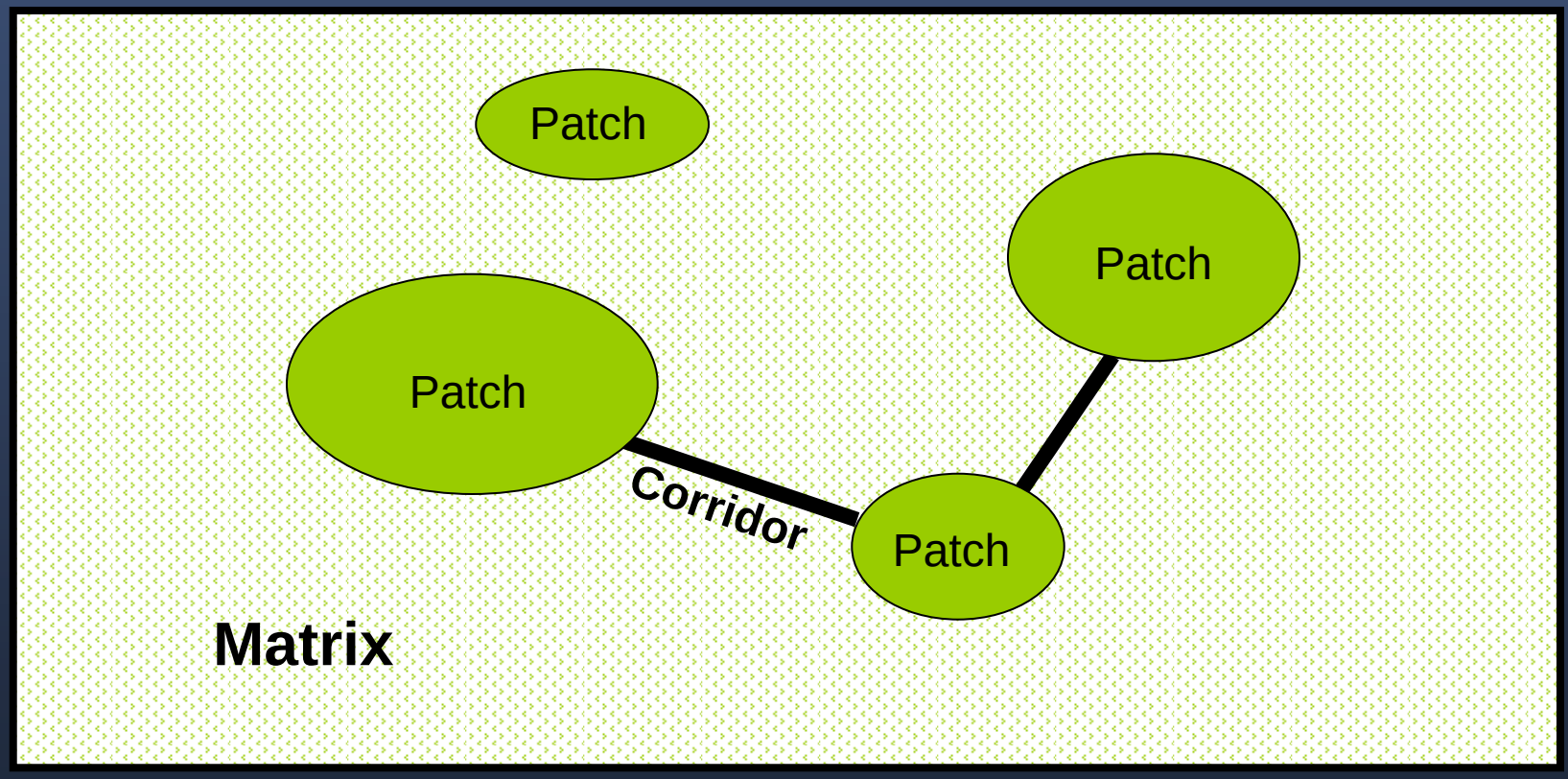
DESIGNING LANDSCAPE RESERVES IN LIGHT OF CLIMATE CHANGE

MICHAEL WHITE
CONSERVATION BIOLOGY INSTITUTE

Landscape Structure

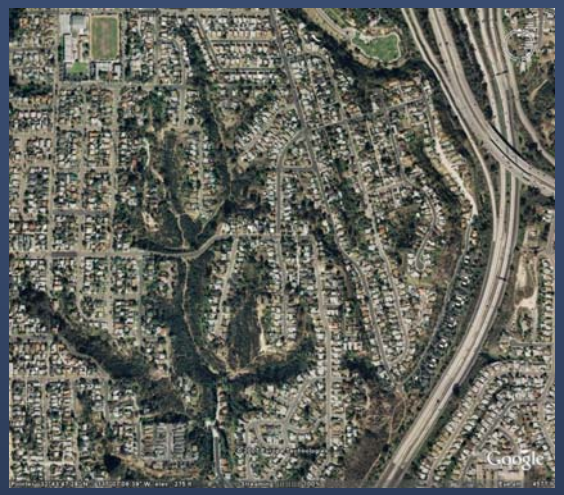
Corridor-Patch-Matrix Model – Forman 1995



Landscape Structure

Landscape Continuum Model – McIntyre and Hobbs 1999

Intact



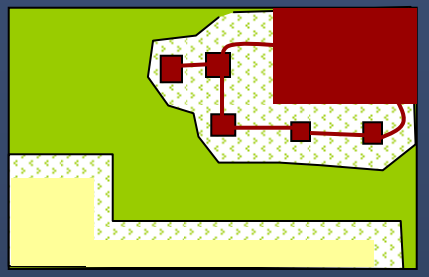
Relictual

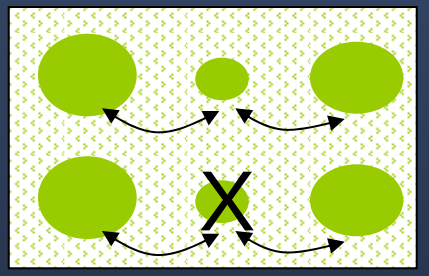
Variegated

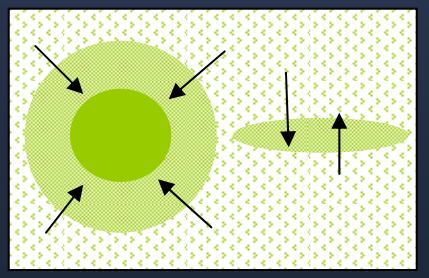
Fragmented

Effects of Landscape Change

- Habitat Loss
- Fragmentation and Reduced Connectivity
- Edge Effects and Habitat Degradation







Conservation Reserves – building the ark

- Network of geographic areas capturing a representation of biodiversity
  - Landscape heterogeneity
  - Structural complexity
  - Connectivity
  - Integrity of ecosystem processes

Reserve Design Principles

Noss, O'Connell and Murphy 1997

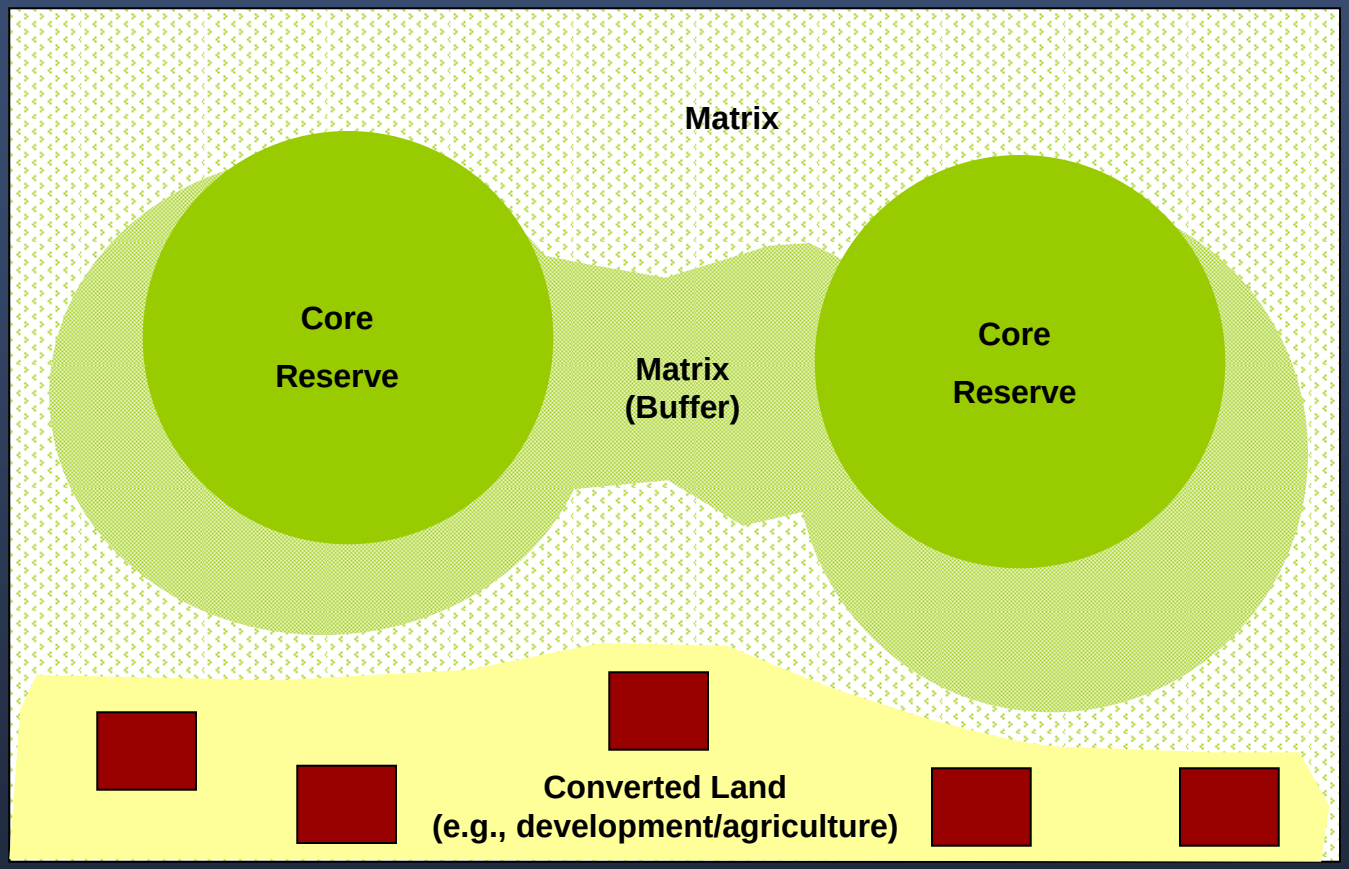
- Species well distributed across their native range
- Large blocks of habitat
- Blocks of habitat close together
- Habitat in contiguous blocks
- Interconnected blocks of habitat
- Roadless or inaccessible blocks of habitat

But “Noah worked two jobs”

Scott and Csuti 1997

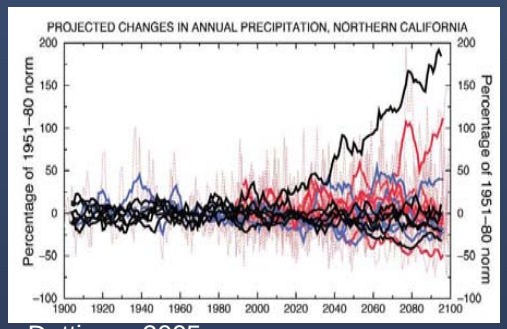
- Reserves not only need all of the passengers (i.e., full complement of biodiversity)
- Reserves must also be capable of sustaining this biodiversity over ecological and evolutionary time
  (i.e., resource management)

Structure of Reserve Systems



Uncertainties associated with climate change projections…

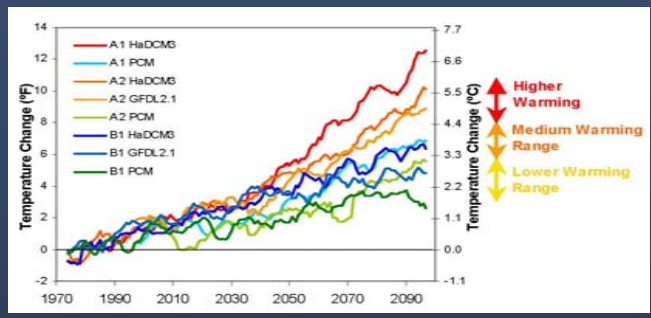
Rainfall



Dettinger 2005

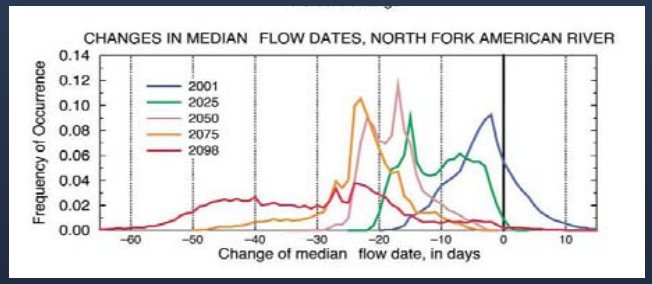
Changing Climates

Temperature



Cayan et al. 2006

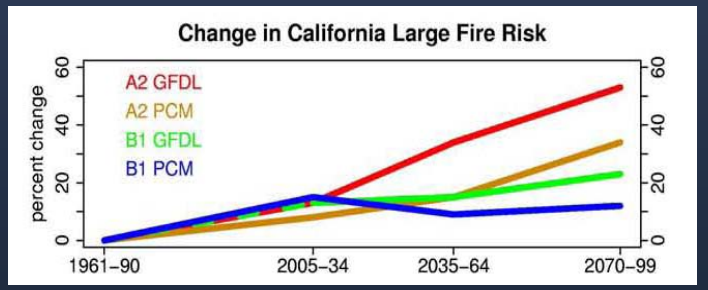
Hydrology



Dettinger 2005

Altered Ecological Processes

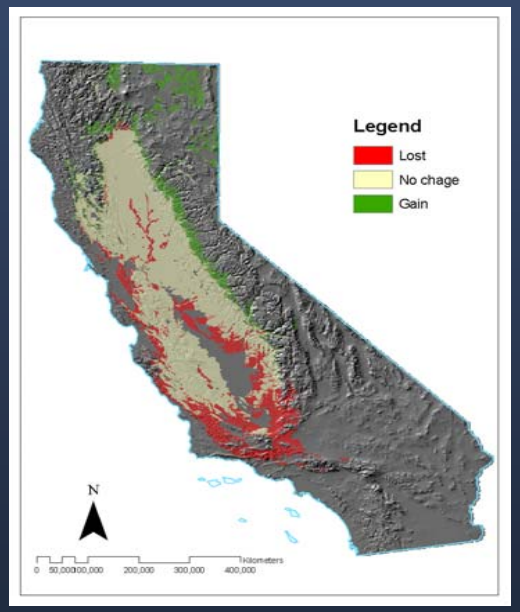
Fire



Westerling and Bryant 2006

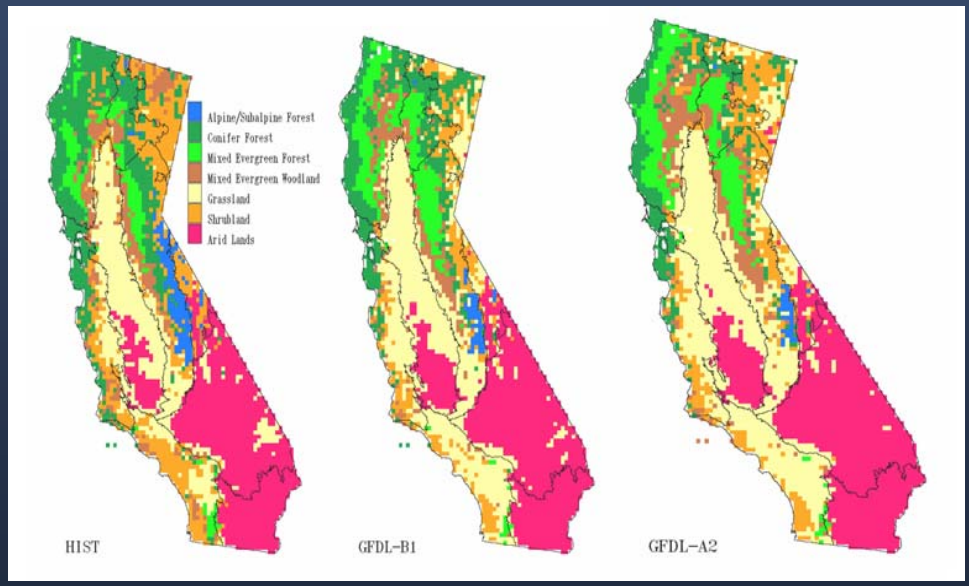
Produce uncertainties with respect to biological outcomes

Species Shifts



Hannah and Ries 2007

Vegetation Community Shifts



Lenihan et al. 2006

Conservation Biology 101

In light of climate change

- Conserve a biogeographic representation of biodiversity
- Build large core habitat reserves
- Provide connectivity among core reserves
- Protect/manage matrix lands

Biogeographic Representation

Ecoregions of California

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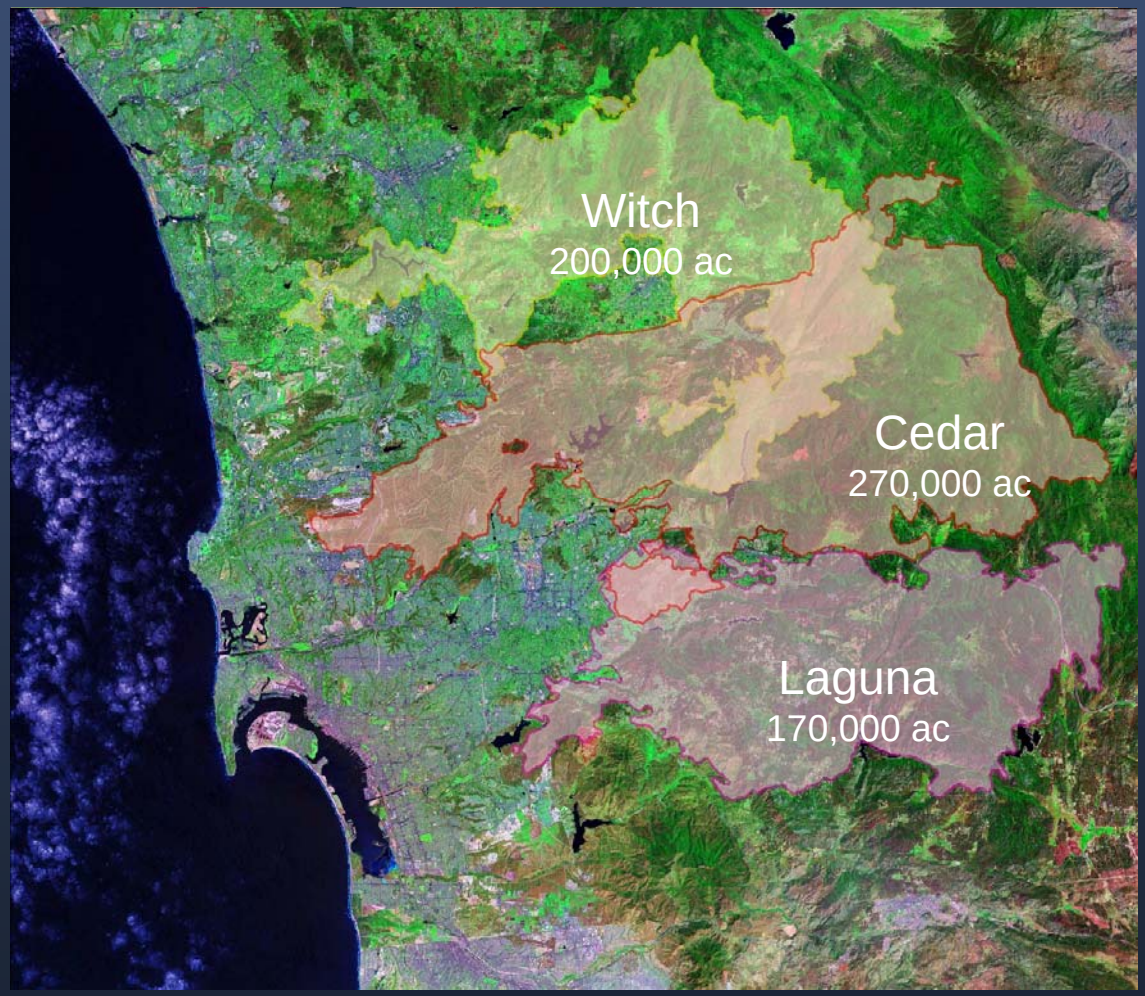
Biogeographic Representation

Ecological subregions of Southern California

Core Habitat Reserve Size

Accommodate Disturbance - Minimum Dynamic Area



Core Habitat Reserve Size

Viable populations of top carnivores

Mountain lion

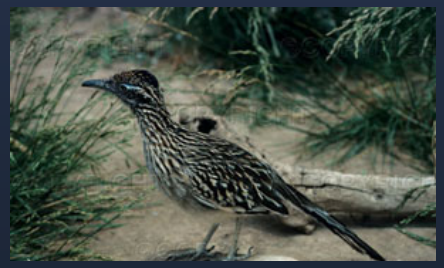
Beier 1993, Beier et al. 2006

250,000 - 500,000 acres

Bobcat

Crooks 2002, Beier et al. 2006

2,500 - 15,000 acres



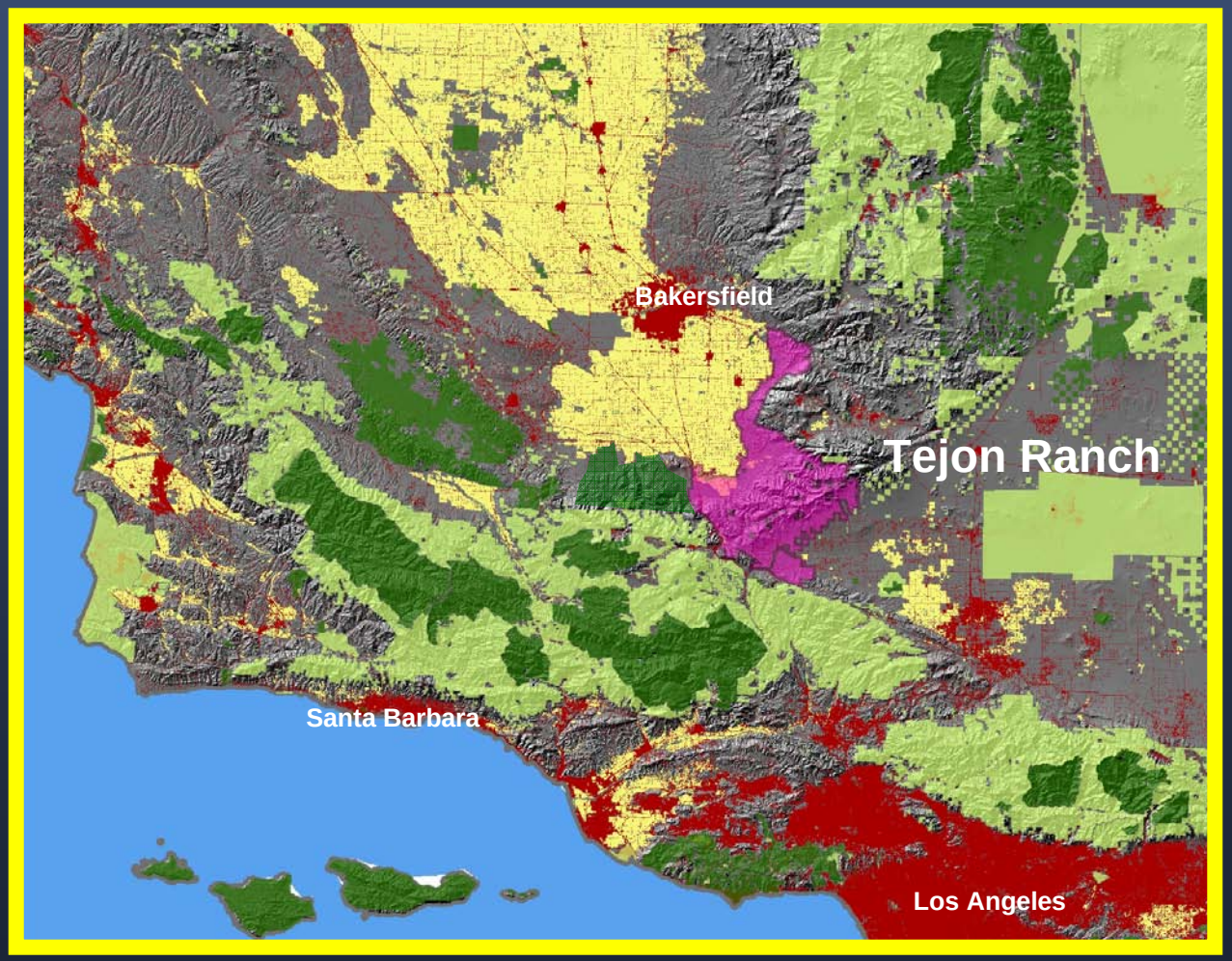
Roadrunner

Crooks et al. 2001, Unitt 2004

400 - 1,000 acres

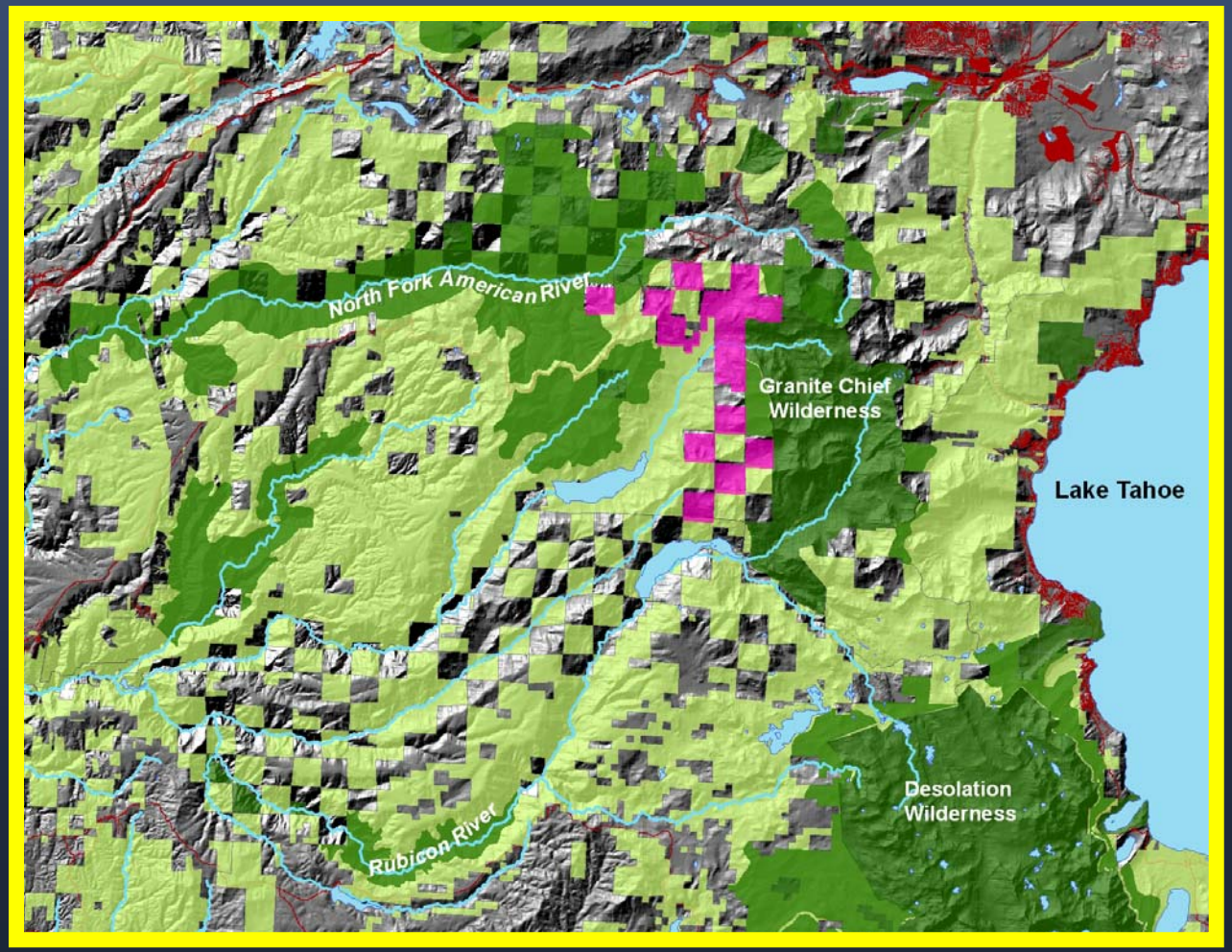
Building Core Habitat Reserves

Large intact wildlands – Tejon Ranch

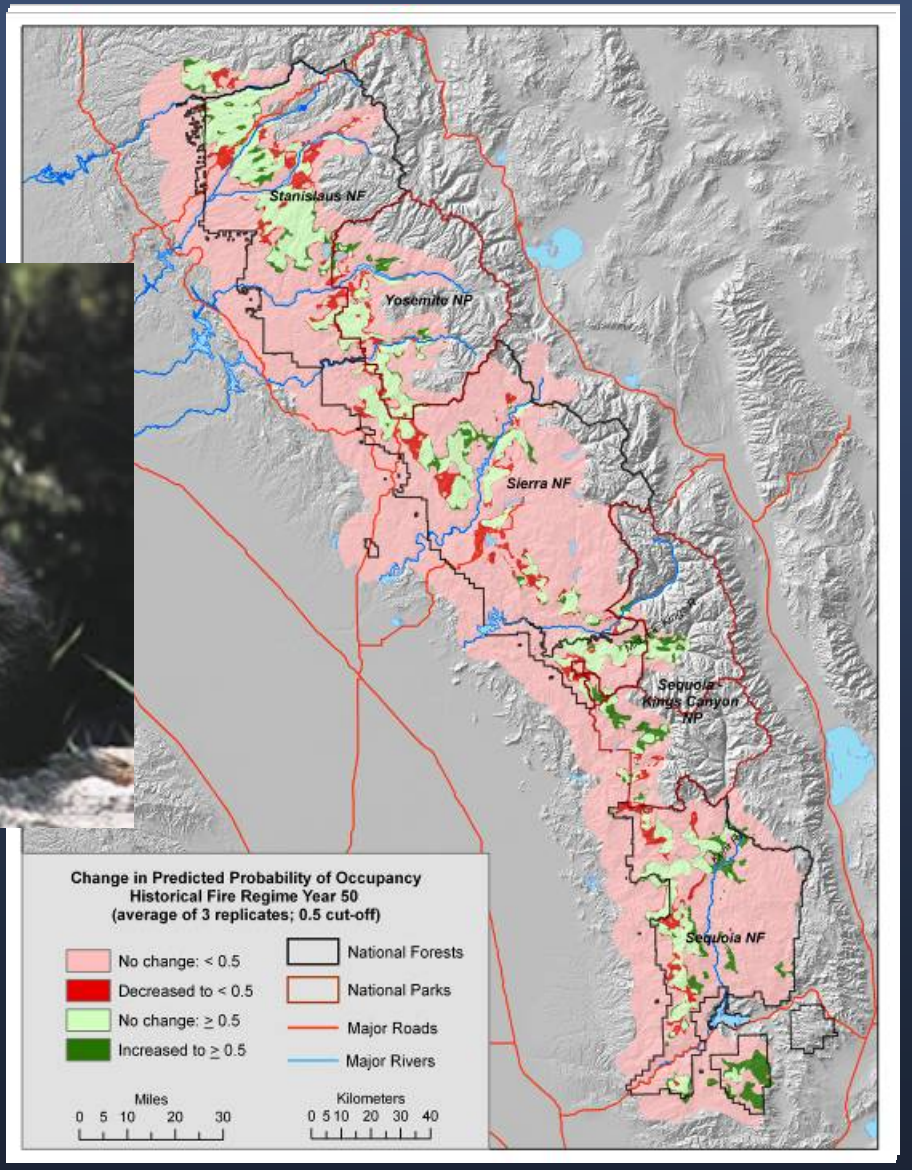


Building Core Habitat Reserves

Bolster Existing Core Areas

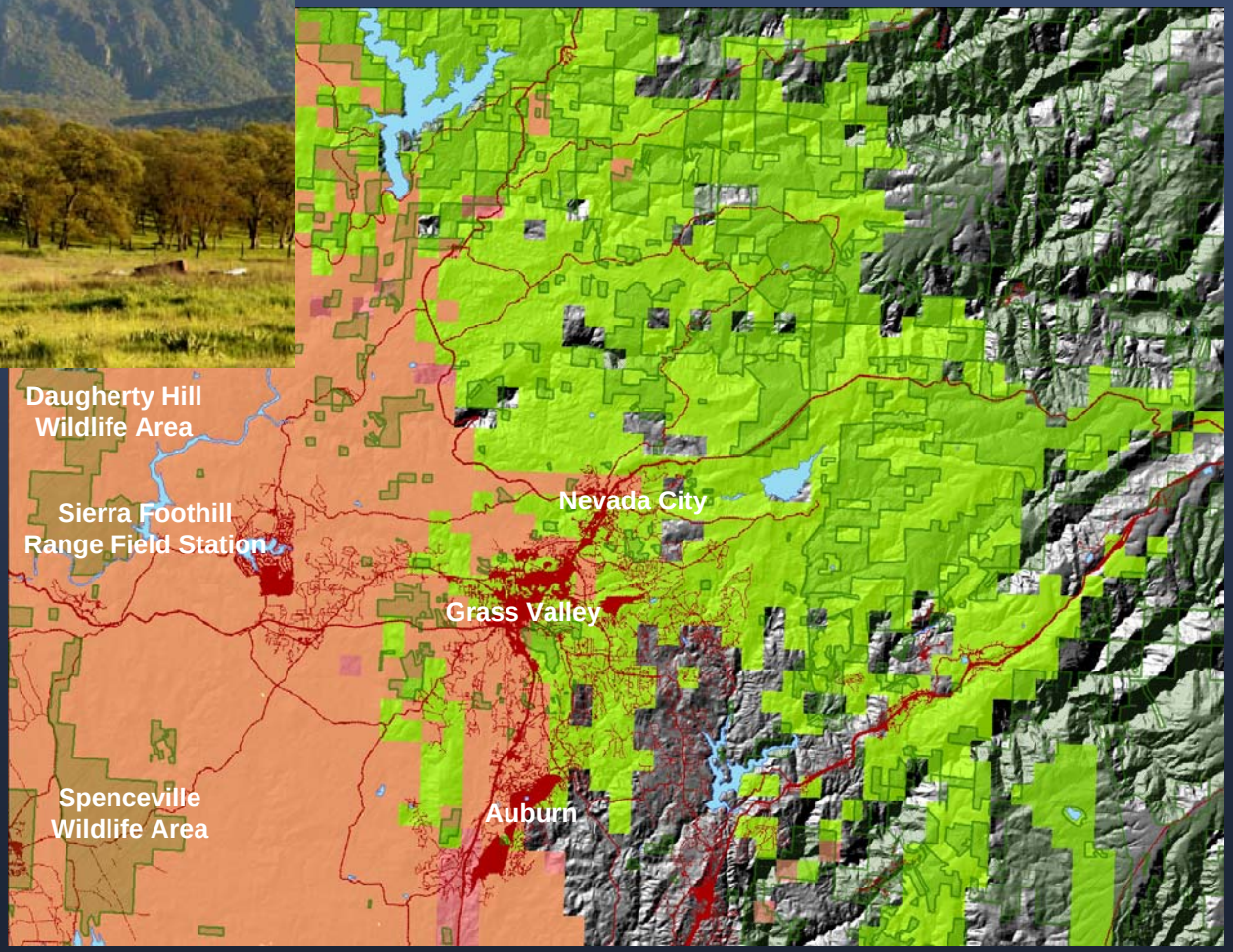


Importance of Matrix Lands



Matrix or Future Core Area?

Blue oaks – Ries and Hannah

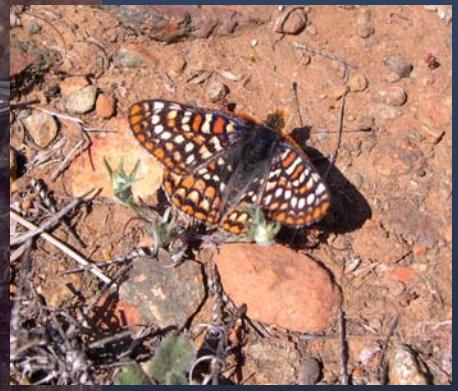


Landscape Connectivity?

Wildlife passage structures

Small Isolated Habitats

Value in an uncertain climate future?



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Take-Home Messages

Importance of adaptive management

- Manage reserves AND matrix lands to accommodate changes.
- Collaborate on research and monitoring to inform land management.
- Recognize that new species assemblages will develop under altered climates.
- Thus, new management regimes may be necessary to accommodate changing ecosystem processes.

Take-Home Messages

- Conservation trade-offs are real.
- Keep future options open with today's decision-making.
- Science must inform conservation actions.
- Matrix matters!