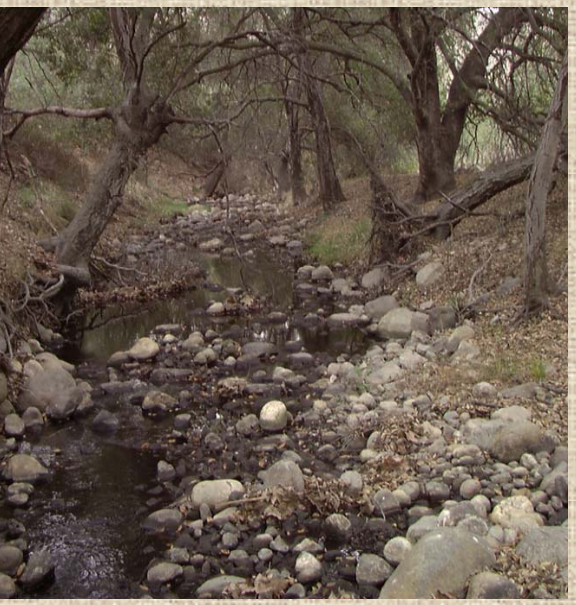
Multi-Scale Assessment of Riparian Ecosystem Integrity (MAREI) Assessment, Alternatives, and Restoration in Southern California Watersheds



Links Back to the Regulatory Process

- Establish general programmatic permits for activities regulated under the 404 Program
- Identify quantity of mitigation (simulation or actual assessment of post project conditions)
- Location of mitigation (Restoration Plan)
- Identification of Avoidance Area
- Comparison of alternatives

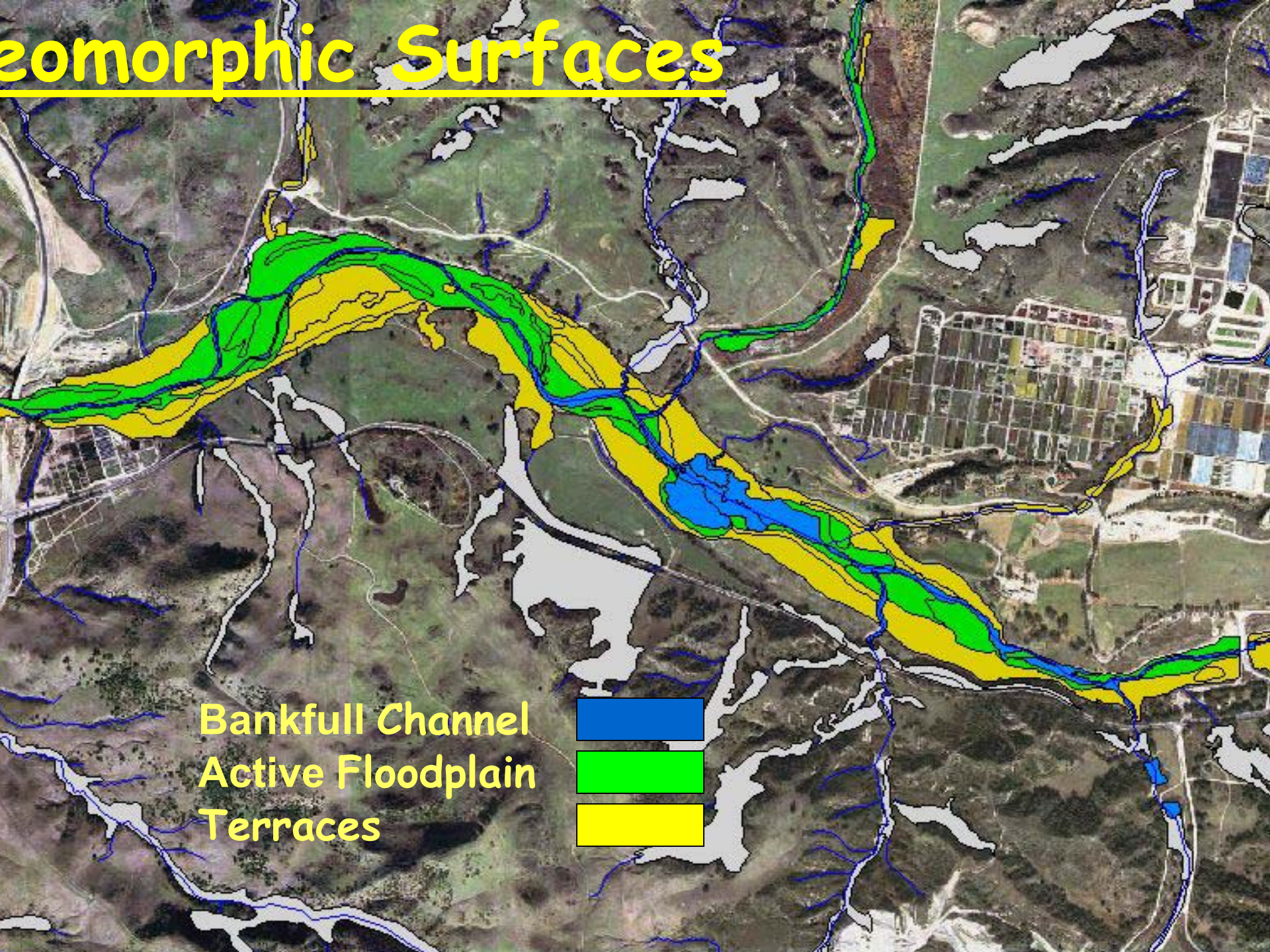
MAREI Approach

- Phase 1: Identify location of riparian ecosystems
- Phase 2: Conduct baseline assessment of hydrologic, water quality, and habitat integrity of riparian ecosystems
- Phase 3: Conduct alternatives analysis
- Phase 4: Develop a watershed restoration plan
- Phase 5: Conduct supplementary studies for indicator revision/verification/calibration

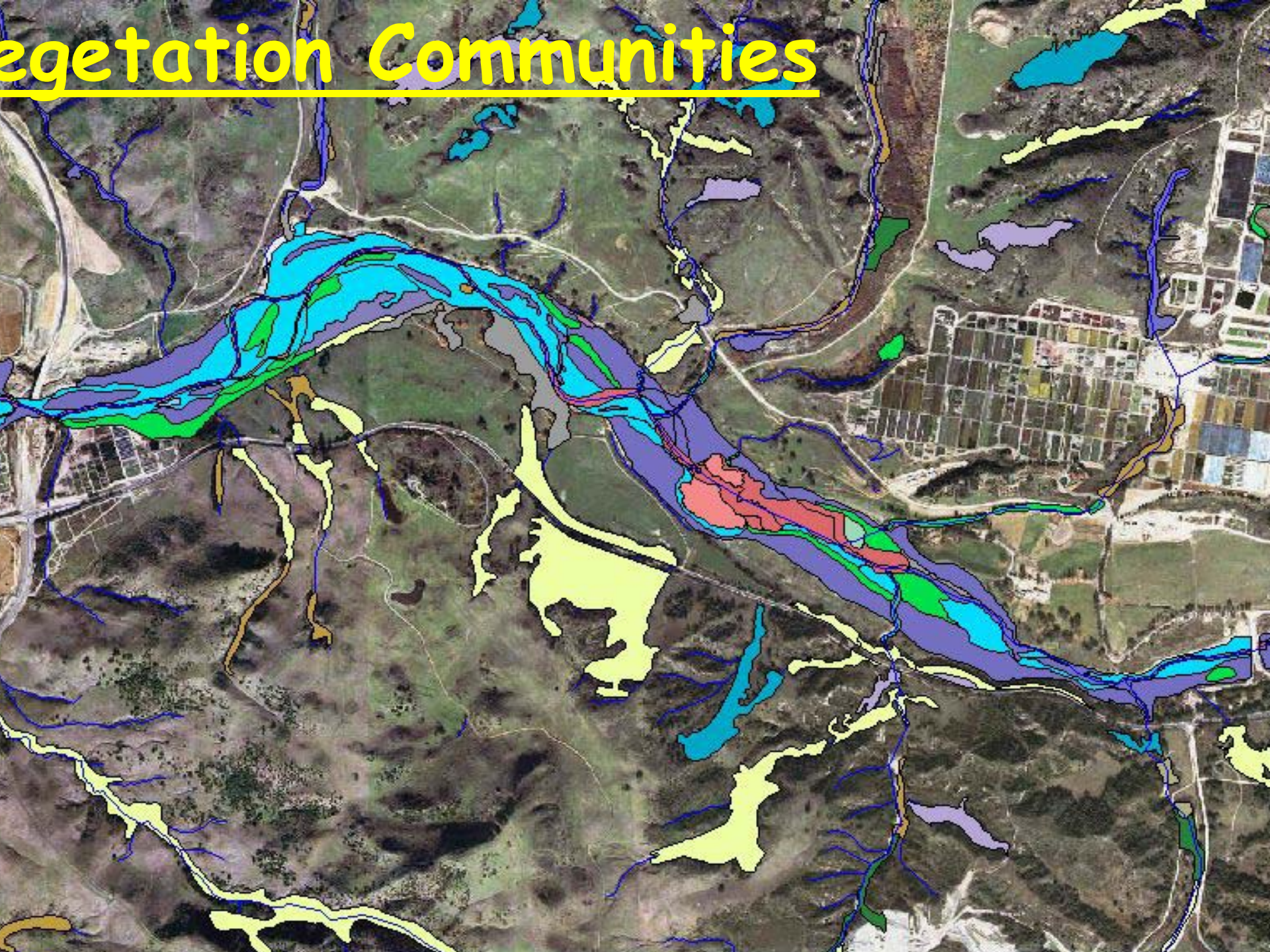
Phase 1: Identification of Riparian Ecosystems

- Planning level delineation of Waters of the United States (WoUS), aquatic resources, and riparian ecosystems (Bob Lichvar – CRREL)
  - Develop GIS coverage for WoUS and riparian ecosystems using aerial photographs and topographic maps
  - Verify with a stratified random array of field samples
  - Assign a "probability" of jurisdictional status to each mapped polygon based on federal and state criteria

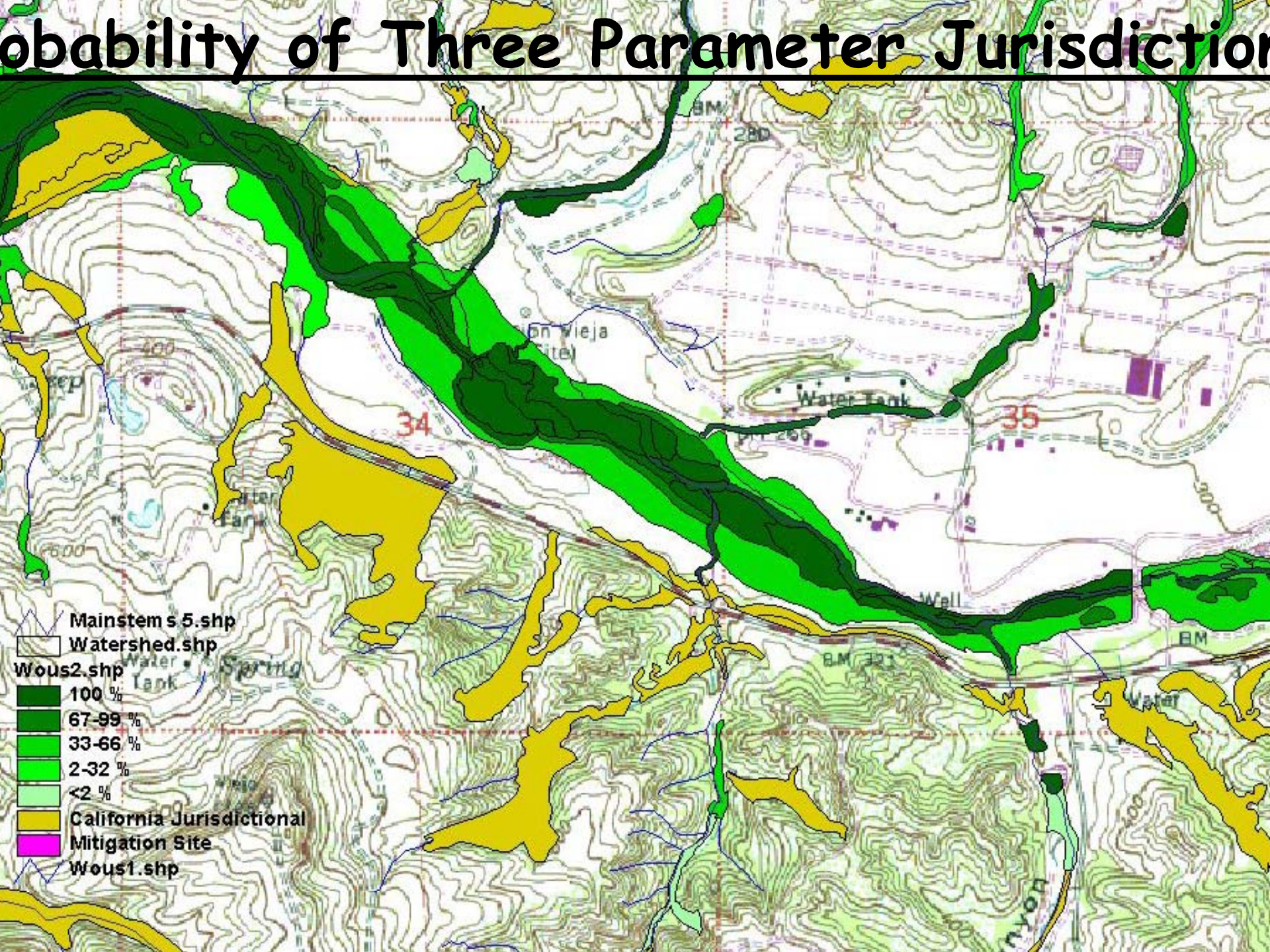
eomorphic Surfaces



egetation Communities



obability of Three Parameter Jurisdiction

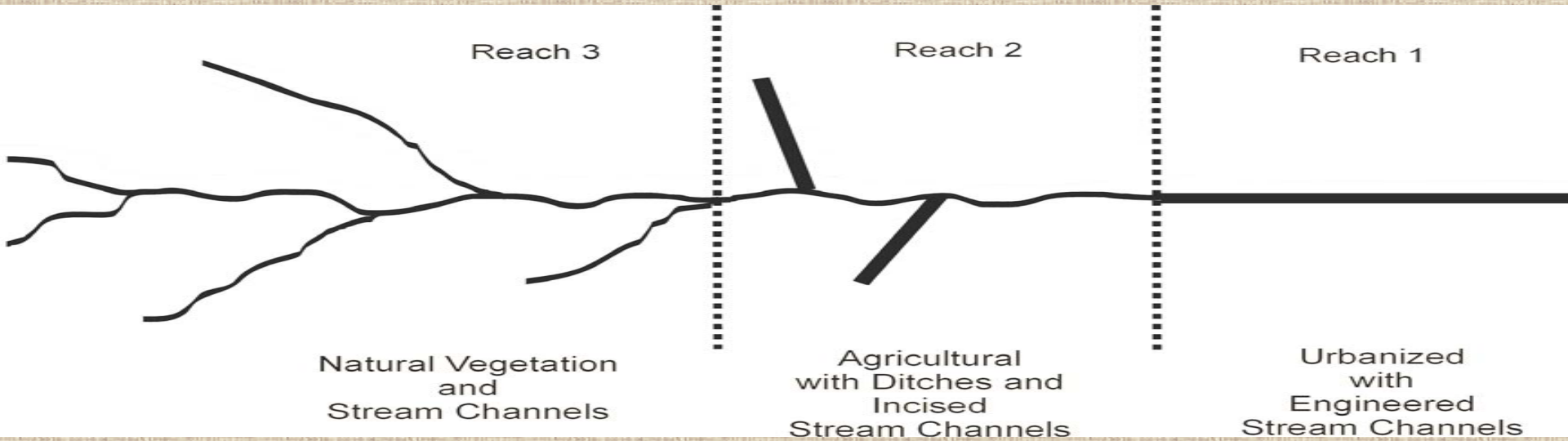


Phase 2: Baseline Assessment

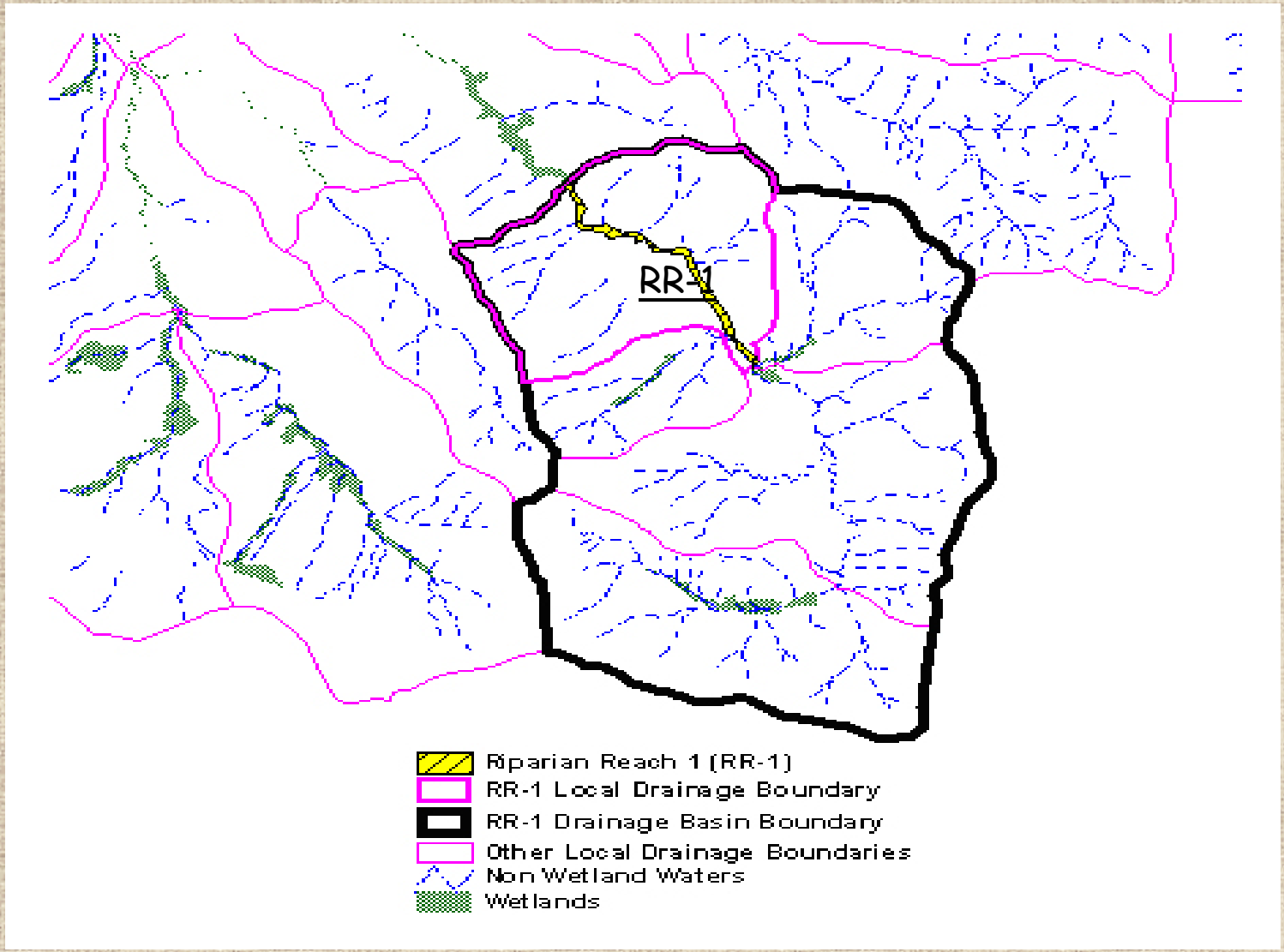
- Define riparian ecosystem assessment units
- Assess hydrologic, water quality, and habitat integrity of the riparian ecosystem units using "indicators" of across multiple spatial scales
- Calculate integrity indices and integrity units for each assessment unit

Riparian Reach Assessment Units

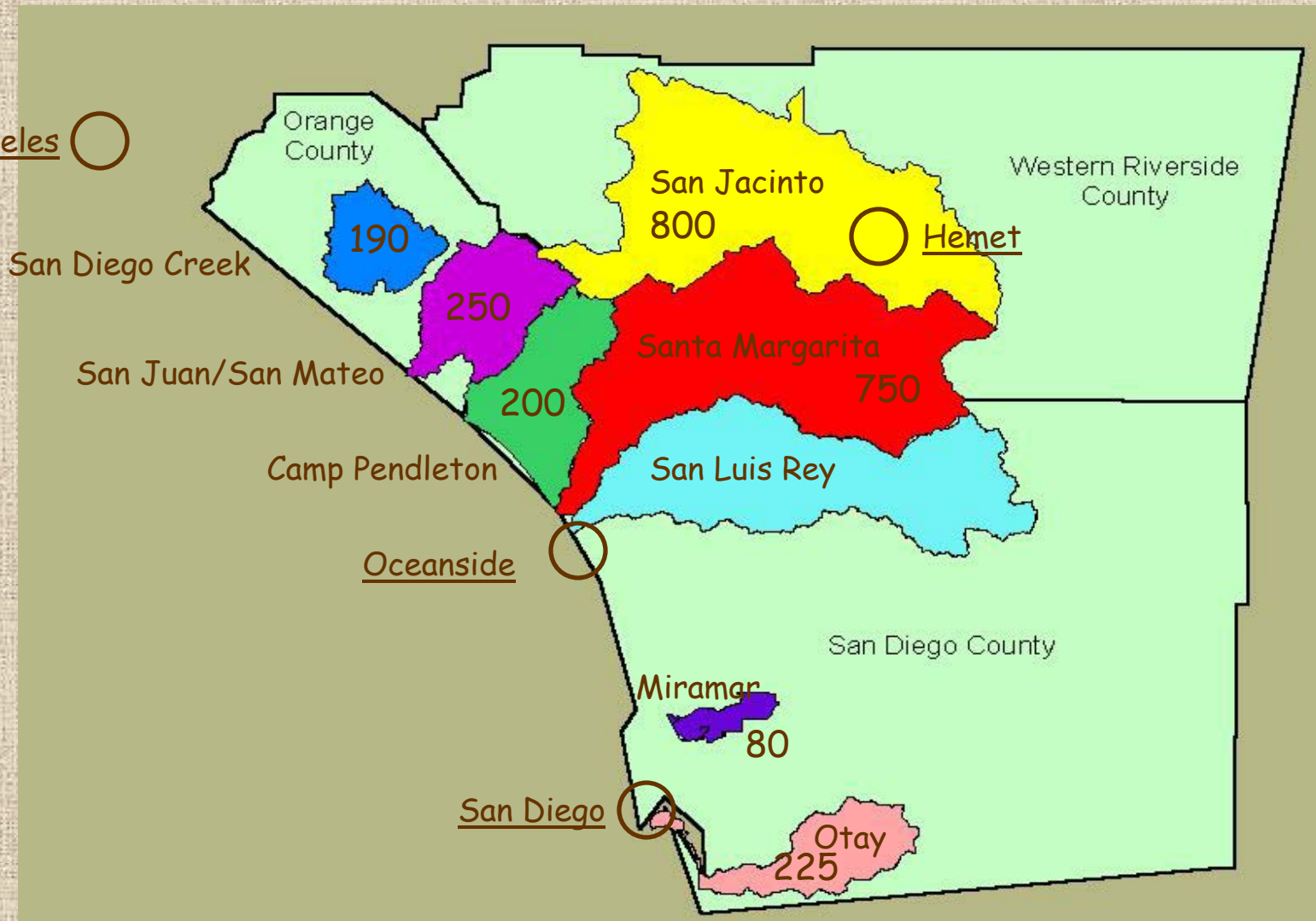
- Riparian reaches are defined as a segment of riparian ecosystem along a mainstem channel that is relatively homogeneous with respect to geology, geomorphology, stream channel geometry, substrate, and hydrologic regim vegetation communities, and cultural alteration
- Riparian reaches are initially identified remotely using aerial photos / topographic maps, and then verified / revised during field data collection



Riparian Reach Assessment Units



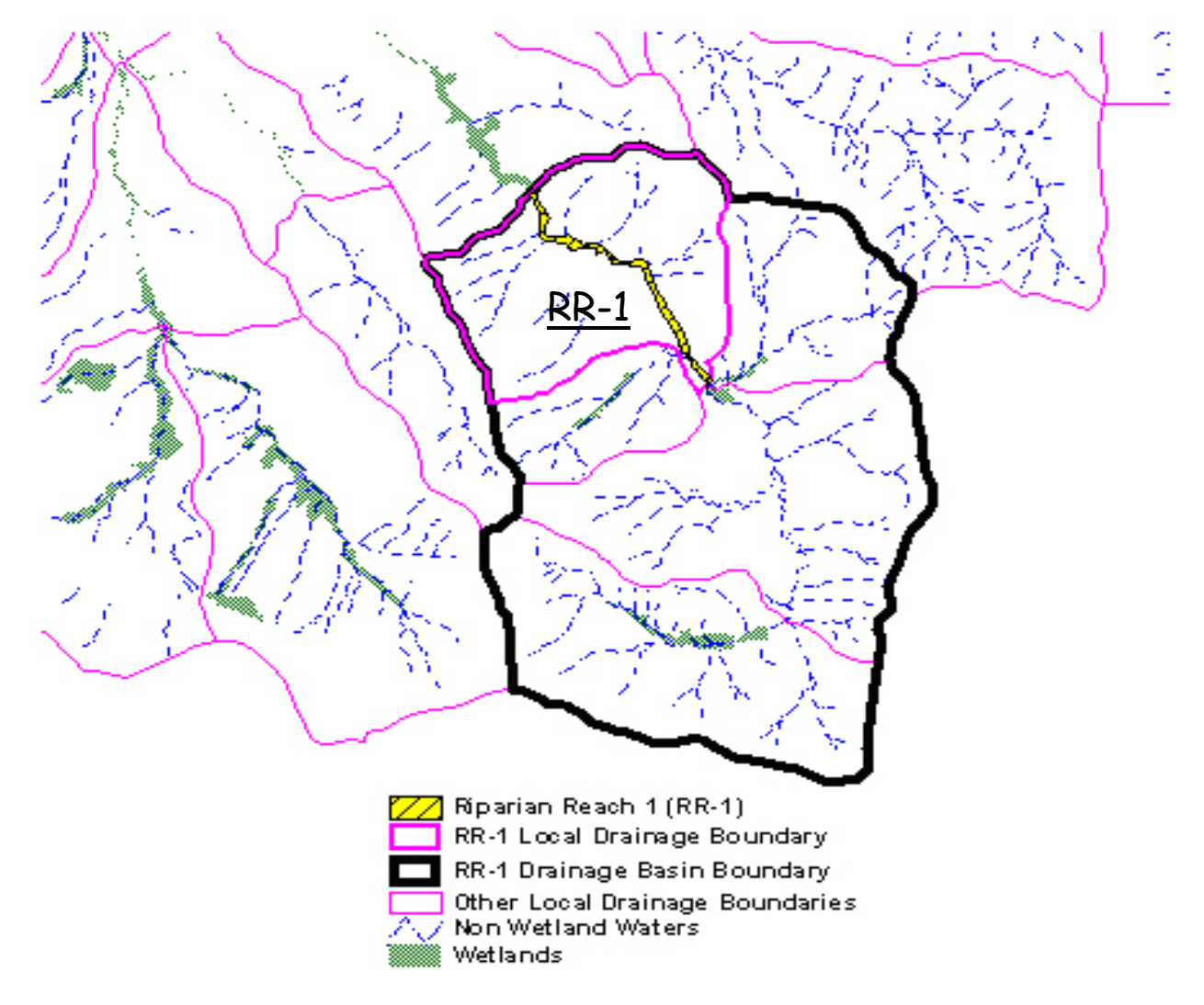
Number of Riparian Reaches



Assessment Indicators

- "Indicators" are used to assess the attributes and characteristic that influence riparian ecosystem integrity
- Indicators capture information at three spatial scales
  - Riparian reach (riparian ecosystem proper)
  - Local drainage
  - Drainage basin

Spatial Scales of Assessment



Hydrologic Indicators

Hydrologic indicators reflect:

- The frequency, magnitude, and temporal distribution of stream discharge
- Interaction between the stream channel and the floodplain

Water Quality Indicators

- Water quality indicators reflect:
  - Land use in a drainage basin with respect to the potential increase in non-point pollutants at multiple spatial scales
  - The stream delivery system in terms of magnitude, frequency, and temporal distribution
  - Hydrologic interaction between stream channel and floodplain

Habitat Indicators

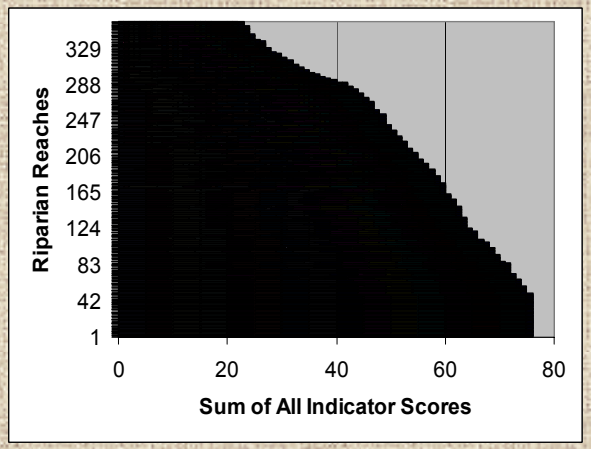
Habitat indicators reflect:

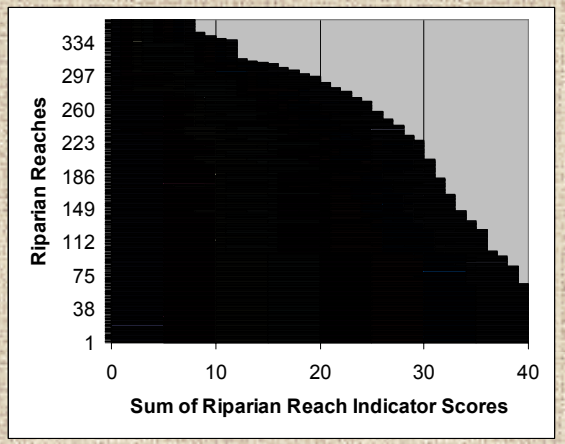
- Spatial extent and quality of riparian habitat
- "Continuity / Connectedness" of riparian habitat at multiple spatial scales
- Spatial extent and quality of adjacent non-riparian habitat (i.e., uplands)

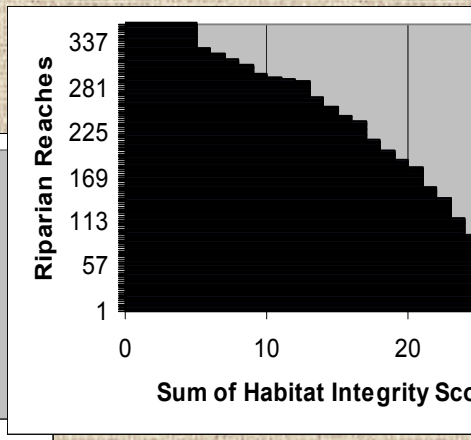
Range of Indicator Scores

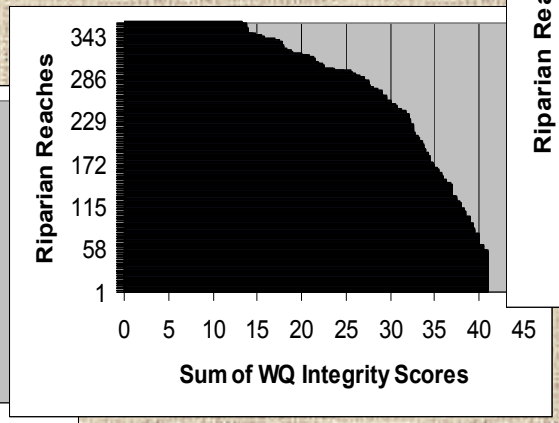
The range of scores for individual indicators and integrity indices exhibit an even distribution

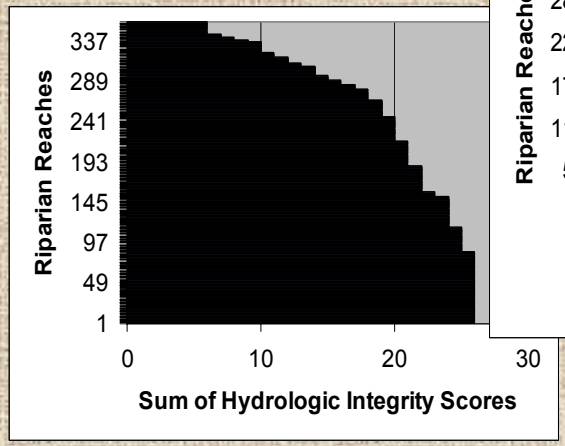
This result is consistent with the range of conditions exhibited in the watersheds



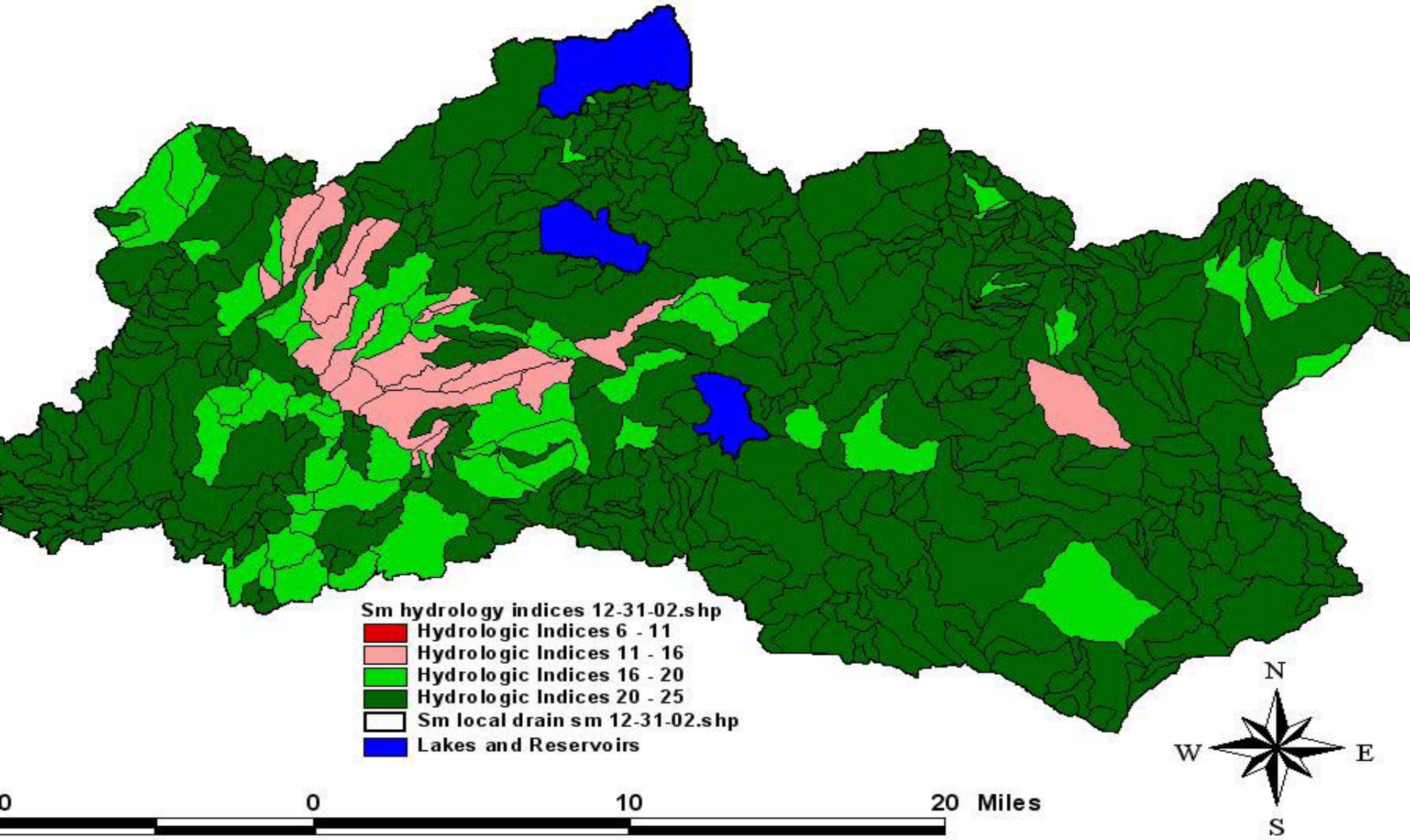




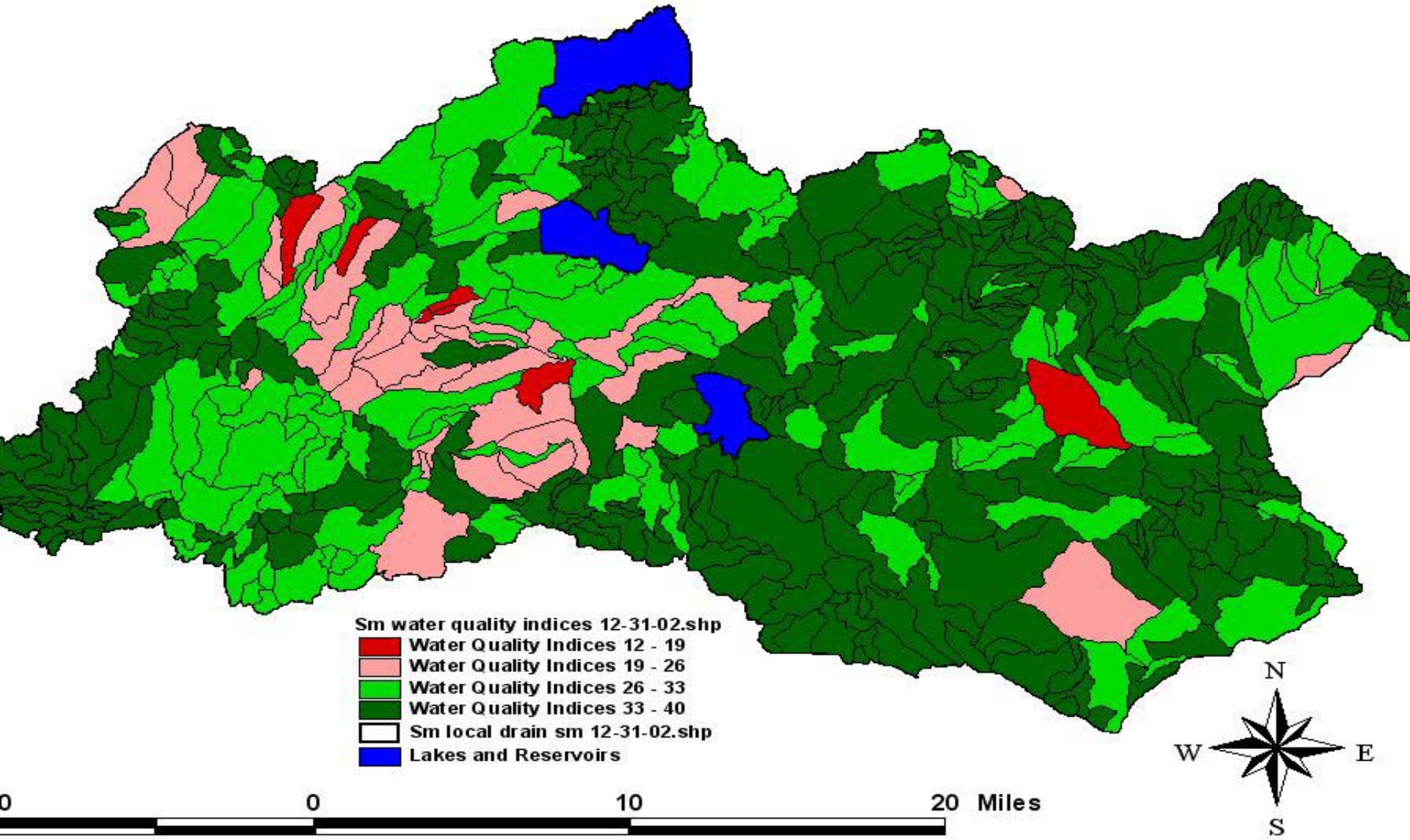




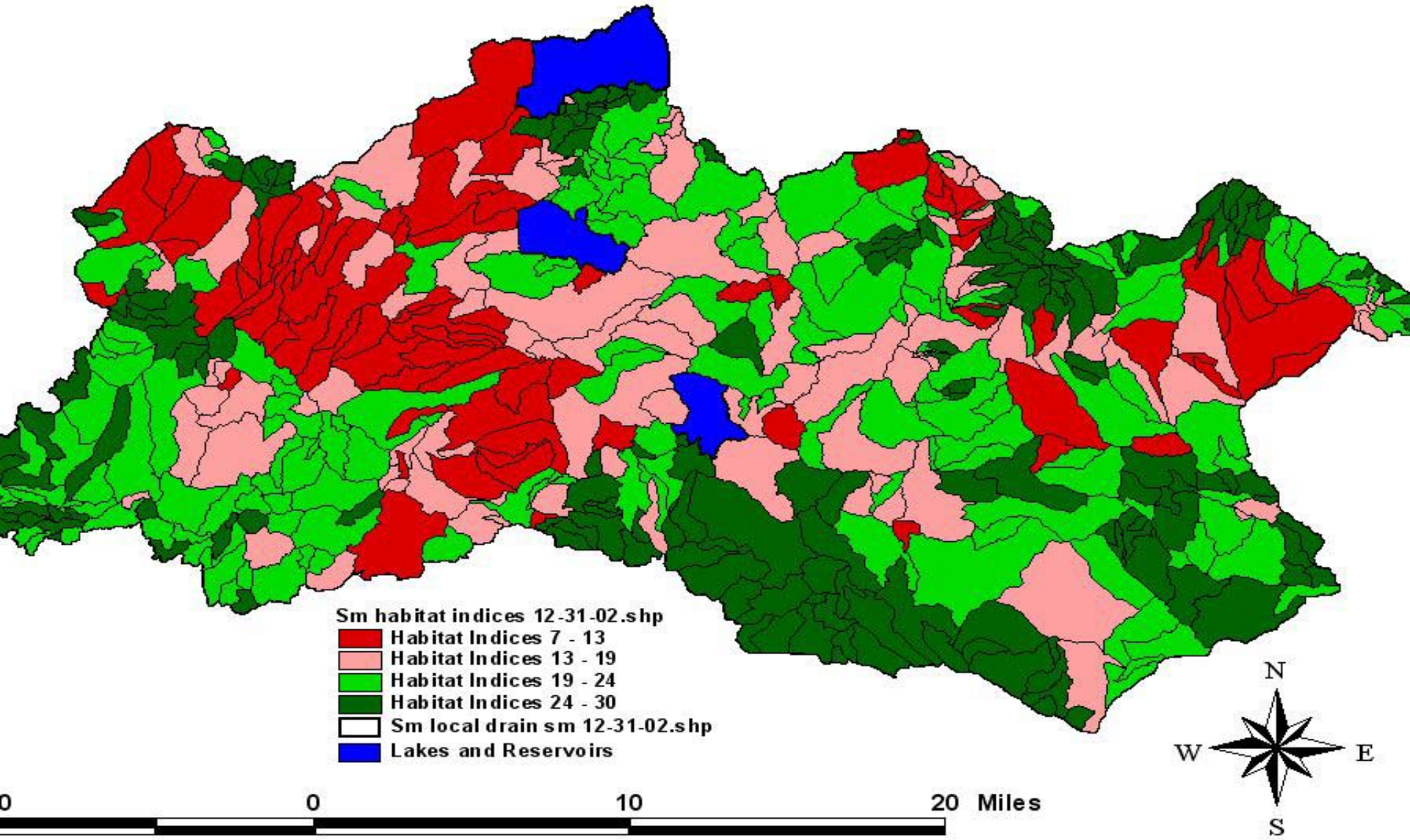
anta Margarita Watershed - Hydrologic Integrity Indice



Santa Margarita Watershed - Water Quality Integrity Indic



Santa Margarita Watershed - Habitat Integrity Indices

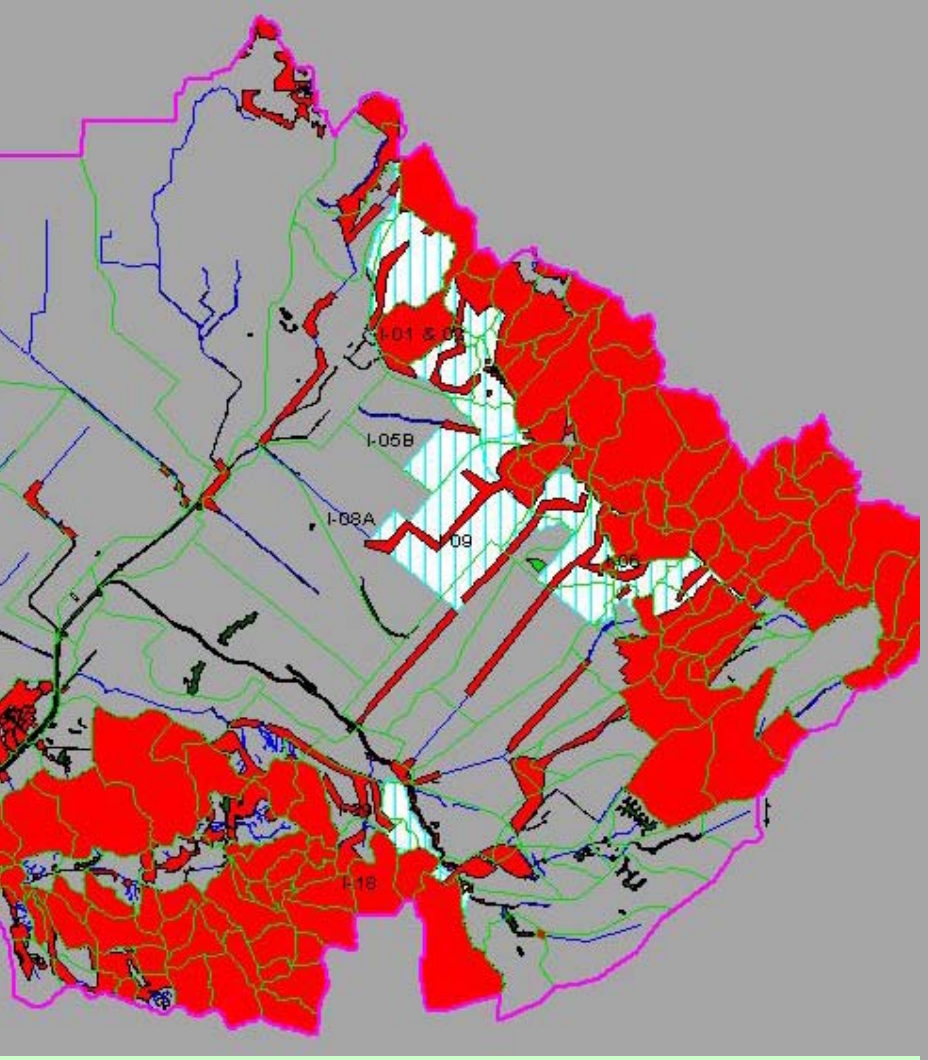


Phase 3: Alternatives Analysis

- Objective 1
  - Develop a "Prospective Aquatic Resources Conservation Area" alternative using baseline assessment results and other criteria:
    - Medium to high integrity indices
    - Headwater reaches
    - Corridors connecting existing large patches
    - Supporting threatened, endangered, or sensitive species
    - Critical habitats and management, conservation, or research reserve areas
    - Current protected NCCP Reserve System
    - Areas >15% impervious sufaces
    - Disconnected reaches in agricultural areas

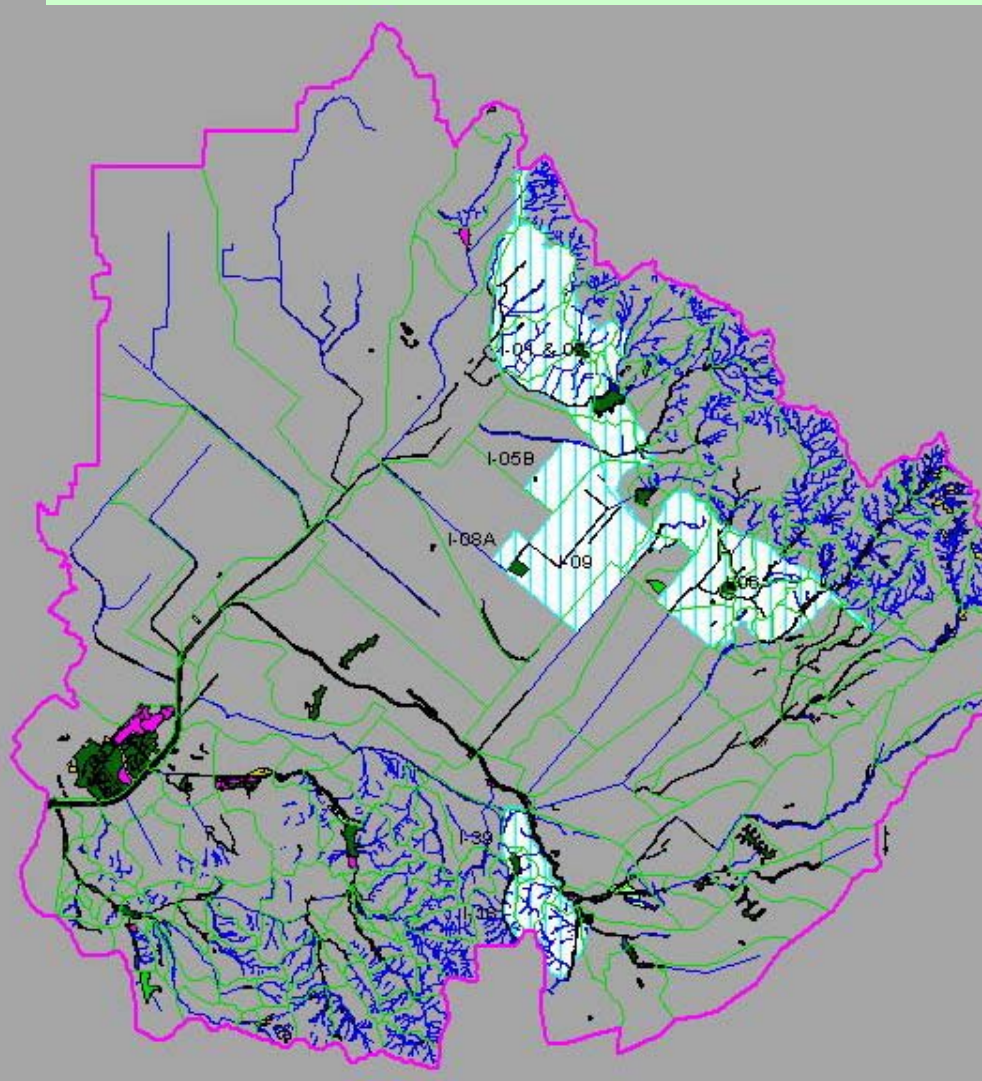
Phase 3: Alternatives Analysis

- Objective 2
  - Assess direct and indirect impacts of all alternatives
    - Simulate direct and indirect effects of each alternative on indicators
    - Recalculate integrity indices and integrity units
    - Compare baseline to simulated results using selected criteria

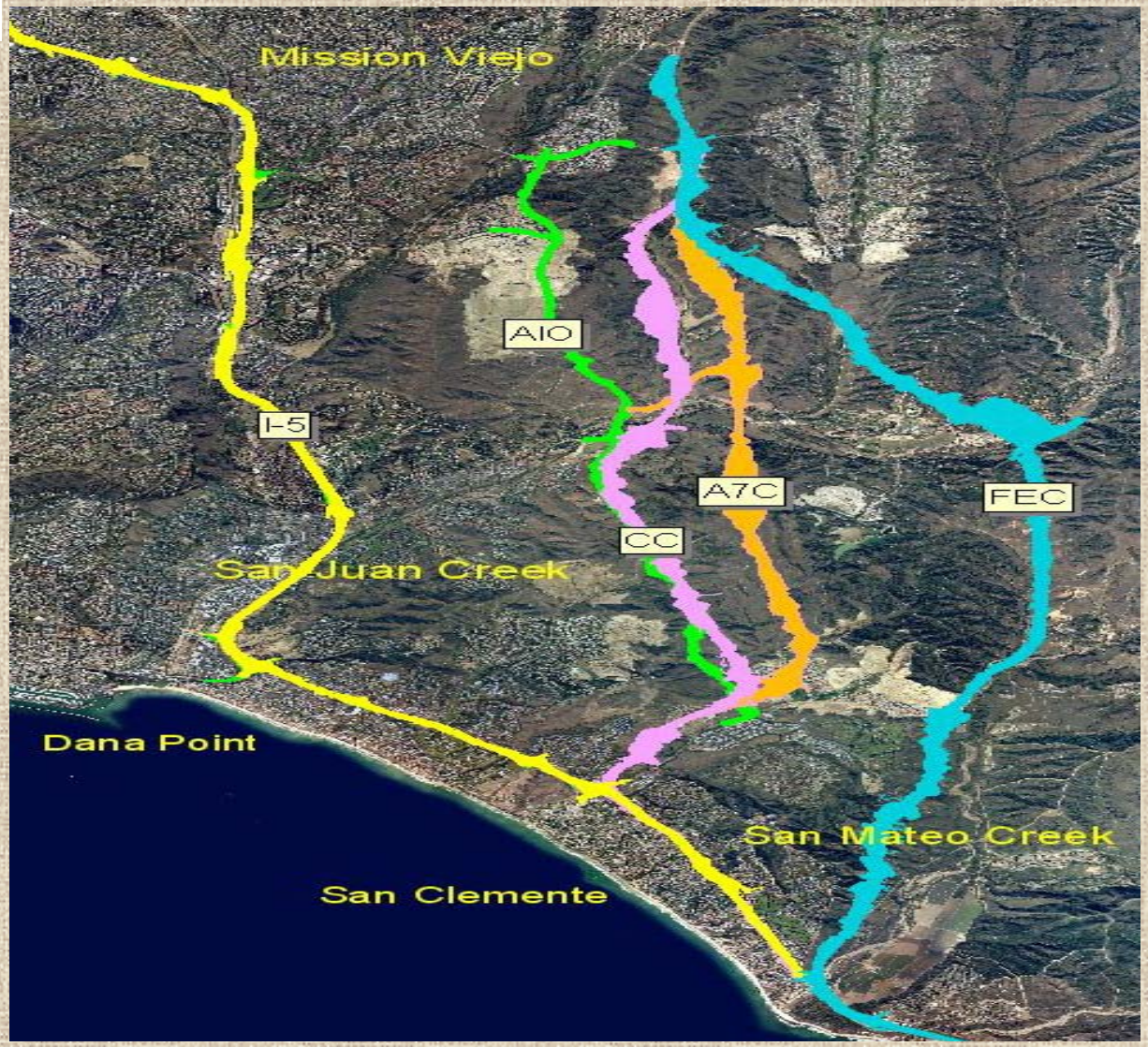


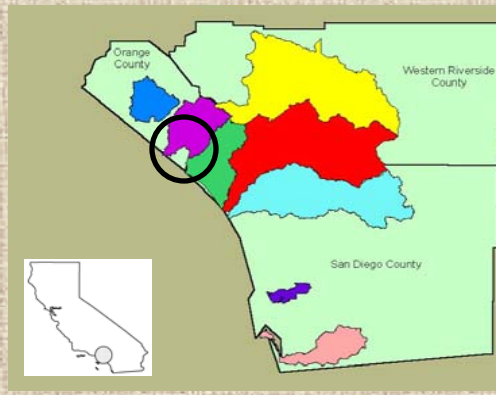
Resource Based Alternative
"Avoidance Area"

General Land Use Plan
Alternative
"Impact Area"



Alternative Transportation Corridors

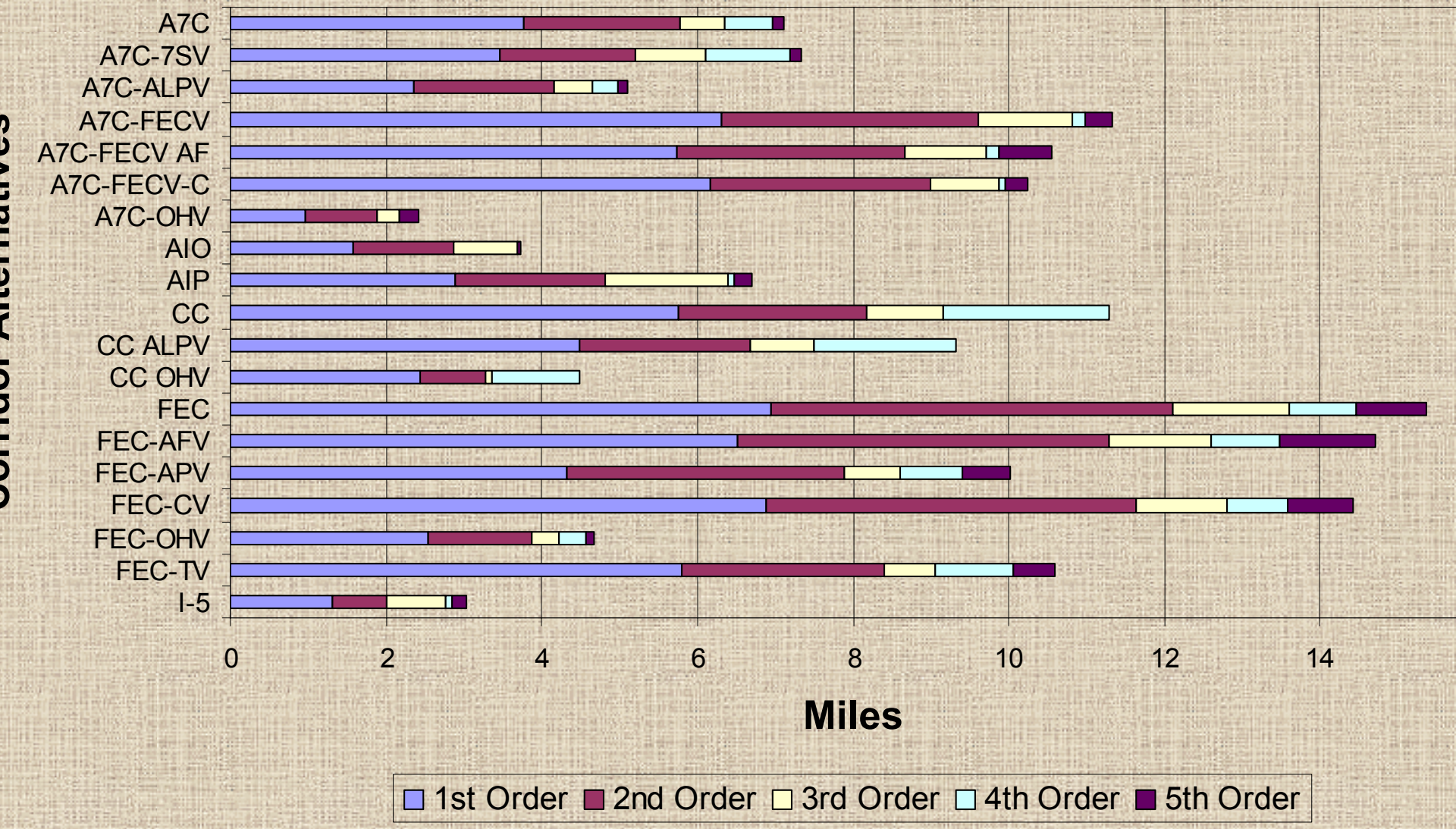




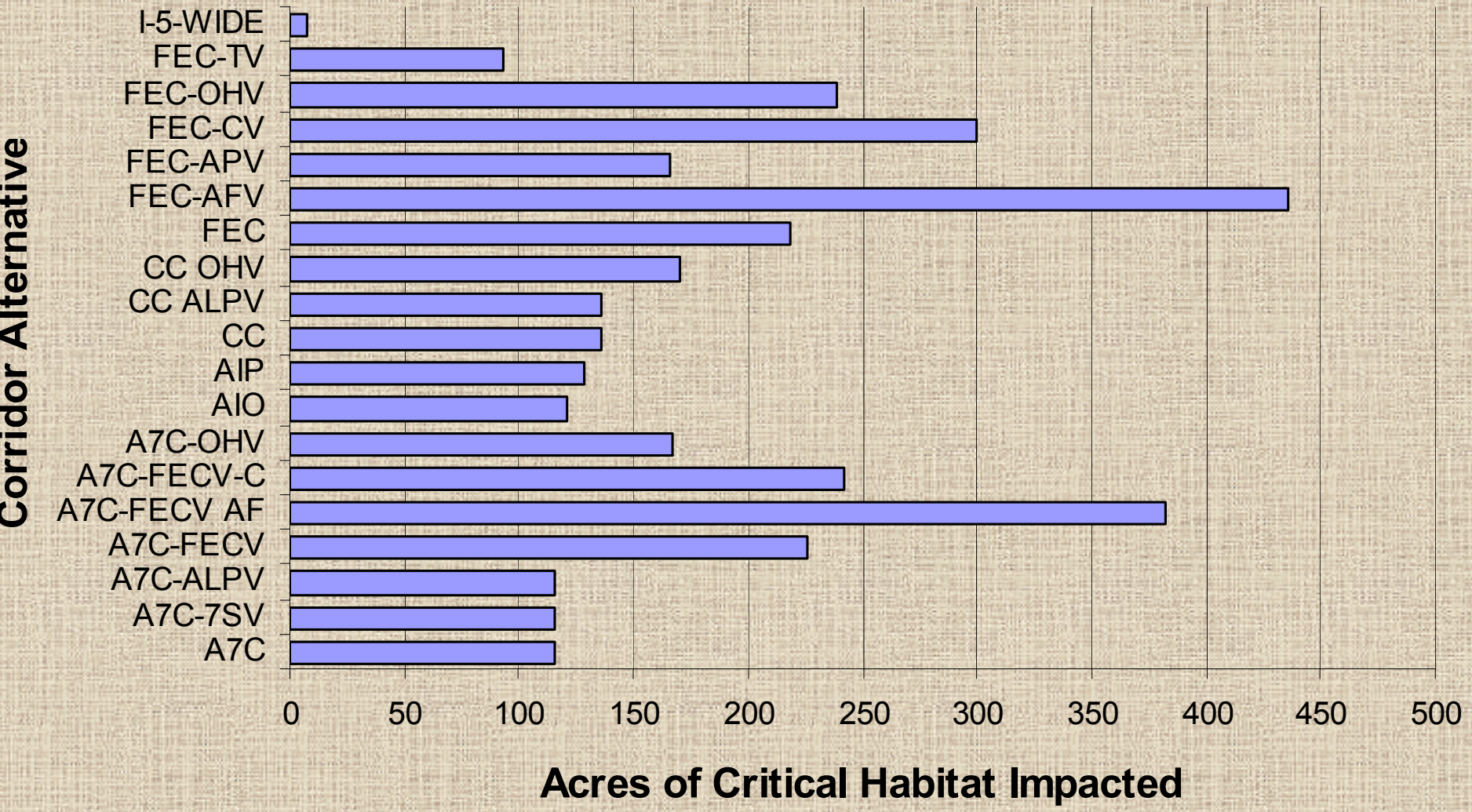
Criteria for Comparing Alternatives

- WoUS directly and indirectly impacted (area / length)
- Riparian ecosystems directly and indirectly impacted (area)
- Critical habitat of threatened, endangered, and sensitive species directly impacted (area)
- Quantity of hydrologic, water quality, and habitat integrity units for riparian ecosystems directly and indirectly impacted
- Change in hydrologic, water quality, and habitat integrity units for riparian ecosystems directly and indirectly impacted

Miles of Stream Channel Directly Impacted (Ultimate Corridor Footprints)



Arroyo Toad Critical Habitat



Loss of Water Quality Integrity Units in Directly Impacted Riparian Ecosystems (Ultimate Corridor Footprints)