

# Planning for Ecological Functions In Regional Open Space Systems

Local Agency Formation Commission (LAFCo)

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# What's the Problem?

- Native plants and animals are isolated in reserves
- Isolation can lead to genetic weakness and population extinction
- Most animals cannot survive in landscapes fragmented by roads, highways, and cities

# The Process of Landscape Fragmentation

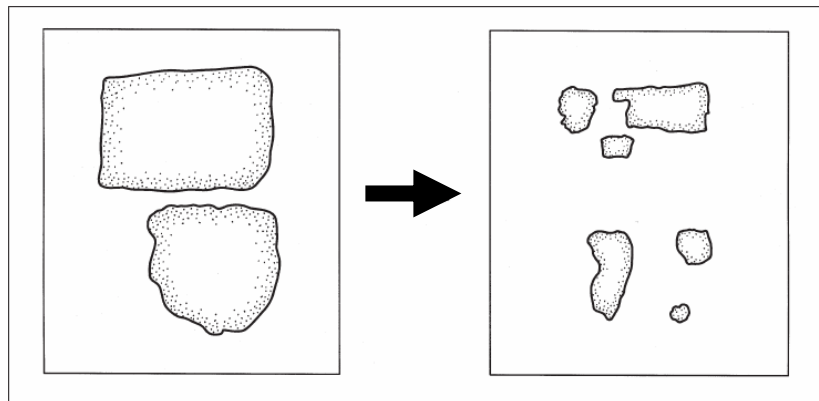
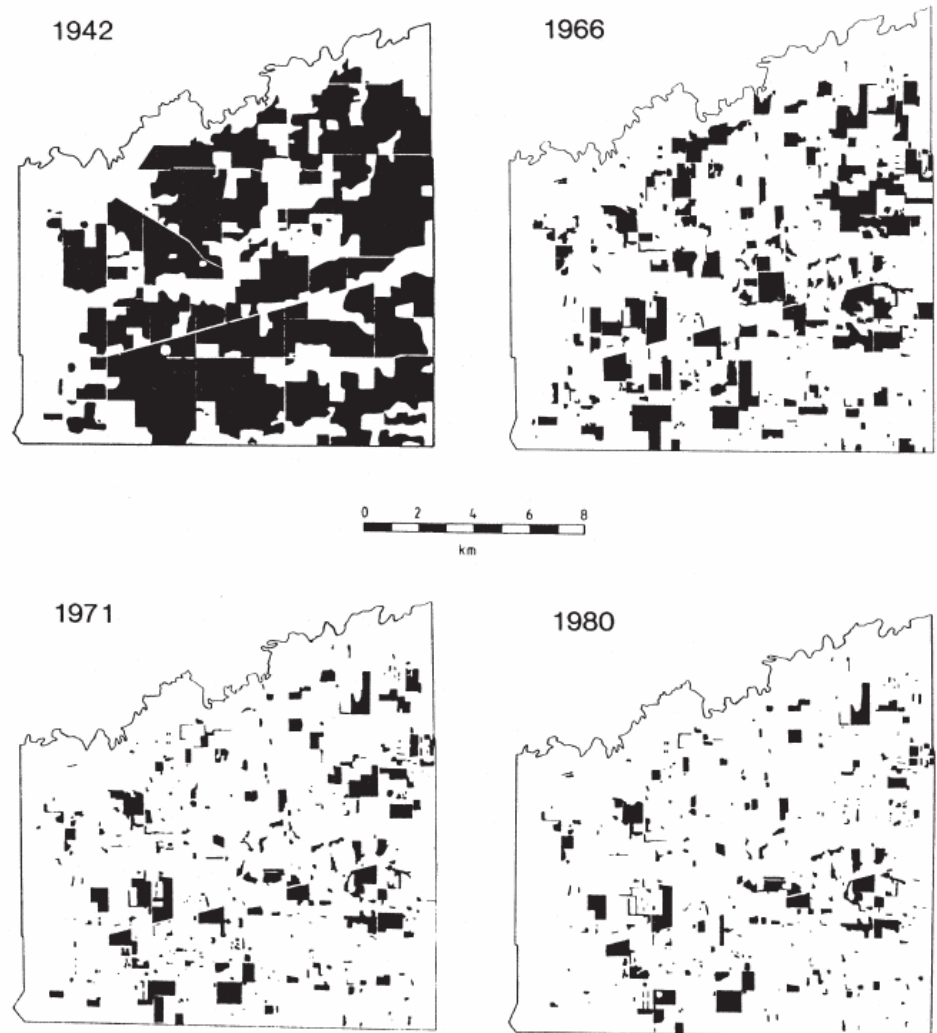


Fig. 2-1 The process of habitat fragmentation has three components: (a) an overall loss of habitat; (b) a reduction in the size of remaining habitats; and (c) an increased isolation of habitats.

## Box 2-1 (cont.)



Change in forest cover at Naringal, south-western Victoria, Australia, illustrating the process of habitat loss and fragmentation in a rural environment. The study area is approximately 20,000ha in size. From Bennett (1990c) with permission, CSIRO Publishers, Australia.

(Bennett 2003)

# De-fragmentation requires the process to go in reverse

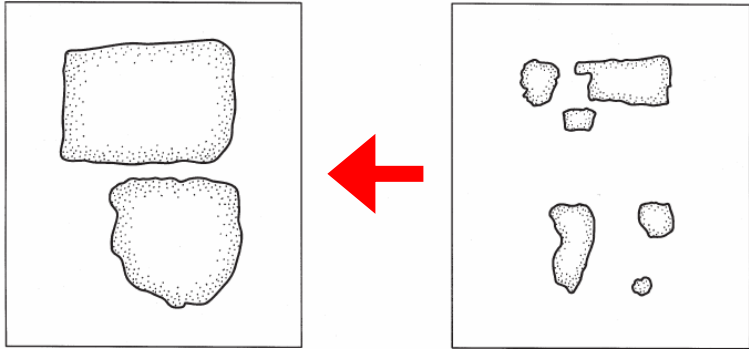
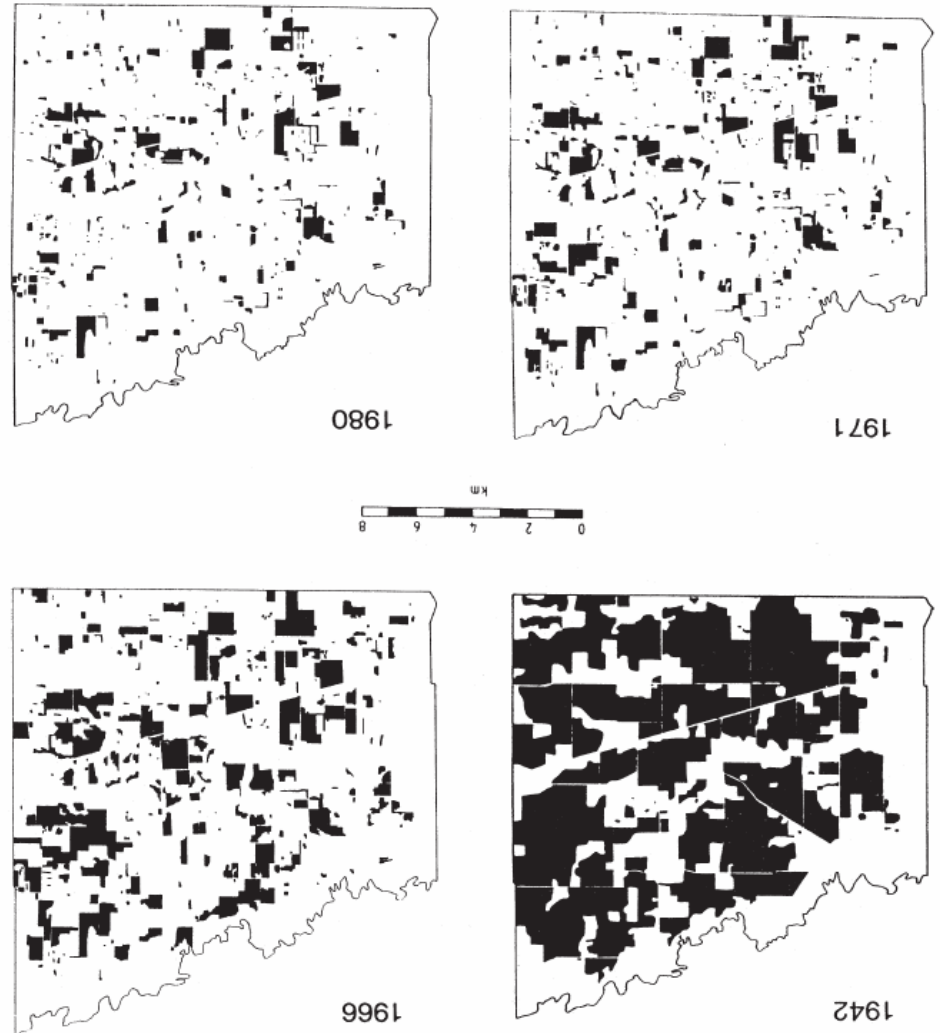


Fig. 2-1 The process of habitat fragmentation has three components: (a) an overall loss of habitat; (b) a reduction in the size of remaining habitats; and (c) an increased isolation of habitats.



(Bennett 2003)

# What's the Solution?

→ Design and construct  
ecological networks

- What are they?
- Why do we need them?
- How can we plan for them?

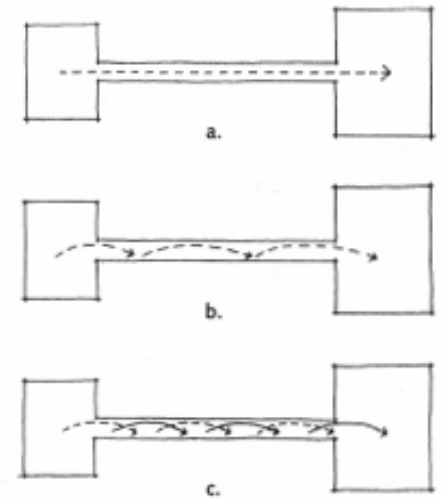
# What is an ecological network?

- Linear open space systems, such as greenways, that incorporate ecological functions
- They consist of core areas (high quality habitat) connected by corridors

# Corridor as conduit:

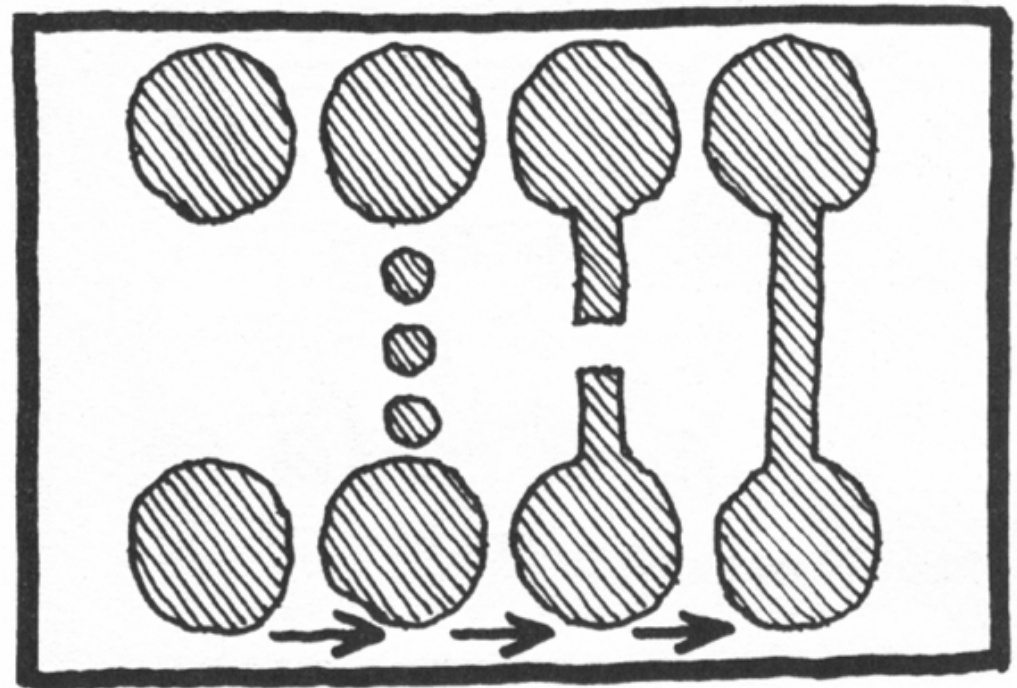
(From Noss 1993)

Figure 3.4 Three ways in which corridors may facilitate dispersal of individual animals and genes between habitat patches: (a) direct, long-distance movement by a single individual; (b) periodic movement by a single animal, punctuated by pauses; and (c) gene flow through a reproducing population resident in the corridor. (From Bennett 1990a, with permission of the author.)

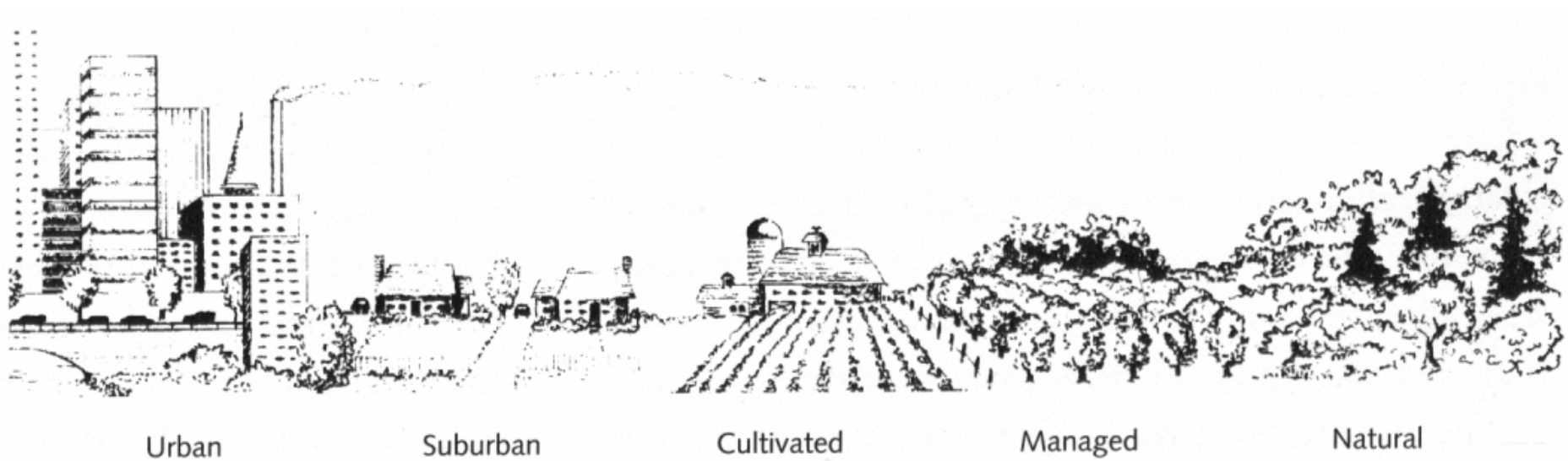


## C4. Stepping stone connectivity

A row of stepping stones (small patches) is intermediate in connectivity between a corridor and no corridor, and hence intermediate in providing for movement of interior species between patches.



# Land Cover Gradient



**Cultural ↔ Natural**

(Thorne 1993)



# Planning Mechanisms

- Habitat conservation plans (HCP)
- Natural community conservation planning (NCCP)
- County open space plans
- City open space plans
- Local and regional flood control systems

# Habitat Conservation Plans (HCP)

- Conservation plans under the federal Endangered Species Act that mitigate for development on habitats occupied by threatened and endangered species
- HCPs range in spatial extent from a single property to multiple counties.

# NCCP Act 2002 Revision

- Section 2820 of the Act
- Specifies conservation planning principles for reserve systems

**(4) The development of reserve systems and conservation measures in the plan area provides, as needed for the conservation of species, all of the following:**

**(A) Conserving, **restoring**, and managing representative natural and seminatural landscapes to maintain the ecological integrity of **large habitat blocks, ecosystem function**, and biological diversity.**

**(B) **Establishing one or more reserves** or other measures that provide equivalent conservation of covered species within the plan area **and linkages between them** and adjacent habitat areas outside of the plan area.**

**(C) Protecting and maintaining habitat areas that are large enough to support sustainable populations of covered species.**

**(D) Incorporating a range of environmental gradients (such as slope, elevation, aspect, and coastal or inland characteristics) and high **habitat diversity to provide for shifting species distributions due to changed circumstances**.**

**(E) **Sustaining the effective movement and interchange of organisms between habitat areas** in a manner that maintains the ecological integrity of the habitat areas within the plan area.**

# California's Wildlife Action Plan

## *California Wildlife: Conservation Challenges*

*(California's Wildlife Action Plan)*

California Department of Fish and Game



Prepared by

Wildlife Health Center  
University of California, Davis

(Bunn, et al. 2006)

# Action Plan Recommendations (1)

(Bunn, et al. 2006)

## *Central Valley and Bay-Delta Region*

- a. The California Resources Agency, Fish and Game, the U.S. Fish and Wildlife Service, public land managing agencies, and local governments need to develop multicounty regional habitat conservation and restoration plans.
- b. Fish and Game, the U.S. Fish and Wildlife Service, the USDA Natural Resources Conservation Service, and local resource conservation districts need to improve conservation and restoration on private lands by assisting private landowners.
- c. Public land managers need to continue improving wildlife habitat for a variety of species on public lands.
- d. Public agencies and private organizations need to work with the San Francisco Bay Joint Venture to protect and restore tidal habitats and baylands in San Francisco Bay.
- e. Public agencies and private organizations need to collaboratively protect and restore habitat connectivity along major rivers in the Central Valley.
- f. Public agencies and private organizations need to collaboratively protect and restore upland linkages among protected areas in the San Joaquin Valley.

# Action Plan Recommendations (2)

- g. Public agencies and private organizations need to collaboratively protect and restore lowland linkages in San Francisco Bay.
- h. Public agencies and private organizations need to collaboratively protect upland linkages and reduce the risk of habitat isolation in the eastern and northern San Francisco Bay area.
- i. Water management agencies need to secure dependable and adequate amounts and quality of water for wildlife.
- j. Water management agencies need to reestablish and maintain more natural river flows, flooding patterns, water temperatures, and salinity conditions to support wildlife species and habitats.
- k. Water management agencies need to restore gravel supply in sediment-starved rivers downstream of reservoirs to maintain functional riverine habitats.
- l. Public agencies and private organizations should protect, restore, and improve water-dependent habitats (including wetland, riparian, and estuarine) throughout the region. Design of these actions should factor in the likely effects of accelerated climate change.

# Action Plan Recommendations (3)

m. Water management agencies, state and federal wildlife agencies, and other public agencies and private organizations need to collaboratively improve fish passage by removing or modifying barriers to upstream habitat.

n. To support healthy aquatic ecosystems, public agencies and private organizations, in collaboration with the California Bay-Delta Authority, need to improve and maintain water quality in the major river systems of this region.

o. Regional water quality boards, in collaboration with other public agencies and private organizations, need to improve and maintain water quality in streams and tidal waters of San Francisco Bay.

p. Fish and Game should expand funding and coordinate efforts to prevent the establishment of invasive species and to reduce the damage of established invasive species.



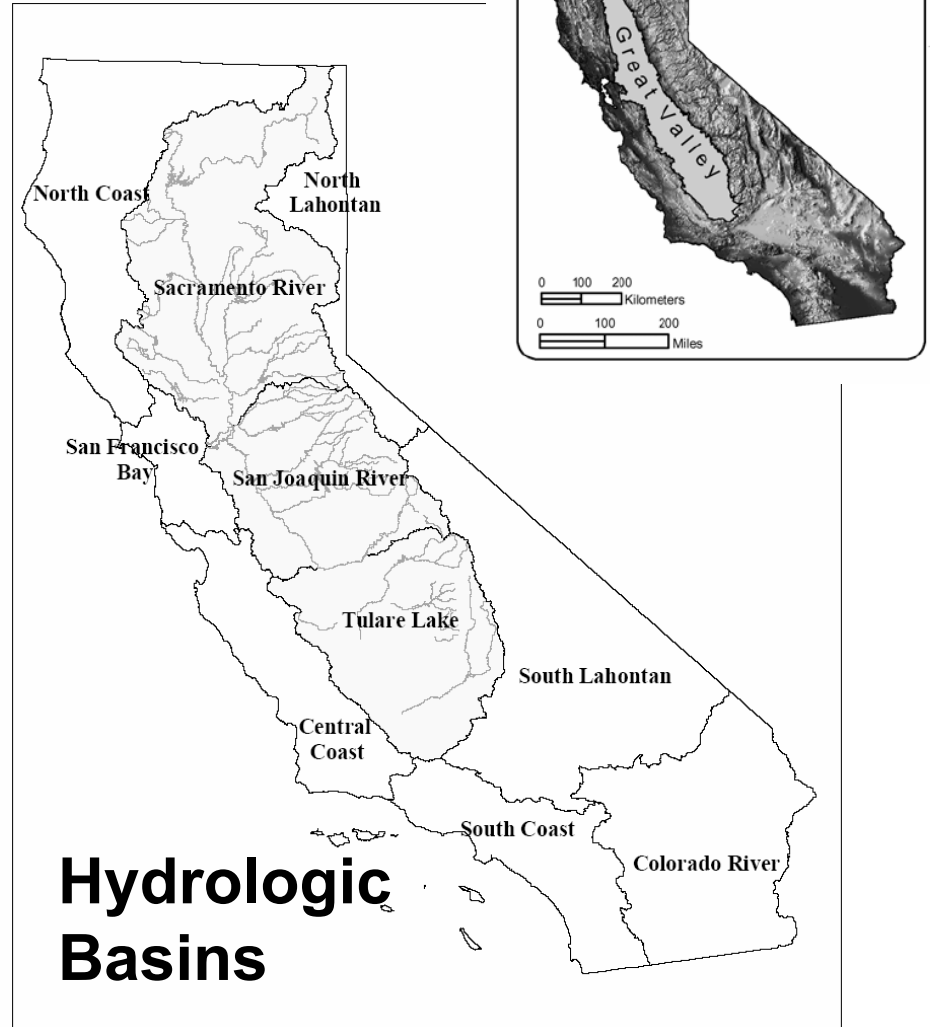
# Floodway Planning

- Flood channels are an interconnected system
- They achieve “connectivity” in the landscape
- Redesign of floodway system
- Climate change
  - Higher intensity storms

# Hydrologic Networks in the Central Valley



**Major  
Rivers  
& Creeks**

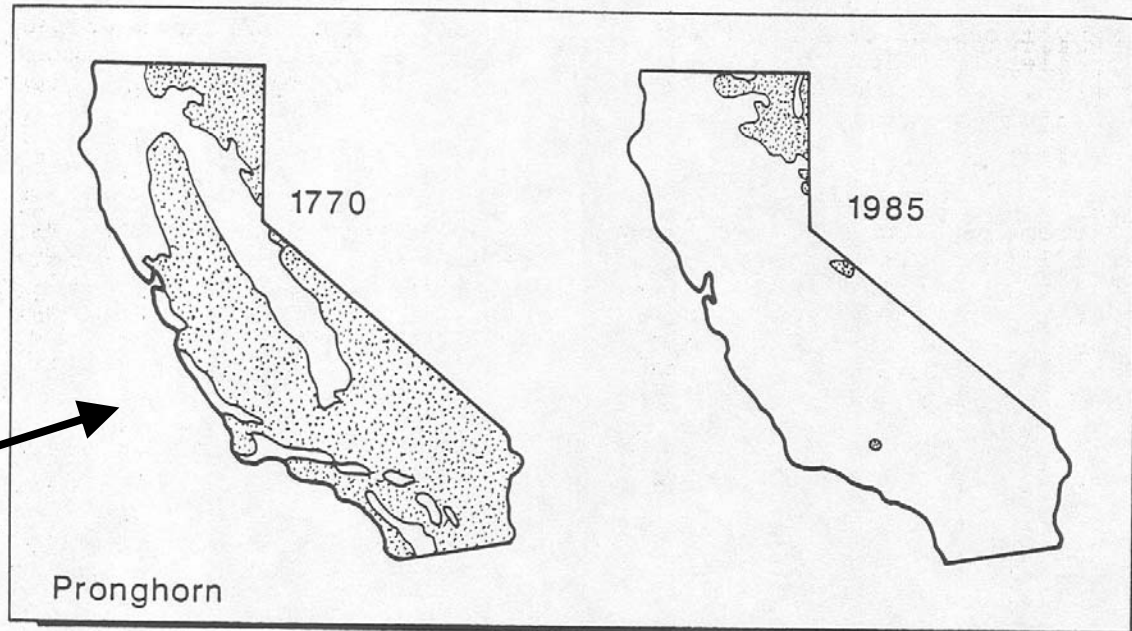
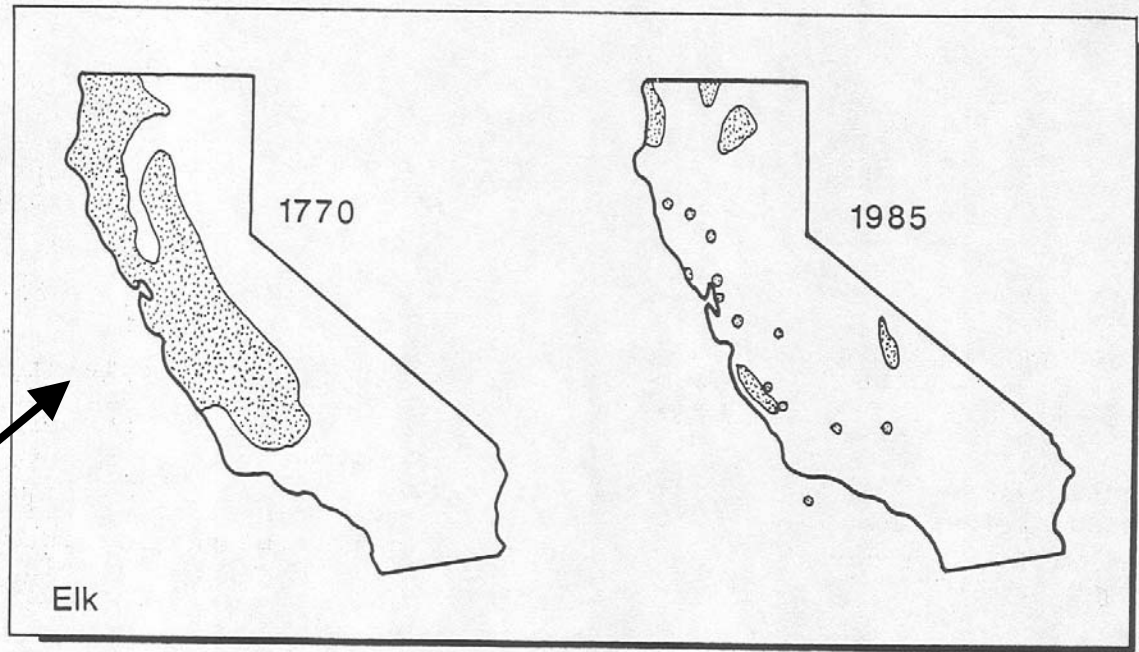


**Hydrologic  
Basins**

# Historic and current distribution of Elk and Pronghorn in California

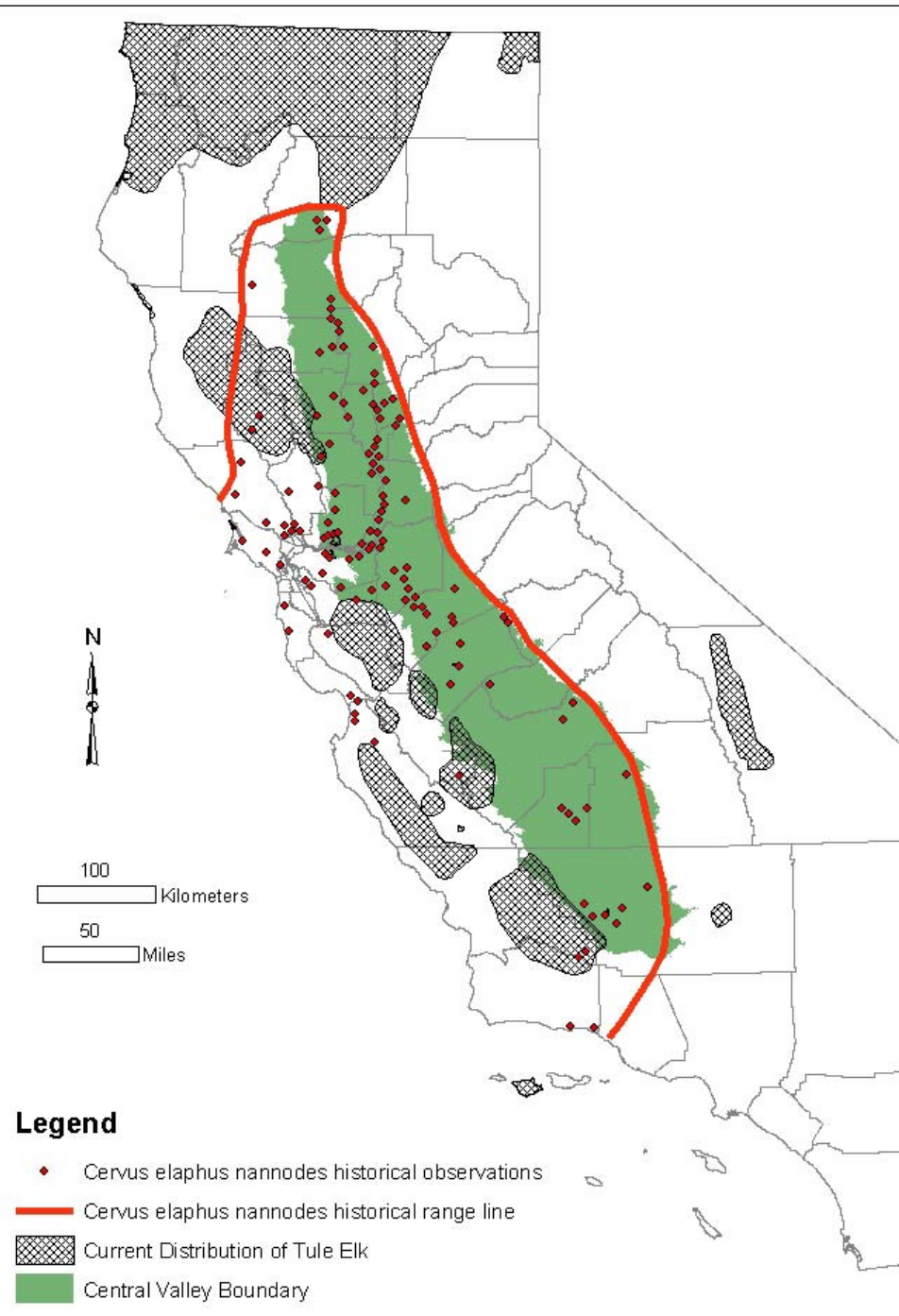


(photo by Bob Gress)



(JSA 1987)

## Current and historic distribution of *Cervus elaphus nonnodes* (tule elk)



# Conclusion

- Regional planning of open space is the best chance of restoring connectivity in cultural landscapes
  - A hierarchical open space system would allow planning for a range of movement needs by various species of concern
- A proactive NCCP-like program is needed to coordinate multi-jurisdictional open space planning across county and city boundaries for implementation on a local basis



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