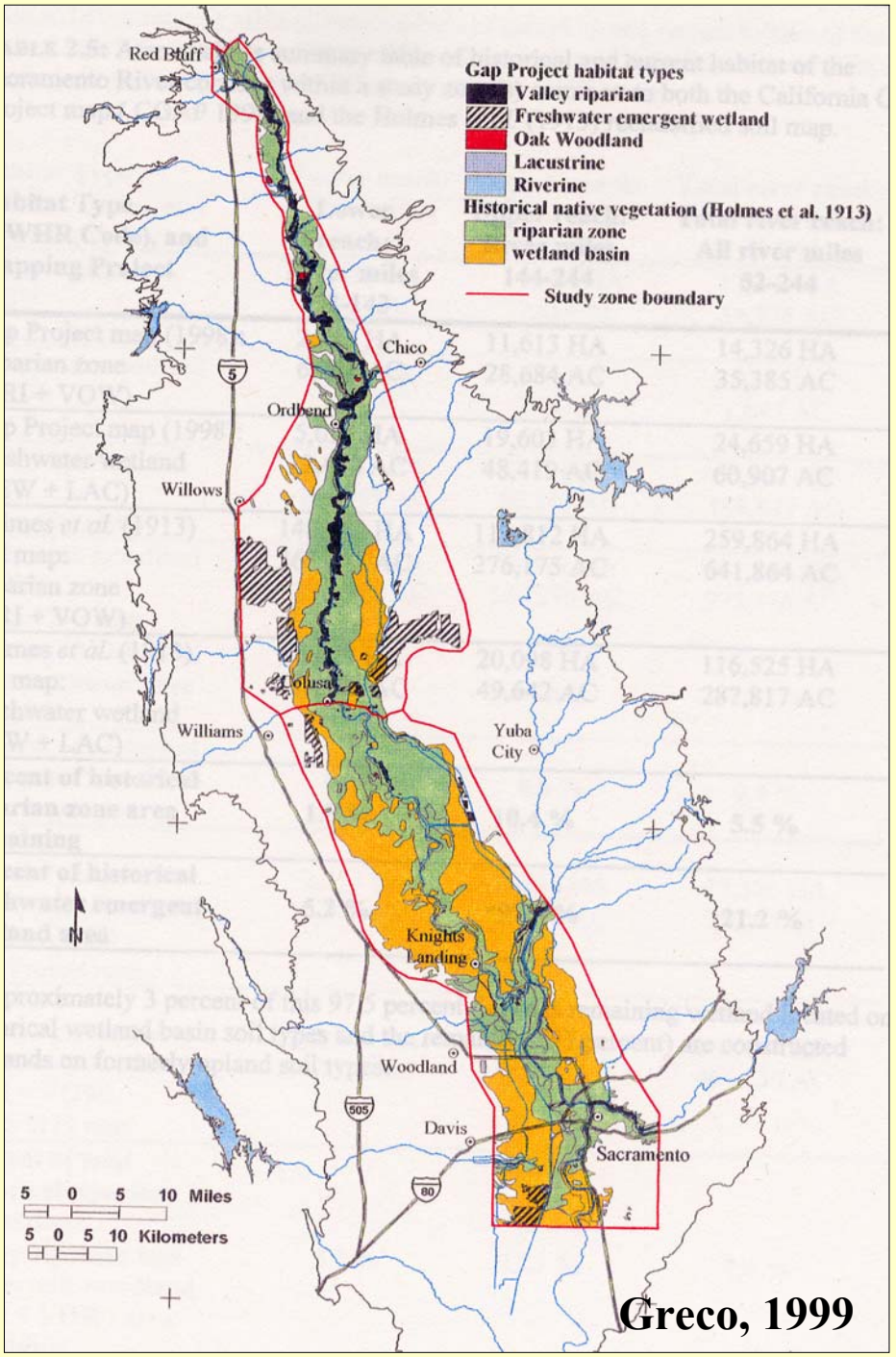
# Arundo and Biodiversity

(A win-lose situation)

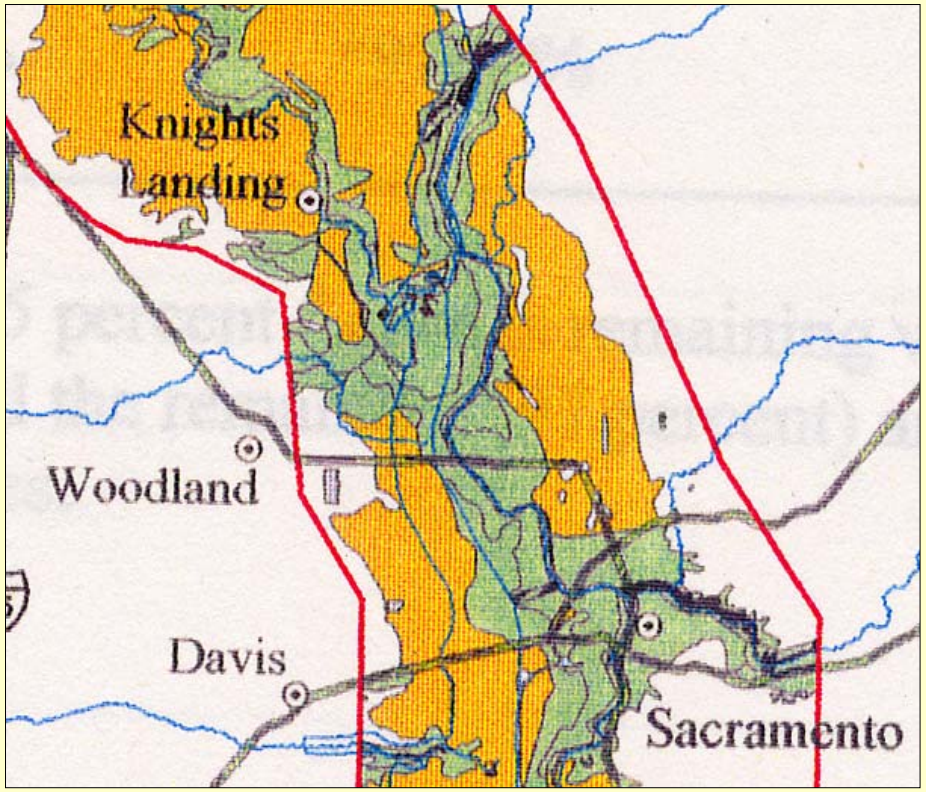
# The Context:

## A story of multiple impacts

- Riparian vegetation provides living conditions to more species than any other habitat type in California (Smith 1980)
- Riparian habitat has been greatly diminished from human activities- 95% or more in California (Faber et al., 1989; Barbour et al., 1993)



# The Context

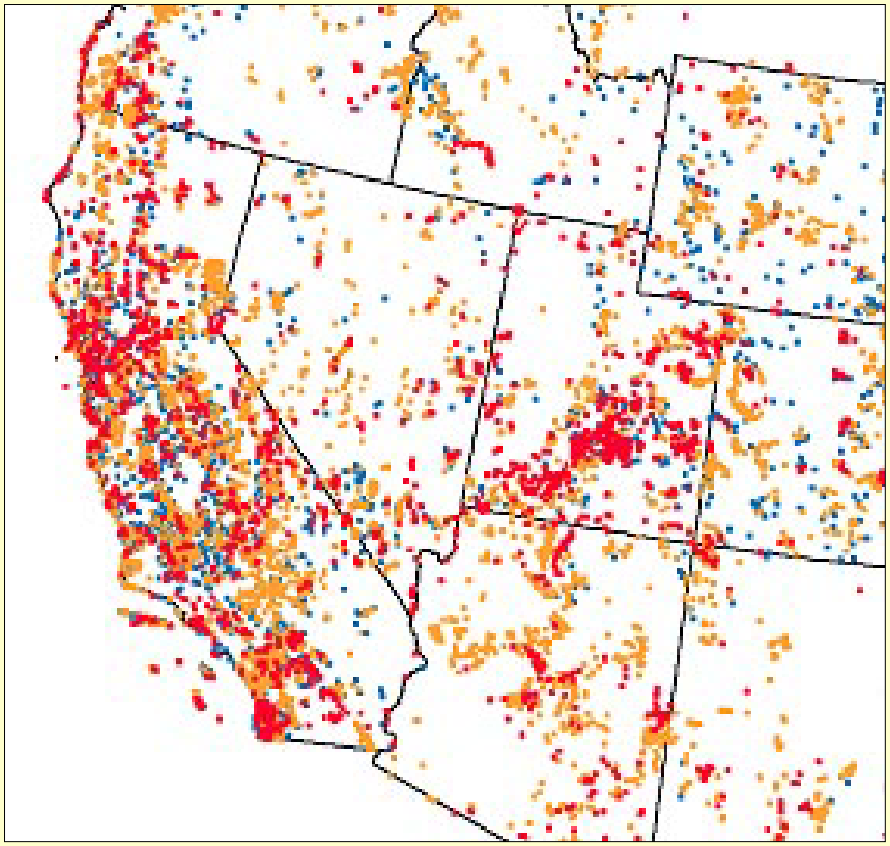



Greco, 1999

- Fragments of a once interconnected regional habitat network now offer refuge to many threatened and endangered species

- Fragmented populations are more vulnerable
  - **Disease**
  - **Flood**
  - **Fire**
  - **Drought**
  - **Predation and parasitism**

# Result: High proportion of imperiled species are those that depend on riparian habitats



Occurrences of rare and imperiled species in the U.S.

- Critically Imperiled (G1)
- Imperiled (G2)
- Excluded Populations

Data Source: TNC and Natural Heritage Programs

# Invasive species further threaten these remnant populations in a number of ways


**Brown-headed cowbird**

**Tamarisk**

**Arundo donax**

# Least Bell's Vireo
## *Vireo bellii pusillus*

Once common from Mexico to Red Bluff, now ~ 2,000 (back from 300) and federal-listed.

Require multi-storied riparian vegetation, insect food source


LEAST BELL'S VIREO
*Vireo bellii pusillus*
Santa Ynez Valley, Santa Barbara County

Photo from ***Wild Birds of California***, by David Lukas

# Southwestern Willow Flycatcher

## *Empidonax trallii extimus*

~70 pairs survive in California

Habitat fragmentation and population decline leaves them vulnerable to brood parasitism by Brown-headed Cowbird

Photos from ***Wild Birds of California***, by David Lukas

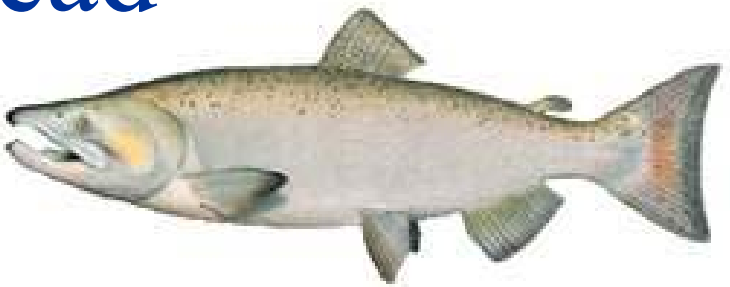
# Arroyo Southwestern Toad
## *Bufo microscaphus californicus*

- Federal-listed endangered

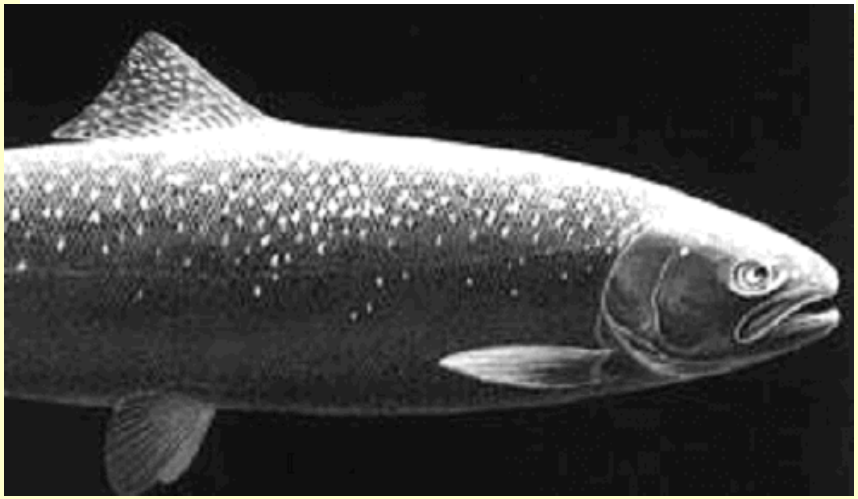
- Require shallow pools, un-silted gravel, algal mats, and insect food source

# Coho and Chinook salmon, Steelhead


Coho salmon



Chinook salmon



Steelhead tout

# *Arundo donax* in the riparian system

- Forms solid stands replacing native vegetation
- Armors banks, aggrades streambeds, prevents normal meander process

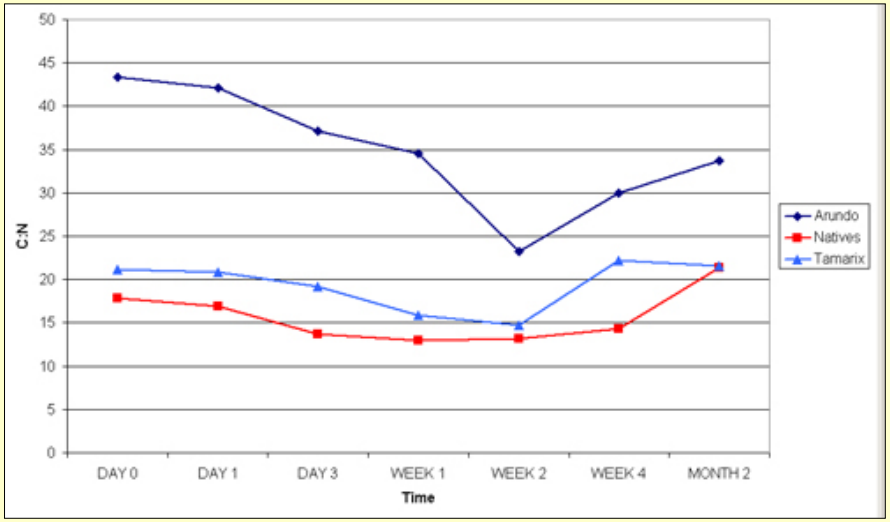
# *Arundo donax* in the riparian system

- Causes catastrophic fire
- Uses enormous amounts of water
- Provides less shade to water, effecting water temperature
- Provides little or no habitat and food

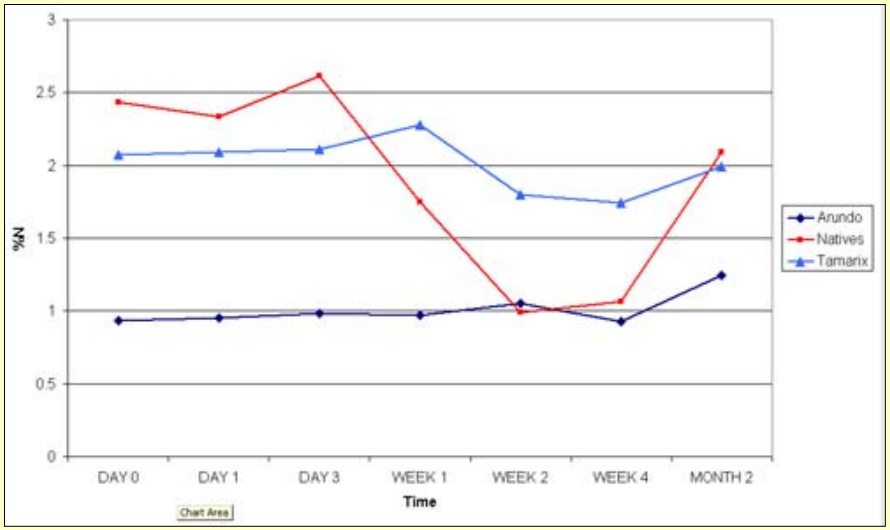
# Arundo as competitor

- A study still underway shows that willow is able to out-compete Tamarisk, but not Arundo (Dudley, unpublished)

# Arundo as food: Nutritional value




C/N ratios during decomposition

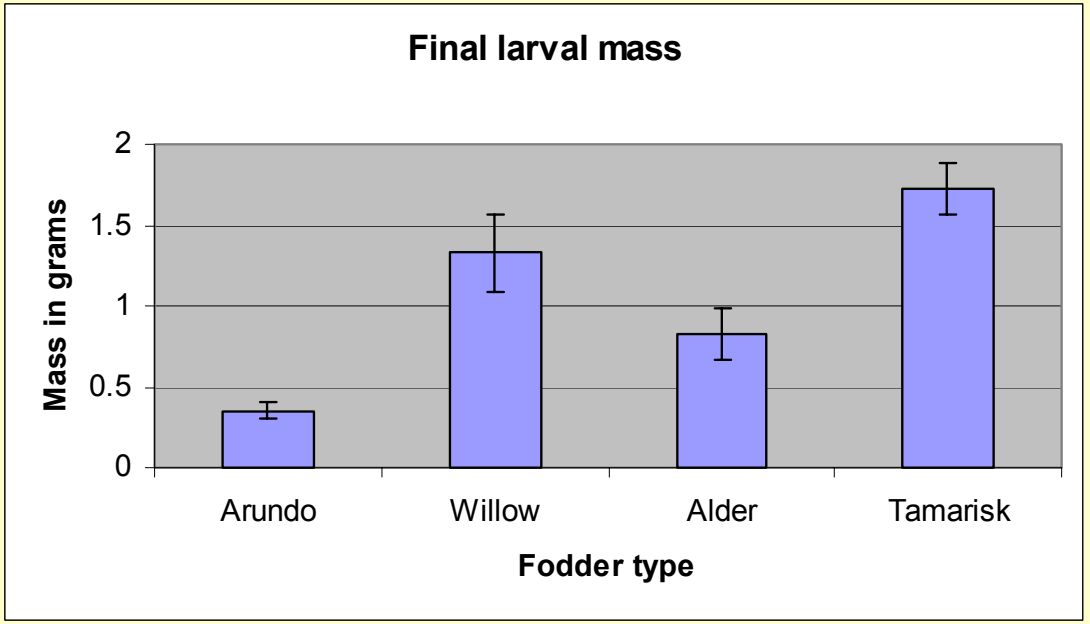



N % during decomposition

A recent study shows Arundo contains about half the N, higher C:N ratio, than natives and even Tamarisk. (Dudley & Herrerra, unpublished)

# Arundo as food: Insect growth

Insect growth responses to Arundo vs. native plant food:




Study comparing Caddisfly larval growth:

Significant reduction in growth rate and final biomass when fed Arundo as compared to willow, alder, and even tamarisk (Dudley & Neargarder, unpublished data)

# Arundo as food

Anecdotal evidence: Least Bell's Vireos FLY AROUND Arundo stands when feeding

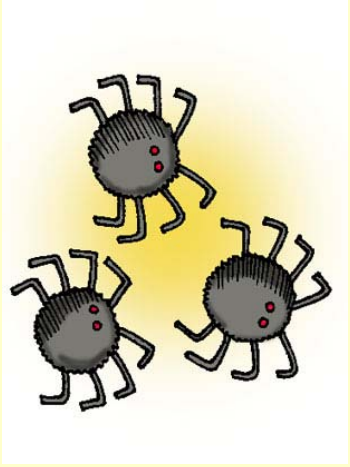
(Hays, L., SAWPA, personal comm.)

# Arundo as habitat: Least Bell's Vireo nesting data

Since 1987:

- 2,688 nests have been found in 40 species of plants.
- 111 of these nests were placed in *Eucalyptus*
- 19 in giant reed

Pike et al.,2002. "Least Bell's Vireos and Southwestern Willow Flycatchers in Prado Basin of the Santa Ana River Watershed, CA"



# Arundo as habitat: Arthropod diversity

Results of a two-year study indicate that the following were significantly lower in Arundo patches compared to other patch types:

- Overall arthropod abundance
- Beetle and spider abundance
- Beetle species richness and diversity
- Spider family richness

(Morgan & Cushman, to be submitted to ***Conservation Biology***)

# Santa Ana Fire, July 10, 2002
# Approx. 100 acres

July 17 Photos by Loren Hayes

July 17  Photos by Loren Hayes

August 22 Grow-back already well underway

# Conclusions

## There is strong evidence that

**Arundo** = biodiversity

- Well before *Arundo donax* completely replaces native vegetation, it is negatively impacting the biodiversity of our riparian ecosystems

Thank you

http://teamarundo.org