

This Pilot Isn't The Final Story

- | We necessarily make many assumptions**
 - Some we know are going to change**

- | The goal is to spur discussion**

- | The outcome of today should be to focus where we go next**
 - Something we can take to a larger spatial scale**

What You'll See Today

- **Present technical options for moving forward**
- **Select one option as our example**
 - Sometimes more than one
- **Play out the assessment scenario**
 - See how the 4 alternatives compare in the pilot watershed

Technical Questions For the Panel From The Pilot Study

- | **What option(s) does the Panel recommend for selecting scoring tools, deriving thresholds, or incorporating uncertainty?**
- | **What additional considerations should we integrate when selecting thresholds?**
- | **What additional considerations should we explore for accommodating uncertainty?**
- | **Are there other technical elements we should explore to support the Policy?**

Road Map For Today

- | **The four alternatives**
- | **Pilot study watershed selection**
- | **The technical issues**
 - Options for Alternatives 2 and 3
 - Options for Alternative 4
- | **Issues to address for the next iteration**
- | **Implementation and regulatory outcomes**

The Four Alternatives

- 1. No action alternative**
- 2. Reference sites must stay reference sites**
- 3. Alt 2 + make all non-reference sites into reference sites**
- 4. Alt 2 + make all non-reference sites into best attainable**

Pilot Study Selection Criteria

- **Data availability**
 - **Probability-based sites**
 - **Compliance-based sites**
- **Has a range of biological conditions**
- **Can set biological expectations**
- **Willing stakeholders**

Ventura River

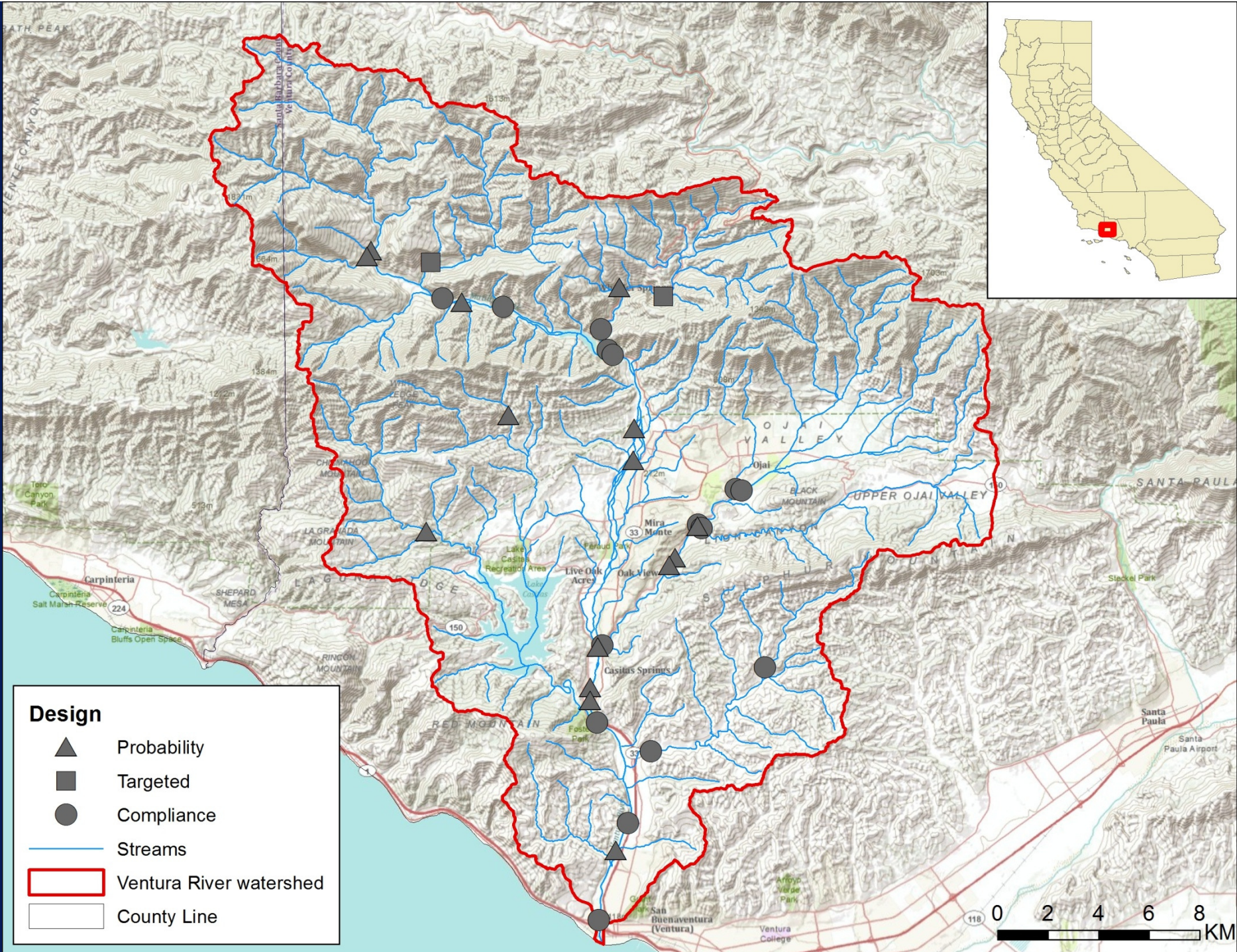


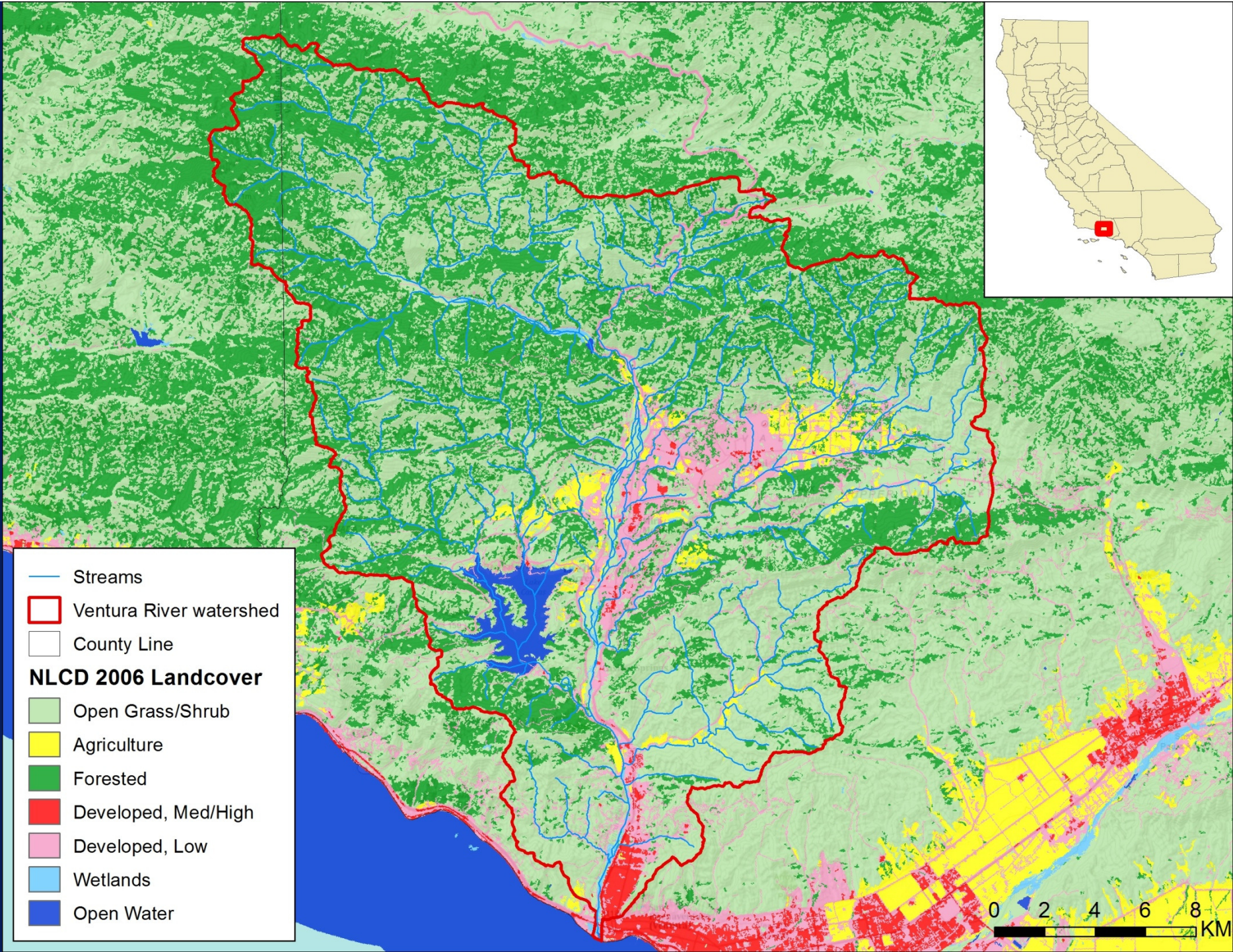
- Streams
- ▭ Ventura River watershed
- ▭ County Line



Ventura River Pilot Study Data Inventory

Monitoring Design	Program	No. of Sites	Time Period	Total No. Samples	Notes
Probability	EMAP, WEMAP, PSA, SMC	15	2000 to 2009	19	Combined and re-weighted
Targeted	RCMP	2	2000 to 2003	3	Includes revisits
Compliance	NPDES	15	2001 to 2009	81	9 sites for all years
Total		38		103	









Site 0



Site 15



Site 11



Site 12



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Technical Issues

- **Scoring tools**
- **Threshold selection**
- **Dealing with uncertainty**
 - **Adaptive sampling for confirmation**

3 Options for Scoring Tools

- Tool options are similar for all Regulatory Alternatives

- Regional multi-metric indices

- Southern California Index of Biotic Integrity (SCIBI)

Use this for
today's example

- Statewide presence-absence indices

- Developing a new O/E model


- Use a combination of tools


- Statewide consistency with regional flexibility

Background on the SCIBI

- **Developed by Ode et al (2005)**
- **Comprised of seven metrics**
 - **#EPT taxa, # Coleoptera taxa, %non-insect taxa, %intolerant individuals, %collector individuals**
- **Scored from 0 to 100, 100 being best**
 - **Has been used to support TMDL listings in So Cal**

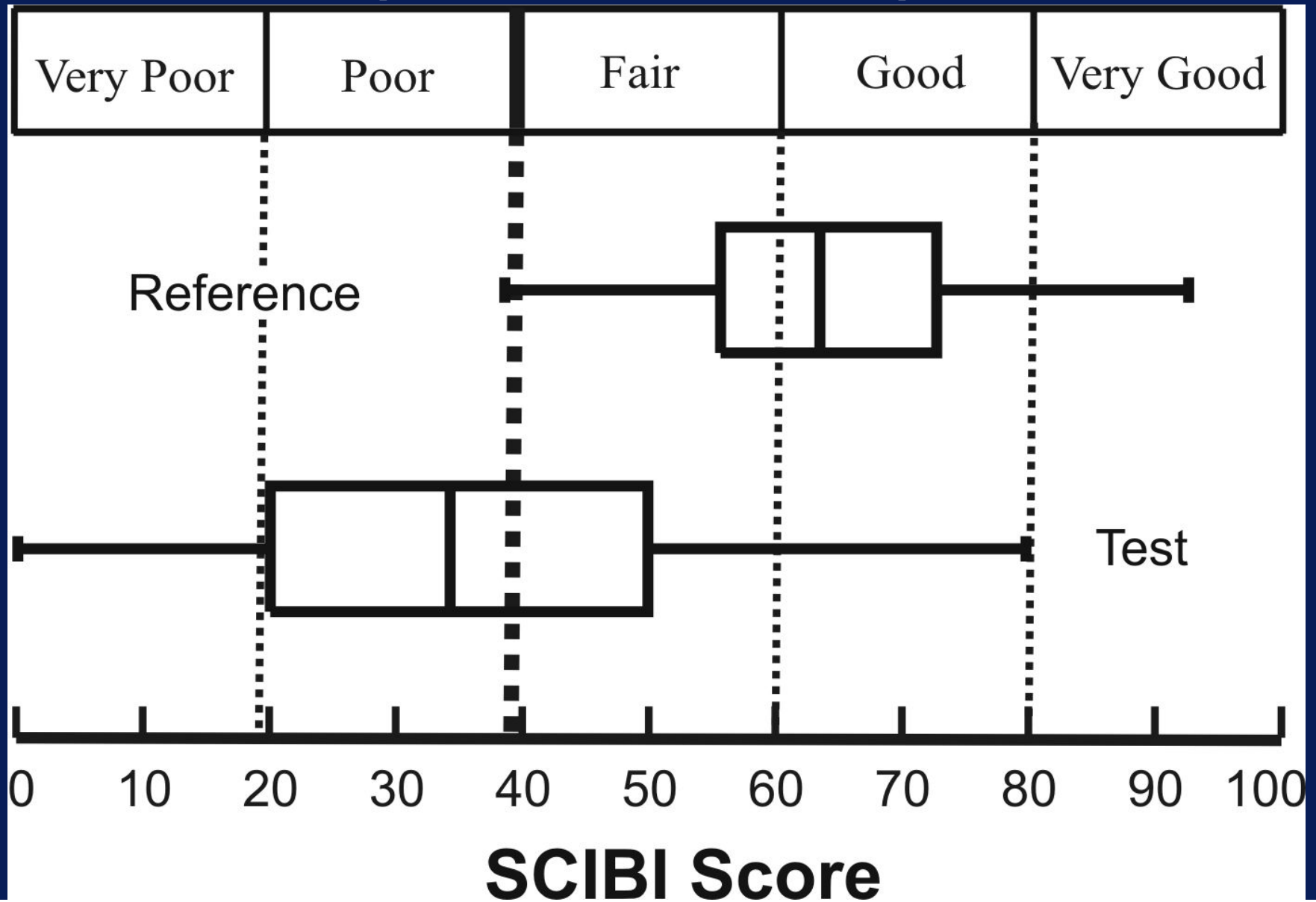
Options for Thresholds

- **Empirically derived expectation**
 - Different from reference condition
 - Currently used for SCIBI

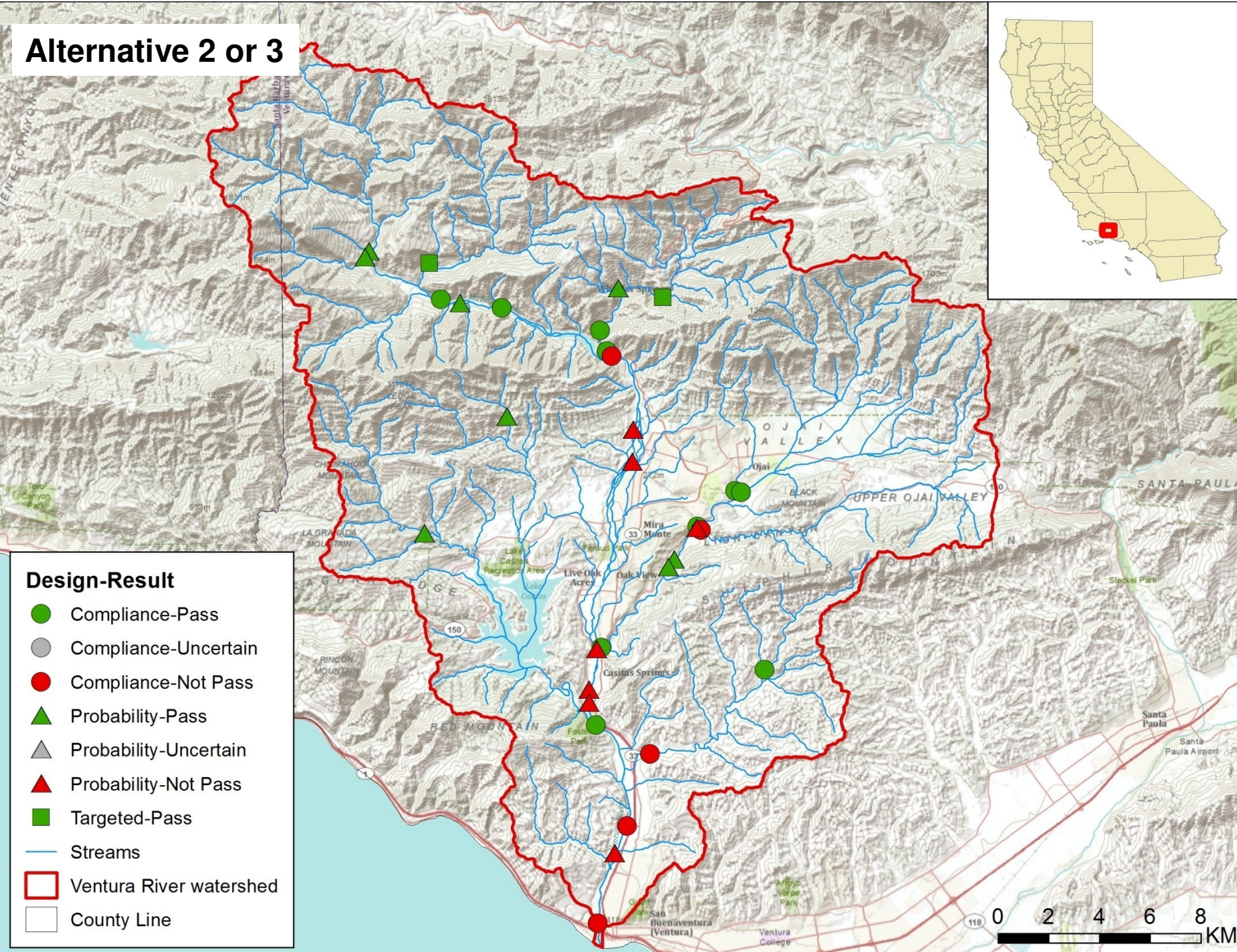
Alternatives 2 and 3
- **Modeled expectation**
 - Stressor-response models we've talked about at previous meetings

Alternative 4
- **Approaches not frequently seen in stream assessment tools**
 - Ecological function
 - Combinations of approaches

Empirical Approach (Threshold = 39)

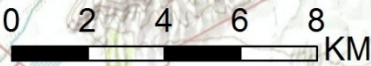


Alternative 2 or 3

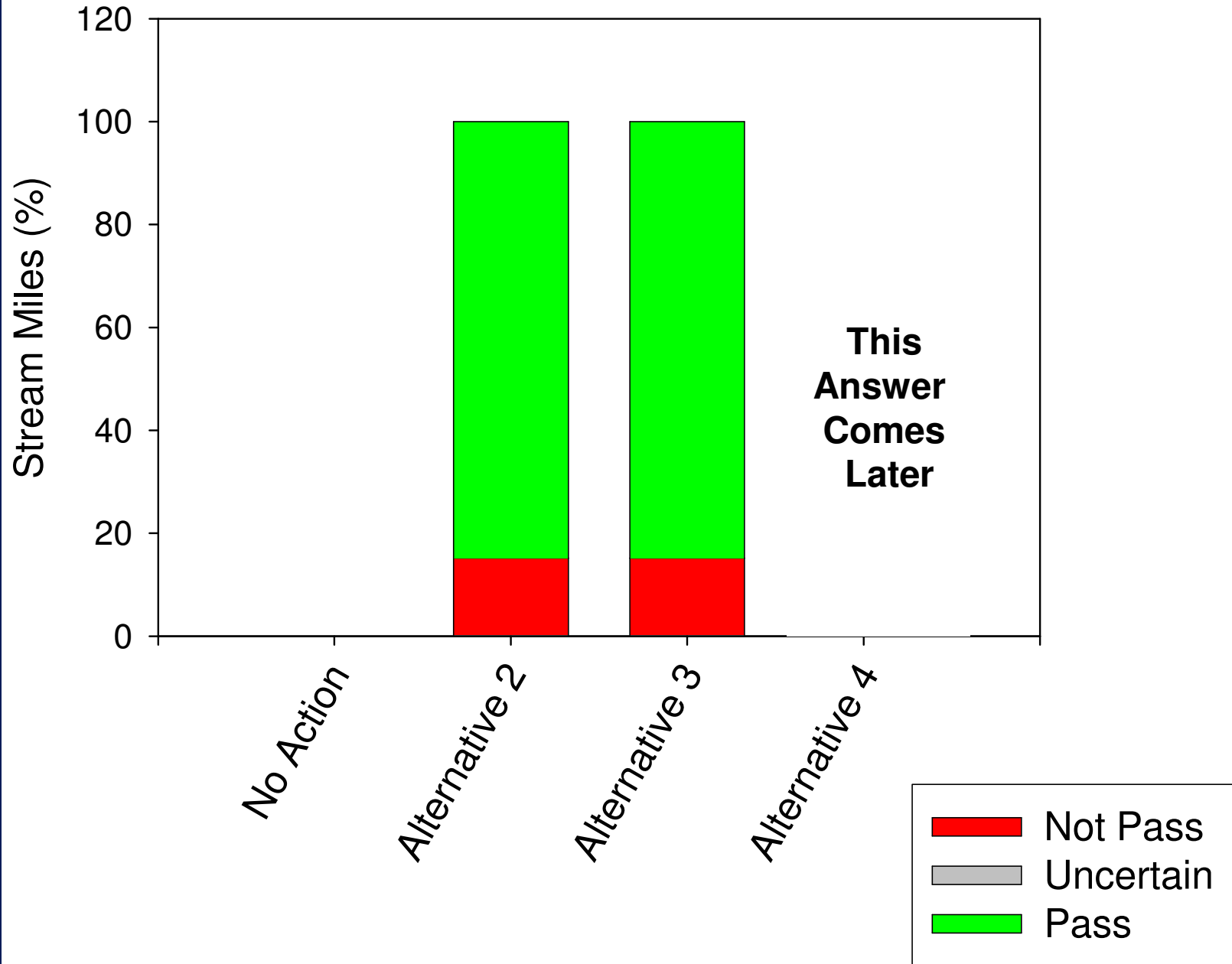


Design-Result

- Compliance-Pass
- Compliance-Uncertain
- Compliance-Not Pass
- ▲ Probability-Pass
- ▲ Probability-Uncertain
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- Targeted-Pass
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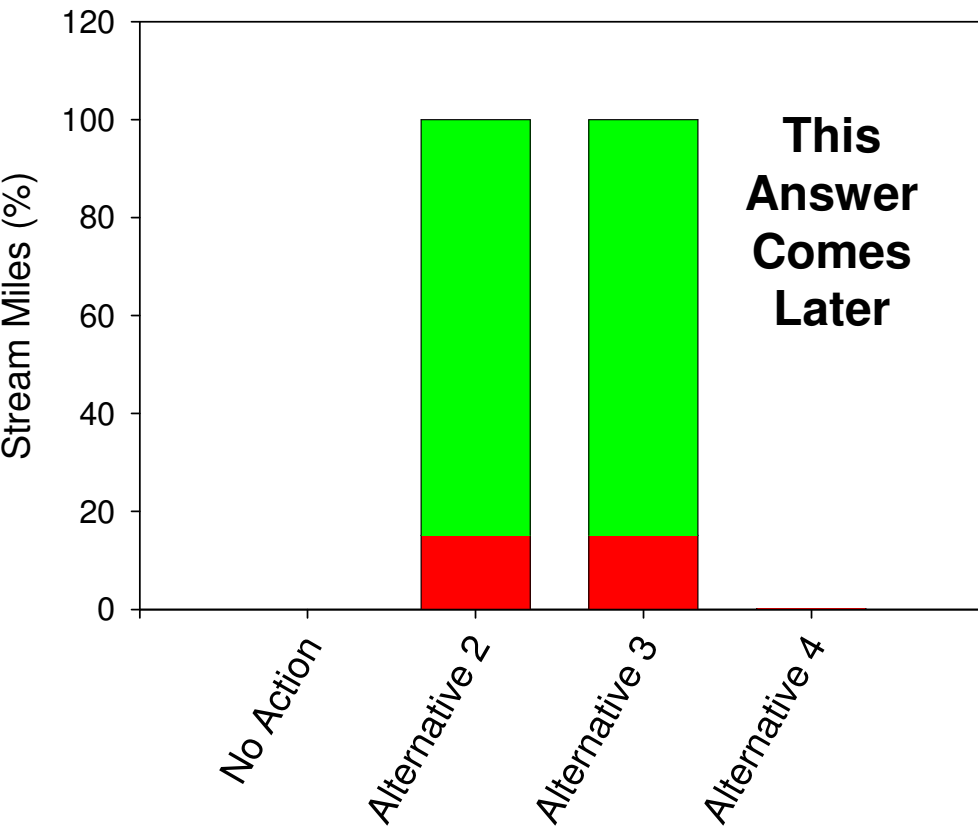
Probability Sites - Extent of Stream Miles



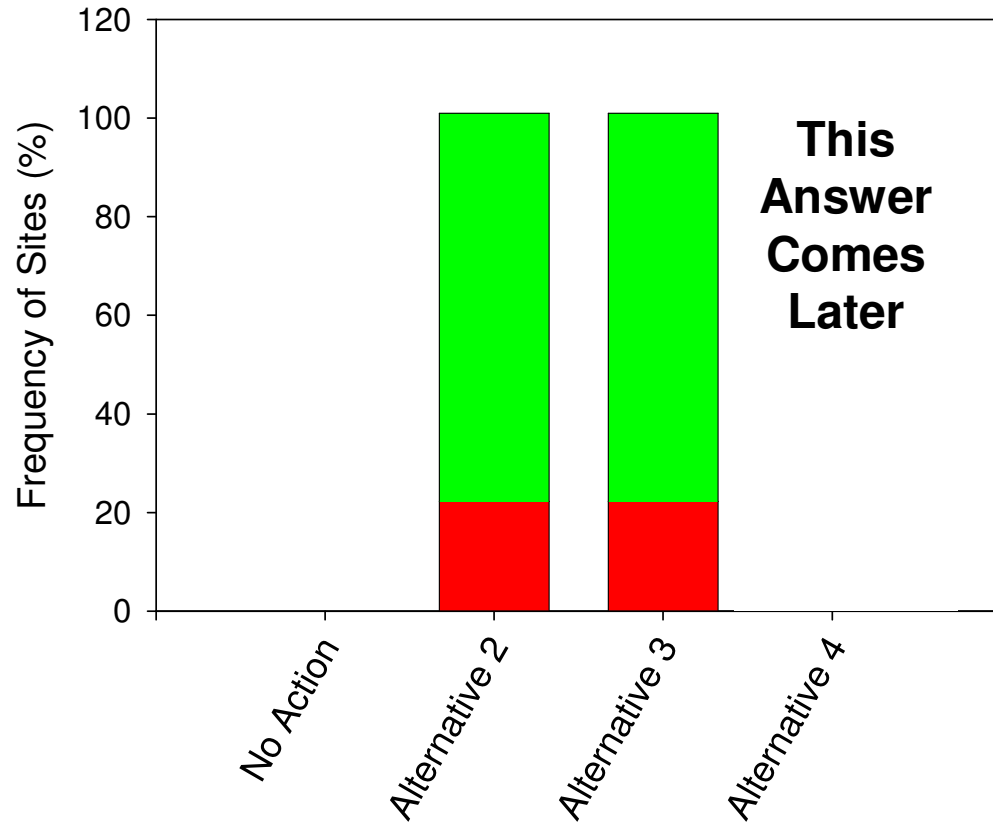
Monitoring Design Can Make a Difference

- | **Probabilistic designs are unbiased**
 - Best estimate of the “true” condition
- | **Compliance designs are focused on areas of concern**
 - Potential bias
- | **The targeted design was focused on reference sites**

Probability Sites - Extent of Stream Miles



Compliance Sites - Extent of Impaired Sites



Technical Challenges

- **Scoring tools**
- **Threshold selection**
- **Dealing with uncertainty**
 - **Adaptive sampling for confirmation**

Alternatives 2&3 - Uncertainty

- **We know there are sources of variability**
 - Method, spatial & temporal, threshold derivation
- **Two generic approaches for incorporating uncertainty**
 - Incorporate uncertainty into your threshold
 - Reduce uncertainty in your site assessment
- **We explore a combination**

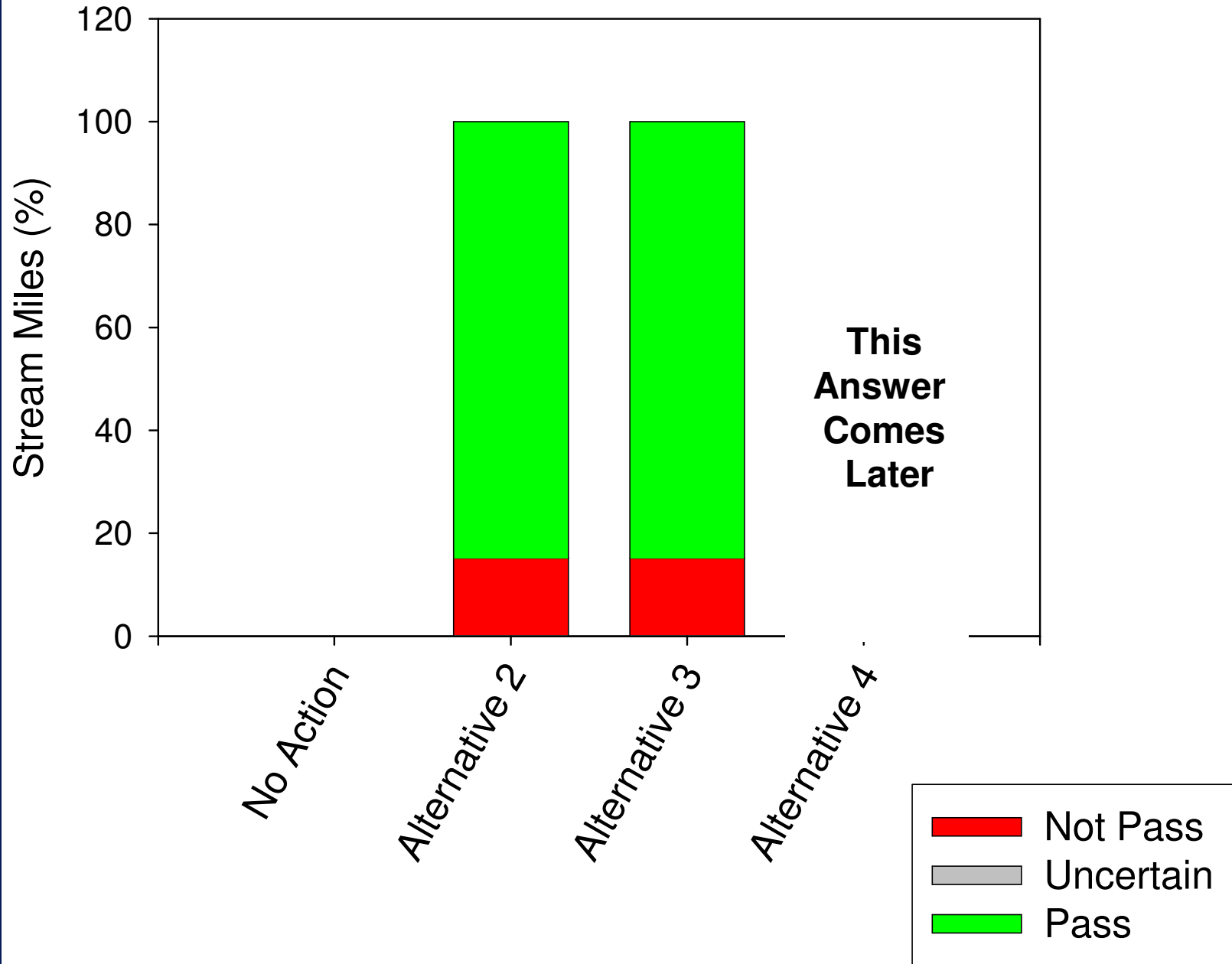
Incorporating Uncertainty Into The Threshold

- Its already incorporated into the scoring tool
 - Use the threshold “as is”
- Use existing reference threshold, but add on an estimate of uncertainty
- Options for adding estimates of uncertainty
 - *A priori* relative percentage
 - Minimum detectable difference
 - Estimated intra- or inter-annual variability

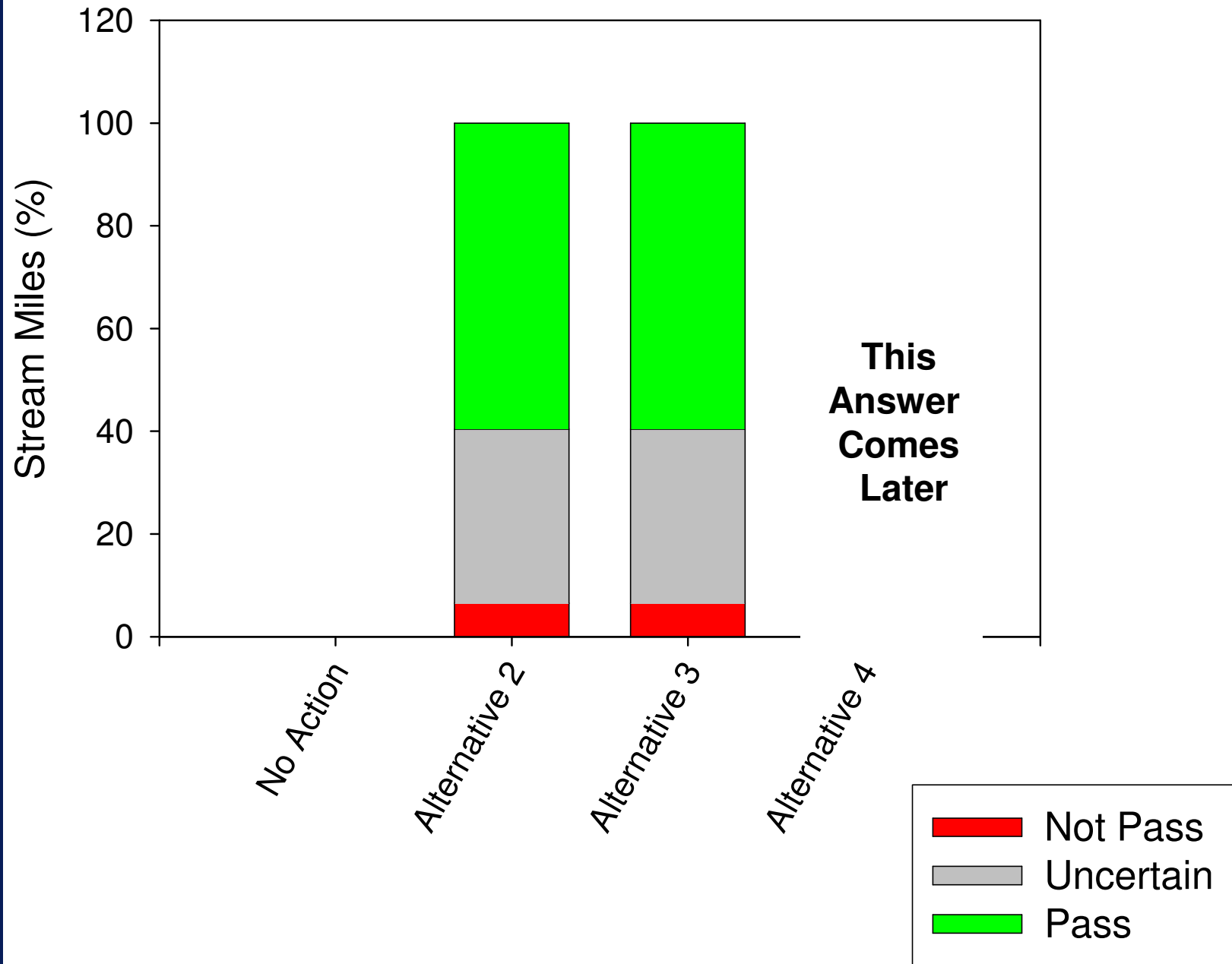
Uncertainty Options

- ***A priori* relative percentage based on best professional judgment**
 - Best guess
 - **Minimum detectable difference**
 - Method variability ca. 13 SCIBI points
 - **Estimated intra- or inter-annual variability**
 - Estimated intra- and inter-annual variability at pilot study sites
 - Std Dev ranged from 3 to 15 SCIBI points
- Use this for today's example

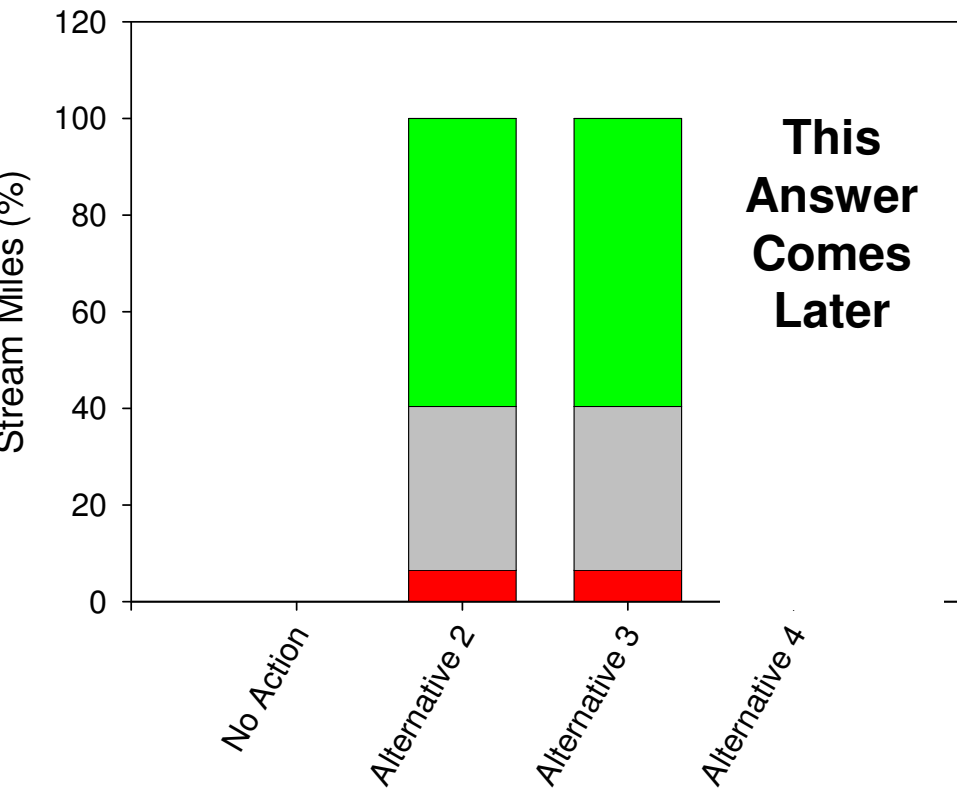
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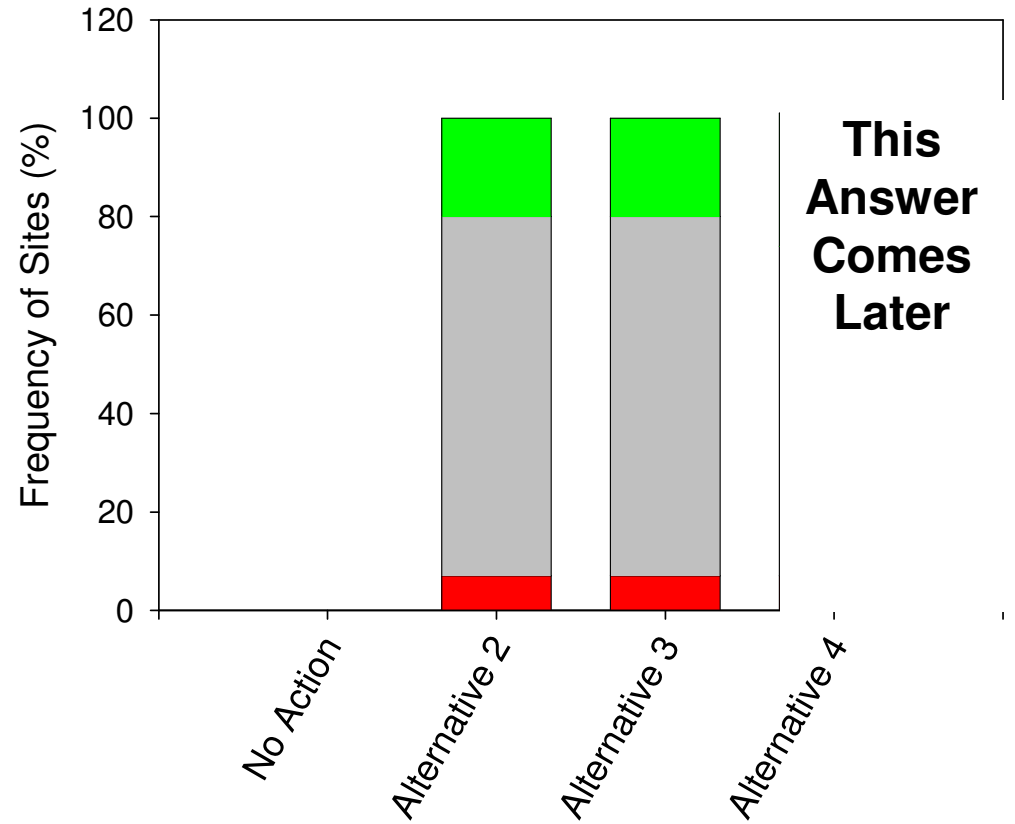
Probability Sites - Extent of Impaired Stream Miles



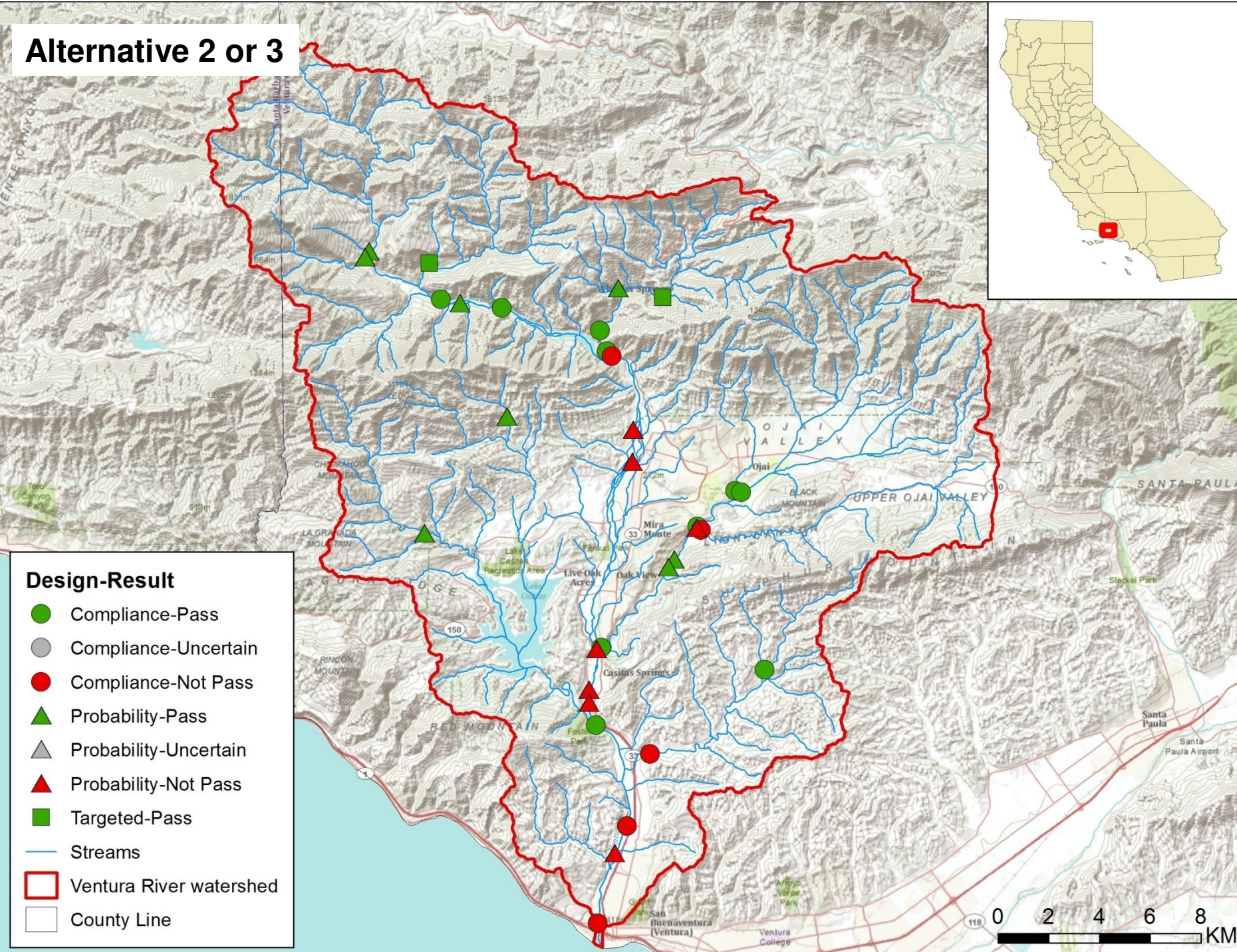
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Compliance Sites - Extent of Impaired Sites

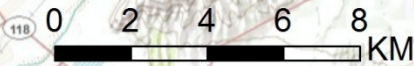


Alternative 2 or 3



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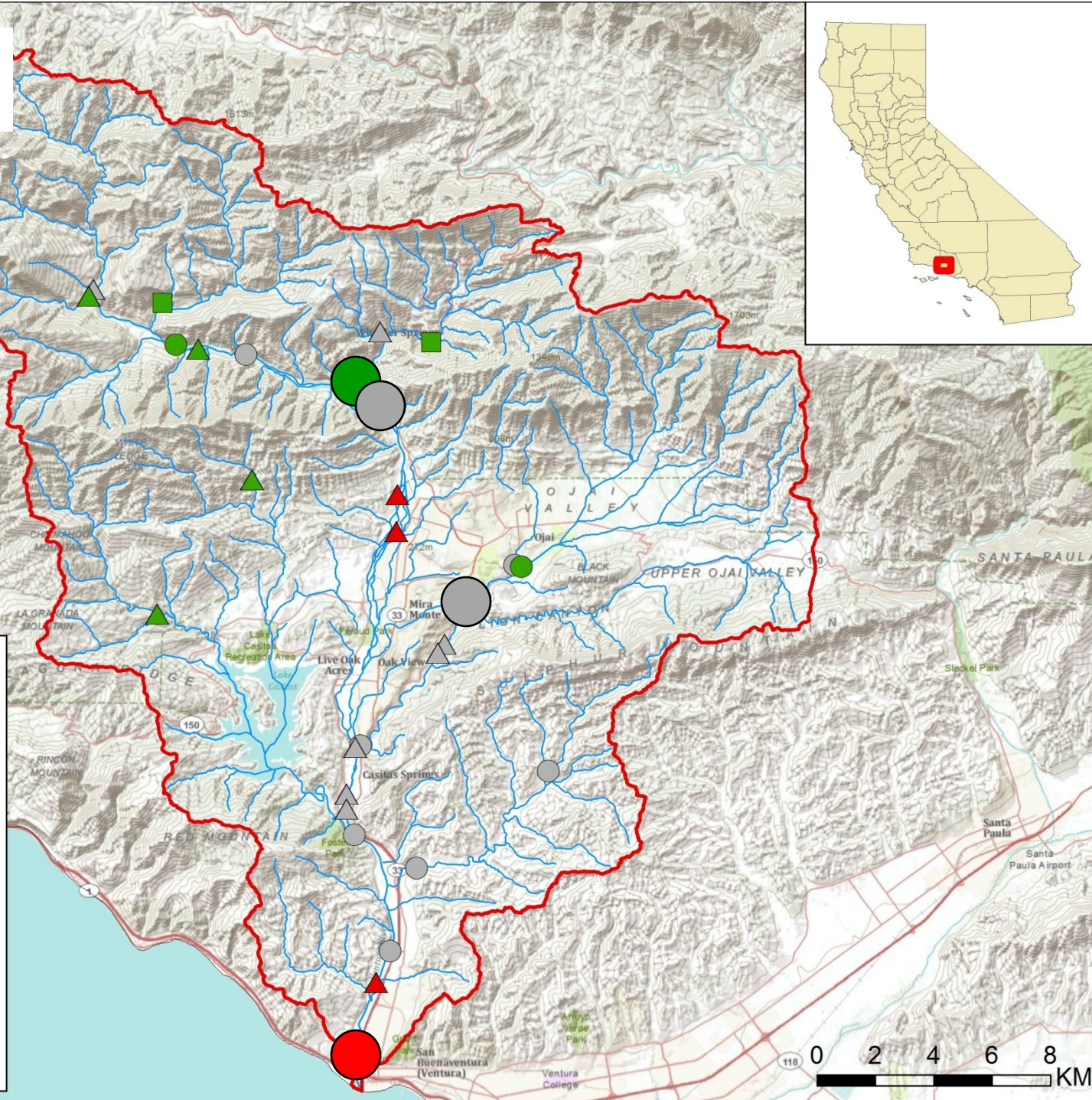


Alternative 2 or 3 With uncertainty

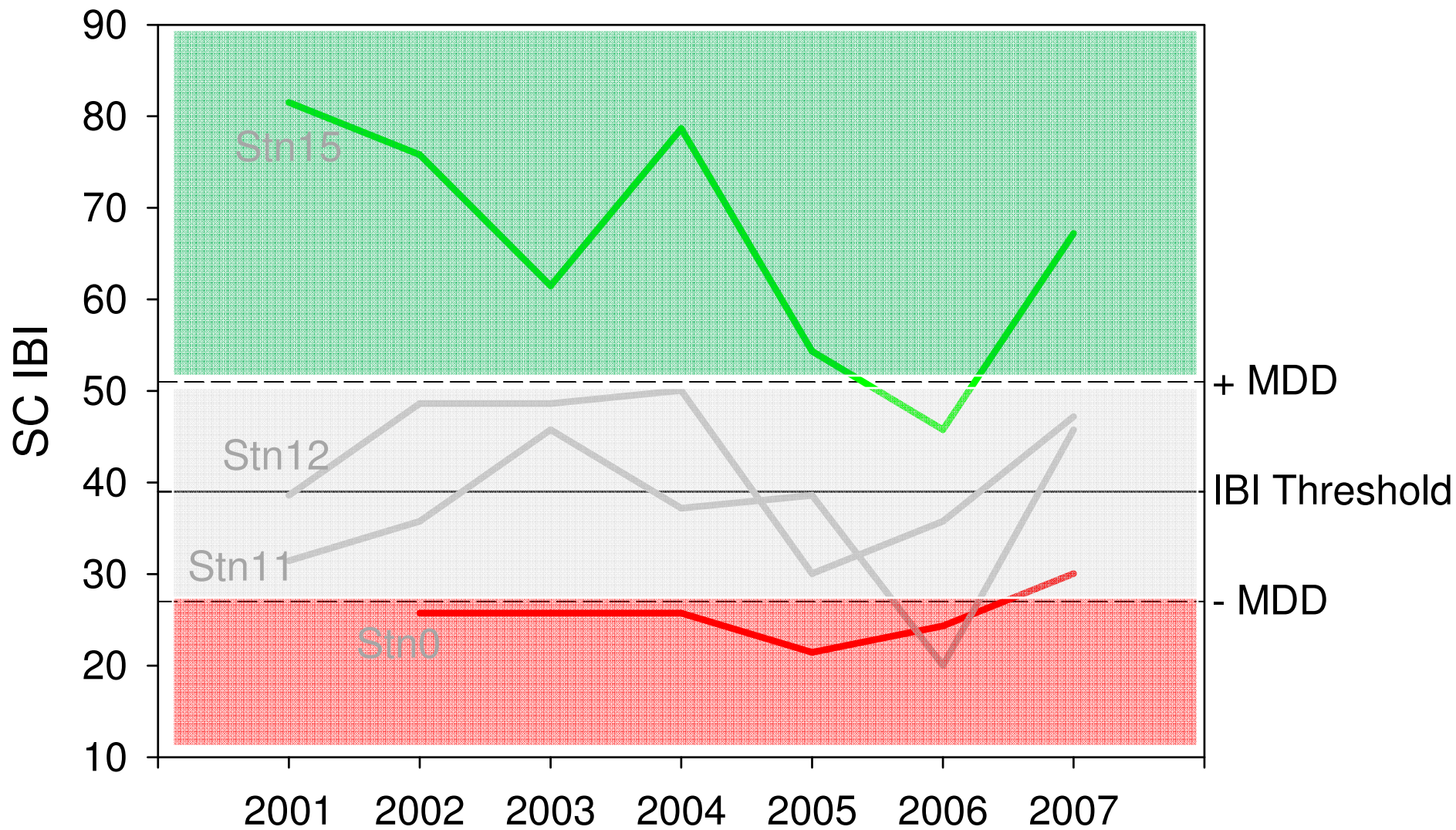


Design-Result

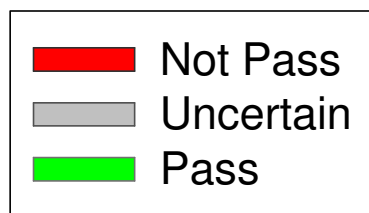
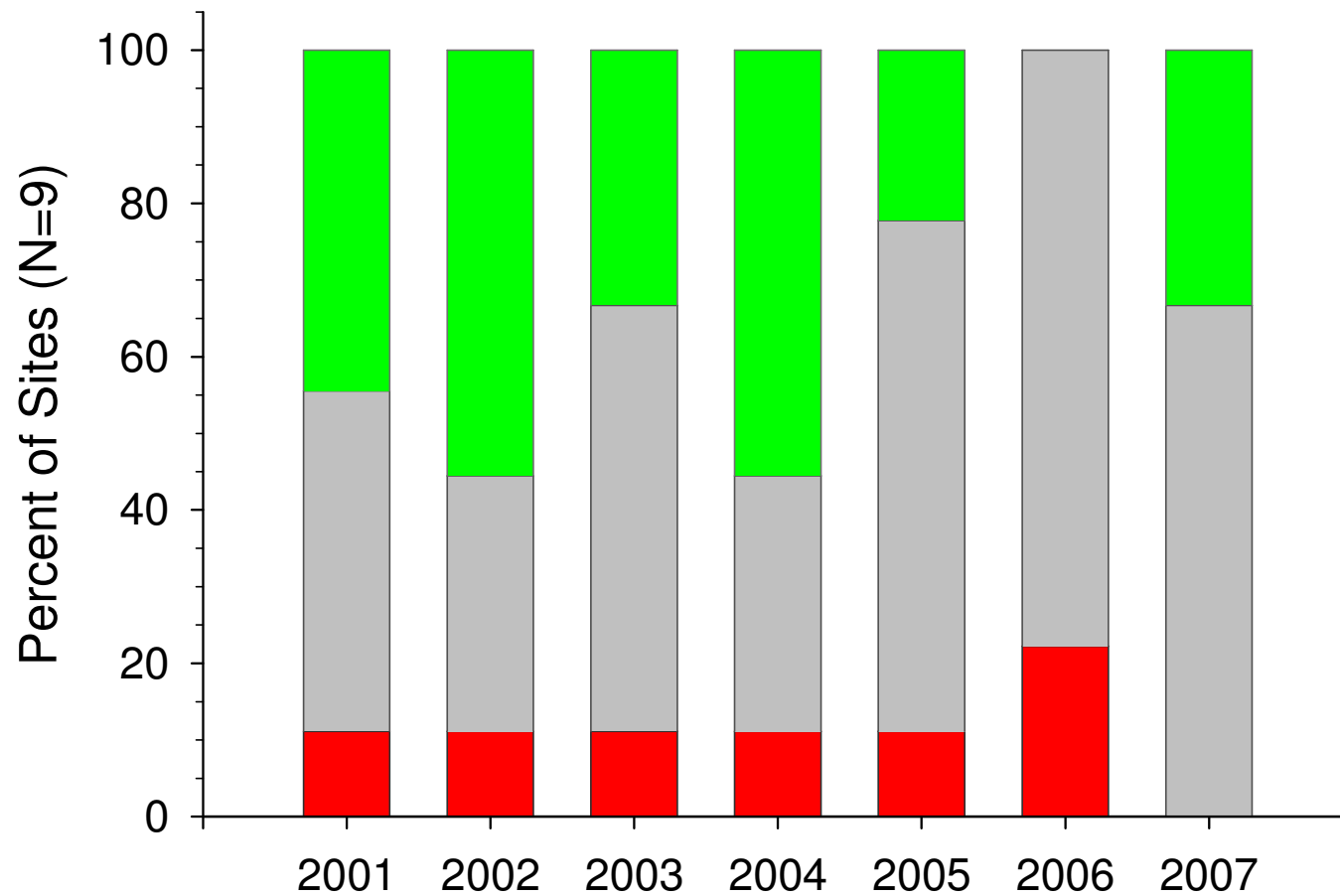
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Ventura River Example Compliance Sites



Ventura River Compliance Site Assessment



Technical Challenges

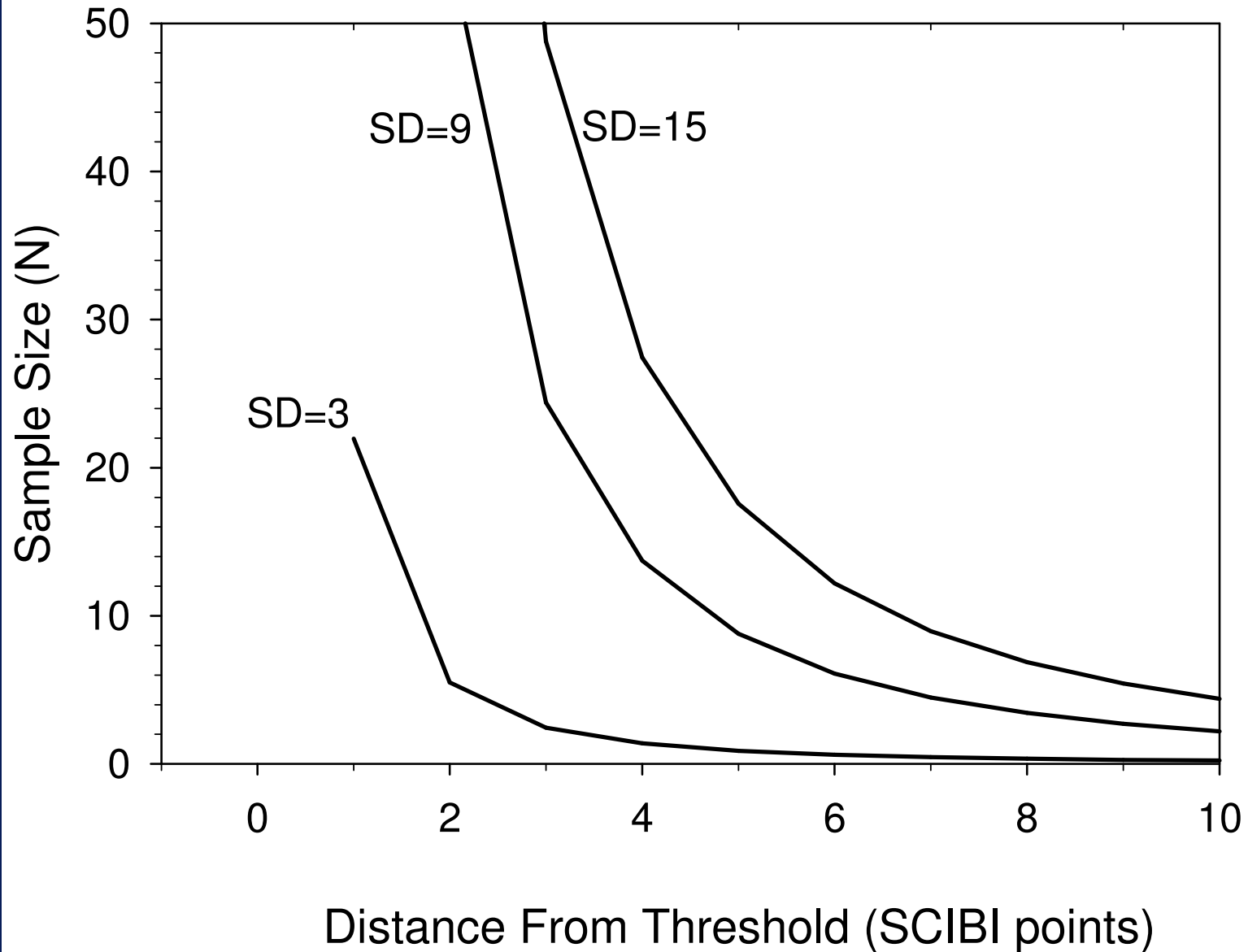
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Options for Adaptive Sampling

- **Two generic options when you fall in the grey zone**
- **Power based on normal distribution**
 - **Sample size is a function of variability and distance from threshold**
- **Frequency based on binomial distribution**
 - **Function of repeated measures, currently used in the State's 303d listing policy**

Power Analysis From Pilot Sites

(alpha = 0.05, beta=0.50)




Frequency of Sampling Based on Binomial Distributions (Probability of Success = 0.50)


No. Of Samples	Allowable No. of "Failures"				
	$\alpha=0.01$	$\alpha=0.05$	$\alpha=0.10$	$\alpha=0.25$	$\alpha=0.50$
1	-	-	-	-	-
2	-	-	-	-	1
3	-	-	-	1	1
4	-	-	1	1	2
5	-	1	1	2	2
6	-	1	1	2	3
7	1	1	2	3	3
8	1	2	2	3	4
9	1	2	3	3	4
10	1	2	3	4	5

Responses During the Stakeholder Committee Meeting

- **Addition of adaptive sampling makes sense**
 - No consensus on what type of sampling
- **Constrain adaptive sampling efforts to within a permit cycle**
- **Don't necessarily make it all about biology**
 - Adaptive sampling could look at additional indicators

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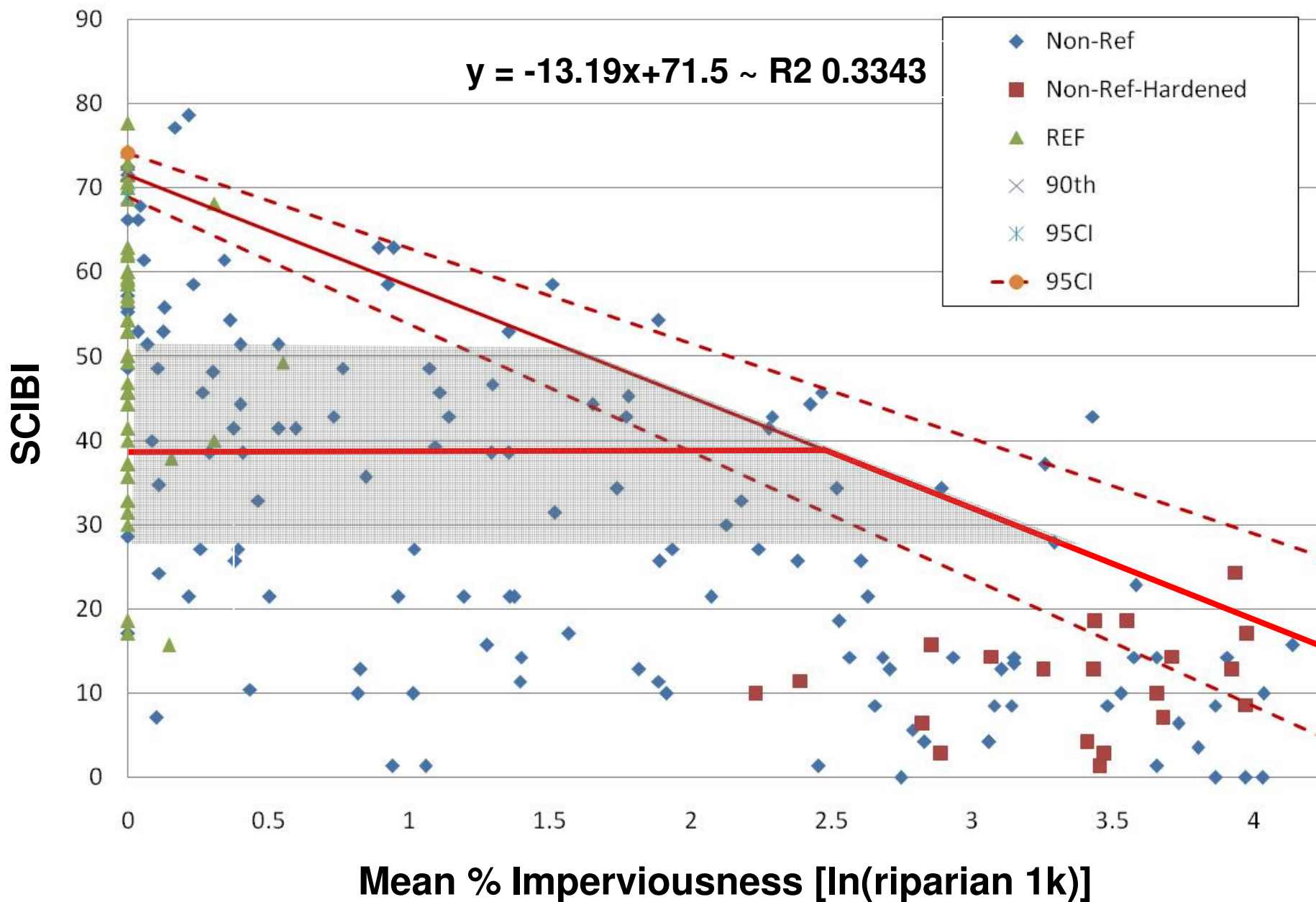
The Panel's Previous Guidance

- **We explored both empirical and modeled biological responses**
 - A hybrid approach combining both is OK
- **We explored multiple models including Multiple Linear Regression, CART, Random Forest**
 - Keep it simple, use a single variable stressor response model
- **We explored various model output scenarios including continuous and discontinuous thresholds**
 - Utilize quantile regression to set a continuous threshold at the 90th percentile

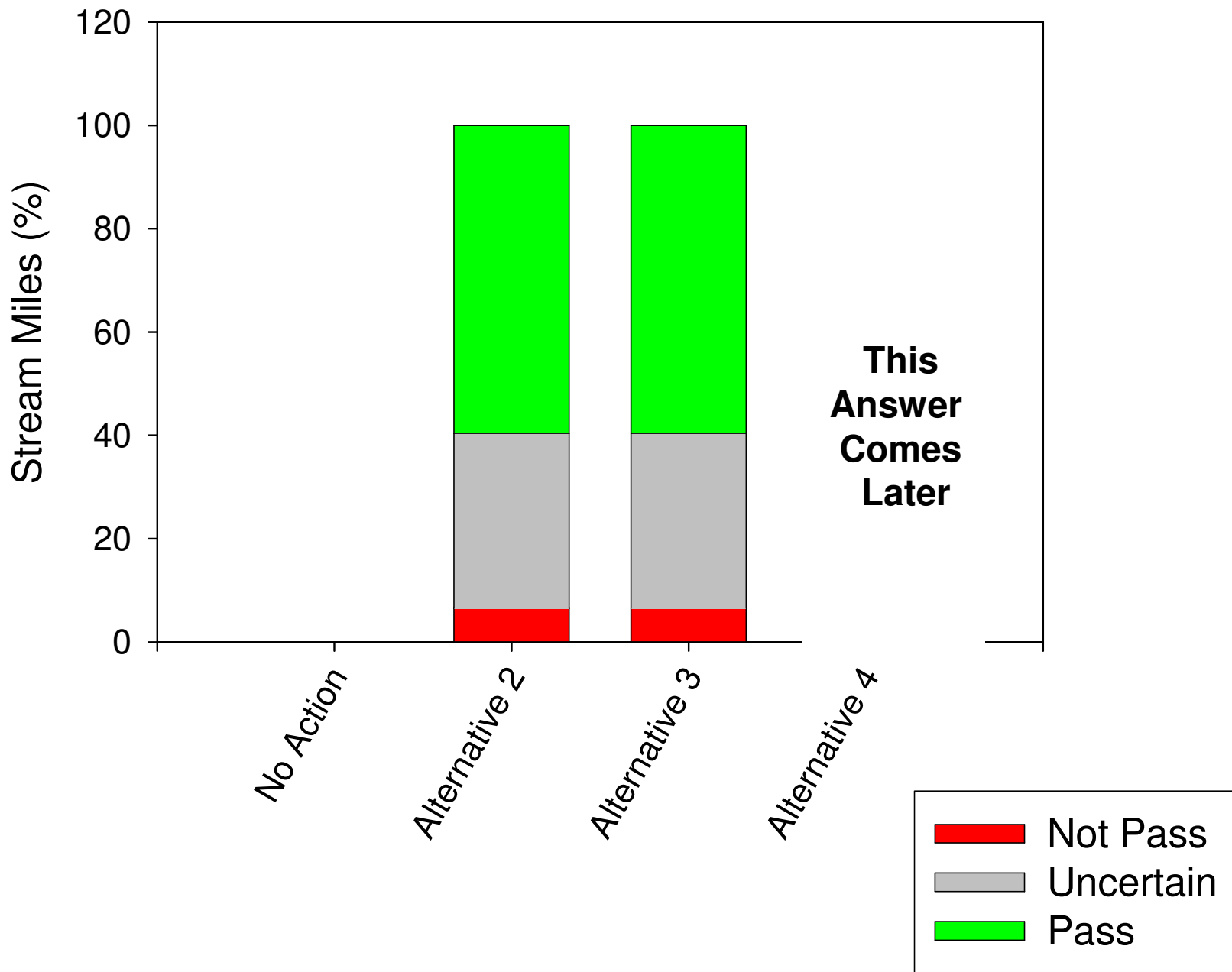
Modeling Overview

- **Focused on SCIBI and a large subset of landscape variables at various spatial scales identified in previous modeling efforts**
- **Used entire SoCal data set except Ventura R (N=313)**
 - Randomly parsed into 2/3 development, 1/3 validation
- **Identified best linear regression models based on adjusted r^2 , AIC**
 - Several potential variables to choose from for Pilot Study
 - Selected percent impervious area in riparian buffer, 1 km upstream of site
- **Estimated 95% confidence interval using Monte Carlo simulations**

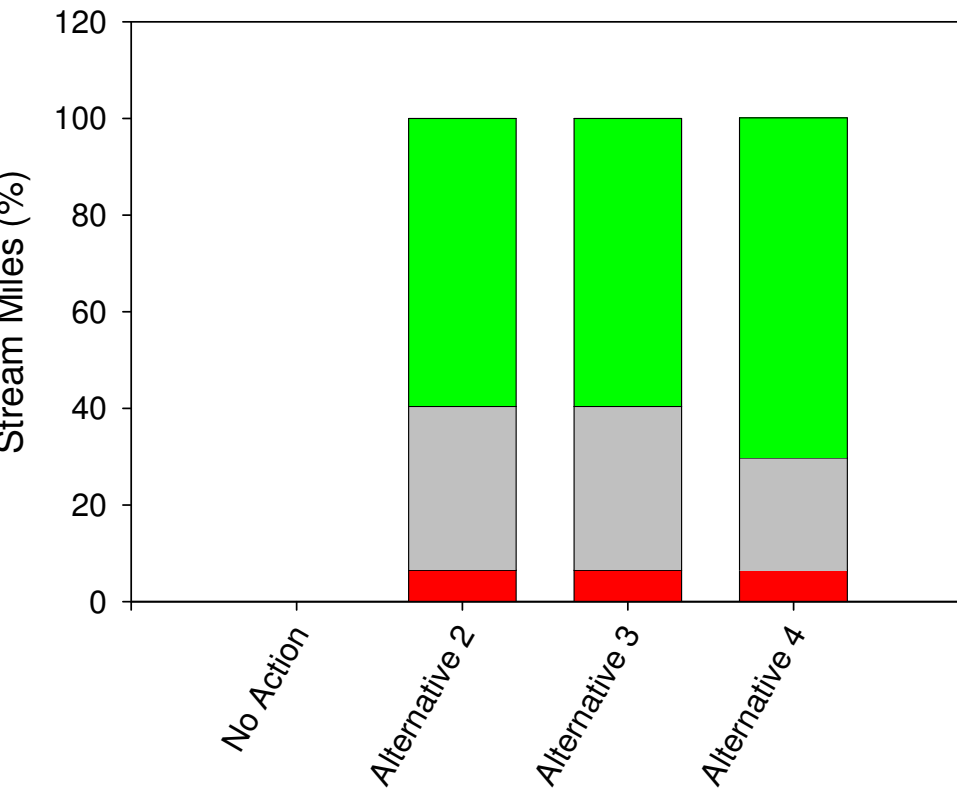
QUANTILE REGRESSION (90th Percentile)



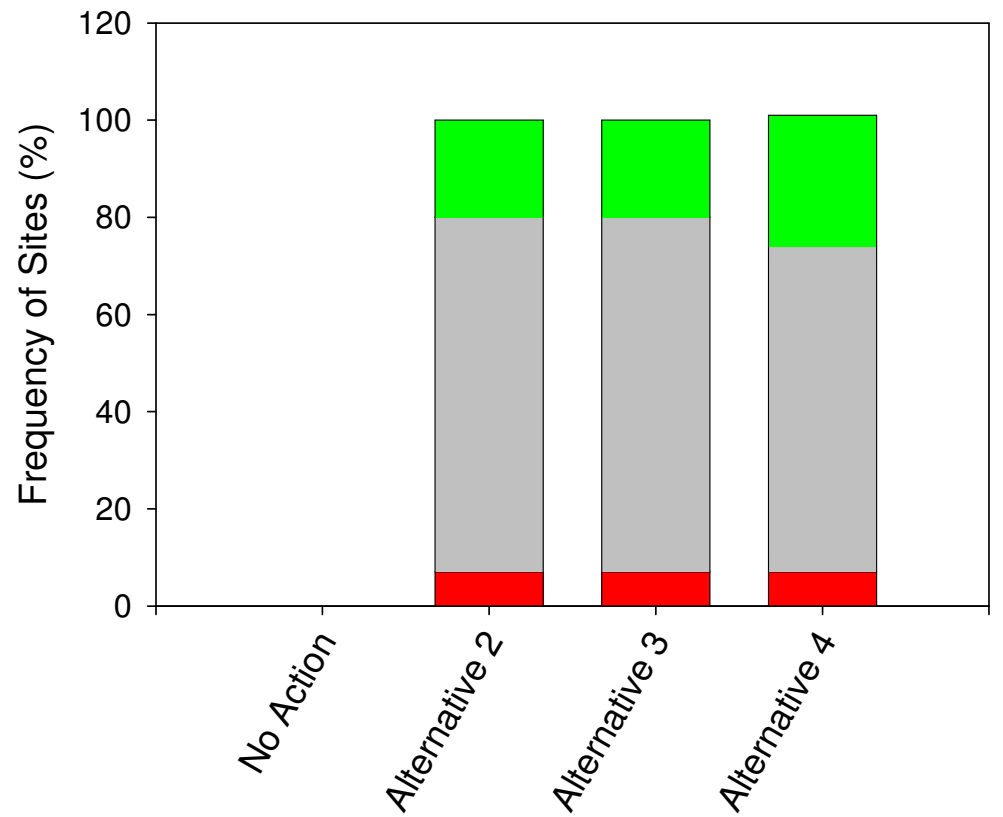
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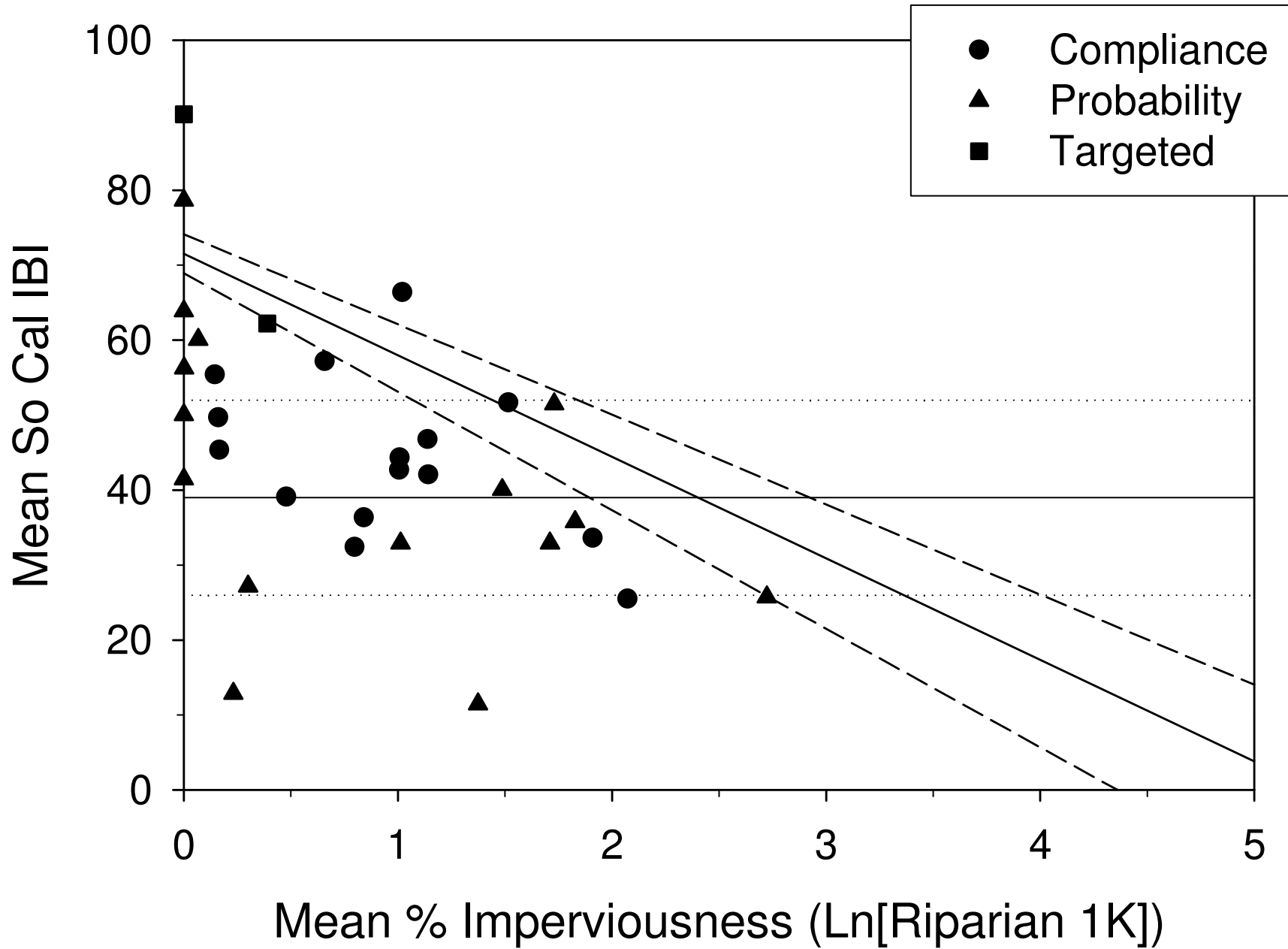
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Ventura River

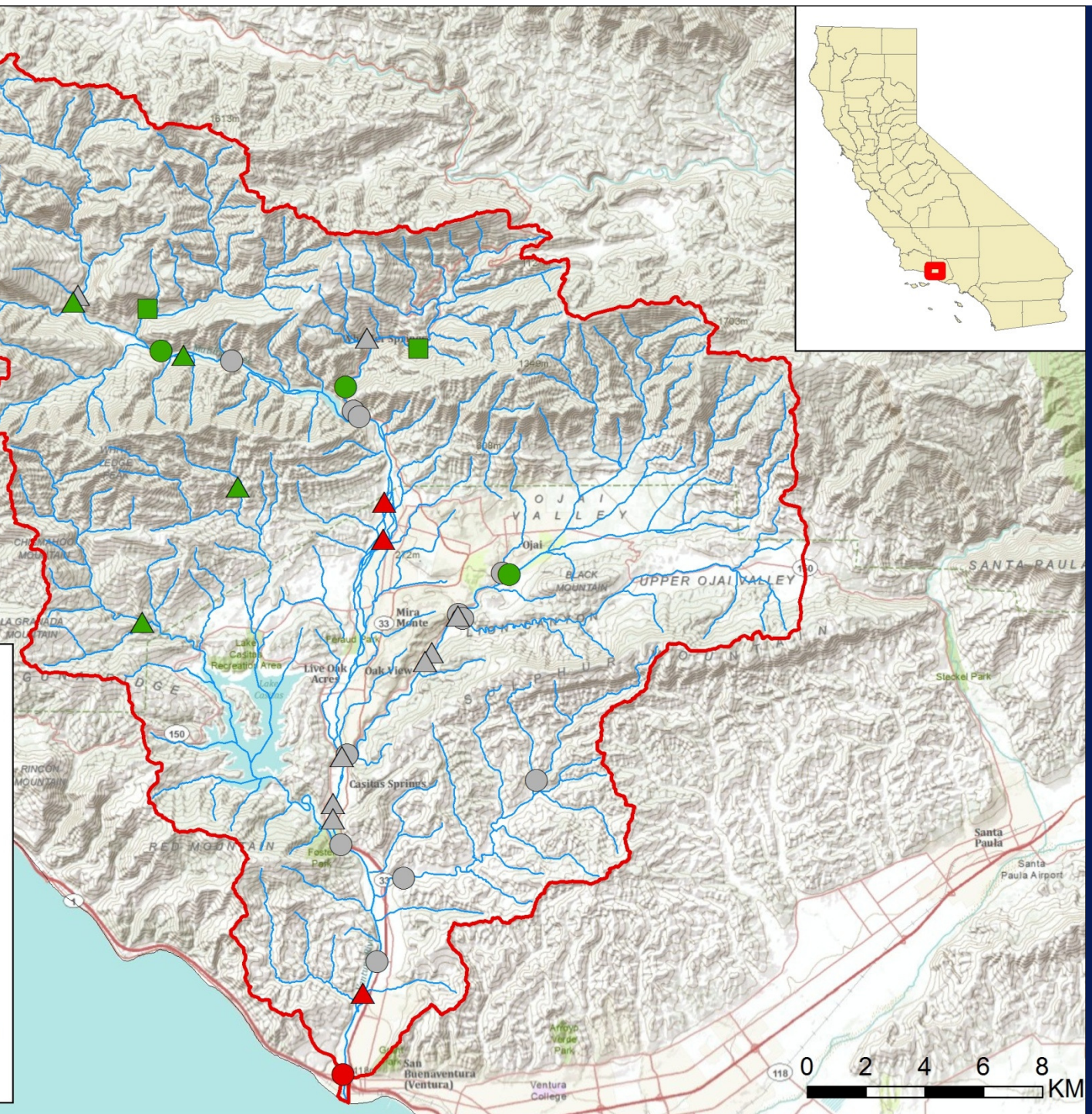


Alternative 2 or 3 With uncertainty

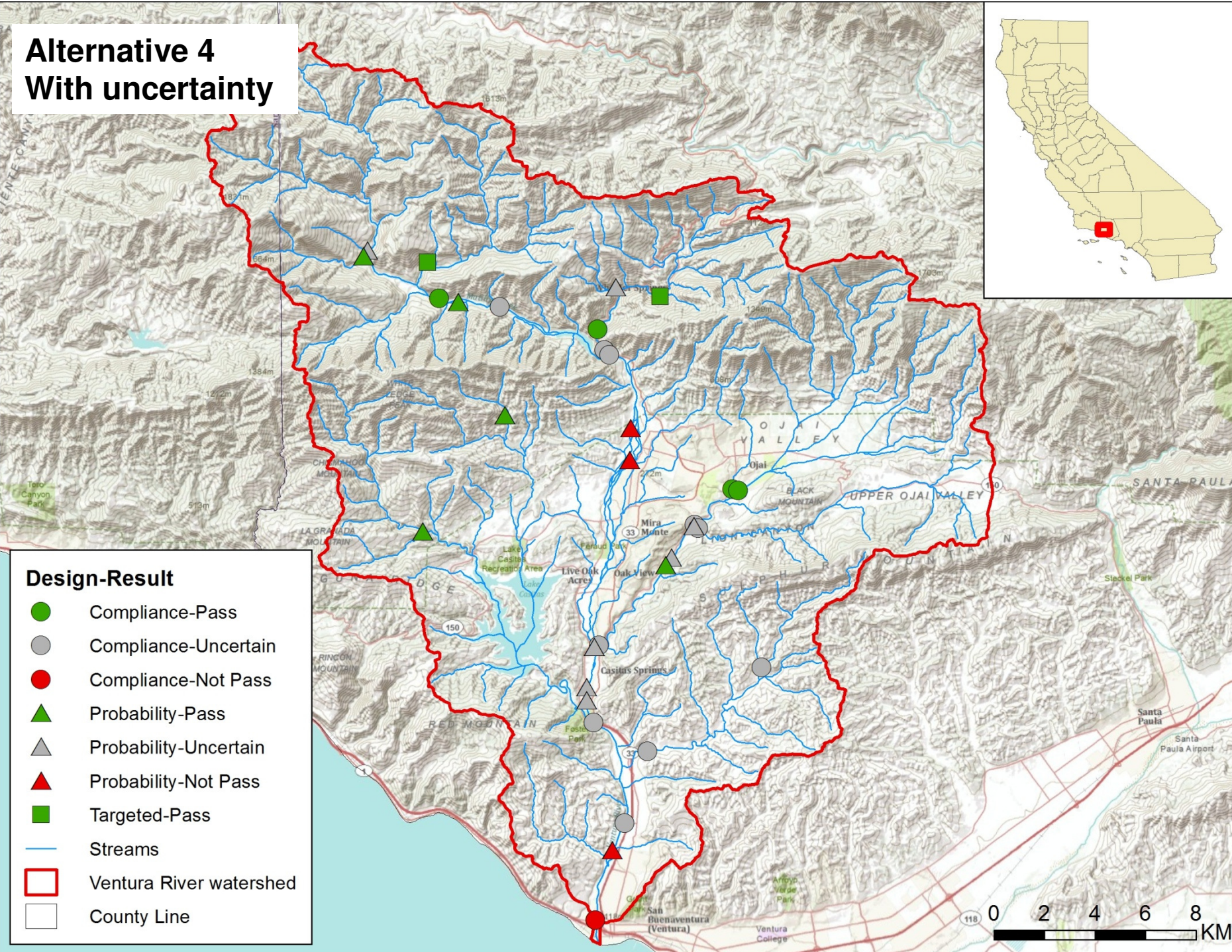


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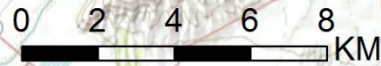
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Alternative 4 With uncertainty



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Technical Issues For Next Iteration

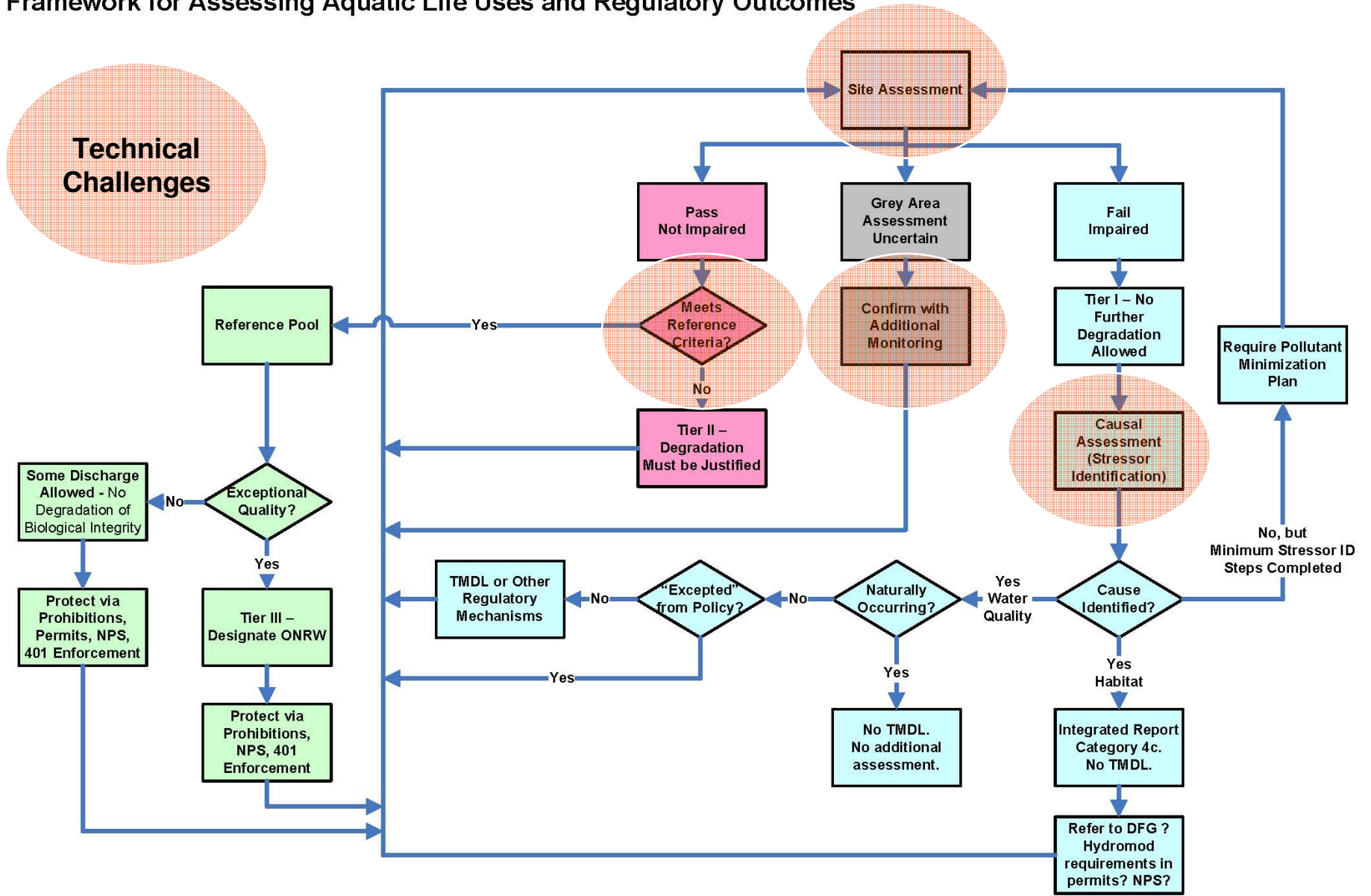
- **Scoring tool evaluation**
 - [SC]IBI vs. new O/E
- **Delineate thresholds**
- **Optimize approach for uncertainty**
- **Need for more detailed modeling**

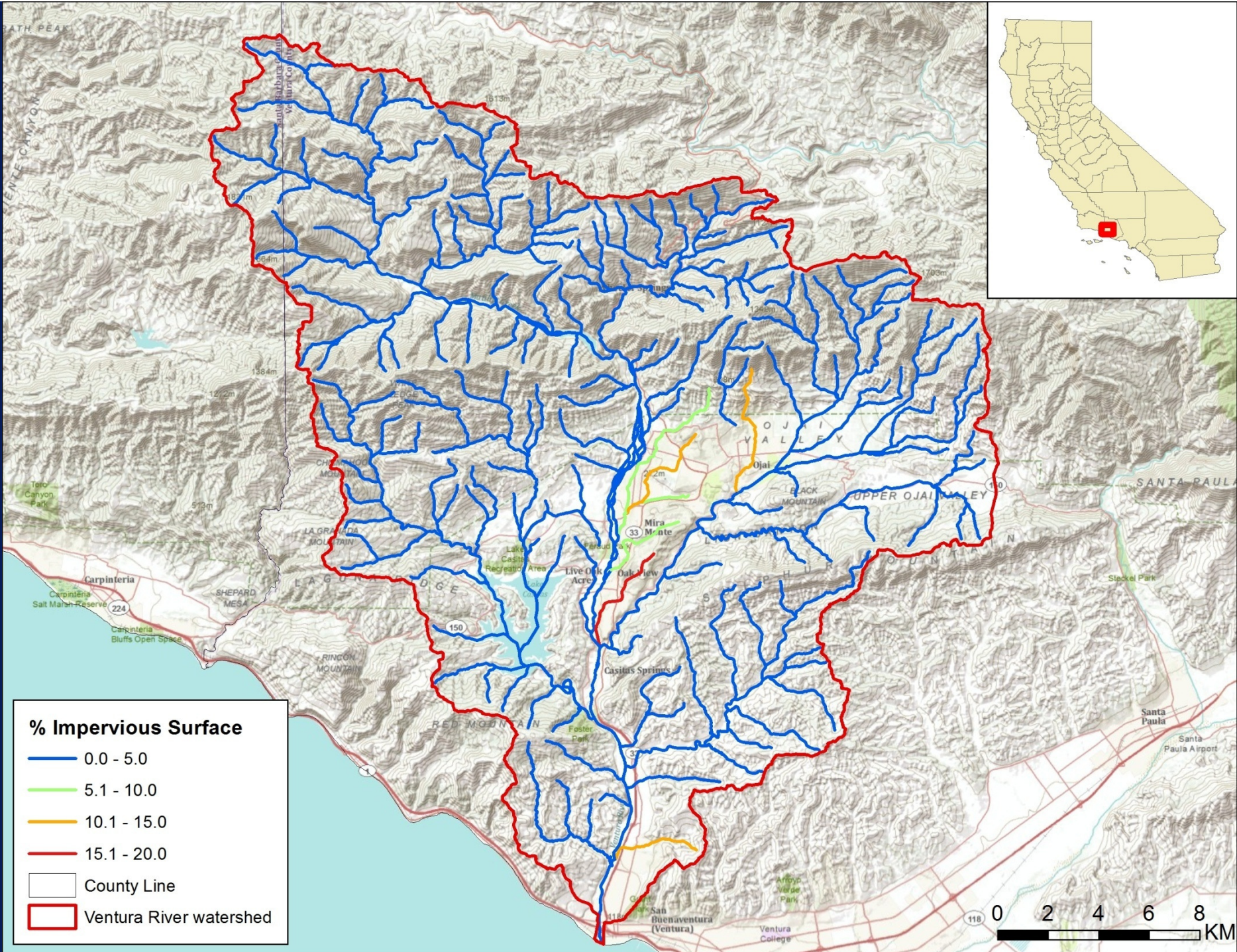
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Framework for Assessing Aquatic Life Uses and Regulatory Outcomes





SWRCB's 303d Listing Guidance (2004) Based on Binomial Distributions

Sample Size	List if the number of exceedences is equal to or greater than
2-24	2
25-36	3
37-47	4
48-59	5

Sample Size As A Function of Confidence

