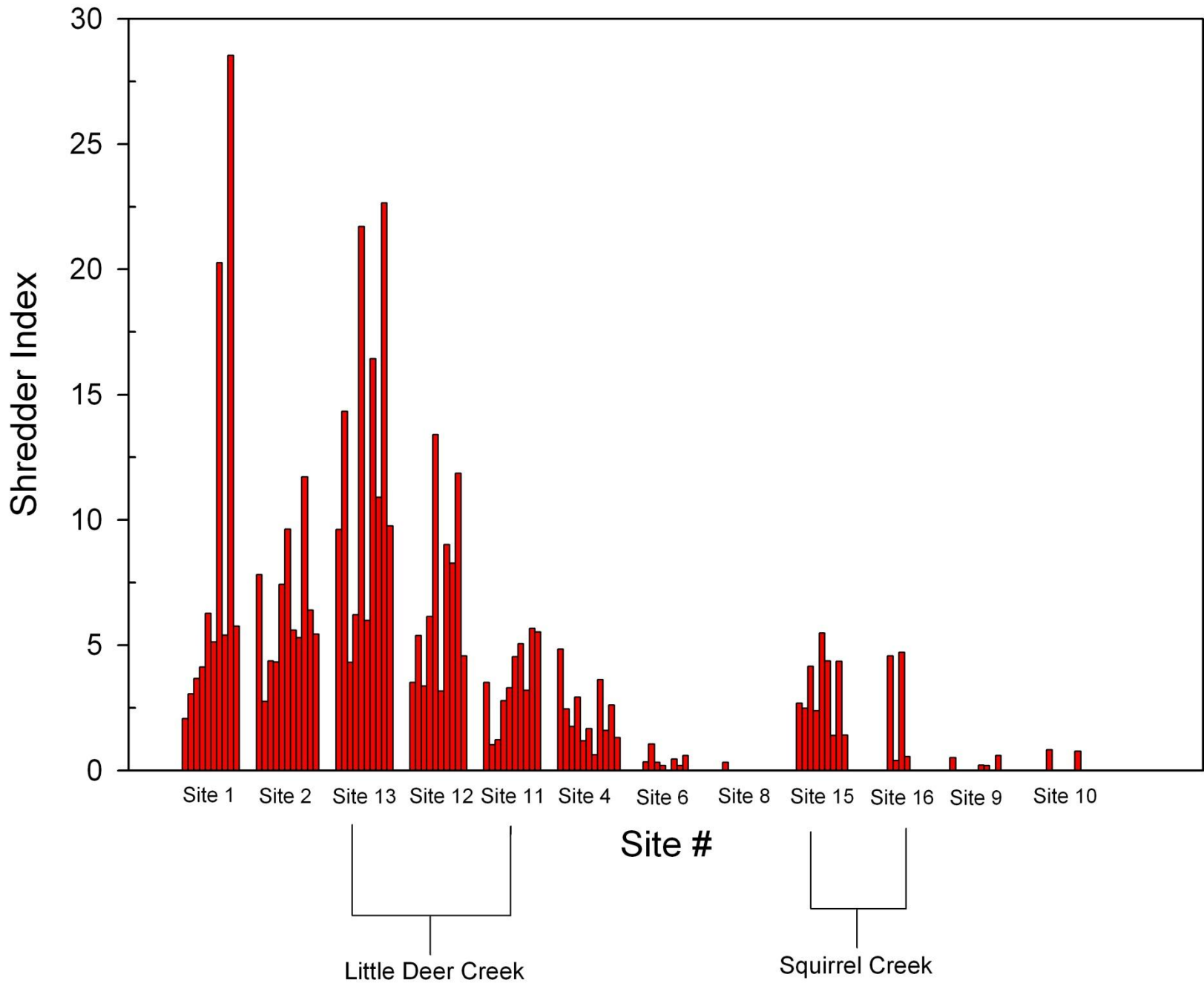


# Sensitive EPT Index





# Shredder Index



**Questions?**



# Fish Electroshocking

Upstream: Brown trout  
Rainbow trout

Downstream:  
Red-ear Sunfish,  
Sacramento Sucker  
Pike Minnow



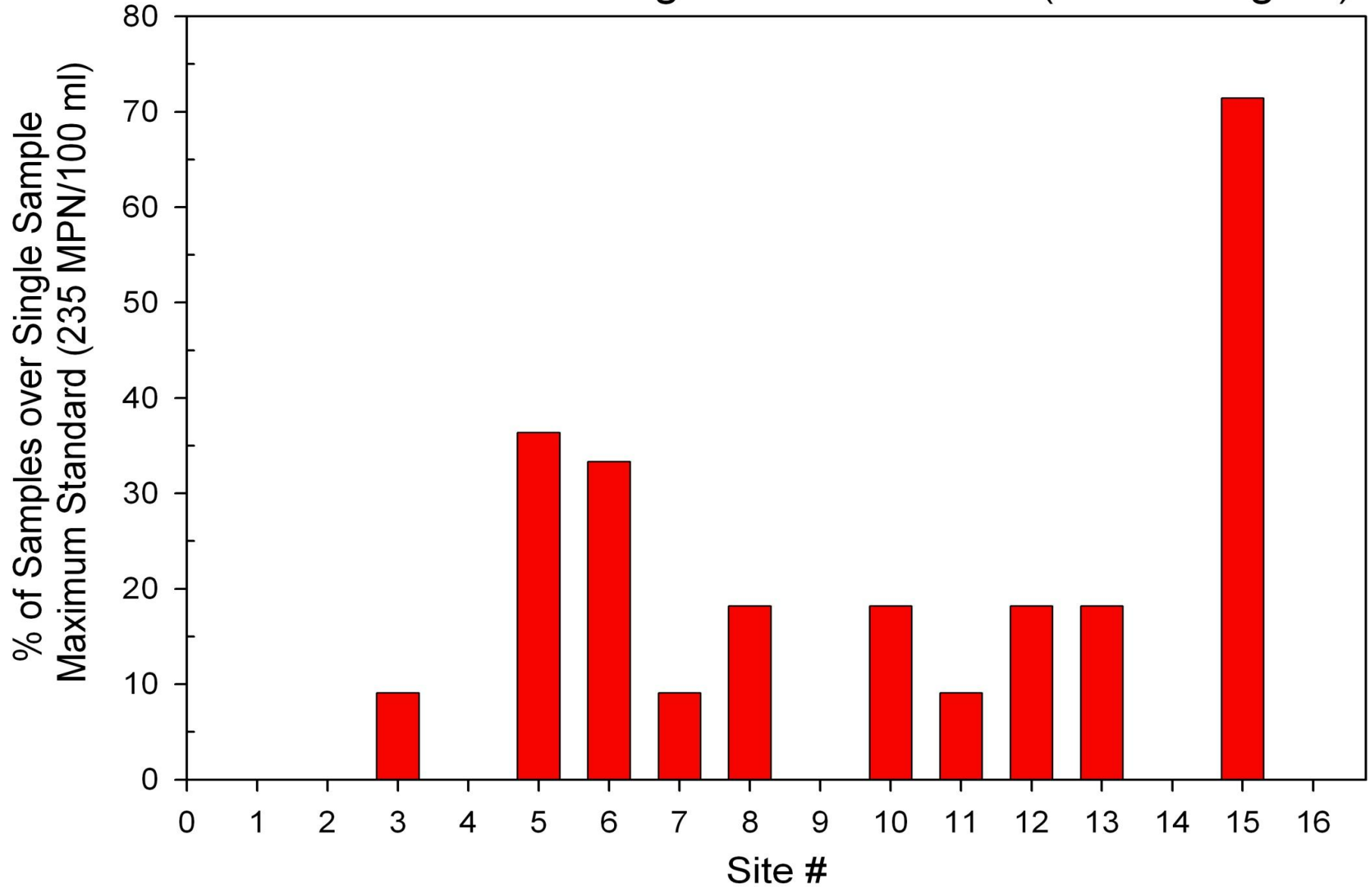




**Bacteria sampling  
and analysis**



% of Samples Exceeding the USEPA Single Sample Maximum Standard for *E. coli* During Summer Months (June - August)



# PLAY

HY-KO PRODUCTS CO. WALTON HILLS, OH 44146-6106

HW-7

## SWIMMING ADVISORY

The Nevada County Environmental Health Department advises that bacteria levels in this portion of the creek are higher than normal.

Swimming in creeks with elevated bacteria levels can increase your risk of illness, especially in the young and elderly. To help reduce your chance of illness, avoid ingesting creek water.

N C Environmental Health contact: Peggy Zarrillo, BEHS # 530-265-1787

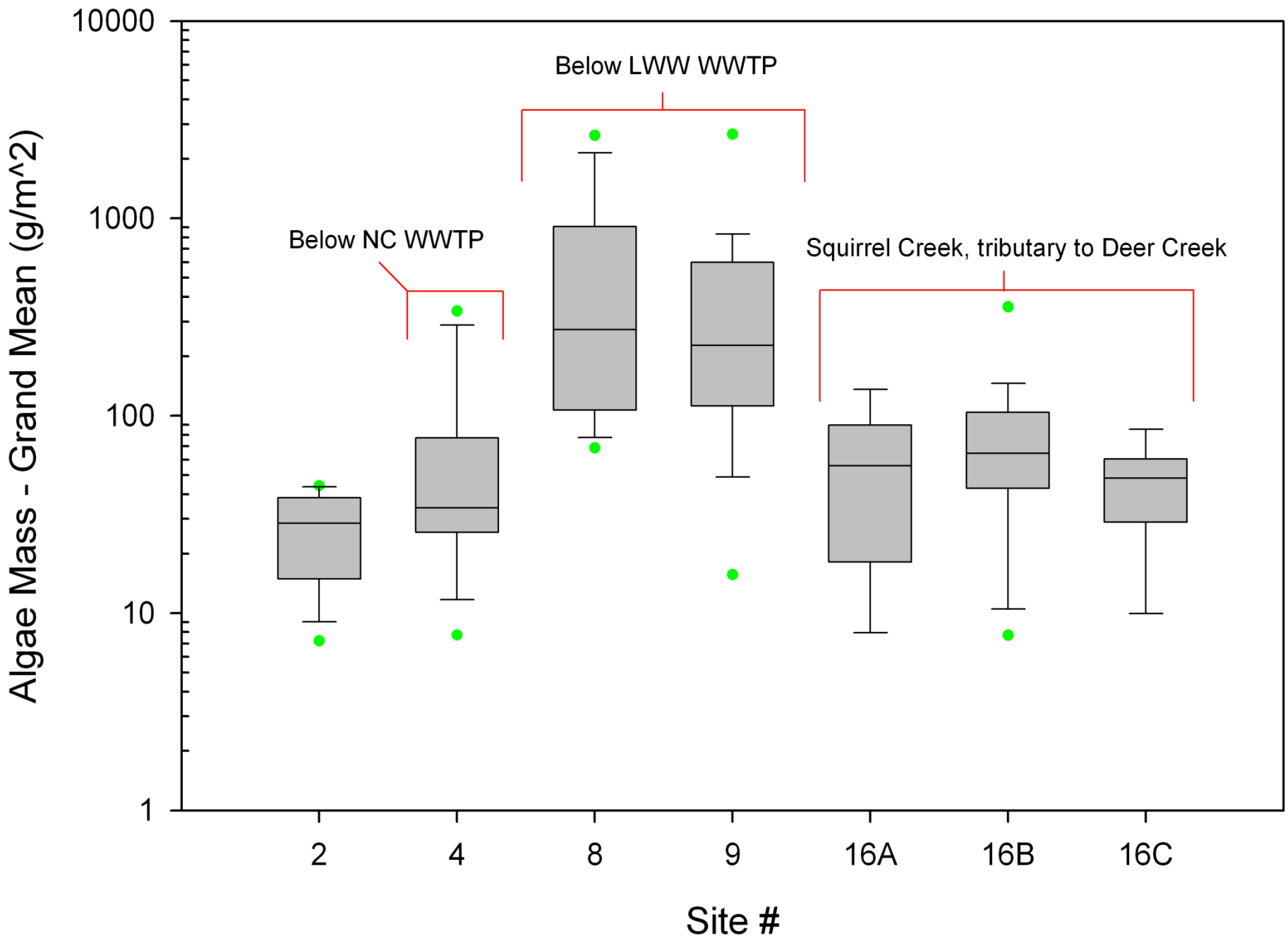


A photograph of a shallow stream flowing over a rocky bed. The water is clear, revealing the dark, wet rocks underneath. The rocks are covered in a thick layer of bright green algae, particularly in the shallower areas. The stream is bordered by more rocks and some green vegetation on the left side. The overall scene is a natural, outdoor setting.

# Algae Studies



# Deer Creek Algae Samples Through Time

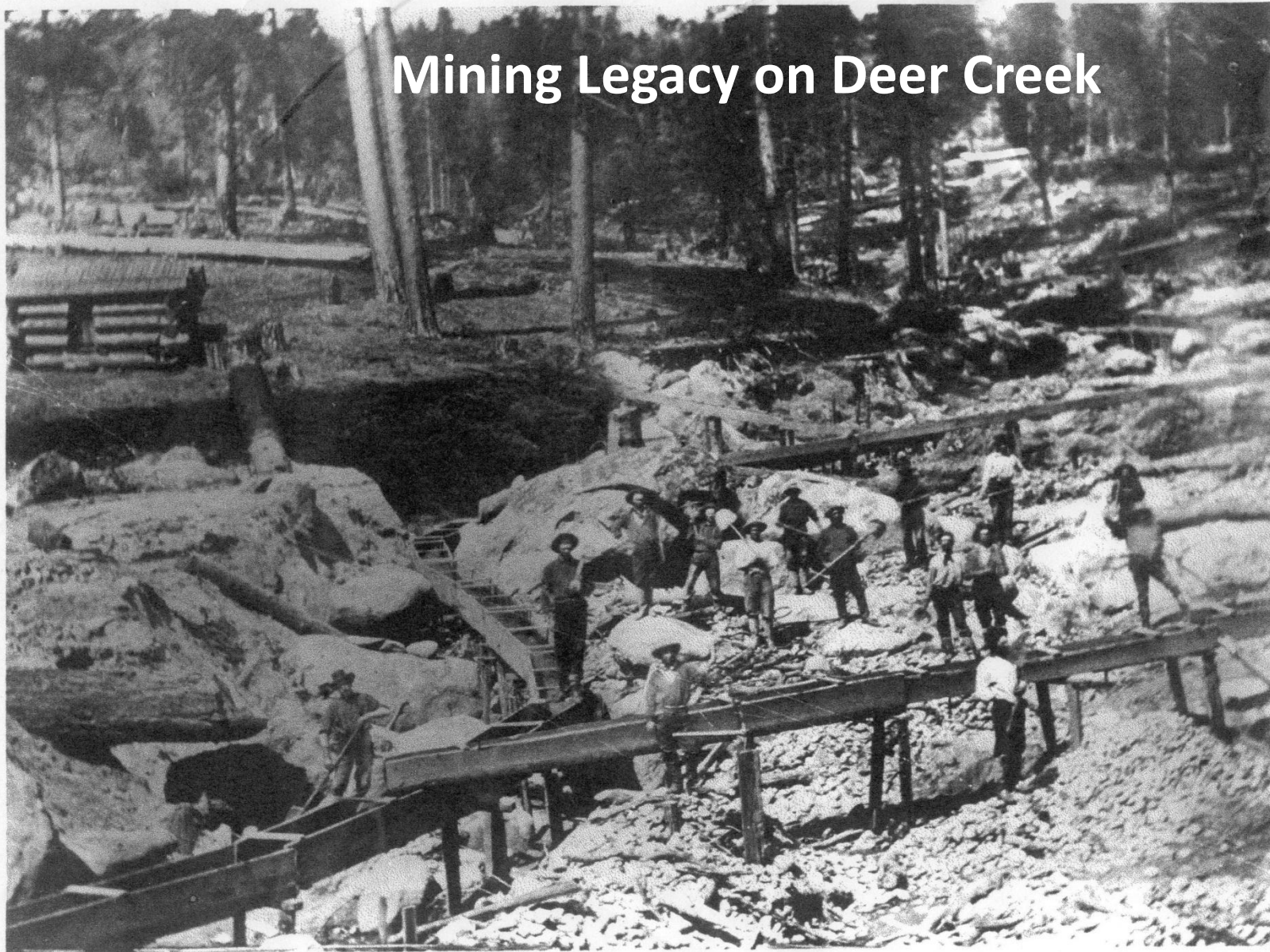




Deer Creek, Nevada County

Approx. 1850

## Mining Legacy on Deer Creek



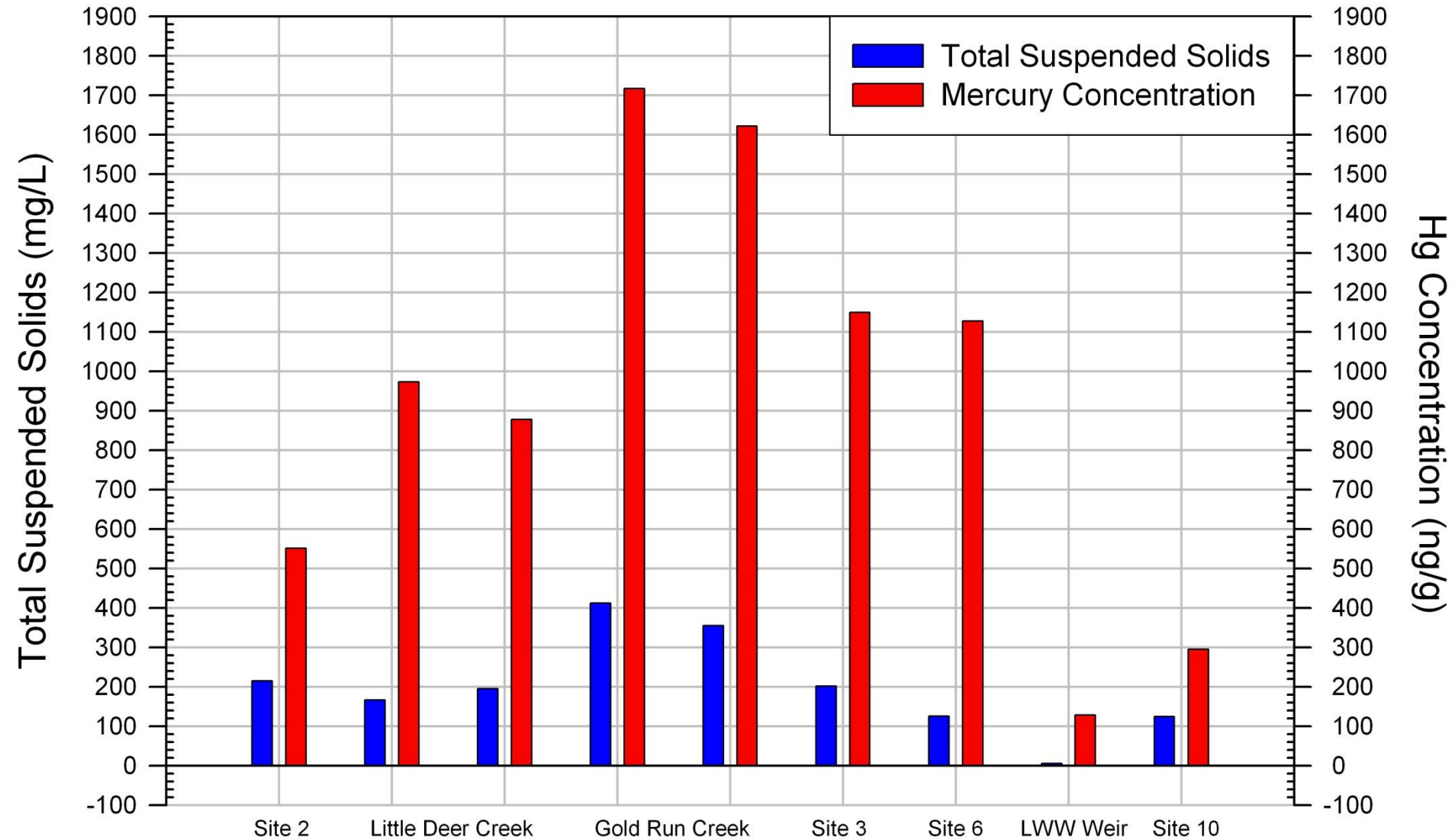


# Storm Sampling





# Total Suspended Solids and Mercury Concentration In Algae and Sediment Mixture Storm Sampling 3/2/2009



**Questions?**

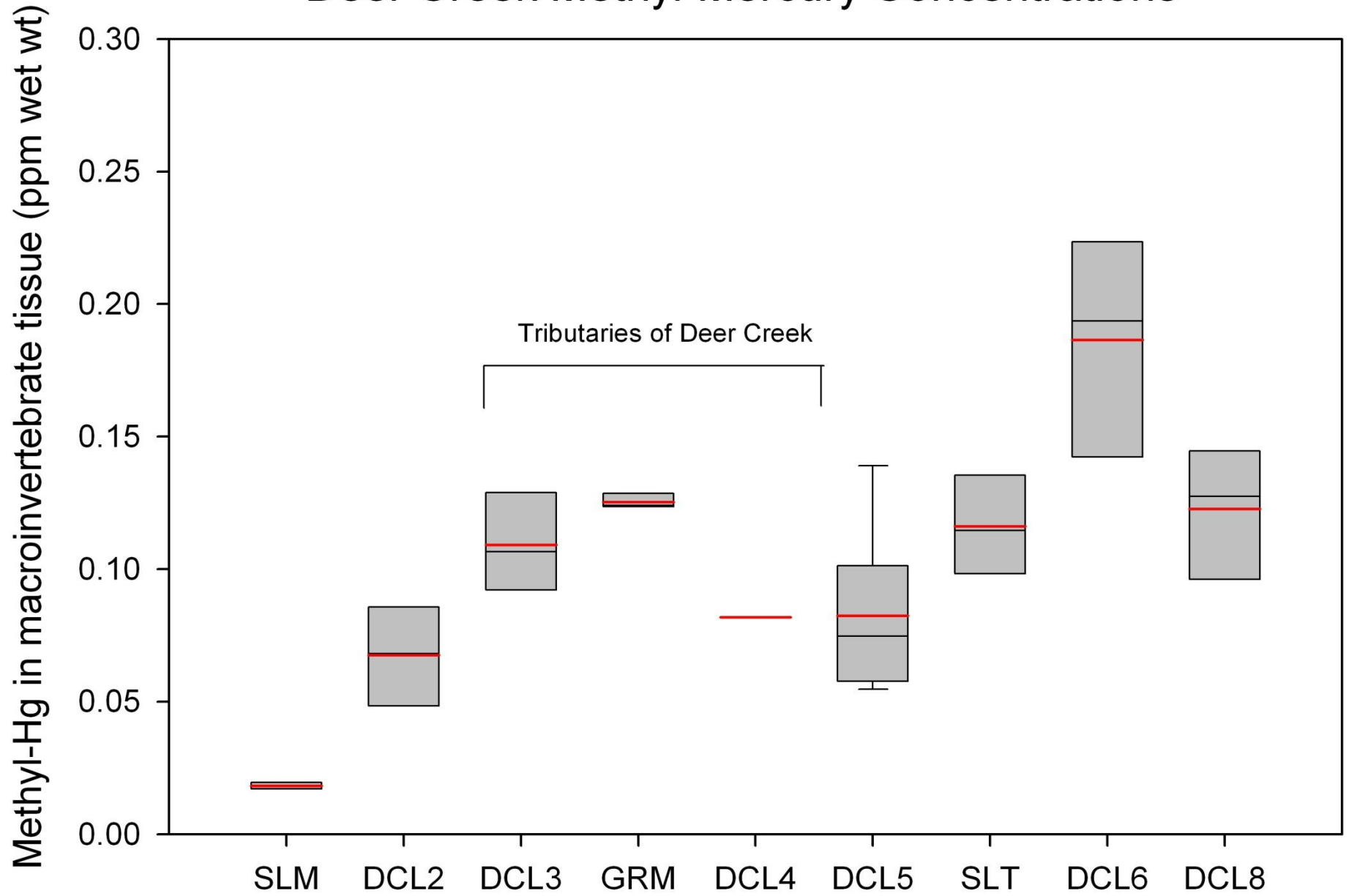




## Heavy Metal Contamination Studies

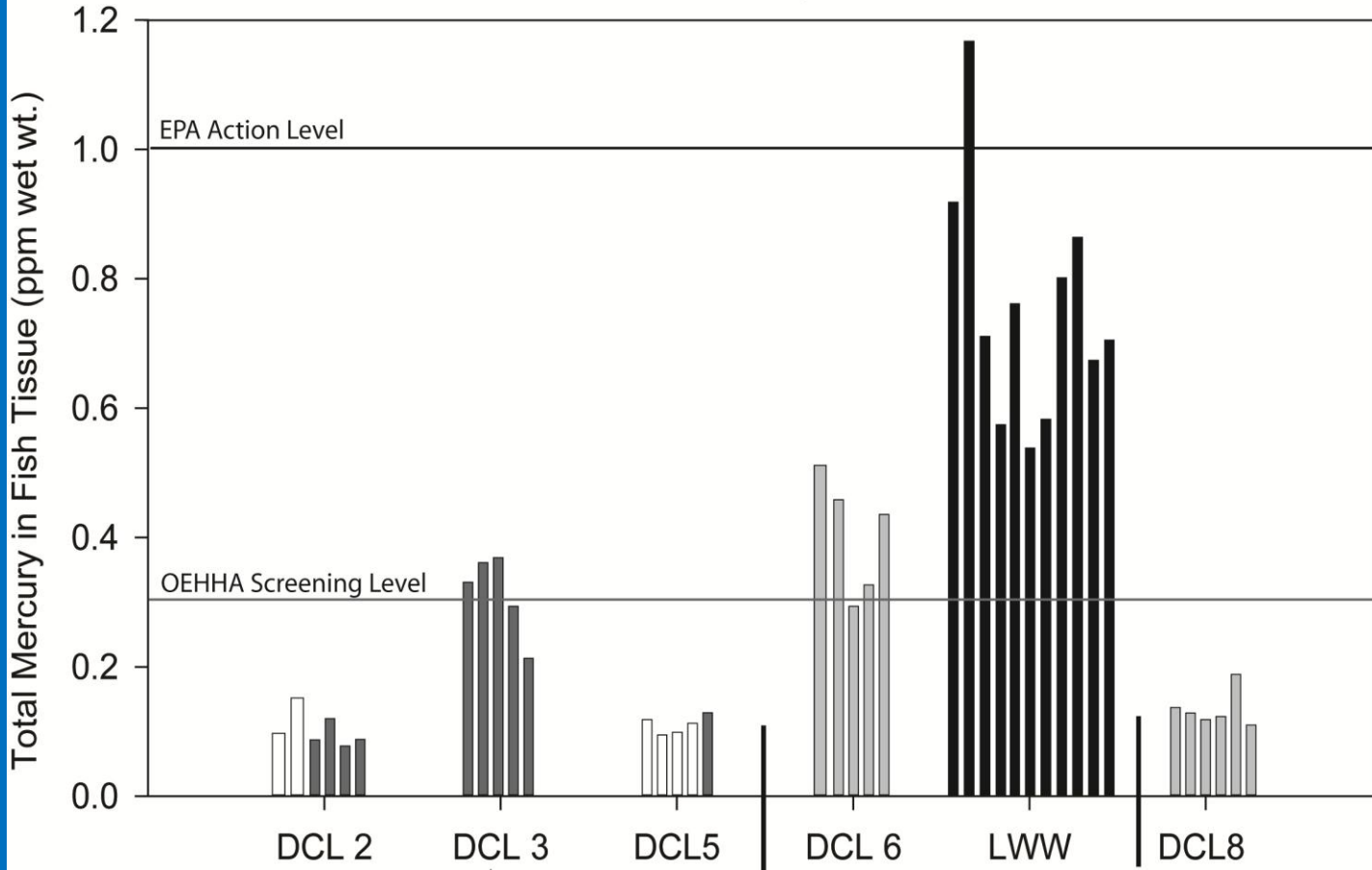


# Deer Creek Methyl-Mercury Concentrations





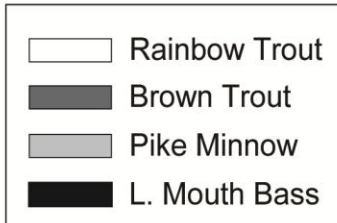
# Total Mercury in Fish



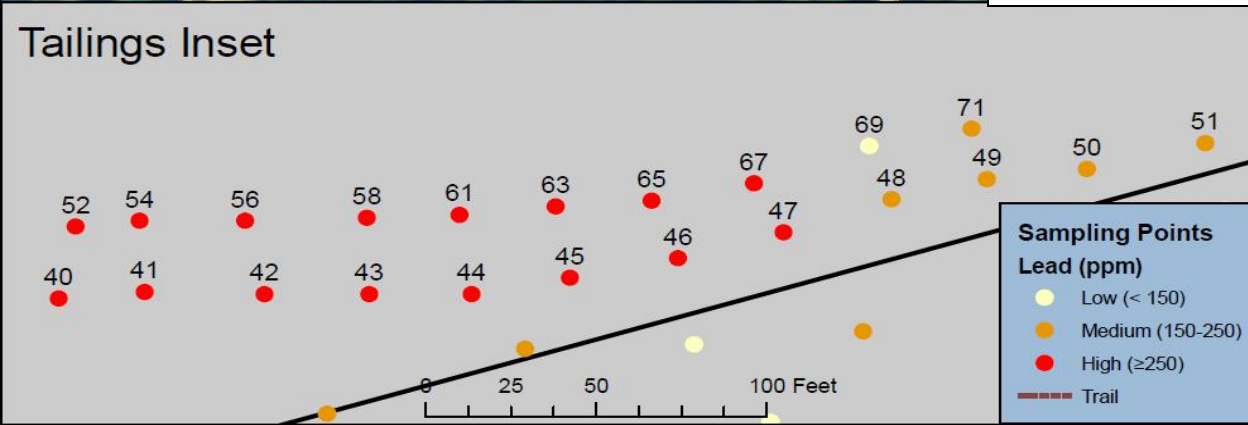
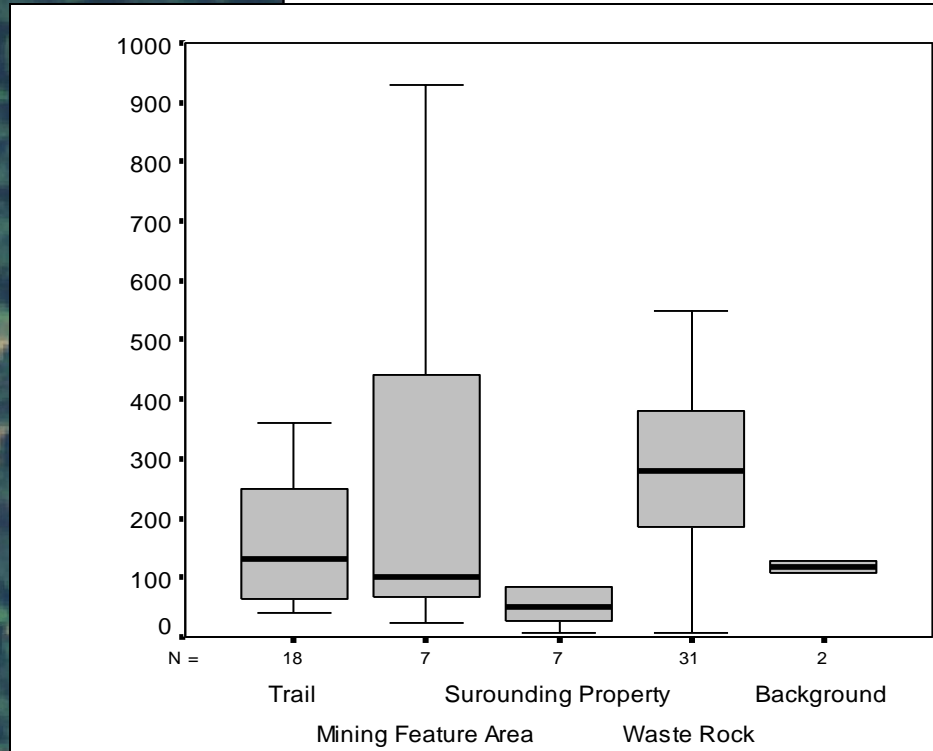
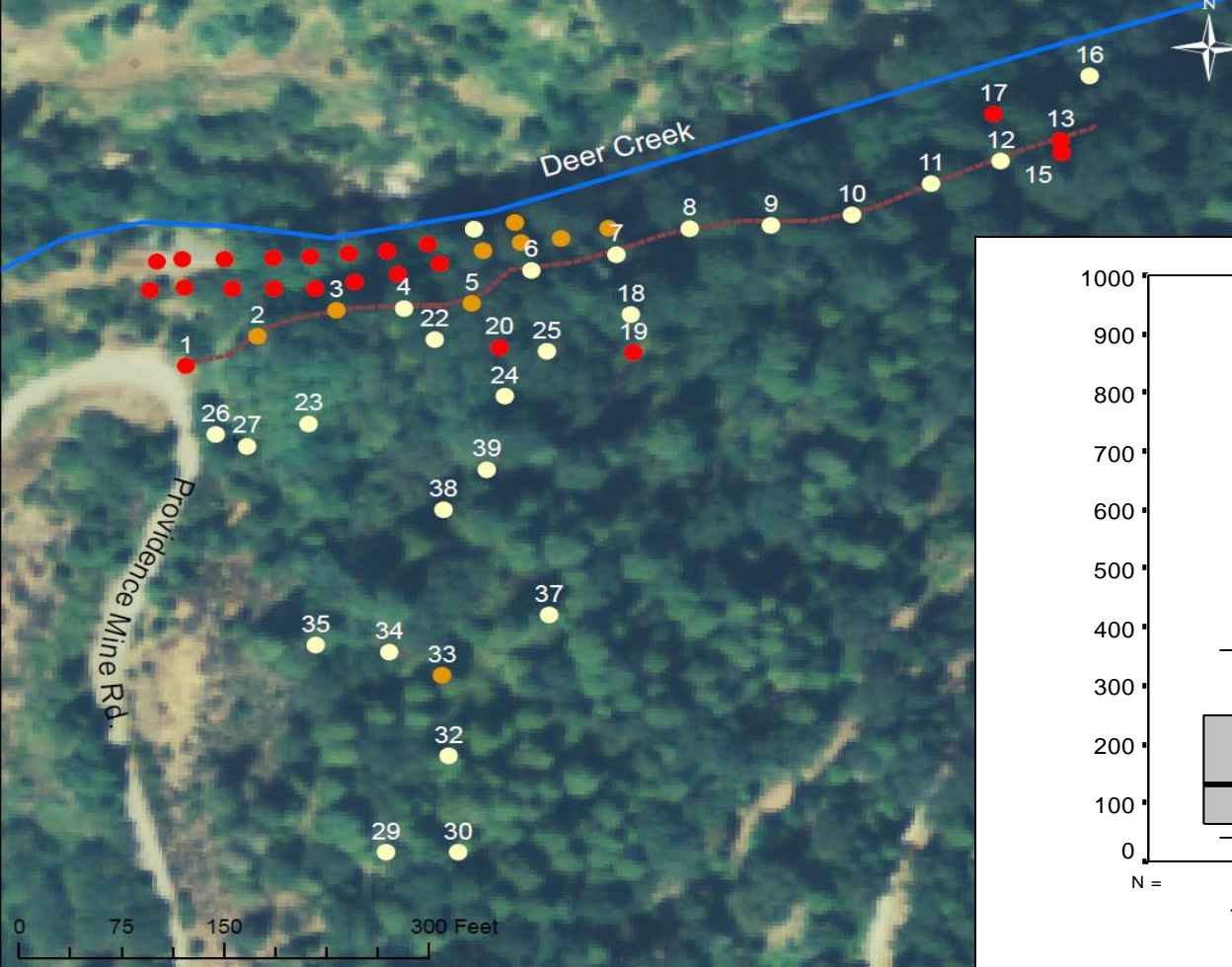
Tributary of Deer Creek

Deer Creek Falls Barrier

Lake Wildwood Reservoir



# Providence





A photograph of a forest trail. In the center, a group of about six people, including children and adults, are gathered around a large, thick tree trunk. One person is reaching up towards the branches. The forest is dense with green foliage and sunlight filtering through the trees. The ground is a dirt path with some fallen leaves. The overall scene is a natural, outdoor setting.

Deer Creek  
Tribute Trail







# How do we use this data?



**State Water Resources Control Board 303(d) impaired water body listing of lower Deer Creek for pH and upper Deer Creek for Hg.**

**Choosing Restoration sites**

**Evaluating success of restoration**

**Educating community members, local County, state, federal governments**

**Health warnings: installation of signs in local park to warn of bacteria contamination**

**Habitat Assessments for CEQA**

**Heavy metal Health warnings from fish consumption and recreational activities**

**Mining Assessments and cleanups**



# Collaborations

Work with county and State on gravel augmentation project for improved salmon habitat

Partnership with Regional Board: 100 water and sediment samples during storms

**Development of riparian interpretive trail on Nevada City and BLM property**

Education to local schools about mining impacts to environmental health. Restoration projects

**Bacteria study in conjunction with Nevada County Environmental Health**

Partnerships with BLM and USGS: sample macroinvertebrates to determine the amount of methyl mercury getting into the food chain

Installation of sediment traps on storm drains within Nevada City

Work with local angler and recreation groups to assess exposure to heavy metals

Collaboratively wrote and adhere to Quality Assurance Project Plan with State Water Resources Control Board. Includes quarterly Technical Advisory Committee and biannual Intercalibration sessions.

**Collaboration with State on arsenic and heavy metal studies**

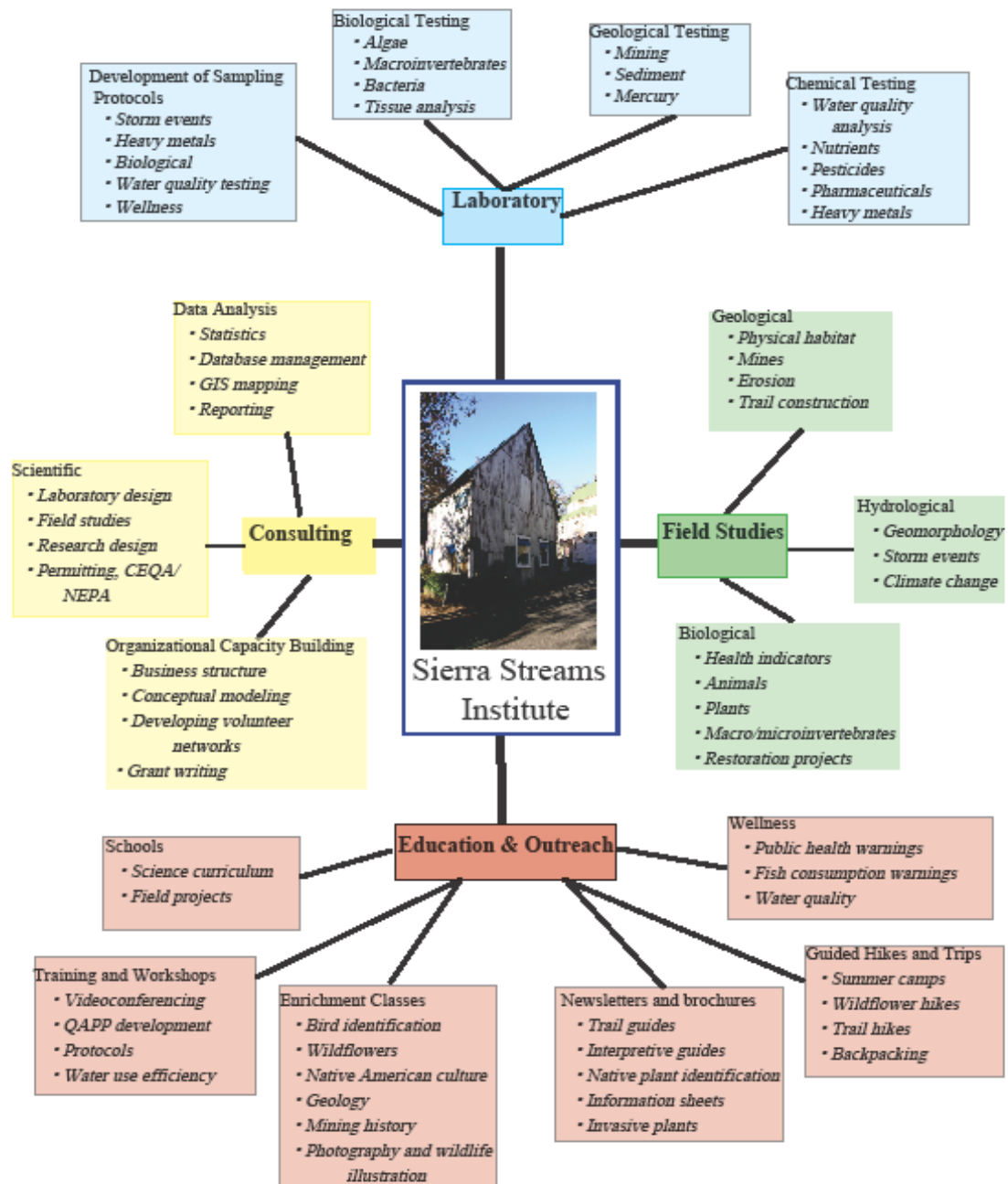
**Restoration project in Nevada City park**

Deer Creek Restoration Plan written with Tsi Akim Maidu



# Our Future







Contact Information:

Joanne Hild  
132 Main St.  
Nevada City, CA 95959

(530) 265-6090

[joanne@friendsofdeercreek.org](mailto:joanne@friendsofdeercreek.org)  
[www.friendsofdeercreek.org](http://www.friendsofdeercreek.org)