EPA's Healthy Watersheds Initiative Concepts Enhance Protection of California's Streams and Watersheds

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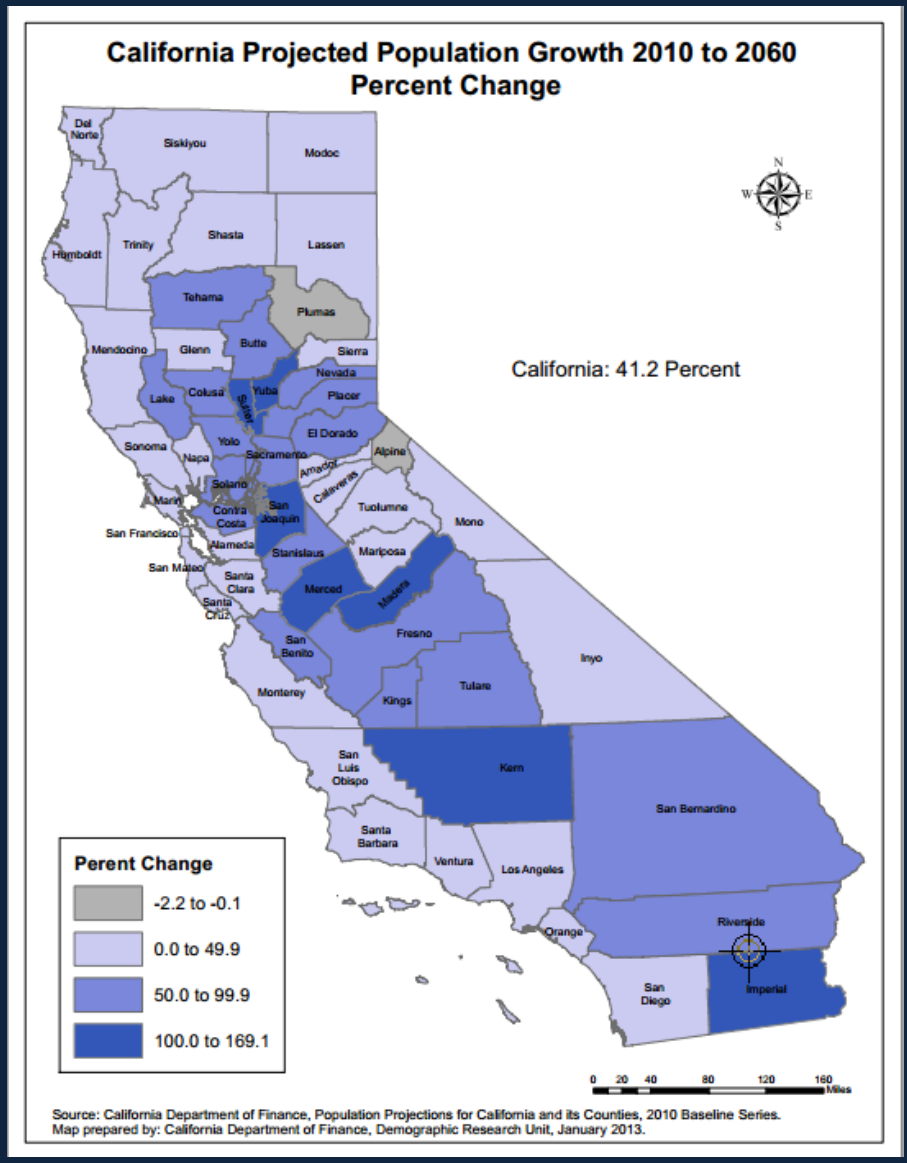
California's rivers face increasing pressure

Population currently 38 million
(1 in every 8 Americans)

- 20% increase by 2030
- 40-50% in dry areas by 2030

Intense competition for water
- domestic/agriculture needs
- environmental flows under increasing strain



California's resource agencies need tools to prioritize protection/remediation

- Building capacity to directly monitor ecological condition
  - *benthic invertebrates*
  - *benthic algae*
  - *riparian condition indicators*

- Need an objective framework for interpreting ecological condition in context of non-biological features/processes

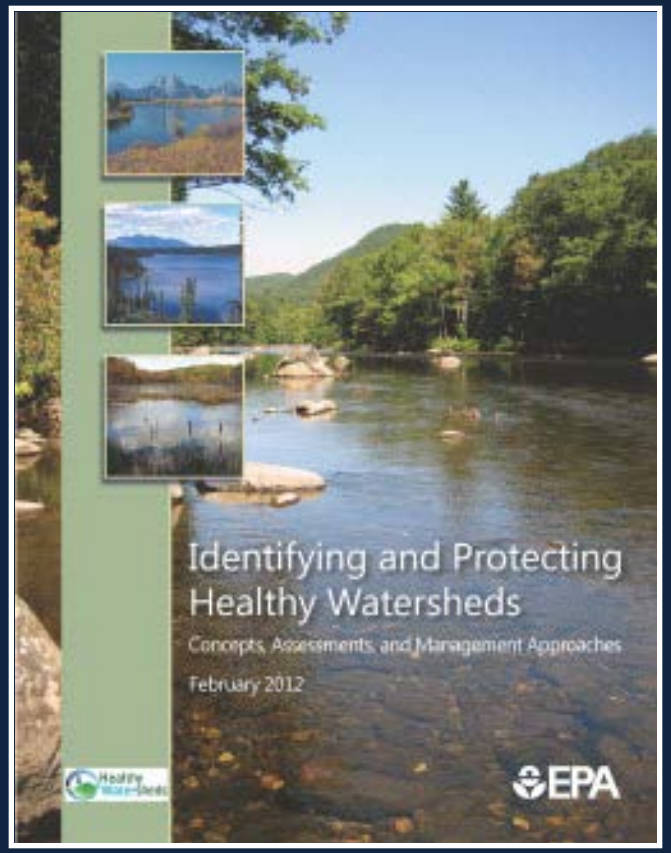
USEPA Healthy Watershed Initiative

EPA HWI website

www.epa.gov/healthywatersheds

Goals of the Initiative

- Protect and maintain healthy watersheds, and increase their numbers over time.
- Raise the visibility and importance of protecting high quality waters.

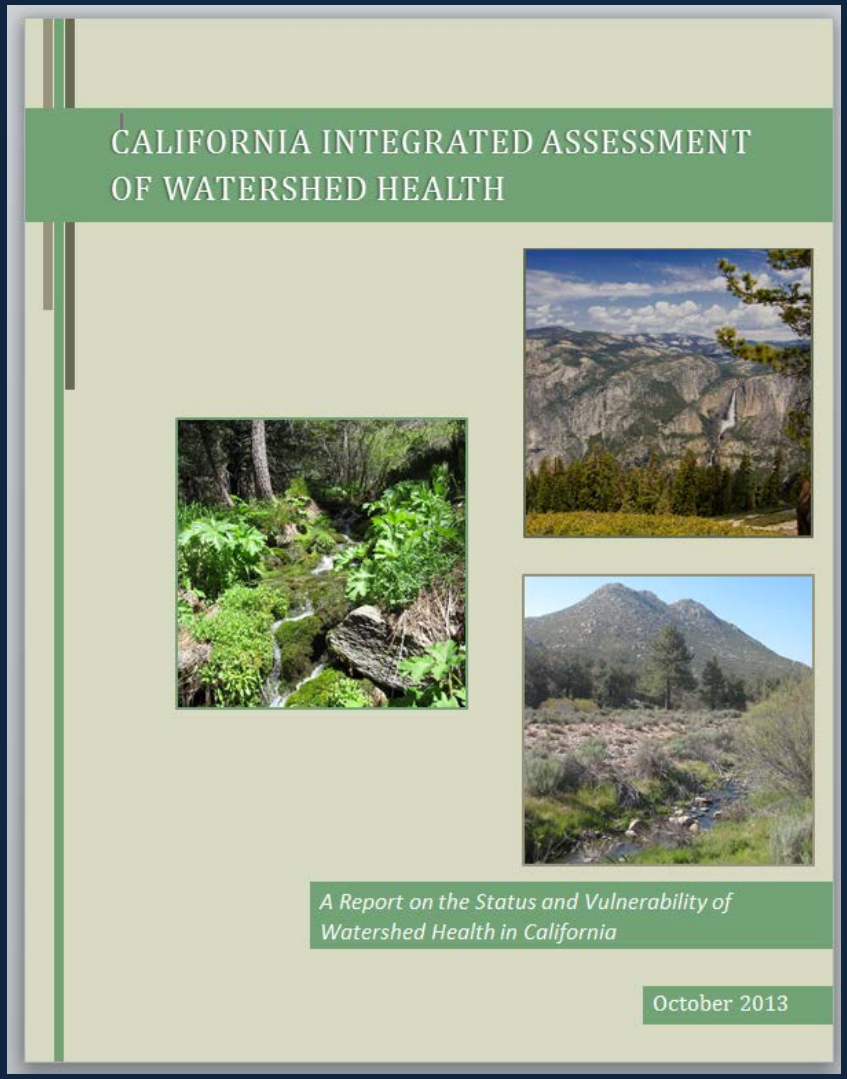


Demonstrations

California, Alabama, Wisconsin

California Integrated Assessment of Watershed Health

Project initiated in 2011
Final report released October 2013



Funded by US EPA with technical support from The Cadmus Group

http://www.mywaterquality.ca.gov/monitoring_council/healthy_streams/docs/ca_hw_report_111213.pdf

- Overview of EPA's HWI approach
- Applying HWI in California
- How to keep it going

HWI's six indicators of watershed health

Landscape Condition

Patterns of natural land cover, natural disturbance regimes, lateral and longitudinal connectivity of the aquatic environment, and continuity of landscape processes.

Geomorphic Condition

Stream channels with natural geomorphic dynamics.

Habitat

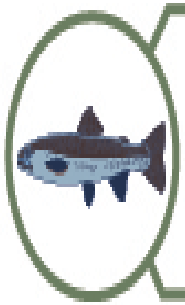
Aquatic, wetland, riparian, floodplain, lake, and shoreline habitat. Hydrologic connectivity.

Water Quality

Chemical and physical characteristics of water.

Hydrology

Hydrologic regime: Quantity and timing of flow or water level fluctuation. Highly dependent on the natural flow (disturbance) regime and hydrologic connectivity, including surface-ground water interactions.



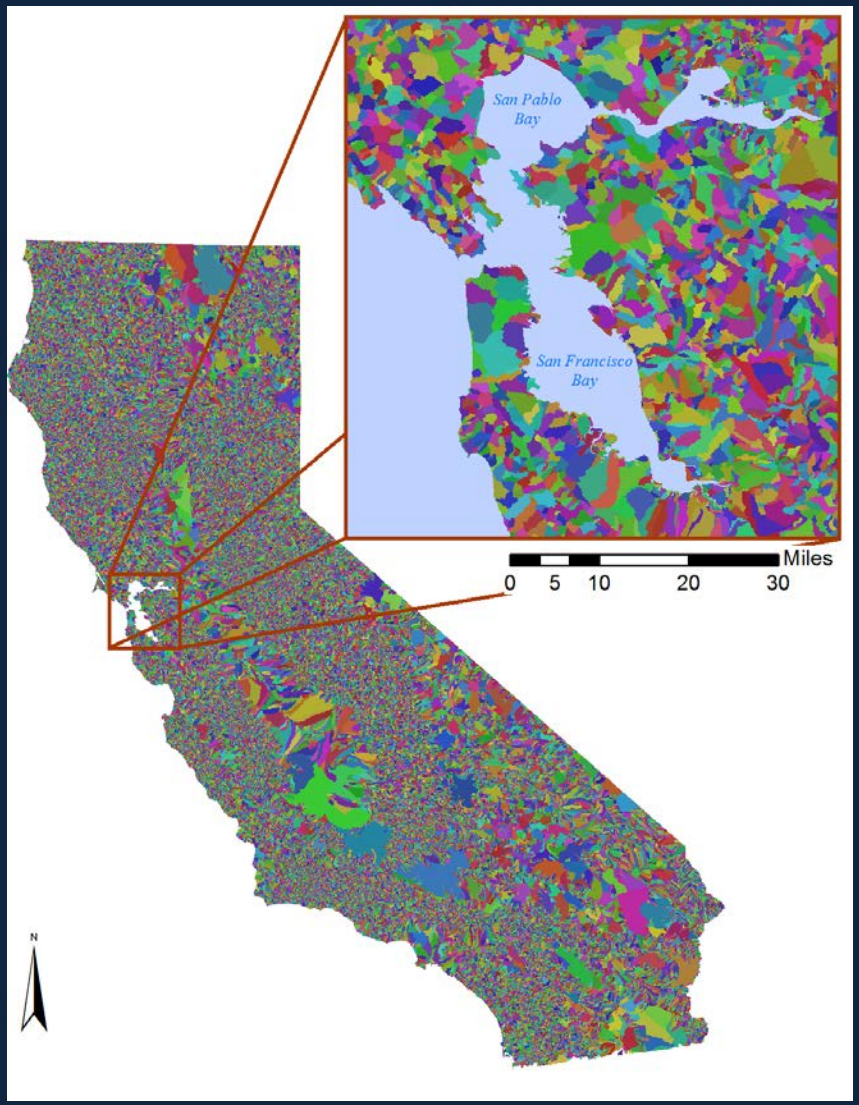
Biological Condition

Biological community diversity, composition, relative abundance, trophic structure, condition, and sensitive species.

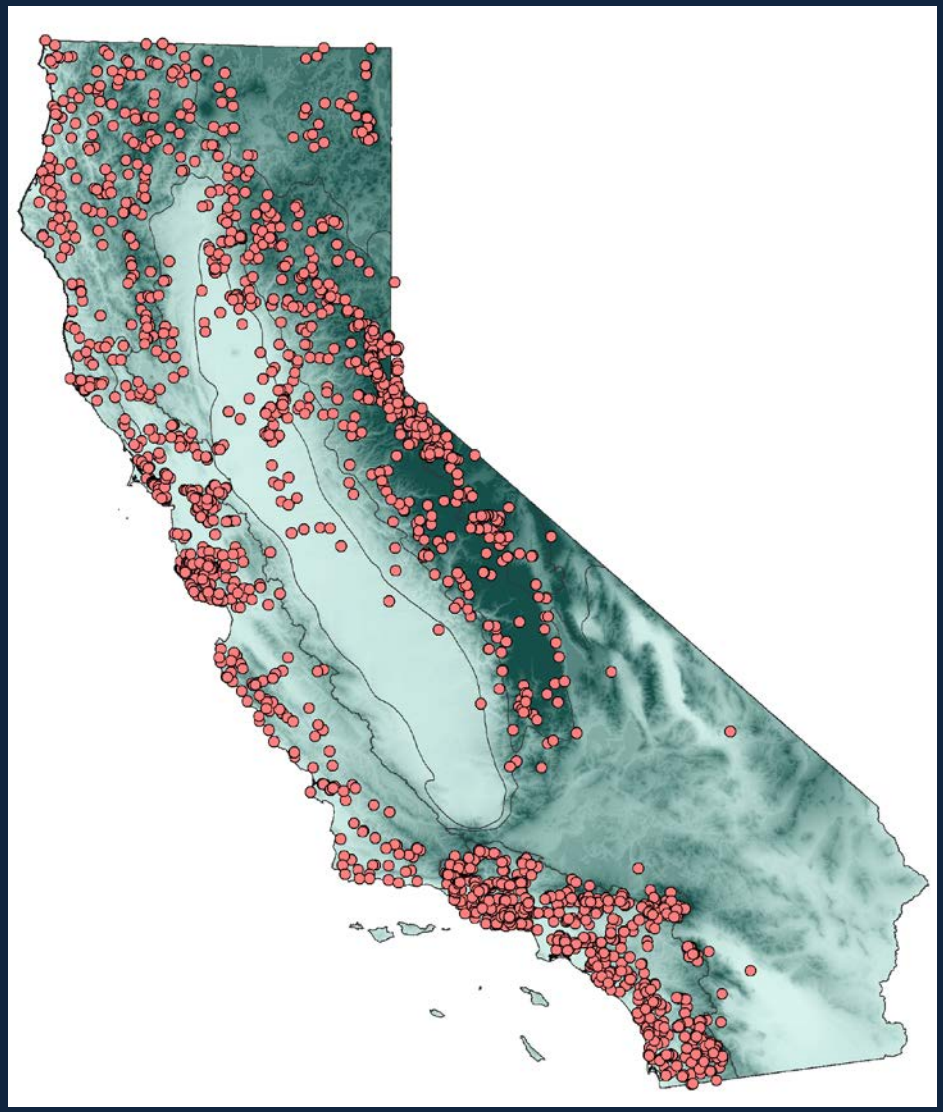
Start with a standard spatial assessment unit

- NHD+ v1 (2006)

~135,000 catchments

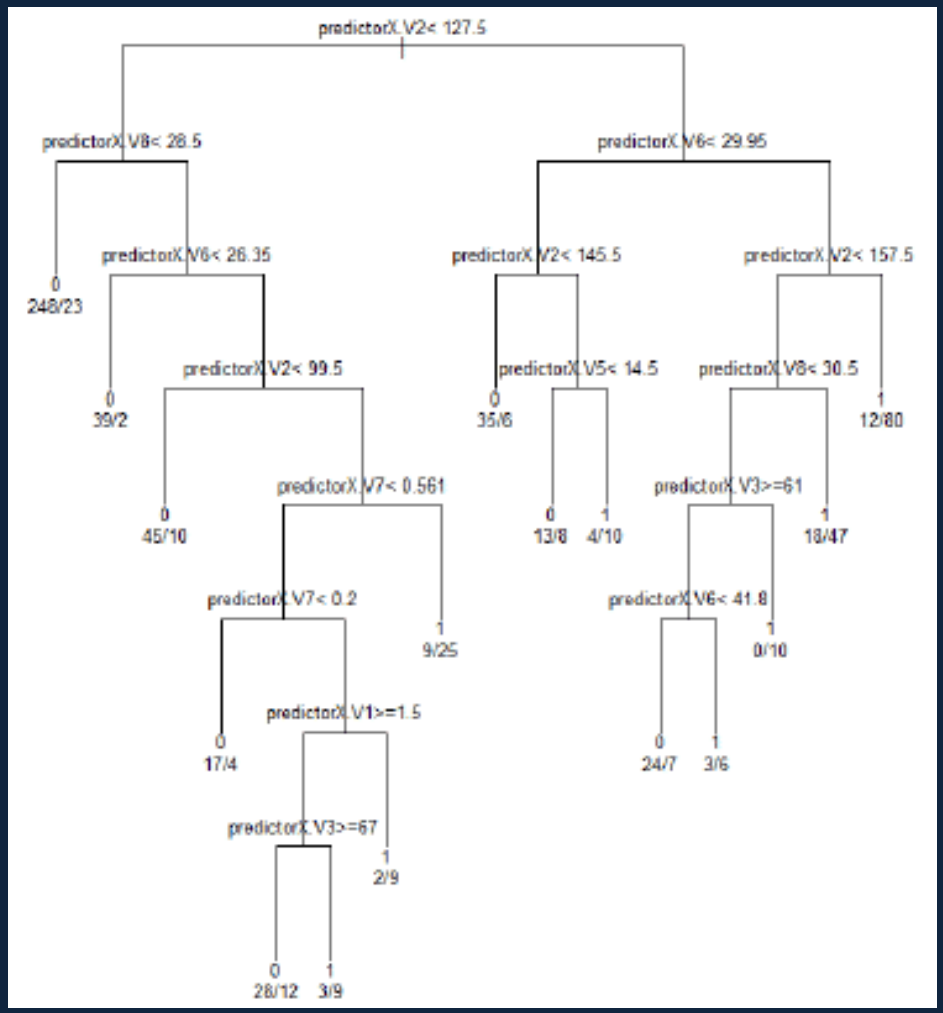


Assemble data for suites of condition indicators (e.g., CSCI scores of stream condition based on benthic invertebrates)

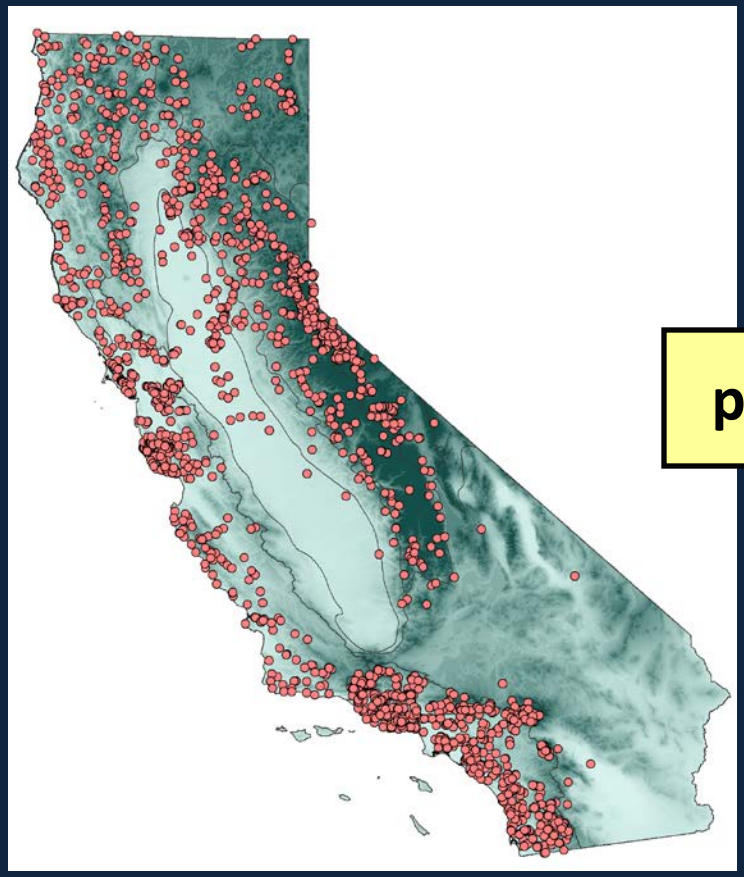


Boosted Regression Tree (BRT) models built to predict indicator scores for all NHD catchments

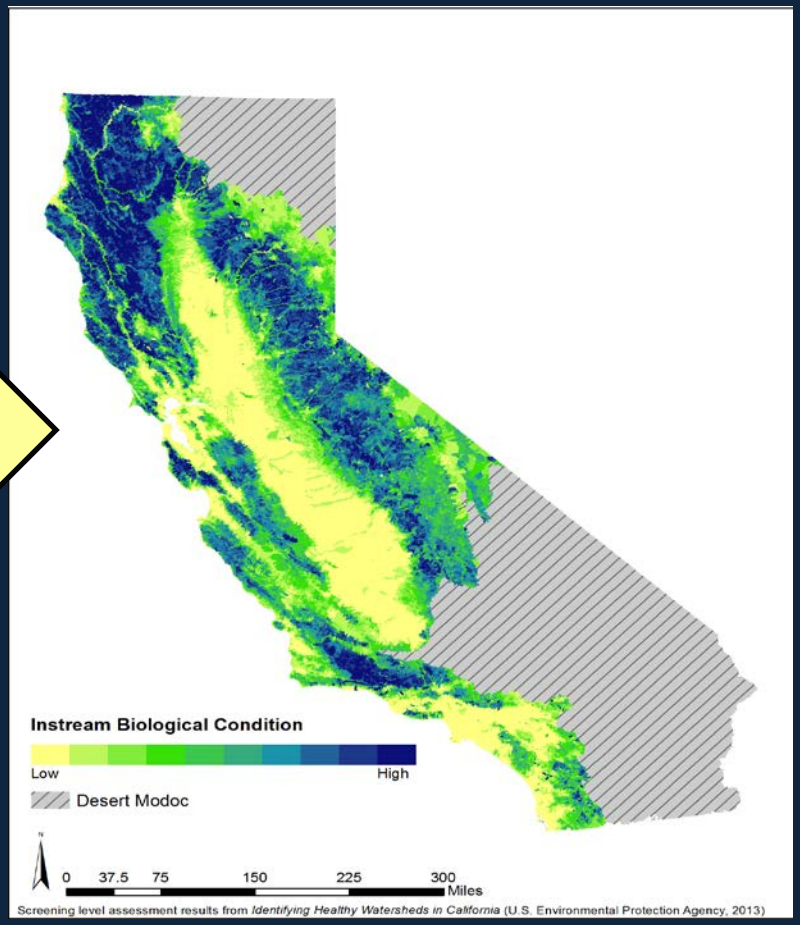
- accommodate diverse data types
- incorporate interactions
- insensitive to linearity



Example: Boosted Regression Tree (BRT) models of California Stream Condition Index scores



predictors

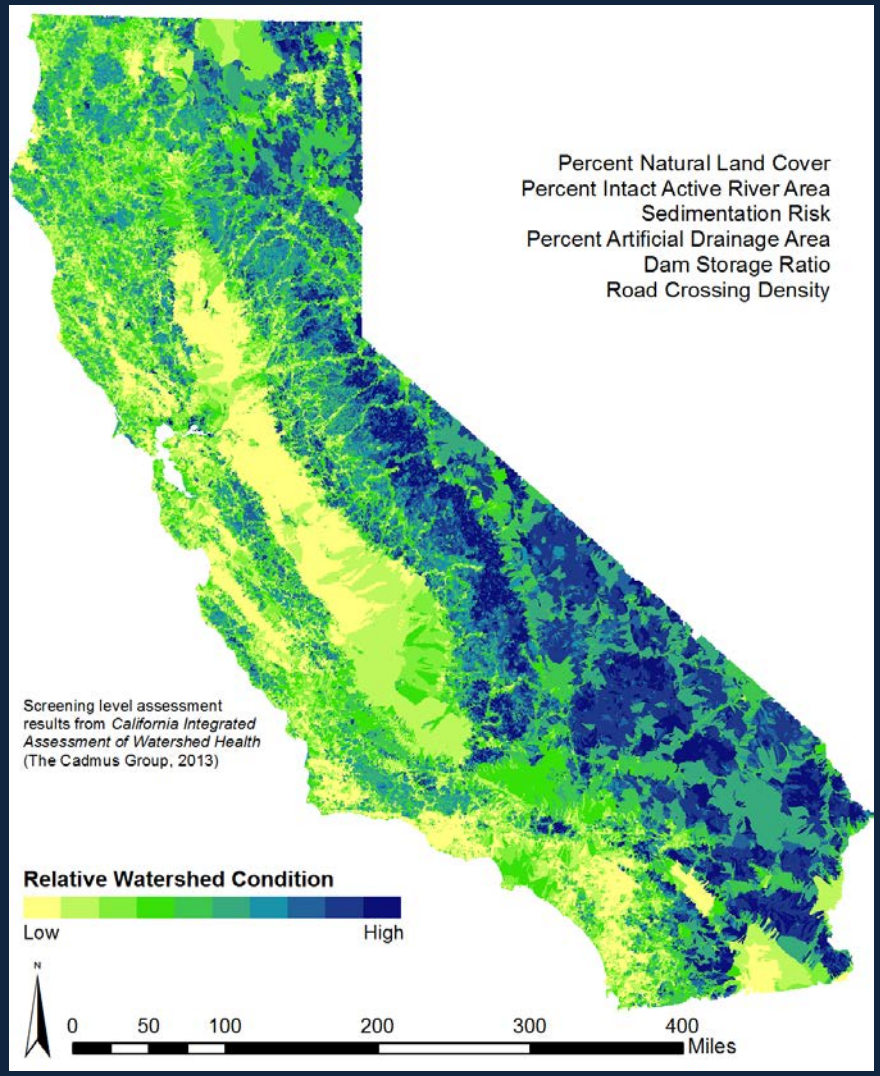


Model output = predicted BMI condition for each NHD catchment

Combine indicators into **indices** describing **ecosystem health and ecological vulnerability**

Watershed Condition

- Percent Natural Land Cover
- Percent Intact Active River Area
- Sedimentation Risk
- Percent Artificial Drainage Area
- Dam Storage Ratio
- Road Crossing Density



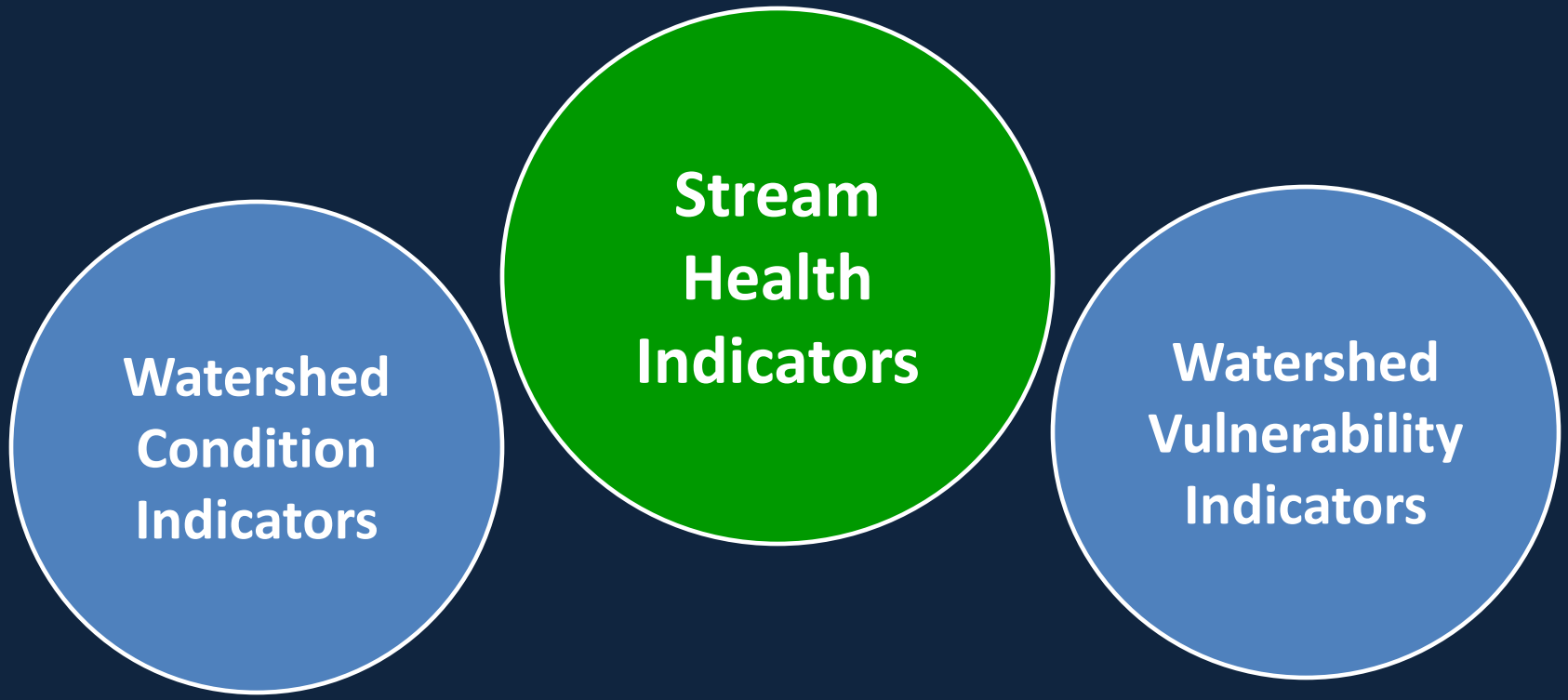
Applying HWI concepts in California

- California's complexity/data patchiness posed challenges
- EPA and CADMUS helped CA implement modifications

California Modifications

- Regrouped indicators to separate structural condition indicators from ecological condition indicators
- Emphasized assessment of potential function, restoration opportunity, and vulnerability

Three indicator groups



Structural influences + risk factors help interpret measures of stream/watershed health and vulnerability

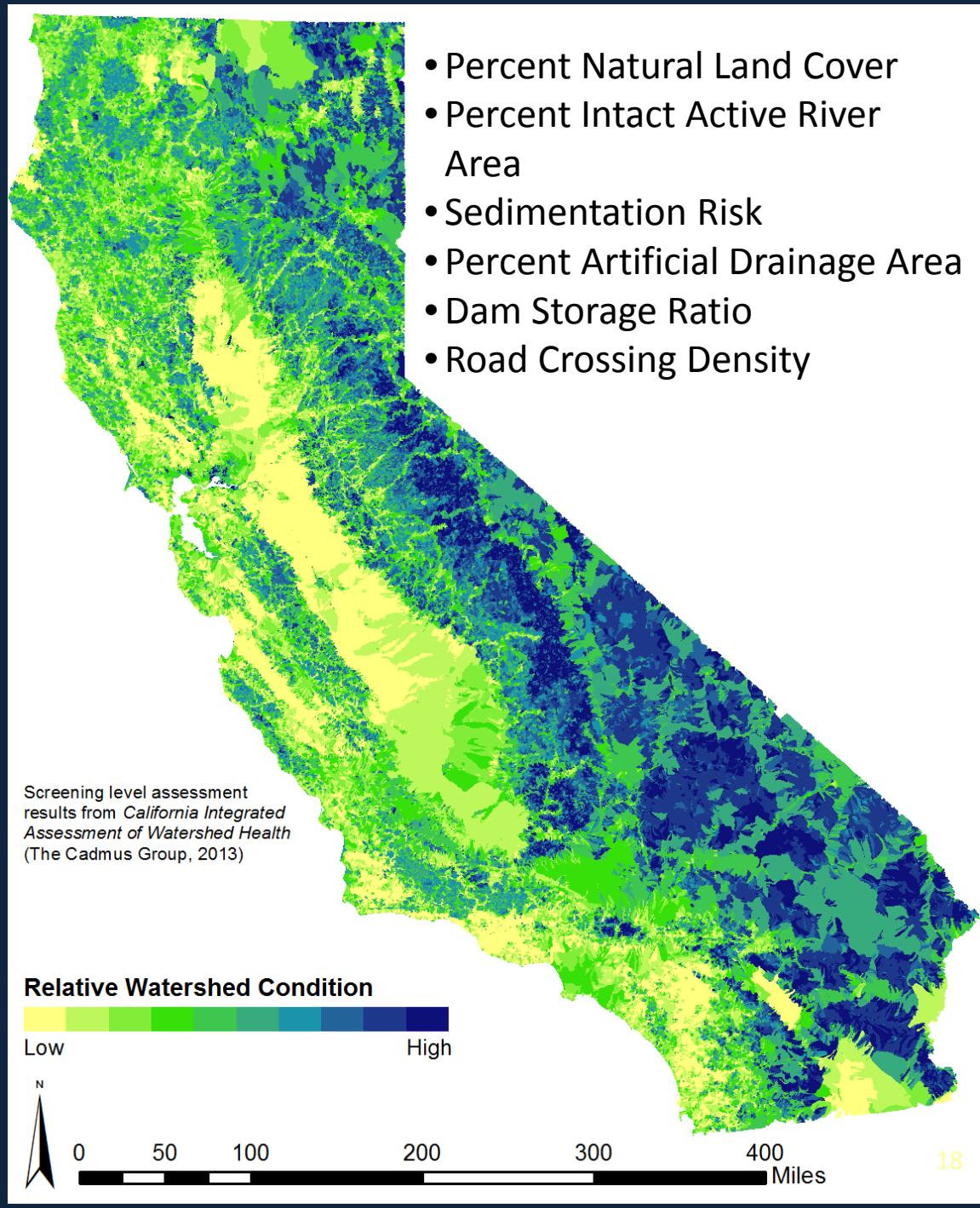
Watershed Condition Indicators

- Current structural condition

- Emphasized datasets with continuous coverage

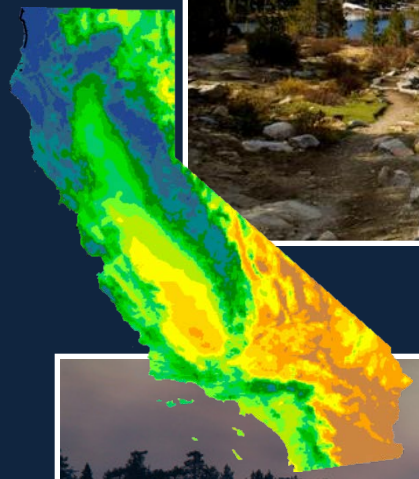
- Examples: land use, development infrastructure, hydrologic modification

Relative Watershed Condition Index

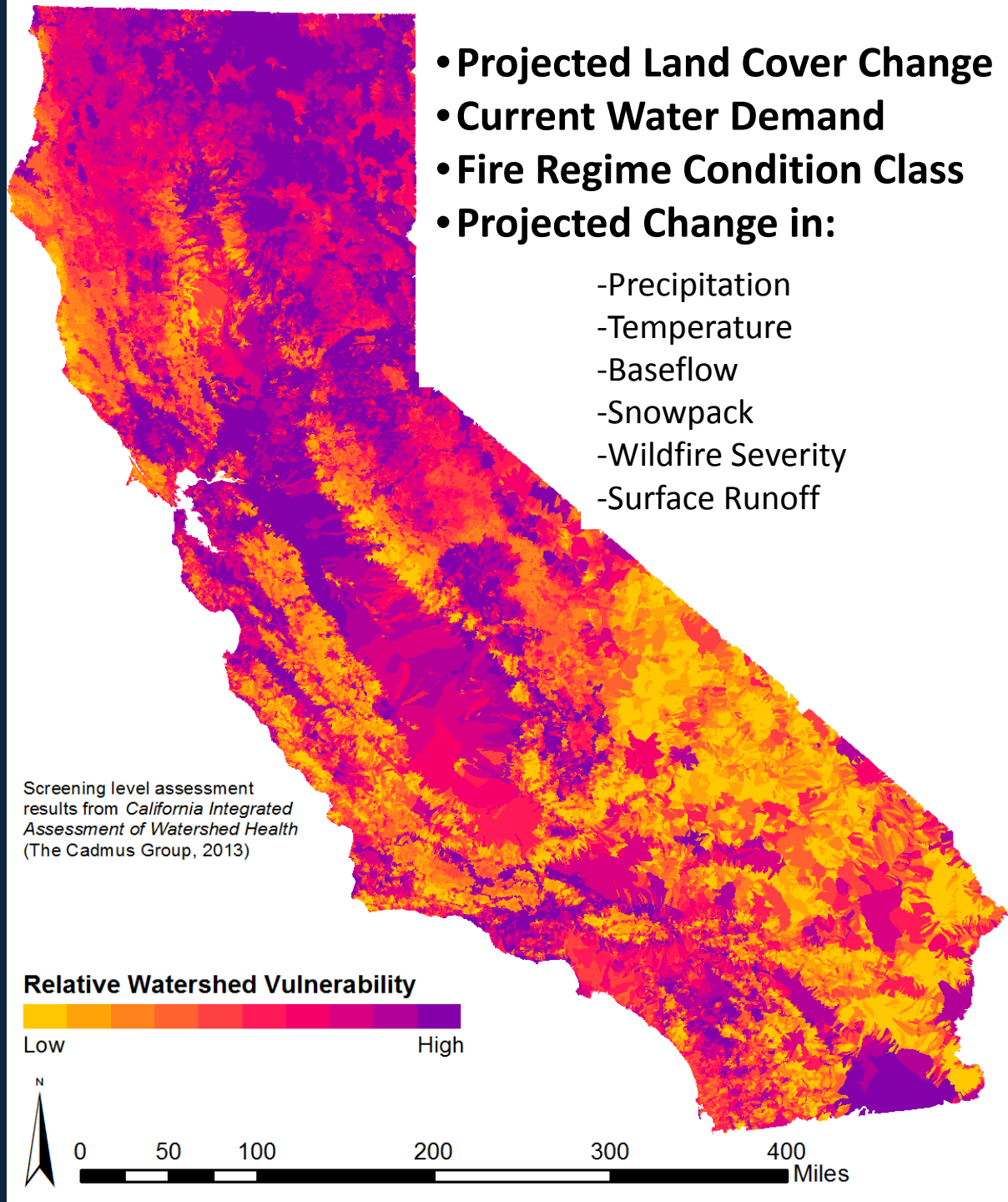


Watershed Vulnerability Indicators

- Characterize potential exposure to future risks (e.g., climate change, development, fire)
- Changes to flow permanence
- Modeled projections, continuous coverage across state



Relative Watershed Vulnerability Index



Stream Health Indicators

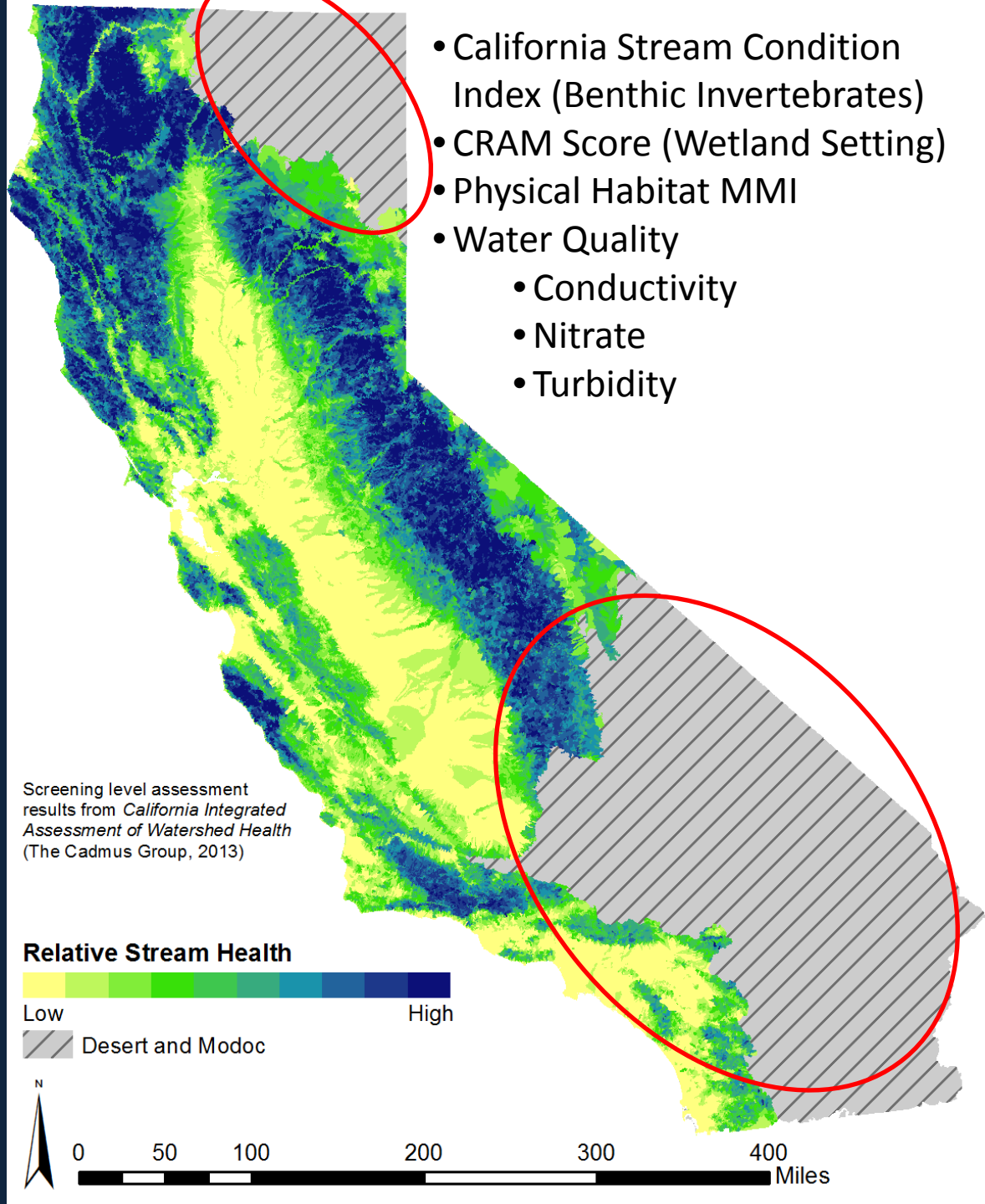
Examples: ecological condition indicators, water quality and habitat measurements

- Field monitoring datasets
- Thousands of streams have been monitored
- BRT models were developed to predict values in unmonitored locations

Relative Stream Health Index*

= areas unassessed due to data limitations

* Using in-stream condition indicators as surrogates of general watershed condition



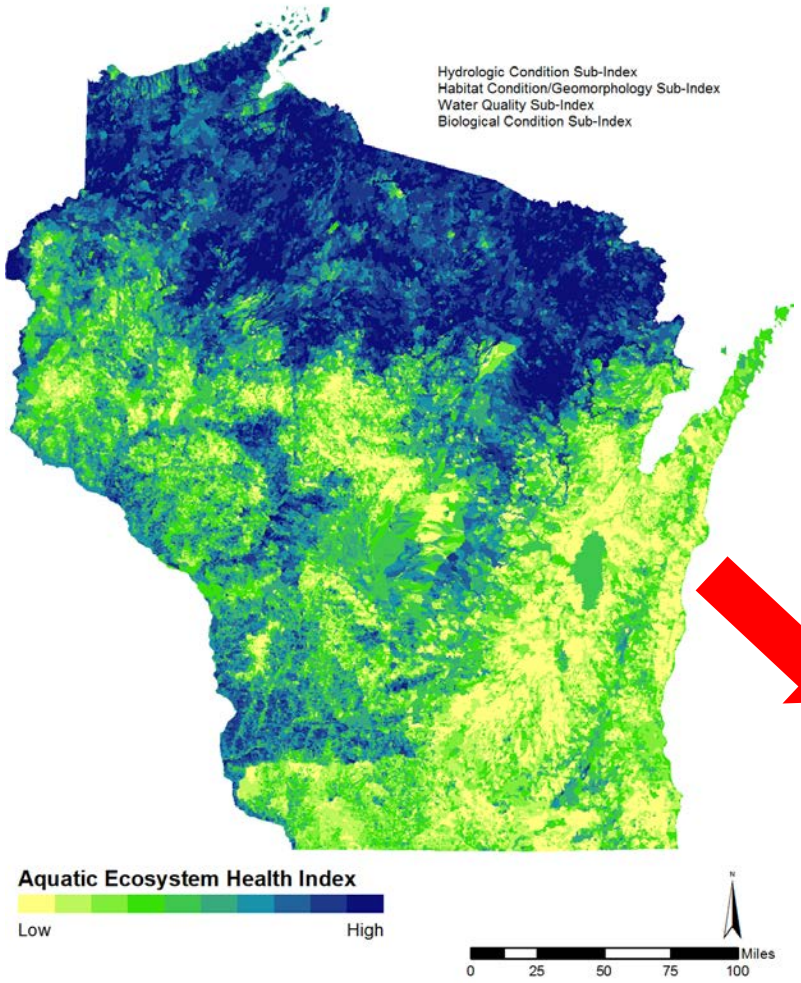
Using the Assessments (Part I)

Assessments are predictions that can improve:

- allocation of monitoring resources
- prioritization of watersheds for restoration and protection
- permitting and enforcement decisions
- communication among agencies/stakeholders

Aquatic Ecosystem Health

Vulnerability



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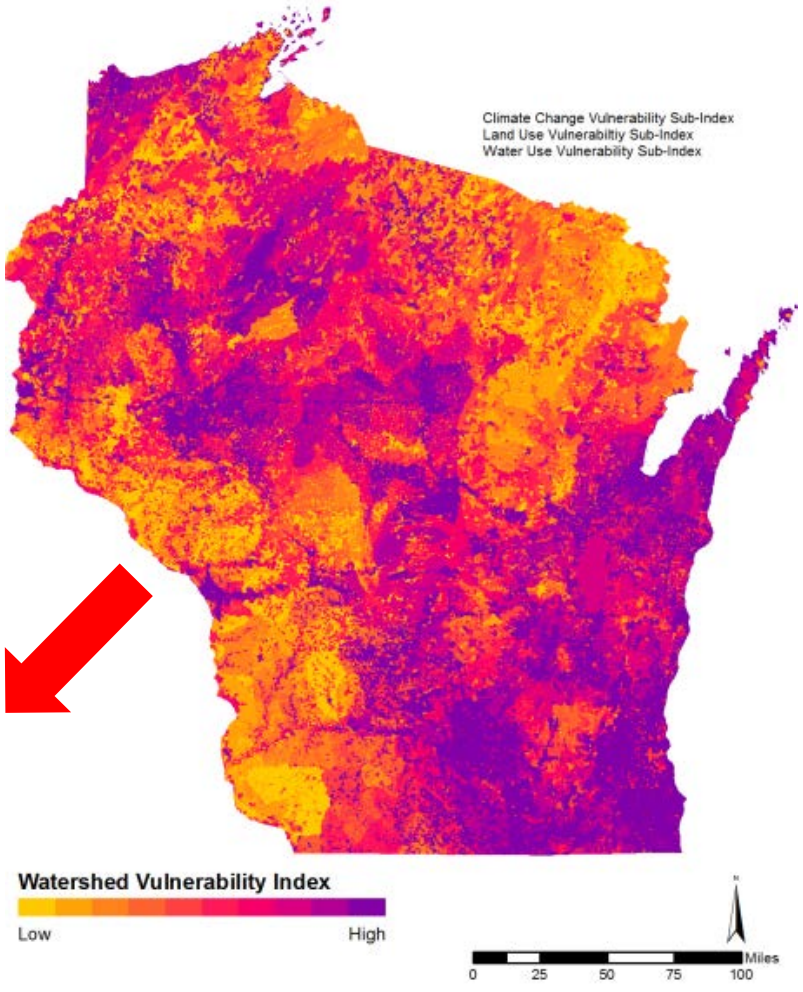
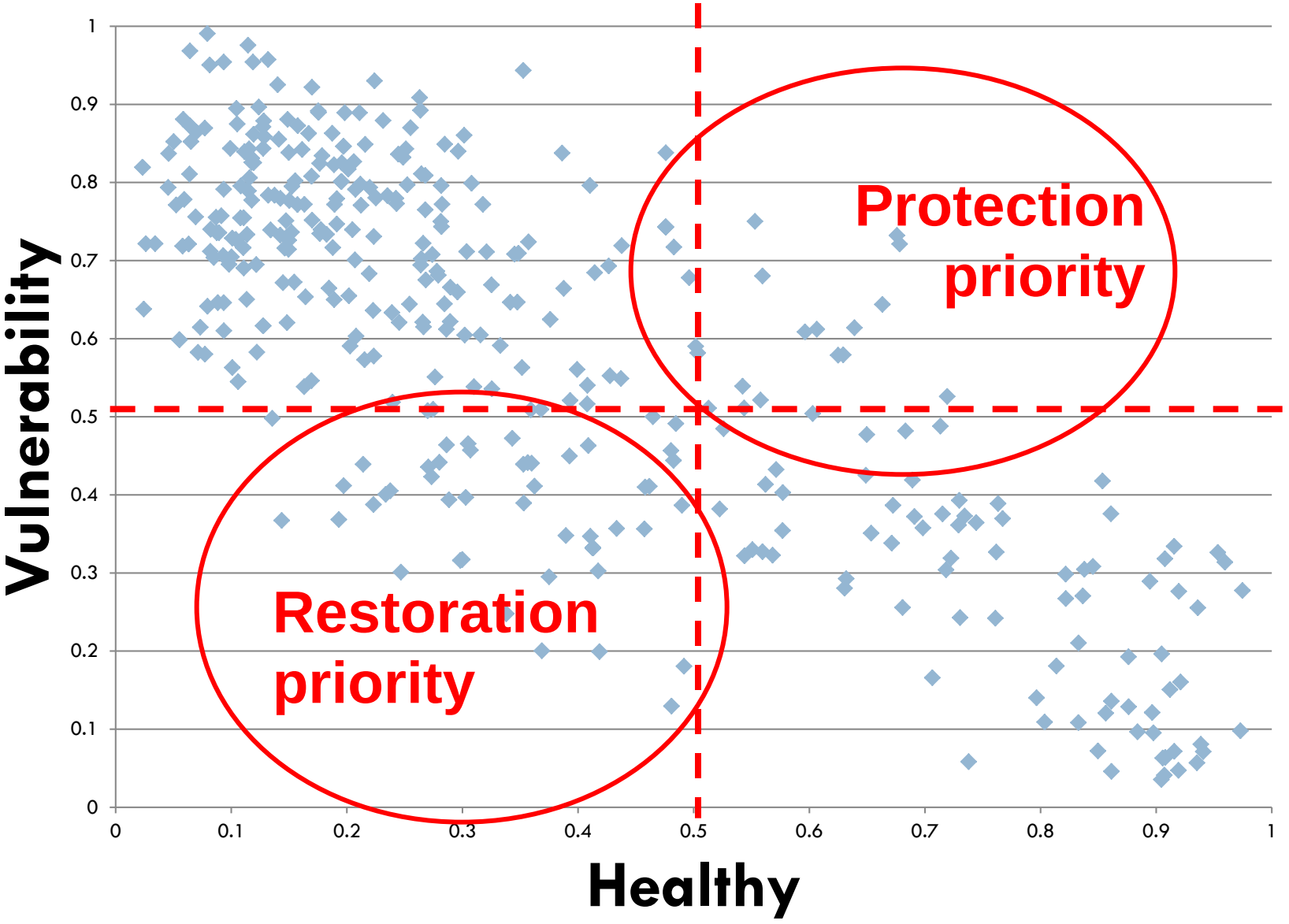
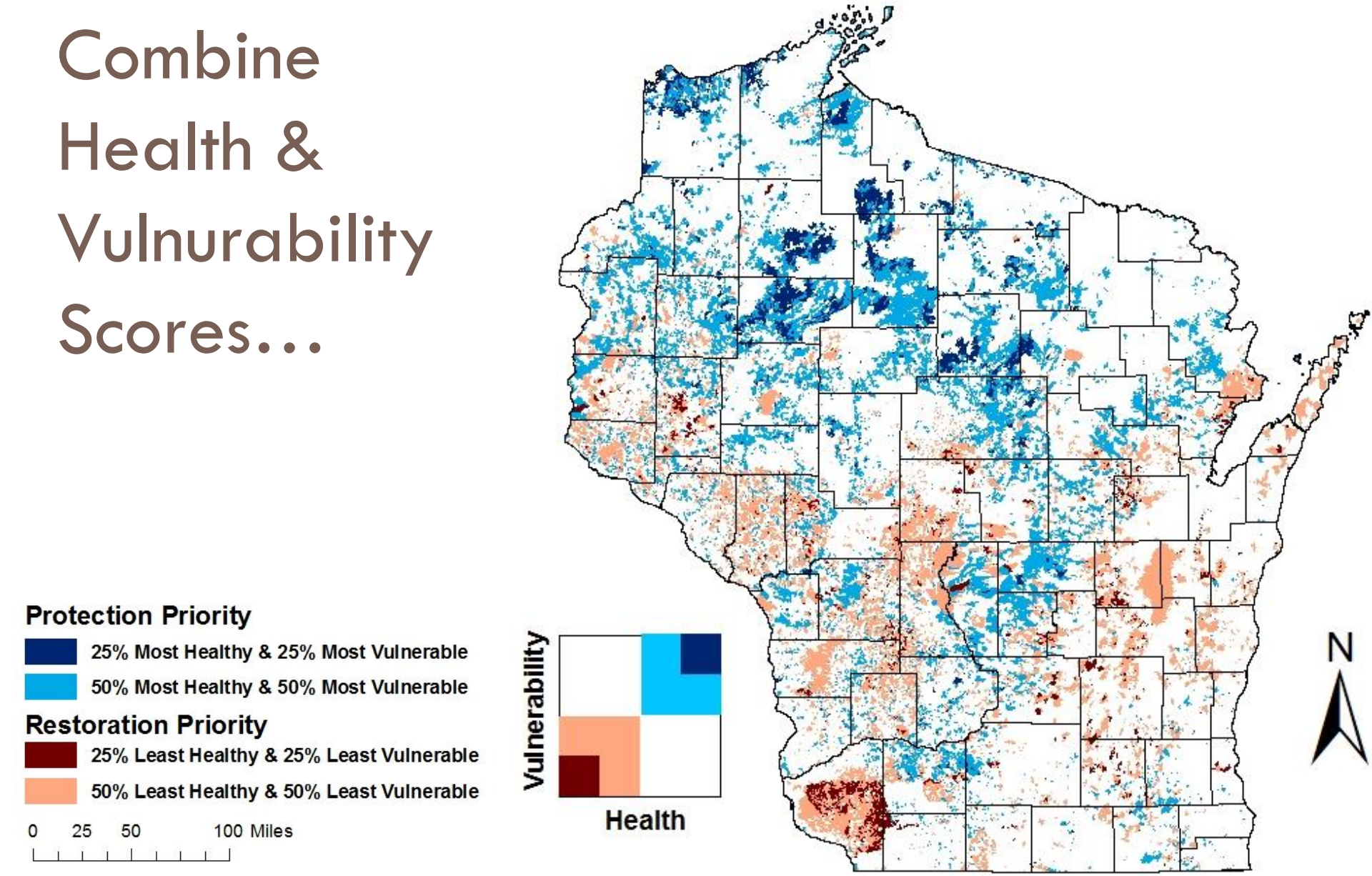


slides courtesy Katie Hein, WI Department of Natural Resources

Combine Health & Vulnerability Scores…



Combine Health & Vulnurability Scores…



Limitations of current version

- Relative ranking of indicators only
- High variability in confidence of indicators
- Limited information about biodiversity or conservation value *(see Jeanette Howard's presentation tomorrow)*

Keeping the ball rolling (Part I)

1. **Need mechanism to test and improve models**
   - Predictions can be tested with adaptive monitoring approaches
     - ➢ *Where do models predict well or poorly?*
   - Add ability to incorporate condition (e.g., CSCI can determine intact vs. altered)

2. **Need mechanism to add/revise data**
   - non-perennial streams
   - biodiversity, conservation value
   - hydrologic alteration
   - additional landuse stressors (grazing, timber harvest)

Keeping the ball rolling (Part II)

3. **How to make it useful**
   - Support custom assessments
     - Select indicators for different applications
     - Weight indicators
   - Develop technical capacity to update models and deliver data (at State Water Board or DFW?)

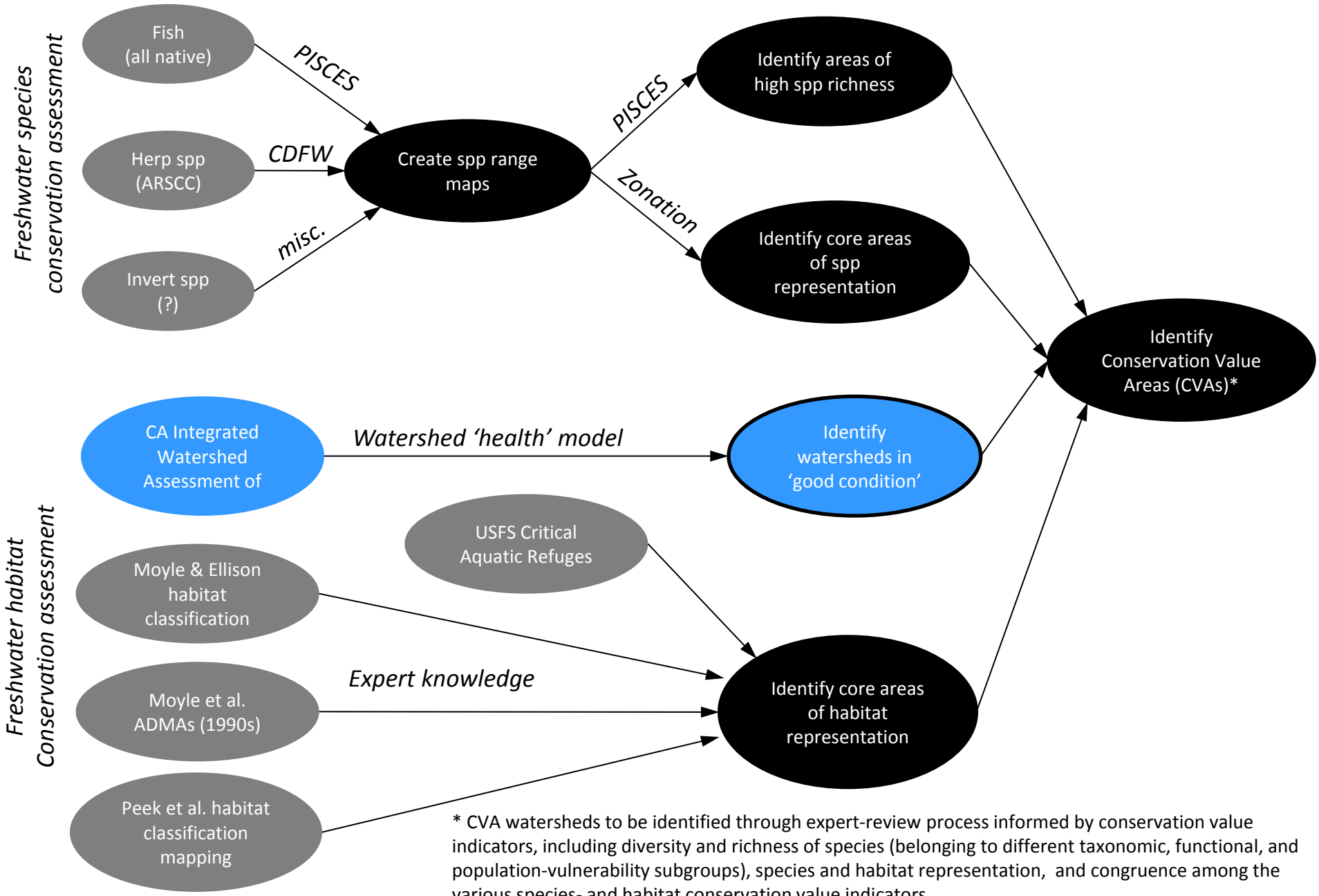
Example of HWI application

The Nature Conservancy assembled a group of experts to create a database of freshwater diversity in California *(see Jeanette Howard presentation tomorrow)*

Goal: Conservation Blueprint that can guide protection and restoration in California's freshwater habitats

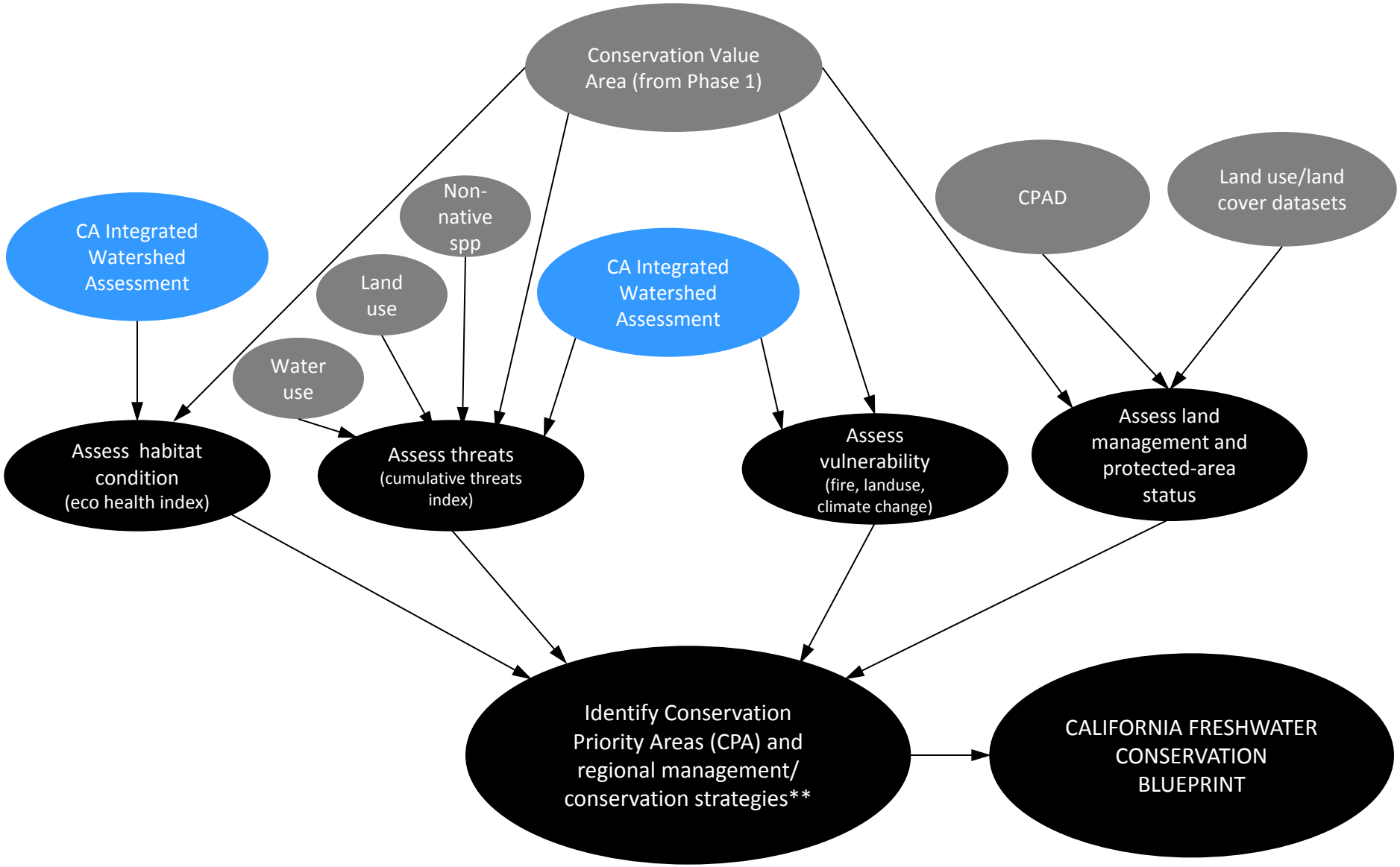
HWI data used to support the Conservation Blueprint and freshwater biodiversity data will in turn improve the HWI datasets

Work Flow to Identify Freshwater Ecosystem Conservation Value Areas (Phase 1)



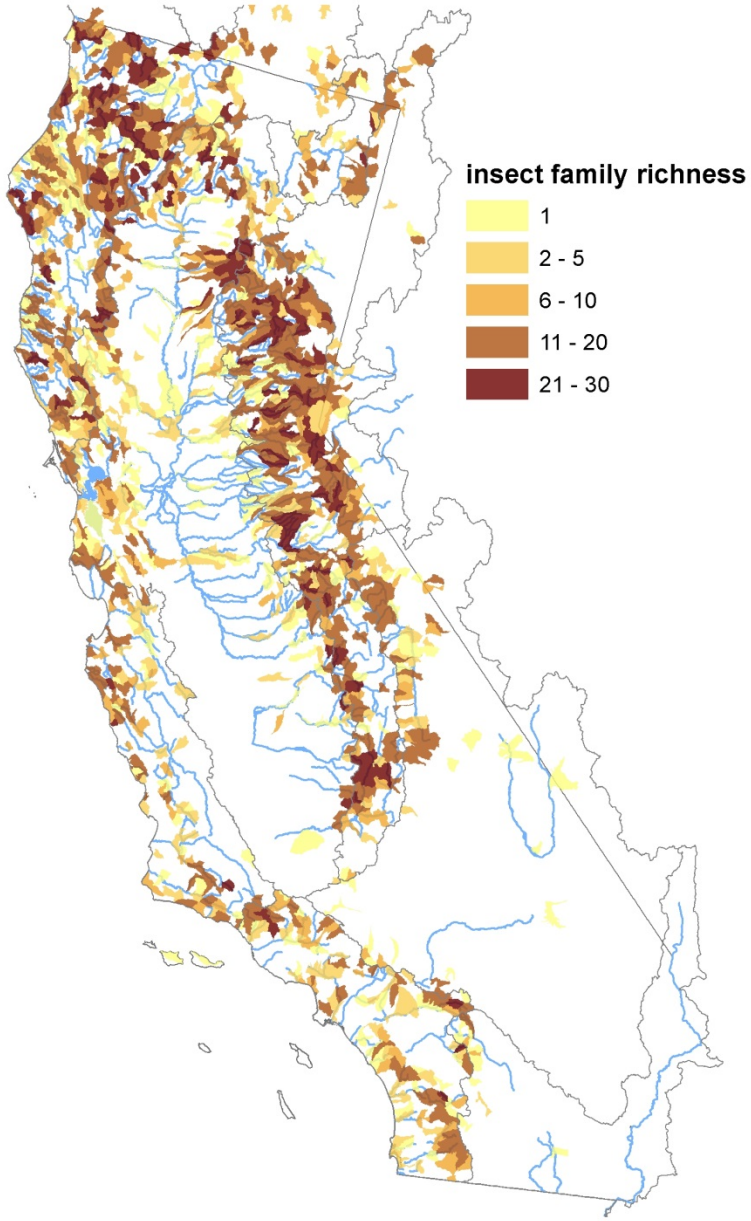
* CVA watersheds to be identified through expert-review process informed by conservation value indicators, including diversity and richness of species (belonging to different taxonomic, functional, and population-vulnerability subgroups), species and habitat representation, and congruence among the various species- and habitat conservation value indicators.

Phase 2: Identify and Develop Management Plan for Freshwater Conservation Priority Areas



** Conservation priority areas and regional management/conservation strategies to be determined through expert review process, informed by current watershed conditions, existing threats, future threats (vulnerability), and land-management status. Strategies will also consider biophysical and life-history requirements of the species and/or habitat indicators of conservation value present within the Conservation Priority Area.

California sensitive invertebrate family subgroups



Arthropods (*n* = 44)

- Ameletidae
- Amphizoidae
- Apataniidae
- Athericidae
- Blephariceridae
- Brachycentridae
- Calamoceratidae
- Capniidae
- Chloroperlidae
- Cordulegastridae
- Corduliidae
- Corydalidae
- Deuterophlebiidae
- Dixidae
- Elmidae
- Ephemerellidae
- Eulichadidae
- Glossosomatidae
- Goeridae
- Helicopsychidae
- Heptageniidae
- Isonychiidae
- Lepidostomatidae
- Leuctridae
- Limnephilidae
- Lutrochidae
- Macromiidae
- Nemouridae
- Odontoceridae
- Peltoperlidae
- Perlidae
- Perlodidae
- Petaluridae
- Philopotamidae
- Phryganeidae
- Psychomyiidae
- Pteronarcyidae
- Ptilodactylidae
- Rhyacophilidae
- Scirtidae
- Sericostomatidae
- Taeniopterygidae
- Tanyderidae
- Uenoidae


Thank you