

Expanded Pilot Study

April 2012

Why A Pilot Study?

- Play out application of biological objectives on a smaller scale before going statewide
- Identify the biggest challenges
- Use as leverage for technical development
 - Policy development

Up Till Now

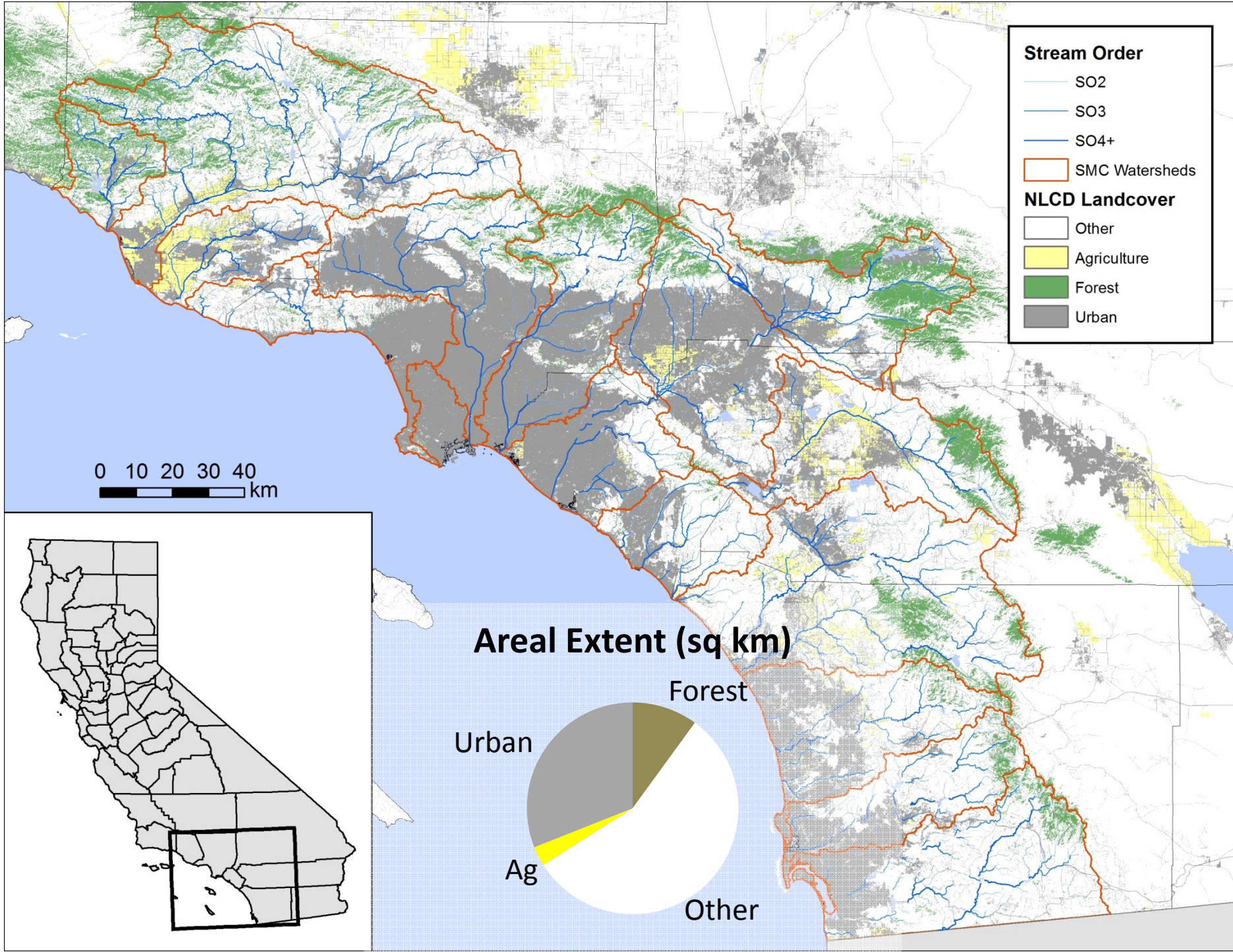
- Demonstrated a pilot in the Ventura River watershed at your last meeting
- Provided some excellent insight
 - Assessment tool selection
 - Threshold development
 - Dealing with uncertainty
- The Science Panel recommended we expand the pilot as we address the new challenges
 - All of southern California

What You'll See Today

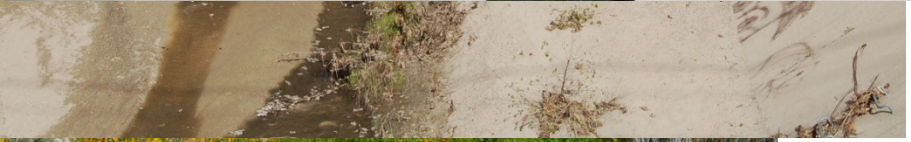
- Description of expanded study area
 - Data inventory
- New assessment tool threshold application
- Dealing with uncertainty
- Regulatory applications
 - Exception classes
 - Antidegradation concepts

So Cal Is A Dynamic Place

- More than 2,300 km of stream miles (NHDPlus)
 - 86% are non-perennial
- Elevation ranges from 0 to >3,700 m (11,500 ft)
 - Annual mean precipitation < 30 cm to >107 cm (41 in)
- Extremes of open lands and urban land uses
 - Agriculture less prominent than other parts of the state

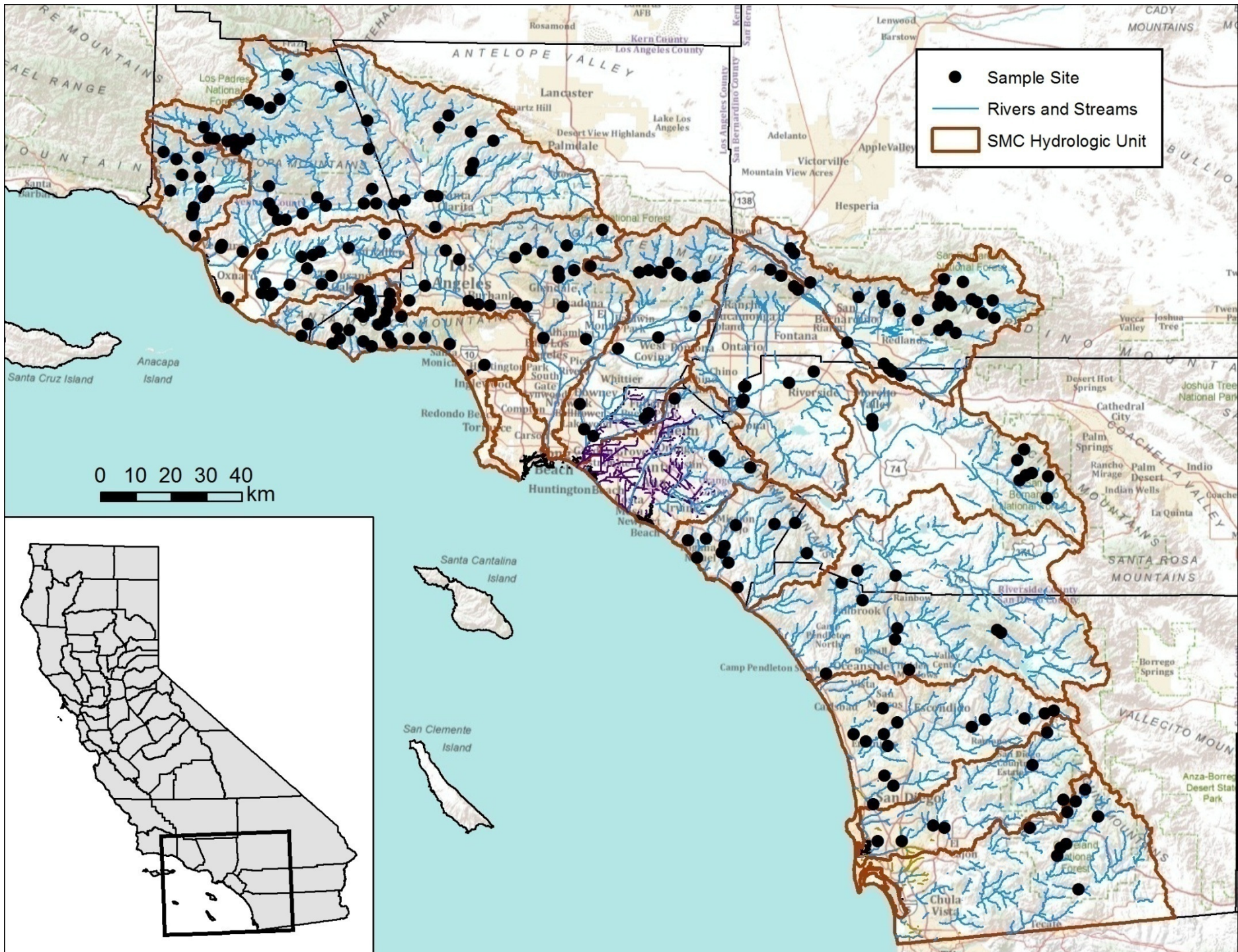






Data Inventory

- Selected multiple probabilistic surveys
 - EMAP, WEMAP, CMAP, PSA, SMC
- 243 unique sites
 - 75 sites with multiple samples
- Spans a decade (2000-2009)
 - Some very wet and very dry years



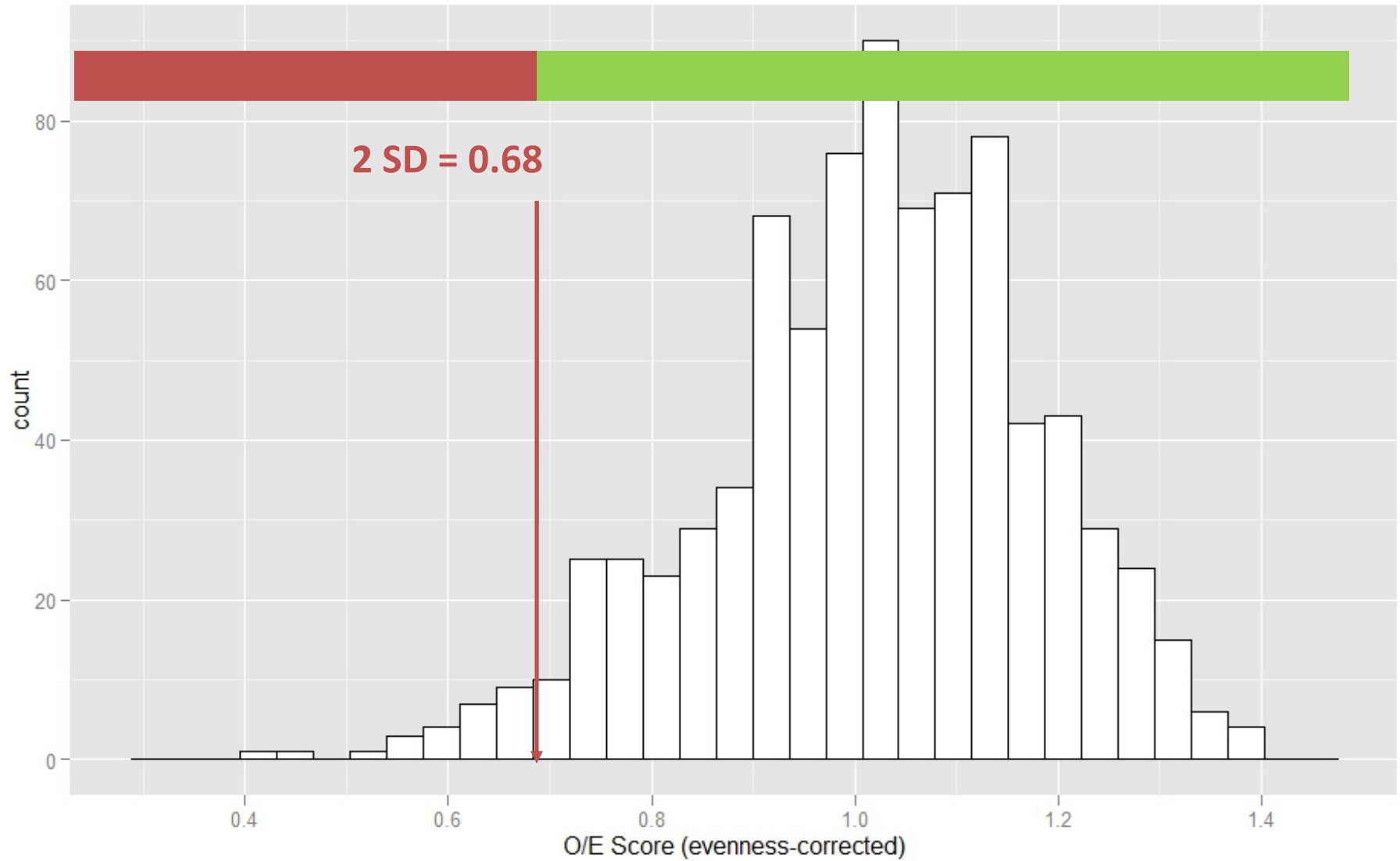
Application of the New Assessment Tool

- Used our preferred assessment tool in this application
 - O/E with evenness correction
- Probability based design enables unbiased extrapolation to extent
 - stream kilometers
- Extent questions work best with thresholds
 - Binary answer of “above or below”, “good or bad”, “reference or non-reference”, etc.

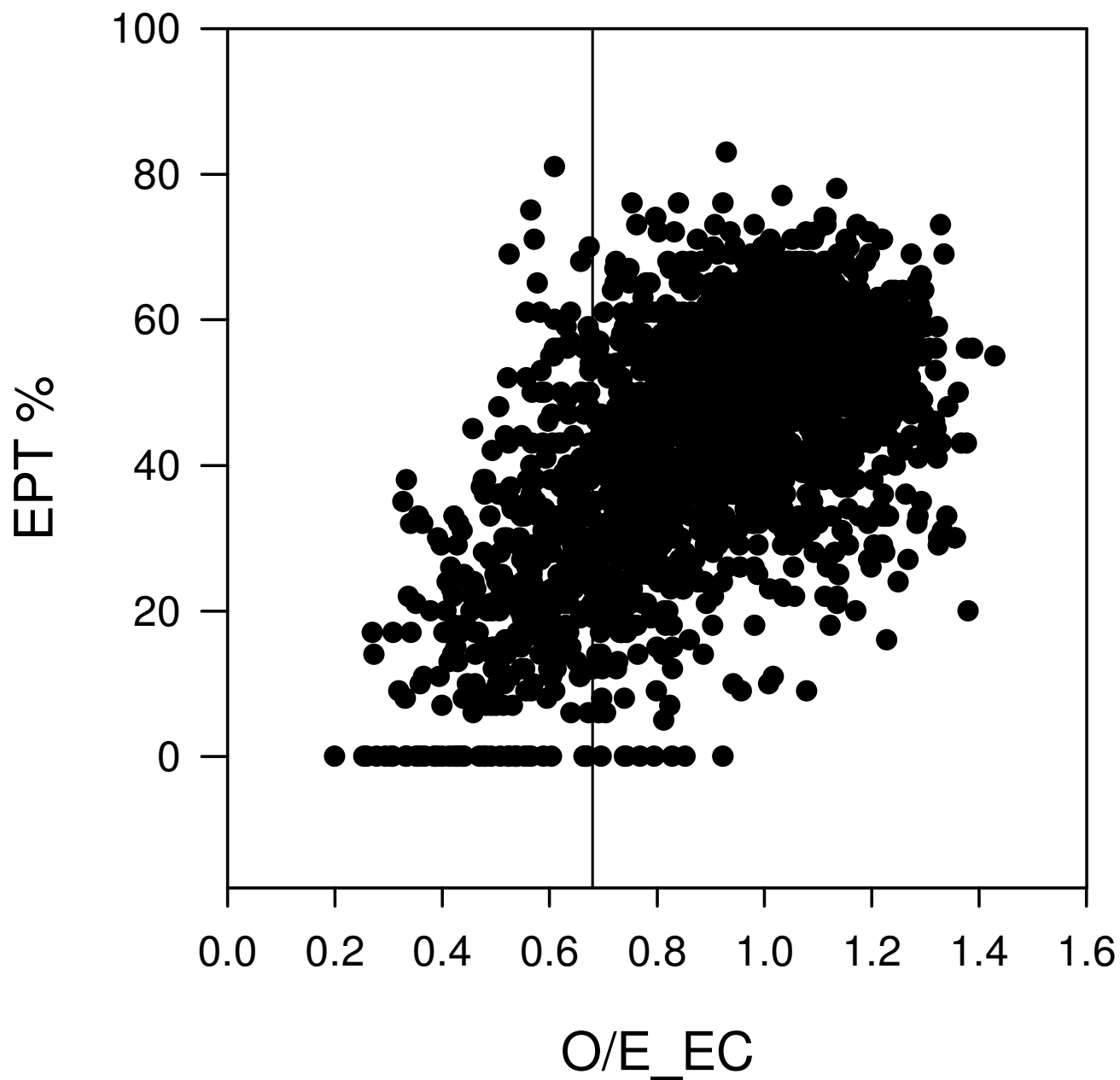
Picking An Assessment Threshold

- We discussed options at our last meeting of the Science Panel
 - Empirically derived population based estimator
 - Modeled using stressor response relationships
 - Ecosystem function based using species traits/metrics
- Panel recommended the population based estimator
 - As a function of reference site distributions
- Standard practice in the literature is 2 standard deviations
 - Approximates 95% of the reference population

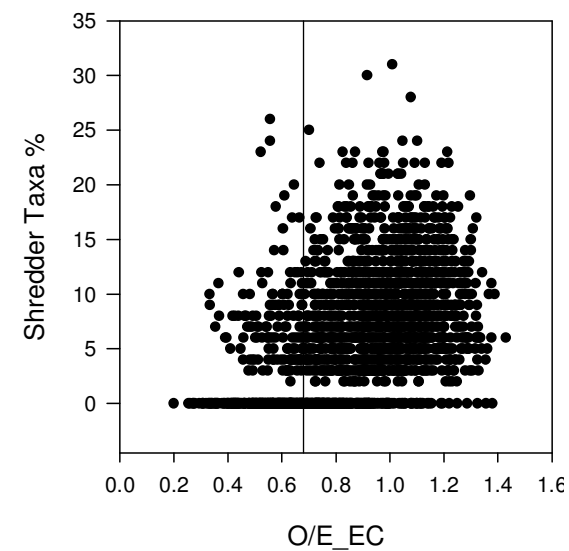
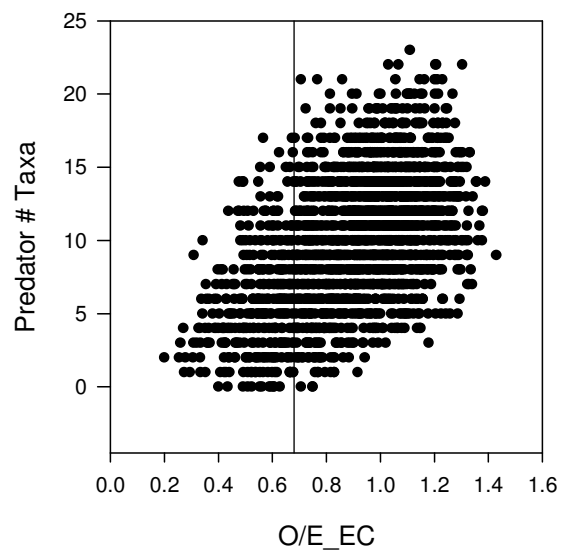
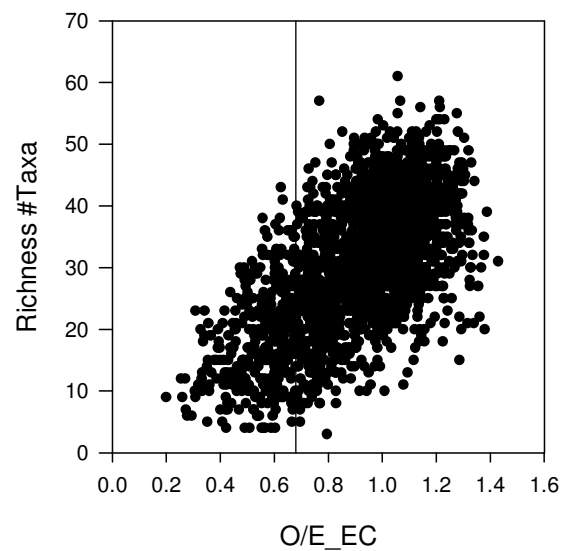
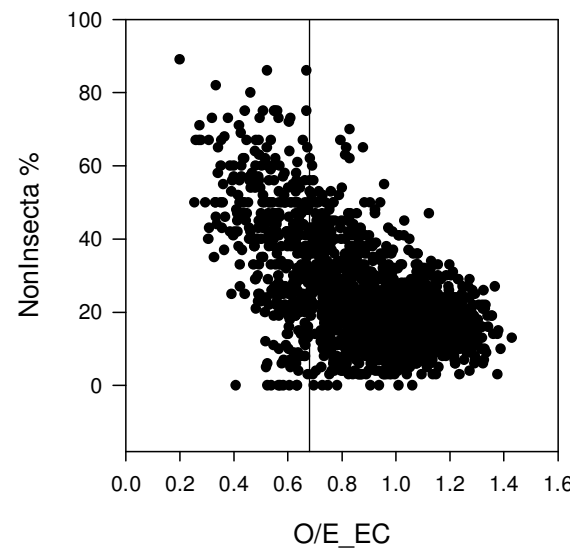
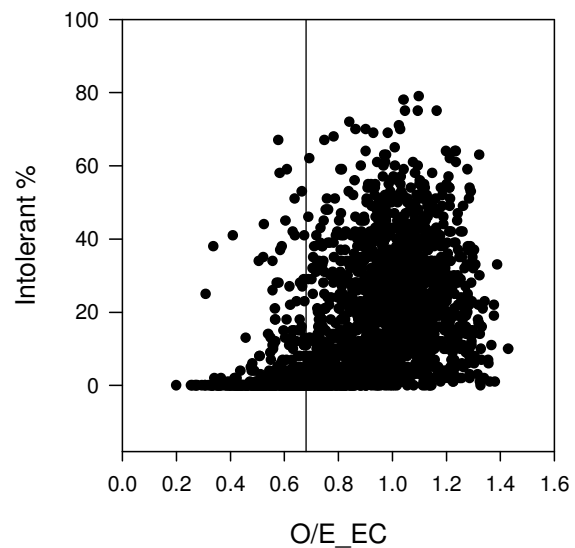
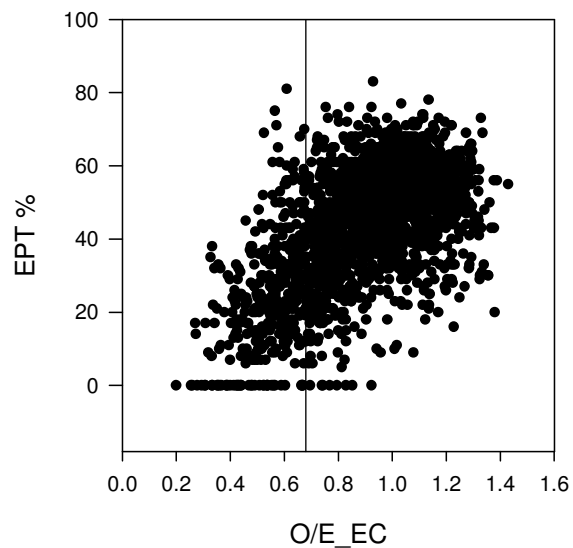
O/E Reference Site Distribution

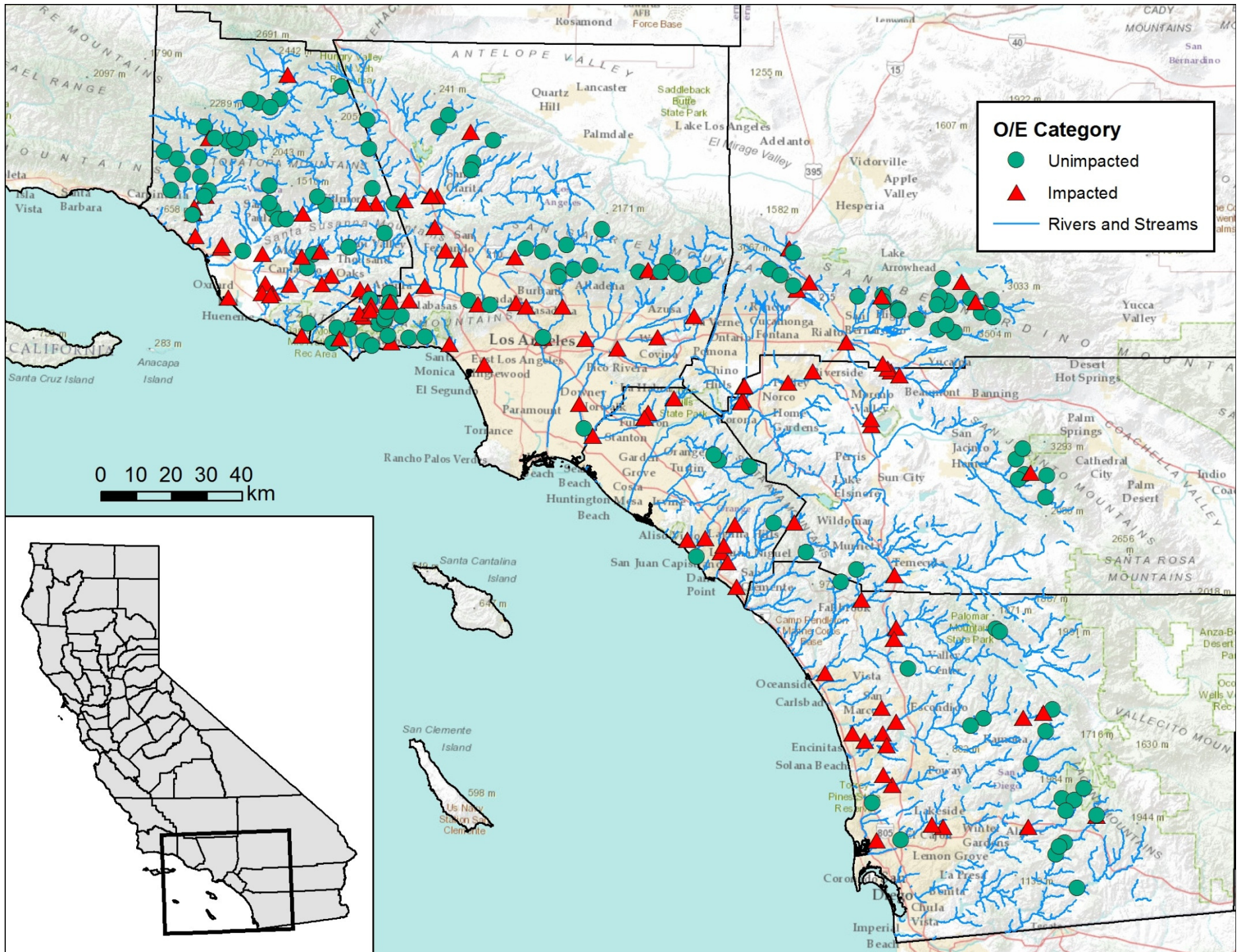


- Does O/E mimic ecosystem attributes?
 - Statewide data
 - Examine biological metrics
 - Evaluate gradients associated with proposed threshold



Statewide Sampling



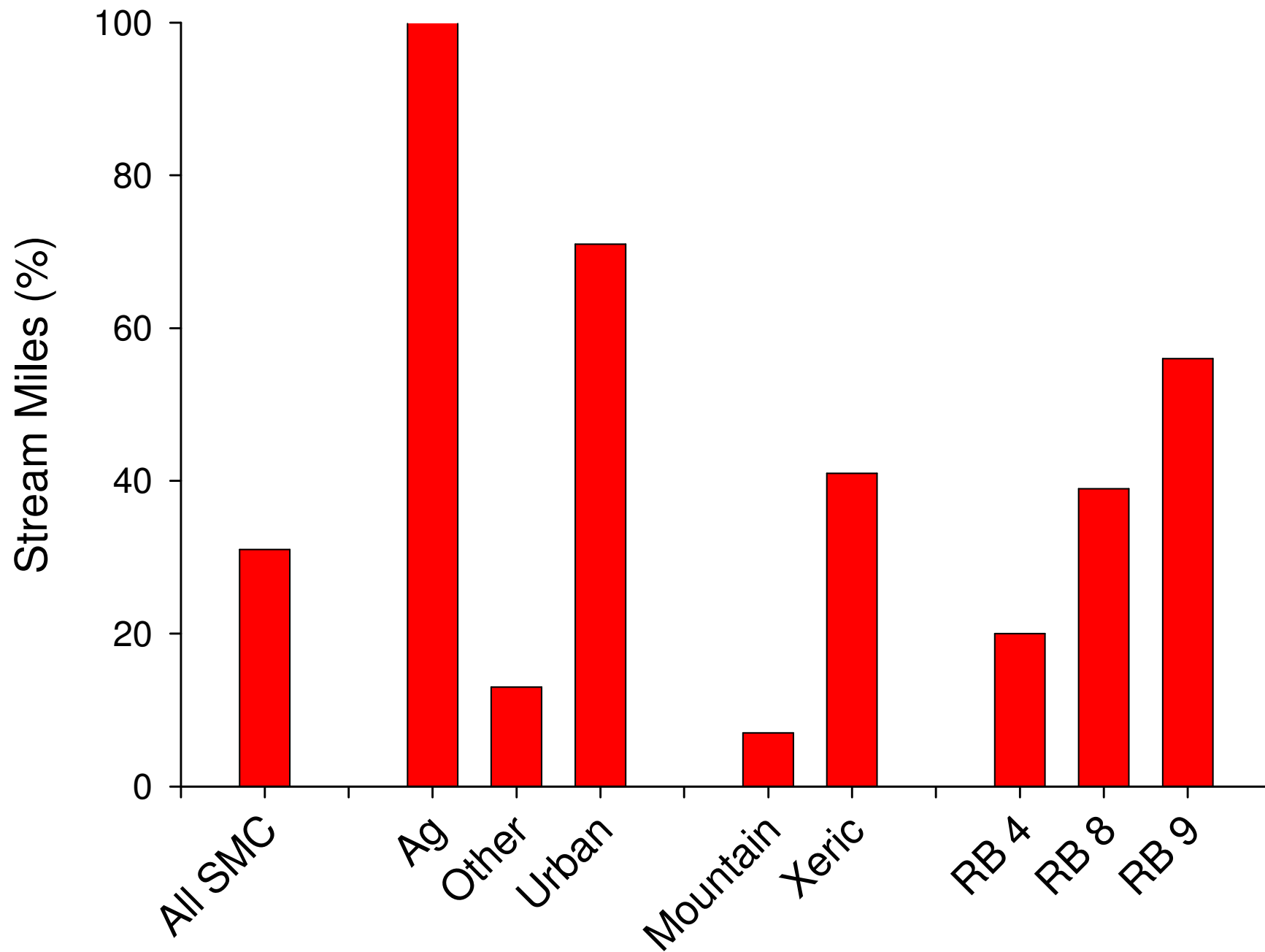


Southern California Stream Inventory

(Based on Probability Site Sampling)

| Stratum | Length (Est. km) | Sample Size (N) | Relative Extent (% of Total) |
|-----------------|---------------------|--------------------|---------------------------------|
| All Streams | 2,228 | 243 | 100 |
| Habitat | | | |
| Mountain | 699 | 86 | 31 |
| Xeric | 1,530 | 157 | 69 |
| Land Use | | | |
| Agriculture | 43 | 6 | 2 |
| Forest/Open | 1,573 | 182 | 71 |
| Urban | 612 | 55 | 27 |
| RWQCB | | | |
| Los Angeles (4) | 1,475 | 136 | 66 |
| Santa Ana (8) | 200 | 54 | 9 |
| San Diego (9) | 553 | 53 | 25 |

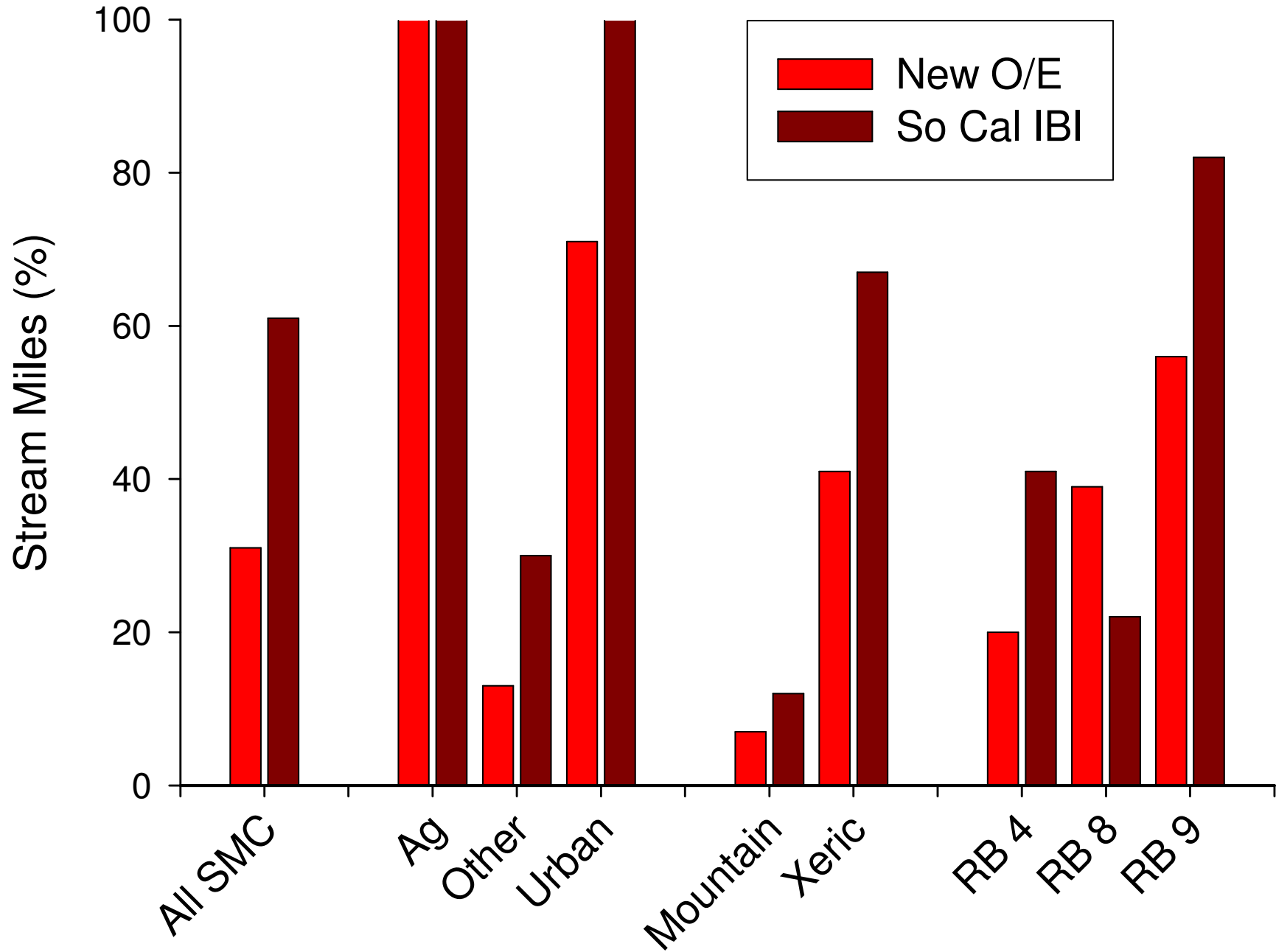
Stream Miles With O/E < 0.68



How Does this Compare To Previous Expectations?

- So Cal Index of Biotic Integrity used in the last pilot
- So Cal IBI used for permits and 303d listing decisions recently
- Estimated stream mile extent based new O/E and So Cal IBI

Impacted Stream Miles With O/E vs. IBI



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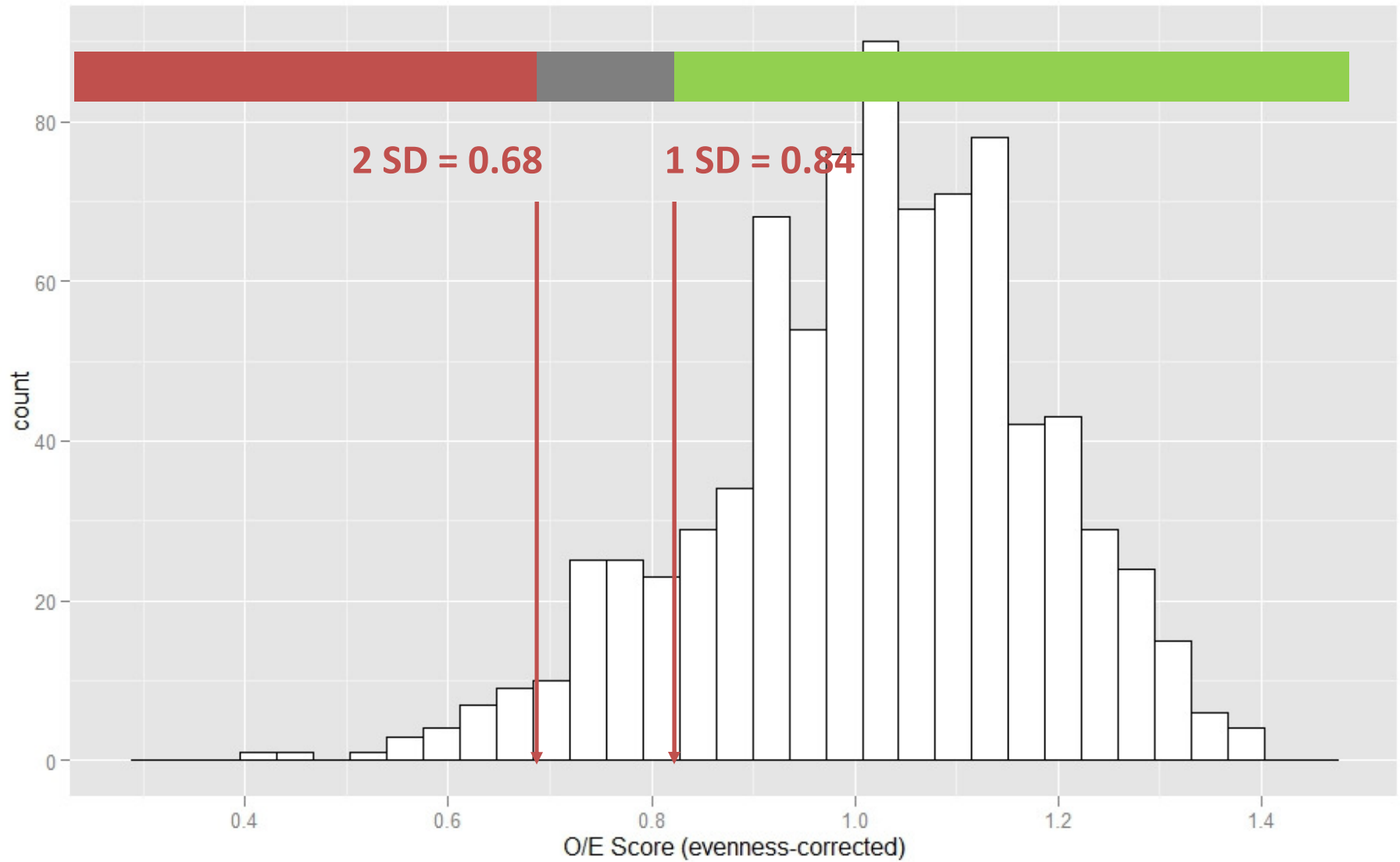
Addressing Uncertainty

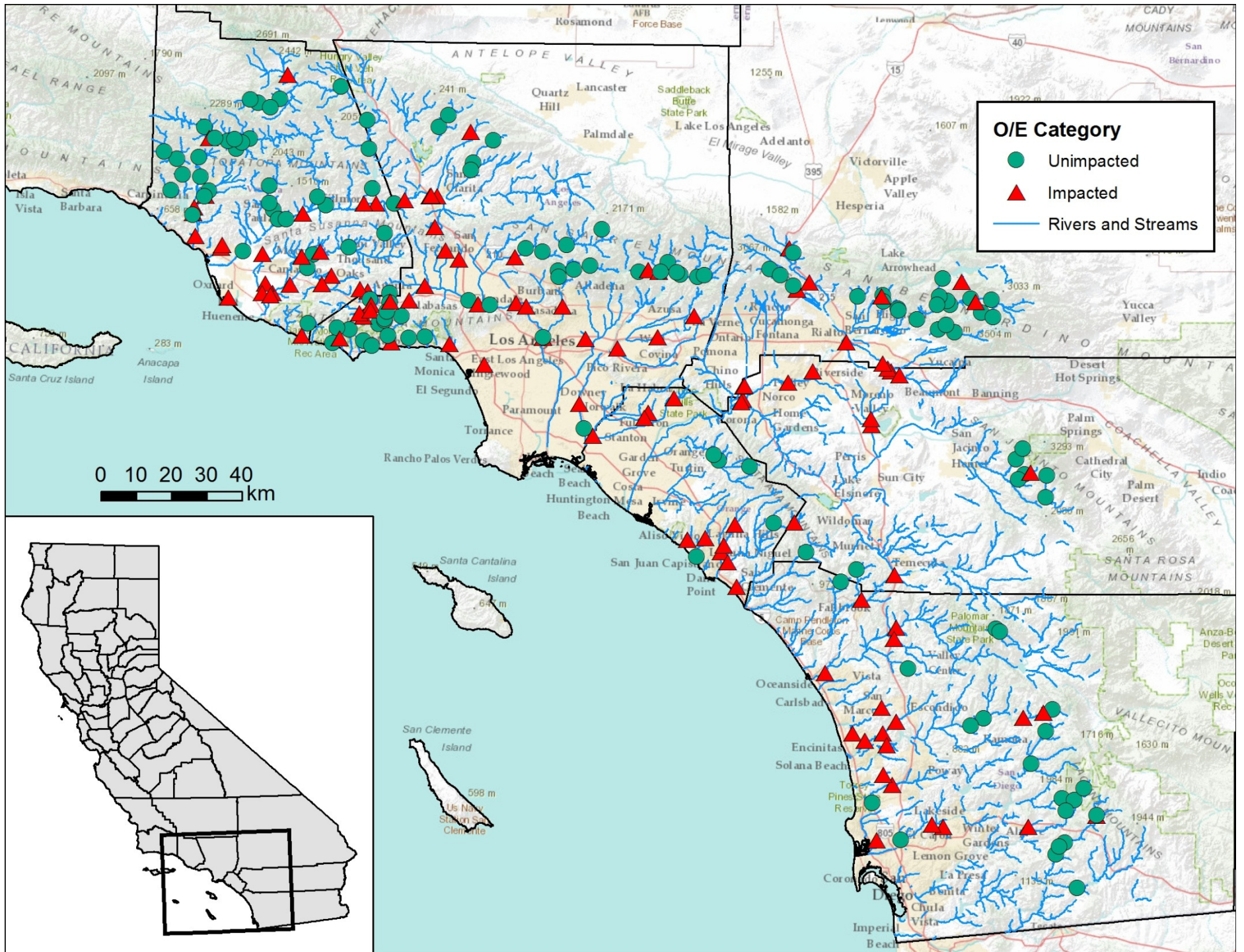
- We discussed sources of uncertainty at our last Science Advisory Panel meeting
 - Spatial, temporal, methodological
- Option 1: Incorporate uncertainty into your threshold
 - Use multiple thresholds
- Option 2: Reduce uncertainty into your site assessment
 - Collect more samples

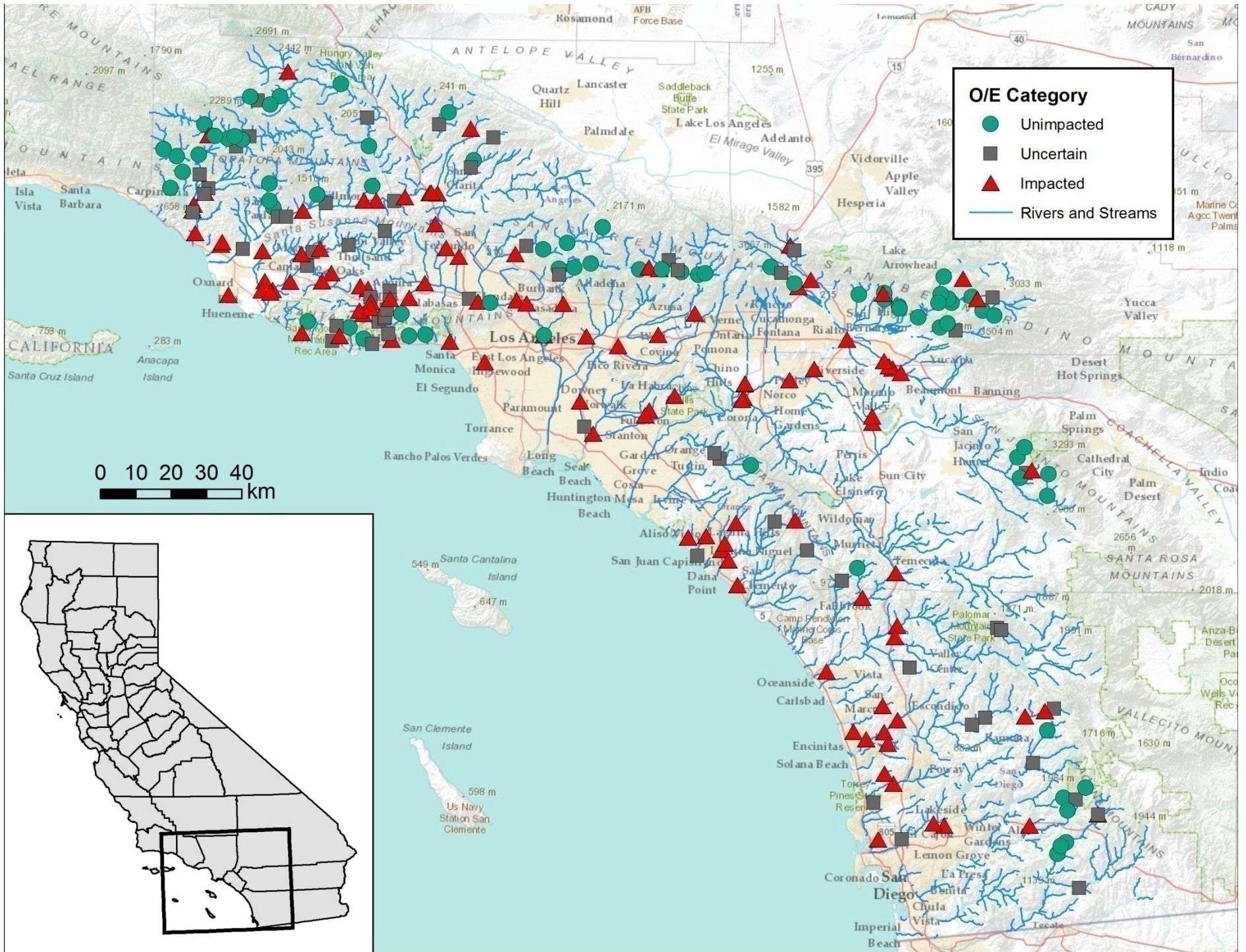
Panel Recommended A Hybrid

- Specifically concerned about Type I and Type II errors
 - Type I: Declared Impaired, but Not Impaired
 - Type II: Declared Not Impaired, but Impaired
- Utilize a three-step process
 - Step 1: set threshold that balance types of error
 - Step 2: add uncertainty bounds to define zones of clearly impaired, clearly unimpaired, and grey zone
 - Step 3: Follow up with additional study in grey zone (re-sample, streamlined causal assessment) to make determination of impairment/non-impairment

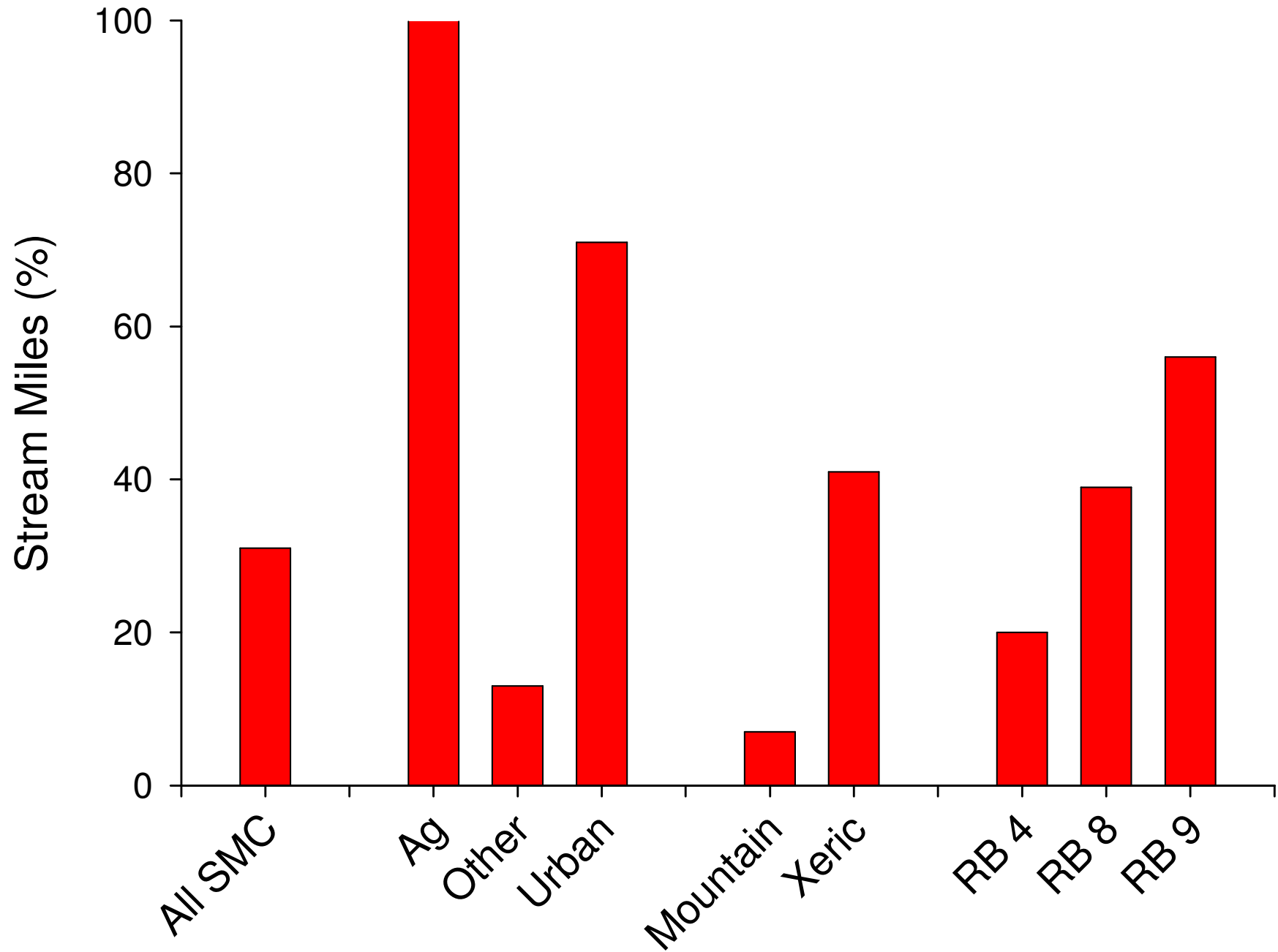
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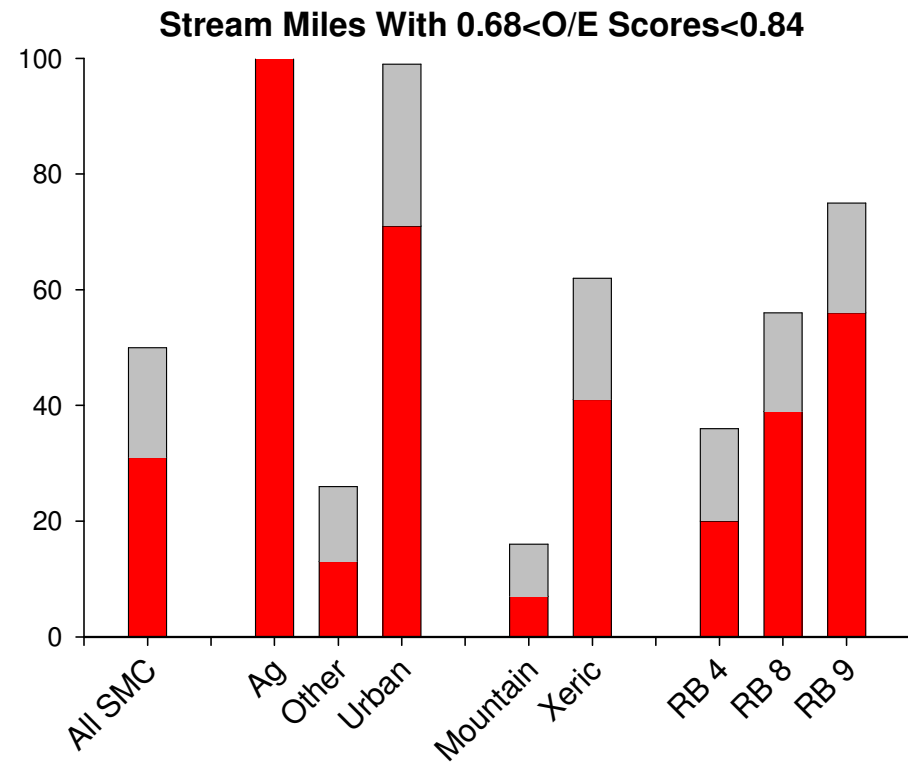
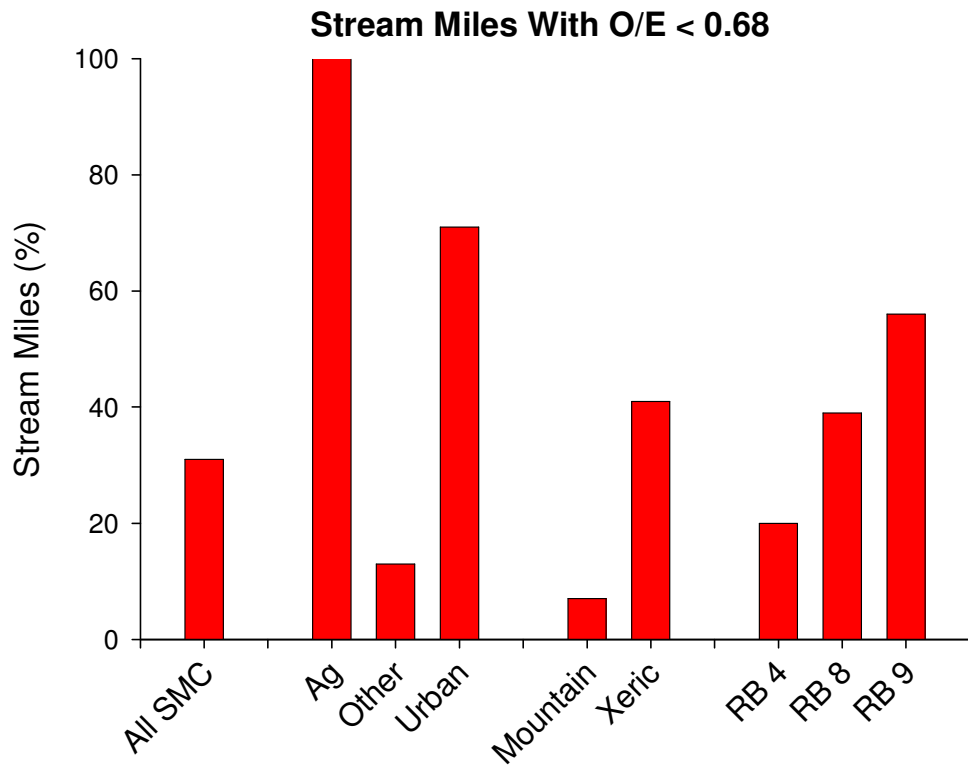


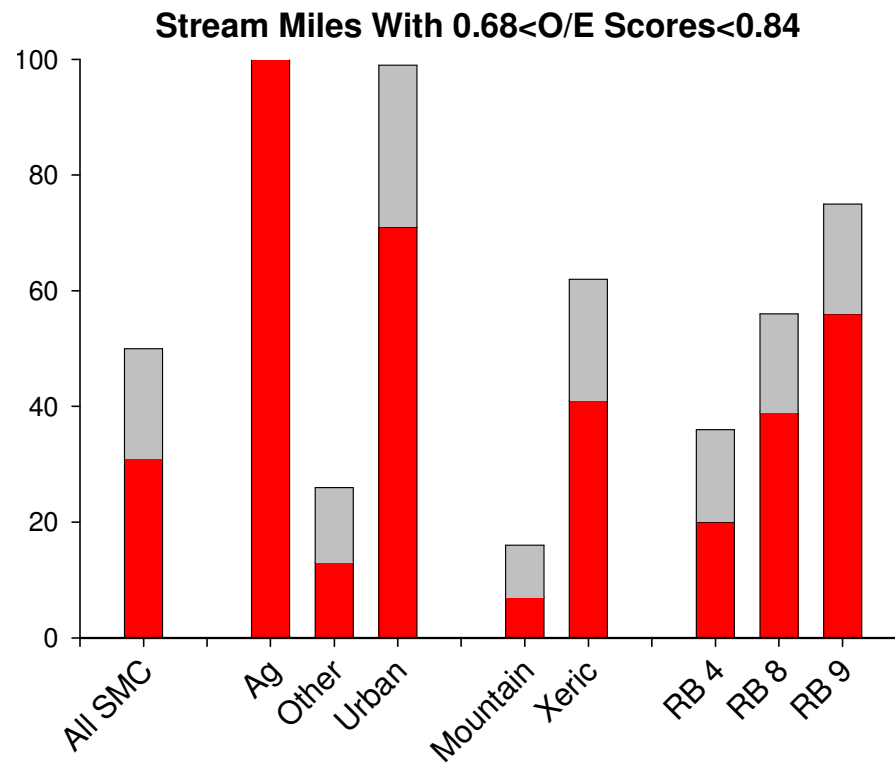
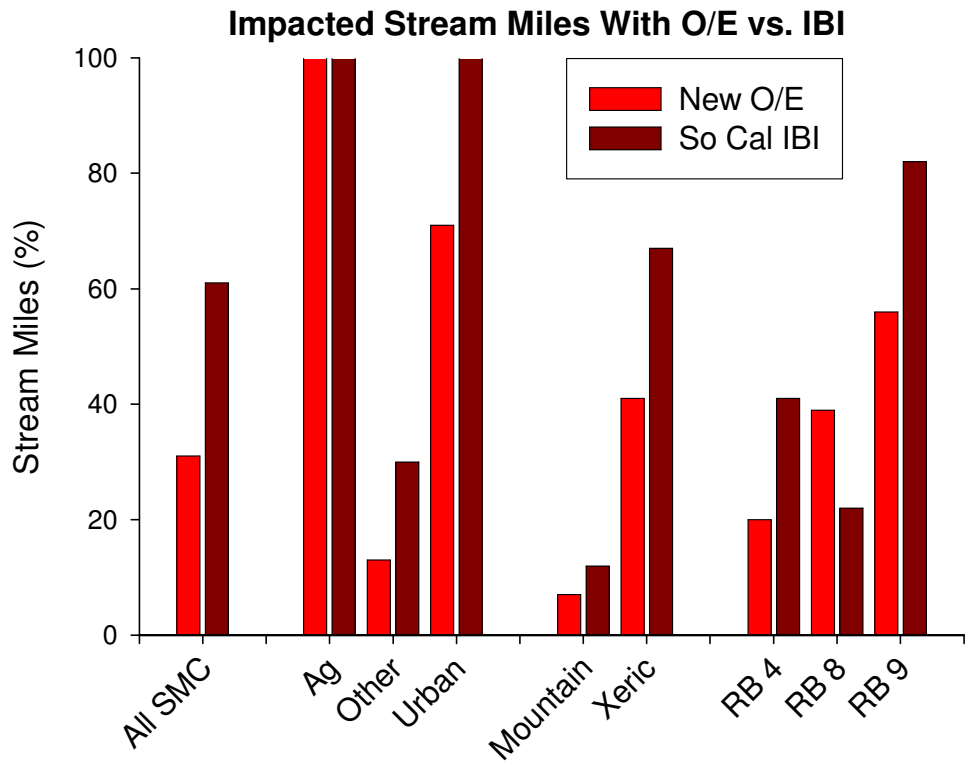




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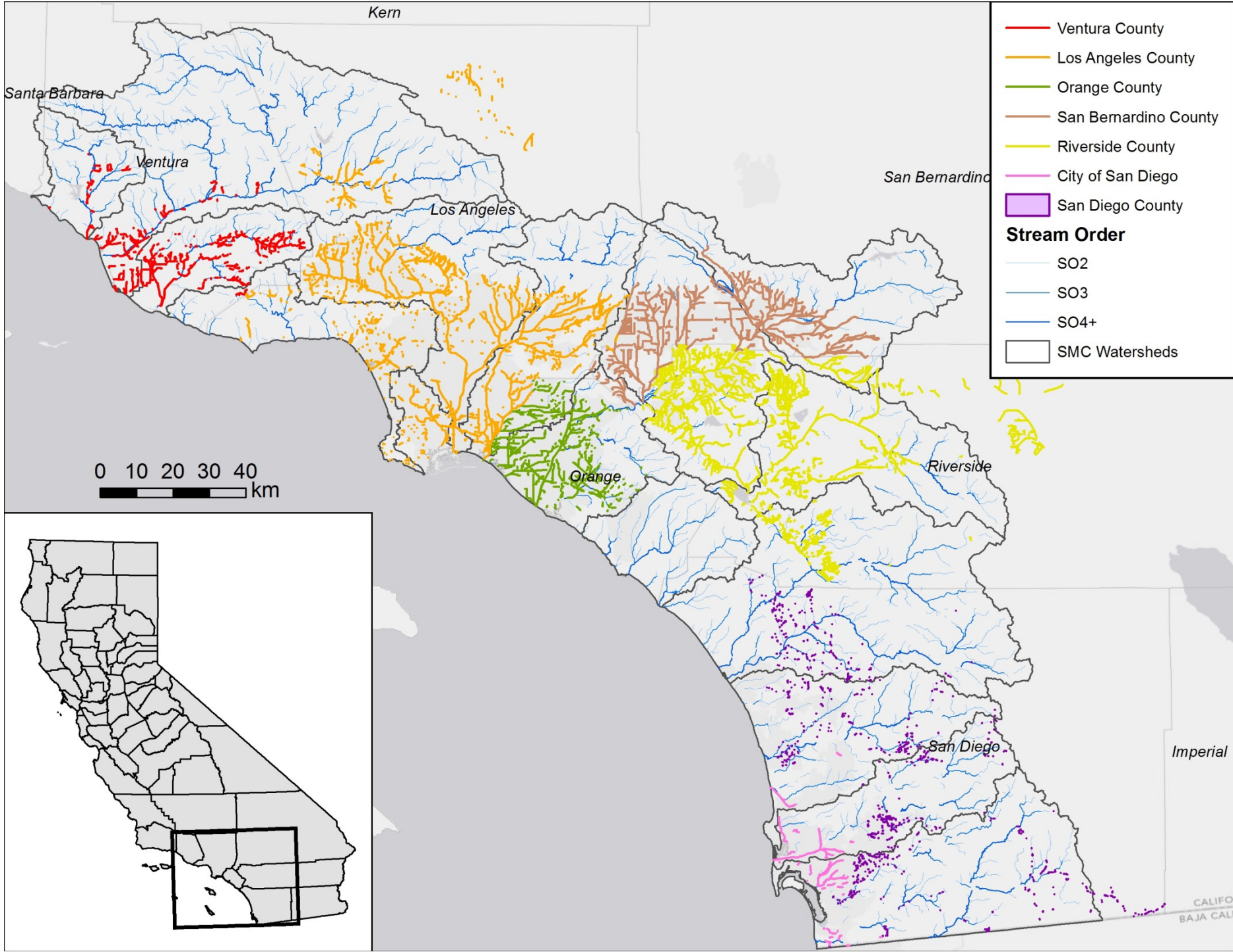
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Setting Biological Expectations for Modified Channels

- What to do with sites that we think cannot attain reference condition?
- We've discussed several options previously
 - Avoid them
 - use a reference threshold and set a long timeline
 - Set a different [lower] expectation
- Came down to an assessment of extent
 - Makes a difference how widespread the exception class would be

Options You Selected For Identifying Exception Stream Classes

- Constructed Channel
- Maintained Channel
- Physical Habitat Score
- Landscape Development Score
- Invasive Species
- Effluent Dominated



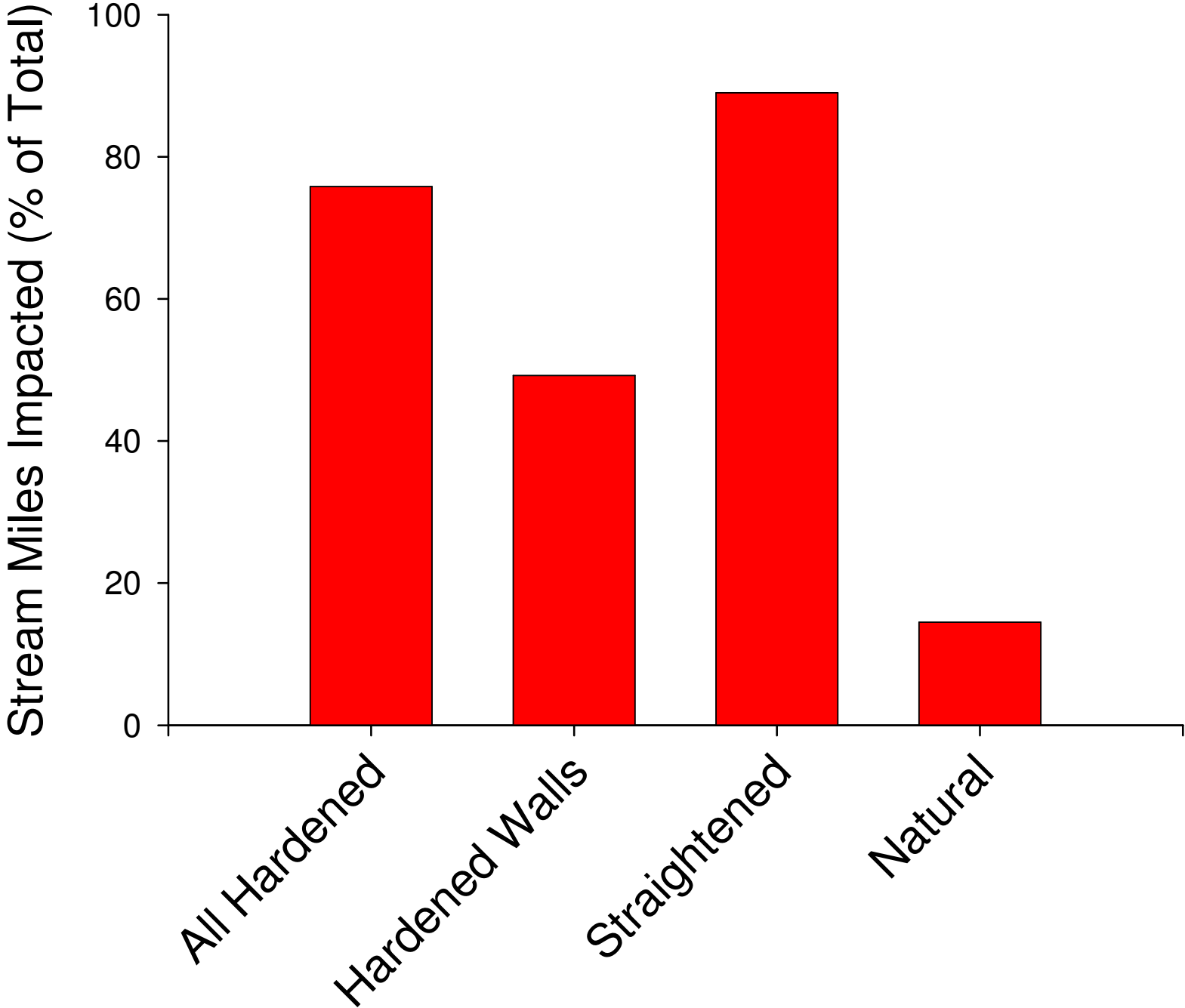
County Flood Control Data Inventories

| | Channel Name | Material Of Construction | Shape | Dimensions | Maintenance |
|-----------------------|--------------|--------------------------|-------|------------|-------------|
| Ventura County | X | | | | |
| Los Angeles County | X | X | X | X | |
| Orange County | X | X | X | | |
| San Bernardino County | X | X | | | |
| Riverside County | X | X | | | |
| San Diego County | X | X | X | X | X |
| City of San Diego | | | | | |

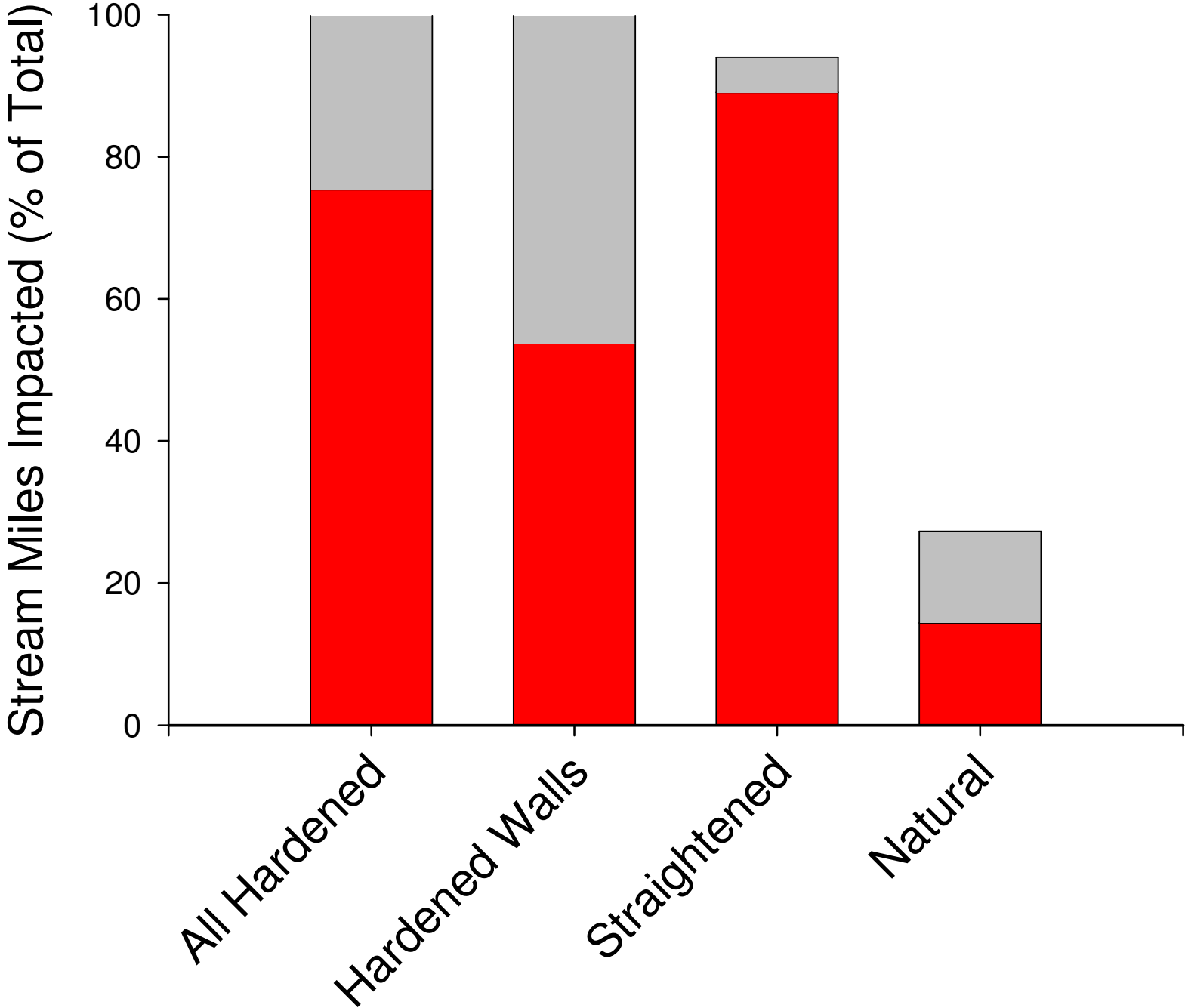
Hardened Channel Inventory Based on Probability Sites

| Hardscape Classification | All Stream | SMC Mountain | SMC Xeric |
|---------------------------------|-------------------|---------------------|------------------|
| Concrete Walls and Bottom | 5% | 0% | 7% |
| Concrete Walls, Soft Bottom | 5% | 0% | 7% |
| Unlined, But Straightened | 14% | 1% | 20% |
| Natural Watercourse | 77% | 99% | 66% |

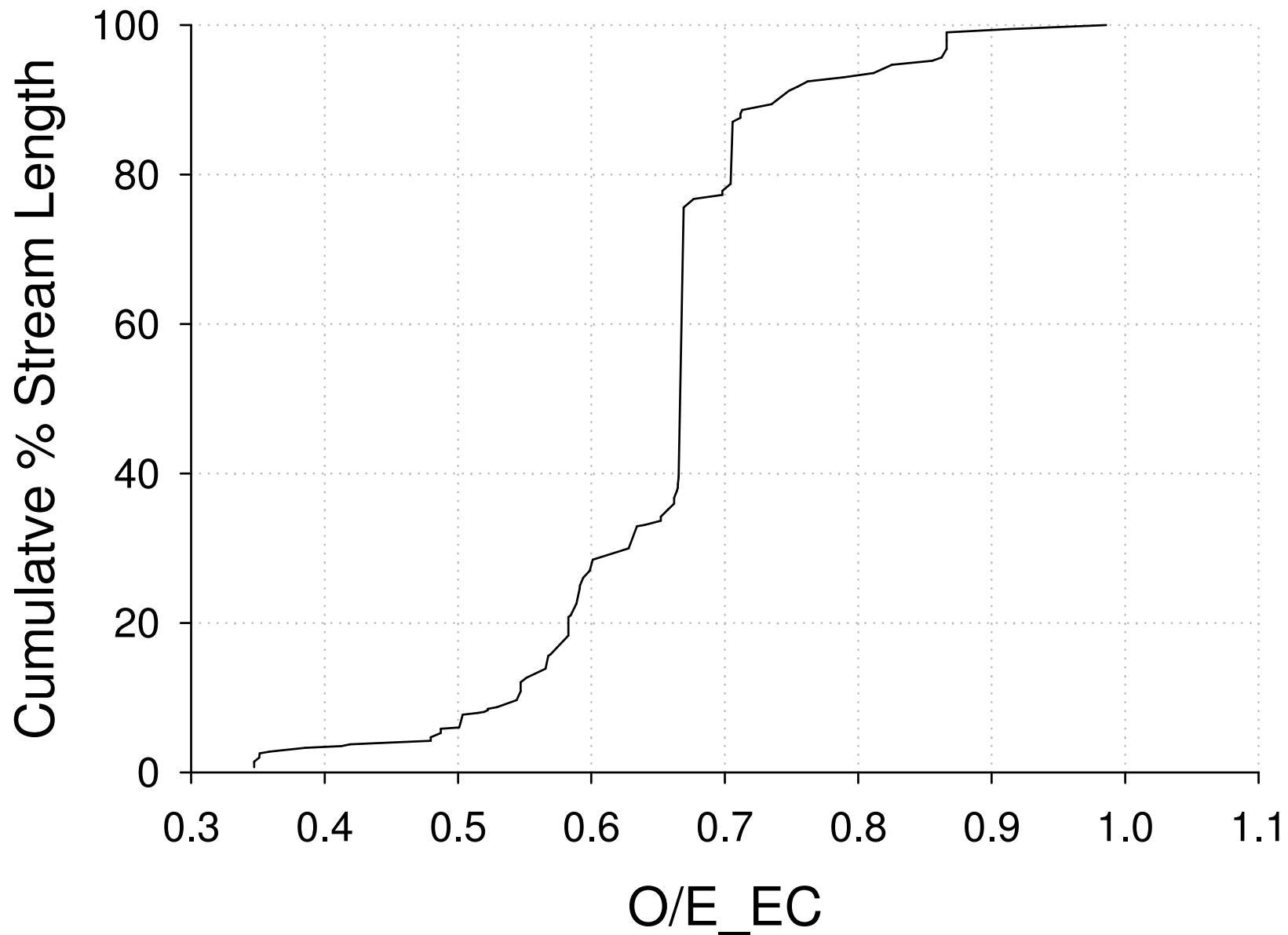
ALL SMC



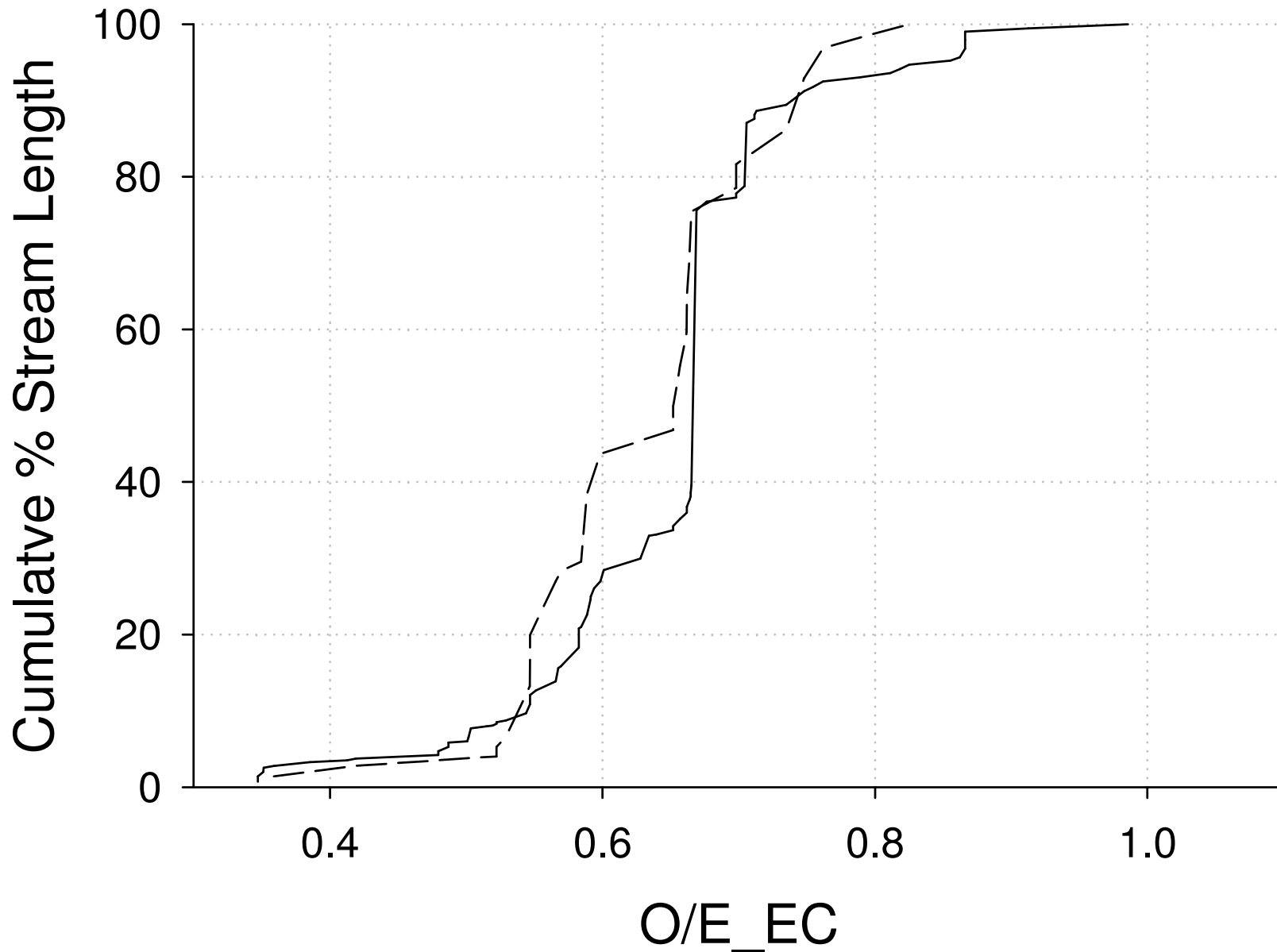
ALL SMC



All Modified Channels



Concrete-Lined vs. All Modified Channels



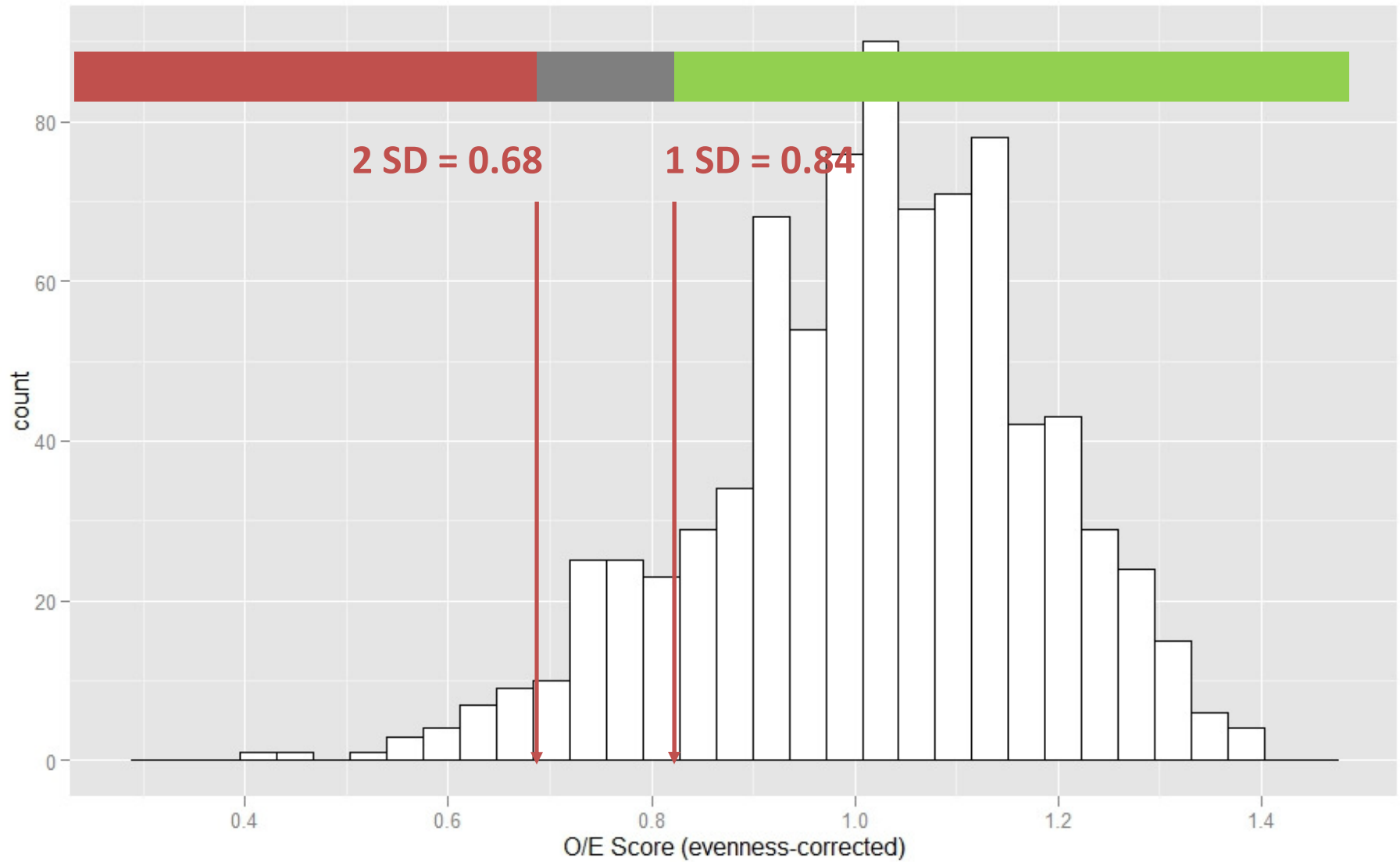
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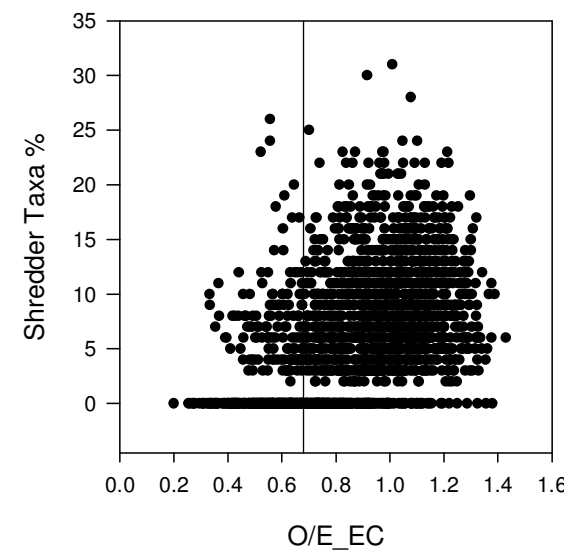
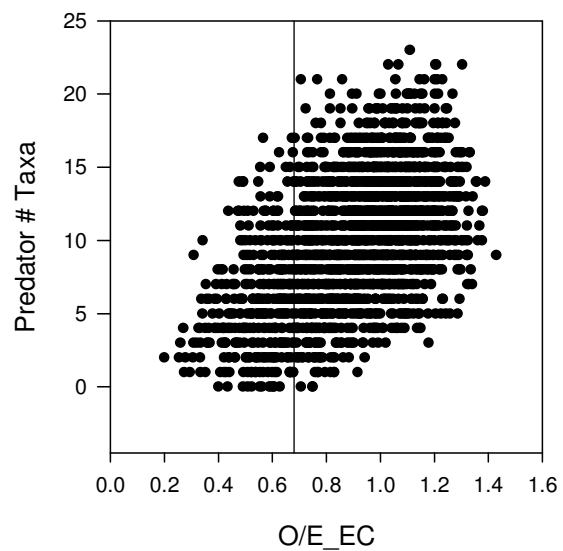
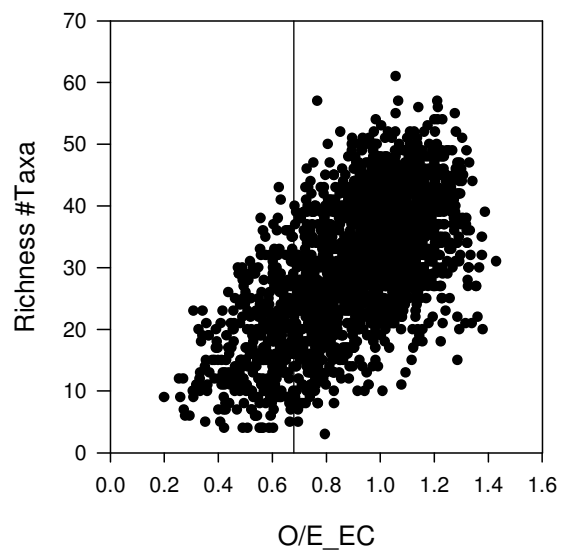
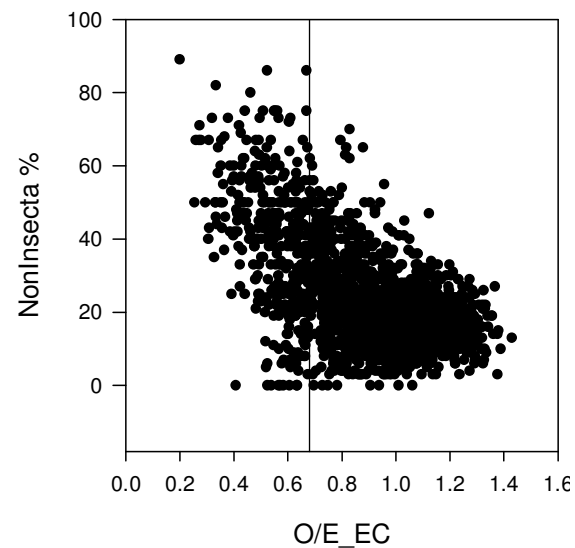
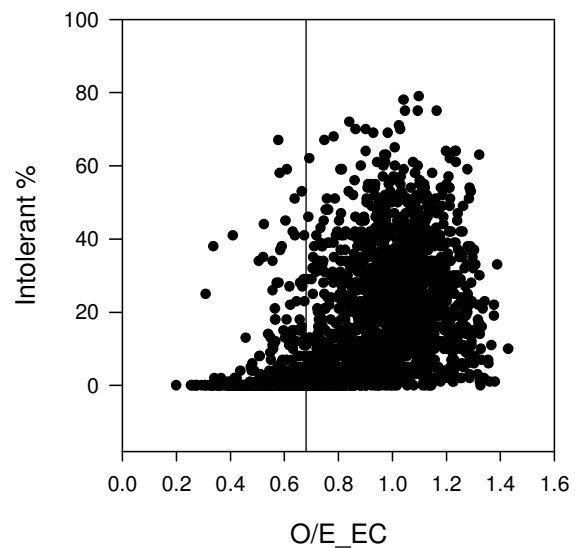
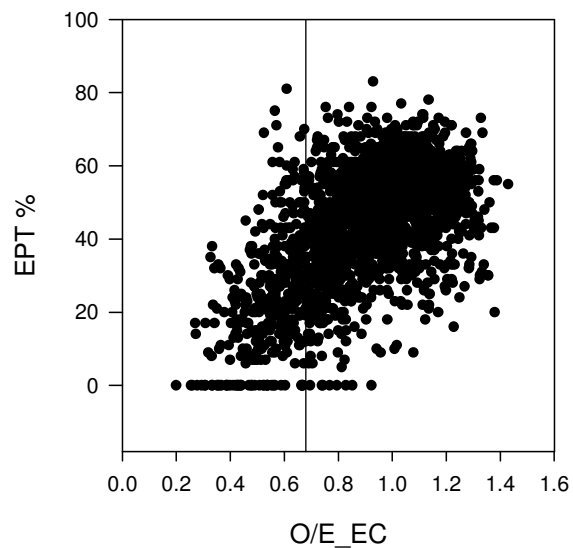
Antidegradation Technical Approaches

- Two basic approaches available
- Use multiple thresholds to create zones
- Some estimate of variability
 - Method variability
 - Intra-annual variability
 - Inter-annual variability
 - Combination

O/E Reference Site Distribution



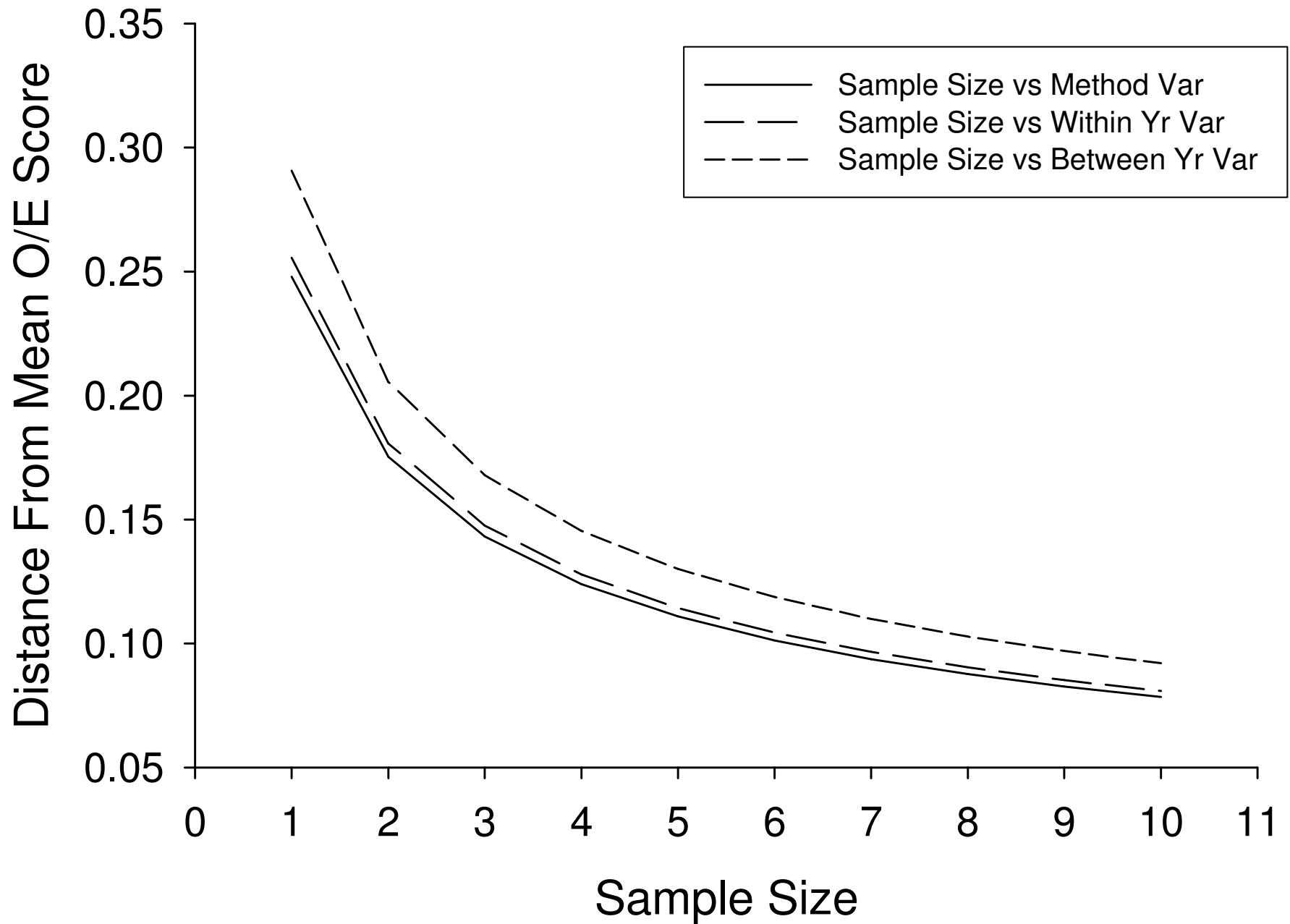
Statewide Sampling



Setting Bounds Based on Confidence

| Type of Variance | Description | Supporting Data | Variance Estimate (O/E Units) |
|------------------|---|----------------------|-------------------------------|
| Sampling Method | Samples collected on the same day at same site | 16 sites, 32 samples | 0.016 |
| Intra-annual | Samples collected at same site, but on different days of same season and year | 6 sites, 24 samples | 0.017 |
| Inter-Annual | Samples collected at same site, but in same season of different years | 18 sites, 69 samples | 0.022 |

Size Of Confidence Interval



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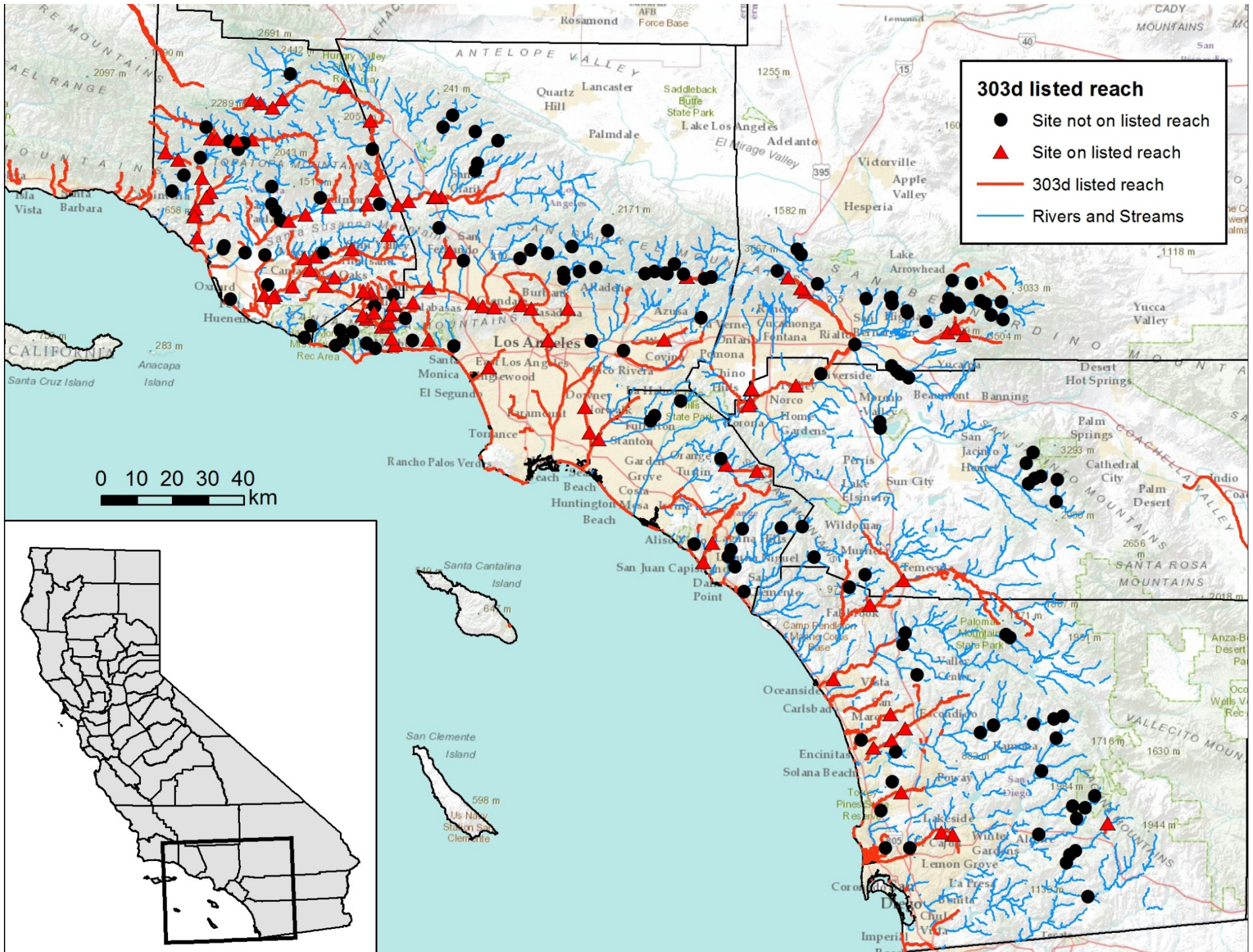
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 - Comparison with 303d listing
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303d Listings in Southern California

- Approximately 32% of stream miles in So Cal are on the 303d list (2006)
- 316 pollutant-waterbody combinations
 - Over a dozen pollutant categories
- Current policy will not list on benthic community effects alone
 - Requires a chemical pollutant co-listing

| POLLUTANT | NUMBER OF STREAMS | ESTIMATED SIZE (stream miles) |
|----------------------|-------------------|-------------------------------|
| Hydromodification | 6 | 70 |
| Metals/Metalloids | 37 | 358 |
| Miscellaneous | 12 | 256 |
| Nuisance* | 4 | 47 |
| Nutrients | 50 | 613 |
| Other Inorganics | 13 | 133 |
| Other Organics | 10 | 70 |
| Pathogens* | 40 | 399 |
| Pesticides | 59 | 505 |
| Salinity | 43 | 698 |
| Sediment | 15 | 124 |
| Toxicity | 14 | 174 |
| Trash* | 13 | 108 |
| Any Pollutant | 57 | 759 |



303d listed reach

- Site not on listed reach
- ▲ Site on listed reach
- 303d listed reach
- Rivers and Streams

0 10 20 30 40 km



Comparing 303d Listings To Biology

- Relationship between existing listings and our assessments of biology on the same reaches?
- Does the relationship improve with specific pollutants?

Percent of So Cal Stream Miles

Contingency Table: Biology vs. Any 303d Listing

| | Listed | Not Listed |
|-----------------------------|--------|------------|
| Biology Does Not Score Well | 16 | 38 |
| Biology Score Well | 16 | 30 |

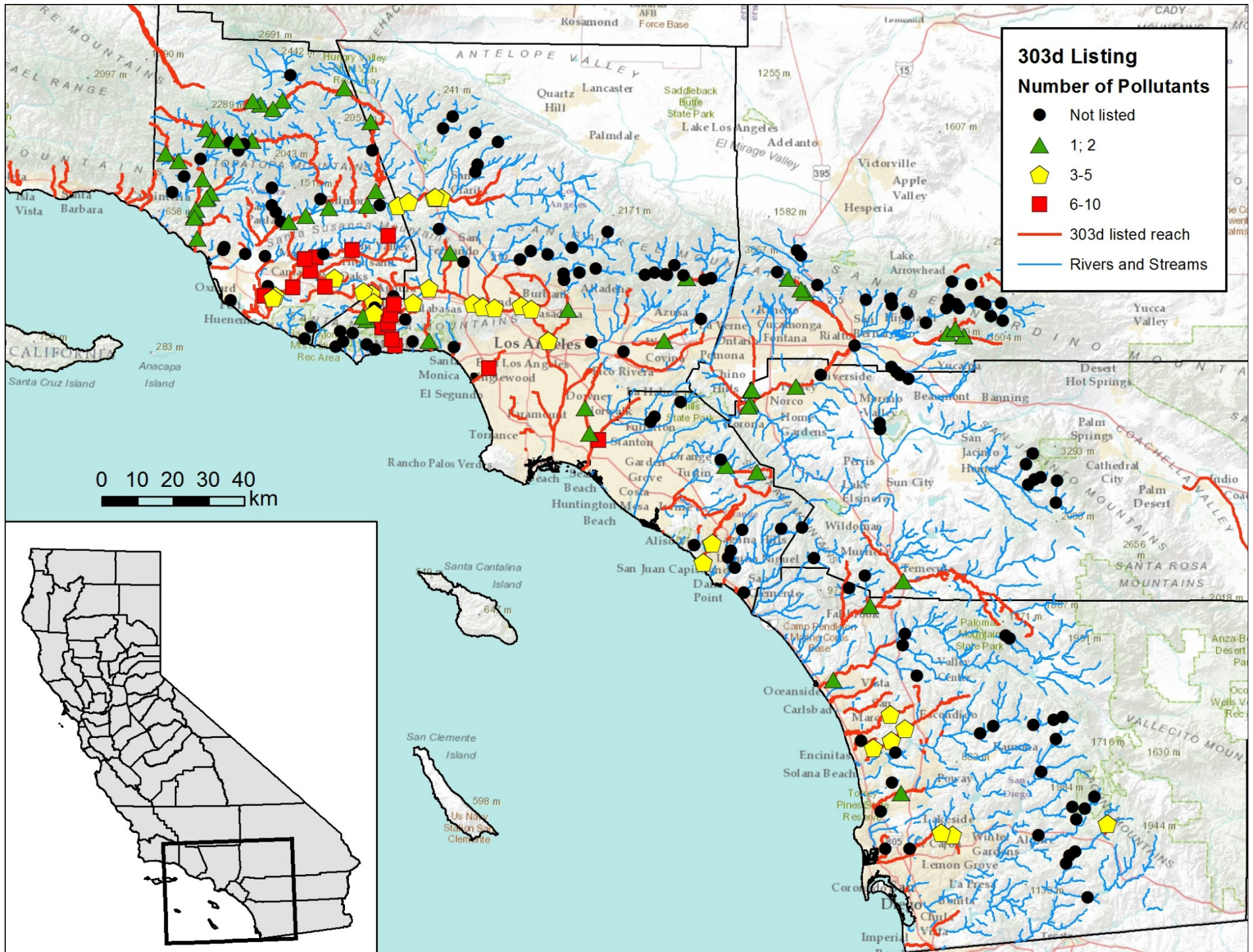
Percent of So Cal Stream Miles

Contingency Table: Biology vs. Nutrient Listings

| | Listed | Not Listed |
|-----------------------------|--------|------------|
| Biology Does Not Score Well | 7 | 24 |
| Biology Score Well | 10 | 59 |

Biology vs. Various Listings (% So Cal Stream Miles)

| LISTING | % AGREEMENT | % DISAGREEMENT |
|-------------------|-------------|----------------|
| Hydromodification | 67 | 33 |
| Metals | 65 | 35 |
| Nutrients | 66 | 34 |
| Pesticides | 64 | 36 |
| Salinity | 61 | 39 |
| Sediment | 64 | 36 |
| Toxicity | 70 | 30 |
| Any | 46 | 54 |



Southern California NEW vs. OLD

