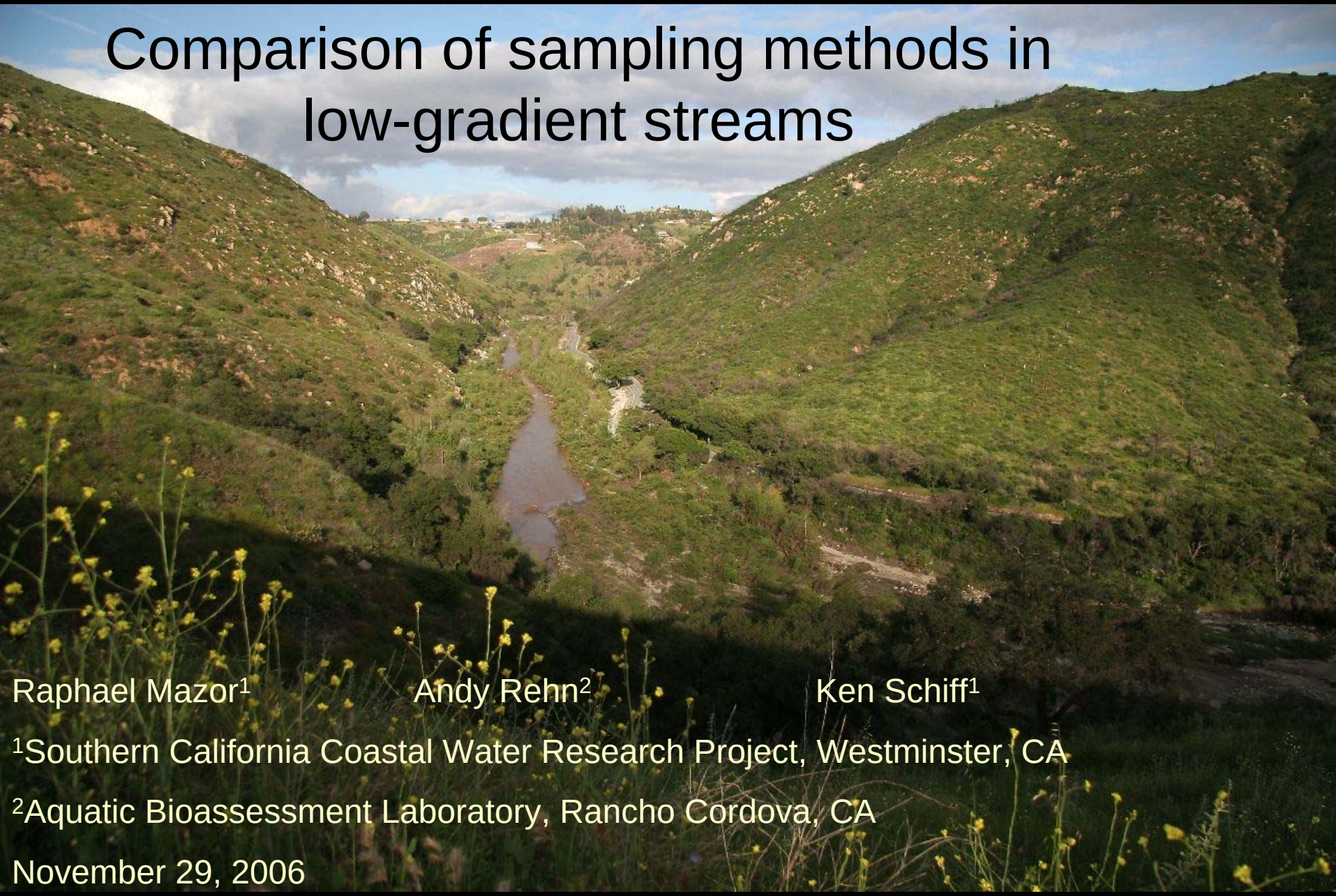
# Comparison of sampling methods in low-gradient streams



Raphael Mazor[1] Andy Rehn[2] Ken Schiff[1]

[1]Southern California Coastal Water Research Project, Westminster, CA

[2]Aquatic Bioassessment Laboratory, Rancho Cordova, CA

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# Intro

Initiation of regional biomonitoring program: Integrating data from SWAMP and NPDES programs.

Sampling methods and assessment tools (SoCal-IBI) have been proposed.

Do these tools work in low-gradient streams?

Low-gradient streams are common in southern California, and their health is of great public interest.

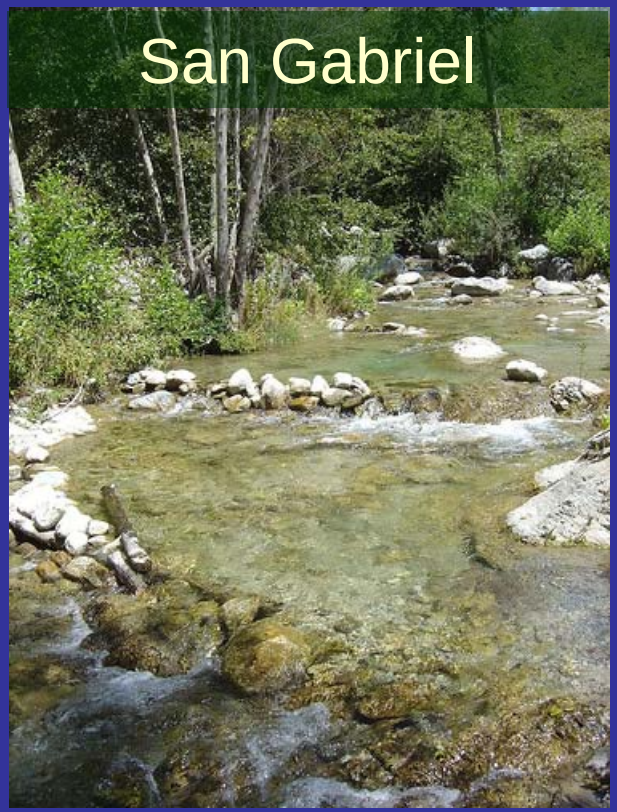
# Questions

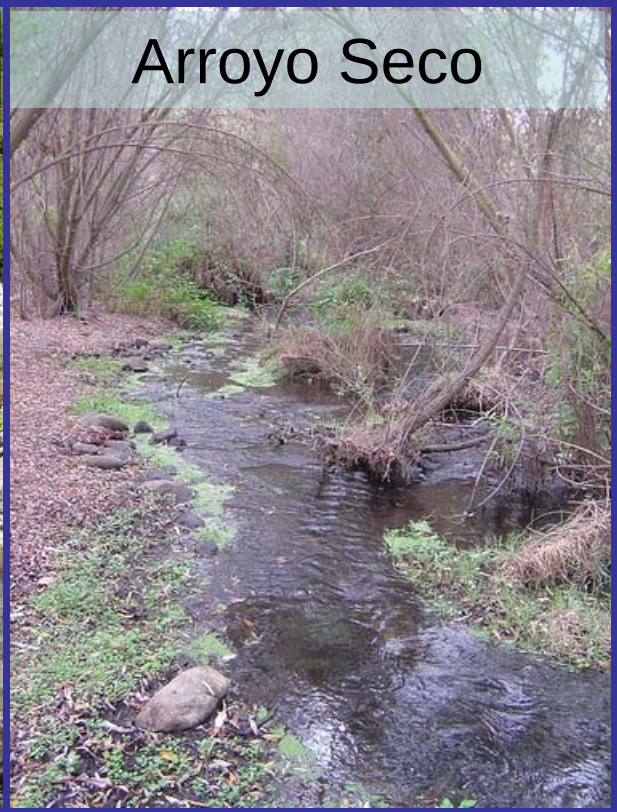
1. Does the So-Cal IBI function well in low-gradient streams?
2. Which sampling methods are the most precise?
3. Do different sampling methods give similar results?

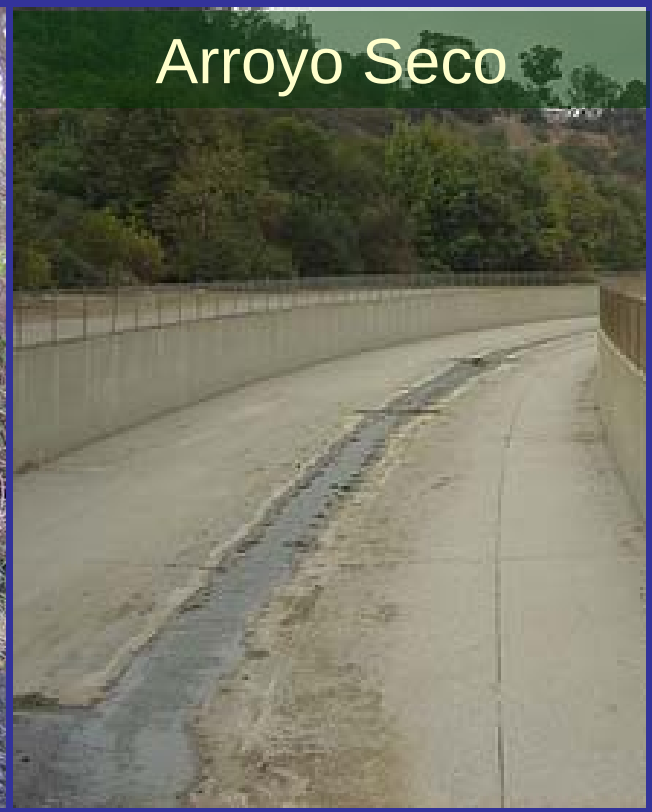
# Background

Sampling methods

**CSBP**: Targets richest habitats (riffles, margins)



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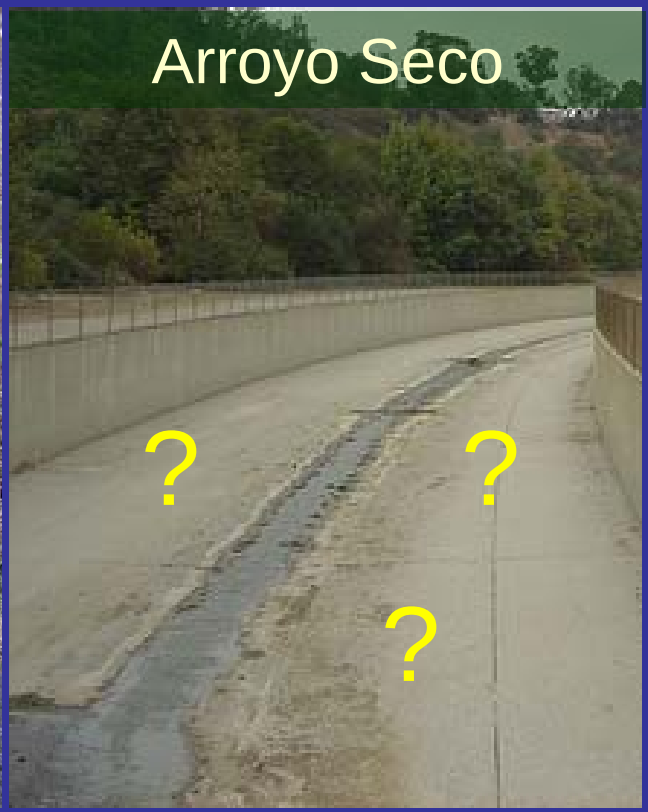
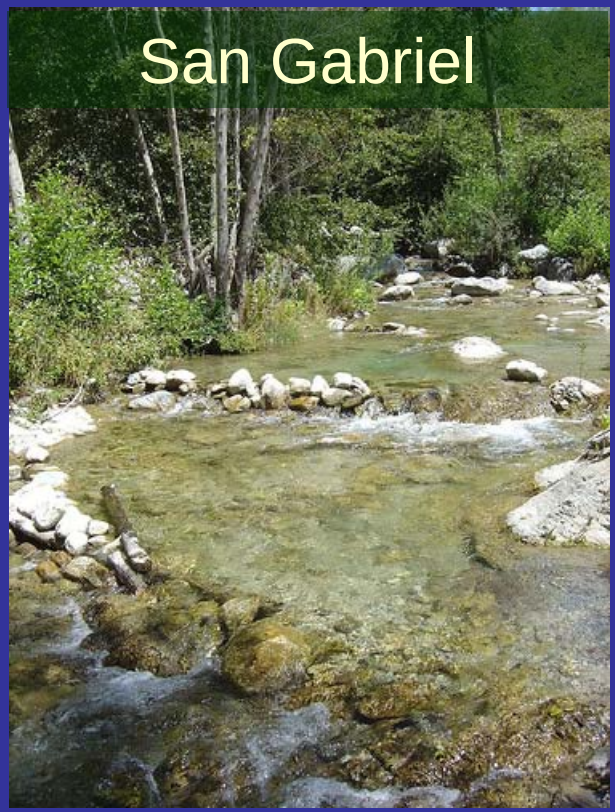
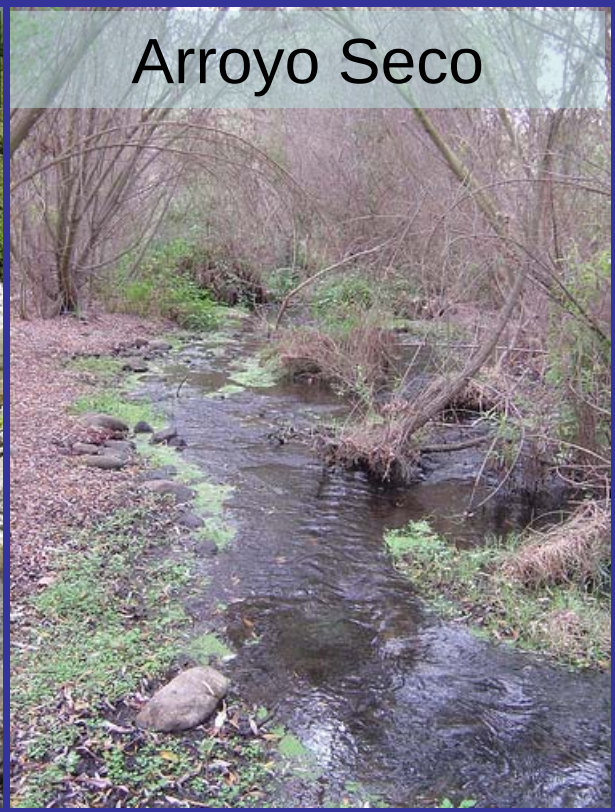


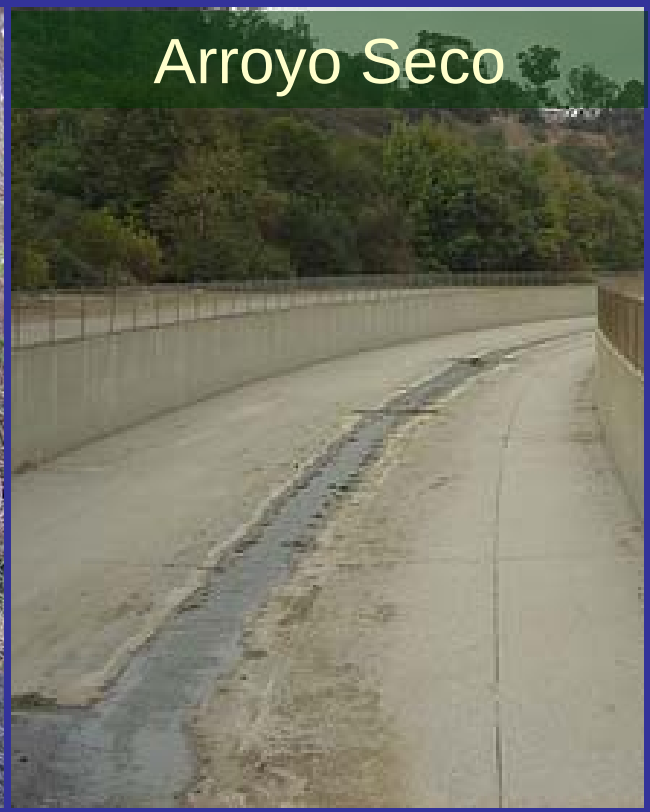
# Background

Sampling methods

**MH**: Multi-habitat (25%, 50%, and 75% of channel width)



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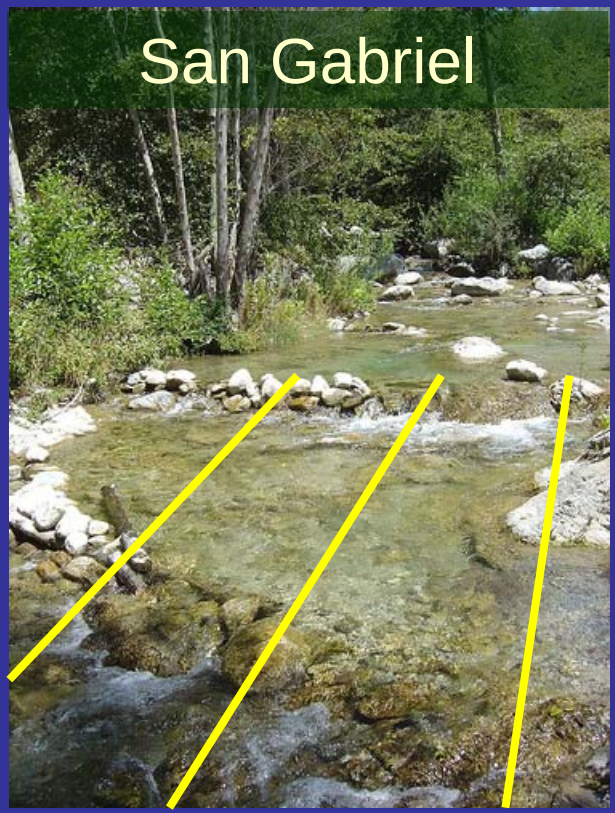
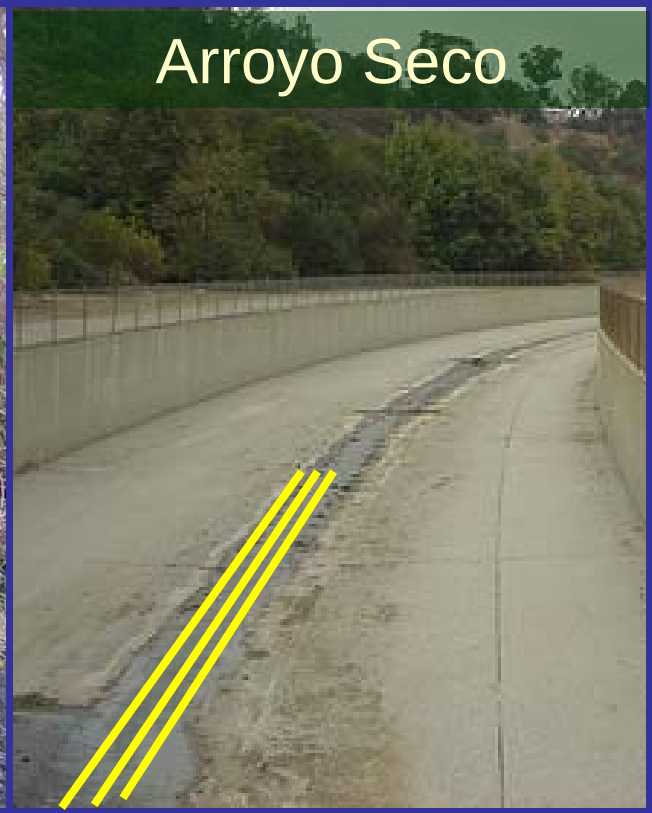


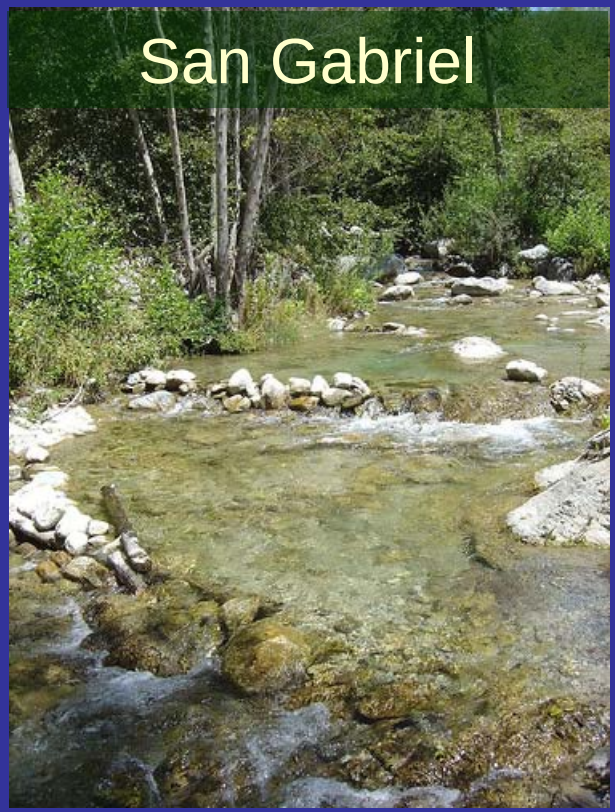


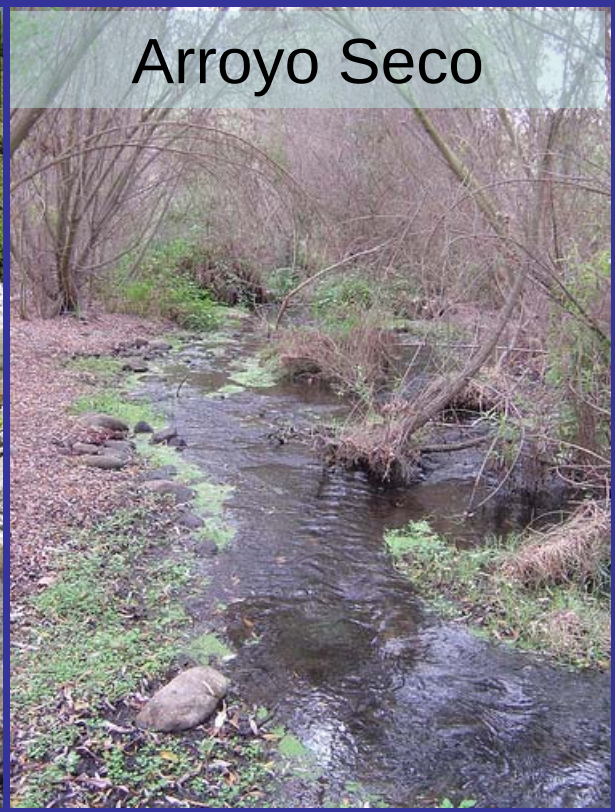


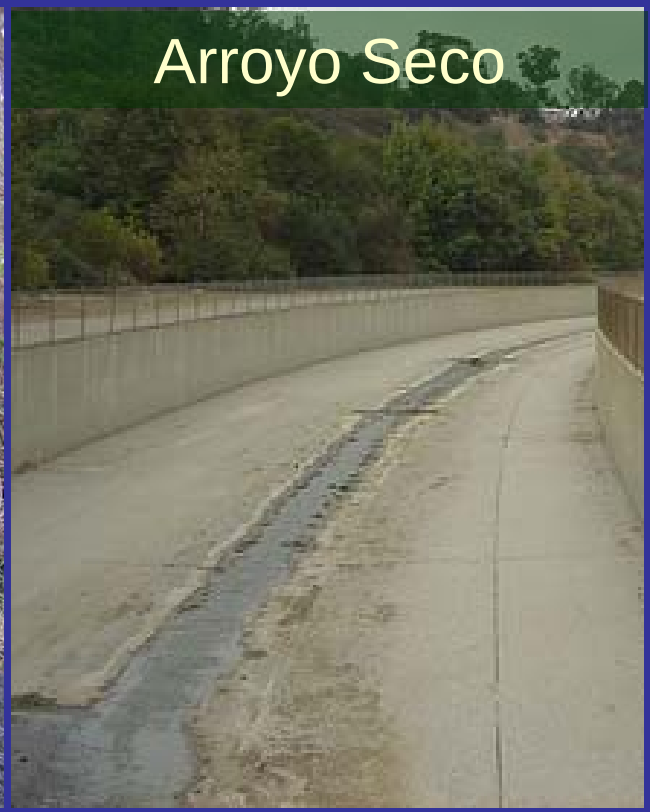
# Background

Sampling methods

**MCM**: Margin-Center-Margin (also gets richest habitats)



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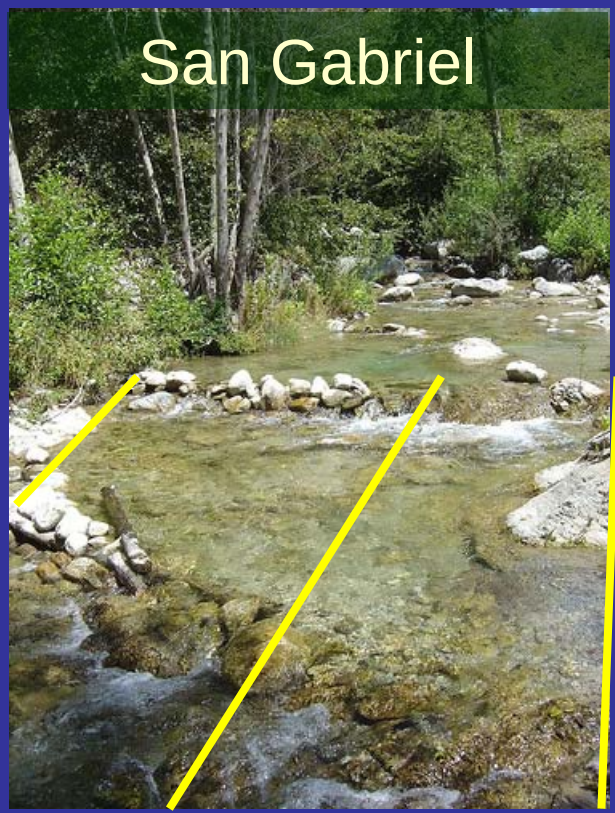
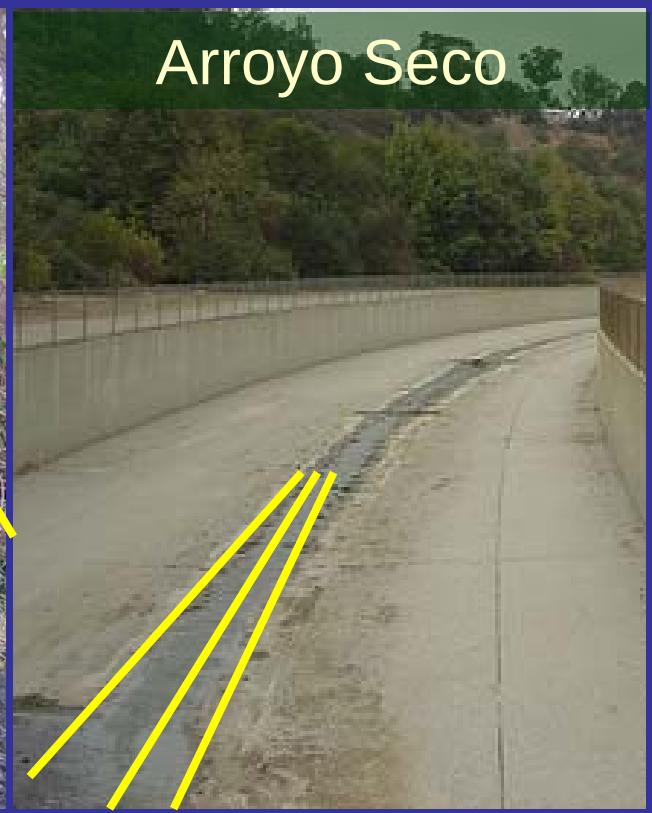
Sampling methods

**MCM**: Margin-Center-Margin (also gets richest habitats)







# Methods

Low-gradient streams sampled in southern California:

- -Santa Clara River (4 sites)
- -Rio Hondo
- -Santa Margarita River (2 sites)
- -Santa Ana River
- -Las Virgenes Creek
- -Agua Hedionda

# Methods

Each method tested in each river, often sampled in triplicate.

500-count samples were sorted and identified.

Metrics and IBI scores were calculated for each sample.

# Results

Number of samples:

| River | CSBP | MCM | MH |
|---|---|---|---|
| Santa Clara | 5 | 5 | 6 |
| Agua Hedionda | 2 | 3 | 3 |
| Rio Hondo | 3 | 3 | 3 |
| Santa Margarita C | 2 | 3 | 3 |
| Santa Margarita D | 2 | 3 | 3 |
| Santa Ana | 3 | 3 | 3 |
| Las Virgenes | 2 | 3 | 3 |
| TOTAL | 19 | 23 | 24 |

# Results

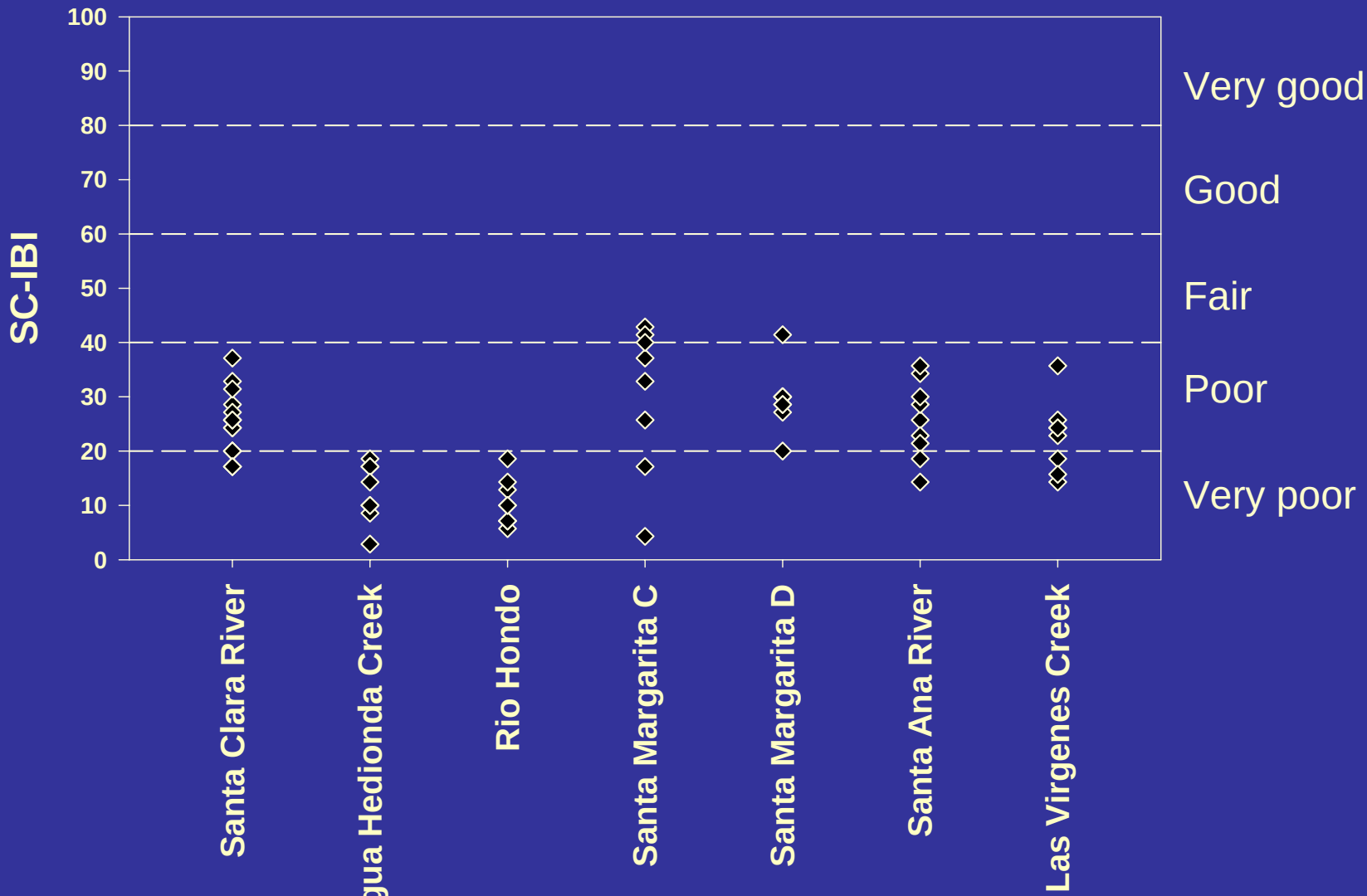
| | CSBP | MCM | MH |
|---|---|---|---|
| Richness | 18.7 | 19.9 | 16.3 |
| Individuals per sample* | 453 | 481 | 377 |

*$p < 0.05$

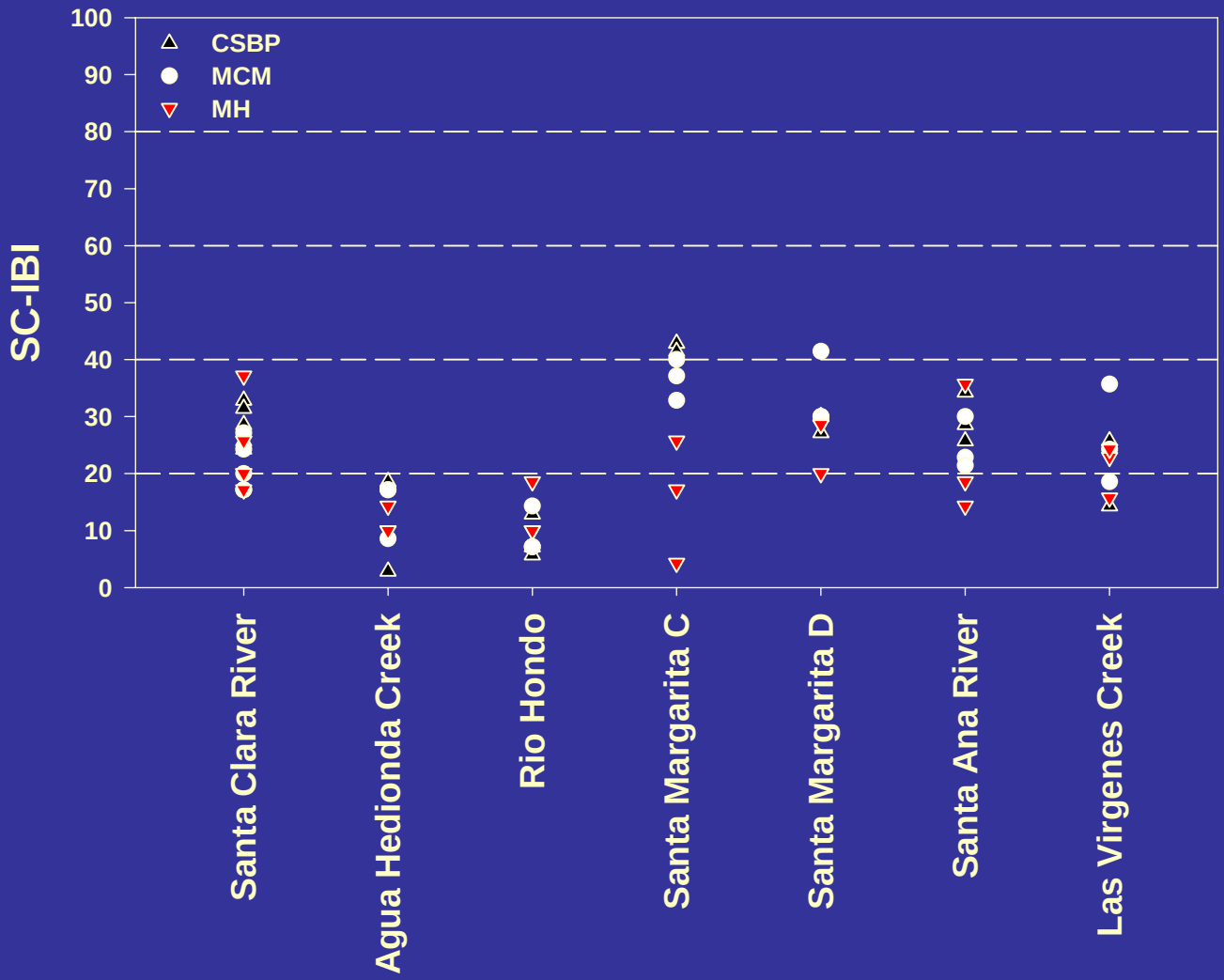
Of 66 samples total, 16 had < 450 organisms, of which 10 were MH samples

Sampling method does ***NOT*** affect richness, but it may result in small samples.

# Results


SC-IBI
100
90
80
70
60
50
40
30
20
10
0
Very good
Good
Fair
Poor
Very poor
Santa Clara River
Agua Hedionda Creek
Rio Hondo
Santa Margarita C
Santa Margarita D
Santa Ana River
Las Virgenes Creek

# Results




Very good

Good

Fair

Poor

Very poor

# Results

Two-way ANOVA on IBI Score

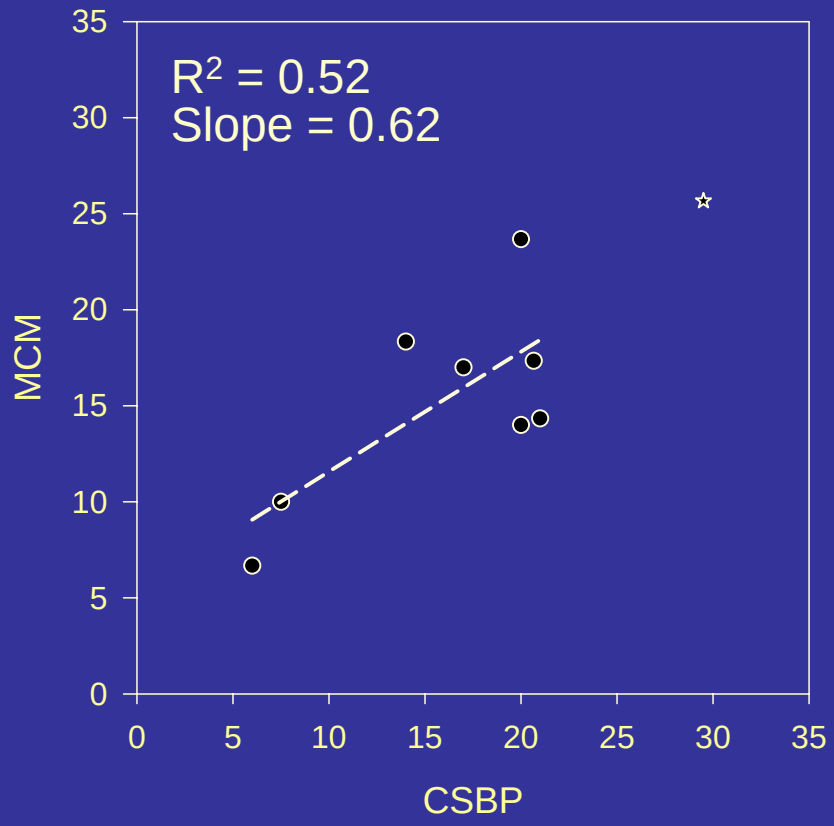
Exclude Santa Margarita C

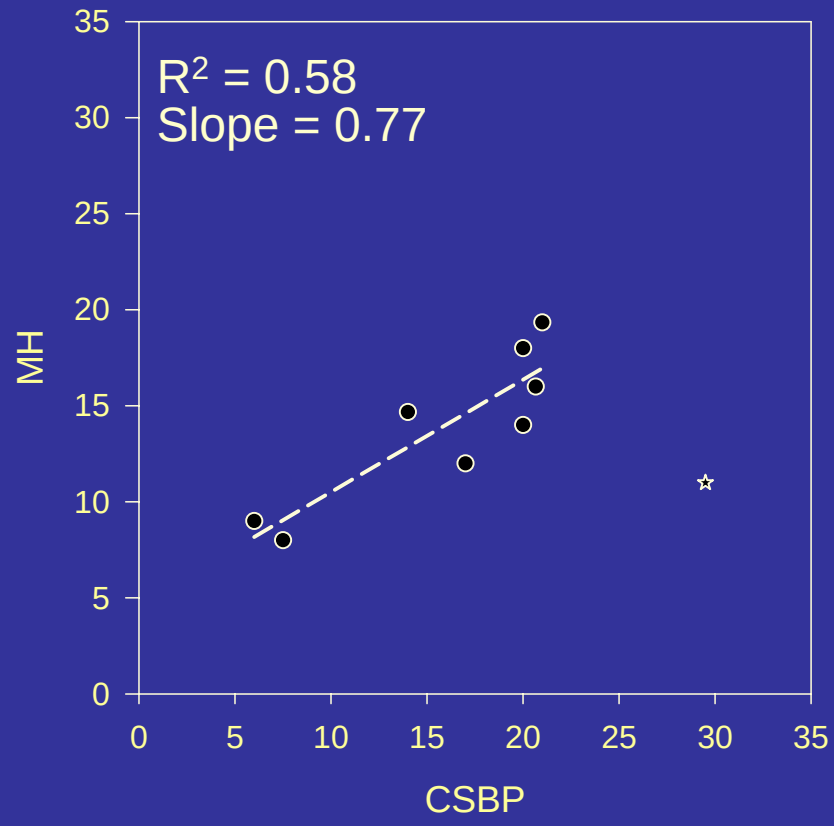
| | SS | d.f. | F | p |
|---|---|---|---|---|
| Method | 39.9 | 2 | 0.6 | 0.575 |
| River | 2641.3 | 5 | 14.8 | <0.001 |
| Interaction | 380.2 | 10 | 1.1 | 0.408 |
| Residuals | 1426.1 | 40 | | |

Method does ***NOT*** affect IBI score at most sites

# Results

SoCal-IBI



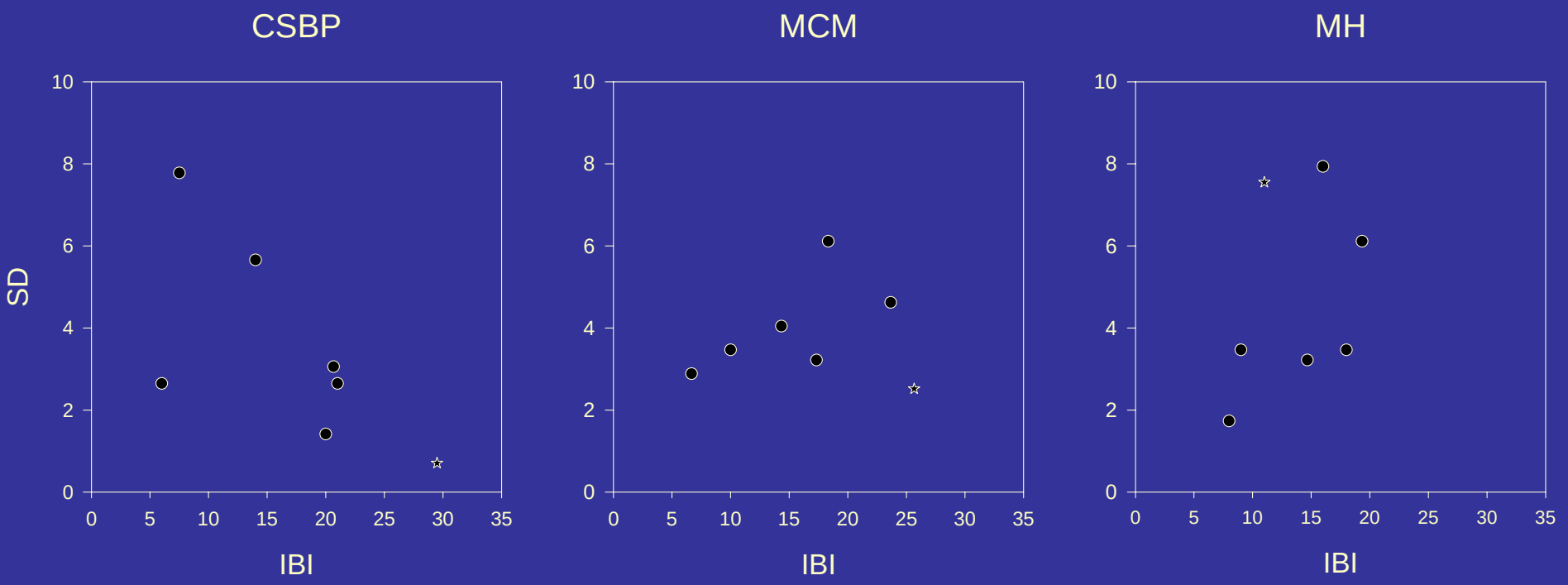




Good relationship between all methods.

# Results

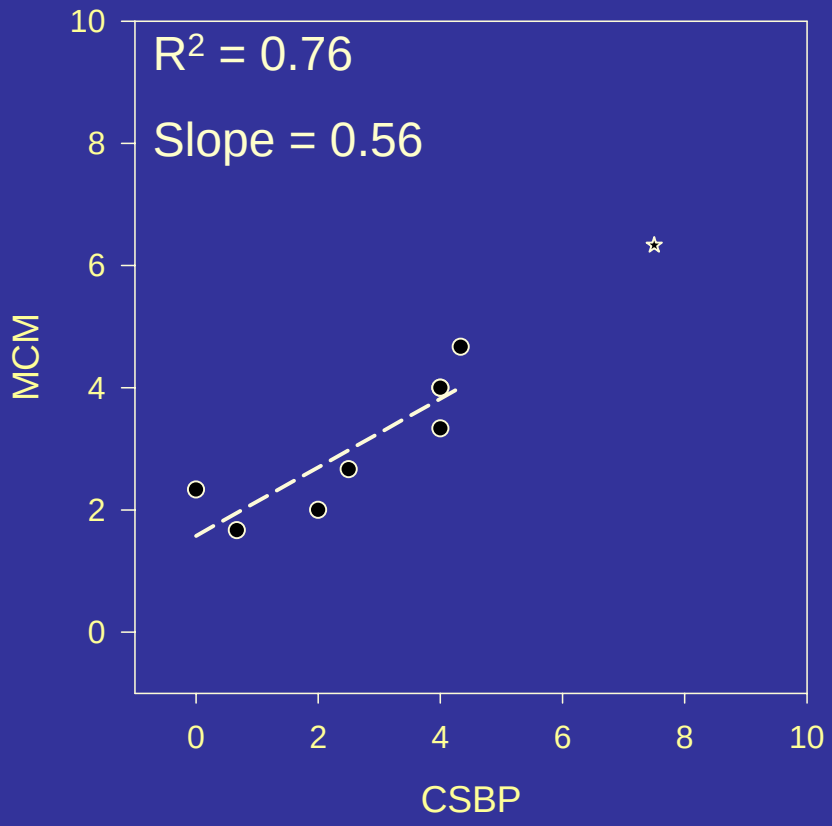
CSBP: High variability at low-scoring sites.

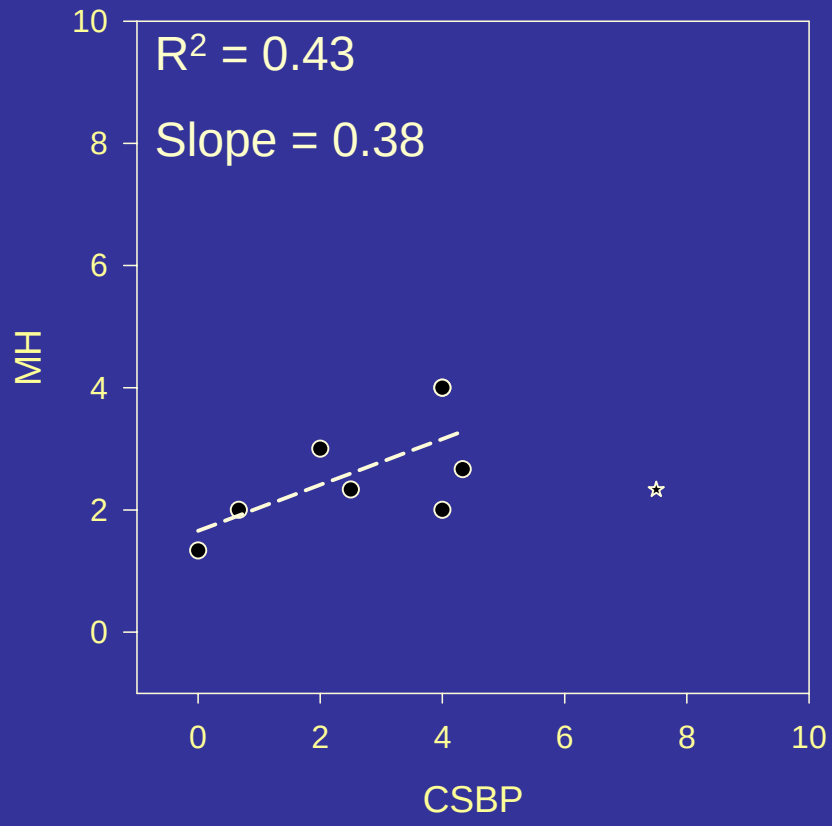
Other methods: High variability at all scores.



# Results

## EPT Taxa

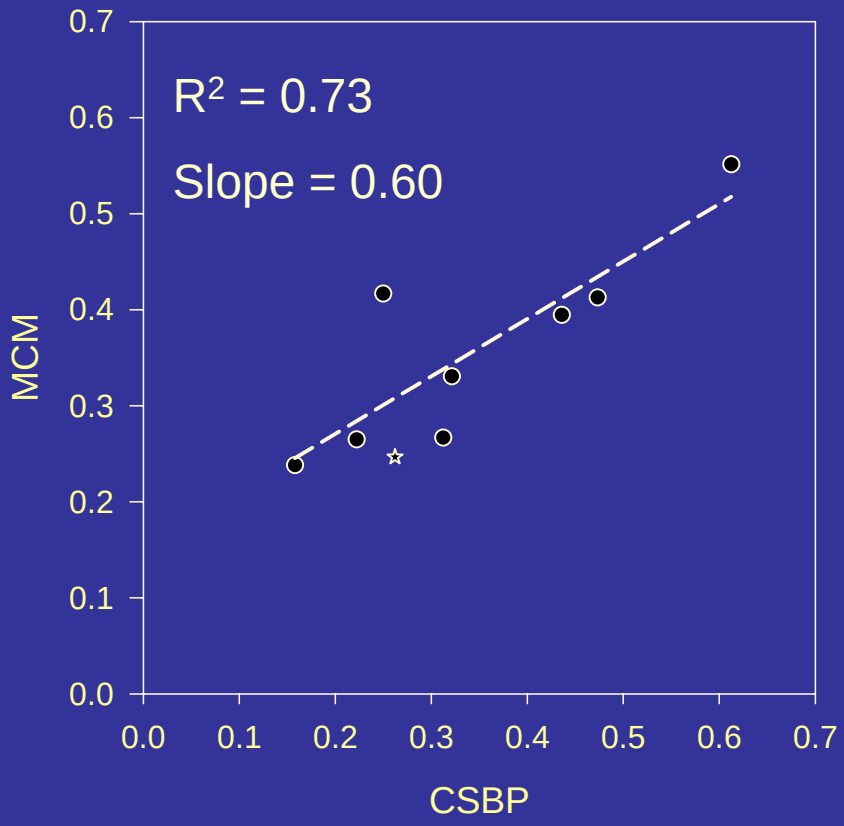


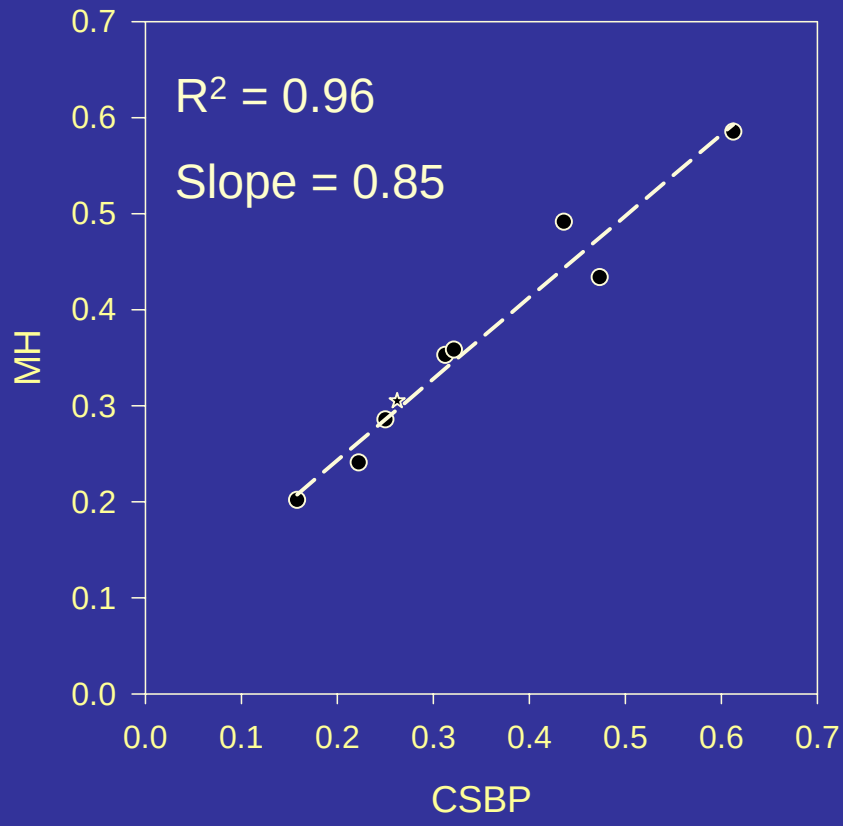




Better relationship between CSBP and MCM than CSBP and MH.

# Results

% Non-insect




Better relationship between CSBP and MH than CSBP and MCM.

# Results - Precision

## Comparisons among streams

Typical questions:

Are streams in San Diego of fair or better condition?

Are streams draining urban areas worse than streams draining open space?

Among-stream variability (SD of site averages):

| | |
|---|---|
| CSBP | 6.6 |
| MCM | 6.1 |
| MH | 4.2 |

MH << MCM < CSBP

# Results - Precision

## Comparisons within streams

Typical questions:

Is this site in better condition following restoration?

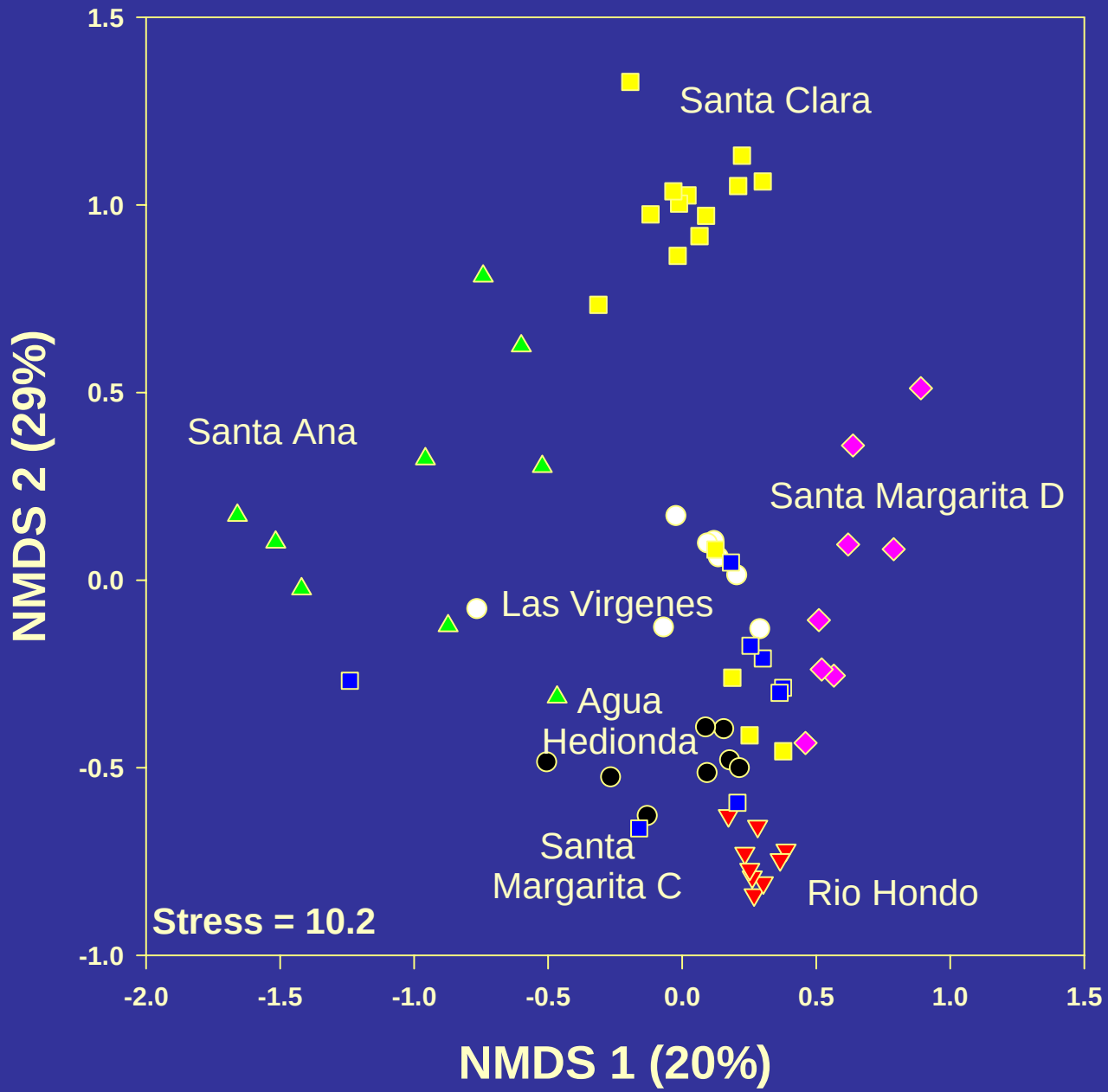
Is this site above a biocriterion threshold?

Within-stream variability (average within-site SD):

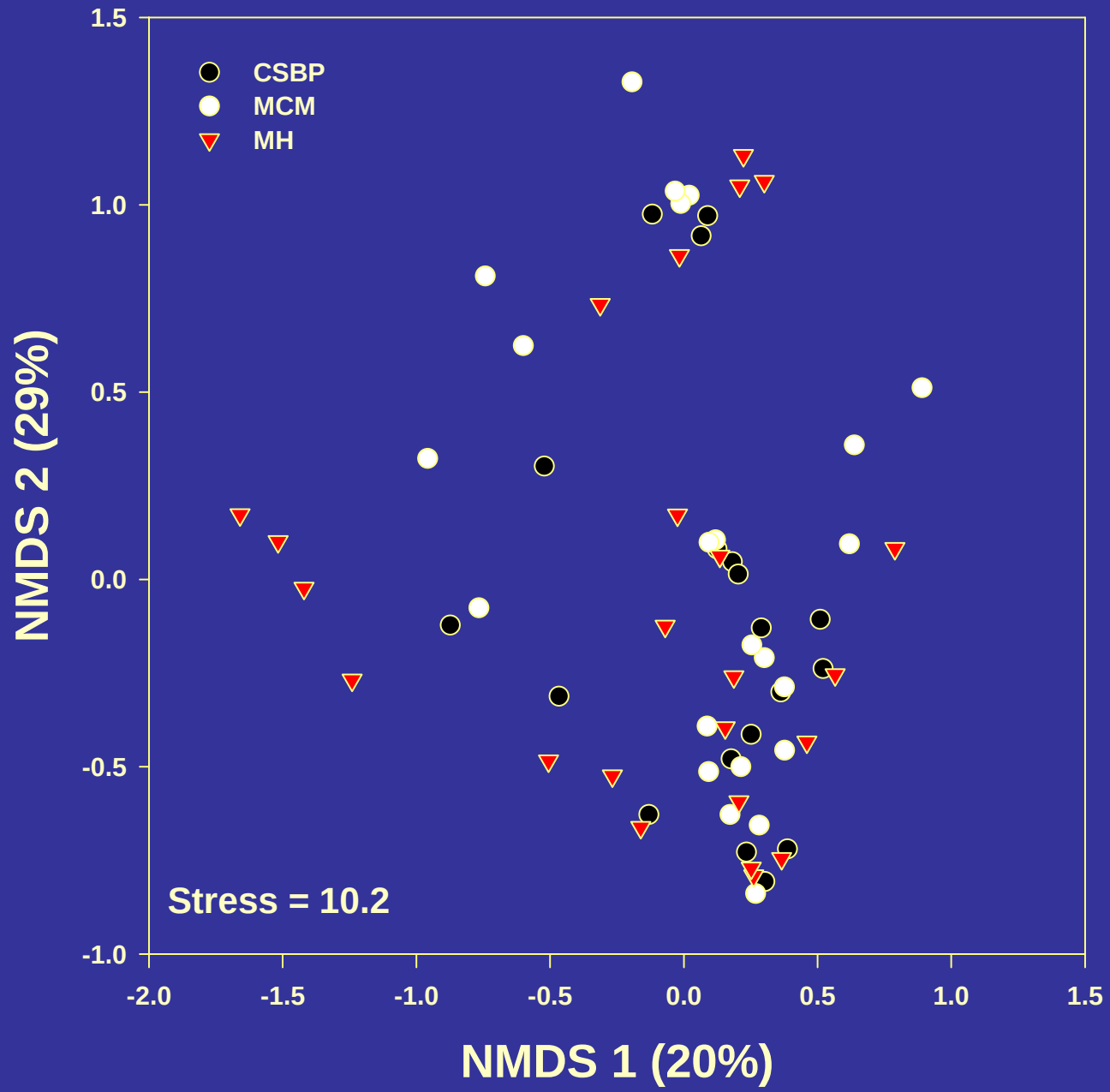
| | |
|---|---|
| CSBP | 3.8 |
| MCM | 3.9 |
| MH | 4.1 |

All methods more-or-less the same.

# Geography strongly influences community structure.



# But sampling method does not.



# Conclusions

**1. Does the So-Cal IBI function well in low-gradient streams?**

All streams are in poor condition.

True status of low-gradient streams?

What about “reference” streams?

# Conclusions

**2. Which sampling methods are the most precise?**

All methods similar for within-stream comparisons.

MH best for among-stream comparisons.

But: low power for most applications.

# Conclusions

**3. Do different sampling methods give similar results?**

Geography, not sampling method, has the strongest influence on community structure and IBI scores.

Correlations between methods are good.

# Conclusions

Next steps:

“Better” reference sites (Central Coast).

Test other assessment techniques (e.g., RIVPACS).

Examine physical habitat data. What drives between-site differences?

# End