San Diego Regional Monitoring Workgroup

Overview of Watershed Assessments from Other Programs

Steven Gruber
Watershed Sciences Project Manager
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Overview

- Goal: Provide a brief overview of some of the watershed assessments being conducted in other regions
- Three types of assessments:
  - Best Professional Judgment
  - "Problem" focused
  - Predictive models
- Most assessments used water quality as a factor in the analysis, but not the main component
- Ranking systems are used, but final assessment relies on interpretation

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Types of Assessment Documents

- **CWAM** – California Watershed Assessment Manual
- **CRAM** – California Rapid Assessment Method
- **SCREAM** – Southern California Riparian Ecosystem Assessment Method
- **SFAM** – Stream Functional Assessment Methodology
- **SWAMP** – Surface Water Ambient Monitoring Program
- **NCWAP** – North Coast Watershed Assessment Program
- **RMAS** – Regional Monitoring and Assessment Strategy
- **SCBWMI** – Santa Clara Basin Watershed Management Initiative

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Methods for Data Integration

Reasons for integrating information in a watershed:

1. **Find areas within the watershed that are likely to be in worse overall condition than other areas because of a combination of different activities located there (watershed-specific)**

2. **Give a relative ranking for a watershed compared to other watersheds to aid in regional prioritization**

3. **Investigate possible causes of measured impacts in the watershed**

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Types of Integrated Approaches

1. **Team Mental Integration – Watershed team reviews the data and uses best professional judgment to assess impacts and management actions**

2. **The Stressor Identification Approach (USEPA) – Team reviews a series of questions about data on each of the conditions evaluated. Depending on the answers to the questions, factors related to the condition can be identified**

3. **Ecosystem Management – Knowledge Based Models that look at interactions among components**

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Example 1: Watershed Vulnerability Analysis

Center for Watershed Protection

Ellicott City Maryland, 2002

Overview

Compares subwatershed quality across the watershed and yields four primary outcomes:

1. Subwatershed classification, which is used to develop specific management criteria for each subwatershed class
2. An effective framework to organize and integrate mapping and monitoring data
3. A rapid forecast of which subwatersheds are most vulnerable to future watershed growth and need planning
4. A priority ranking identifying subwatershed that merit prompt restoration actions

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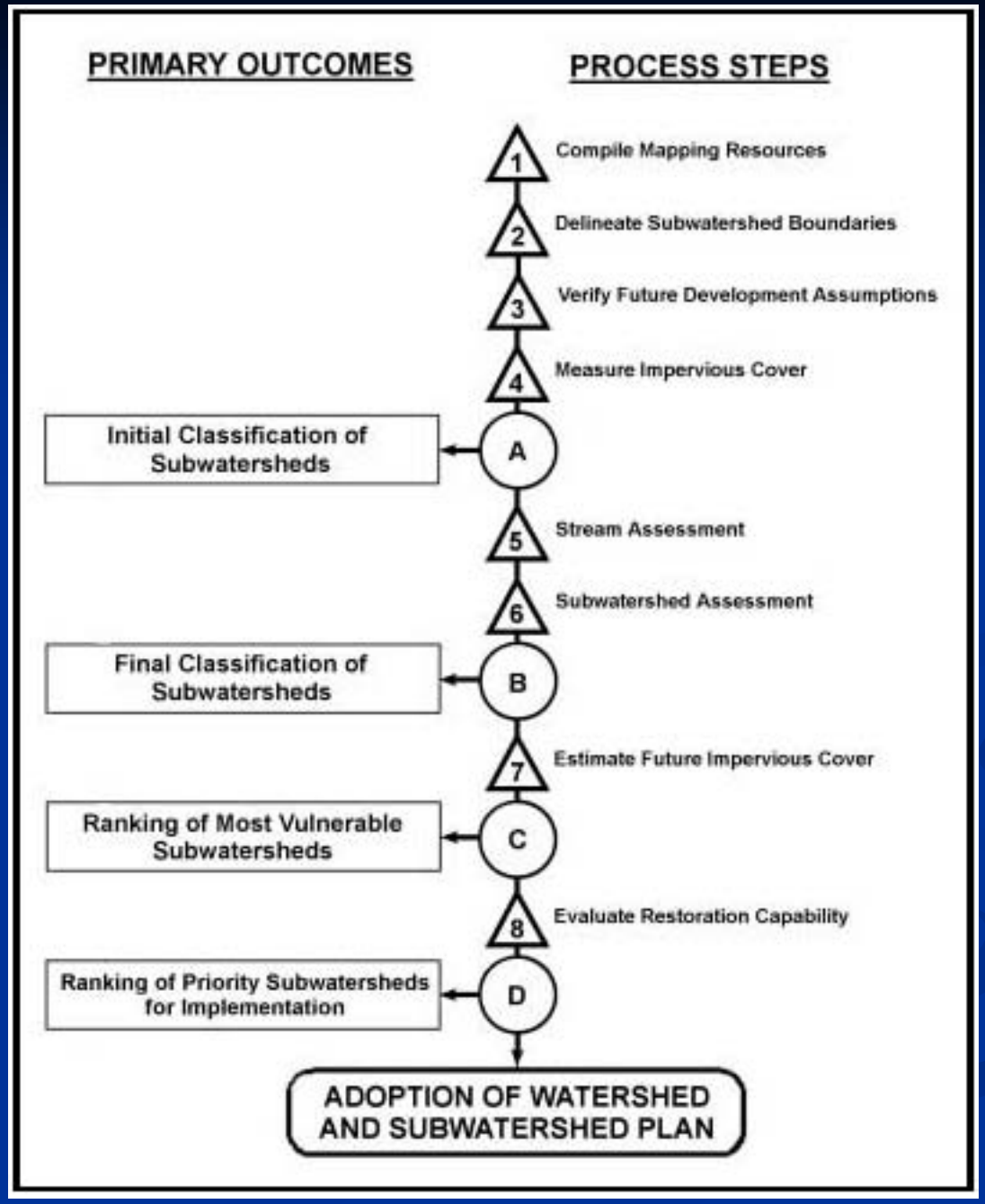

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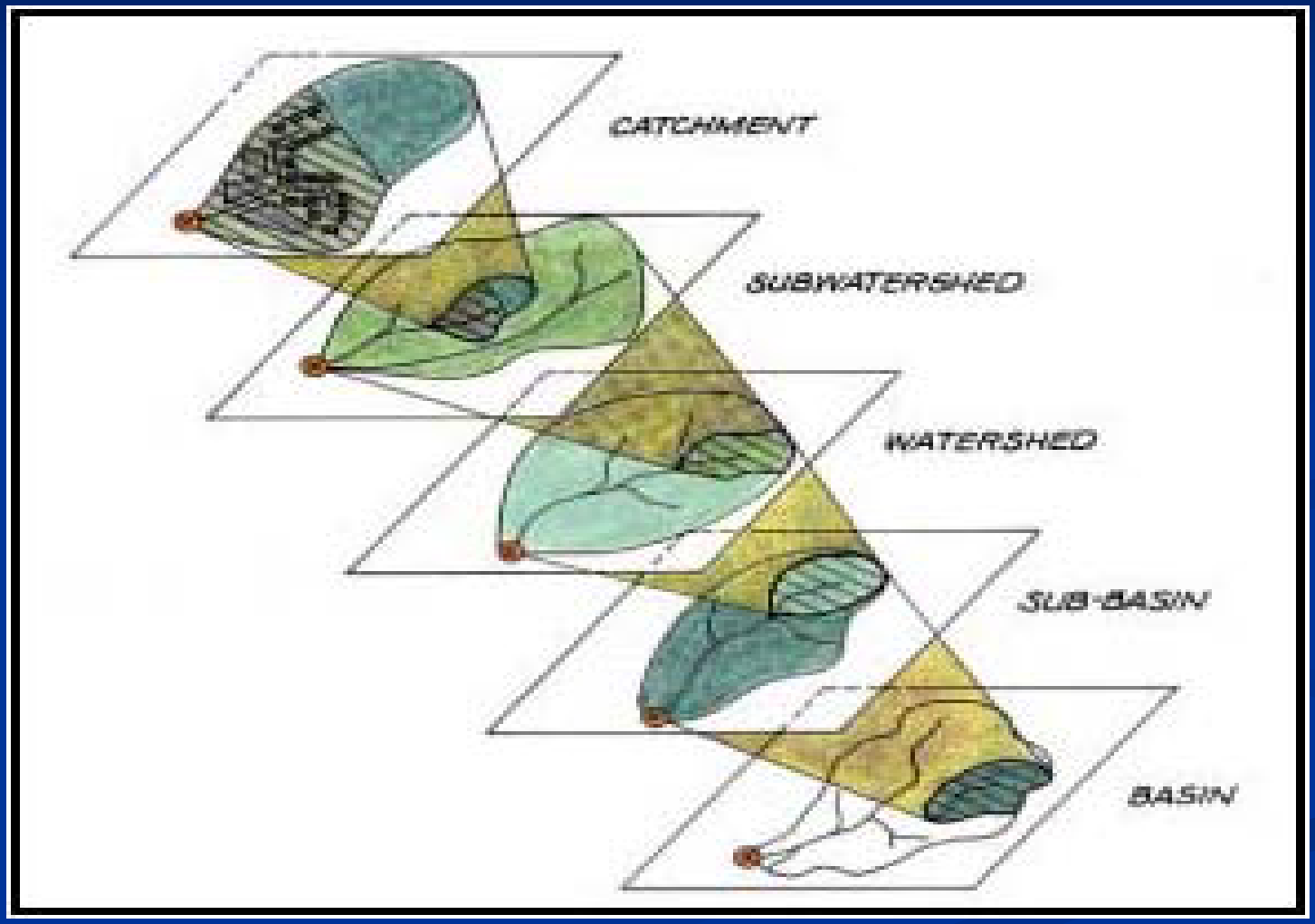
Identify Management Units



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Description of Management Units

Watershed Management Unit	Typical Area (square miles)	Influence of Impervious Cover	Sample Measurement Measures
Catchment	0.05 to 0.5	Very Strong	Storm water management and site design
Subwatershed	0.5 to 30	Strong	Stream classification and management
Watershed	30 to 100	Moderate	Watershed-based zoning
Sub-basin	100 to 1,000	Weak	Basin planning
Basin	1,000 to 10,000	Very Weak	Basin planning

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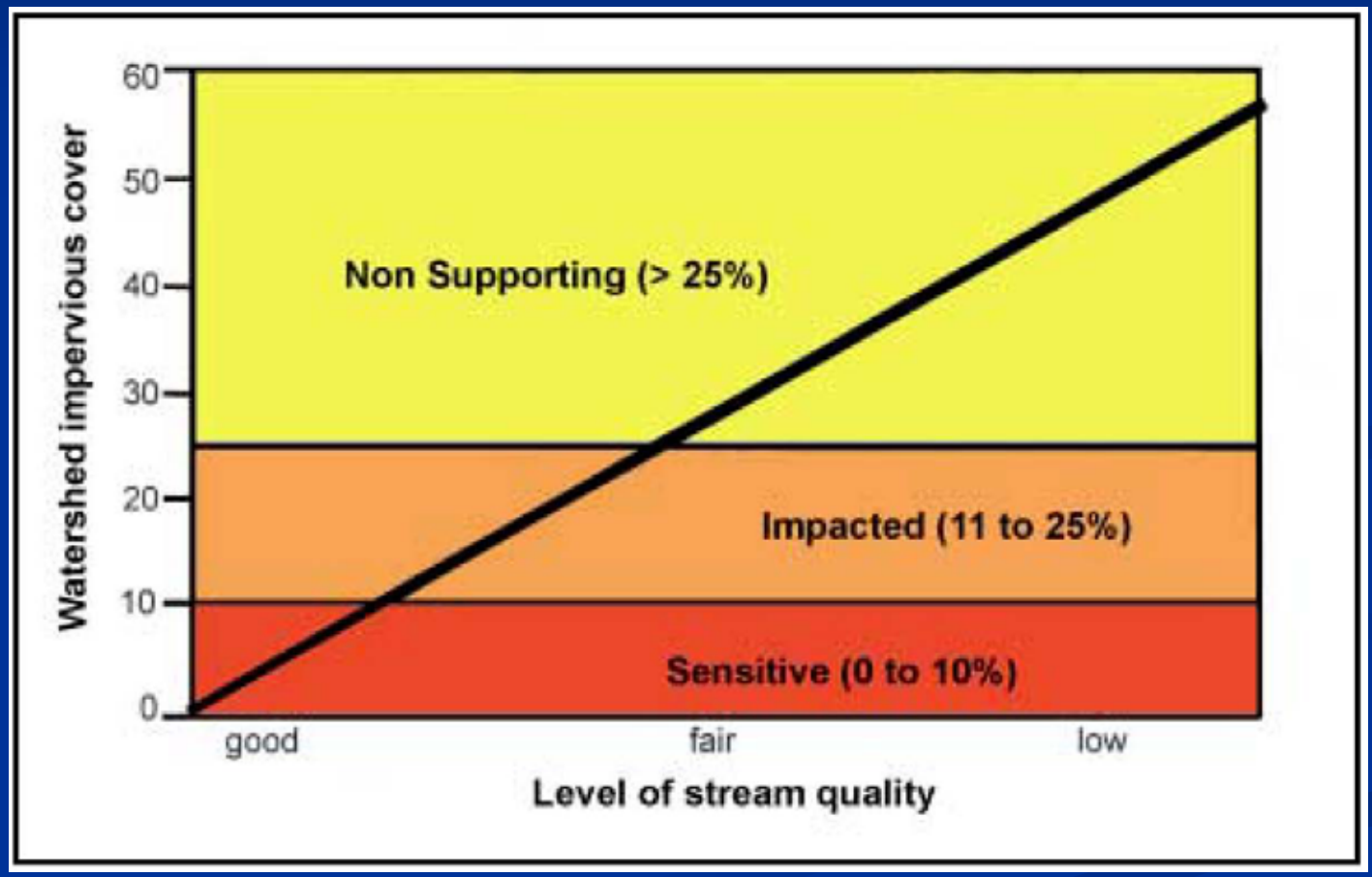
The Impervious Cover Model



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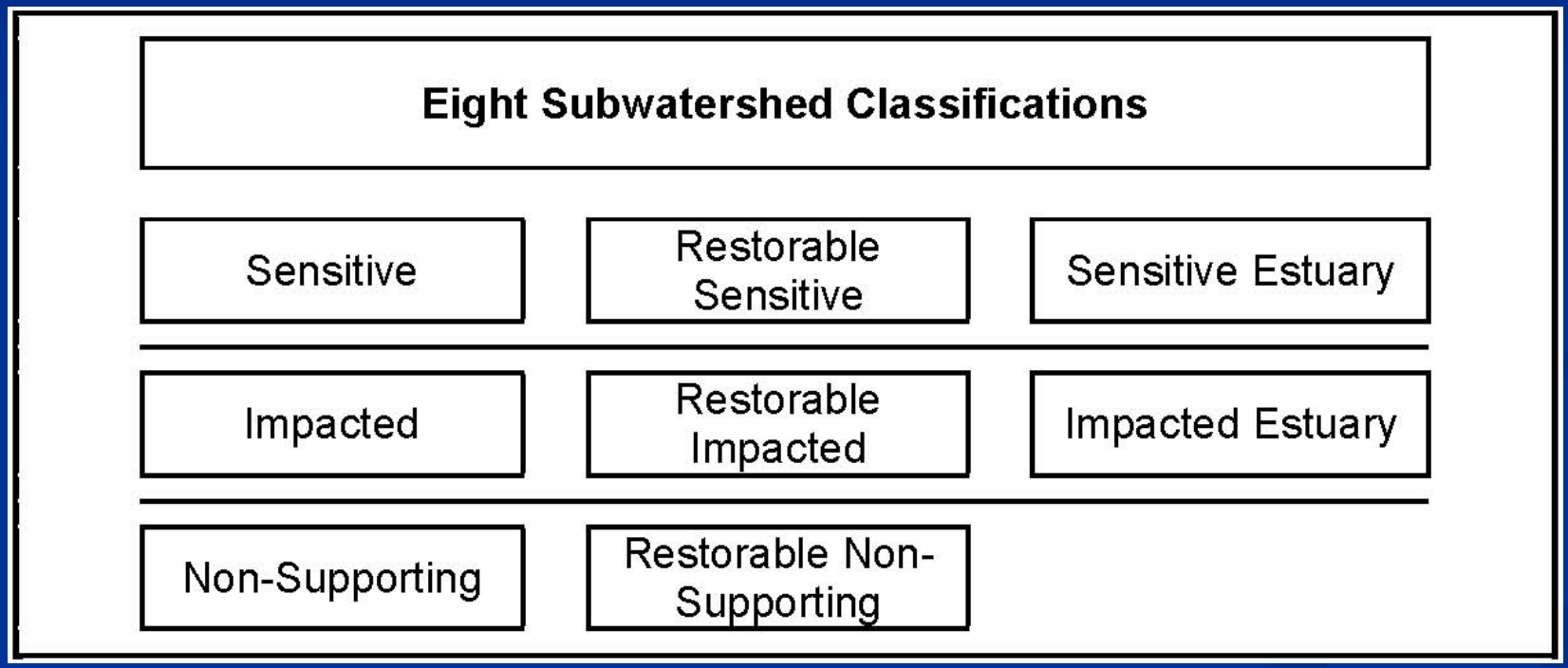
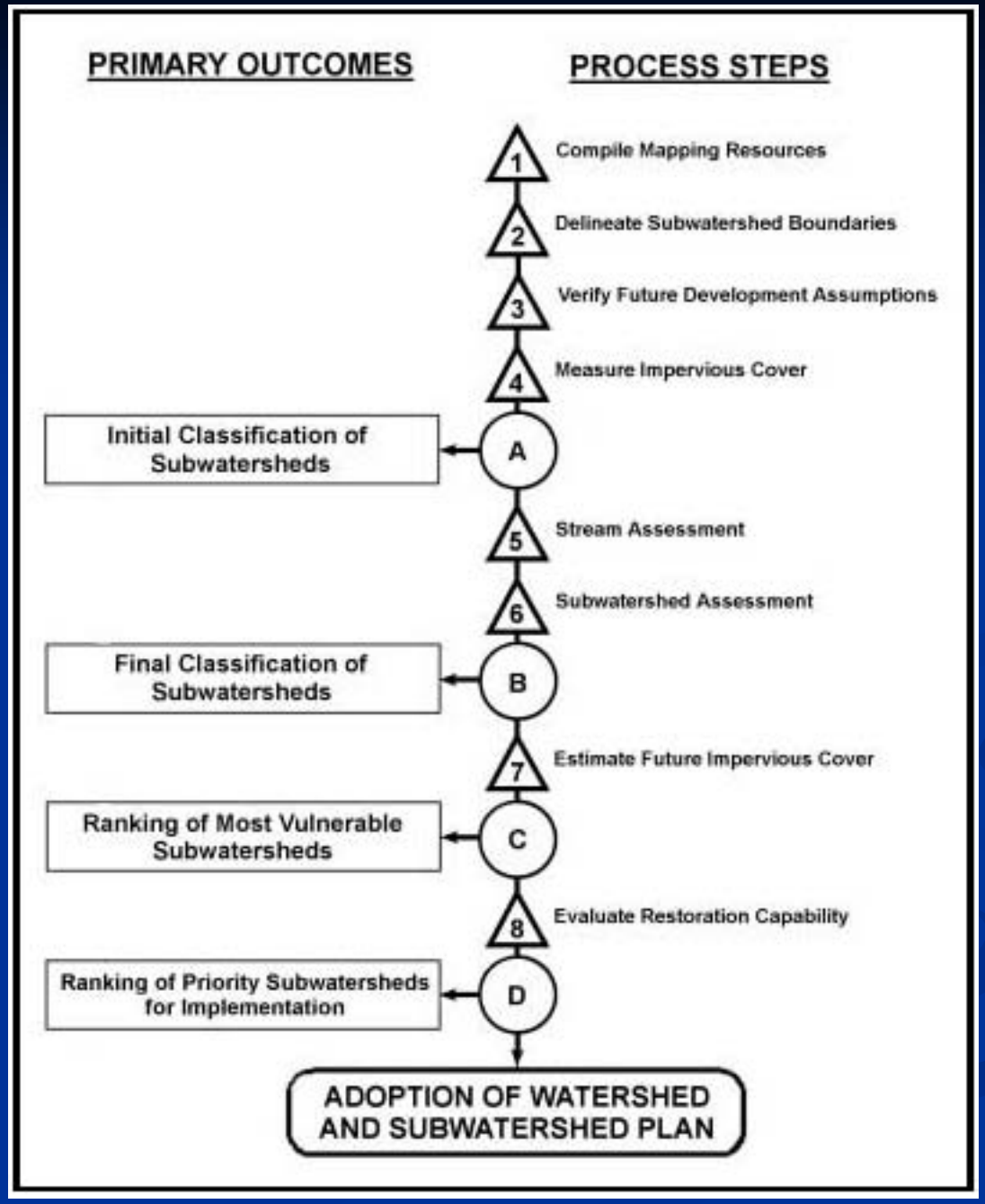
Example of Subwatershed Classification Scheme





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Example 2: Assessment of Stream Ecosystem Functions for the Coyote Creek Watershed

Santa Clara Valley Urban Runoff Pollution Prevention Program

Santa Clara Valley, 2003

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Overview

Focuses on stream ecosystem function (Hydrogeomorphic Approach – HGM)

1. Stream reaches classified using factors related to geomorphology and urbanization

2. Assesses capacities of reaches to support four physical ecosystem functions:
   - Hydrologic processes and channel dynamics
   - Aquatic habitat
   - Riparian habitat and
   - Landscape level connectivity

3. Water quality used to "assist" in interpreting results

4. Future capacities were assessed by estimating relative positive and negative impacts

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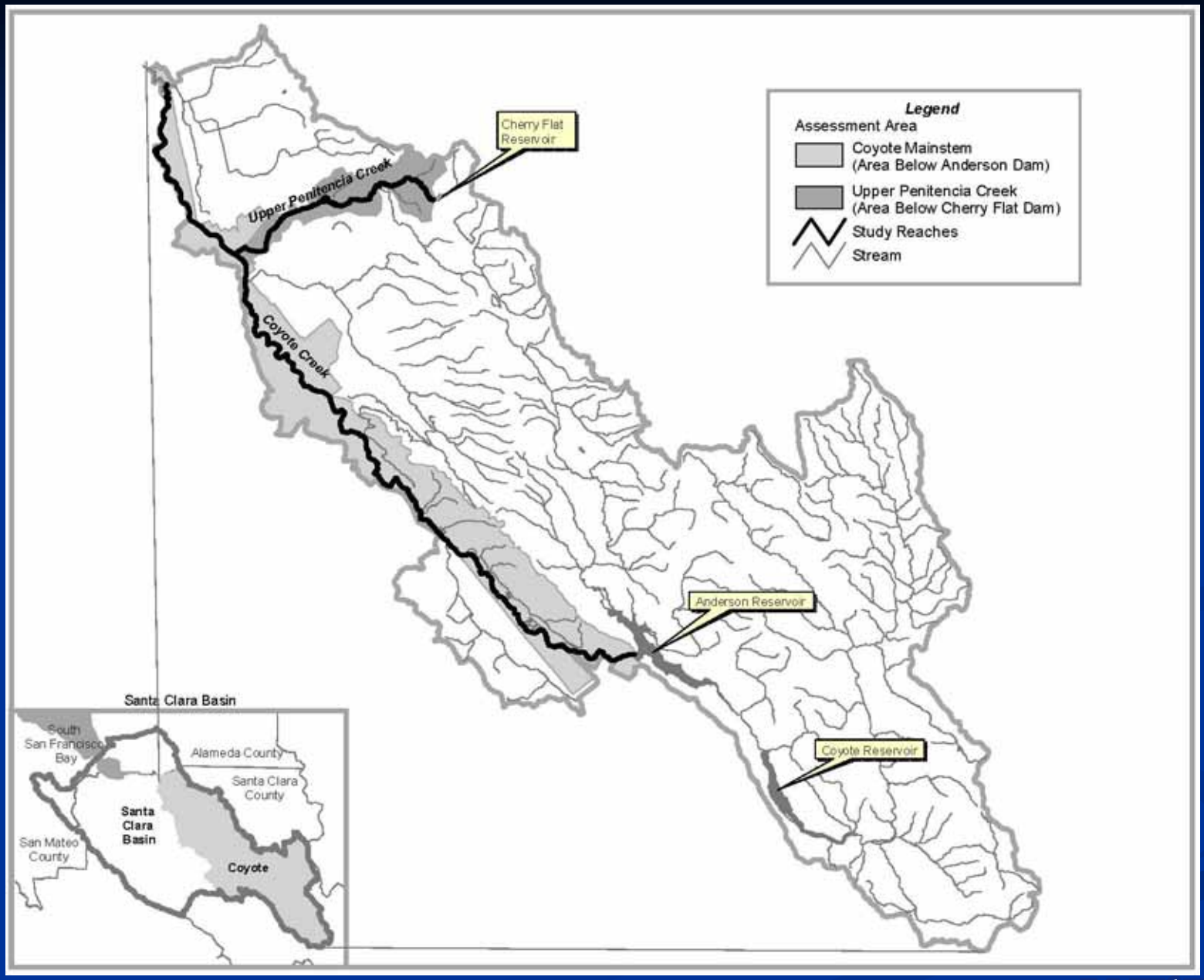

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Ranking of Model Variables

- **Definition:** Description of variable
- **Rational for Selecting the Variable:** why variable is important in the assessment
- **Measurement Protocol:** Measures used to assess the variable
- **Scaling Rationale:** Criteria used to develop the index with the appropriate scale

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Example of Model Input Variable – Land Use

Model Variable: Predominant Land Use (V_{LU})	
Measurement or Condition	**Index**
A. Percent imperviousness in drainage basin < 2%. **and/or** B. Land in natural state, not altered by human activities, including grazing and road crossings	1.0
A. Percent imperviousness in drainage basin 2 - 9% **and/or** B. Rural Residential and/or agriculture, grazing and road crossings	0.50
A. Percent imperviousness in drainage basin 10 - 19% **and/or** B. Moderate urbanization	0.1
A. Percent imperviousness in drainage basin ≥ 20% **and/or** B. Heavily urbanized	0.0

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Biological Metrics - Macroinvertebrates

BMI Metric	Description	Response to Impairment
Richness Measures		
1. Taxonomic Richness	Total number of individual taxa.	Decrease
2. EPT Taxa	Number of taxa in the orders Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly)	Decrease
Composition Measures		
3. EPT Index	Percent composition of mayfly, stonefly and caddisfly larvae.	Decrease
4. Shannon Diversity Index	General measure of sample diversity that incorporates richness and evenness (Shannon and Weaver 1963)	Decrease
Tolerance/Intolerance Measures		
5. Percent Dominant Taxon	The highest percentage of organisms represented by one taxon.	Increase
6. Percent Intolerant Organisms	Percentage of organisms that are highly intolerant to water and/ or habitat quality impairment as indicated by Tolerance Values equal to or less than 3.	Decrease
7. Percent Tolerant Organisms	Percentage of organisms that are highly tolerant to water and/ or habitat quality impairment as indicated by Tolerance Values equal to or greater than 7.	Increase
Functional Feeding Groups (FFG)		
8. Percent Collectors	Percent of macroinvertebrates that collect or gather material	Increase
9. Percent Filterers	Percent of macroinvertebrates that filter suspended material from the water column	Increase
10. Percent Shredders	Percent of macroinvertebrates that shred leaf litter	Decrease

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Example of Model Results

Study Reach Measurement type	1	2	3	4	5	6	7	8	9	10	1
Hydrologic Process/Channel Dynamics											
Alterations to Hydro-regime		0.5	0.5	0.5	0.5	0.1	0.1	0.5	0.1	0.5	0
Floodplain Access		0.1	0.1	0.1	0.5	0.5	0.5	1	0.5	1	
Channel Modification		0.5	0.5	0.5	1.0	1.0	0.1	1.0	0.1	1.0	1
% Sand/fines substrate		0.1	0	0	0.1	0.5	0.5	0.5	0.5	0.5	0
% Pools > 26% embedded		0.1	0.5	0.1	0.1	0.5	0.5	0.1	0.5	0.5	0
Cumulative % imperviousness		0.0	0.0	0.0	0.1	0.1	0.5	0.5	0.5	0.5	0
Riparian Habitat											
% Canopy Cover		0.5	0.5	1	1	0.5	0.1	0.5	0.1	0.5	
% Length continuous riparian		0.5	0.5	0.5	0.5	0.1	0.1	1	0.1	1	0
% Bank Vegetated		0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0
Aquatic Habitat											
% Large Woody Debris		0.5	0.5	1	0.5	0.5	0.5	0.5	0	0.5	0
% Rootwad		0.5	0	0.1	0.1	0.1	0	0.5	0.5	1	0
% Terrestrial Vegetation		0.5	0.1	0.1	0.5	0.5	0.5	0.5	0.5	0.1	0
% Aquatic Vegetation		0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0
% Undercut banks		0.5	0	0.1	1	0.5	0	0.5	0	0.1	0
% Boulder/Cobble		0.5	0.1	0.5	0.5	0.5	1	0.5	0.5	0.5	
% Gravels		0.1	0	0	0	0.1	0.1	0.5	0.5	0.5	0
% Spawn gravel > 26% embedded		0.5	0	0	0	1	1	0.5	1	1	0
% Juvenile area		0	0.1	0.1	0.1	0.1	0.1	0.5	1	1	
Landscape Connectivity											
Migration barriers	1.00	0.25	1.00	1.00	0.25	0.25	0.25	0.25	0.25	1.00	0
Reach Scores											
Hydrologic Process/Channel Dynamics	ND	0.31	0.41	0.38	0.53	0.46	0.33	0.61	0.33	0.64	0
Riparian Habitat	ND	0.58	0.75	0.75	0.75	0.52	0.30	0.67	0.23	0.67	0
Aquatic Habitat	ND	0.26	0.20	0.28	0.24	0.41	0.41	0.46	0.53	0.64	0
Landscape Connectivity	1.00	0.25	1.00	1.00	0.25	0.25	0.25	0.25	0.25	1.00	0

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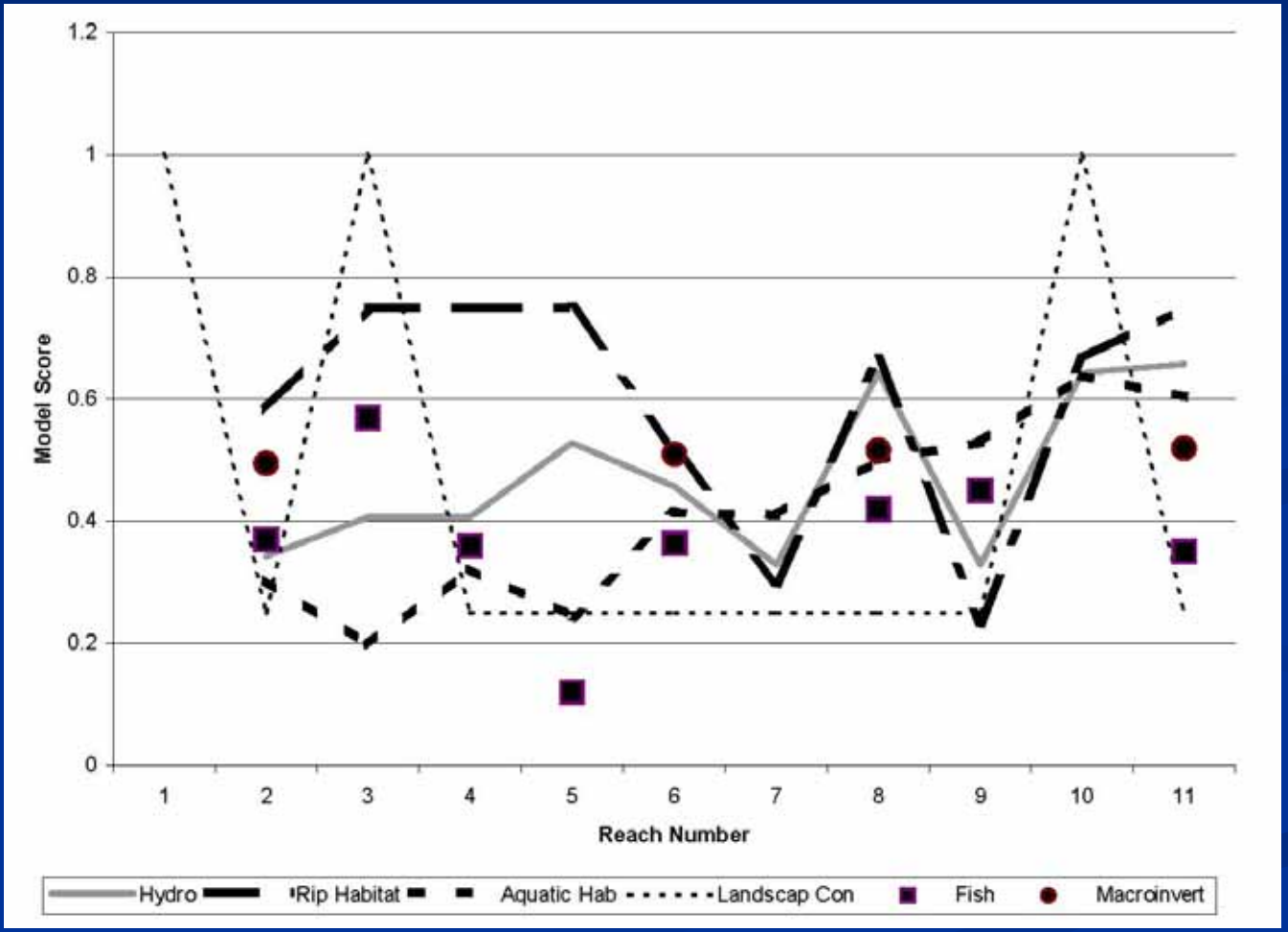
Stream Ecosystem Function Capacities



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Final Assessment – Interpretation of the Results by Reach

- Hydrologic processes and channel dynamics
- Riparian habitat condition
- Aquatic habitat condition
- Landscape connectivity
- Water quality
- Fish community
- Macroinvertebrate community

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Final Assessment and Recommendations

Ecosystem Function Score	Hydrologic Processes	Riparian Habitat	Aquatic Habitat	Landscape Connectivity	Fisheries Community	Macroinvertebrate Community
Existing	⊙	●	⊙	★	⊙	ND
Future	⊙	●	○	★	⊙	ND
Potential	⊙	●	⊙	★	◑	ND

- Provides a tabular summary ranking of functional capacity from low to high
- Identifies potential management actions based on existing data
- Identifies needed monitoring Activities to fill data gaps
- Identifies predicted impacts from future actions

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Example 3: Regional Monitoring of Southern California's Coastal Watersheds

- SCCWRP, 2007

Overview

- Goal is to provide a large-scale, regional monitoring program of southern California's streams and rivers
- Motivation behind the integrated regional approach comes from Storm water Monitoring Coalition and Surface Water Ambient Monitoring Program (SWAMP)
- Focus on Reference Approach for assessment
- Addresses Three Questions:

1. What is the condition of streams in southern California?
2. What are the major stressors to aquatic life?
3. Are conditions in locations of special interest getting better or worse?

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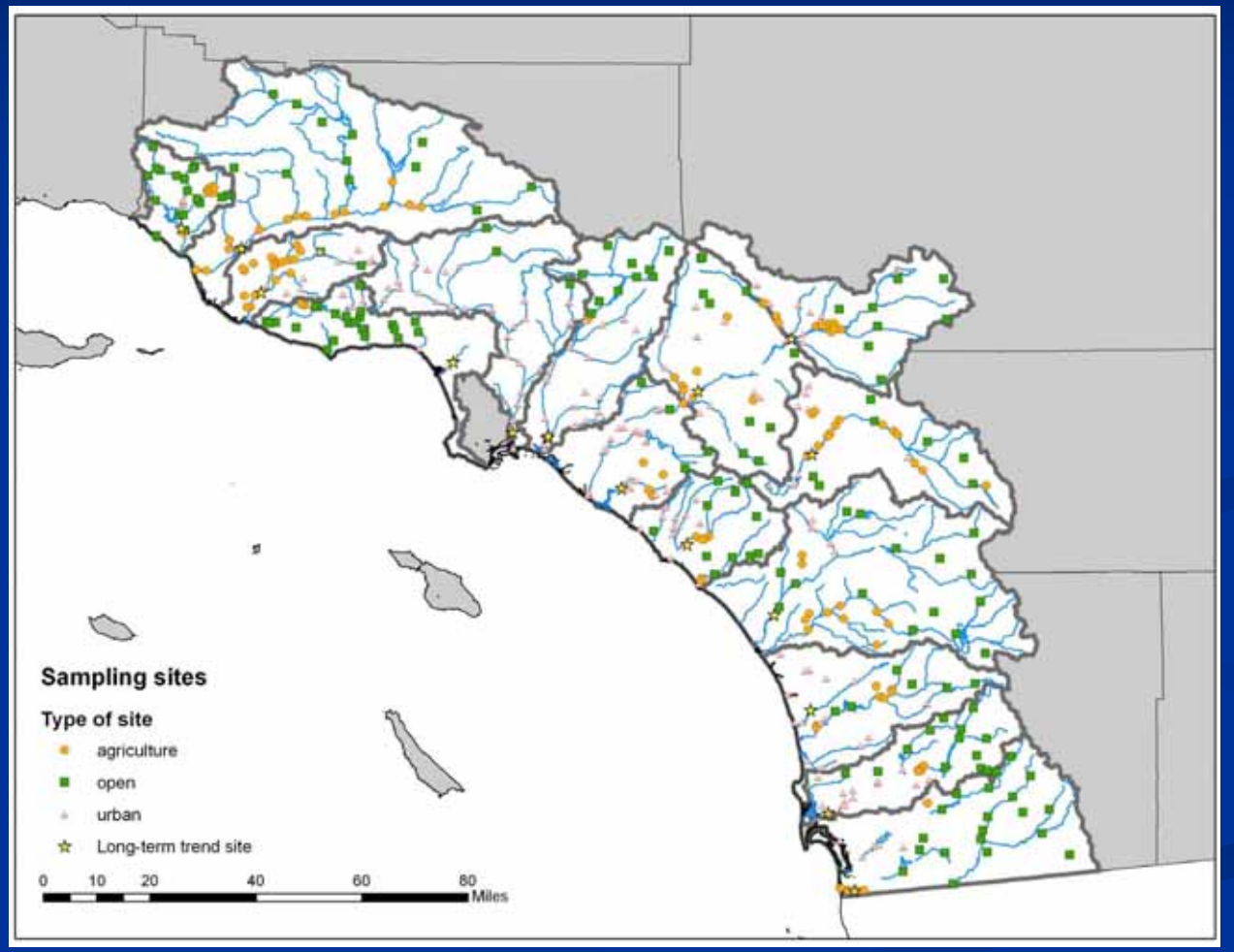
Sample Sites for the SMC Regional Watershed Monitoring Program



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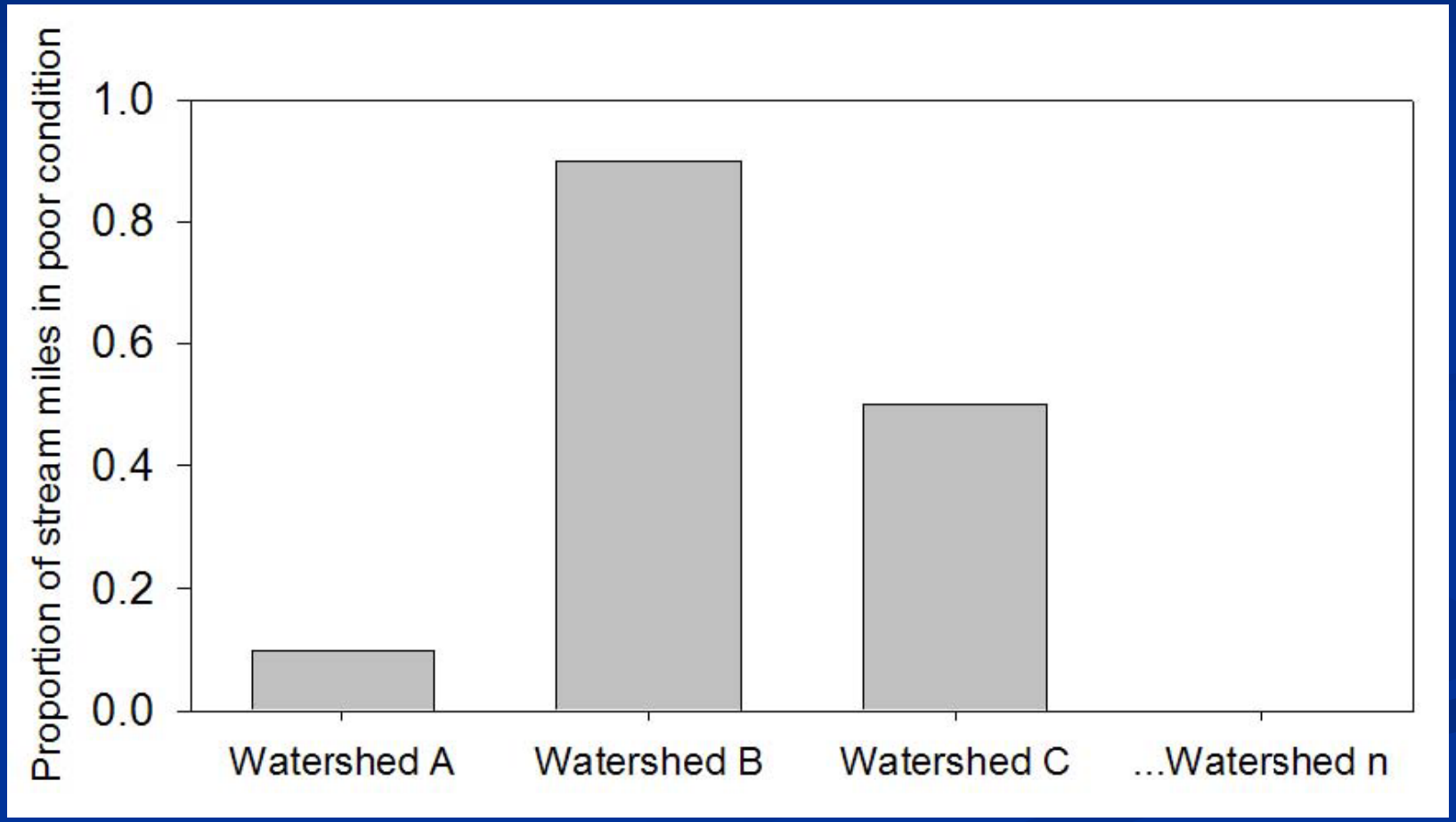
Question 1: What are the conditions of streams in Southern California?

Distribution of Degraded Stream Miles



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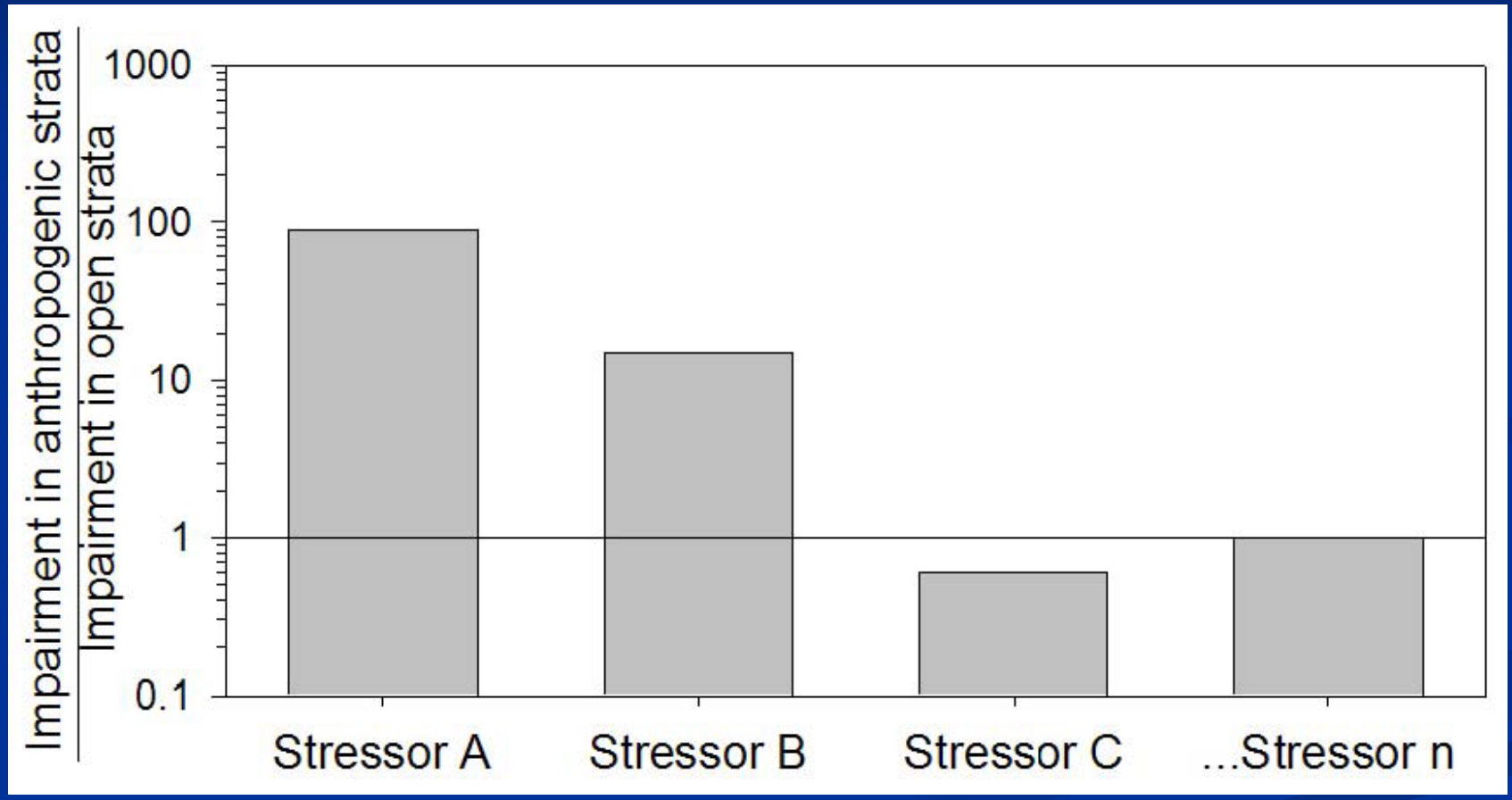
Question 2: What are the stressors to aquatic life?

Relative Risk for Stressors to an Indicator



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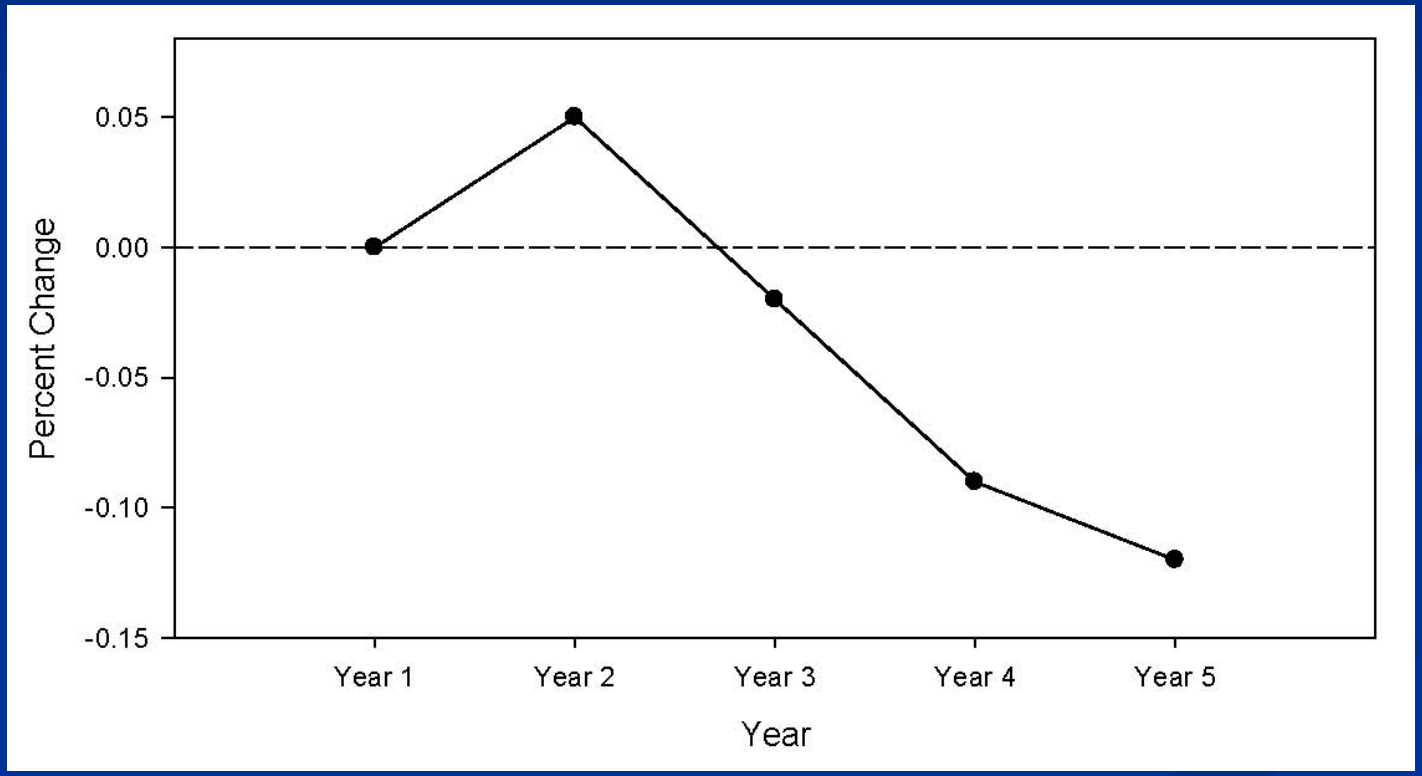
Question 3: Are conditions getting better or worse?

Trends in a Constituent Measured at a Trend Site



Summary

- Numerous types of watershed assessments are available
- There is no one best method available for all uses
- Most methods integrate several variables to arrive at the final assessment
- Assessments require interpretation
- Most effective methods are designed to meet the needs of the location and site-specific issues

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