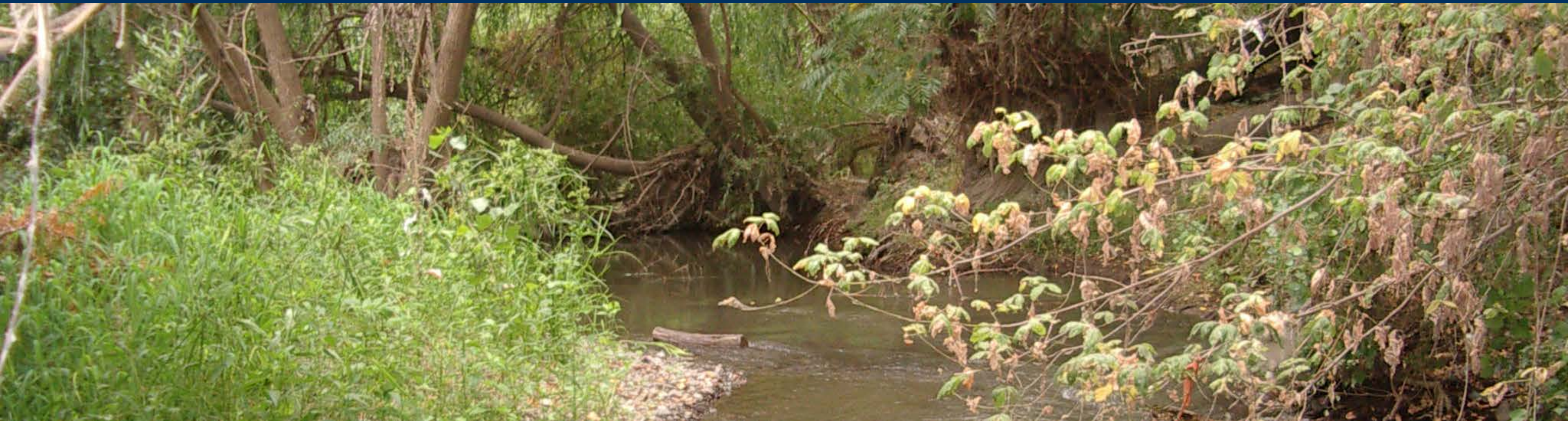
Using the California Rapid Assessment Method (CRAM) to Quantify Riverine Riparian Condition in Santa Clara County Watersheds

Sarah Pearce and Sarah Lowe
San Francisco Estuary Institute

Doug Titus and Lisa Porcella
Santa Clara Valley Water District



Santa Clara Valley Water District

- County voters approved a 15-year program called the Safe, Clean Water and Natural Flood Protection Program.
- Priority D5 Project supports Ecological Data Collection and Analysis.
- Since 2010, the District has developed and implemented an environmental monitoring and assessment framework to monitor and track ecological stream conditions.

Collaboration

The District has collaborated with the San Francisco Estuary Institute (SFEI) to conduct watershed-wide stream and riparian condition surveys throughout Santa Clara County in order to characterize and track the distribution, abundance, and condition of its creeks, rivers, riparian, and wetland habitats.

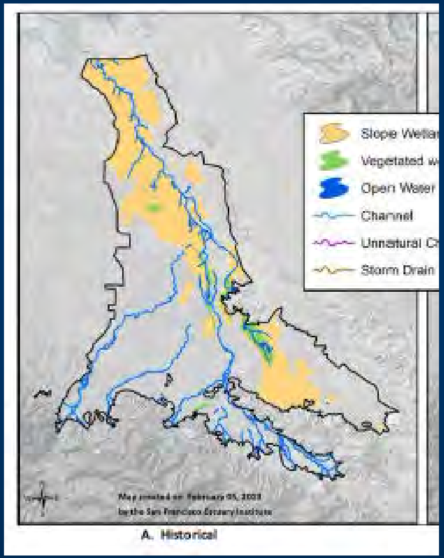
Level 1-2-3 Framework

The 3-level framework is recommended by US EPA and the Wetland and Riparian Area Monitoring Plan (WRAMP), and classifies management questions based on the types of data required to answer them.

Level 1: Map-based Inventories and Landscape Profiles (CARI)

Level 2: Rapid Assessment of Overall Condition (CRAM)

Level 3: Intensive Assessment of Selected Aspects of Condition, Stress, or Function



What is CRAM?

CRAM is a field-based "walk and talk" diagnostic tool that, when used as directed, provides rapid, repeatable, numeric assessment of the *overall condition* of a wetland based on visible indicators of its form, structure, and setting, relative to the least impacted reference condition.

California Rapid Assessment Method

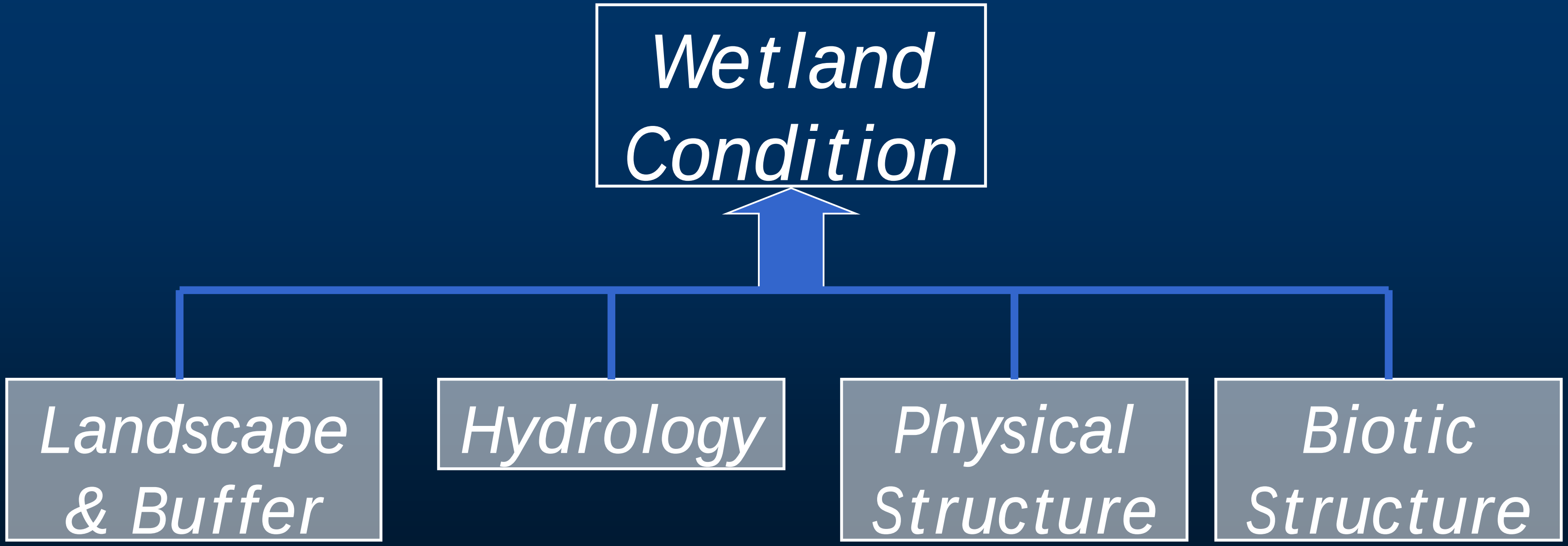
What is overall condition?

Overall condition is the capacity or potential of a wetland to provide the functions and services expected for the same type of wetland in its natural setting, assessed relative to "best" reference condition.

CRAM Details

CRAM requires a team of 2-3 trained practitioners less than 3 hours to assess a representative wetland area.

Practitioners score 4 Attributes, each with 2-3 metrics, that roll up to an Overall Score. Scores range from 25 to 100.



Attribute 1: Buffer and Landscape Context

- Stream Corridor Continuity
- Buffer
  - Percent of AA with Buffer
  - Average Buffer Width
  - Buffer Condition

Attribute 2: Hydrology

- Water Source
- Channel Stability
- Hydrologic Connectivity

Attribute 3: Physical Structure

- Structural Patch Richness
- Topographic Complexity

Attribute 4: Biotic Structure

- Plant Community Composition
  - Number of Plant Layers
  - Number of Co-dominant Species
  - Percent Invasion
- Horizontal Interspersion
- Vertical Biotic Structure

Attribute 1: Buffer and Landscape Context

- Stream Corridor Continuity
- Buffer
  - Percent of AA with Buffer
  - Average Buffer Width
  - Buffer Condition

Attribute 2: Hydrology

- Water Source
- Channel Stability
- Hydrologic Connectivity

Attribute 3: Physical Structure

- Structural Patch Richness
- Topographic Complexity

Attribute 4: Biotic Structure

- Plant Community Composition
  - Number of Plant Layers
  - Number of Co-dominant Species
  - Percent Invasion
- Horizontal Interspersion
- Vertical Biotic Structure

Stream Corridor Continuity

- Assesses riparian continuity upstream and downstream 500m from the Assessment Area
- Breaks in ecological or hydrological connectivity
- Riparian connectivity for wildlife and fisheries movement

Buffer Condition

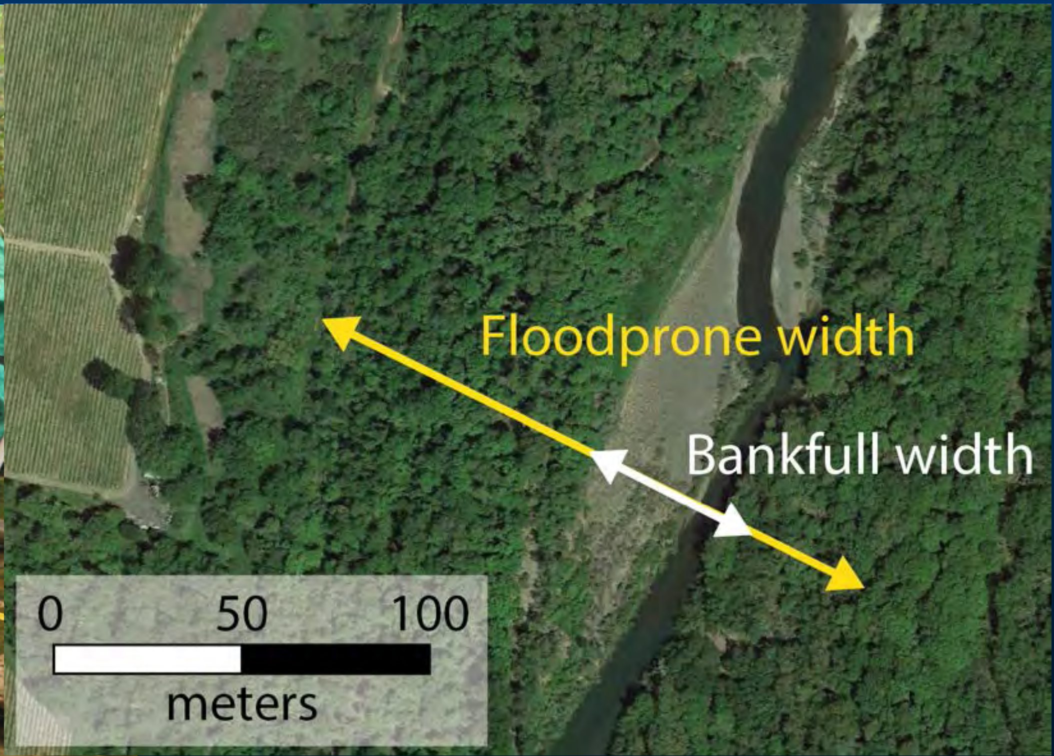
- Buffer is a zone of transition between the wetland and its surrounding environment
- Overall capacity to serve as habitat, filter contaminants, control erosion, reduce invasions
- Native vs Non-native vegetation, soil disturbance or compaction, intensity of human visitation

Channel Stability

- Is the channel in equilibrium, aggrading, or degrading?
- Channel stability affects adjacent riparian vegetation. Is it abundant? Is it declining in stature or vigor? Are riparian trees leaning or falling into the channel? Has the floodplain been abandoned? Are there partially buried living trees or shrubs?

Hydrologic Connectivity

- Looks at the ability of the fluvial system to accommodate flood waters. Can flood waters access the floodplain?
- Measure channel entrenchment



Structural Patch Richness

- Complexity of form and structure affecting biodiversity and wetland functions
- Physical complexity promotes ecological complexity and increases ecological functions, beneficial uses, and overall condition

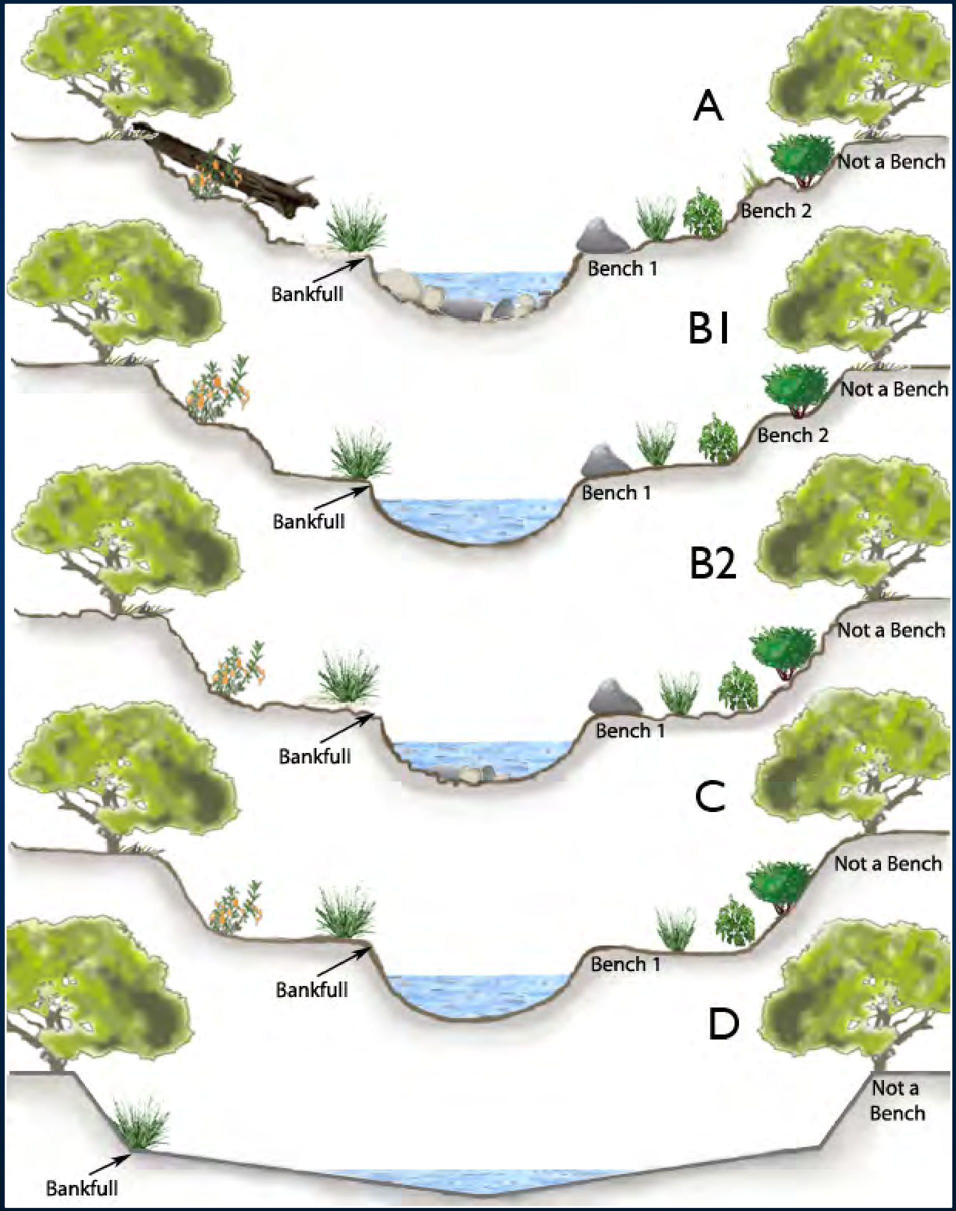
Debris jam

Standing snag

Slope failure

Topographic Complexity

- Observes physical surfaces and elevation gradients, and associated macro and micro topography
- Promotes variable hydroperiods, moisture gradients, and ecological complexity



Plant Community Composition

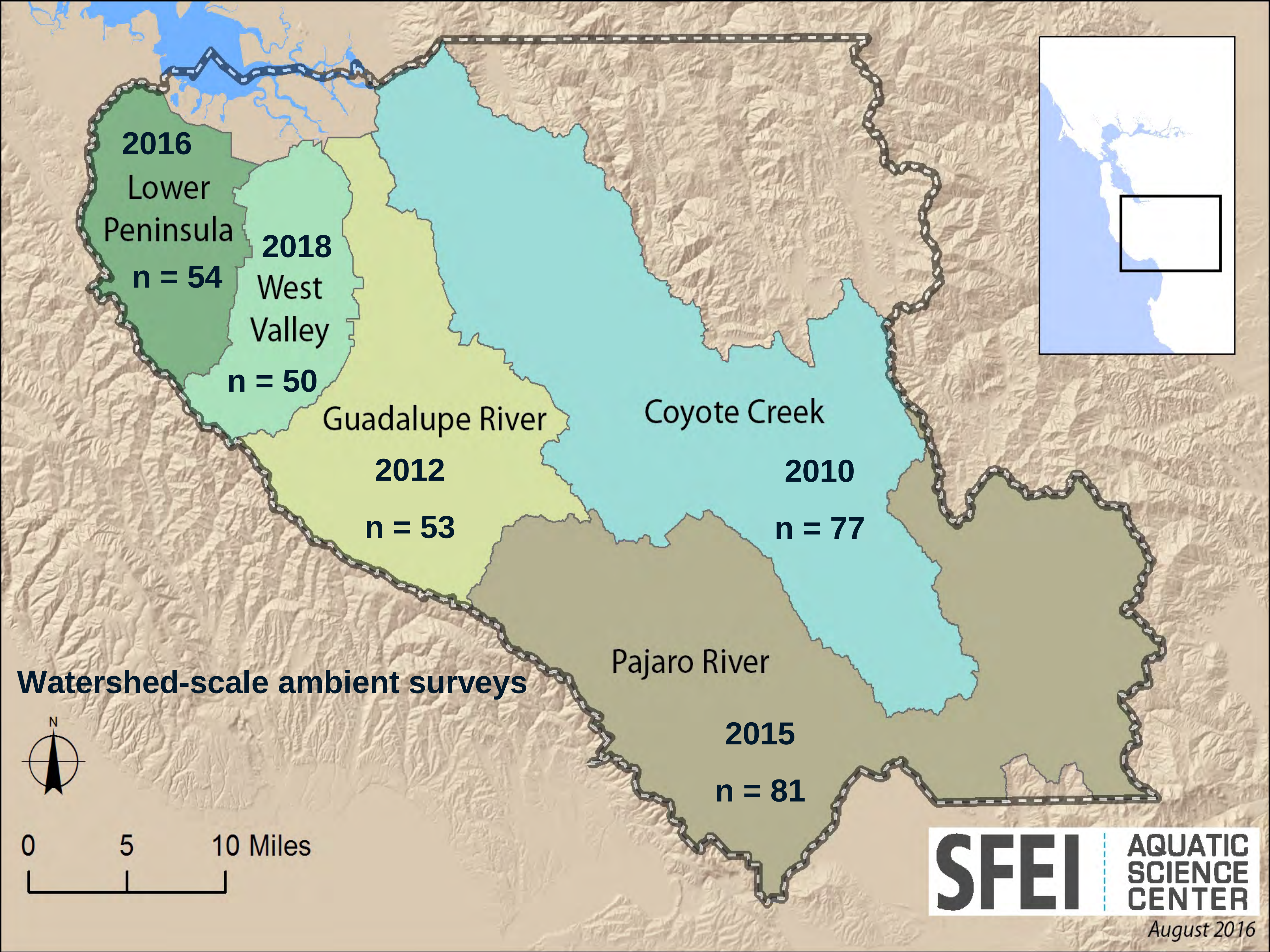
- Integrates tangible structure, ecological structure, and ecological processes into representative vegetation characteristics
- Looks at the diversity of vegetation: number of plant layers, number of co-dominant species, percent invasive species

Horizontal Interspersion

- Looks at the horizontal distribution of different vegetation associations, representing different habitat types
- Higher scores for sites with more zones and more interspersion

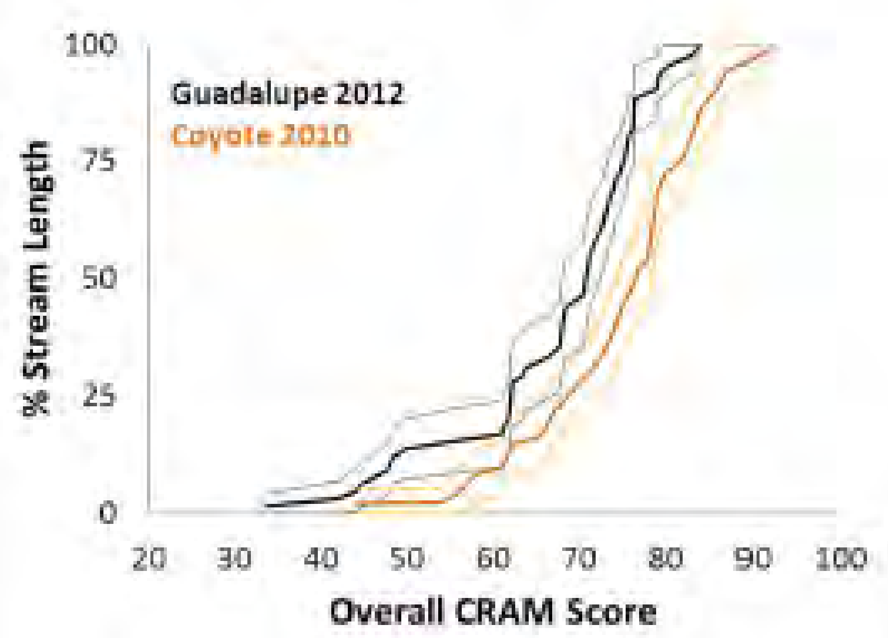
Vertical Biotic Structure

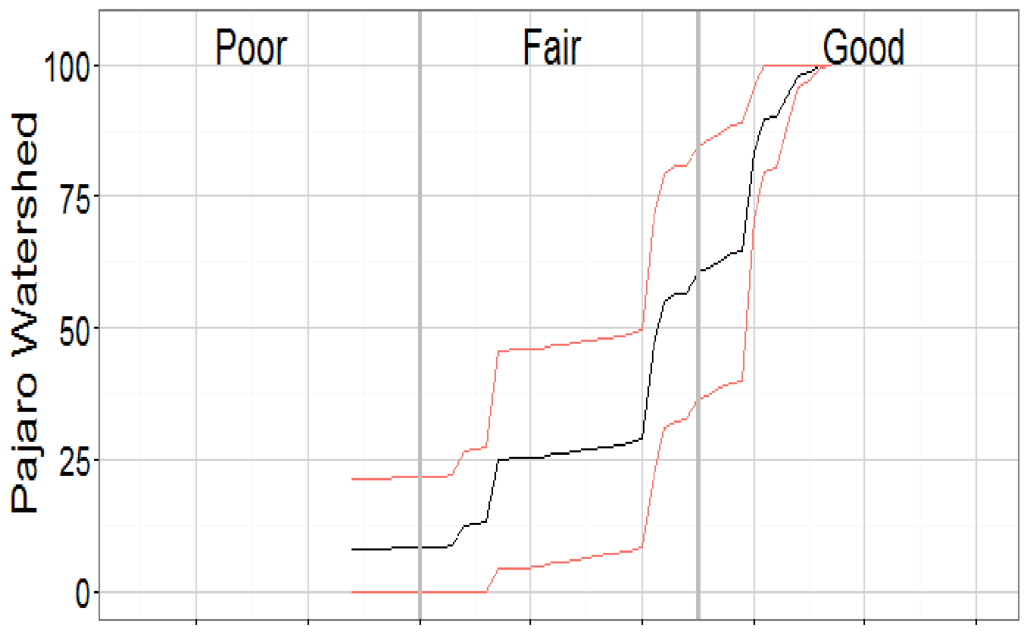
- Assesses the degree of overlap of plant layers
- Considers the vertical diversity of habitat, knowing that wildlife use parallels vegetation structure
- Also, light and temperature gradients, rainfall interception, reduced evaporation from soils


2016
Lower Peninsula
n = 54
2018
West Valley
n = 50
Guadalupe River
2012
n = 53
Coyote Creek
2010
n = 77
Pajaro River
2015
n = 81
Watershed-scale ambient surveys
N
0
5
10 Miles
SFEI
AQUATIC SCIENCE CENTER
August 2016

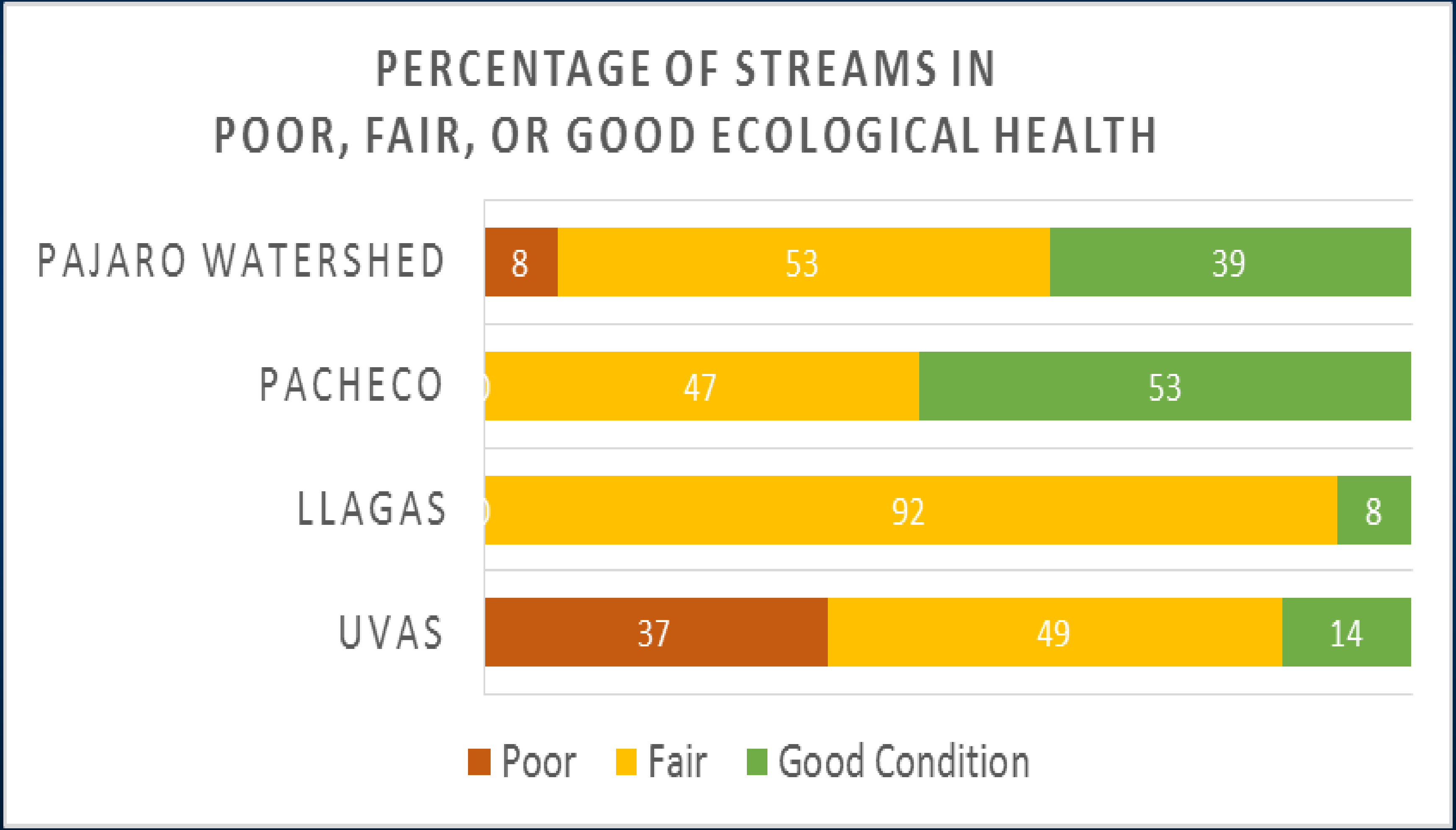
Results: CDF plots

Cumulative Distribution Function plots (CDFs) estimate the proportions of stream miles within each watershed that are likely to have any particular ecological condition score. The statistical design and sample provides a statistical estimate of condition with a known level of confidence.

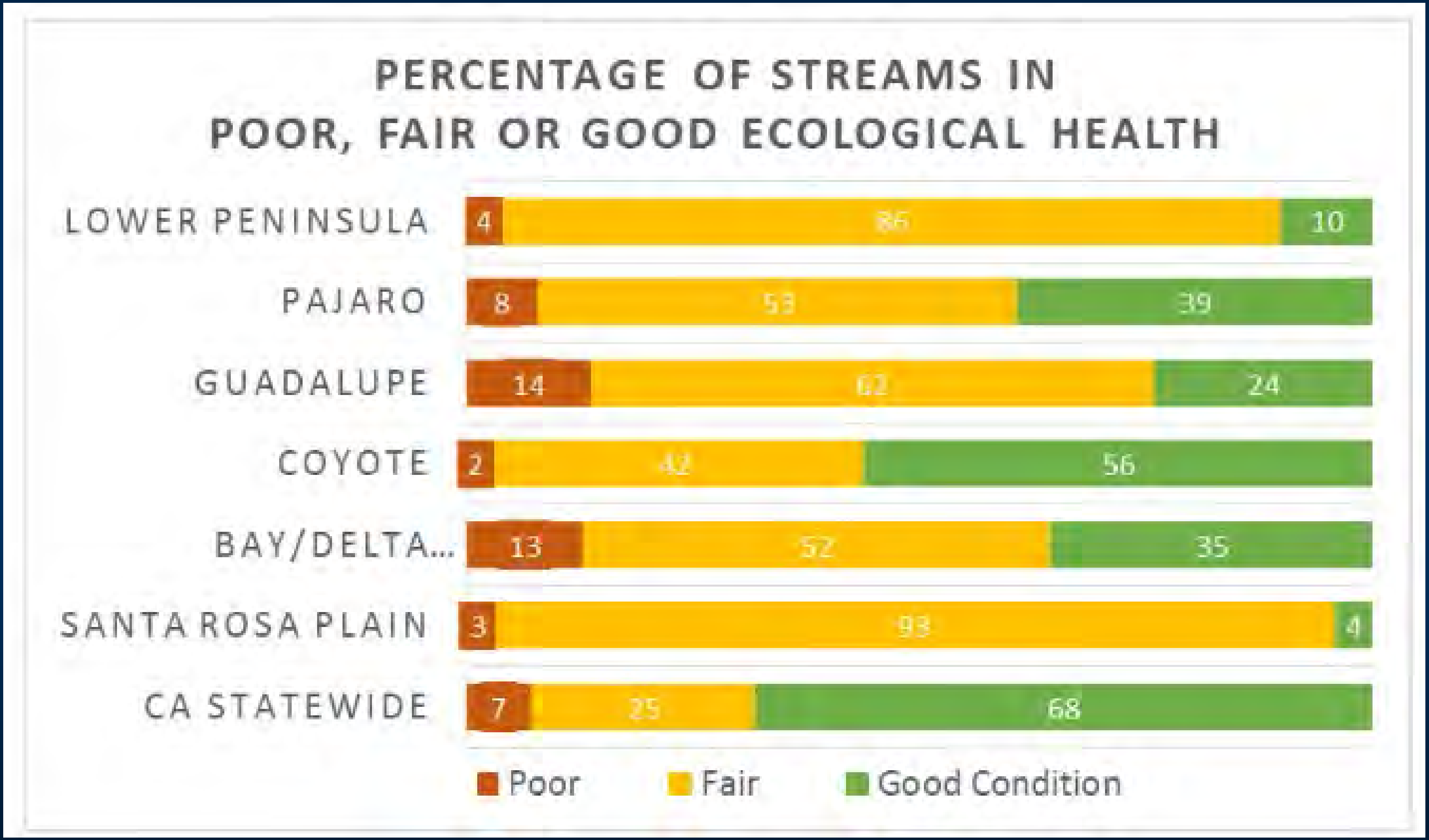




Pajaro: sub-watershed level



Watershed Comparison



Future Use

The District will re-survey each watershed on roughly a 5 year basis to make informed landscape-based asset management decisions.

Benefits:

- Improves watershed and asset management decisions
- Provides a systematic, scientific guide for decisions and actions to improve stream conditions
- Supports effective design options for capital projects
- Maximizes the impact of restoration dollars with more reliable data on countywide stream conditions

Conclusions

- CRAM was built for wetland and stream assessment, but it also can provide important information about riparian condition.
- Organizations such as SCVWD have been using CRAM as part of a Level 1-2-3 framework to quantify ecological condition of streams and riparian areas within a watershed, or compare condition between watersheds.
- CRAM supports informed watershed-based management decisions, planning, and stewardship. It can be used as a monitoring tool that is clearly linked to specific, trackable management questions.


Thank you