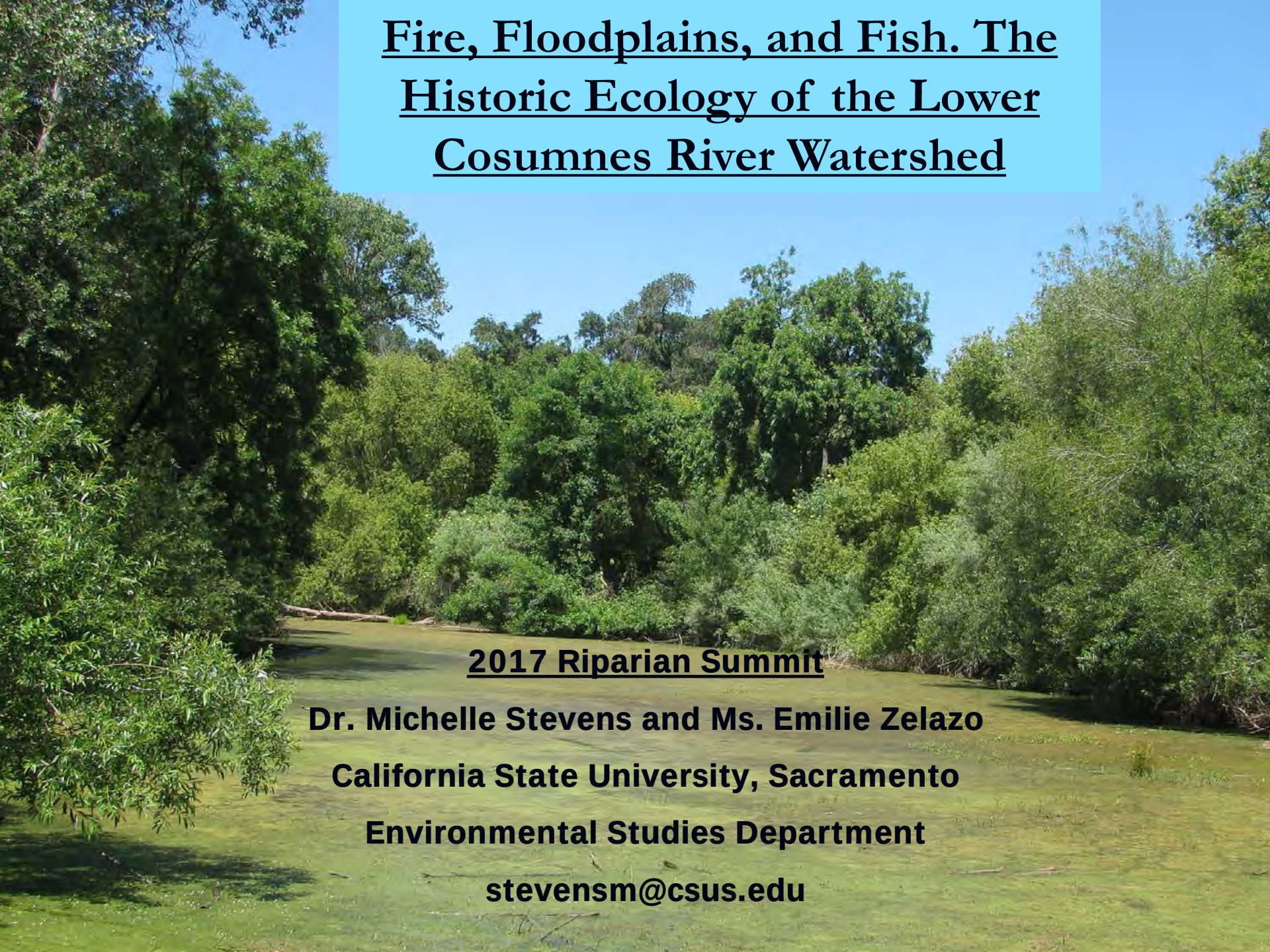
Fire, Floodplains, and Fish. The Historic Ecology of the Lower Cosumnes River Watershed



2017 Riparian Summit

Dr. Michelle Stevens and Ms. Emilie Zelazo

California State University, Sacramento

Environmental Studies Department

stevensm@csus.edu

Reciprocal Restoration

- "Reciprocal restoration is the mutually reinforcing restoration of land and culture such that repair of ecosystem services contributes to cultural revitalization, and renewal of culture promotes restoration of ecological integrity" (Robin Kimmerer).

Key Elements of Eco-Cultural or Reciprocal Restoration

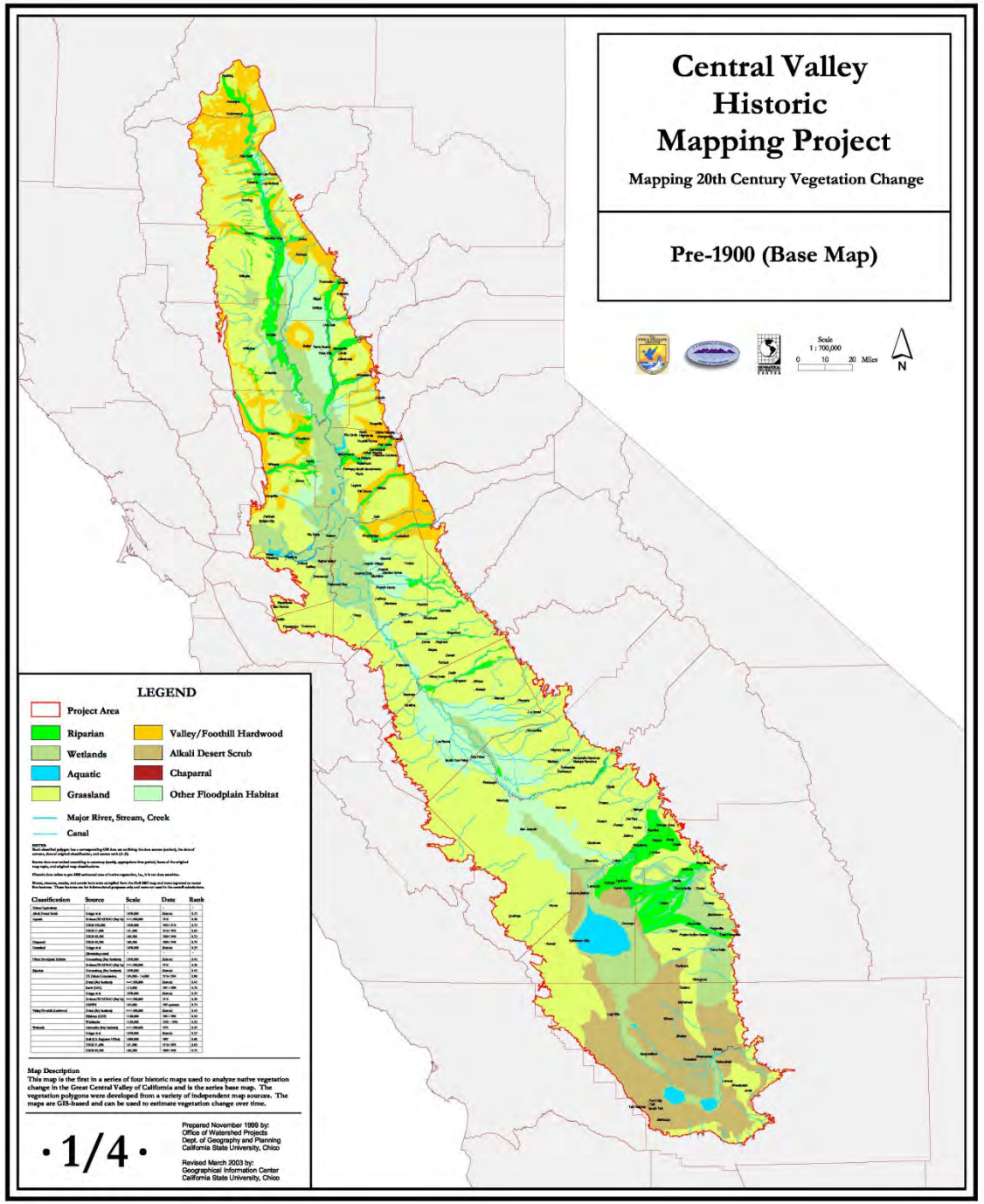
- Focus on Cultural Keystone Species
- Revitalization of place-based, sustainable economies
- Restoration of traditional land management practices such as fire
- Sense of place, Stewardship, World renewal
- Inter-generational equity

Historic Ecology

- This paper will explore archaeological fish faunal remains, ethnographic data, and traditional knowledge to reconstruct the landscape of the lower Cosumnes River watershed prior to Euro-American settlement and alteration.

Traditional Resource Management

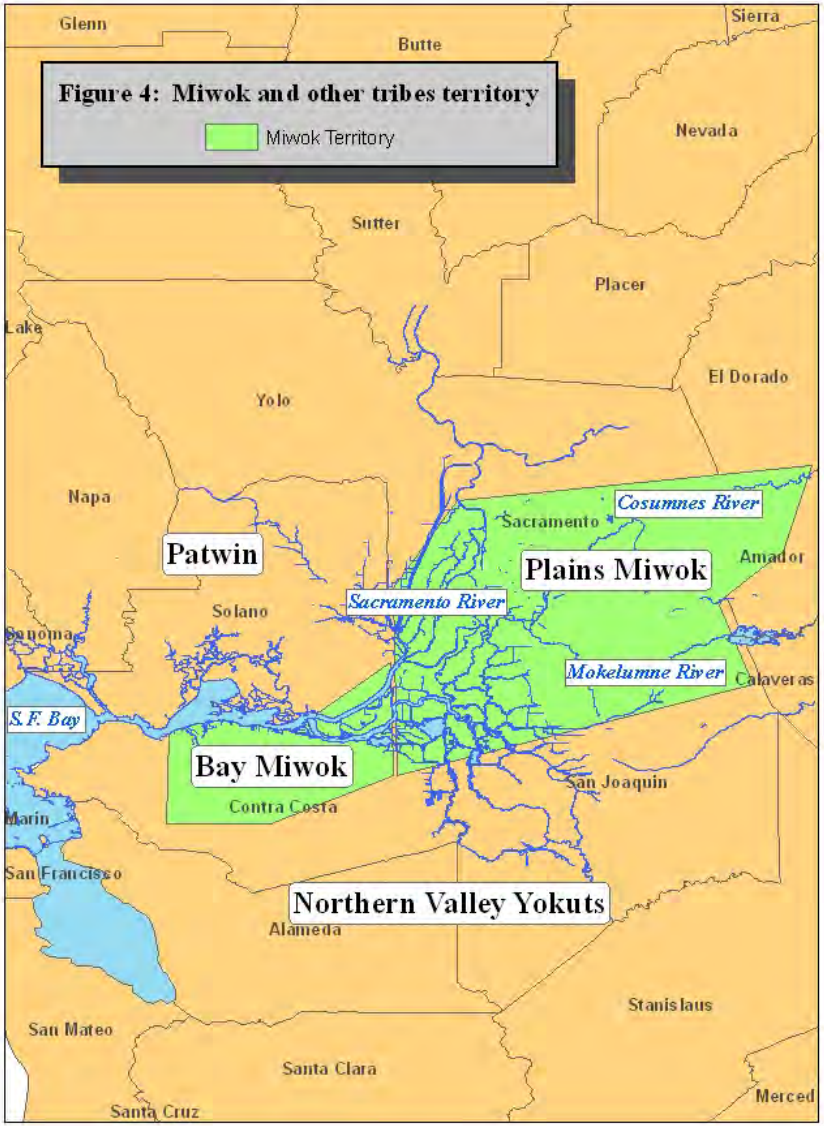
- increase habitat interspersion;
- create a more open & park-like riparian physiognomy;
- increase species diversity;
- attenuate peak velocities and flood flows;
- increase water availability and late season stream flows;
- increase groundwater recharge; and
- increase production of cultural resources.


Central Valley
Historic
Mapping Project
Mapping 20th Century Vegetation Change
Pre-1900 (Base Map)
Scale
1 : 700,000
0 10 20 Miles
N
LEGEND
Project Area
Riparian
Wetlands
Aquatic
Grassland
Valley/Foothill Hardwood
Alkali Desert Scrub
Chaparral
Other Floodplain Habitat
Major River, Stream, Creek
Canal
Classification
Source
Scale
Date
Rank
Map Description
This map is the first in a series of four historic maps used to analyze native vegetation change in the Great Central Valley of California and is the series base map. The vegetation polygons were developed from a variety of independent map sources. The maps are GIS-based and can be used to estimate vegetation change over time.
·1/4·
Prepared November 1999 by:
Office of Watershed Projects
Dept. of Geography and Planning
California State University, Chico
Revised March 2003 by:
Geographical Information Center
California State University, Chico

Where People Lived

- There are at least 130 archaeological sites along the eastern Delta periphery.
- Geomorphically, half of sites are located on stream banks and natural levees near rivers
- 17% are in the floodplain;
- 14% at lakes, sloughs and marshes;
- 8% on alluvial or marine sedimentary terraces; and
- 7% are found on top of Pleistocene aeolian sand dunes (Pierce 1988).

Whose territory are we in?



High Densities of Human Inhabitation in Pre-Settlement Time

- Populations of close to 80,000 people have been estimated for the Sacramento Valley prior to European arrival (Cook 1976).
- For the Plains Mewuk, numbers as high as 57 individuals per square mile along the streams and sloughs have been estimated for pre-historic times (Johnson 1976).

Sustainable Habitation for 6,000 years

- The Sacramento region has supported the same vegetation pattern for the past 6000 years (West et al. 2007).
- Further, dated core data suggests that the eastern Delta margin stabilized 5000 years ago allowing for a resilient wetland plant community to become established here (Pierce 1988).

Traditional Environmental Knowledge (TEK)

An integral body of practical and spiritual knowledge that has evolved through the successful adaptation of an intelligent people to their particular ecosystem

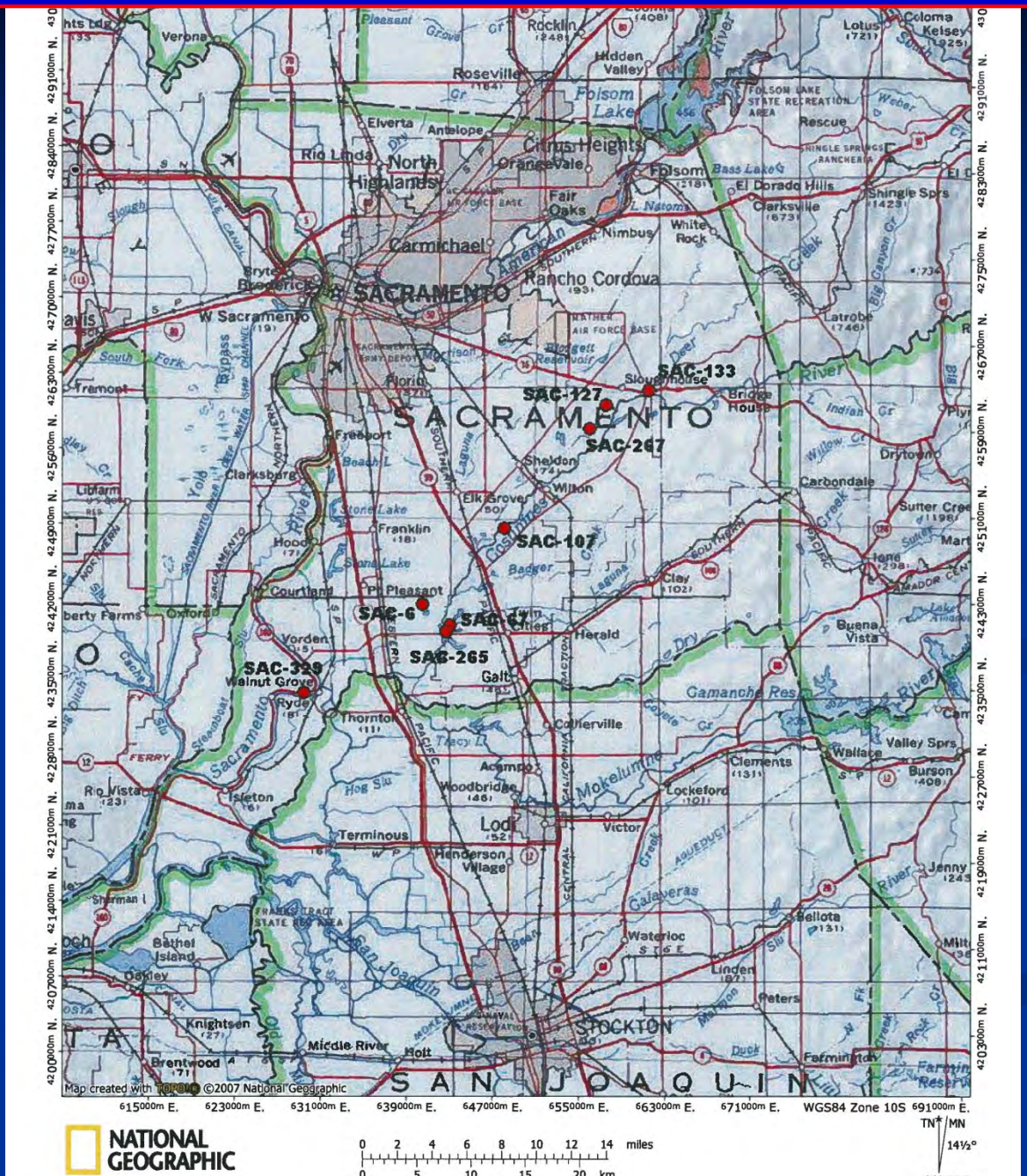
Research Methodology

- Archaeological Records
- Early Written Records
- Oral Interviews
- Participant Observation
- Review of ethnographic literature
- Analysis of Museum artifacts
- Ecological field experiments
- Analysis of archaeological remains

Use of archaeological remains to complement historic record

- Archaeological remains may help to illuminate areas where certain habitats were thriving before historical forces altered the landscape. The archaeological record can serve as a text from which to read the lives of Delta's past flora and fauna, geography and demography before the advent of historical documentation.

Archaeological Sites in Study Area



- *We can use sources such as early land surveys, early explorers records, General Land Office surveys (much of the data is earlier than this survey, in the 1850s and 1860s)*

October 11, 1769, Father Juan Crespi, "While here at this place, they have reported that there are many hills covered with hazelnut thickets through this vicinity, some of which thy have found bearing nuts. They say it had been burned off by the heathens, and plainly when the trees were in flower. Hazelnuts grow on thickets, the highest of which are a yard-and-half or yard and three-fourths tall. As we could see, the heathens burn them (probably for basketry material), for it was plainly not long since they had been burnt."

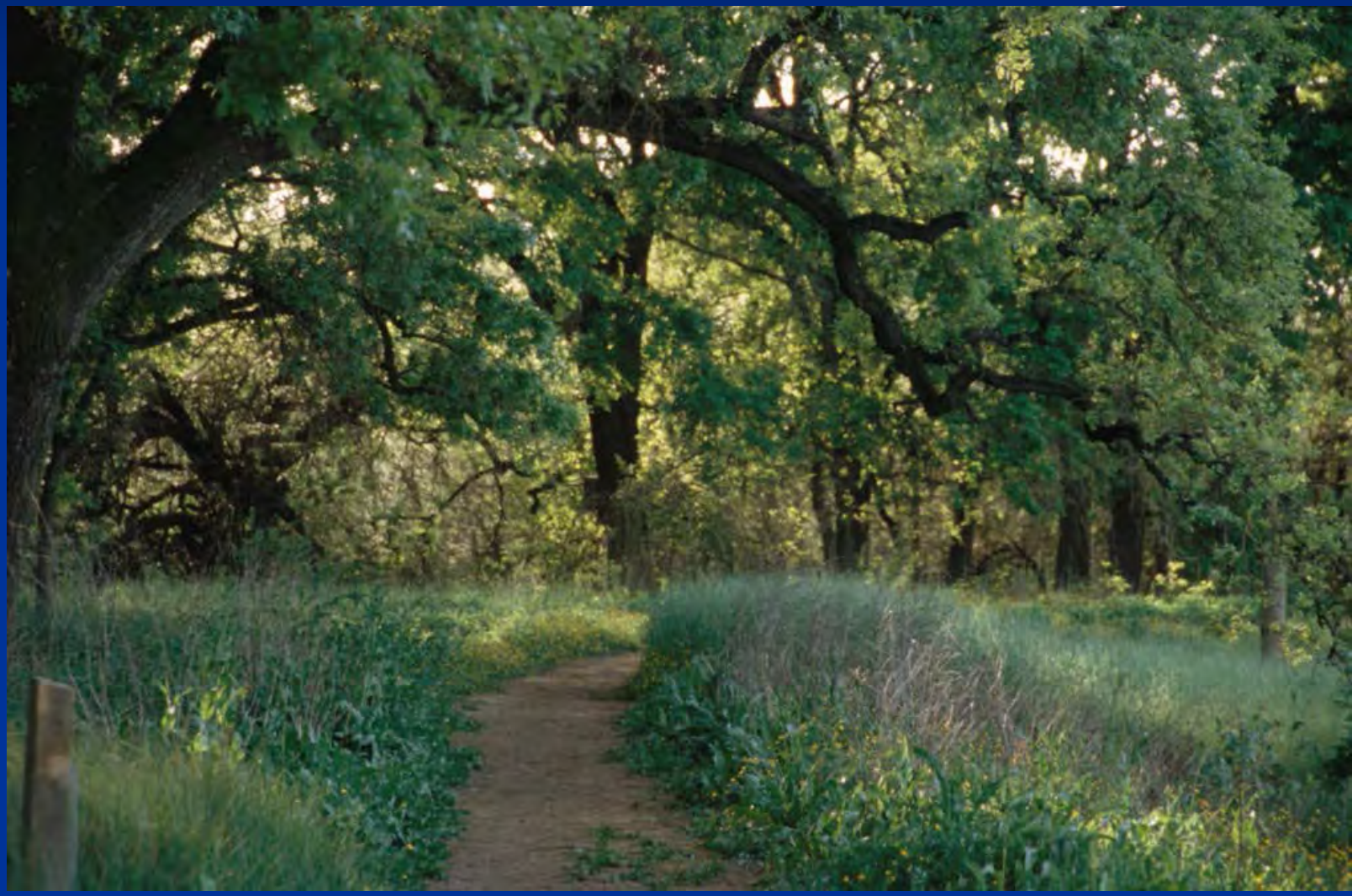
Oral/ ethnographic tradition

- The oral traditions and traditional management practices of the living descendants of the Delta's original caretakers/inhabitants are also valuable clues as to what was available where. This is especially valuable as a supplement to the paleo-botanical record.

Oral Interviews

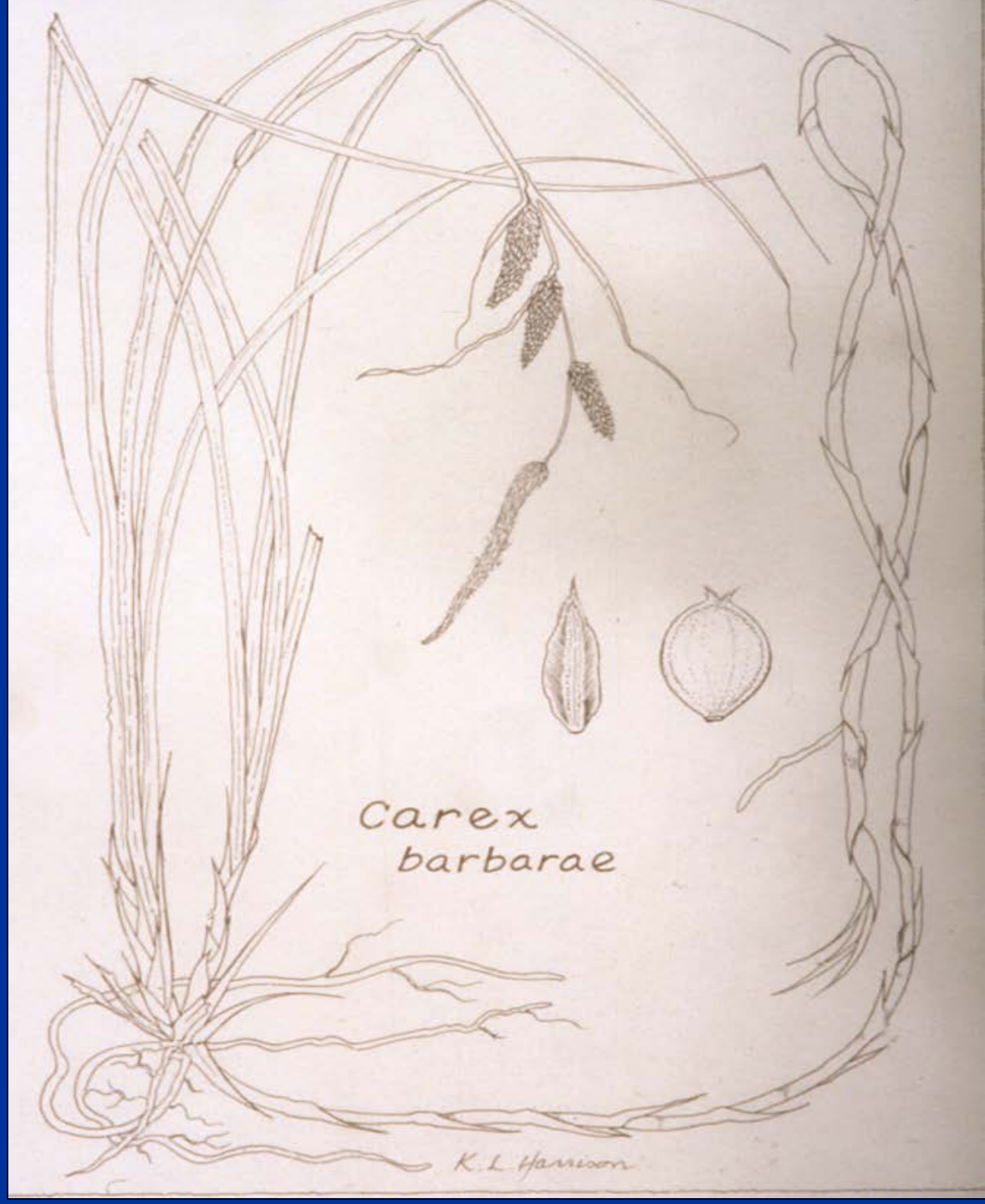
Participant Observation

Valley Oak Riparian Woodland



Case Study

White Root (*Carex barbarae*)



Pomo coiled feather basket

CA Tribes using *Carex barbarae* for basketweaving

- 22 tribes within the range of Cx barbarae used for basketweaving
- 12 Northern California tribes make twined baskets using conifer roots
- 2 Southern California tribes make coiled baskets using bulrush (*Juncus leseurii*, *J. breweri*), deergrass (*Mulhenbergia rigens*), and sourberry (*Rhus trilobata*)

Cradle to grave significance of California Indian basketry tradition

Sedge Bed Management Techniques

- Burning
- Pruning rhizomes
- Tilling/ aeration of soil
- Selective harvest – leaving all age classes
- Harvesting during a specific season
- Resting sedge beds every 2 to 4 years
- Weeding, removing stones and branches
- Replanting

Rhizomes

Mabel McKay,
Pomo basketweaver
and Indian doctor,
holding white root rhizomes

Coiled Baskets

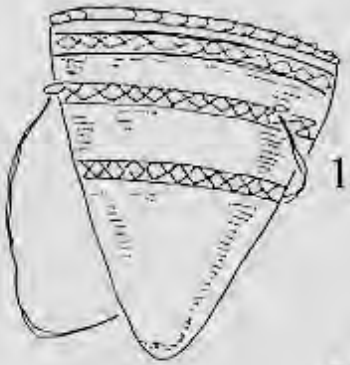
Mush, Storage, or Washing Basket

300 roots 3' long for a 1.5-2 gallon basket

200 roots, 1.5-2' long for 1.5-2 gallon basket

Gift Basket

20 to 100 roots



Twined Baskets

Cooking basket

1,000 to 3,000 roots

Seed Beater

50 to 60 roots

White Root Harvest

per Year per Tribelet[1]

- 600 coils harvested per year per tribelet
- 100 split rhizomes per coil (two rhizomes per plant)
- 60,000 rhizomes harvested from 15,000 plants
- Each *Carex barbarae* plant tended for 1 m center
- 15,000 m^2 white root bed tended annually

3.7 acres white root bed tended annually

[1]Data from Warm Springs Dam Ethnobotanical Mitigation –Dry Creek, Lake Sonoma, California, Dry Creek and Cloverdale Pomo nation (Parrish et al. 1980; Peri 1978; 1985; Peri et al. 1976; 1979; 1980; 1982*)

Quantity of Fiber Material Used
(Indian hemp, Milkweed)

- Gill Net Requires 60,110 stalks
- Bag Net Requires 4,425 stalks
- Feather Cape (regalia) 500 stalks
- Deer Net 35,000 stalks

Food - Geophytes – Pinole Camas -

Fire size and intensity specific to culturally significant resource being managed

Fish of Cosumnes River

- Cosumnes River is home to 41 species of fish, 14 of which represent native species
- Fourteen native fish are found in the study area;
- 12 of these fish species are also found in the archaeological record

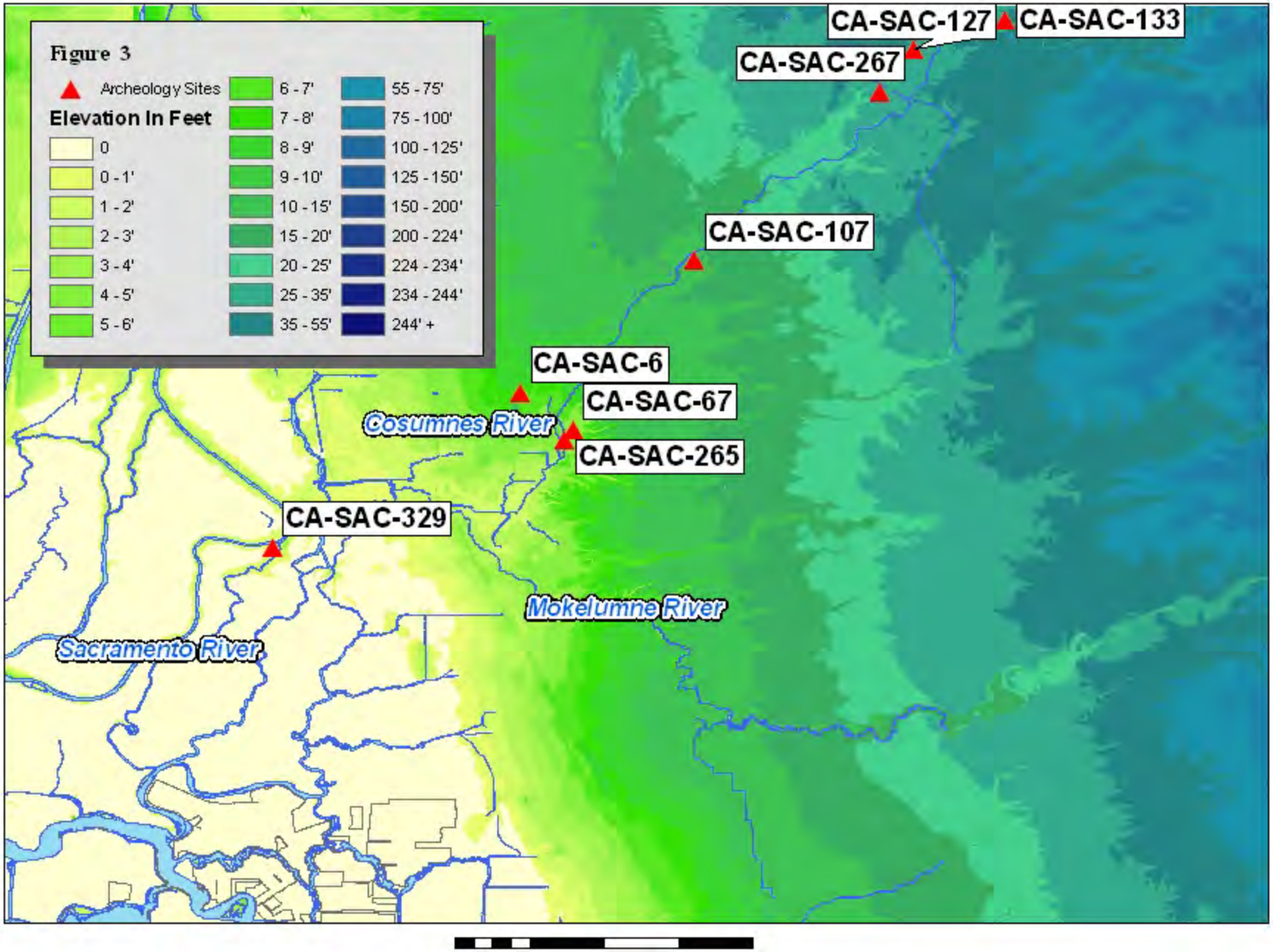


Figure 3
Archeology Sites
Elevation In Feet
0
0 - 1'
1 - 2'
2 - 3'
3 - 4'
4 - 5'
5 - 6'
6 - 7'
7 - 8'
8 - 9'
9 - 10'
10 - 15'
15 - 20'
20 - 25'
25 - 35'
35 - 55'
55 - 75'
75 - 100'
100 - 125'
125 - 150'
150 - 200'
200 - 224'
224 - 234'
234 - 244'
244' +
CA-SAC-127
CA-SAC-133
CA-SAC-267
CA-SAC-107
CA-SAC-6
CA-SAC-67
Cosumnes River
CA-SAC-265
CA-SAC-329
Mokelumne River
Sacramento River

EXAMPLE CA-SAC-329

- CA-SAC-329 is located on levee deposits on the southern bank of the Sacramento River within the historical spillway of the confluence of the Cosumnes and Mokelumne Rivers
- this site is described as a seasonal camp and is associated with a tule marsh habitat
- immediate access to the riparian forest and surrounding marsh.

Fish from Archaeological Record

- Sacramento Perch composes more than half of the deposit.
- Thicktail Chub comprises the next most common species
- followed by Sacramento Sucker and Hitch, then other minnow species.
- Salmon and Sturgeon not adequately represented = don’t remain in record (cartilaginous) and are processed on site

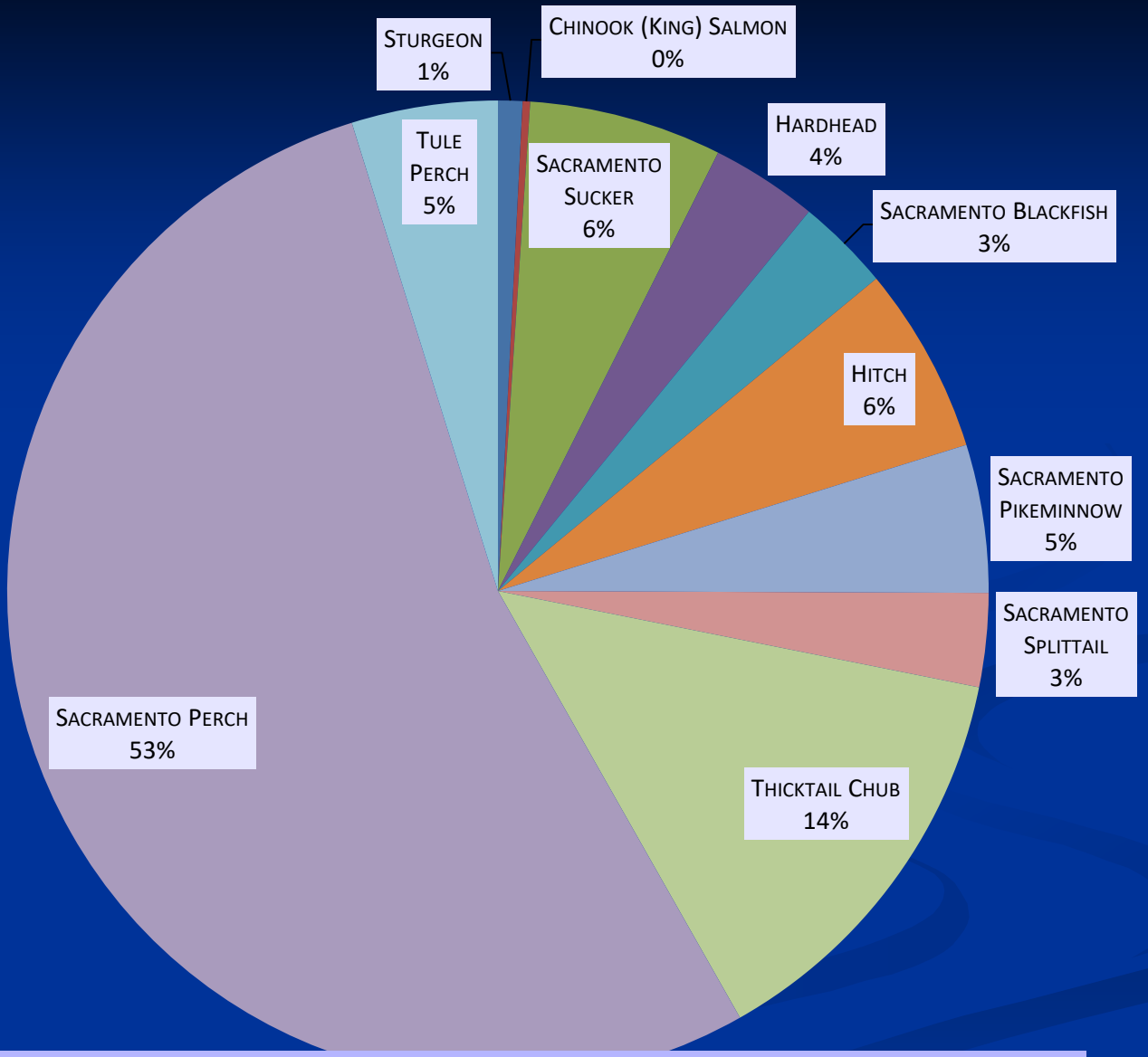


Figure 8 - CA-SAC-329 Fish Species Composition

Burning as a Keystone Management Tool

- Fish habitat enhanced by prolonged spring inundation during spawning & floodplain rearing
- Reducing senescent vegetation provides good substrate for eggs and larvae.
- Burning mobilizes nutrients, providing important nutrition for larval fish.
- Traditional tending practices optimized habitat productivity and fecundity for native fish species

Honoring Ancestors –

Gathering White Root – Title 9 Indian Education

Riparian Restoration Recommendation

- We recommend this information be utilized to honor California Indian cultures in the watershed whose ancestors cared for, managed, and conducted specific renewal ceremonies.
- We also recommend this information be used for conservation of native species and traditional resource management of the Cosumnes River and Delta, and as a template for cultural and ecological restoration of this valuable habitat

Conclusion

1. Floodplain biodiversity and native fish productivity benefit from burning and other TRM practices utilized by Native Californians.
2. These practices increase habitat quality, productivity and resiliency to adapt to the ever-changing and unpredictable California climate.

Ecological and Cultural Restoration

References

- Bennyhoff, J. A. 1977 *he Ethnogeography of the Plains Miwok*. Center for Archaeological Research at Davis Publication no. 5. Davis: University of California.

- Grossinger, R. M. 2001 Documenting Local Landscape Change: The San Francisco Ba Area Historical Ecology Project. In *The Historical Ecology Handbook: A Restorationist's Guide to Reference Ecosystems*. Dave Egan and Evelyn A. Howell, eds. Pp. 425<n>442. Washington, DC: Island Press.

- Hankins, D. Hankins, D. 2005. Pyrogeography: Spatial and Temporal Relationships of Fire, Nature, and Culture. Unpublished Ph.D. dissertation, University of California, Davis.

- Stevens, M.L. and E. Zaloza. 2015. Fire, Floodplains and Fish: the Historic Ecology of the Lower Cosumnes River Watershed. Edited by Pei Lin Yu, In Rivers, Fish and the People. Tradition, Science and Historical Ecology of River Fisheries in the American West. University of Utah Press.

- Stevens, M.L. **2003**. The Contribution of Traditional Resource Management (TRM) of White Root (*Carex barbarae* Dewey, Cyperaceae) by California Indians to Riparian Ecosystem Structure and Function. In Faber, P.M. (ed.). California Riparian Systems: Processes and Floodplain Management, Ecology, and Restoration. 2001 Riparian Habitat and Floodplains Conference Proceedings, Riparian Habitat Joint Venture, Sacramento, California. pp 502-511