Citizen-based Monitoring Characterizes Water Quality and BMIs throughout a Western Sierra Stream

SIERRA Streams INSTITUTE

Linking Water, Science and People

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Overview

- Background of SSI programs and community partnerships
- Case Study: Pioneer Park habitat health before and after restoration
- Case Study: Habitat health below Lake Wildwood Wastewater Treatment Plant before and after nitrate removal

Our history

- Started in 1996 as Friends of Deer Creek by a group of concerned local citizens and property owners.

- Focused on scientific investigation and methods, to find solutions to Deer Creek's problems.


Sierra Streams Institute Programs
Restoration
Restoration of salmon habitat
Remediation of bacterial contamination
Research
Transport of mercury over dams
Health impacts of mining contaminants
Education
Hands-on science
Training
State protocols for watershed groups
Laboratory
Chemical and biological analysis

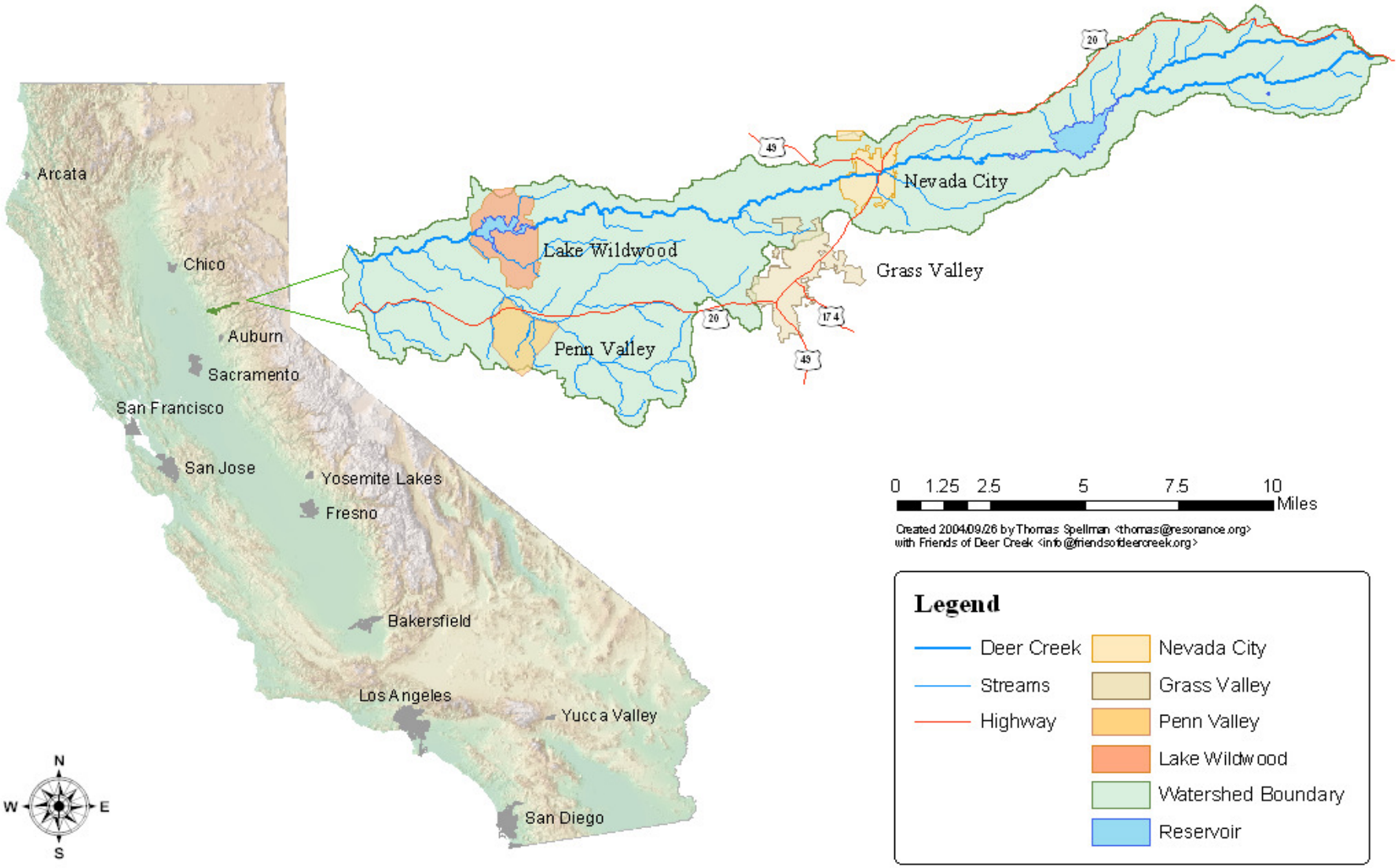
Community-based Participatory Research

Sierra Streams Institute is working with local citizens to improve:

- **environmental health of ecosystems**
- **public health of community members**
- **science education**

Citizens participate in all levels of work.

Deer Creek Watershed



Lake Wildwood Wastewater Treatment Plant

Reduction of nitrates in effluent

Successful community partnership

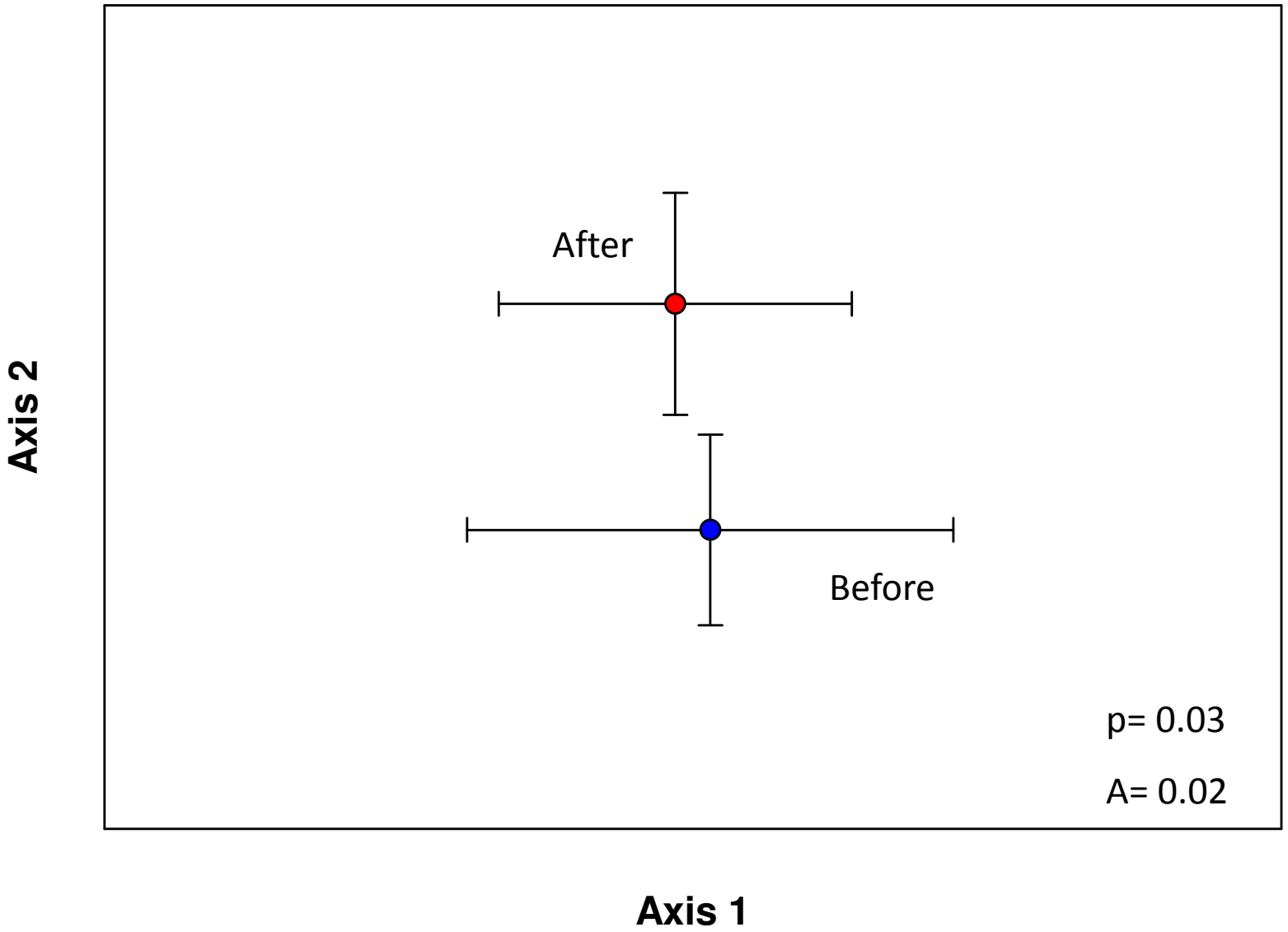
Pioneer Park Restoration

- Could not remove cement due to Arsenic contamination
- Removed invasive plant species, replanted with natives
- Added boulders and shifted bridge to change hydrology, reduce sedimentation
- Successful at getting City of Nevada City to follow BMP's

Pioneer Park Restoration

Shredder Index increased from μ= 3.4 to 6.4 (SE ± 1.4, t= 2.1, p= 0.04)

Pioneer Park Restoration- BMI



Indicator Species Analysis

(Dufrene and Legendre 1997)

Group 1 (Before Restoration)

Trichoptera, Polycentropodidae:
Indicator Value= 32.1, p= 0.21
Filterer-Collector, Tolerance Value= 6

Group 2 (After Restoration)

Megaloptera, Corydalidae:
Indicator Value= 37.5, p= 0.2
Predator, Tolerance Value= 0

Plecoptera, Pteronarcyidae:
Indicator Value= 40, p= 0.17
Shredder, Tolerance Value = 0

Summary

- Restoration work is improving conditions for BMI communities

- BMI are good indicators of ecosystem health

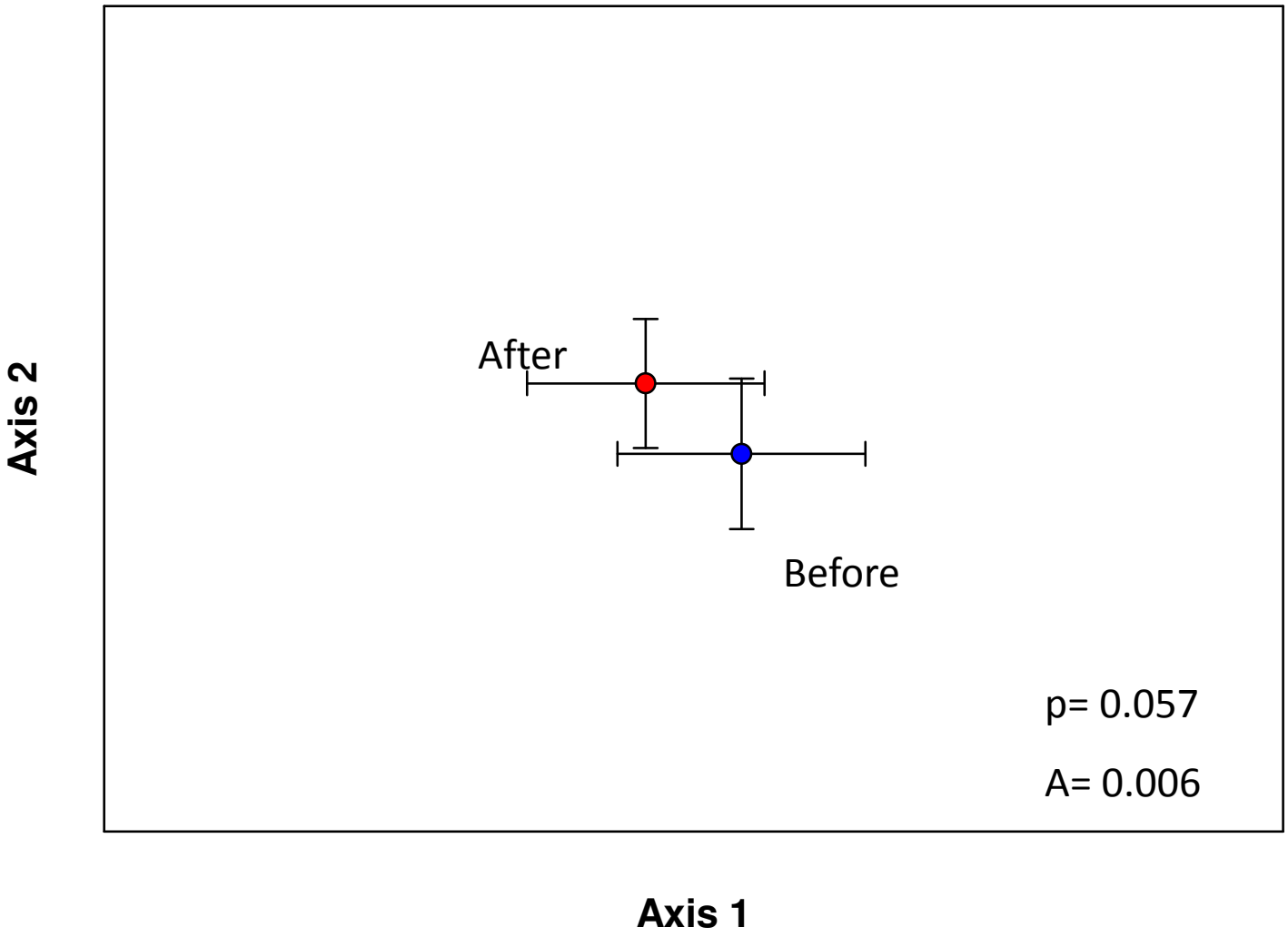
- Results show volunteers & community how successful their work has been



Lake Wildwood Wastewater Treatment Plant Upgrade

- Government mandate in June 2007
- Upgrade to fully denitrify wastewater, produce more consistent, contained flows
- Reduced NO_3 from μ= 1.085 mg/L to 0.67 mg/L (SE ± 0.18, z= -440.5, p= 0.03)
- Reduced water temperature from μ= 18.5°C to 15.9°C
  (SE ± 1.24, t= 2.16, p= 0.04)

LWW Upgrade- BMI Communities



Indicator Species Analysis

(Dufrene and Legendre 1997)

Group 1 (Before Upgrade)

None!

Group 2 (After Upgrade)

Diptera, Tipulidae:
Indicator Value= 30.2, p= 0.05
Shredder
Tolerance Value= 3

www.bugguide.net

Summary

- Upgraded practices at Wastewater Treatment Plant shows improved water quality and trend of improving BMI health

- Increased residents' awareness of watershed

- Developing relationship with wastewater treatment plant to manage discharge

Future Directions

- LWW additional upgrades: UV disinfection (no NaClO) beginning 2013
- Continued restoration and monitoring along Deer Creek
- Algae data
- More multivariate analyses (combine biological and environmental data sets)
- Continue citizen participatory research

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