Mountain Meadows: Connecting Aquatic and Terrestrial Health Indicators

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Beyond Conservation: New knowledge for a new era of river restoration and management.

Overview

- Why meadows are important
- Project Goals
- Challenges associated with meadows
- Methods
- Results
- Future directions

Project Goals

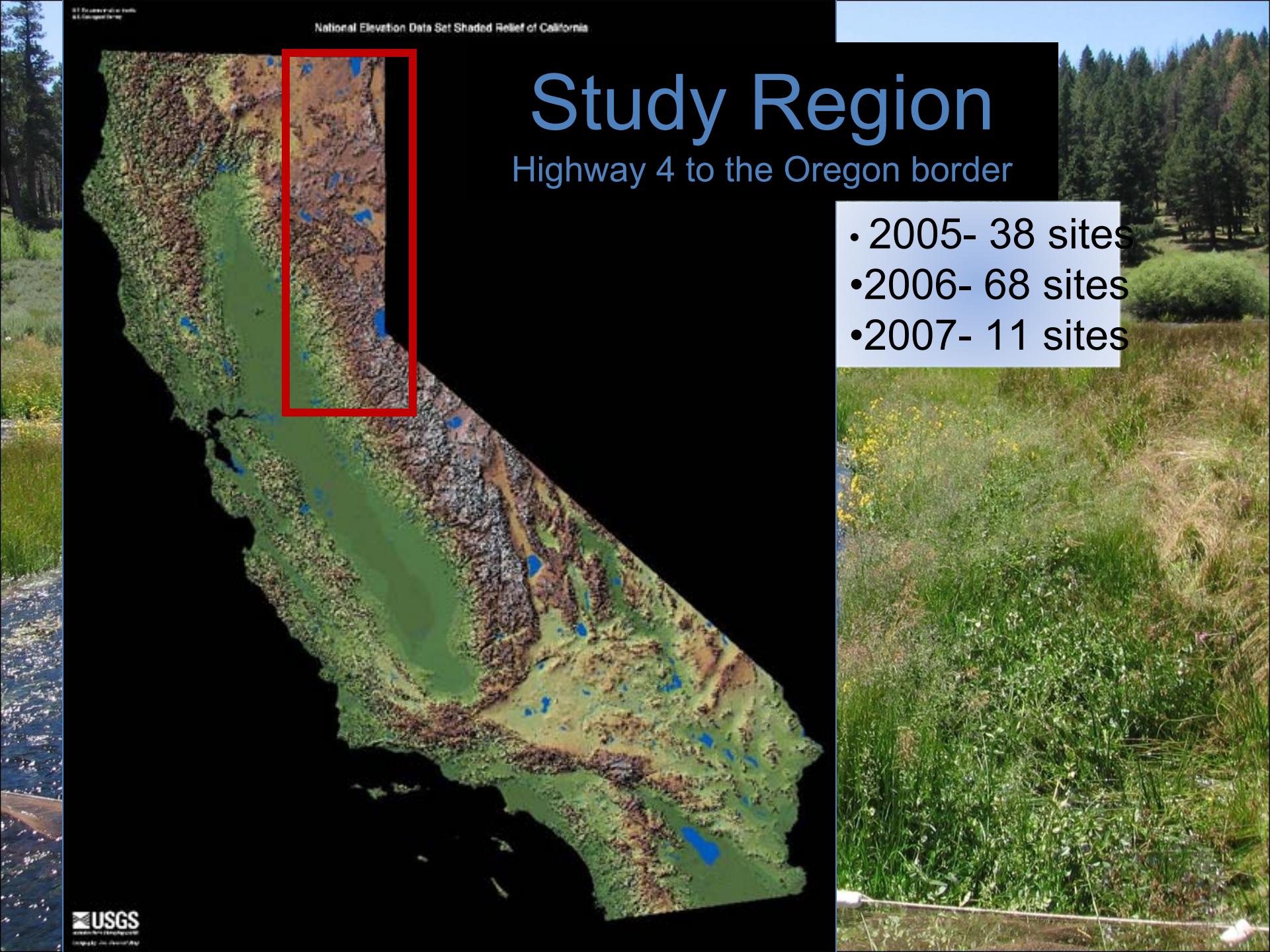
- Develop indices of biotic integrity specific to meadow streams
- Determine connectivity between instream and terrestrial measures of integrity
- Compare instream indices with results from prior vegetation health surveys
- Develop a standardized "First Look" protocol for assessing meadow conditions

Meadow Challenges

No two meadows alike

Meadow Characteristics

- Meadow communities are substrate driven
- Extensive variation in substrate and tree cover leads to variability in results
- Established IBIs tend to not be representative of this type of habitat
- Scores are lower than local reference conditions as a result of normal meadow habitats



Study Region

Highway 4 to the Oregon border

- 2005- 38 sites
- 2006- 68 sites
- 2007- 11 sites

Sampling Protocol

Sample Aquatic Invertebrates	• All habitats (favoring riffles), 9 kick nets, sort 300 individuals to family
Sample Fish	• Single pass backpack electrofishing, measure, weigh, identify to species and release
Survey Vegetation	• Identify all vegetation within sampling reach riparian zone to lowest taxonomic level, estimate % cover
Survey Physical Habitat	• Using EPA/CSBP protocol
Survey Amphibians & Reptiles	• Visual encounter survey in riparian zone

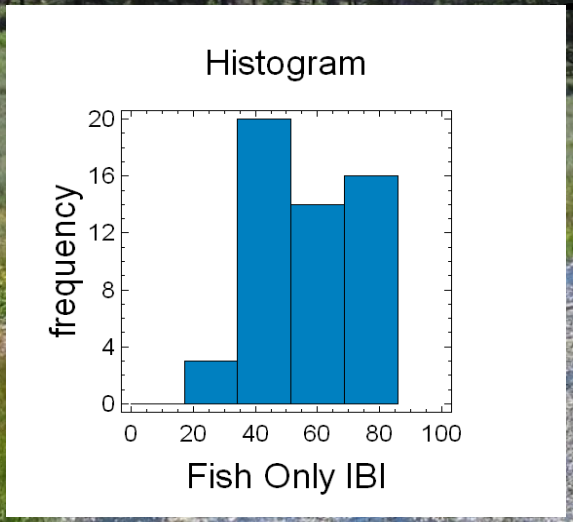
IBIs

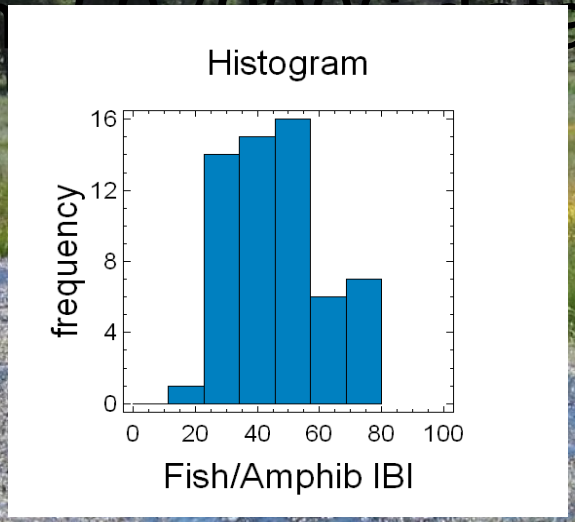
- Fish-only IBI
- Fish and Amphibian IBI
- Invertebrate IBI
- Physical Habitat Index
- Vegetation Health Index

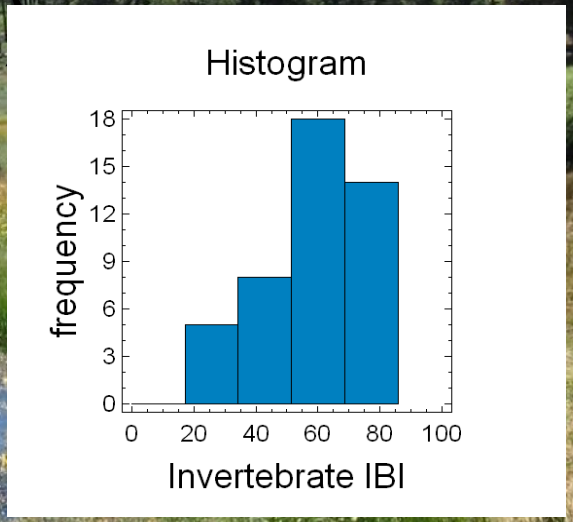
Score Interpretation

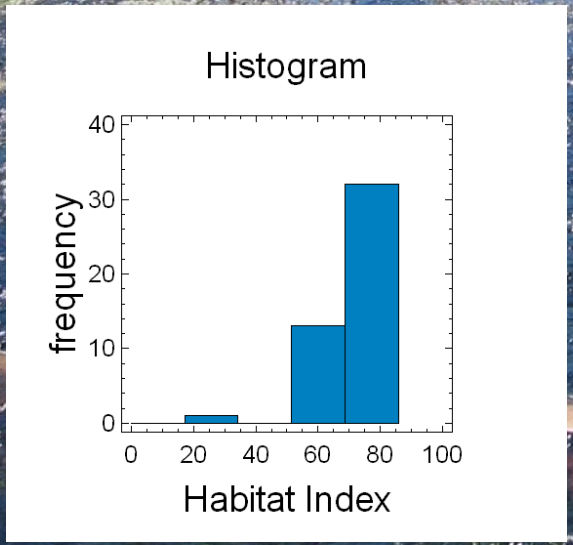
Score 0-25 = poor condition	• Extensive past or continuing degradation, almost complete loss of function
Score 26-50 = marginal condition	• Significant past or continuing impacts observed, but site still supports limited function
Score 51-75 = fair condition	• Considerable past or current impacts observed, with some impairment of function and loss of most sensitive taxa
Score 76-100 = excellent condition	• Site in excellent condition, very few impacts observed, potential reference site

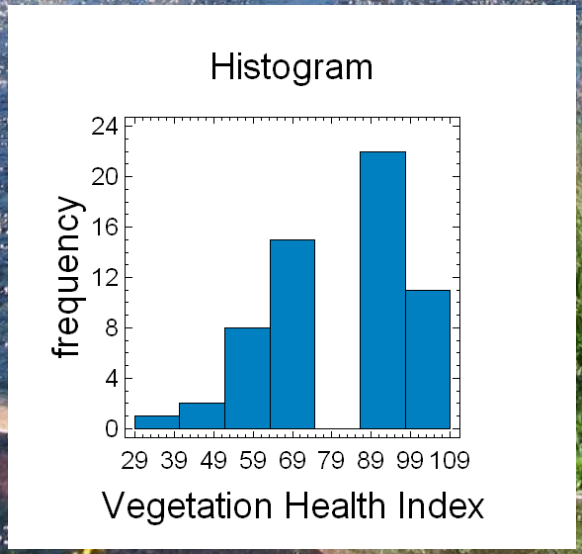
IBI Score frequency distributions

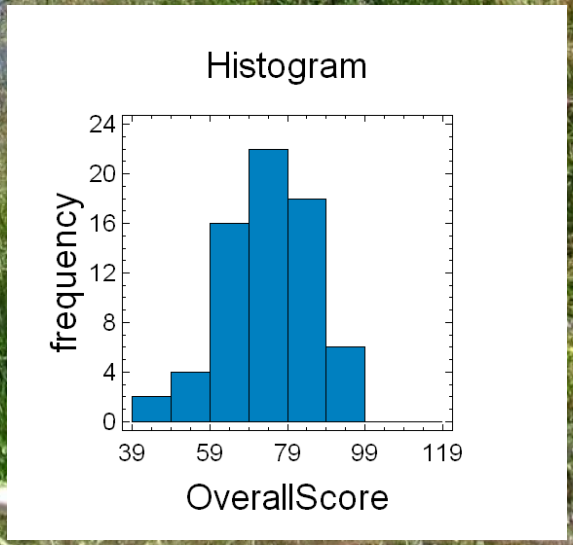




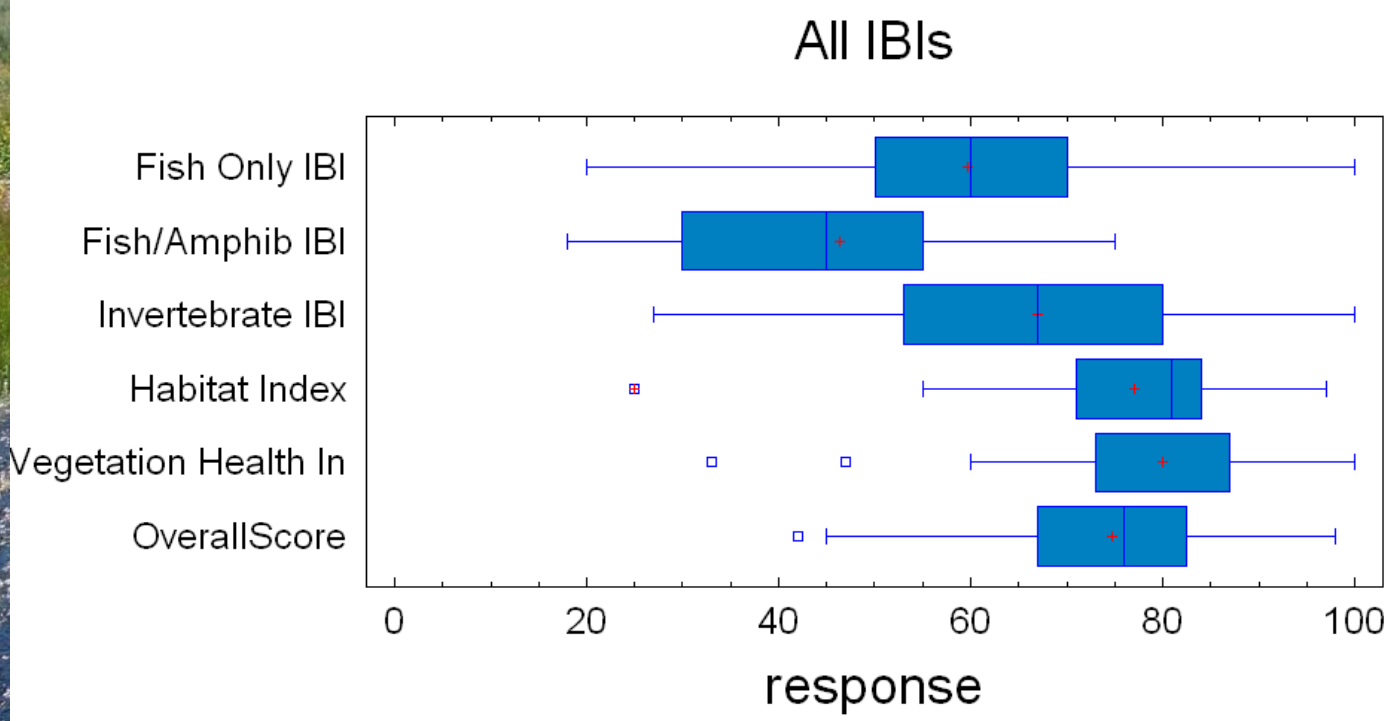








IBI means



	Mean
Fish Only IBI	59.7
Fish/Amphib IBI	46.3
Invertebrate IBI	67.0
Habitat Index	77.1
Vegetation Health In	79.9
OverallScore	74.0

Correlations

Pearson correlations	Fish-only IBI	Fish/Amphibian IBI	Invertebrate IBI	Habitat Index	Vegetation Health Index
Fish-only IBI	—	0.7135	-0.0249	-0.0456	-0.2123
P-value	—	0.00000	0.8518	0.7319	0.1064
Fish/Amphibian IBI	0.7135	—	-0.0253	-0.1890	-0.1503
P-value	0.0000	—	0.8494	0.1516	0.2559
Invertebrate IBI	-0.0249	-0.0253	—	0.3724	0.0790
P-value	0.8518	0.8494	—	0.0037	0.5522
Habitat Index	-0.0456	-0.1890	0.3724	—	0.5518
P-value	0.7319	0.1516	0.0037	—	0.0000
Vegetation Health Index	-0.2123	-0.1503	0.0790	0.5518	—
P-value	0.1064	0.2559	0.5522	0.0000	—

Results

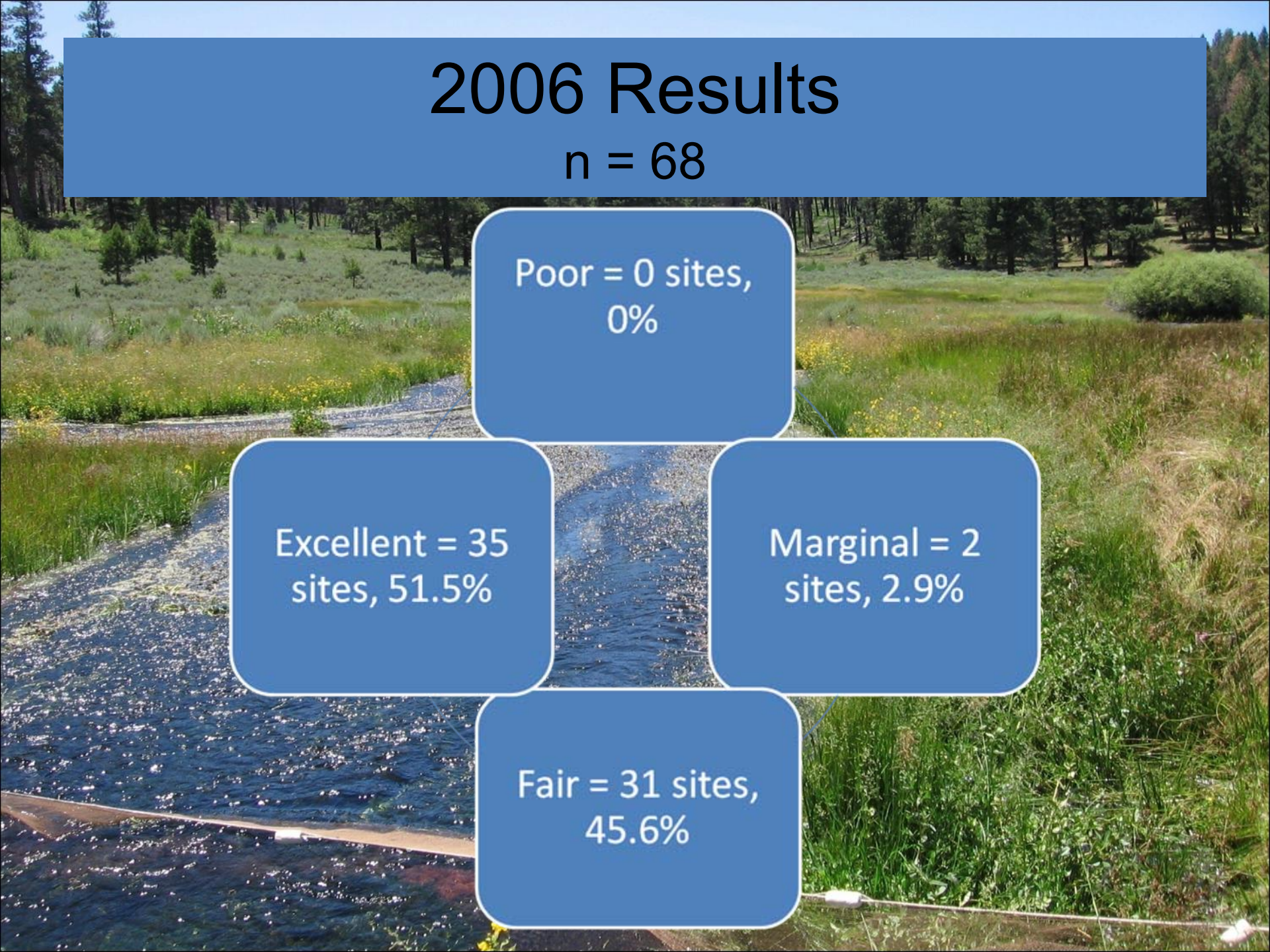
Significant correlation ($p=<0.05$) between Invertebrate IBI and Habitat Index

Significant correlation between Vegetation Index and Habitat index

No Significant correlation between Fish-based IBIs and other indices

2006 Results

n = 68



Comparison

Willow Creek, overall score = 87

Cedar Creek, overall score = 43

Discussion

Most (97%) of the meadows in the study area are in “excellent” or “fair” overall condition

Public land management has improved considerably in recent years

Results indicate meadow systems are resilient, and respond well when impacts are addressed

However…

Serious impacts that result in extensive incision, erosion, scouring, and lowered water table cannot be easily reversed

Stream channel type is altered and a new, narrow riparian corridor will develop within the incision

Water table will remain lowered, uplands disconnected

Significant, lasting loss of biodiversity

Over-grazing is the Dominant Impact

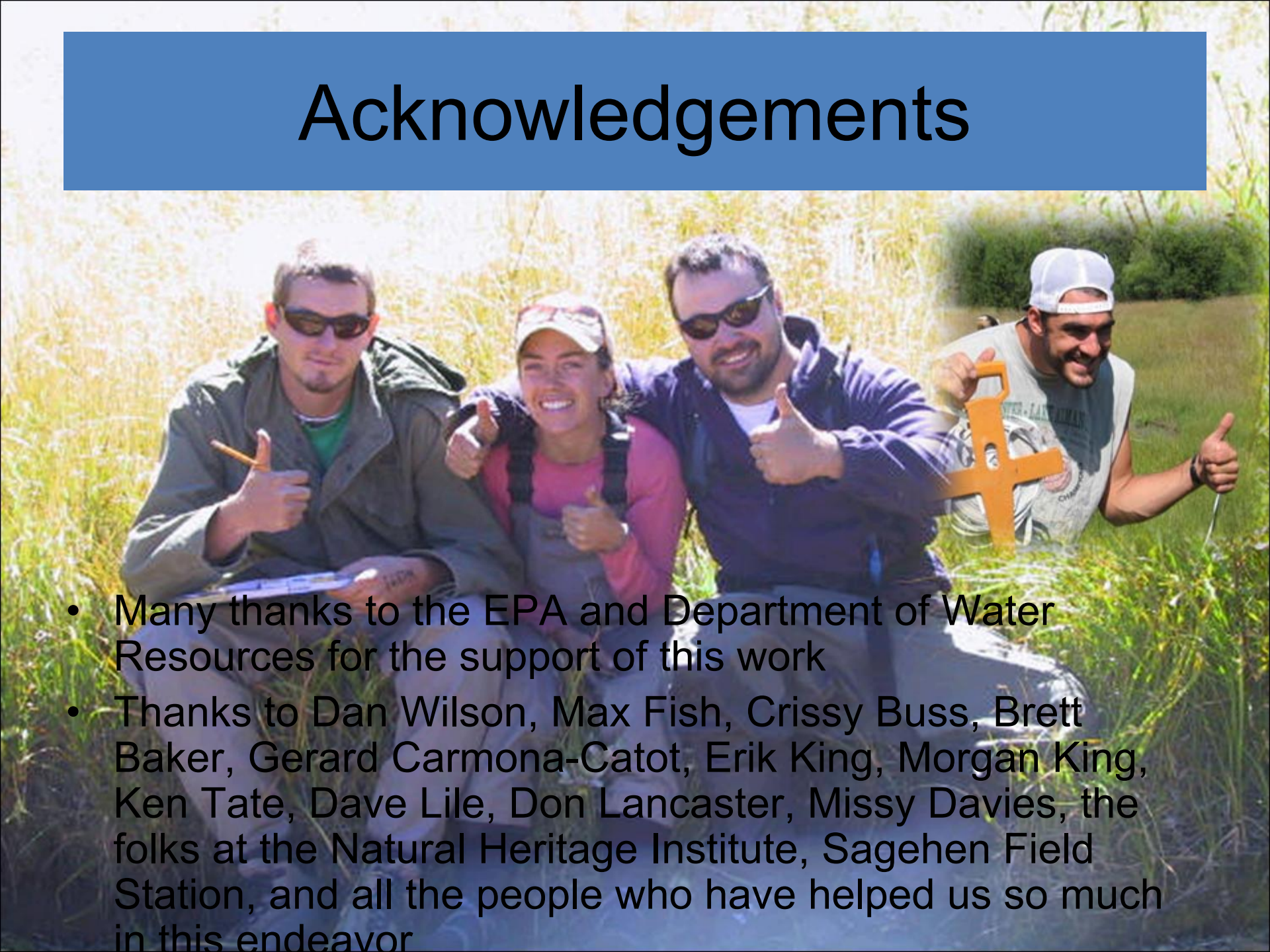
2007 Work

Target more impacted streams to improve indices (Lassen & Modoc counties)

Temperature study on select streams to complement standard sampling protocol

Revise physical habitat index to be more meadow-specific

Acknowledgements



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