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Conservation in Changing Landscapes

2009 Napa County Watershed Symposium

- **Systematic Conservation Planning –**
  Setting Priorities for Biodiversity

- **Environmental Change in *California* and *Napa* Region**

- **Adapting Conservation Strategies to a Changing World**


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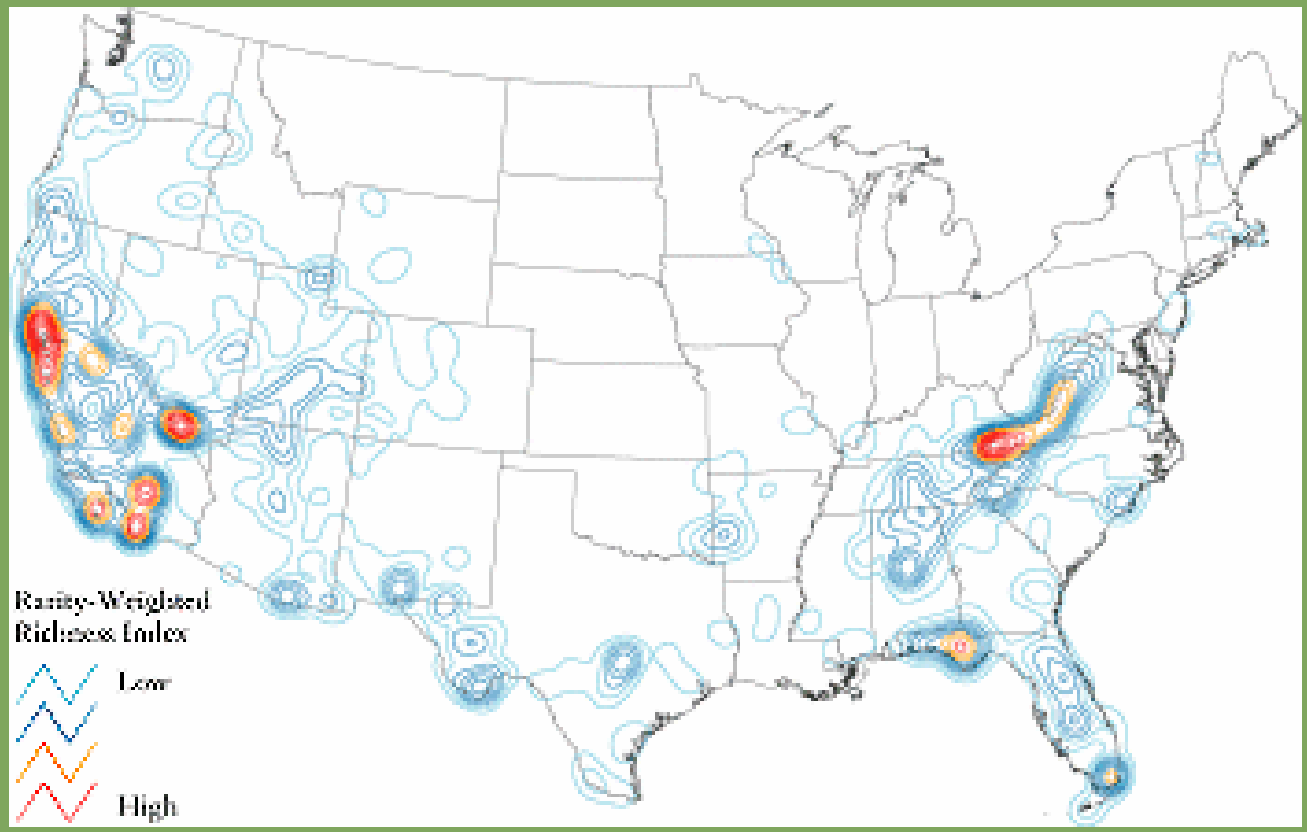
To preserve the plants animals and natural communities that represent diversity of life on Earth by protecting the lands and waters they need to survive.



Source: Precious Heritage

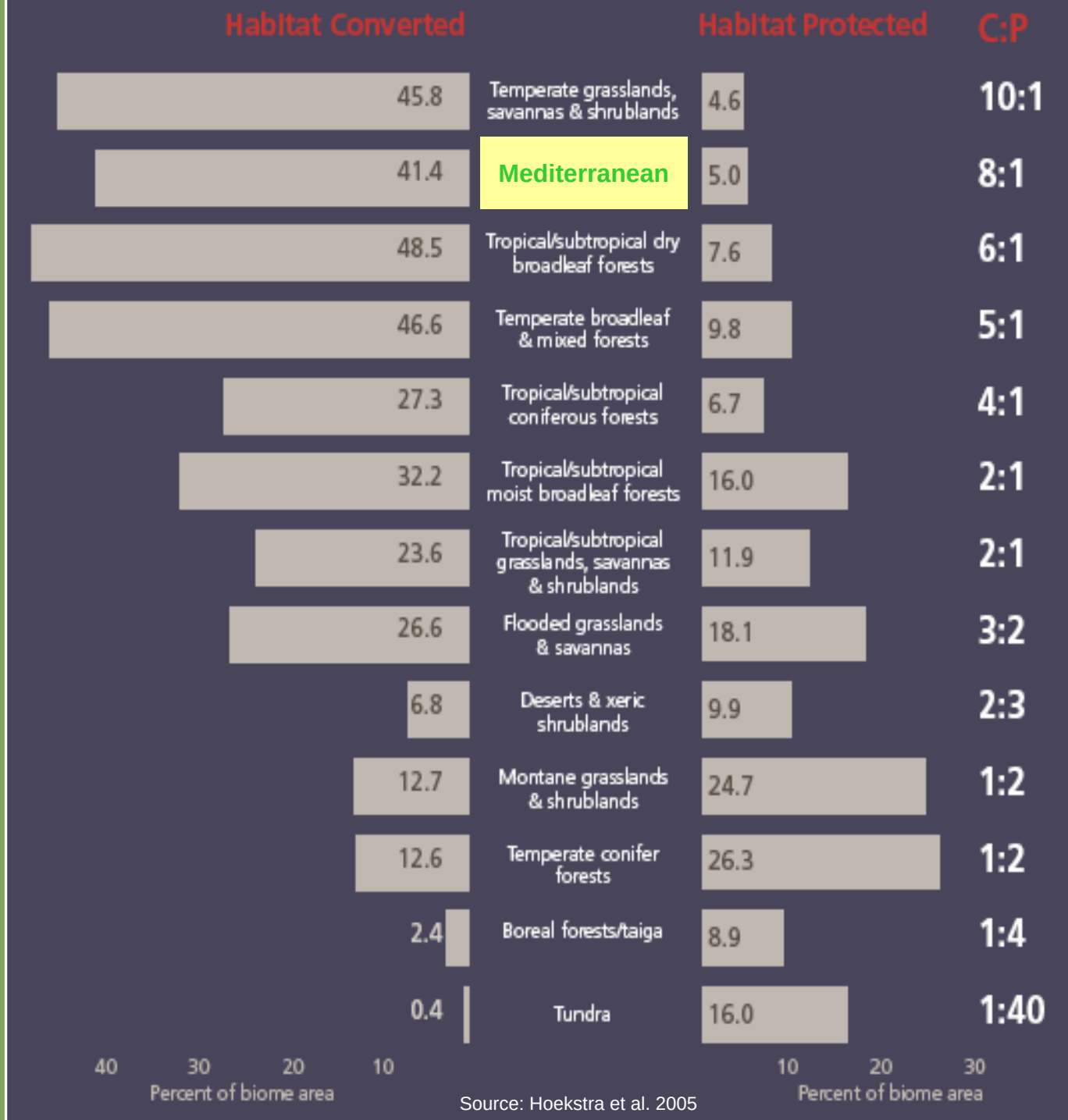
Napa County – Biodiversity Hotspot

oak woodlands, grasslands, serpentine chaparral, cypress forests, riparian and aquatic habitats
~75 sensitive species

Global Impact: 2015 Goal

By 2015, The Nature Conservancy will work with others to ensure the effective conservation of places that represent at least 10% of every major habitat type on Earth.

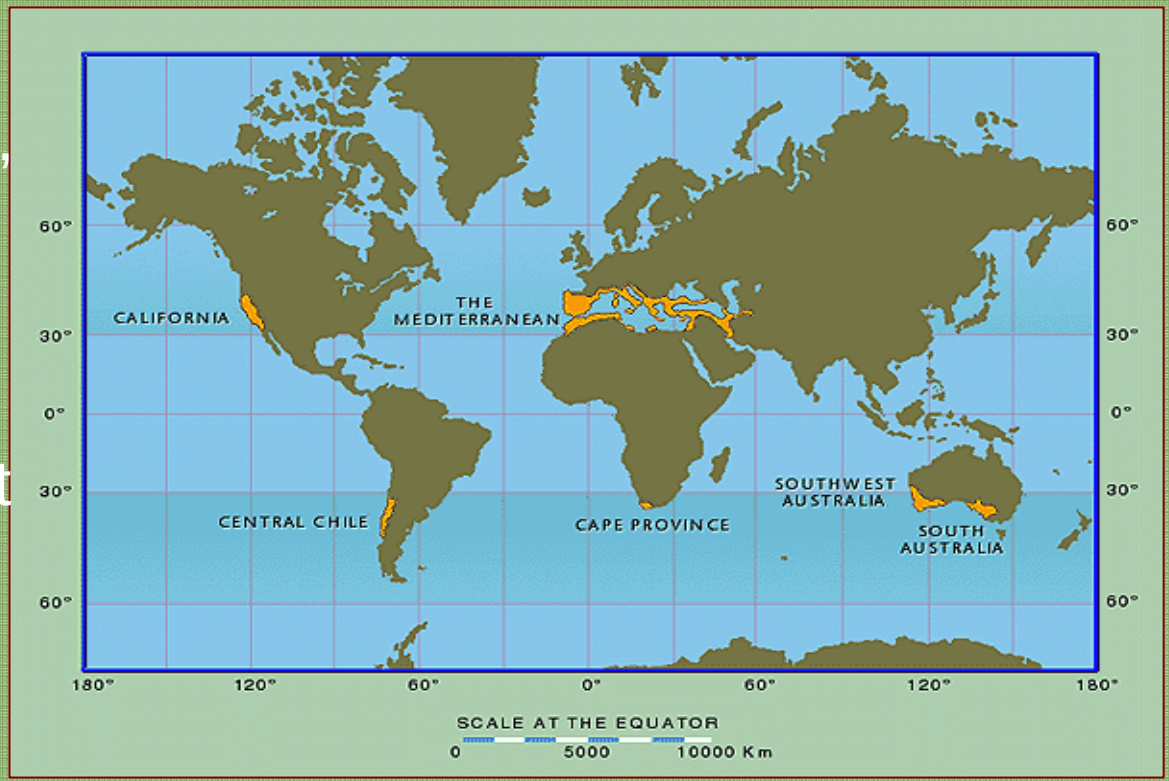
Ratio Habitat Conversion to Habitat Protection



Source: Hoekstra et al. 2005

Mediterranean Biome: A Global Conservation Priority

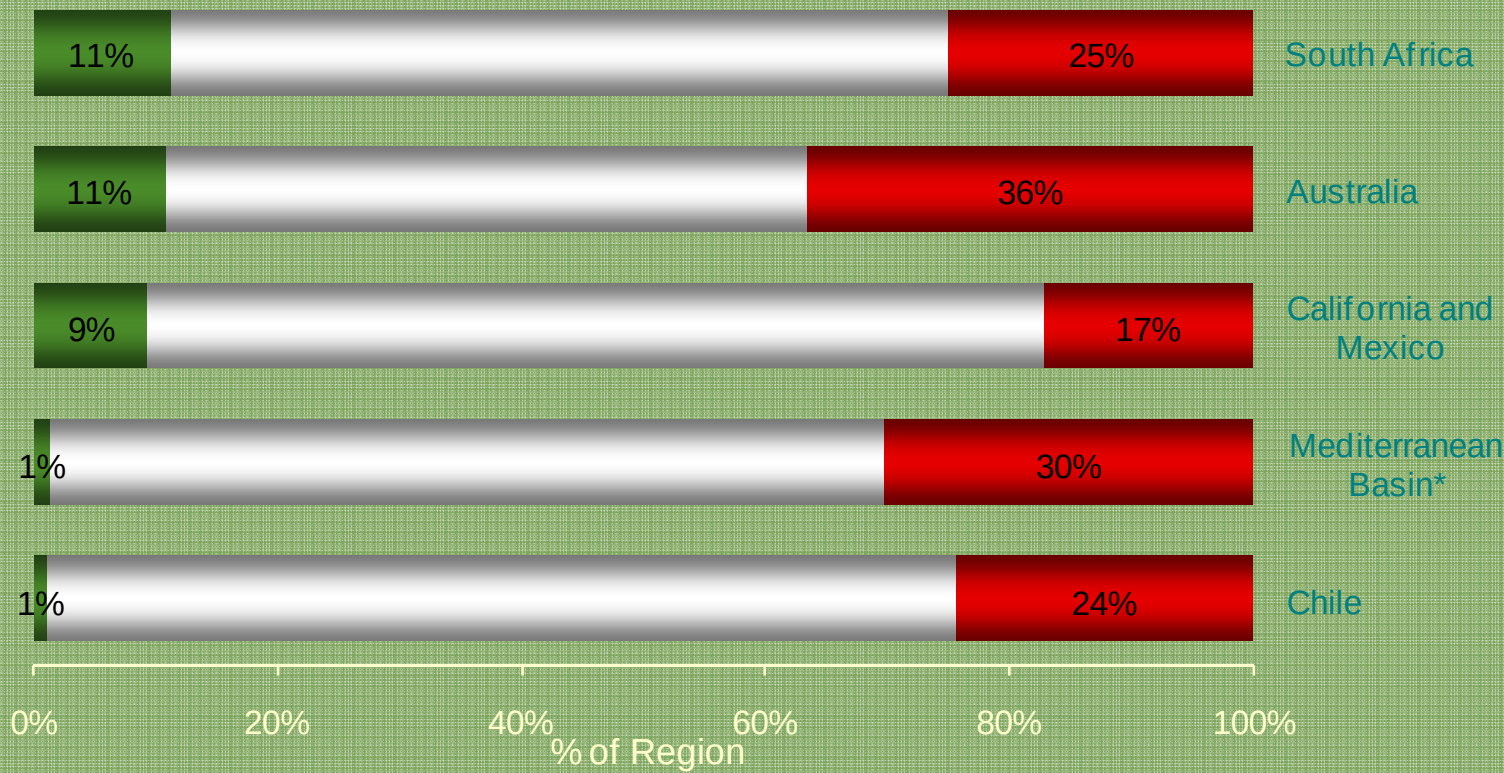
- Characterized by hot, dry summers and cool, wet winters
- Cover just 2.2% of Earth's surface but support 20% of world's plant species
- Over 50% of plant species endemic



More threatened than tropical forests

Only 4% protected world-wide

Conversion/Protection by Mediterranean Region



% Conversion

% Protection (IUCN I-IV)

* Mediterranean basin protected area from global dataset

Source: The Nature Conservancy

Conservation Approach: Conservation by Design

Core conservation approach is to conserve portfolios of functional conservation areas within and across ecoregions to conserve a full array of ecological systems and viable native species.

Ecoregional Assessments

An ecoregional portfolio is a map of the lands and waters needed to sustain the ecoregional biodiversity; designed to capture the full array of native species, natural communities and ecological systems that collectively define the diversity of the ecoregion.

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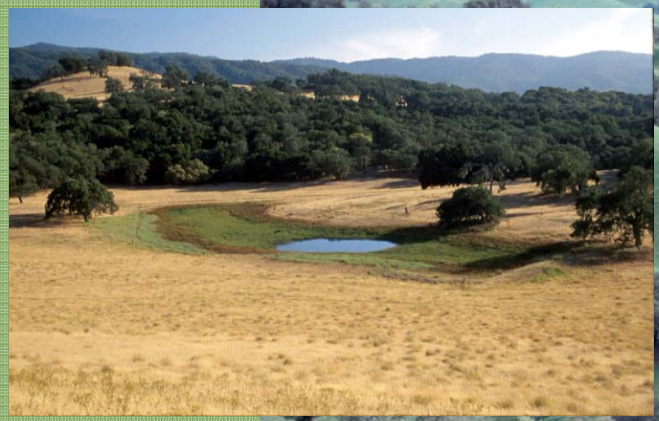
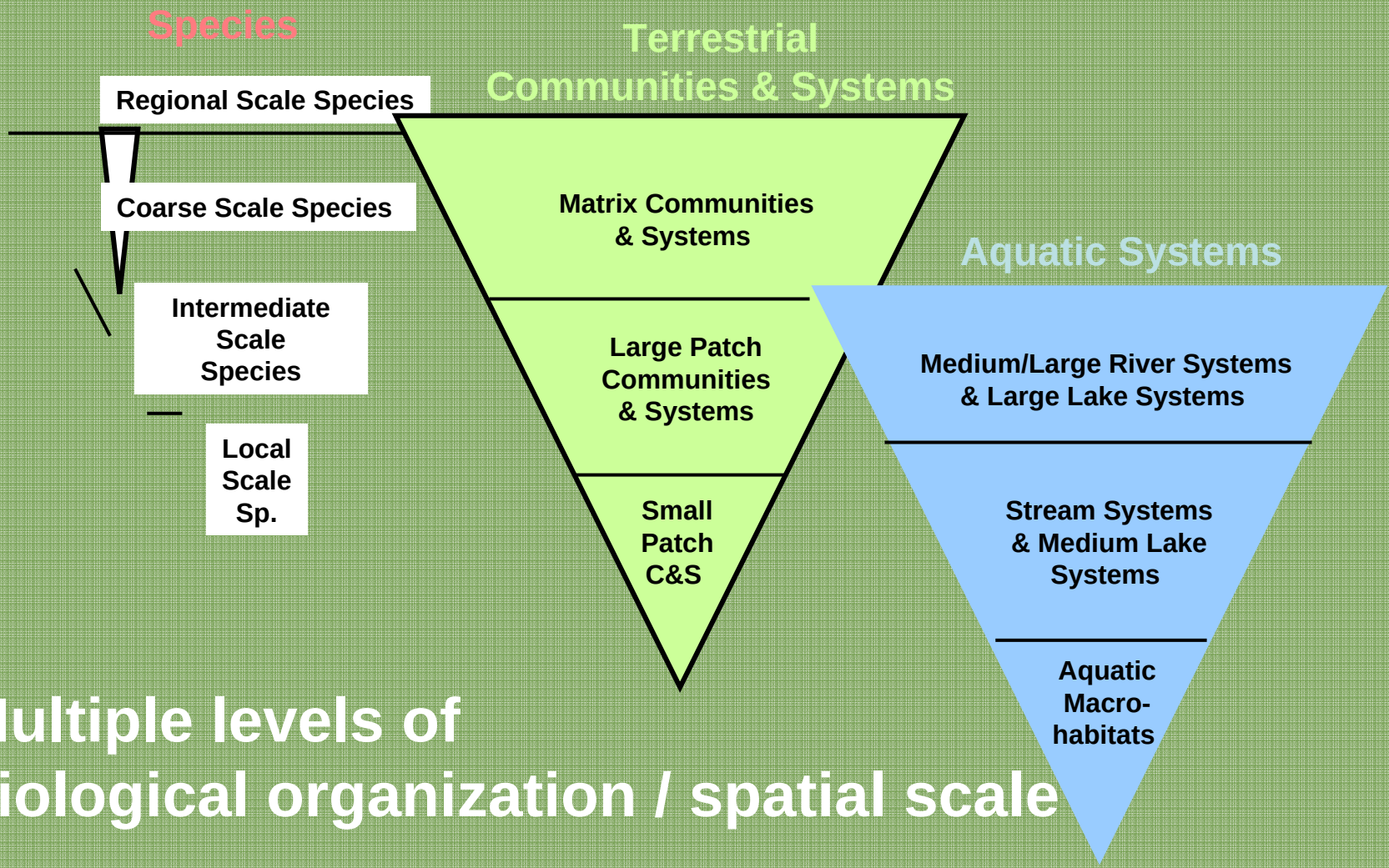
Select Conservation Targets



Functional Landscapes



Multiple levels of biological organization / spatial scale

Ecoregional Planning

Select Conservation Targets

Species

Ecological Communities

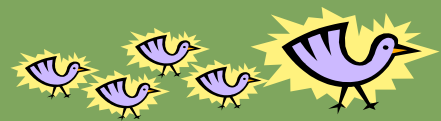
Ecological Systems

Set Conservation Goals

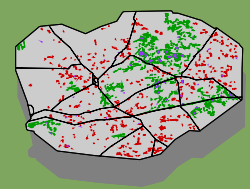
Number and Distribution

Assess Viability of Target Occurrences

Size



Condition



Landscape Context

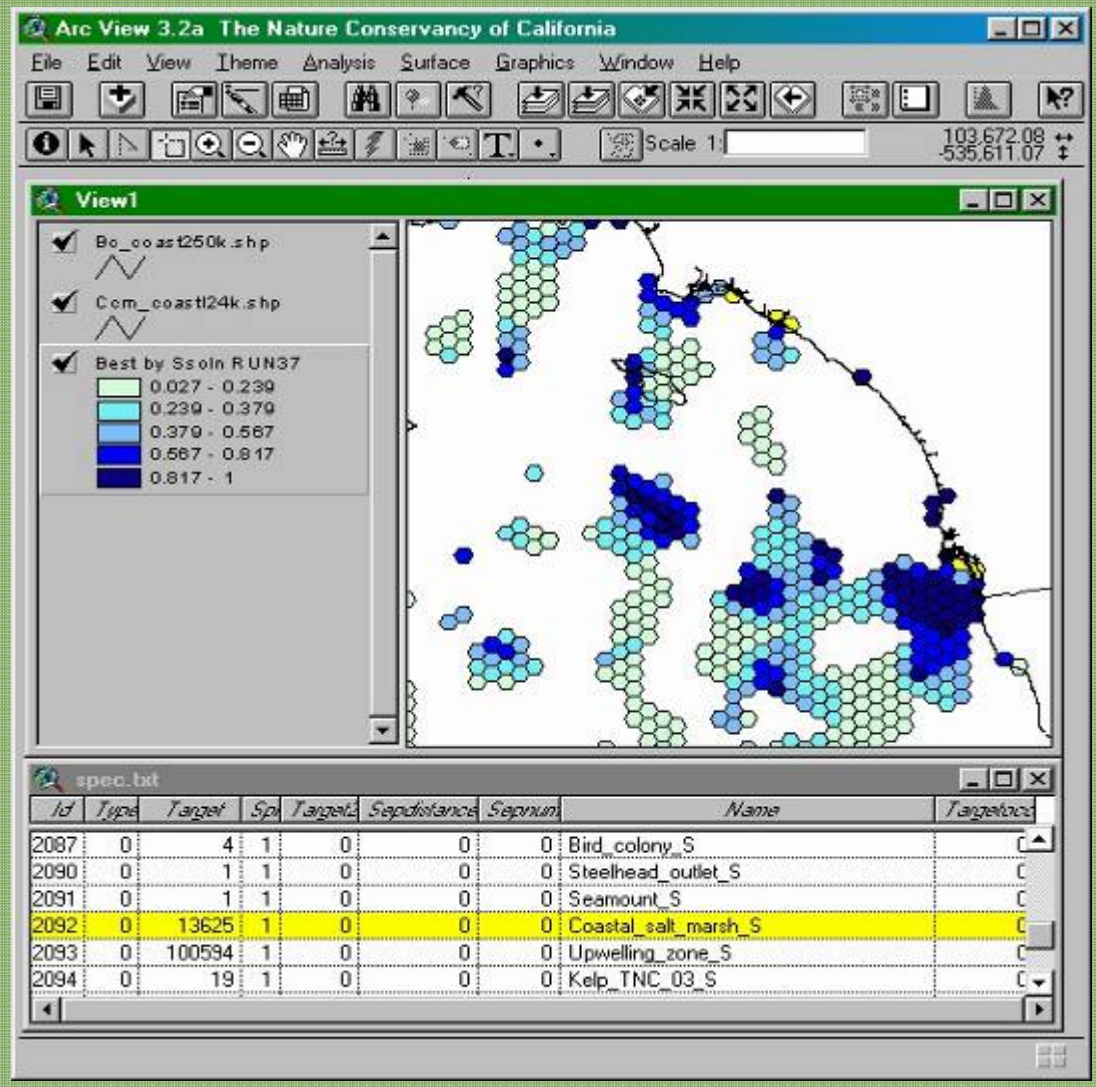
Site Selection Tools

Site Selection Software (MARXAN) – well-tested tool

Selects spatially efficient network that meets goals

Avoids impacted areas

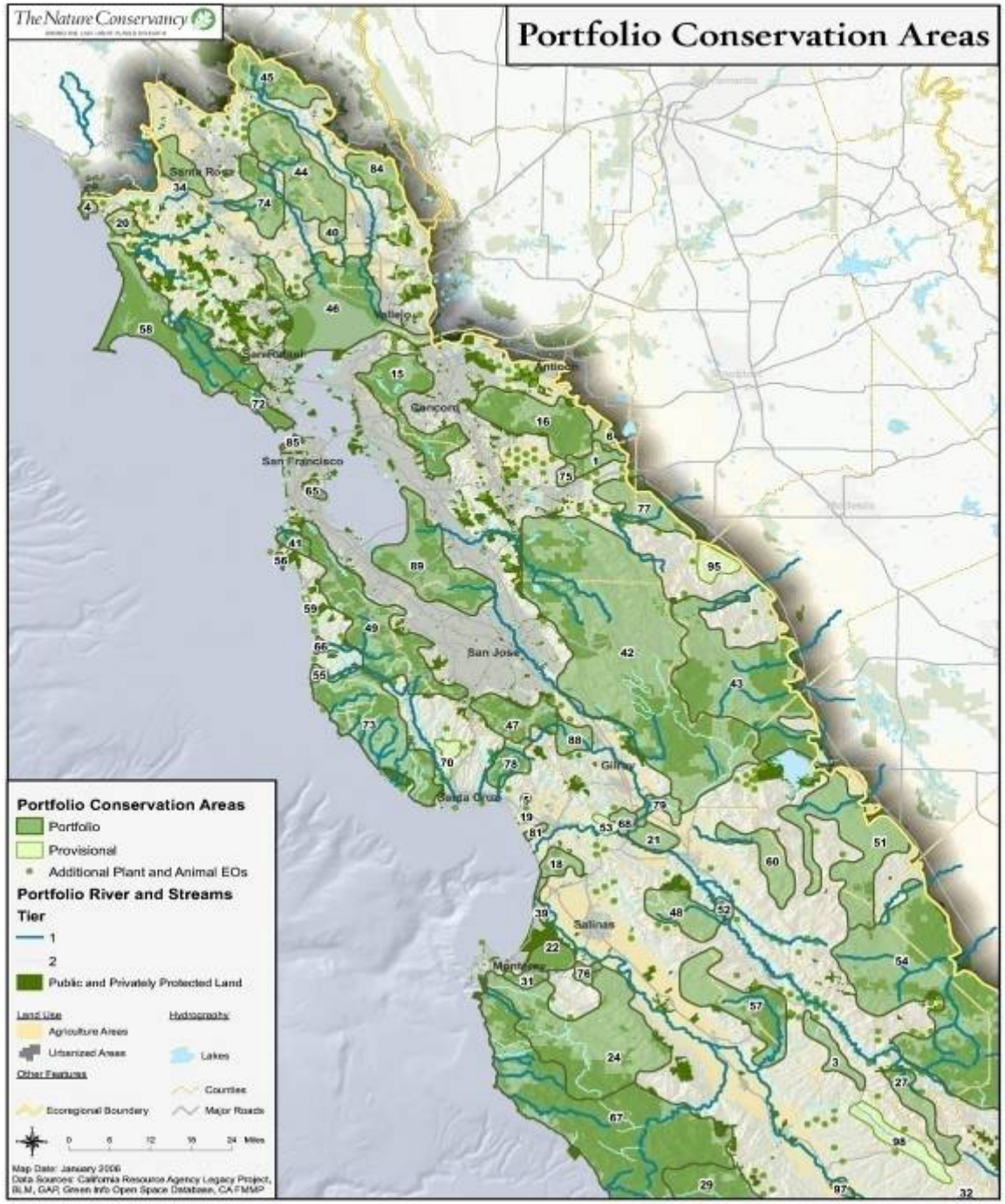
Builds off existing protected/public lands

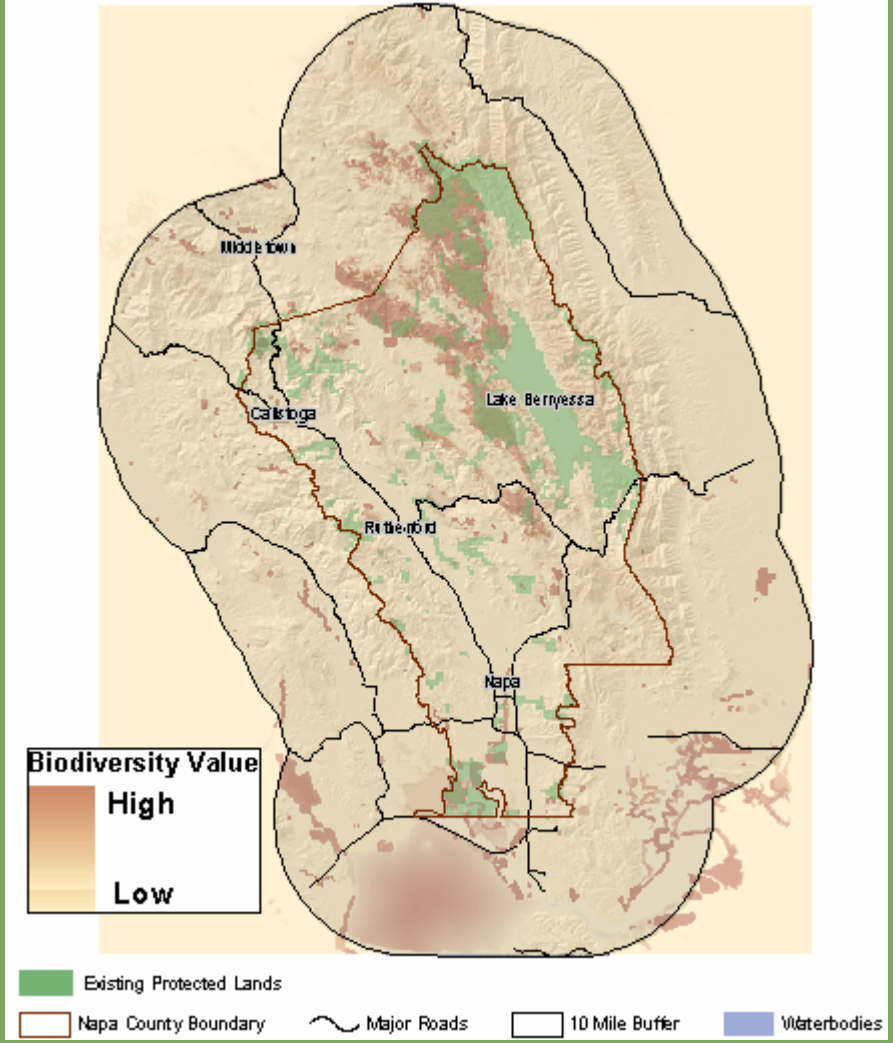


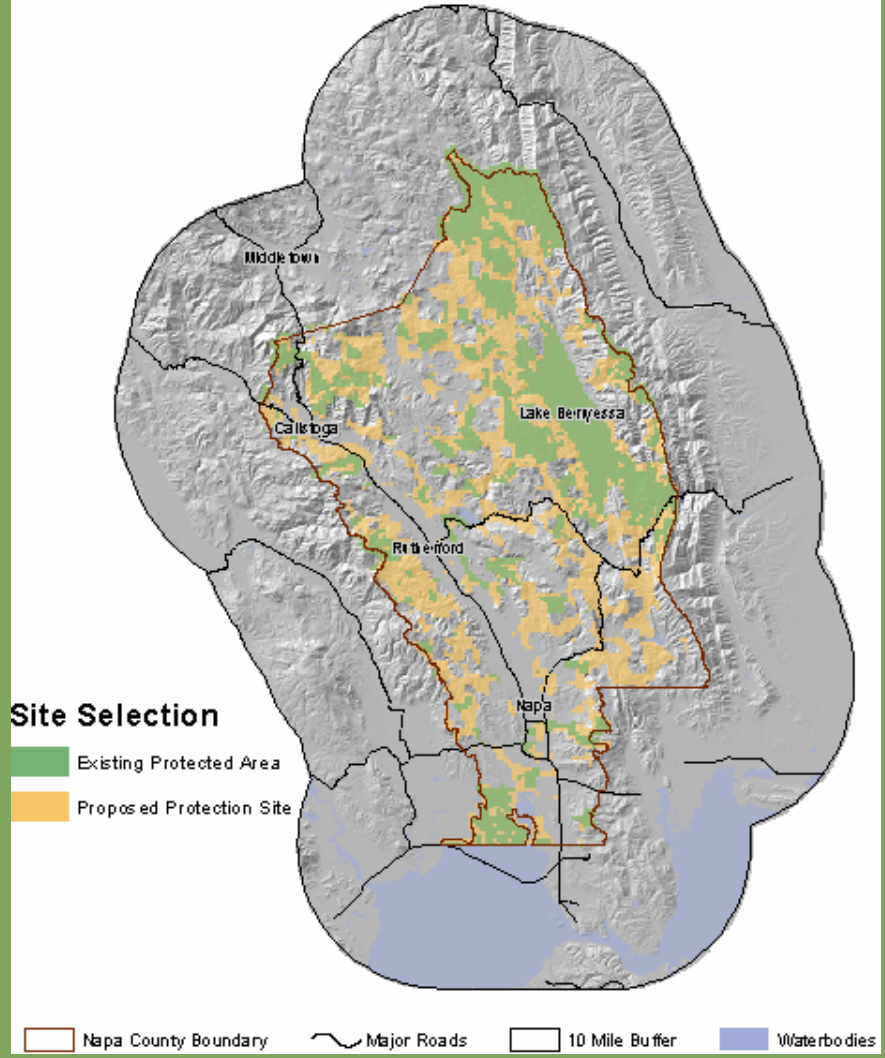
MARXAN: Ball and Possingham, 2000

Marxan Optimization Model

Portfolio Conservation Areas







NatureServe

Conservation Prioritization in Napa County, 2003

CONSERVING THE LANDSCAPES OF NAPA COUNTY






2003

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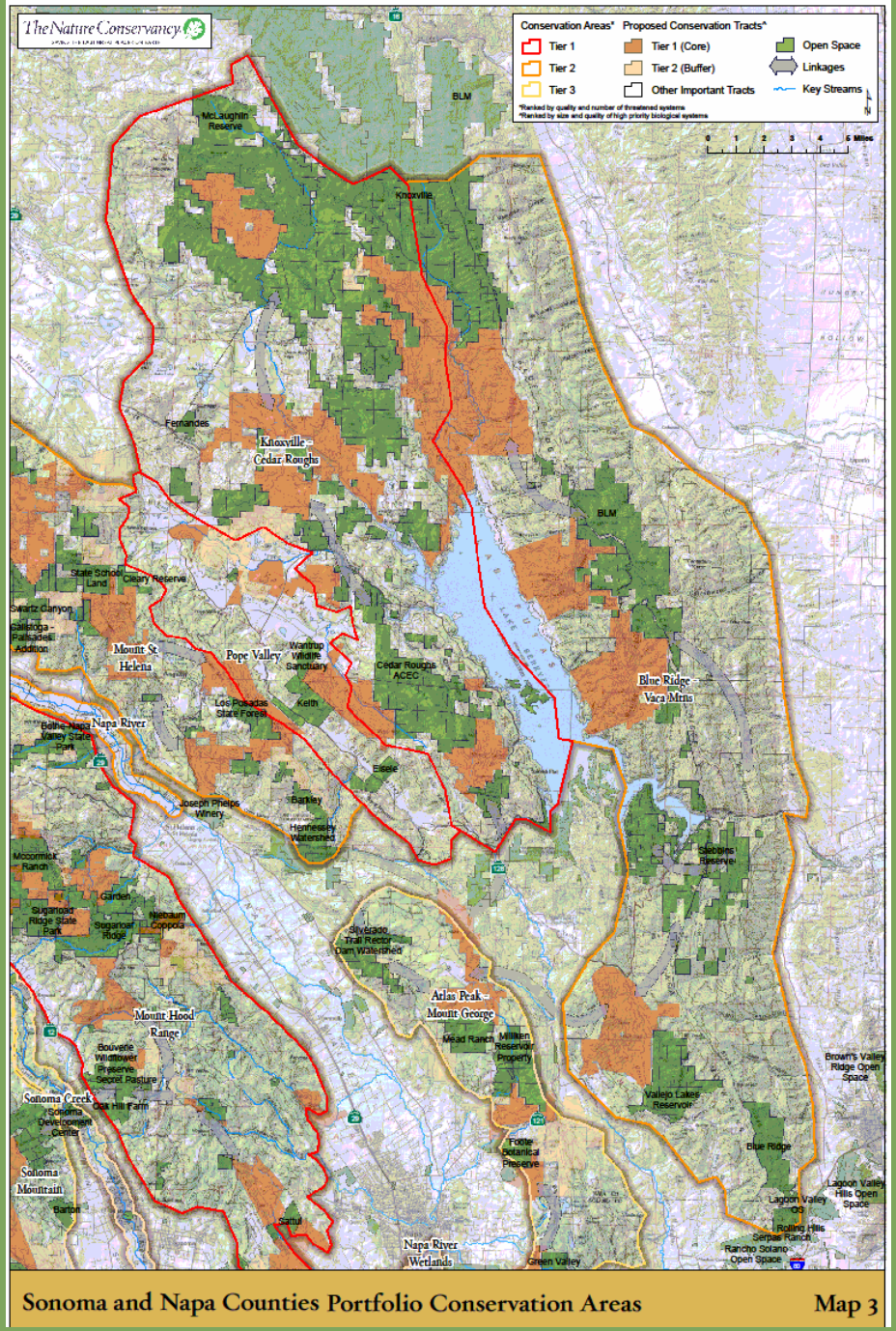
SAVING THE LAST GREAT PLACES ON EARTH



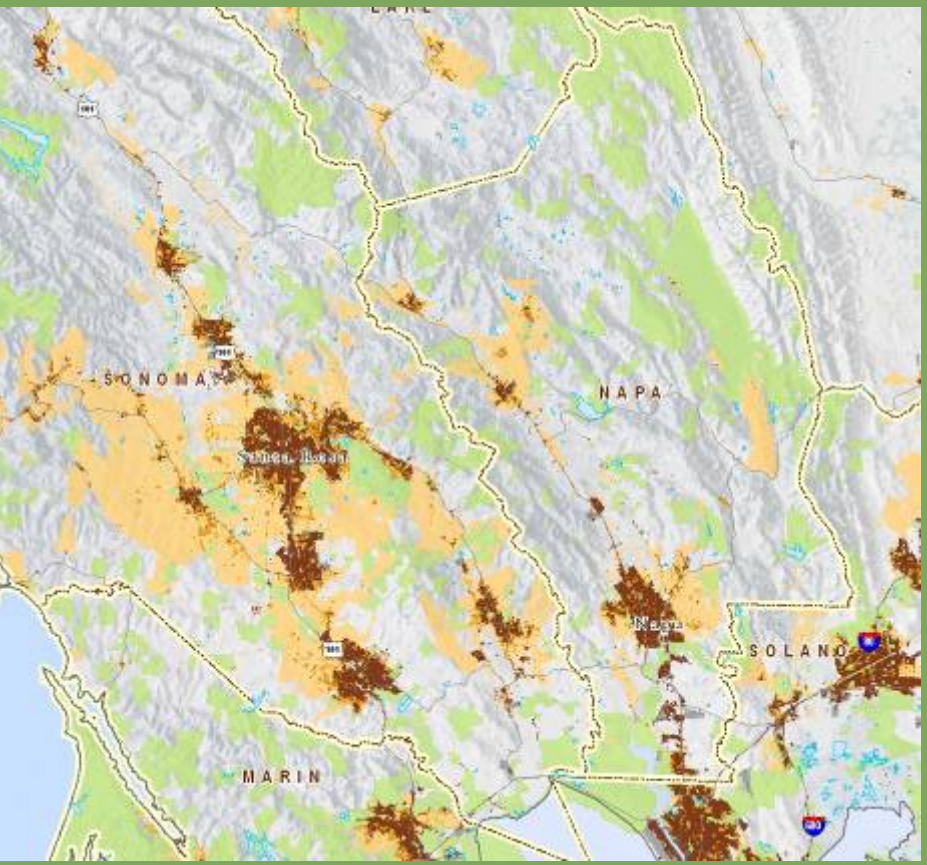
Sonoma and Napa Counties Portfolio Conservation Areas Map 3

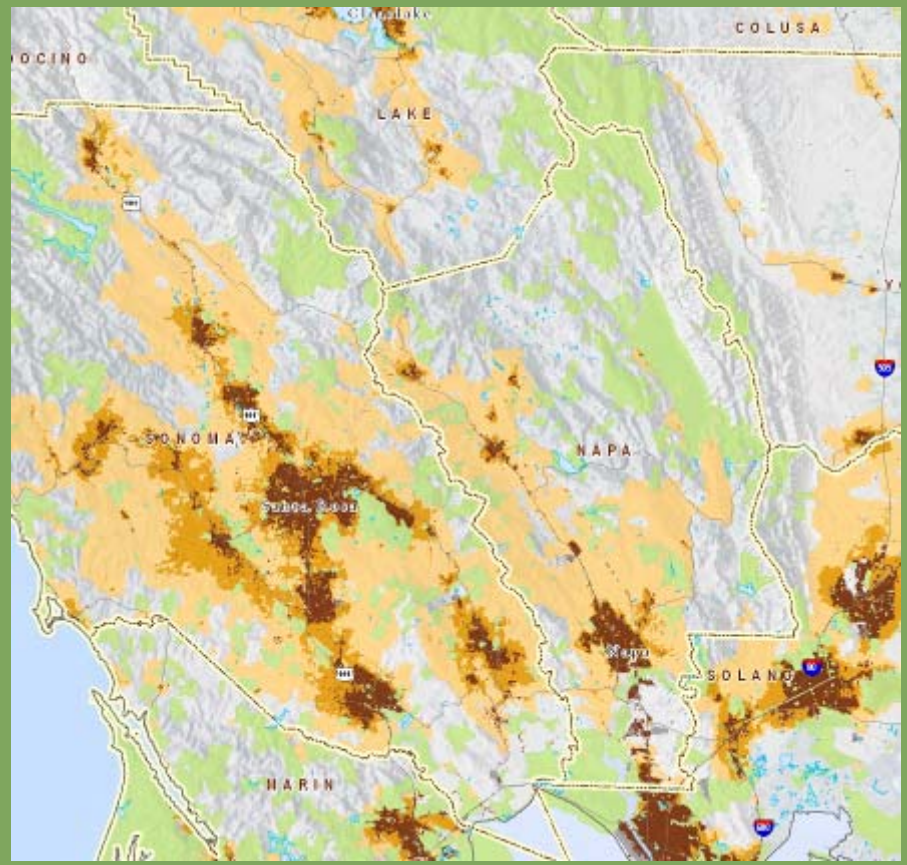
Systematic Conservation Planning

Map, Prioritize, Protect, Repeat…

But what about dynamic threats? ***Climate change?***

How can we design conservation projects
to adapt to environmental change?



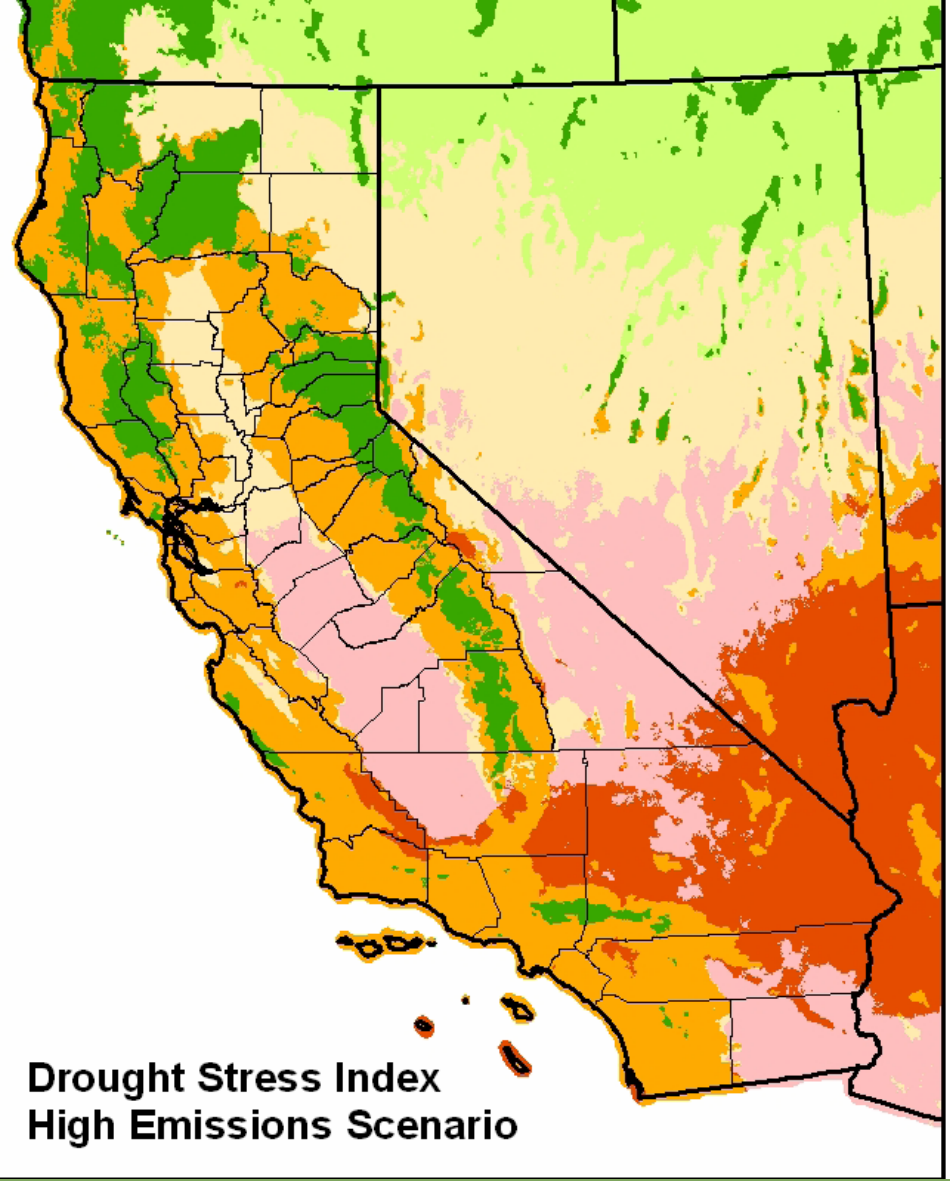


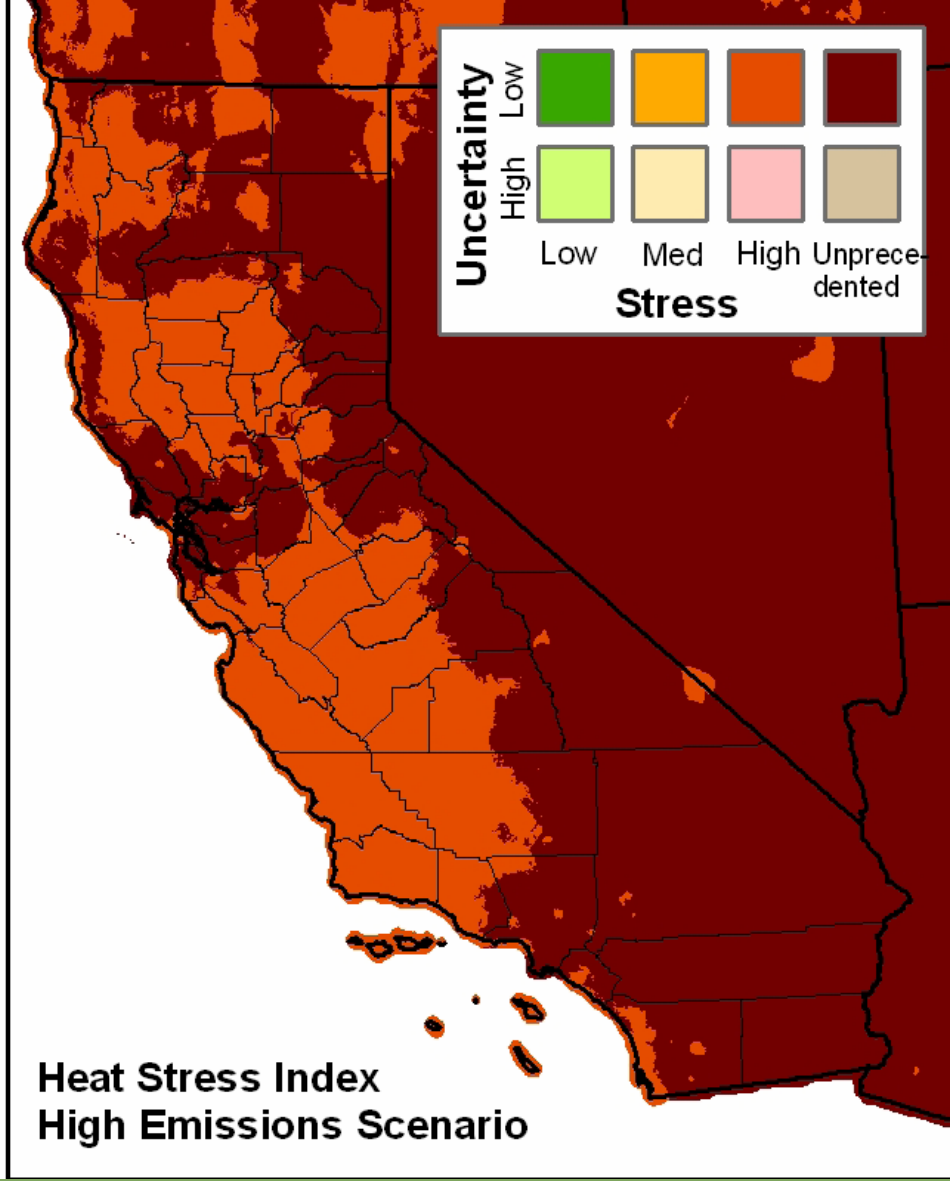
2000

2030

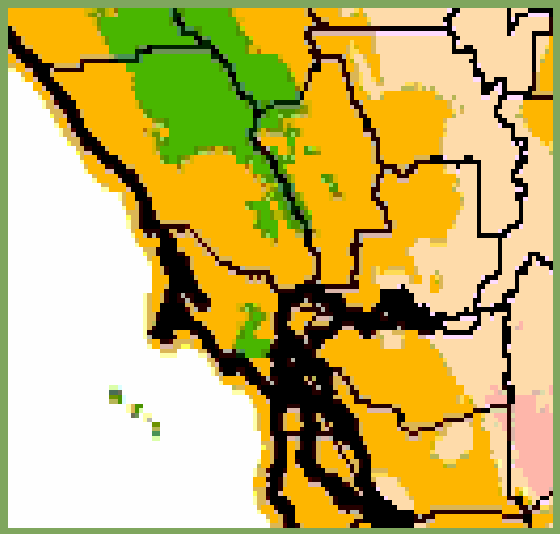
Napa Region Urban, Sub-urban, Ex-urban Development 2000-2030

Source: SeRGOM, Theobald 2005

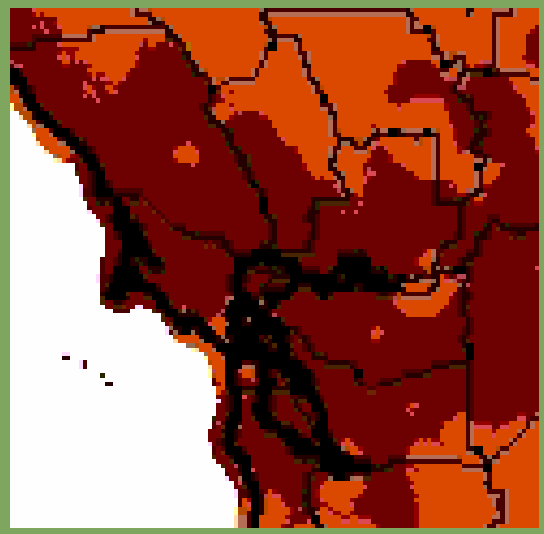




15 Global Climate Change Models run under IPCC A2 High Emissions Scenario



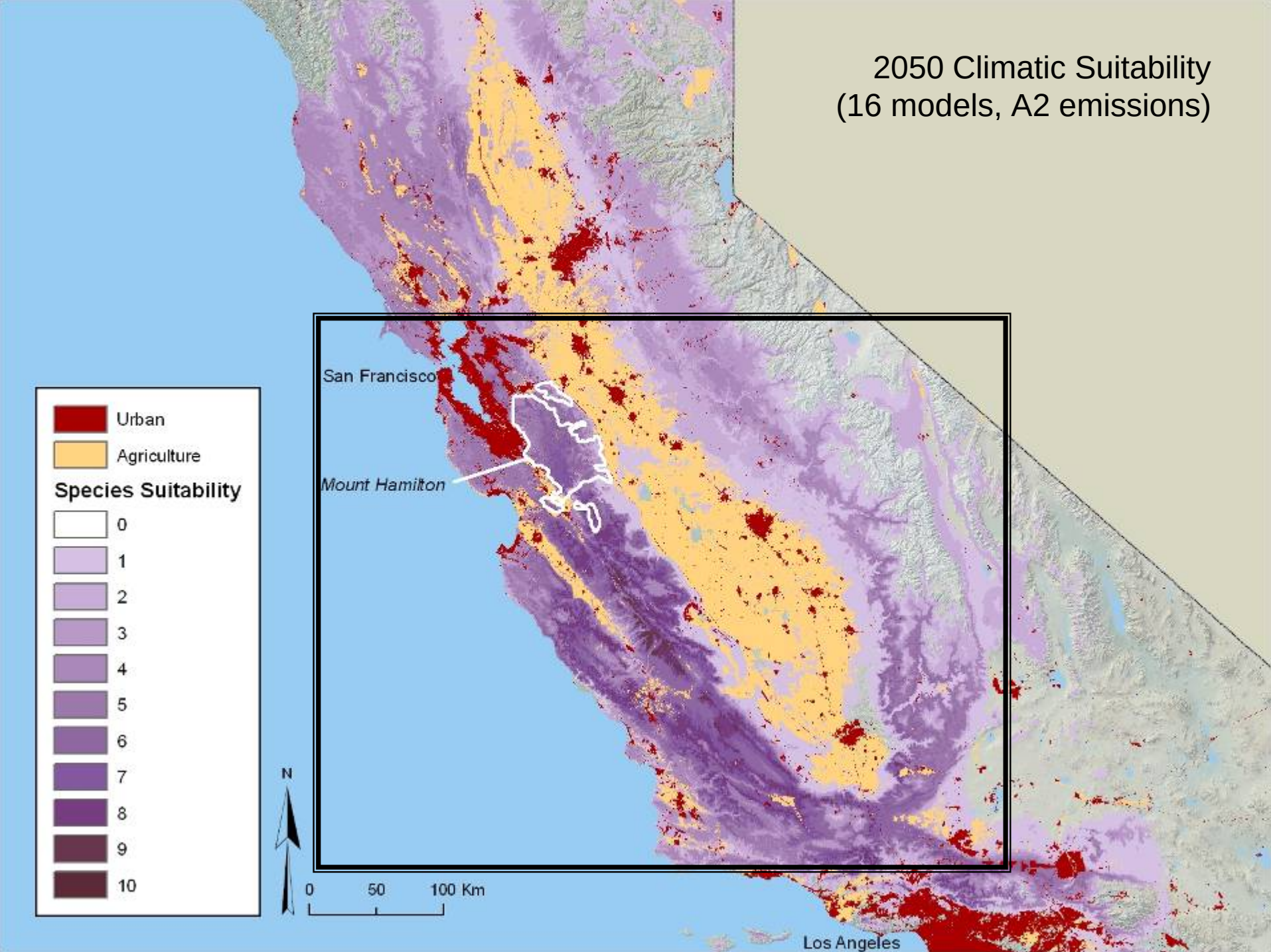
21 Cent. Drought Stress

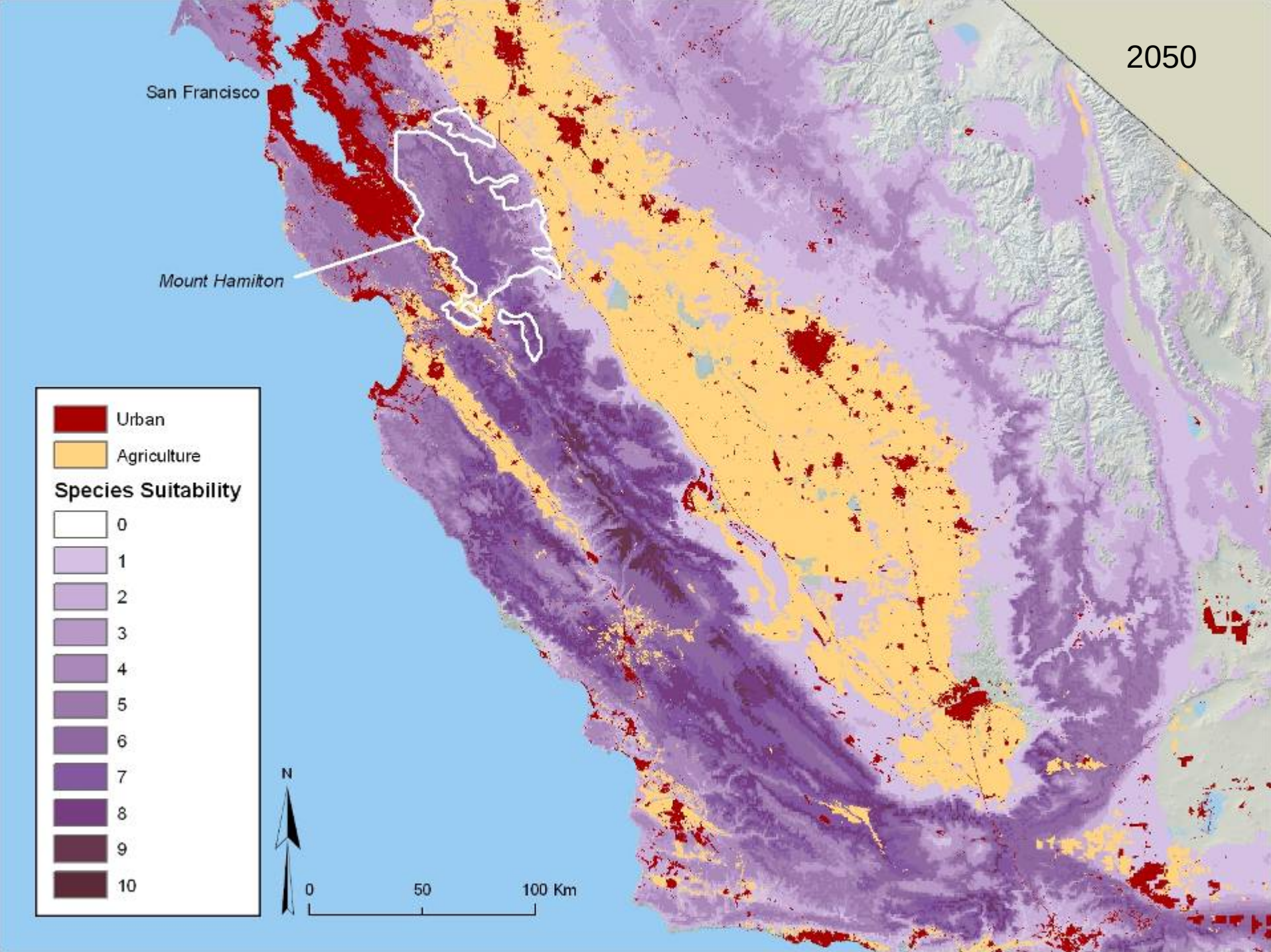


Heat Stress

Napa Region – **Low Drought Stress,** Low Uncertainty
(54 yrs wetter than 1900-99); 1-5 inch increase

High Heat Stress, Low Uncertainty
(99 yrs July Max hotter than 1900-99); 6-8 degree F increase


2050 Climatic Suitability
(16 models, A2 emissions)
San Francisco
Mount Hamilton
Urban
Agriculture
Species Suitability
0
1
2
3
4
5
6
7
8
9
10
N
0
50
100 Km
Los Angeles


2050
San Francisco
Mount Hamilton
Urban
Agriculture
Species Suitability
0
1
2
3
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7
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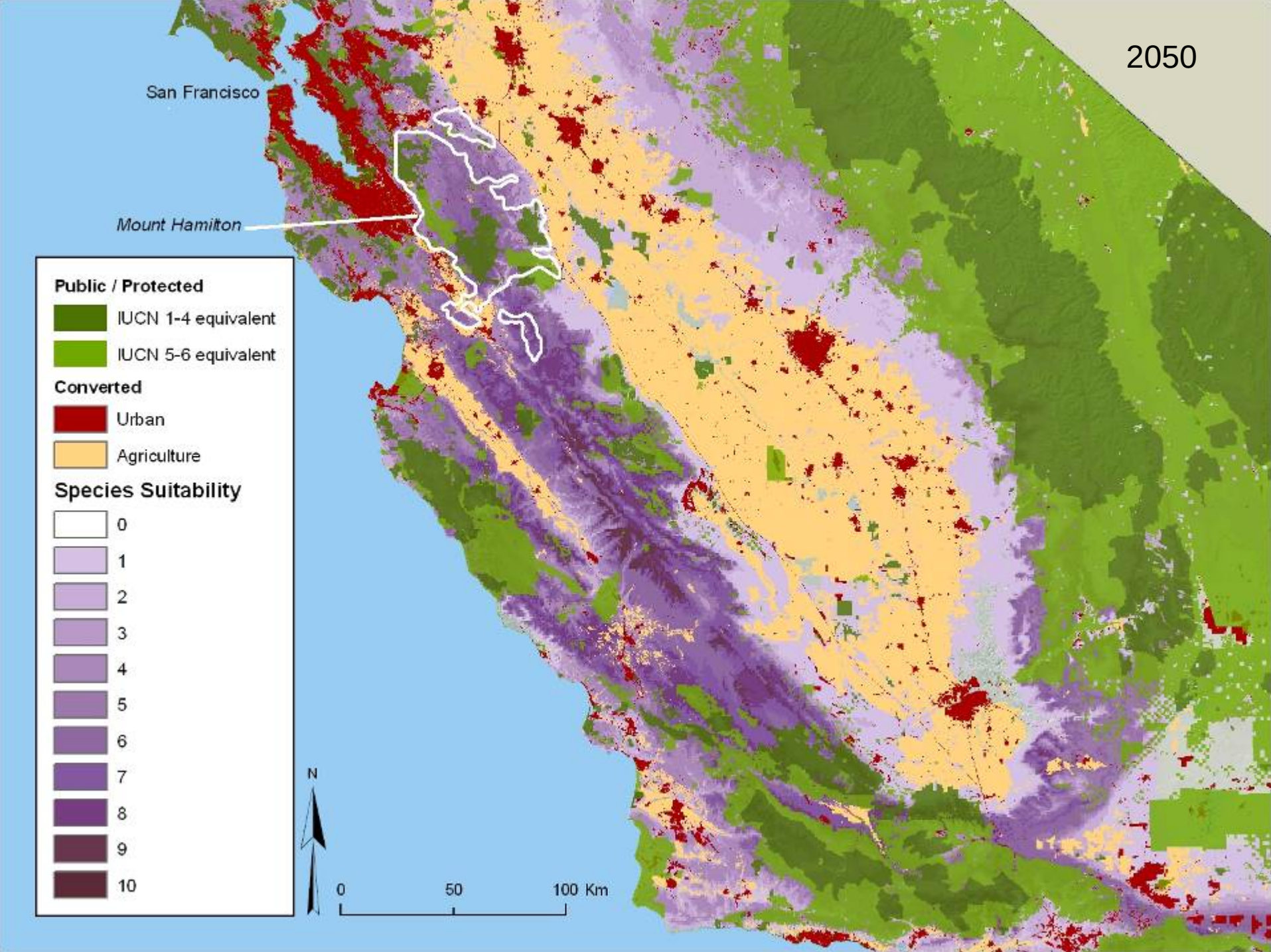
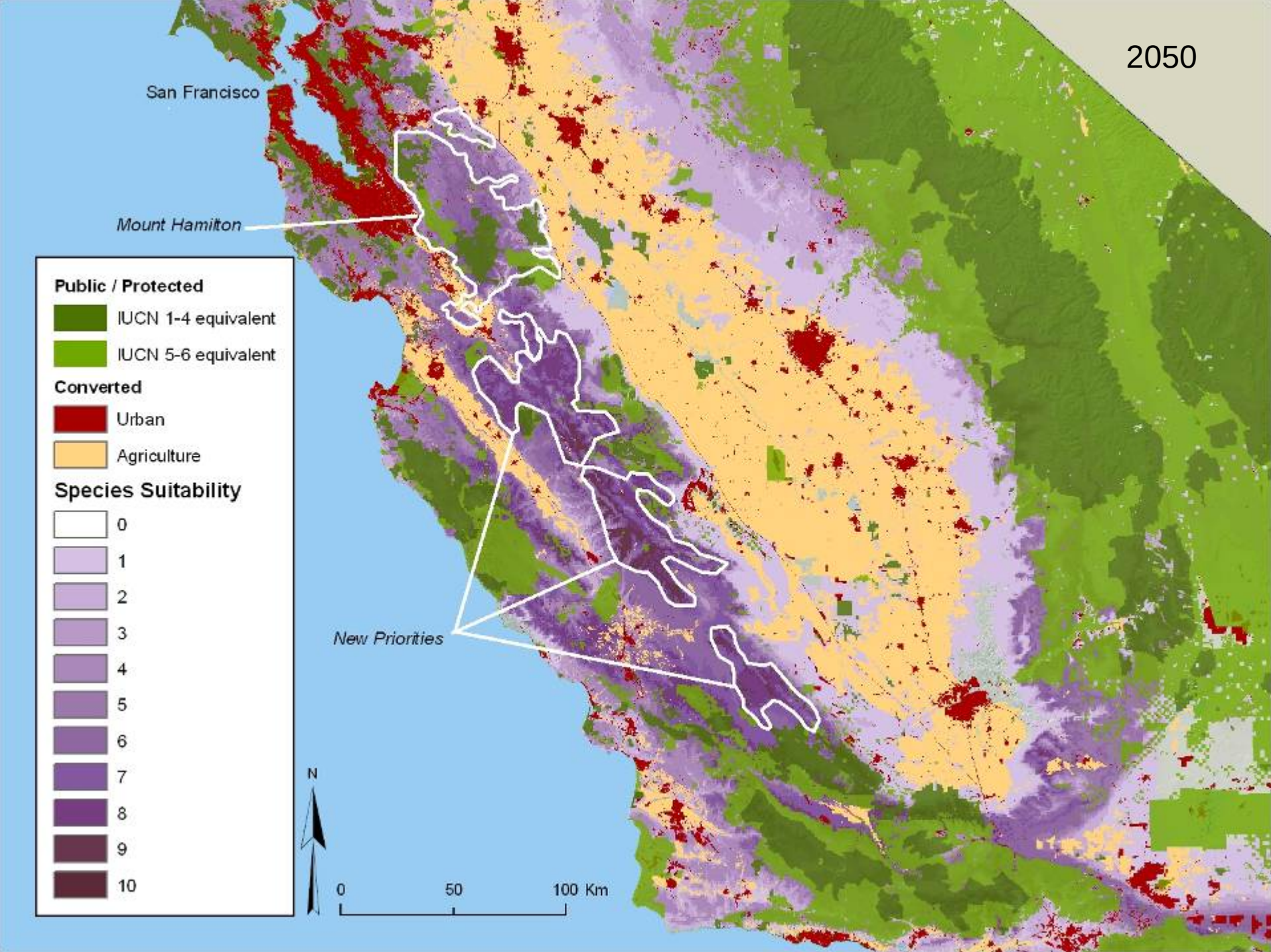
0
50
100 Km


2050
San Francisco
Mount Hamilton
Public / Protected
IUCN 1-4 equivalent
IUCN 5-6 equivalent
Converted
Urban
Agriculture
Species Suitability
0
1
2
3
4
5
6
7
8
9
10
N
0
50
100 Km


2050
San Francisco
Mount Hamilton
New Priorities
Public / Protected
IUCN 1-4 equivalent
IUCN 5-6 equivalent
Converted
Urban
Agriculture
Species Suitability
0
1
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3
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9
10
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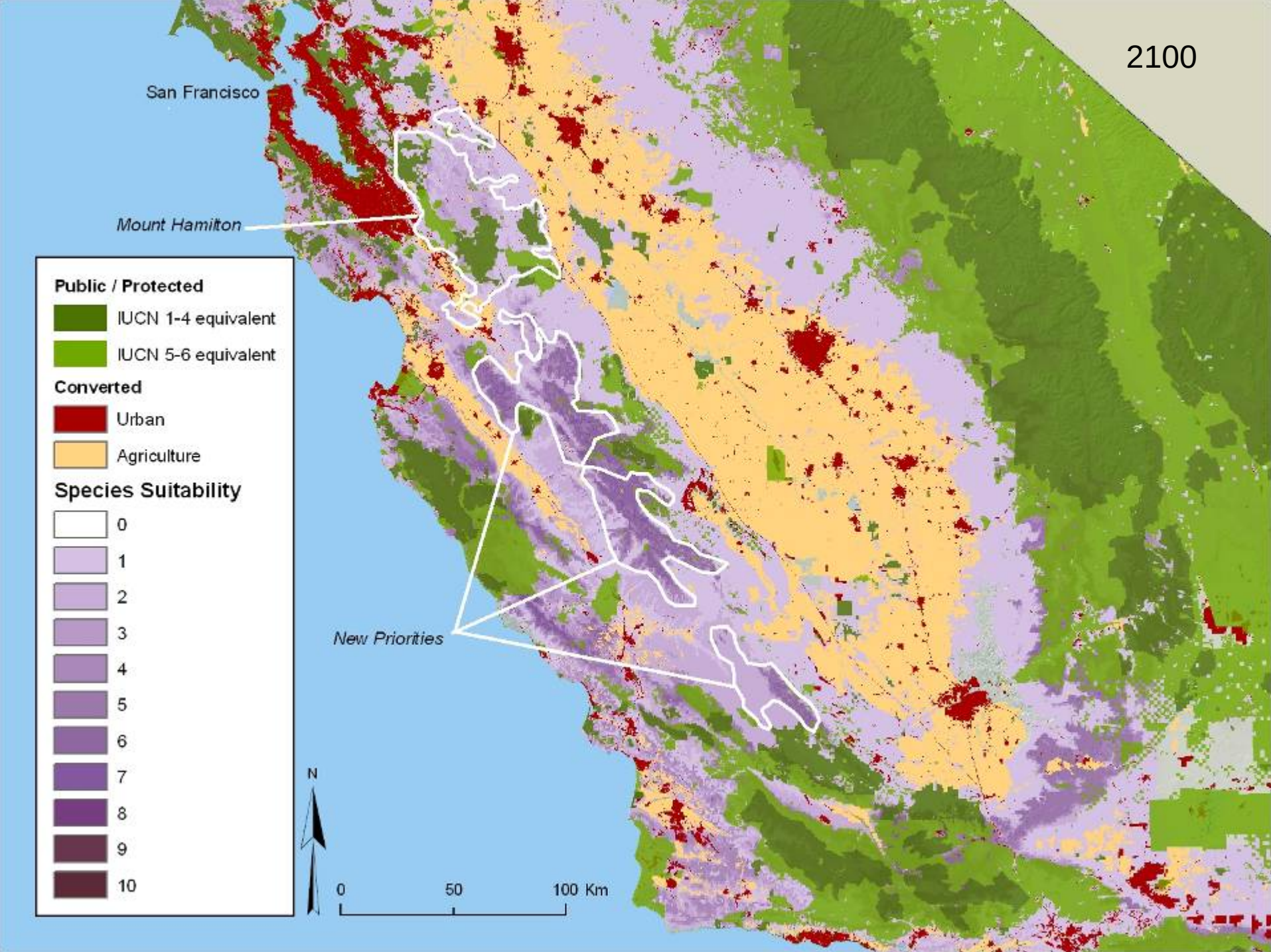
50
100 Km

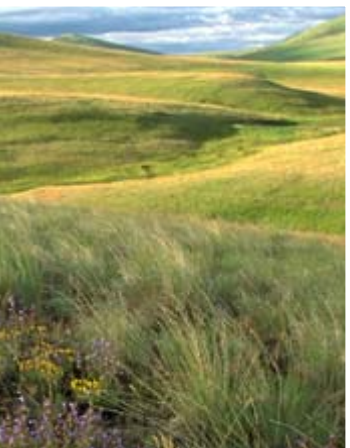

2100
San Francisco
Mount Hamilton
New Priorities
Public / Protected
IUCN 1-4 equivalent
IUCN 5-6 equivalent
Converted
Urban
Agriculture
Species Suitability
0
1
2
3
4
5
6
7
8
9
10
N
0
50
100 Km

Elements of Adaptive Conservation

Large, Connected Conservation Areas
– elevational and directional gradients

Increasing Uncertainty of Effectiveness of Protected Areas

Need Higher Biological Function from Entire Landscape
– *Ecosystem Services*



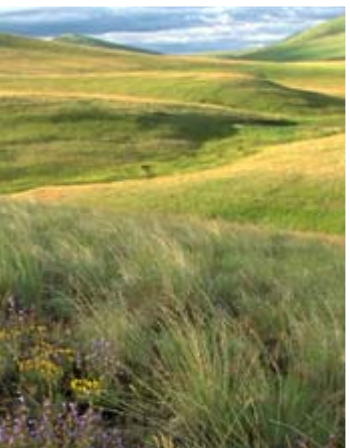
What are ecosystem services?

"Ecosystem services are the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life."

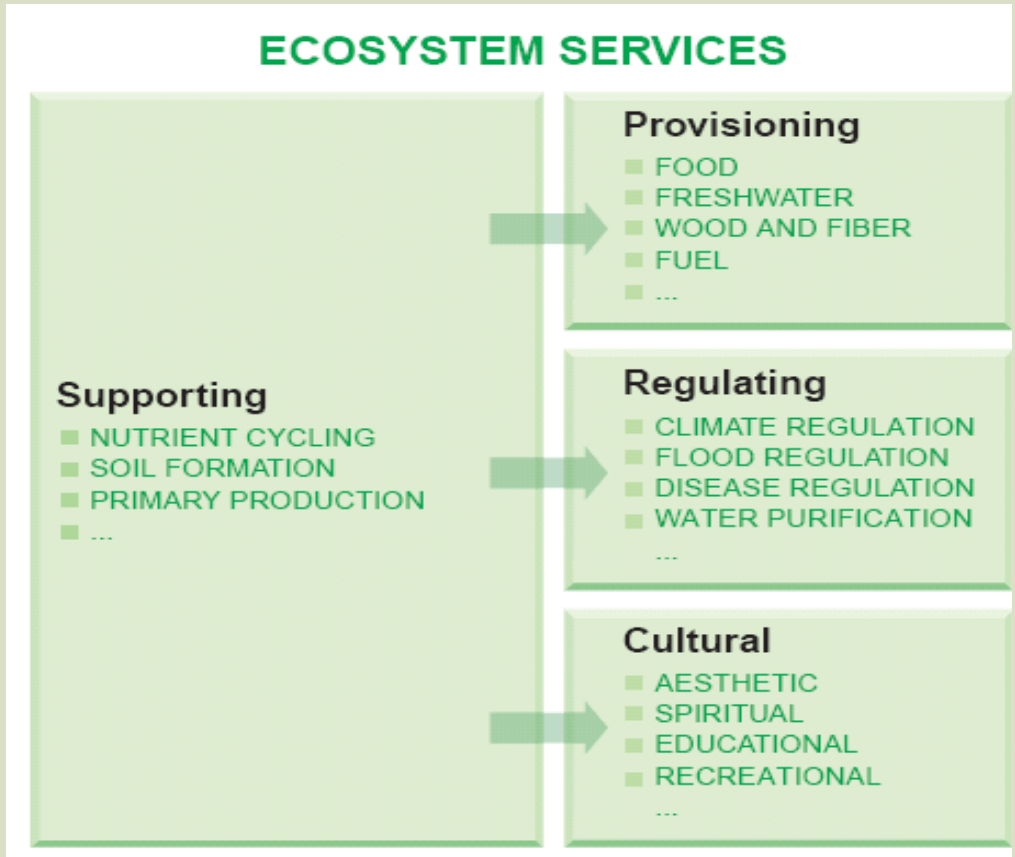
- G. Daily, *Nature's Services: Societal Dependence On Natural Ecosystems, 1997*

" Ecosystem services are the benefits people obtain from ecosystems"

-Millennium Ecosystem Assessment, 2005



Categories of ecosystem services



Ecosystems benefit humans in a multitude of ways

Source: Millennium Ecosystem Assessment

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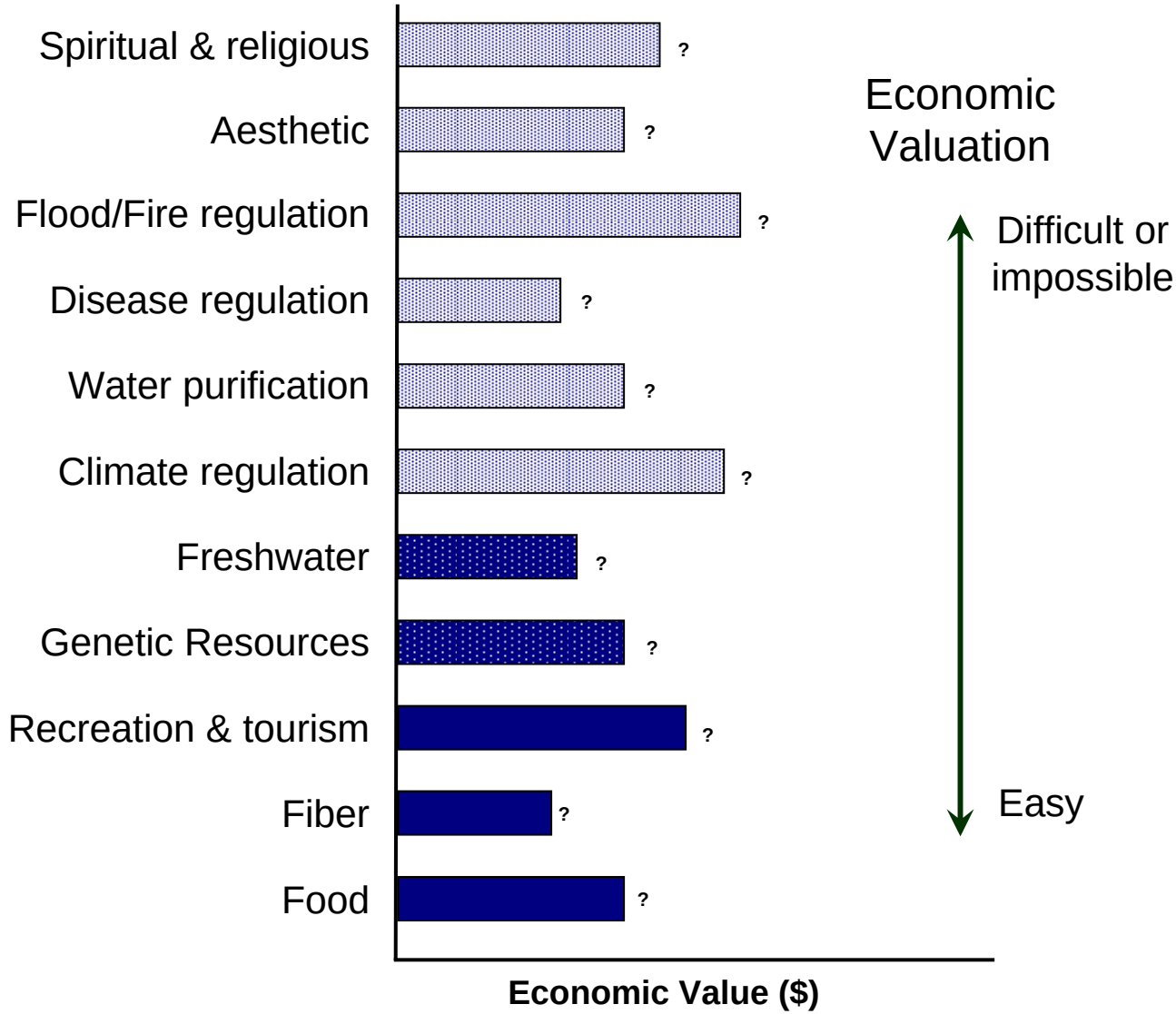
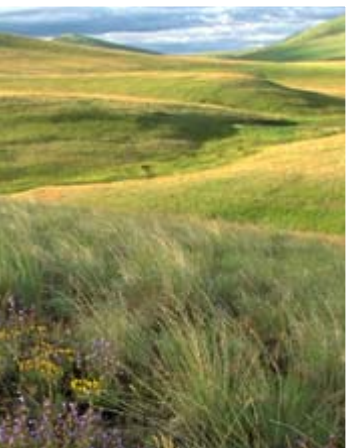
Mapping Ecosystem Services

- Pollination
- Carbon Sequestration
- Water quality
- Water quantity and timing
- Commodity production
- Biodiversity
- Recreation
- Cultural and non-use

Many services are public goods

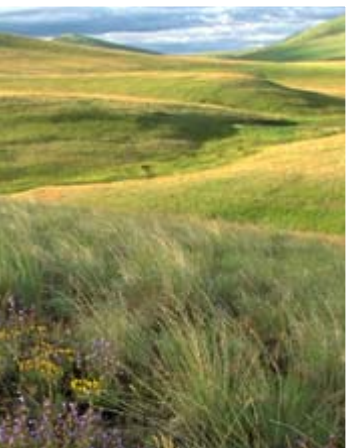


Source: Millennium Ecosystem Assessment



TNC Ecosystem Service Initiatives in California

- Natural Capital Project – Sierra Nevada
- CEC-Scenarios: Climate Change Impacts on Ecosystem Services
- Statewide Analyses of Services and Value
- Regional Advance Mitigation Project



The Natural Capital Project: a new approach

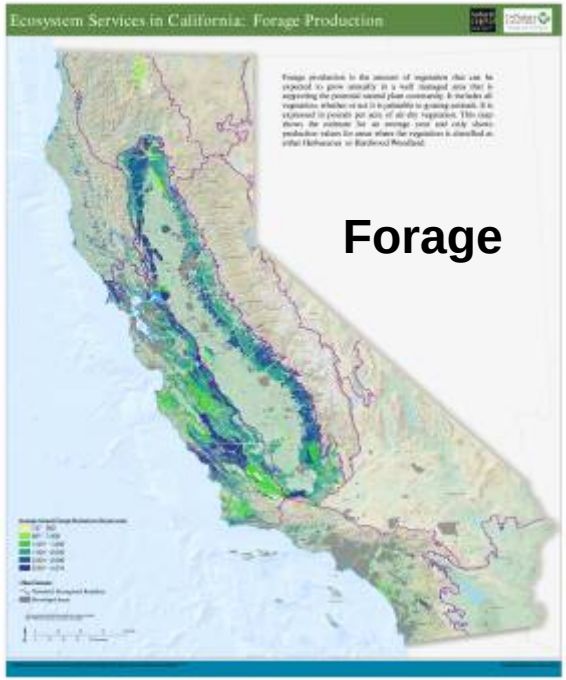
Project Goals:

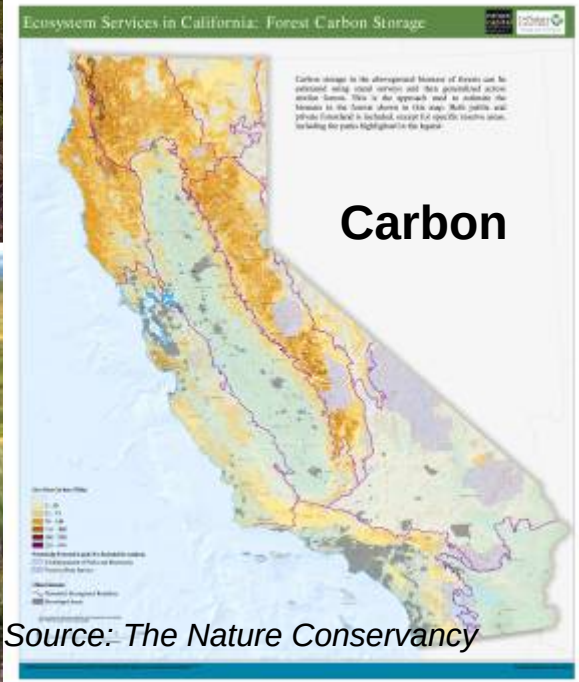
- Make conservation mainstream and economically attractive
- Incorporate multiple ecosystem services into natural resource decisions
- Change the way ecosystems are utilized by integrating environmental systems, economic benefits and human well-being
- Provide information, examples and tools to make that easy

Woods Institute for the Environment Stanford University

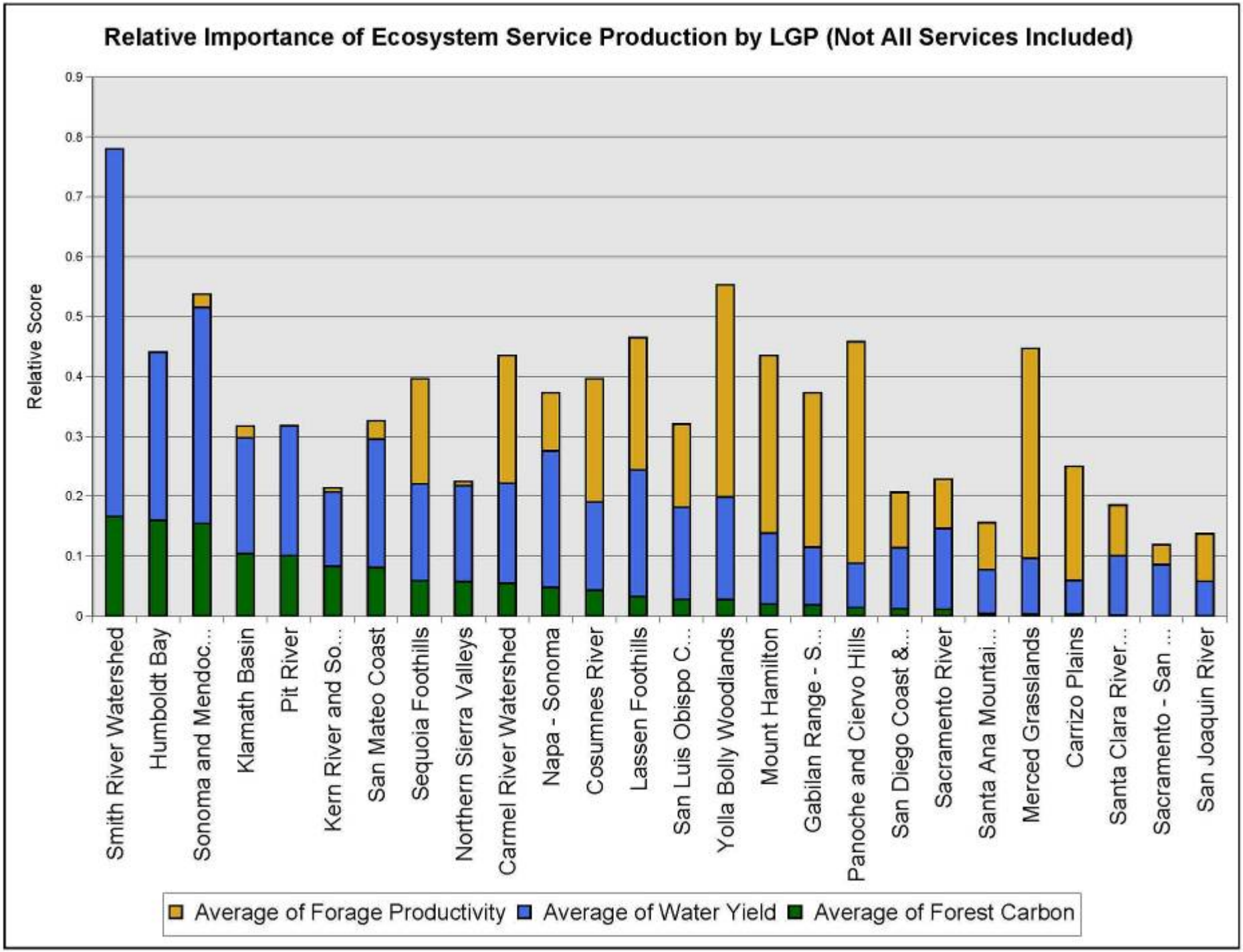
WWF

The Nature Conservancy





Source: The Nature Conservancy


Relative Importance of Ecosystem Service Production by LGP (Not All Services Included)
Relative Score
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Smith River Watershed
Humboldt Bay
Sonoma and Mendoc...
Klamath Basin
Pit River
Kern River and So...
San Mateo Coast
Sequoia Foothills
Northern Sierra Valleys
Carmel River Watershed
Napa - Sonoma
Cosumnes River
Lassen Foothills
San Luis Obispo C...
Yolla Bolly Woodlands
Mount Hamilton
Gabilan Range - S...
Panoche and Ciervo Hills
San Diego Coast &...
Sacramento River
Santa Ana Mountai...
Merced Grasslands
Carrizo Plains
Santa Clara River...
Sacramento - San ...
San Joaquin River
Average of Forage Productivity
Average of Water Yield
Average of Forest Carbon

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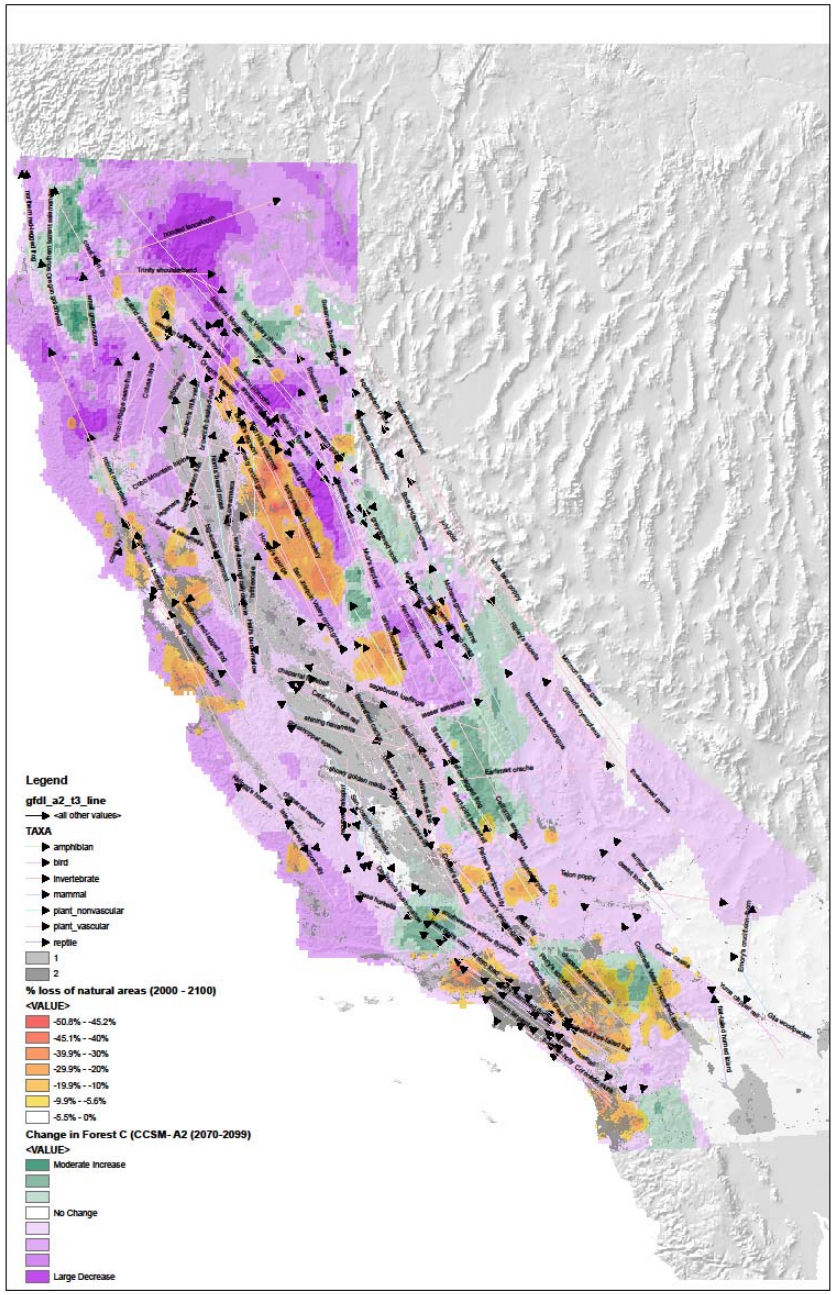
Integrating Changes in Forest Carbon, Natural Areas and Species' Ranges



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