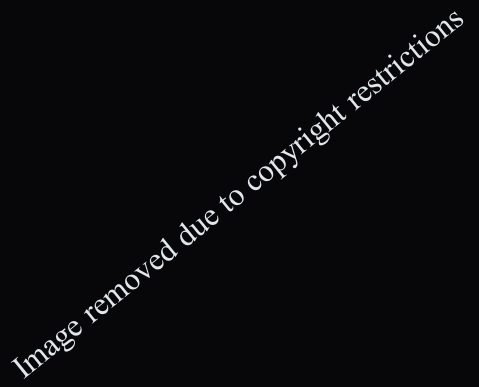
HISTORICAL BASIS FOR RESTORING TO STAGE 0



Land Case Map B-128, courtesy of The Bancroft Library

Sean Baumgarten

Resilient Landscapes Program
San Francisco Estuary Institute

Salmonid Restoration Federation Conference

April 13, 2018

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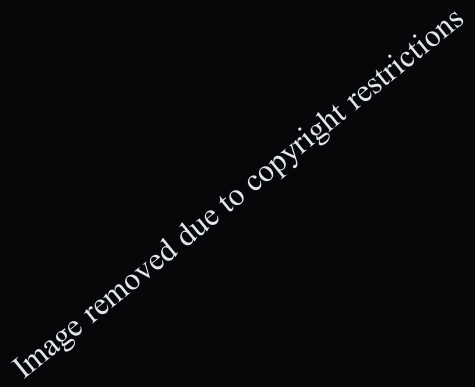
SAN FRANCISCO ESTUARY INSTITUTE & THE AQUATIC SCIENCE CENTER

CO-AUTHORS



Land Case Map B-128, courtesy of The Bancroft Library

Robin Grossinger

Julie Beagle

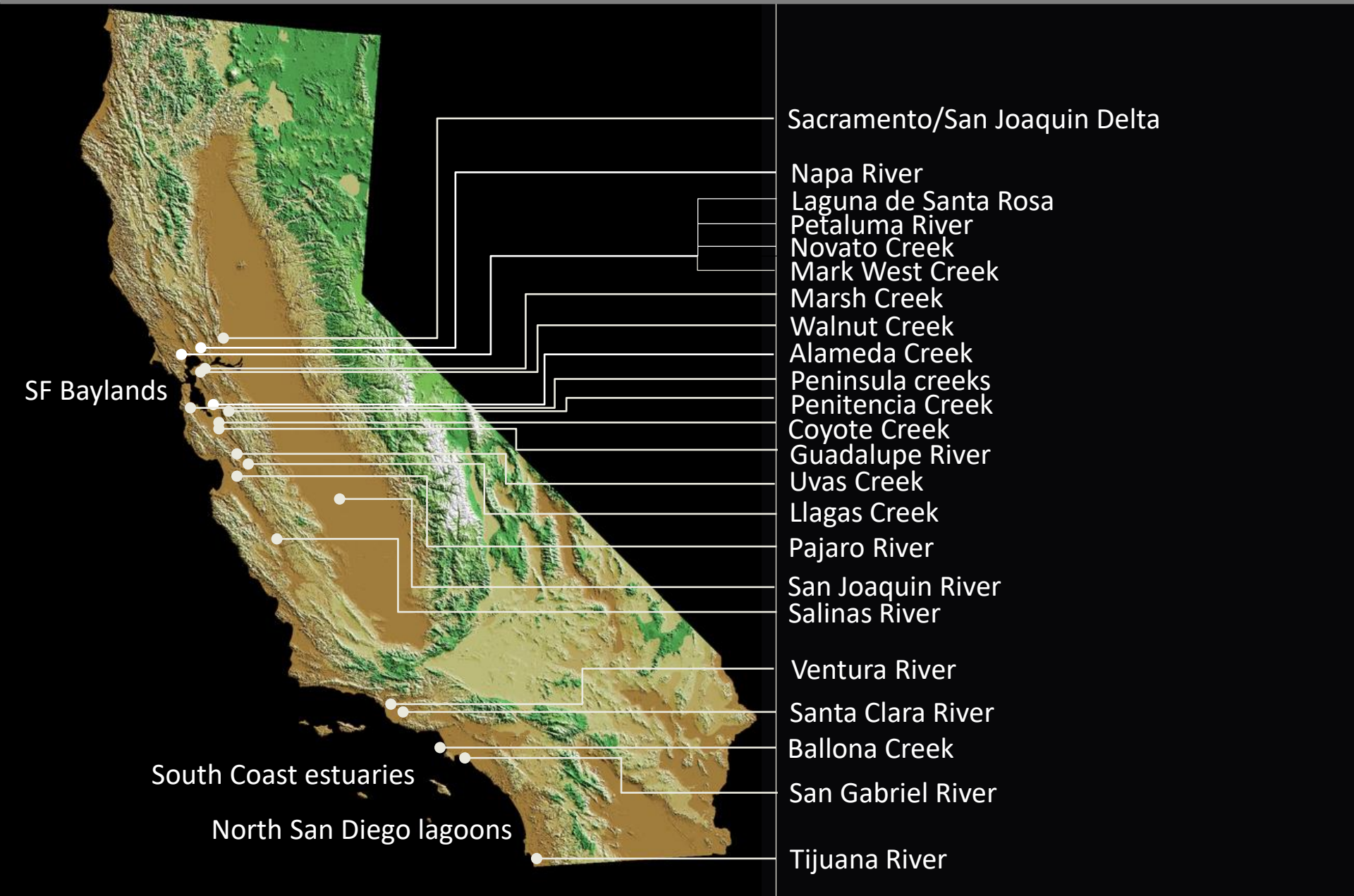
Erin Beller

Scott Dusterhoff

SFEI | AQUATIC SCIENCE CENTER

SAN FRANCISCO ESTUARY INSTITUTE & THE AQUATIC SCIENCE CENTER

Historical Ecology Studies by SFEI and partners



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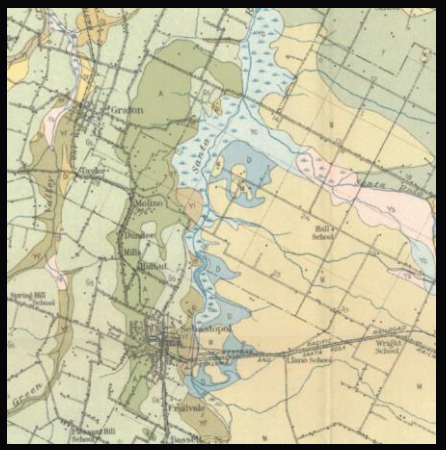
Photographs and Drawings

Maps

Image removed due to copyright restrictions



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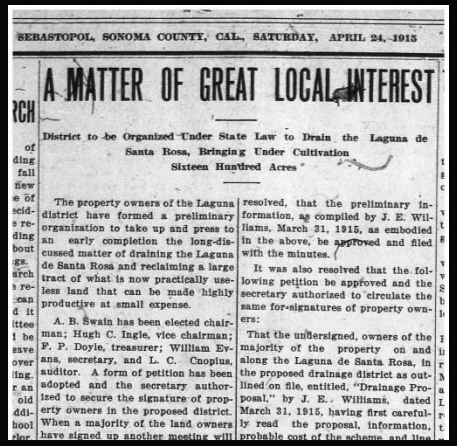


SEBASTOPOL, SONOMA COUNTY, CAL., SATURDAY, APRIL 24, 1915

A MATTER OF GREAT LOCAL INTEREST

District to be Organized Under State Law to Drain the Laguna de Santa Rosa, Bringing Under Cultivation Sixteen Hundred Acres

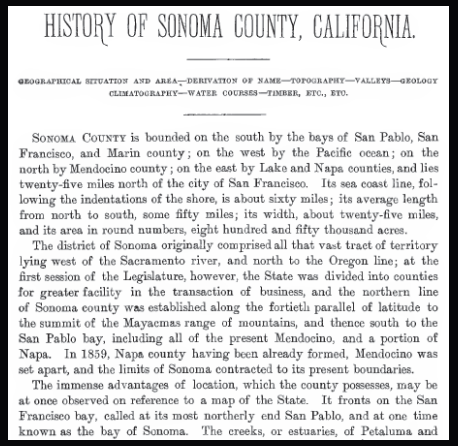
The property owners of the Laguna district have formed a preliminary organization to take up and press to an early completion the long-discussed matter of draining the Laguna de Santa Rosa and reclaiming a large tract of what is now practically useless land that can be made highly productive at small expense.

A. B. Swain has been elected chairman; Hugh C. Ingle, vice chairman; P. P. Doyle, treasurer; William Evans, secretary, and L. C. Cnopius, auditor. A form of petition has been adopted and the secretary authorized to secure the signature of property owners in the proposed district. When a majority of the land owners have signed up another meeting will

resolved, that the preliminary information, as compiled by J. E. Williams, March 31, 1915, as embodied in the above, be approved and filed with the minutes.

It was also resolved that the following petition be approved and the secretary authorized to circulate the same for signatures of property owners:

That the undersigned, owners of the majority of the property on and along the Laguna de Santa Rosa, in the proposed drainage district as outlined on file, entitled, "Drainage Proposal," by J. E. Williams, dated March 31, 1915, having first carefully read the proposal, information, probable cost of the scheme, and the



HISTORY OF SONOMA COUNTY, CALIFORNIA.

GEOGRAPHICAL SITUATION AND AREA—DERIVATION OF NAME—TOPOGRAPHY—VALLEYS—GEOLOGY CLIMATOGRAPHY—WATER COURSES—TIMBER, ETC., ETC.

SONOMA COUNTY is bounded on the south by the bays of San Pablo, San Francisco, and Marin county; on the west by the Pacific ocean; on the north by Mendocino county; on the east by Lake and Napa counties, and lies twenty-five miles north of the city of San Francisco. Its sea coast line, following the indentations of the shore, is about sixty miles; its average length from north to south, some fifty miles; its width, about twenty-five miles, and its area in round numbers, eight hundred and fifty thousand acres.

The district of Sonoma originally comprised all that vast tract of territory lying west of the Sacramento river, and north to the Oregon line; at the first session of the Legislature, however, the State was divided into counties for greater facility in the transaction of business, and the northern line of Sonoma county was established along the fortieth parallel of latitude to the summit of the Mayacmas range of mountains, and thence south to the San Pablo bay, including all of the present Mendocino, and a portion of Napa. In 1859, Napa county having been already formed, Mendocino was set apart, and the limits of Sonoma contracted to its present boundaries.

The immense advantages of location, which the county possesses, may be at once observed on reference to a map of the State. It fronts on the San Francisco bay, called at its most northerly end San Pablo, and at one time known as the bay of Sonoma. The creeks, or estuaries, of Petaluma and

Image removed due to copyright restrictions

Texts

Thomas Doughty, ca. 1825 – 1830
View on the Brandywine River: Gilpin's Paper Mill
Brandywine River Museum

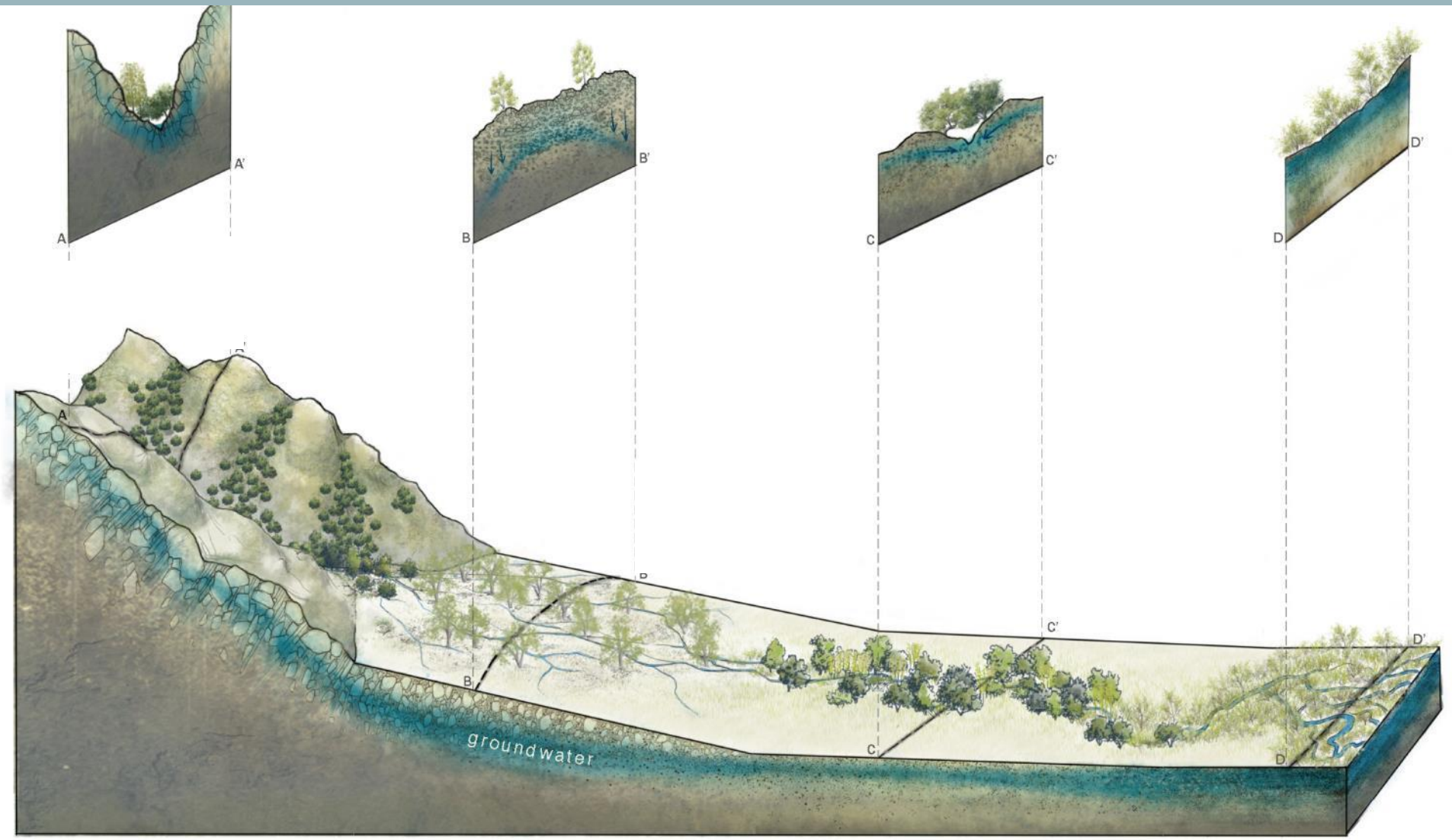
General Land Office, 1853

Puget Sound River History Project

Geographic/Historical Setting: CA Coastal Range

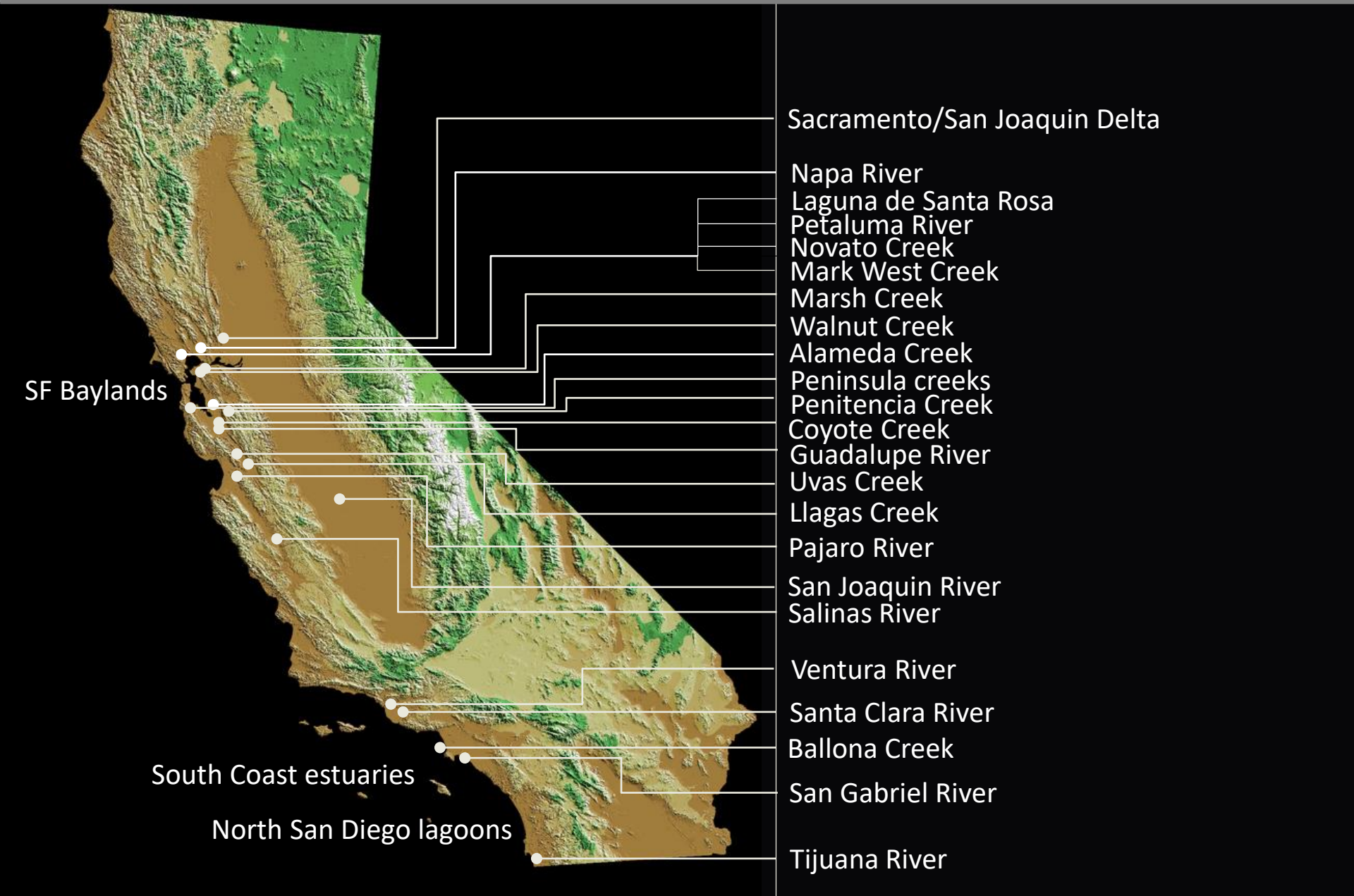
- Mediterranean climate; less wet, intermittent streamflow
- Not forested valleys: oak savannas, meadows
- Different land use history: later development

Conceptual model of channel type diversity: CA streams (Alameda Creek HE Study, Stanford et al. 2013)

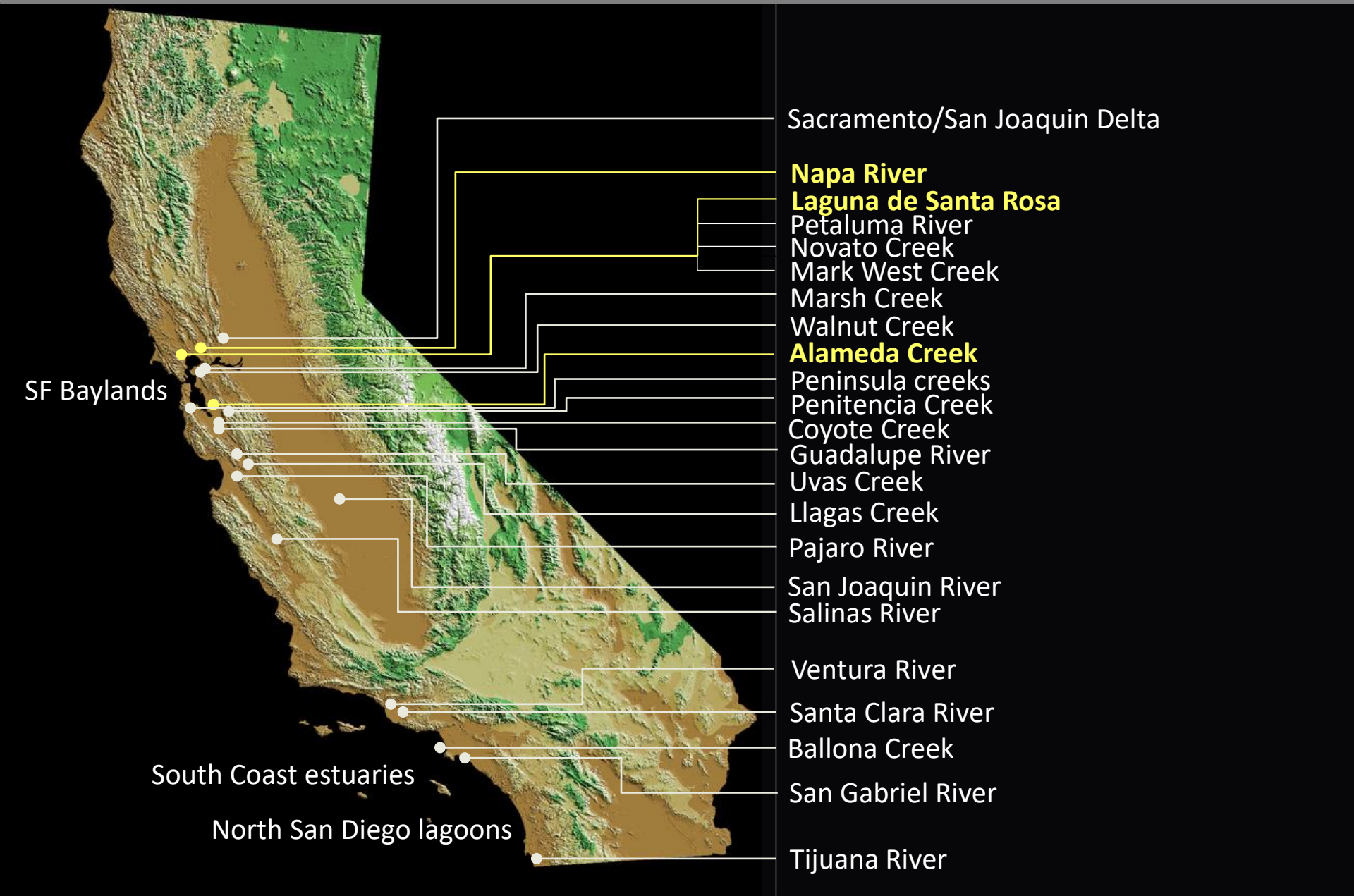


Source: Stanford et al. 2013

Historical Ecology Studies by SFEI and partners

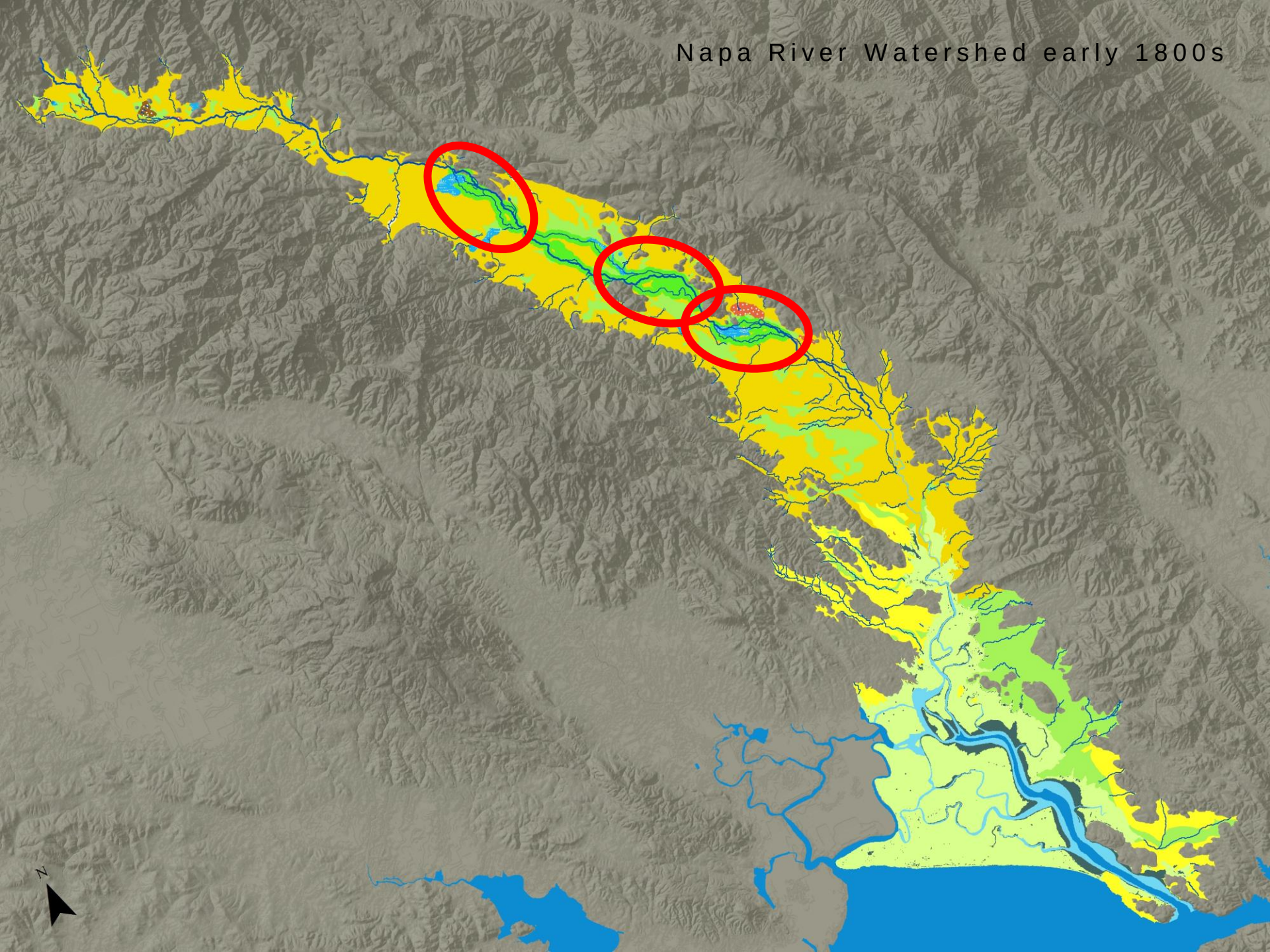


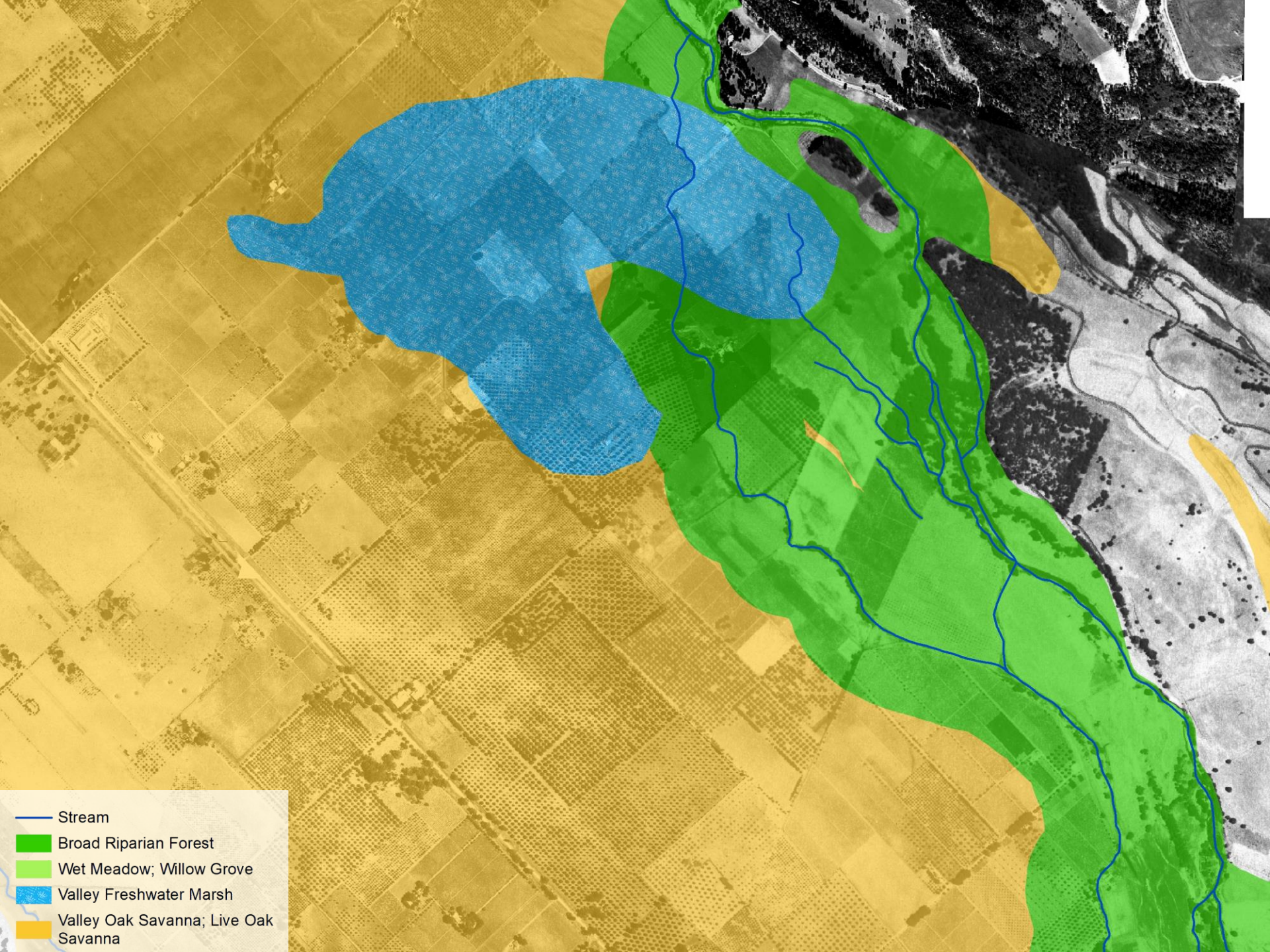
Historical Ecology Studies by SFEI and partners

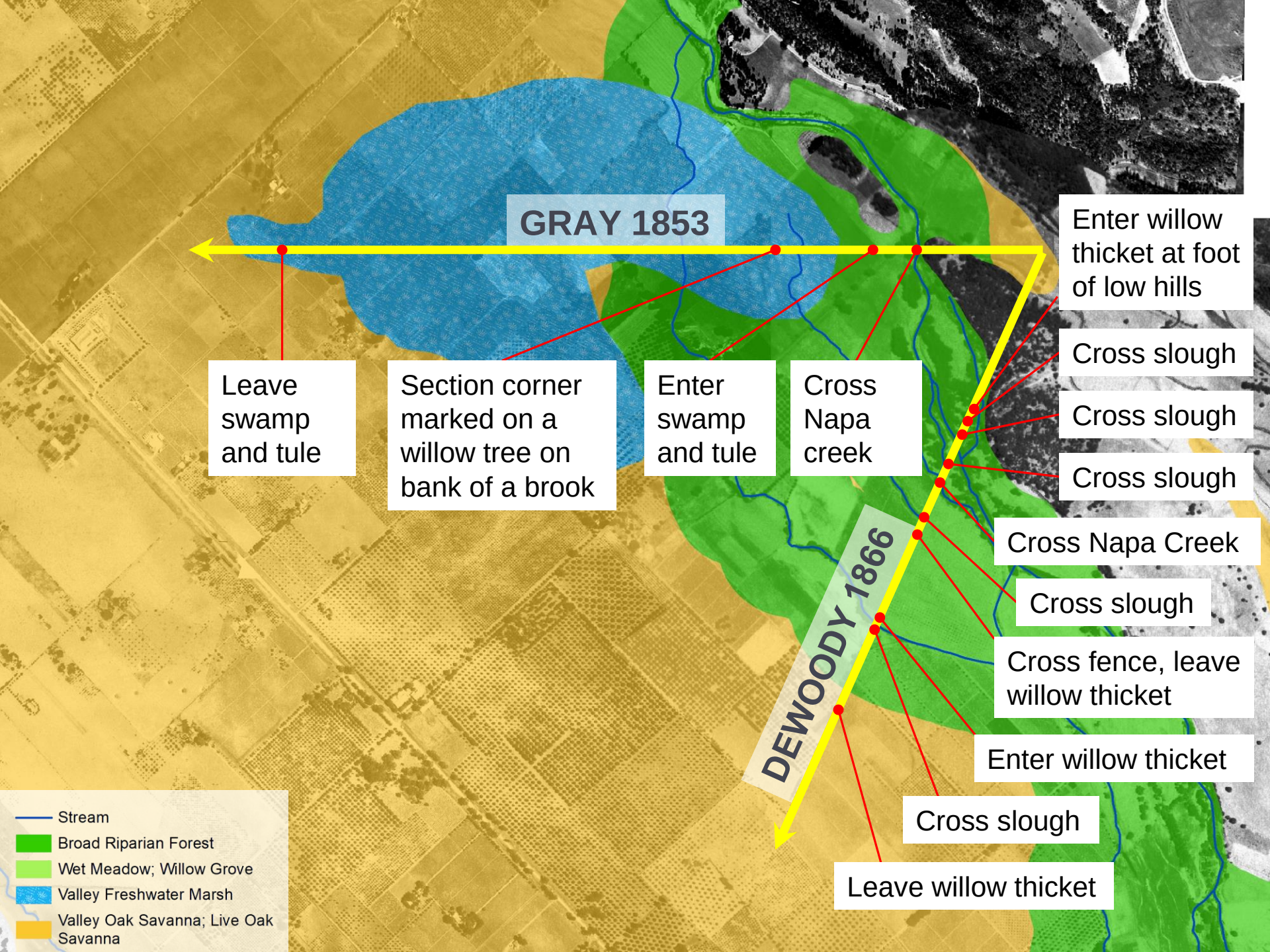


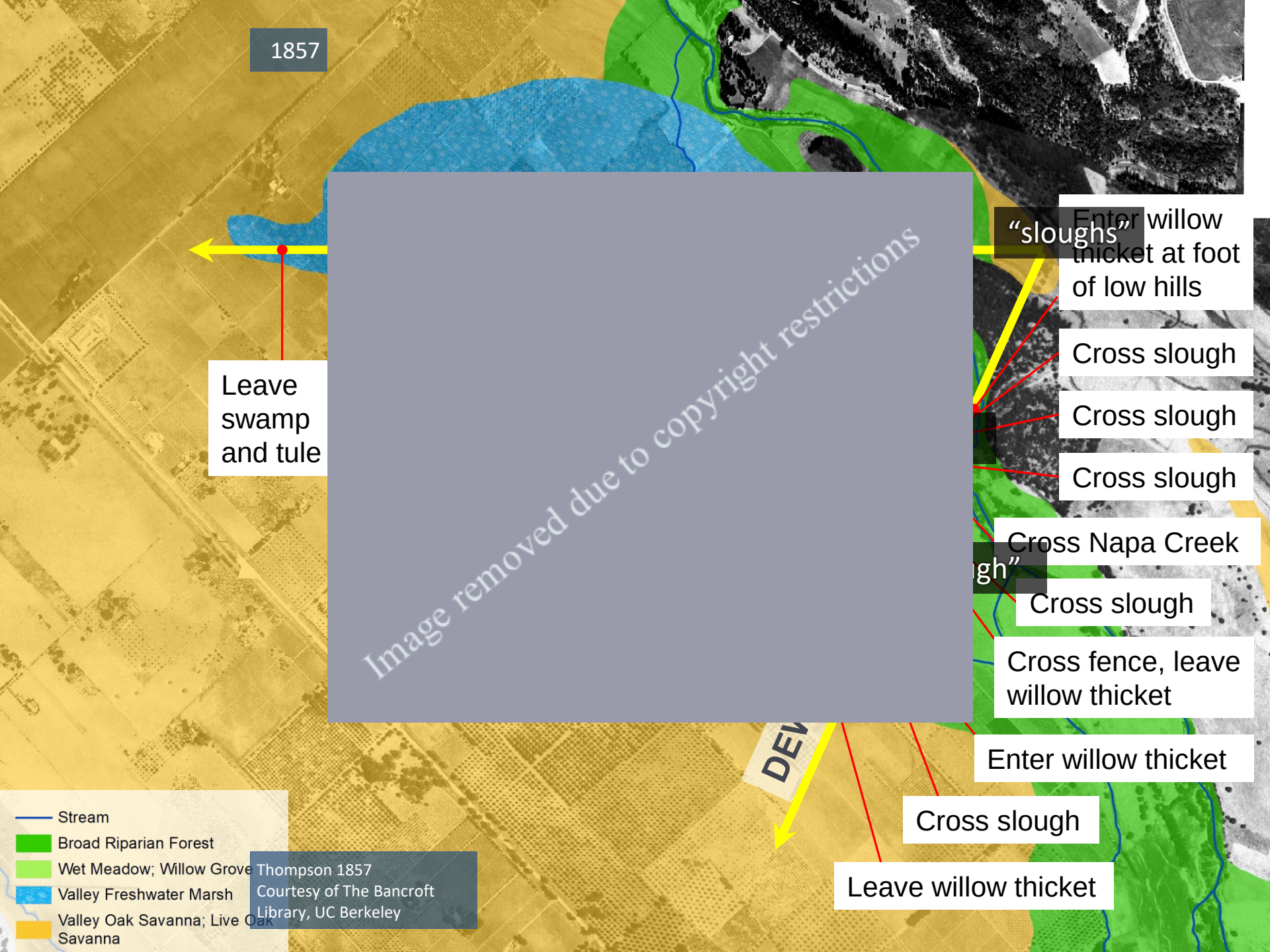
Napa River

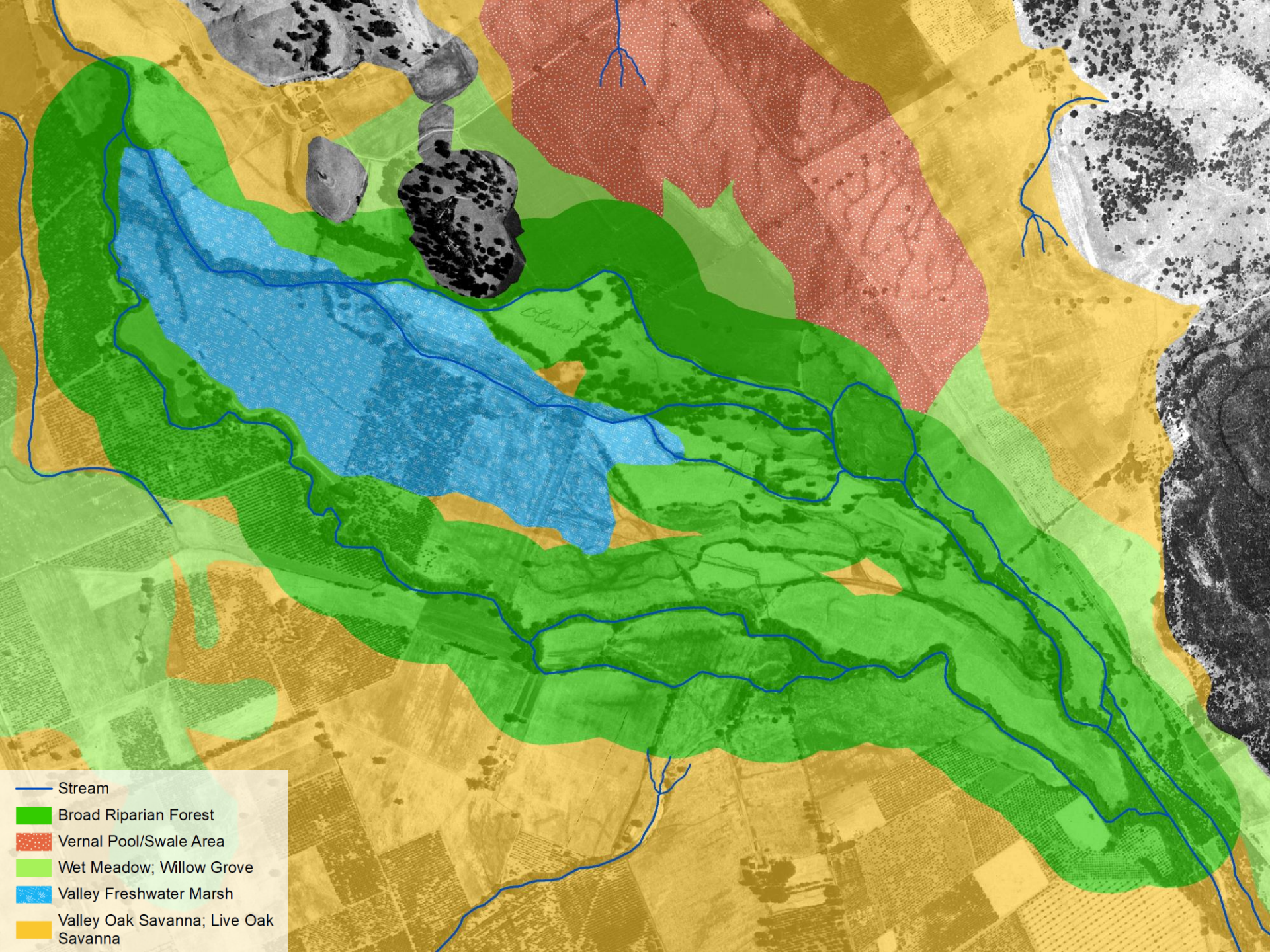
Napa County

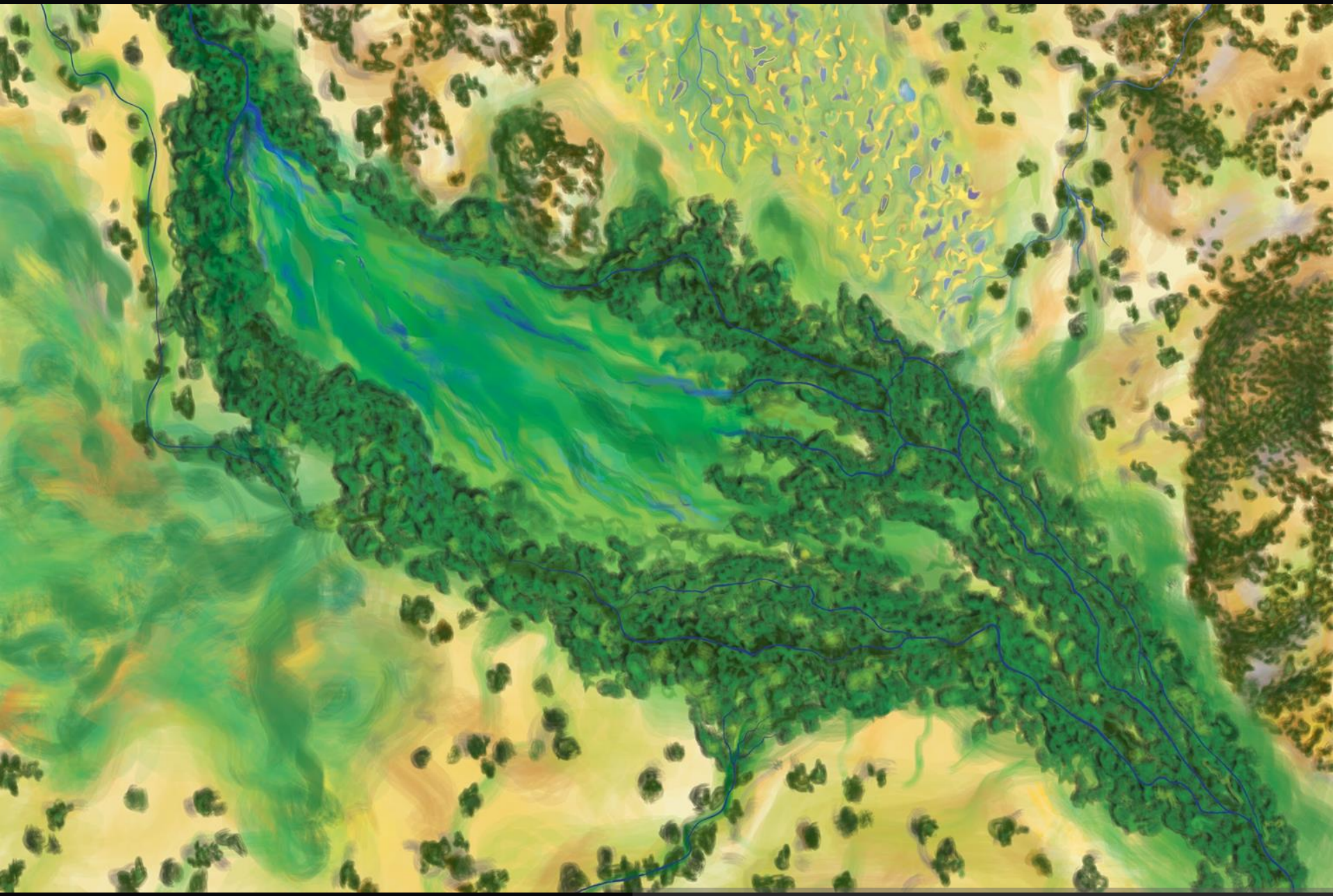

Napa River Watershed early 1800s
N


Stream
Broad Riparian Forest
Wet Meadow; Willow Grove
Valley Freshwater Marsh
Valley Oak Savanna; Live Oak Savanna


GRAY 1853
Leave swamp and tule
Section corner marked on a willow tree on bank of a brook
Enter swamp and tule
Cross Napa creek
Enter willow thicket at foot of low hills
Cross slough
Cross slough
Cross slough
Cross Napa Creek
Cross slough
Cross fence, leave willow thicket
Enter willow thicket
Cross slough
Leave willow thicket
DEWOODY 1866
Stream
Broad Riparian Forest
Wet Meadow; Willow Grove
Valley Freshwater Marsh
Valley Oak Savanna; Live Oak Savanna


1857
Image removed due to copyright restrictions
Leave swamp and tule
“sloughs”
Enter willow thicket at foot of low hills
Cross slough
Cross slough
Cross slough
Cross Napa Creek
Cross slough
Cross fence, leave willow thicket
Enter willow thicket
Cross slough
Leave willow thicket
Stream
Broad Riparian Forest
Wet Meadow; Willow Grove
Valley Freshwater Marsh
Valley Oak Savanna; Live Oak Savanna
Thompson 1857
Courtesy of The Bancroft Library, UC Berkeley

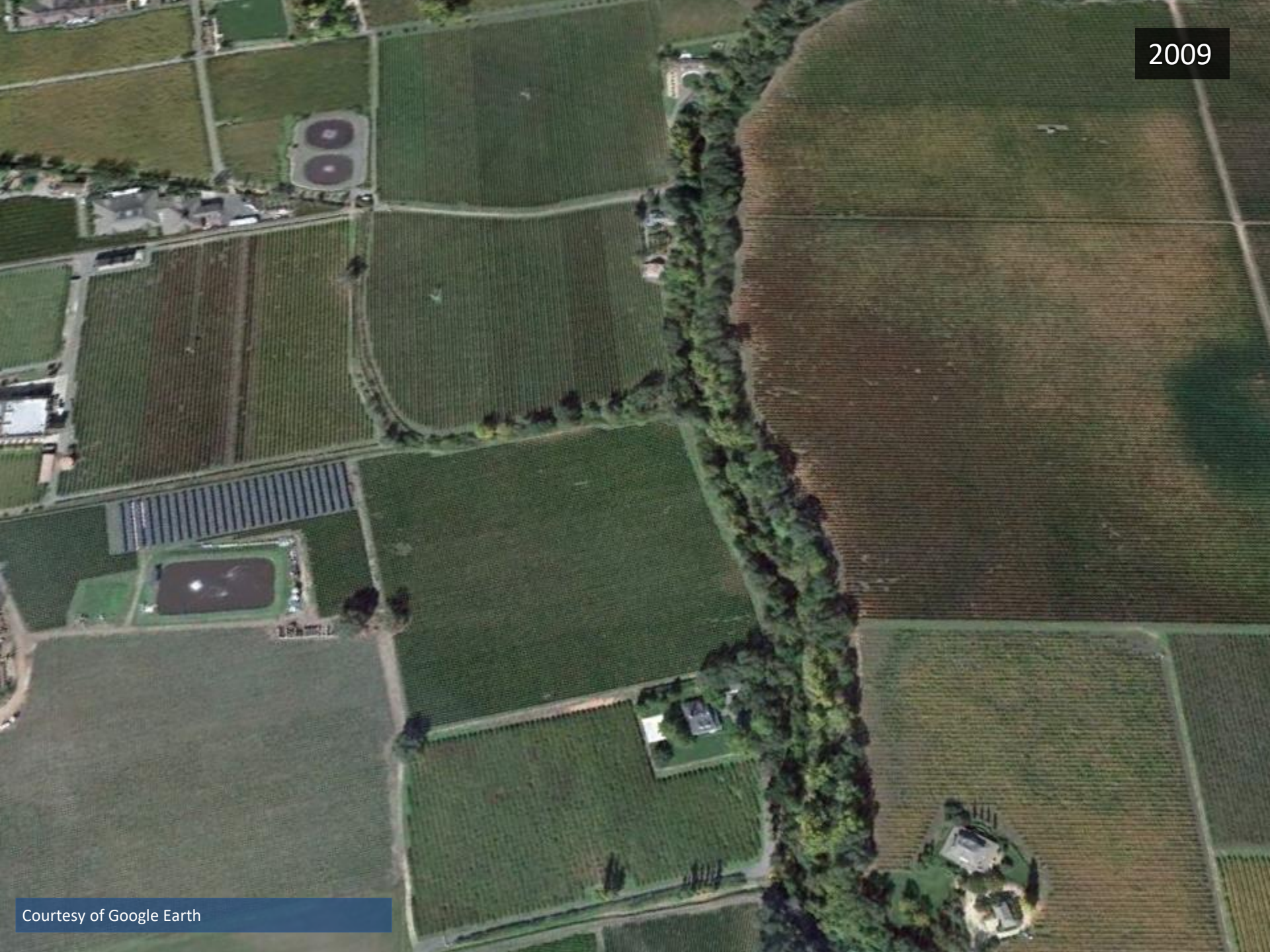

Stream
Broad Riparian Forest
Vernal Pool/Swale Area
Wet Meadow; Willow Grove
Valley Freshwater Marsh
Valley Oak Savanna; Live Oak Savanna



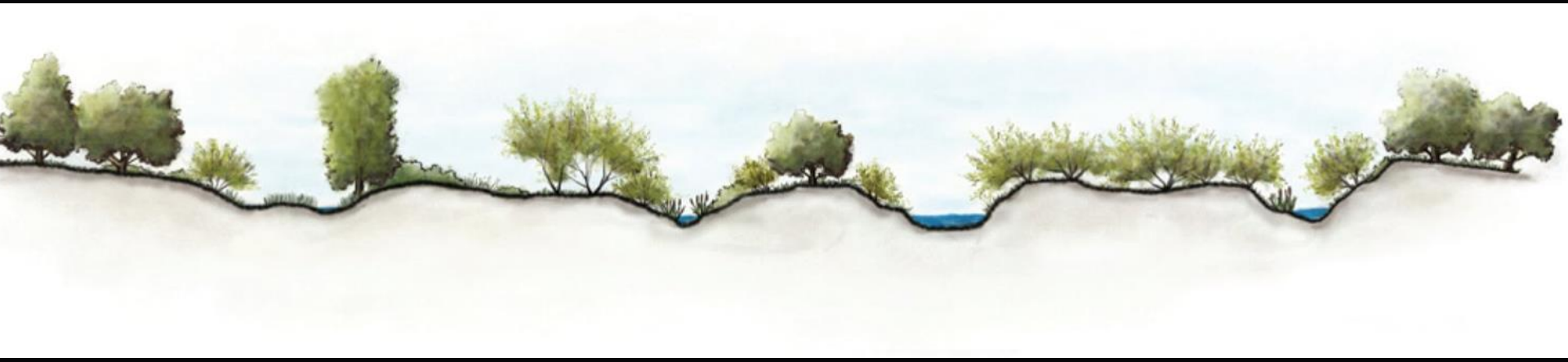
SFEI and Brian Mabeus, Bay Nature

USDA 1942
Courtesy of Napa County Resource Conservation District and Natural Resources Conservation Service

USDA 2009
Courtesy of National Agricultural Imagery Program

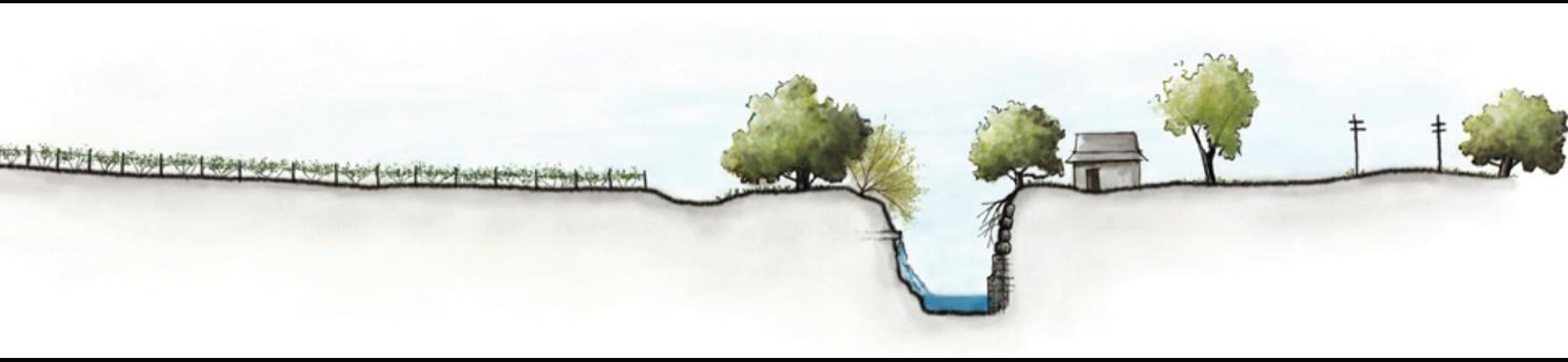

2009
Courtesy of Google Earth

Early 1800s

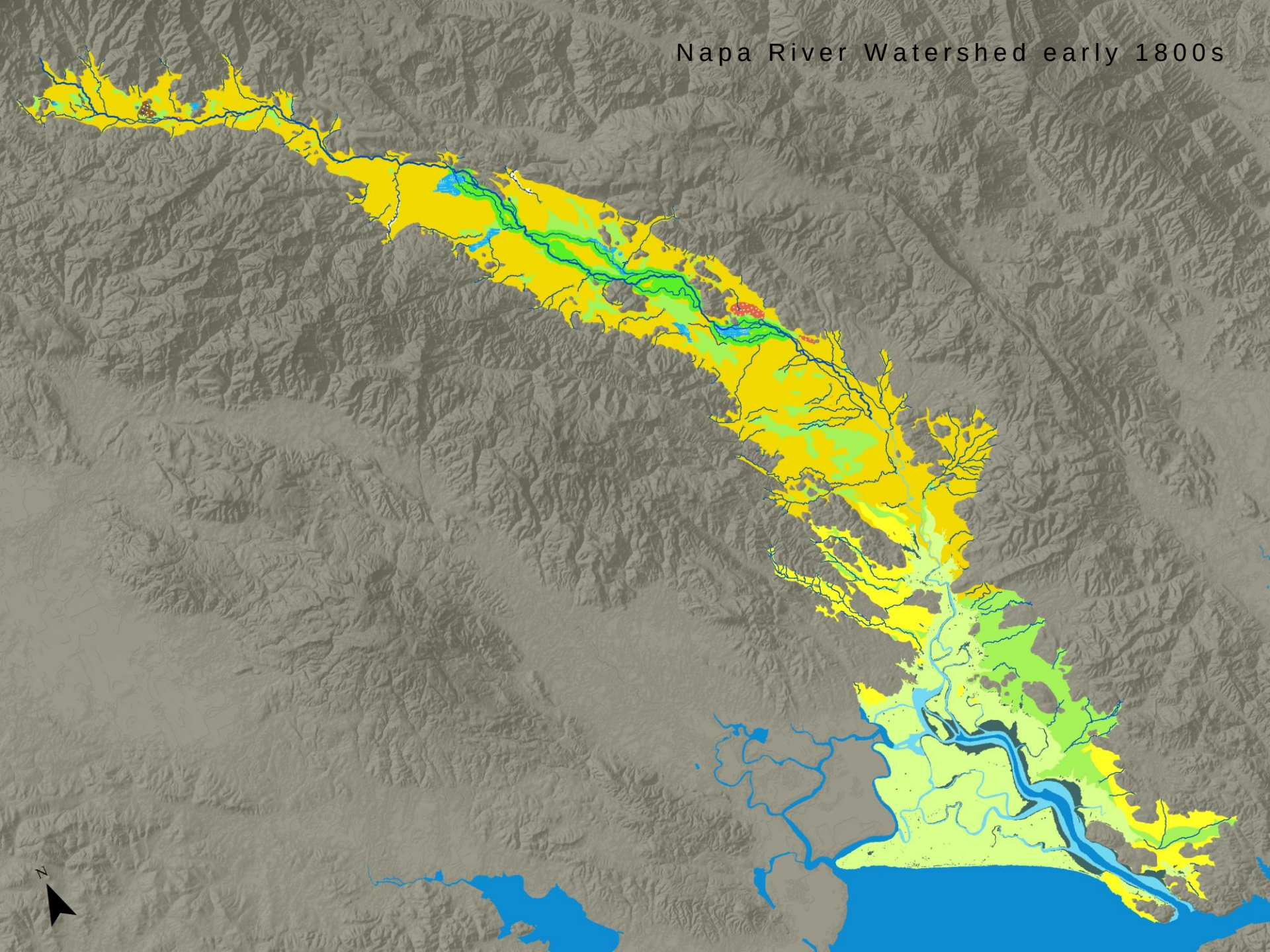


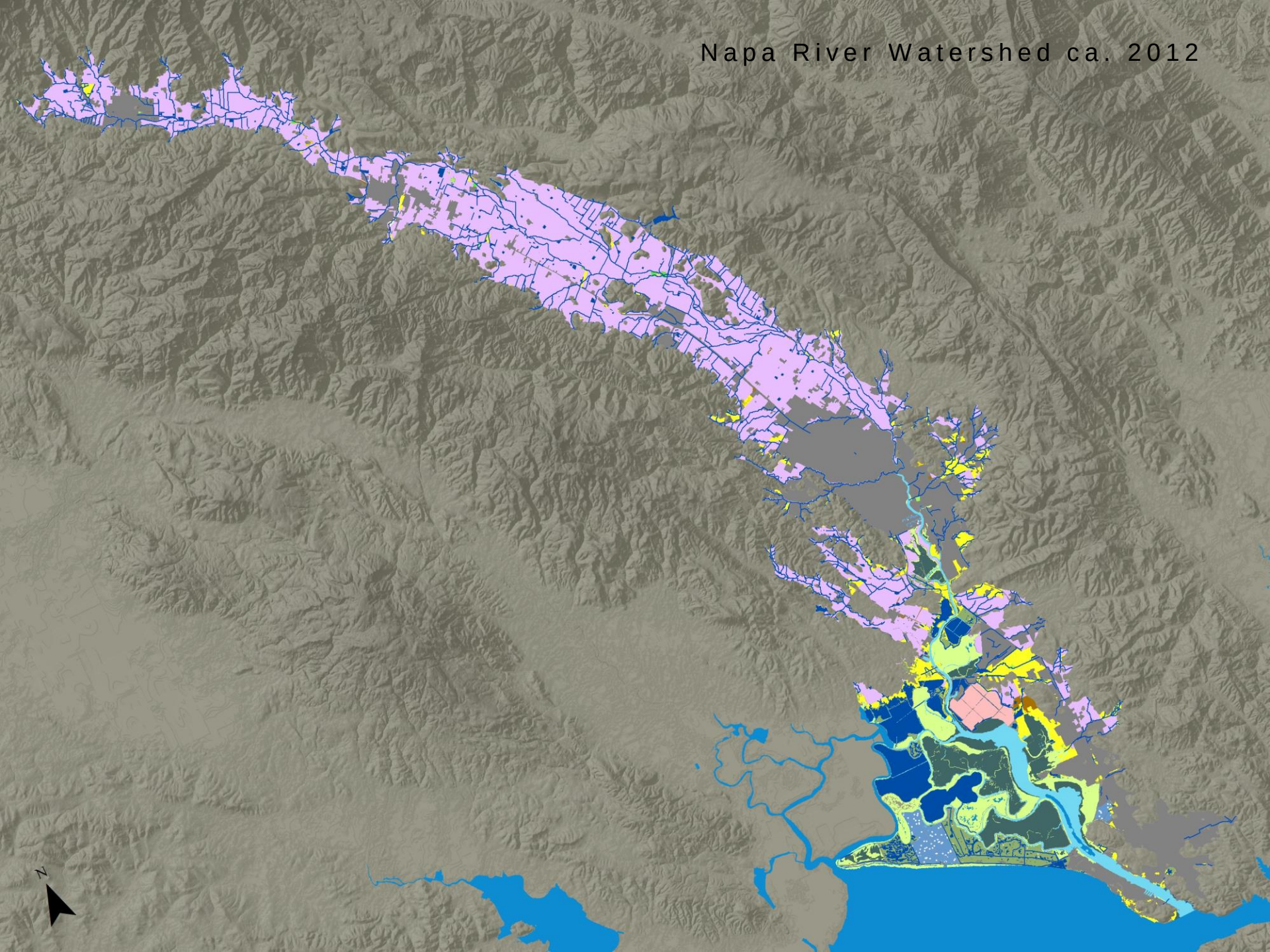
SFEI and Jen Natali

Channel Incision



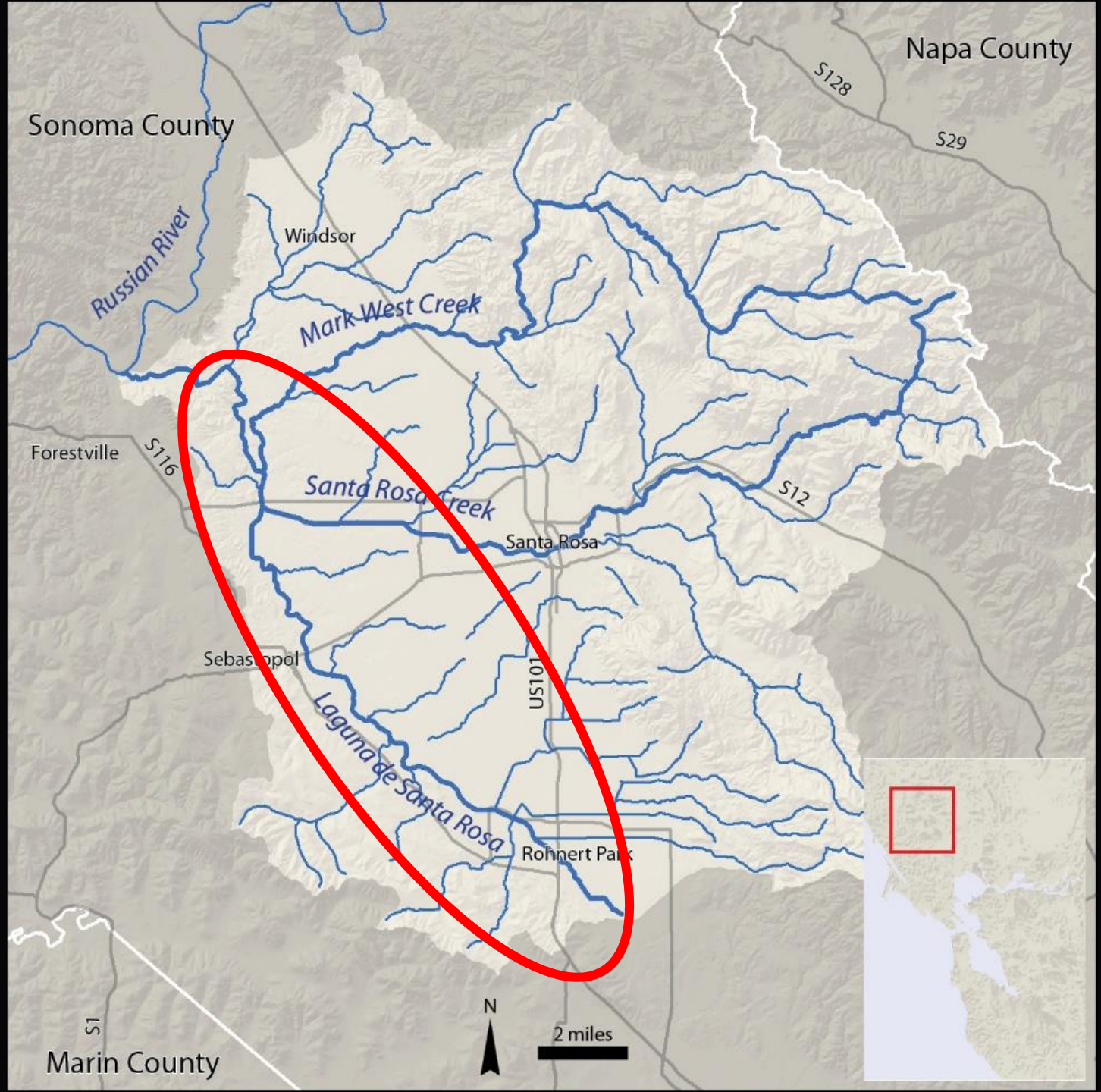
SFEI and Jen Natali


Napa River Watershed early 1800s
N


Napa River Watershed ca. 2012
N

Laguna de Santa Rosa

Sonoma County

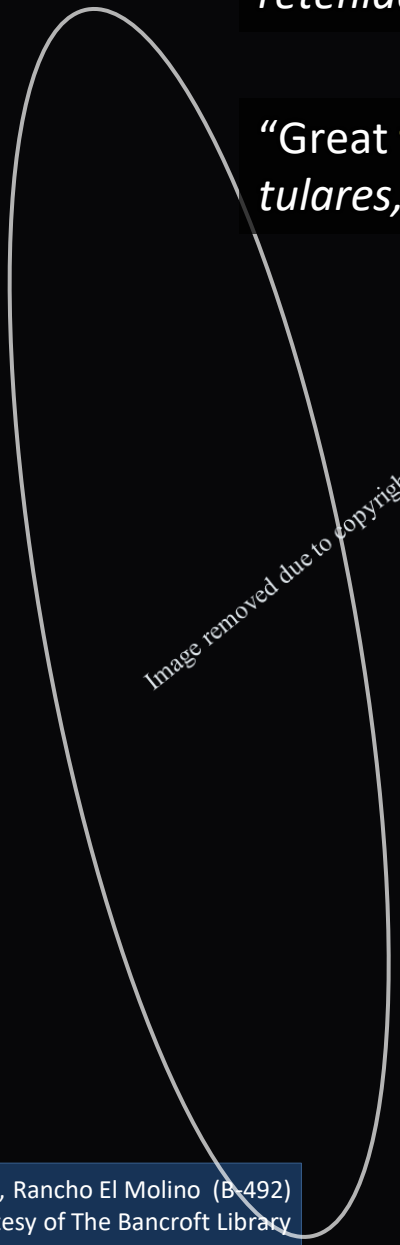

Napa County
Sonoma County
S128
S29
Russian River
Windsor
Mark West Creek
Forestville
S116
Santa Rosa Creek
S12
Santa Rosa
Sebastopol
US101
Laguna de Santa Rosa
Rohnert Park
S1
Marin County
N
2 miles

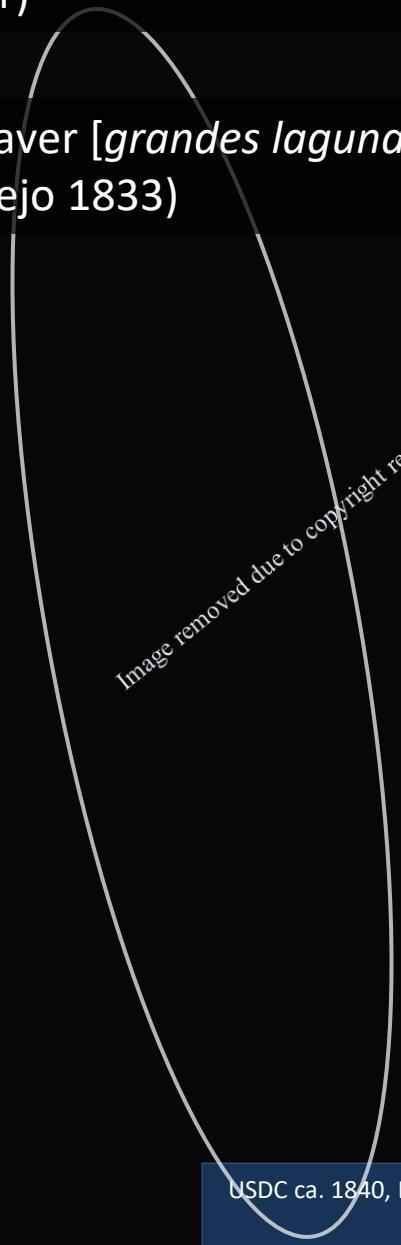
1858

ca. 1840

"A lagoon and a stream with **many pools of retained water** [*una laguna y una arroyo con muchas posas de agua retenida*]" (Moraga 1810, September)

"Great **tulare lakes** teaming with beaver [*grandes lagunas tulares, y abunda de castores*]" (Vallejo 1833)

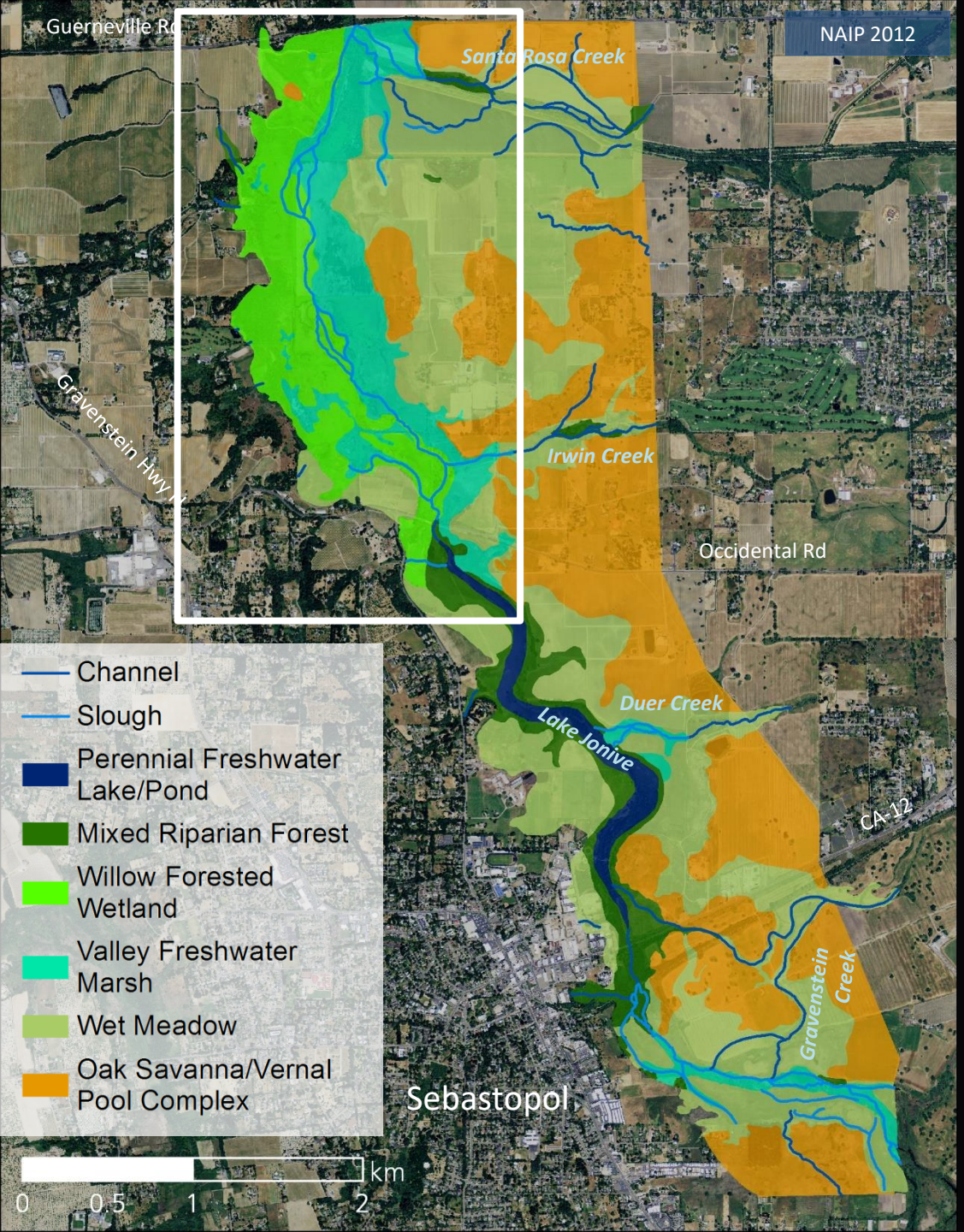




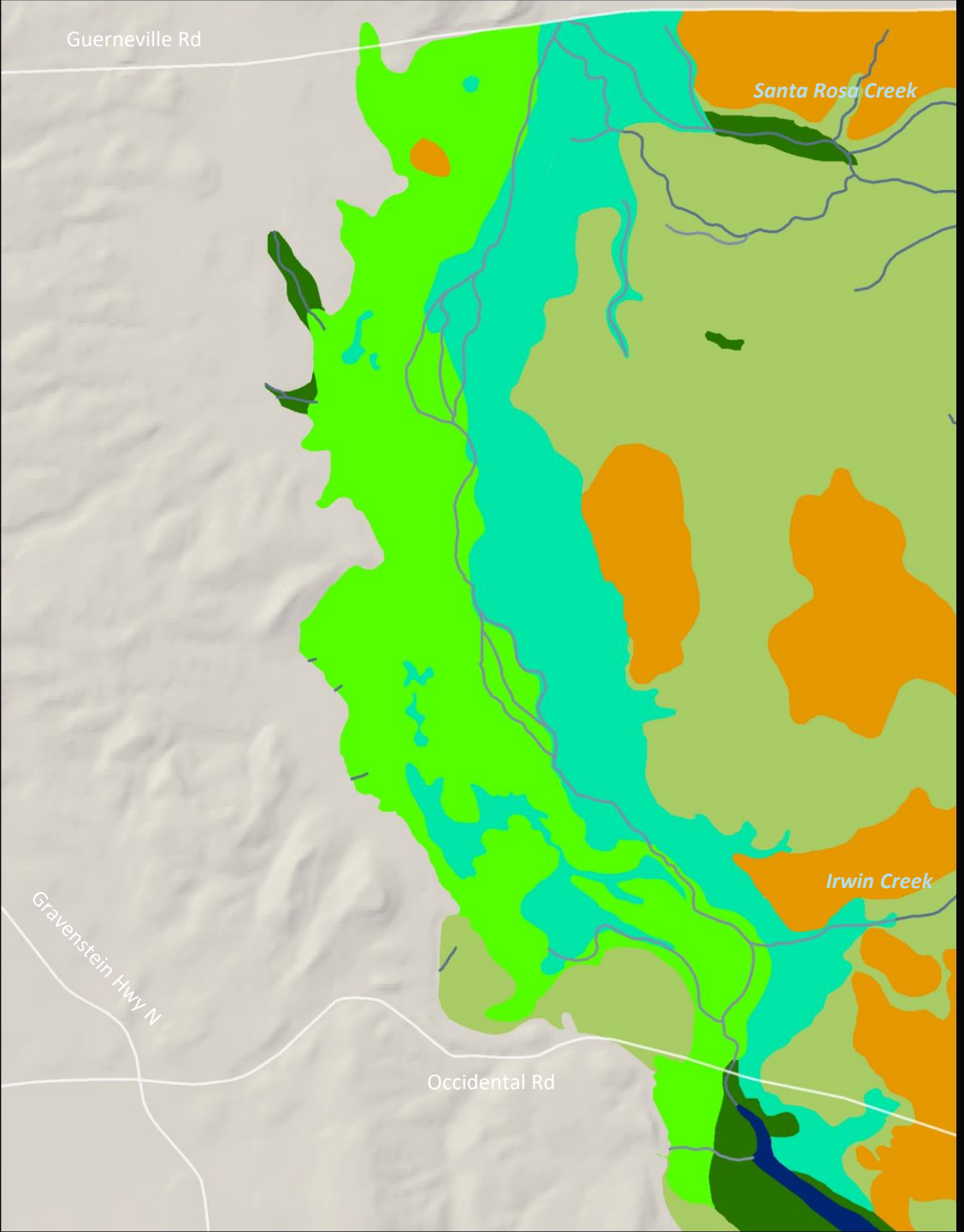
USDC 1858, Rancho El Molino (B-492)
Courtesy of The Bancroft Library

USDC ca. 1840, Rancho Llano de Santa Rosa (B-128)
Courtesy of The Bancroft Library

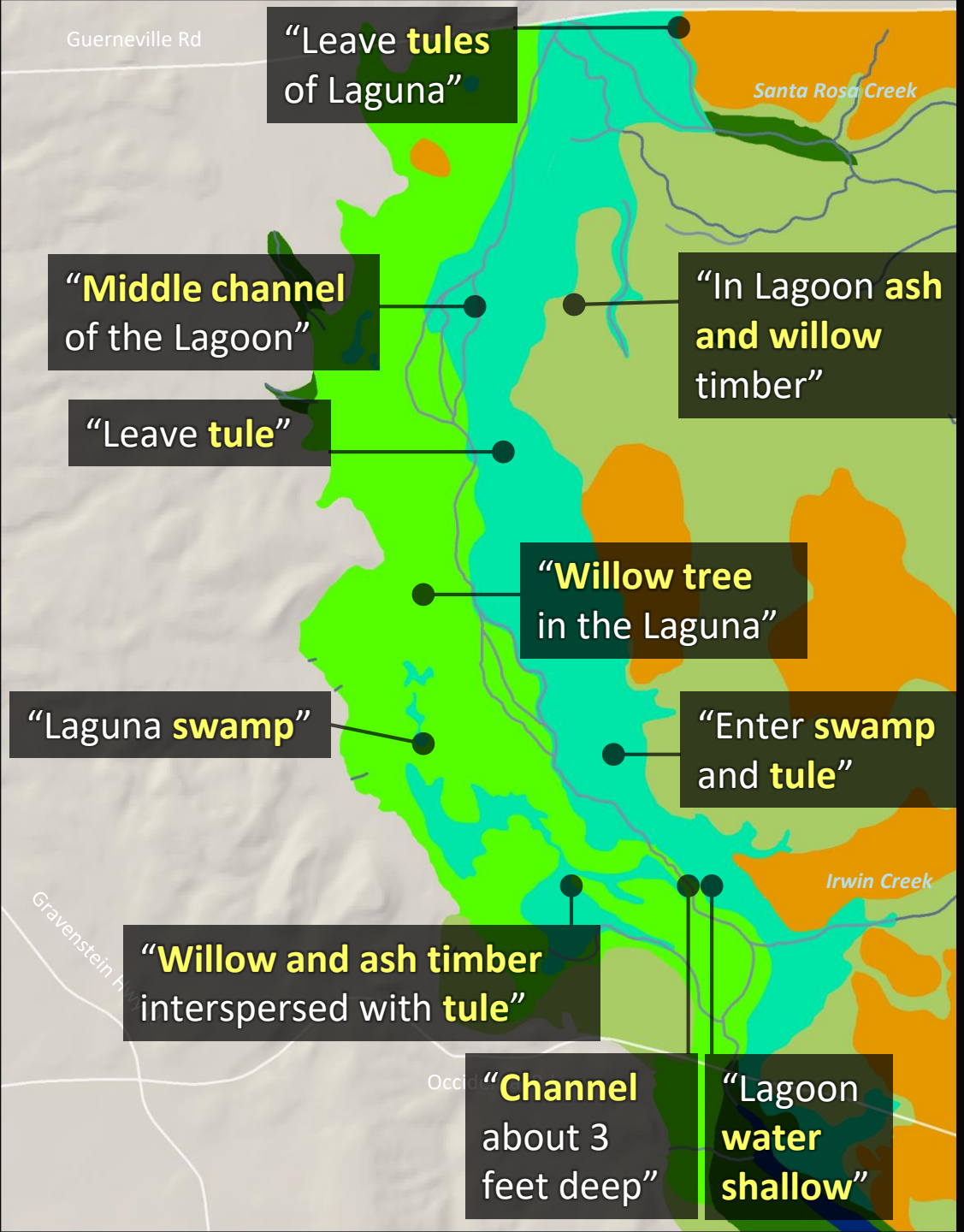
Historical Habitat Types and Channels



Historical Habitat Types and Channels



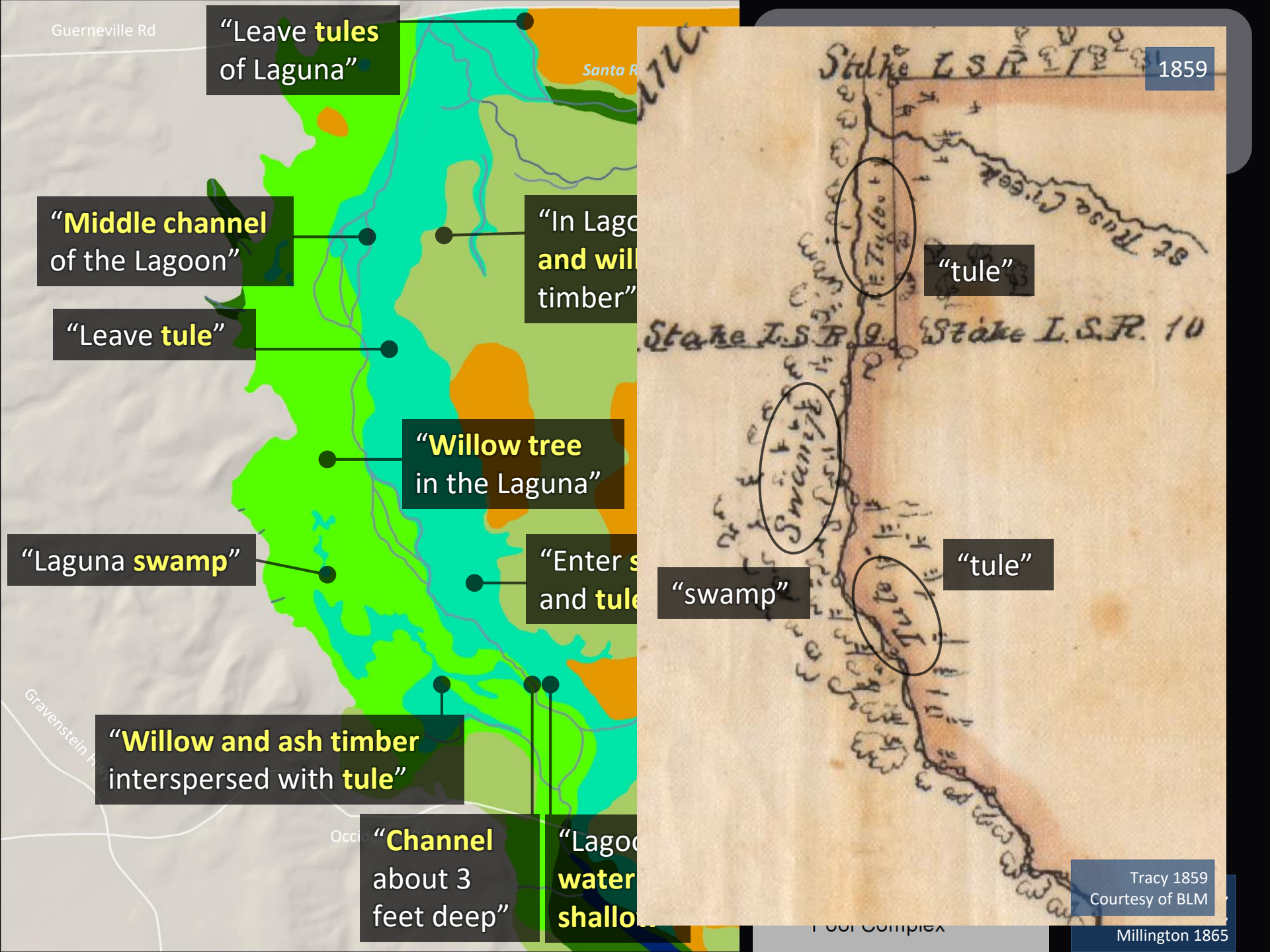
- Channel
- Slough
- Perennial Freshwater Lake/Pond
- Mixed Riparian Forest
- Willow Forested Wetland
- Valley Freshwater Marsh
- Wet Meadow
- Oak Savanna/Vernal Pool Complex

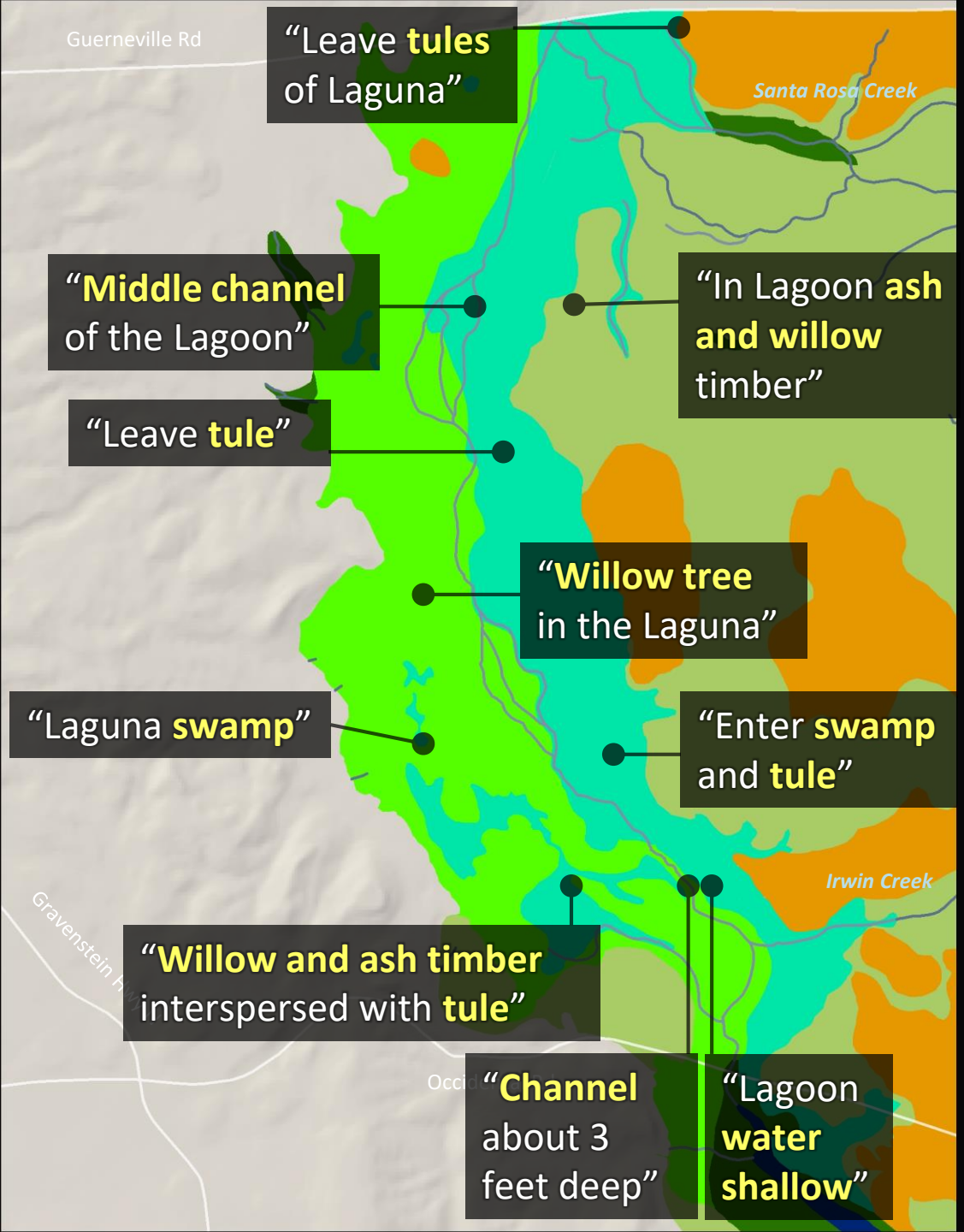


1859-60 Field Surveys

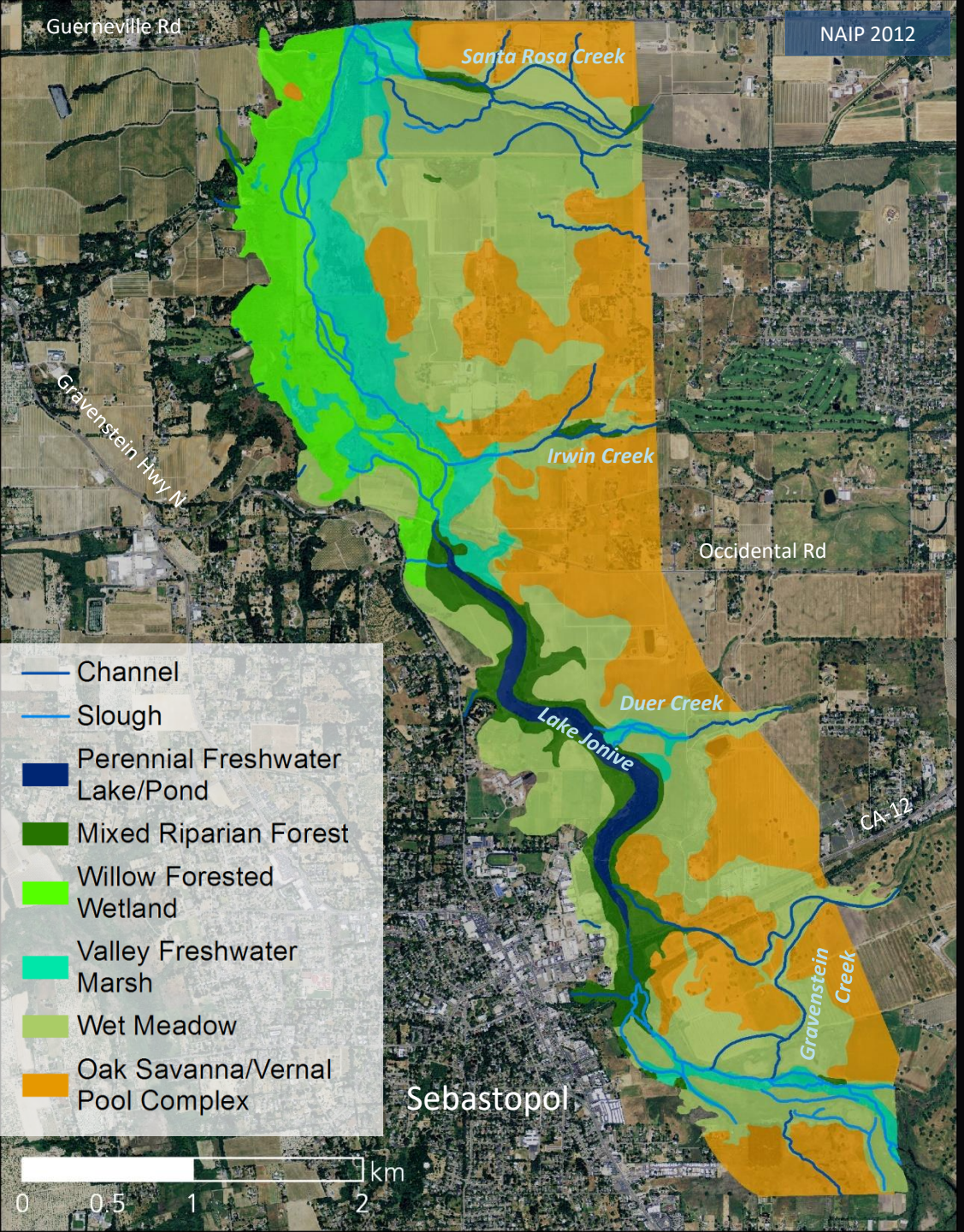
- Channel
- Slough
- Perennial Freshwater Lake/Pond
- Mixed Riparian Forest
- Willow Forested Wetland
- Valley Freshwater Marsh
- Wet Meadow
- Oak Savanna/Vernal Pool Complex

Sources: Tracy 1859, Eliason 1861, Millington 1865


Guerneville Rd
"Leave tules of Laguna"
"Middle channel of the Lagoon"
"In Lago and will timber"
"Leave tule"
"Willow tree in the Laguna"
"Laguna swamp"
"Enter s and tule
"Willow and ash timber interspersed with tule"
"Channel about 3 feet deep"
"Lagoo water shallo
1859
"tule"
"swamp"
"tule"
Tracy 1859
Courtesy of BLM
Millington 1865


Guerneville Rd
"Leave tules of Laguna"
Santa Rosa Creek
"Middle channel of the Lagoon"
"In Lagoon ash and willow timber"
"Leave tule"
"Willow tree in the Laguna"
"Laguna swamp"
"Enter swamp and tule"
Irwin Creek
"Willow and ash timber interspersed with tule"
"Channel about 3 feet deep"
"Lagoon water shallow"


1942
USDA 1942
Millington 1865



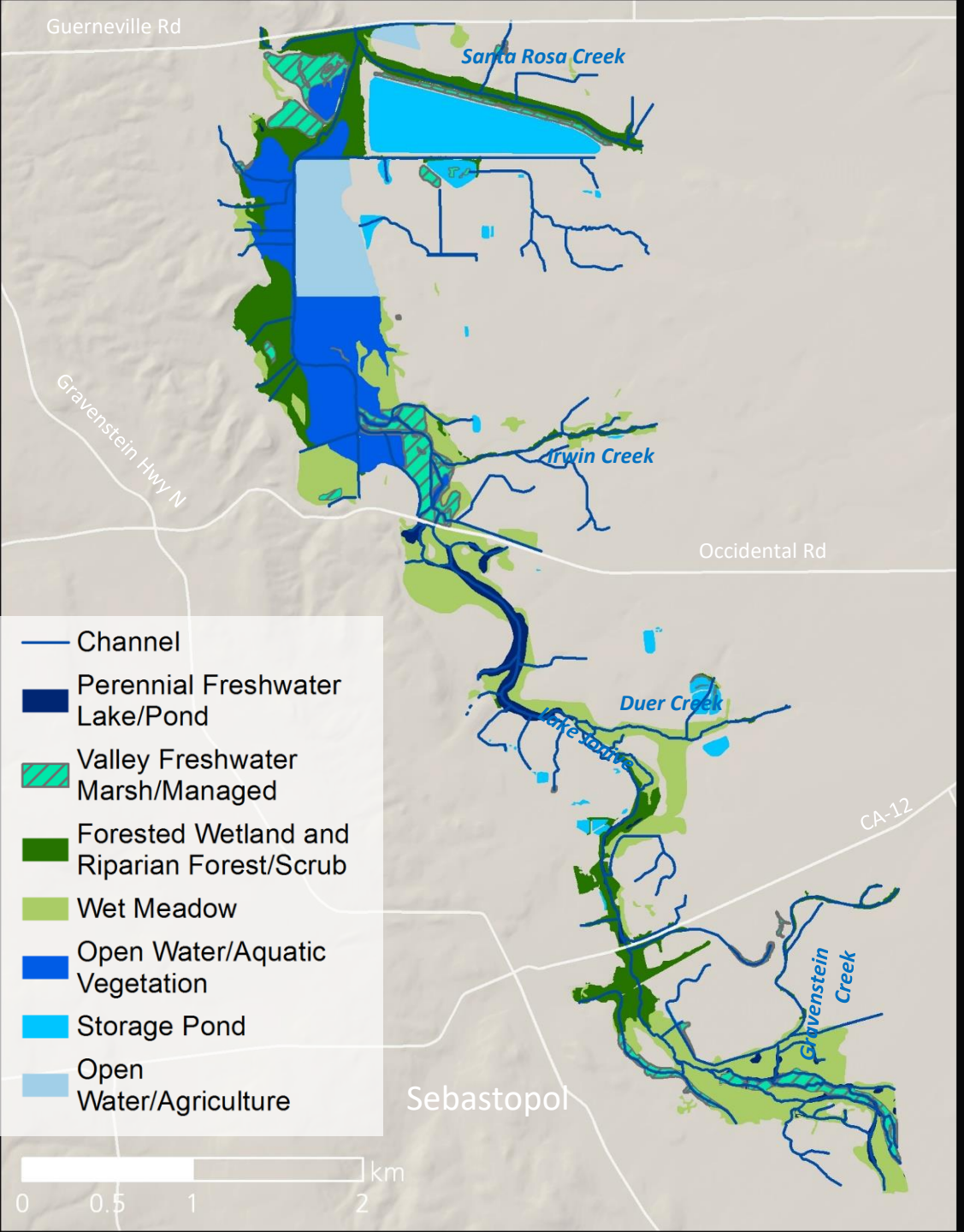
Historical Habitat Types and Channels

"**From the clear waters of [Lake Jonive] have been caught salmon-trout** that filled the sportsman's heart with joy" (*Sebastopol Times* 1/2/1903)

"In the high hills which form the eastern boundary of Santa Rosa Township three large creeks rise… **The salmon trout run up these streams nearly to their source to spawn**" (*Sonoma Democrat* 1/2/1875)

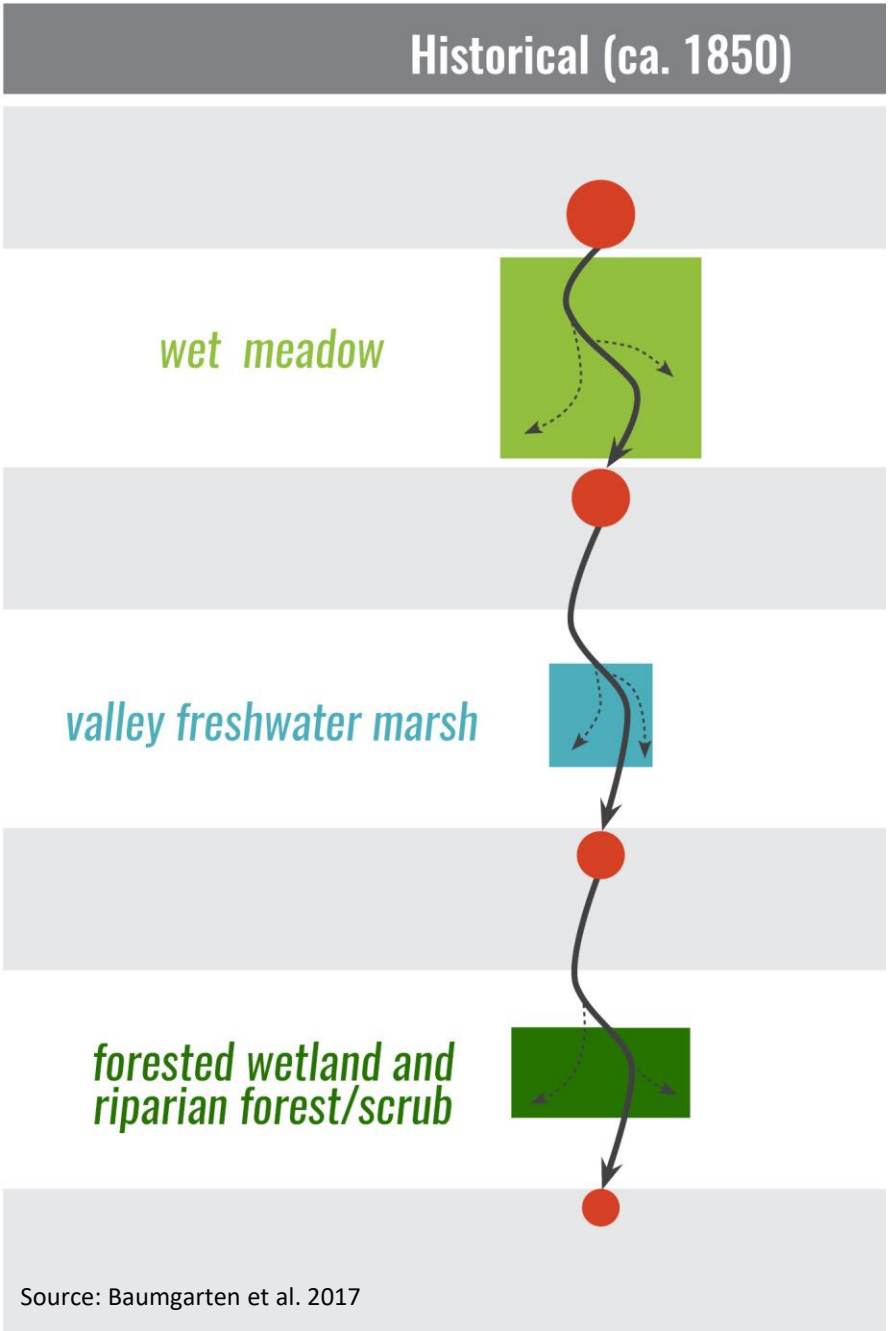
"**Salmon trout** are plentiful in **Mark West Creek**" (*Sonoma Democrat* 2/18/1882)

Modern Habitat Types and Channels



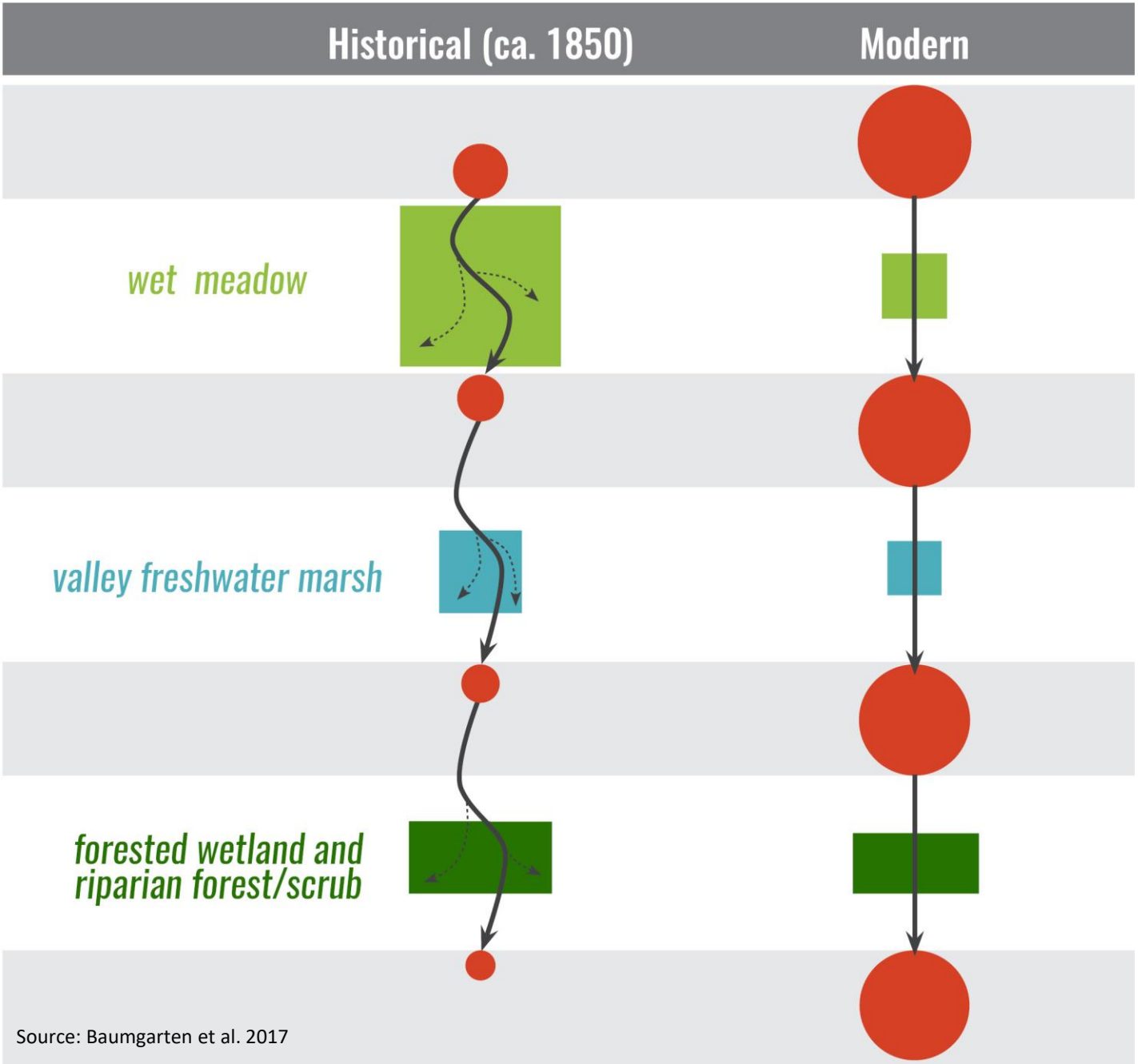
"The Laguna de Santa Rosa does continue to provide **abundant potential winter refugia** for coho salmon" (NMFS 2010)

NUTRIENT TRANSPORT AND ASSIMILATION (CONCEPTUAL)



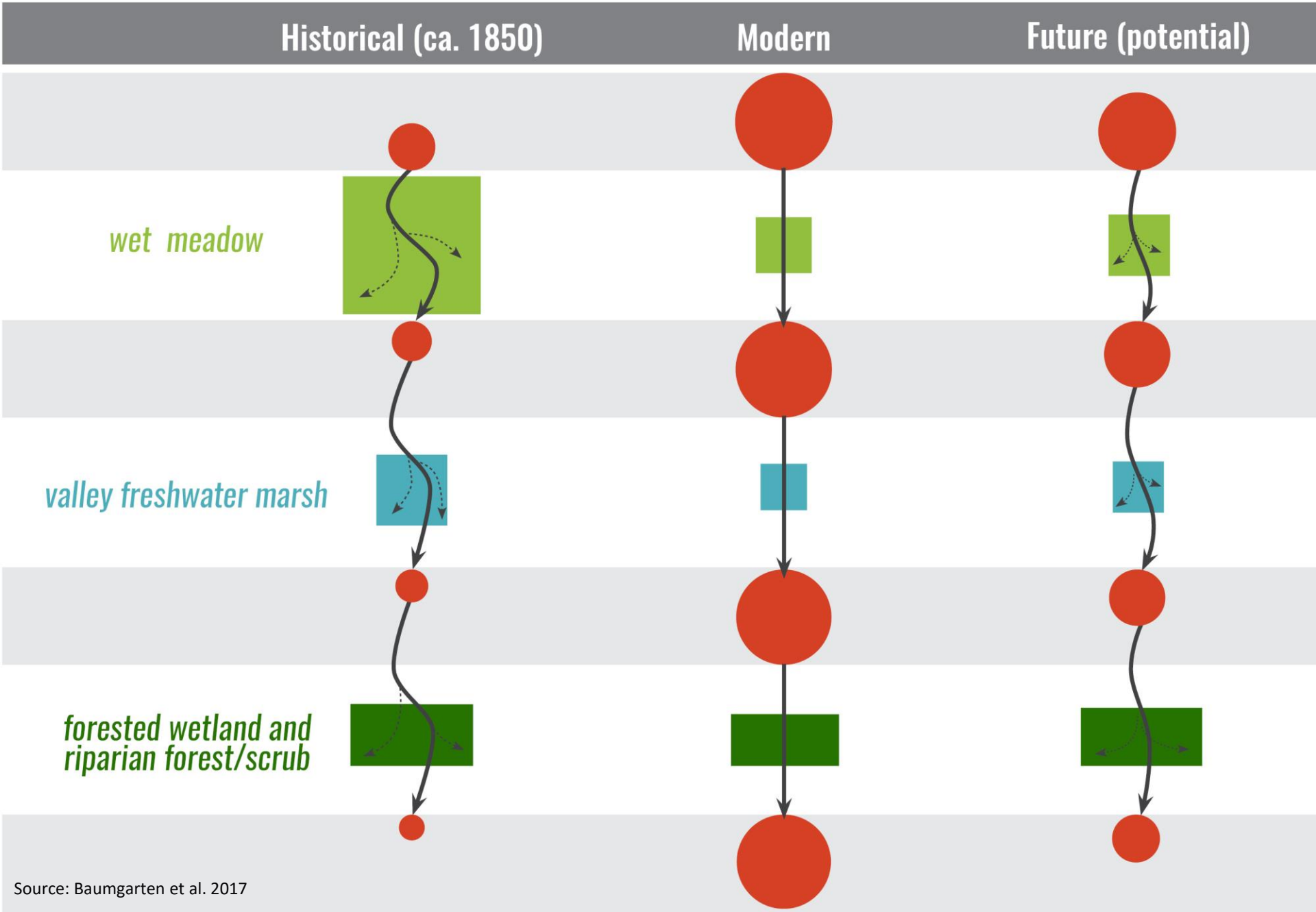
Source: Baumgarten et al. 2017

NUTRIENT TRANSPORT AND ASSIMILATION (CONCEPTUAL)



Source: Baumgarten et al. 2017

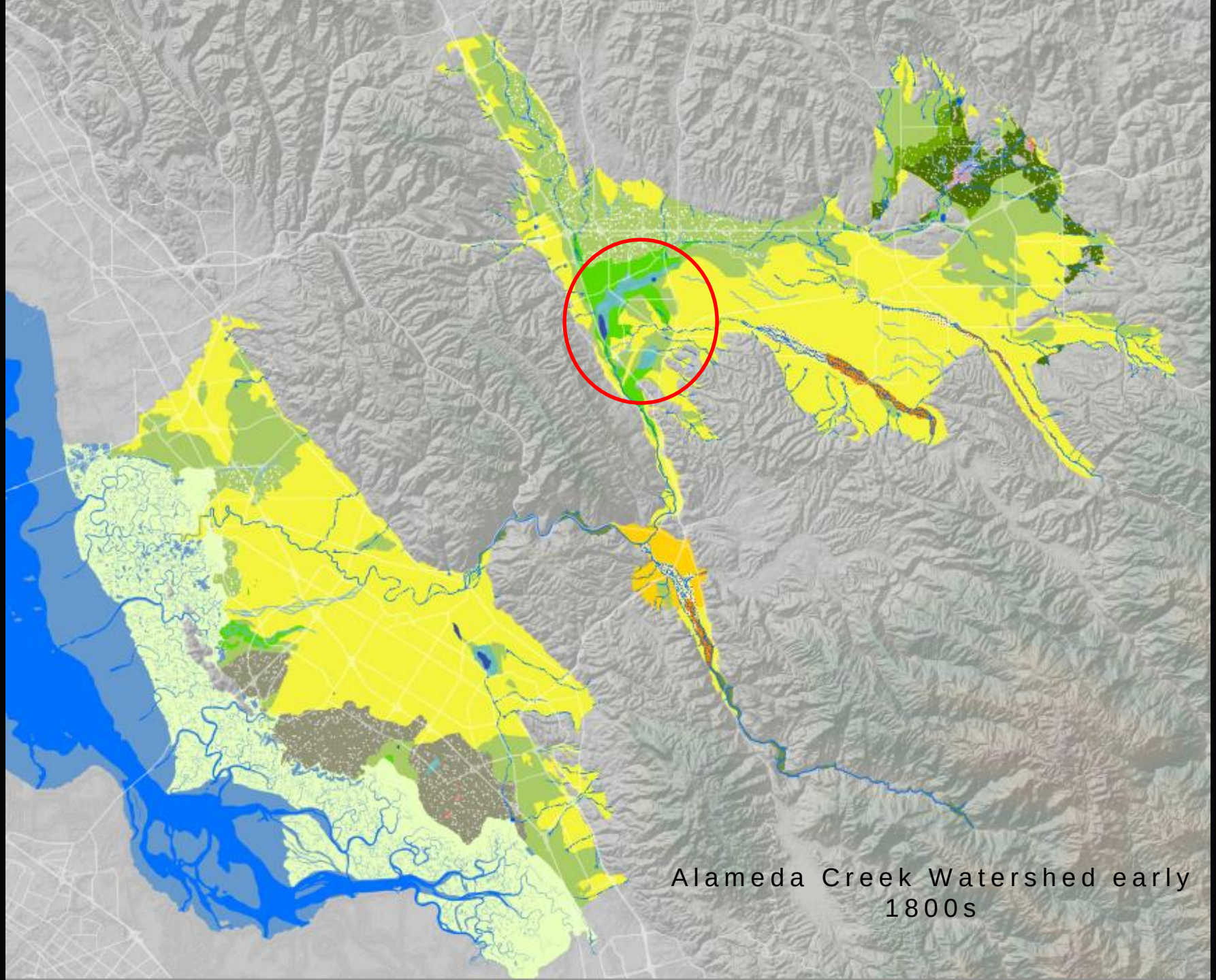
NUTRIENT TRANSPORT AND ASSIMILATION (CONCEPTUAL)

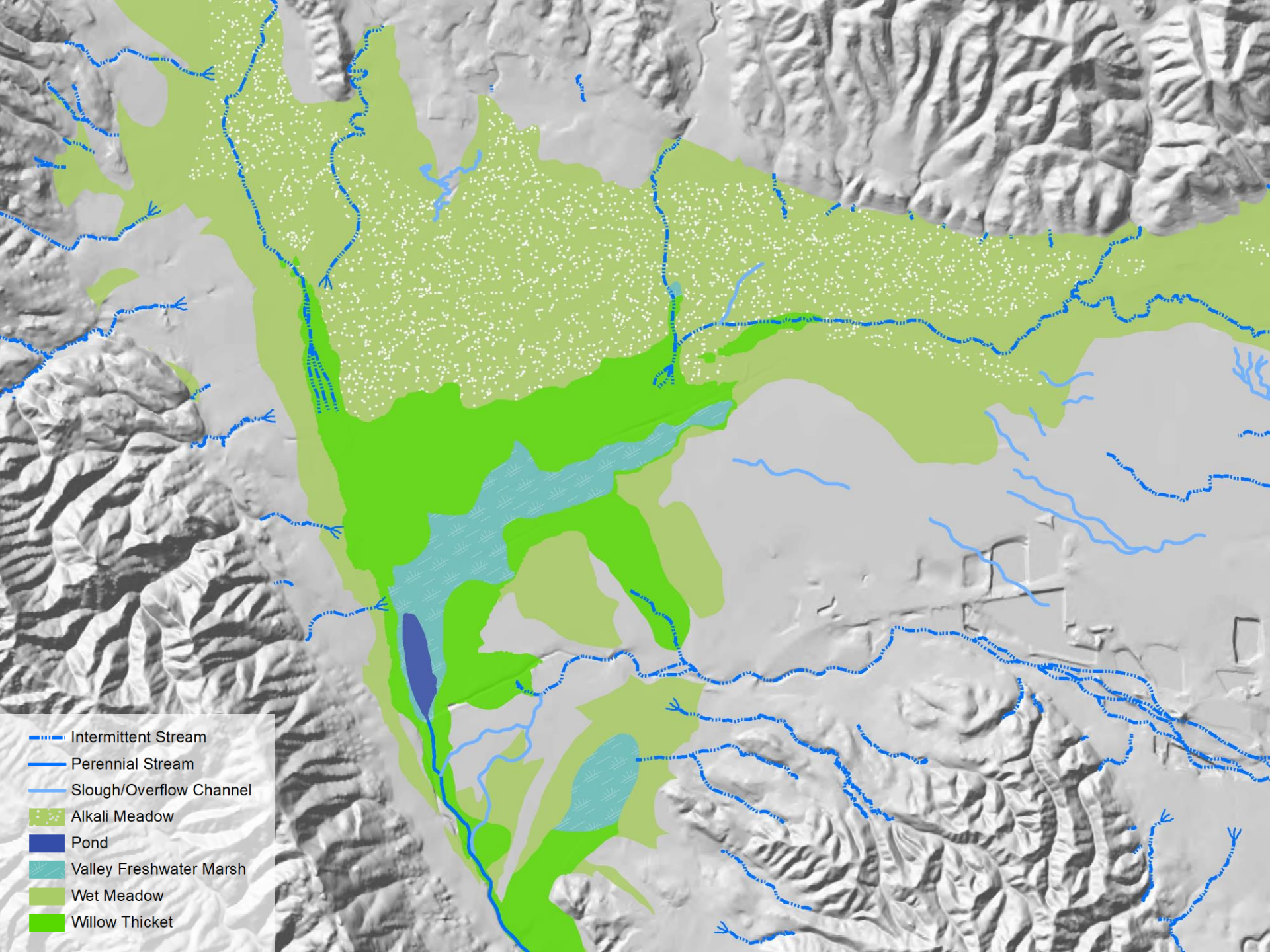


Source: Baumgarten et al. 2017

Pleasanton Marsh and Arroyo de la Laguna

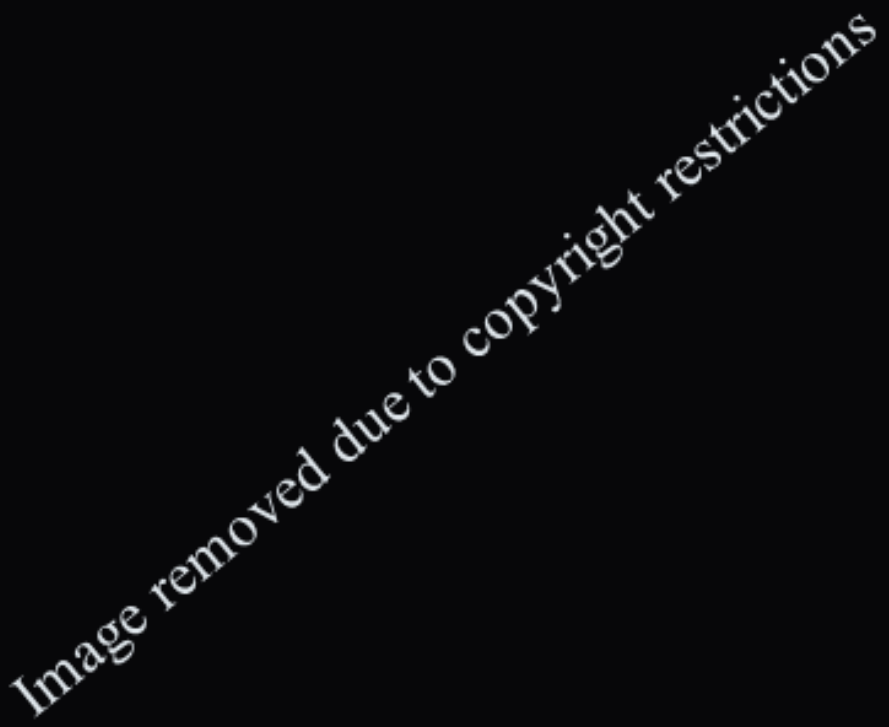
Alameda County


Alameda Creek Watershed early 1800s


Intermittent Stream
Perennial Stream
Slough/Overflow Channel
Alkali Meadow
Pond
Valley Freshwater Marsh
Wet Meadow
Willow Thicket

1880

“Tule swamp abounding
with copious living springs”

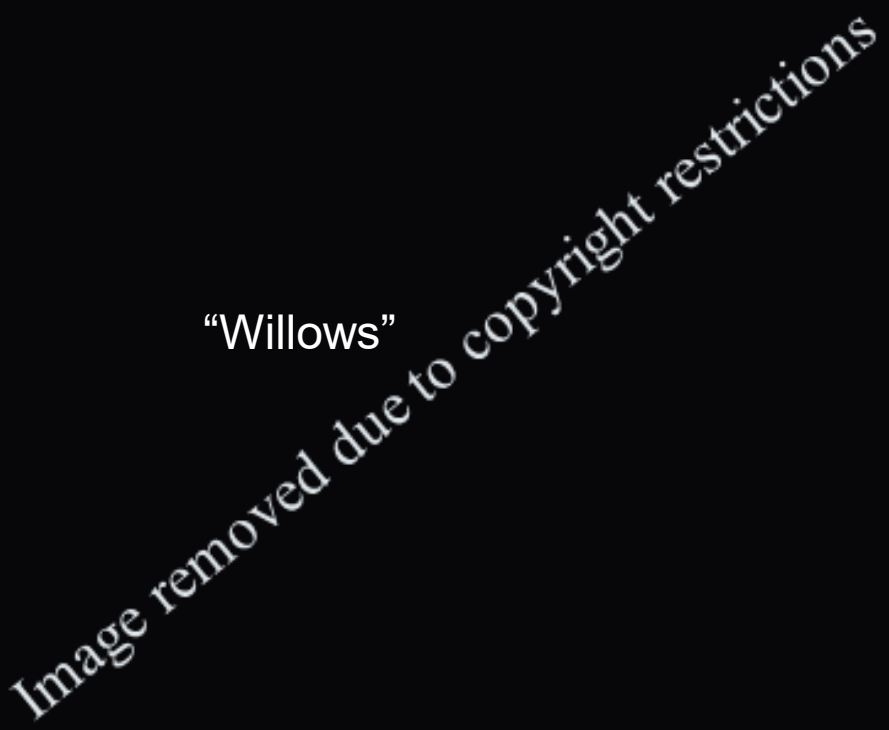


Allardt 1880
Courtesy of The Bancroft Library

“Many tulares and lakes” (Fages 1772)

1880

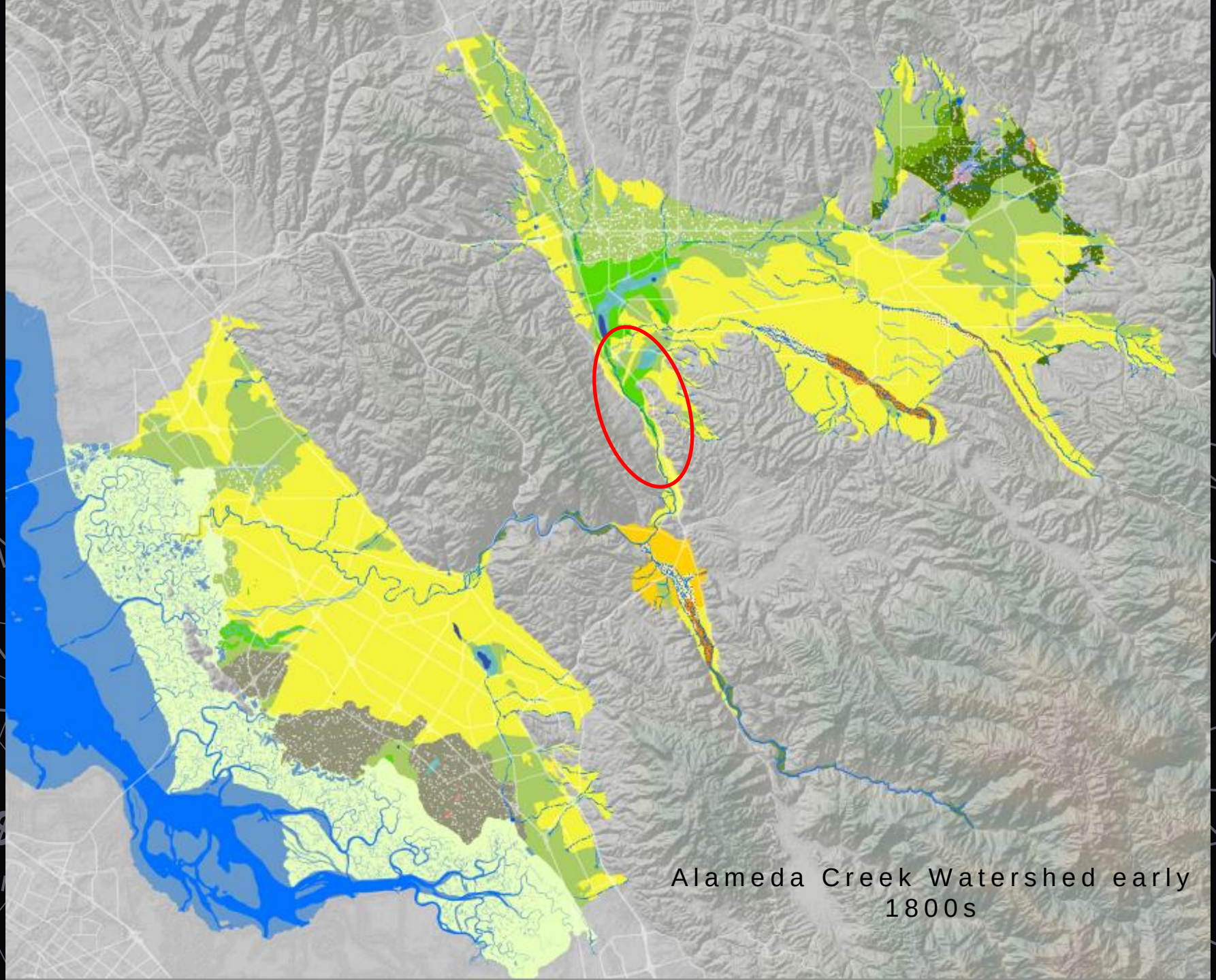
“Tule”

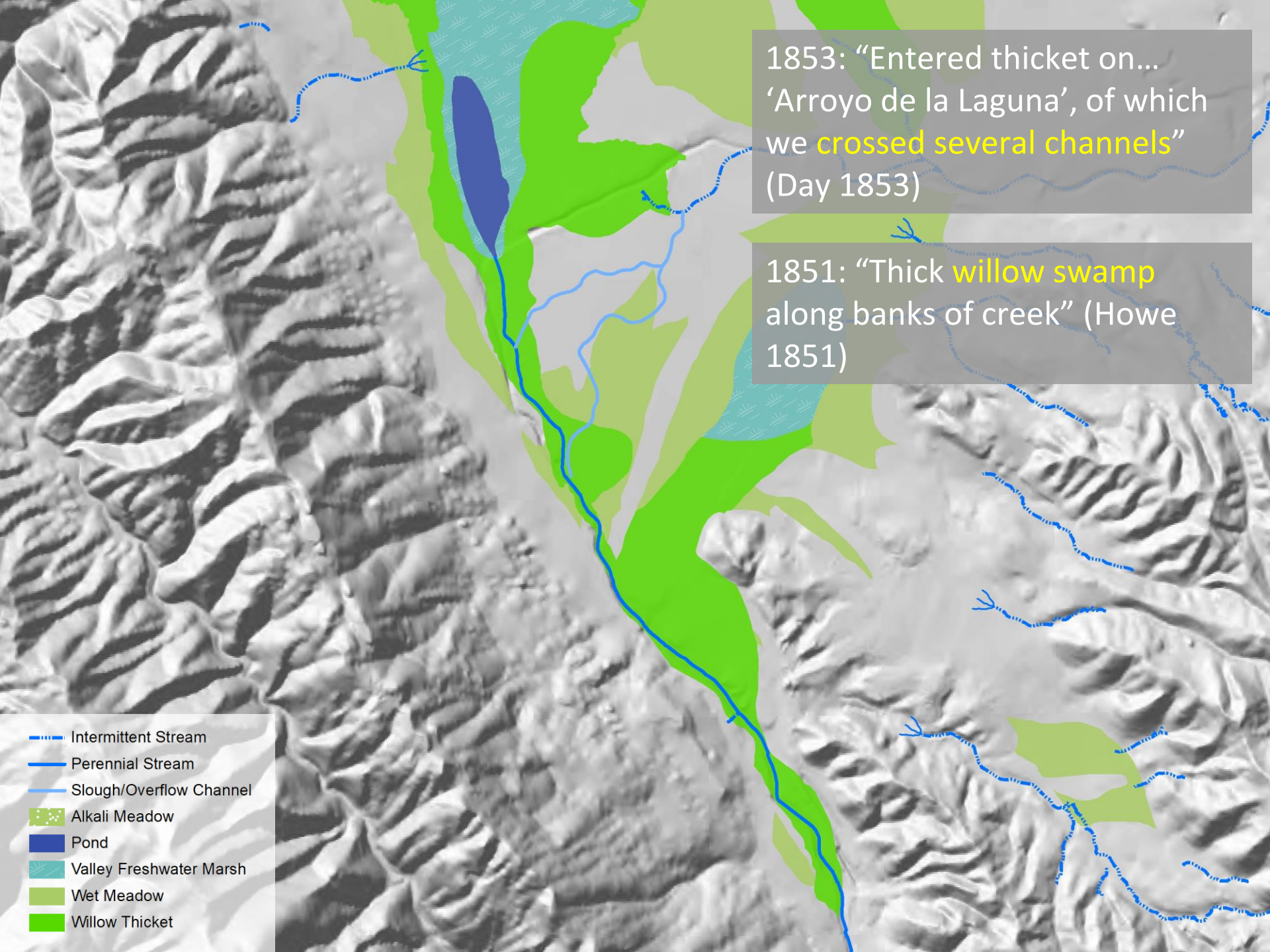


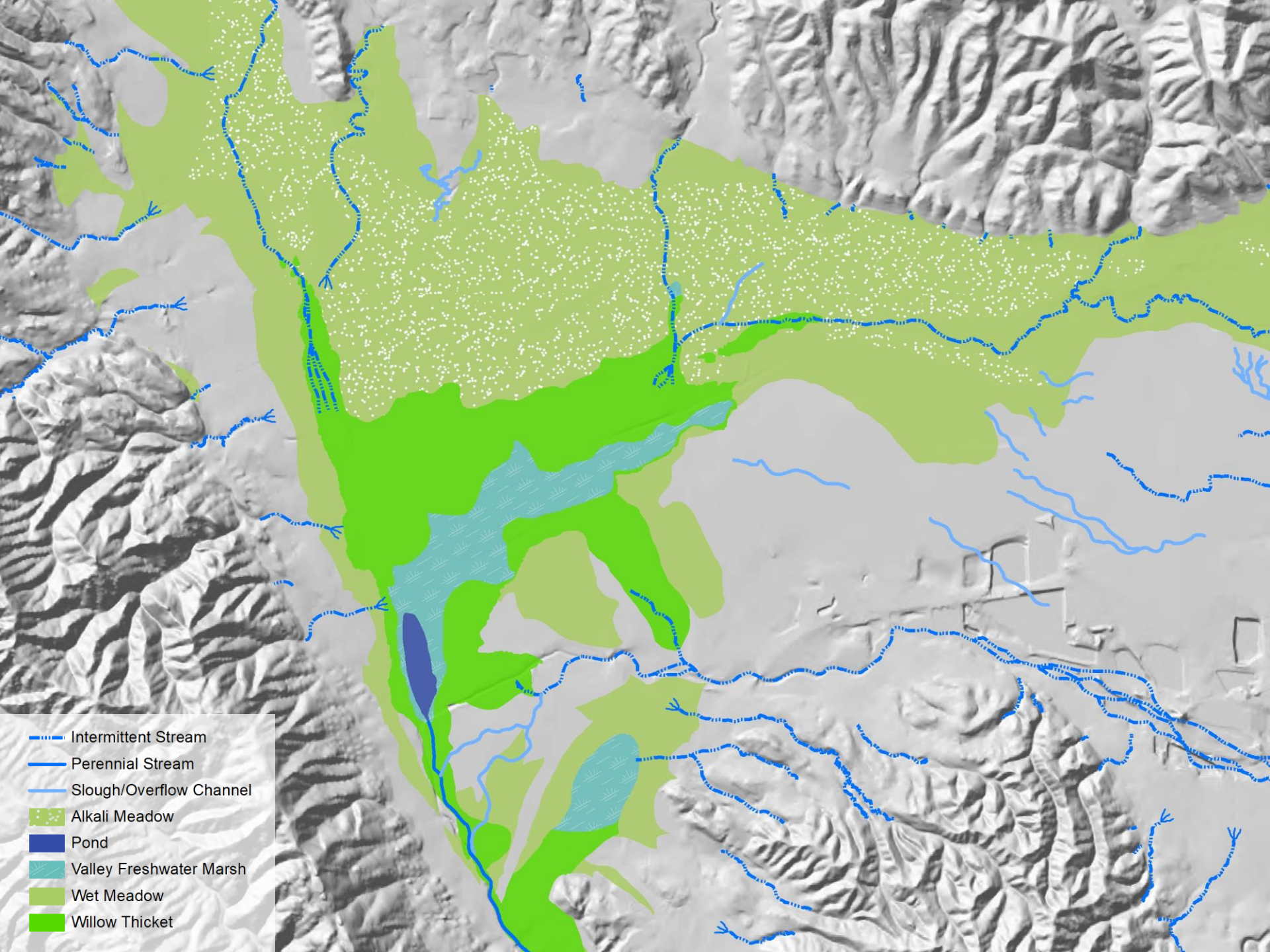
“Willows”

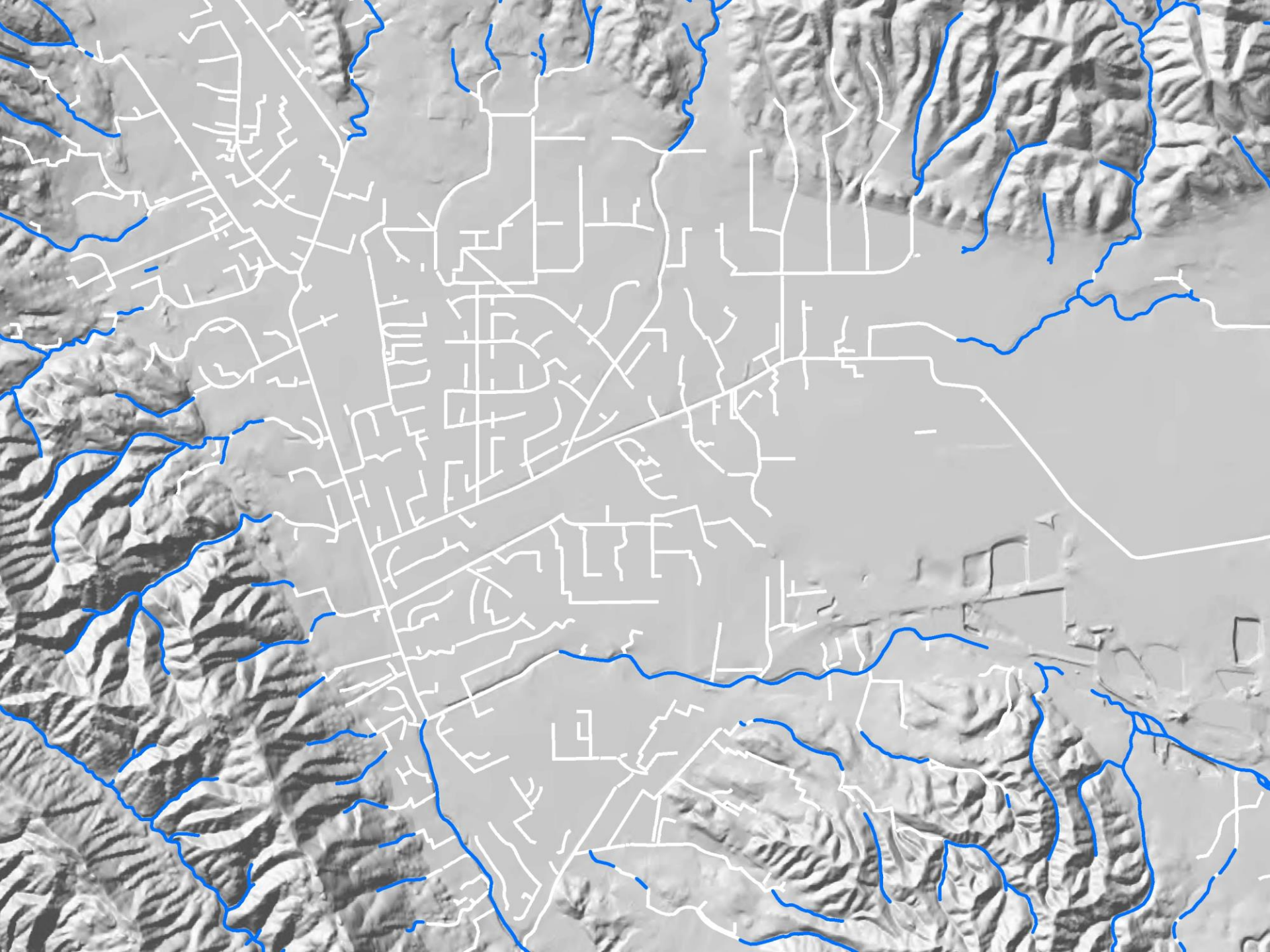
“Lagoon”

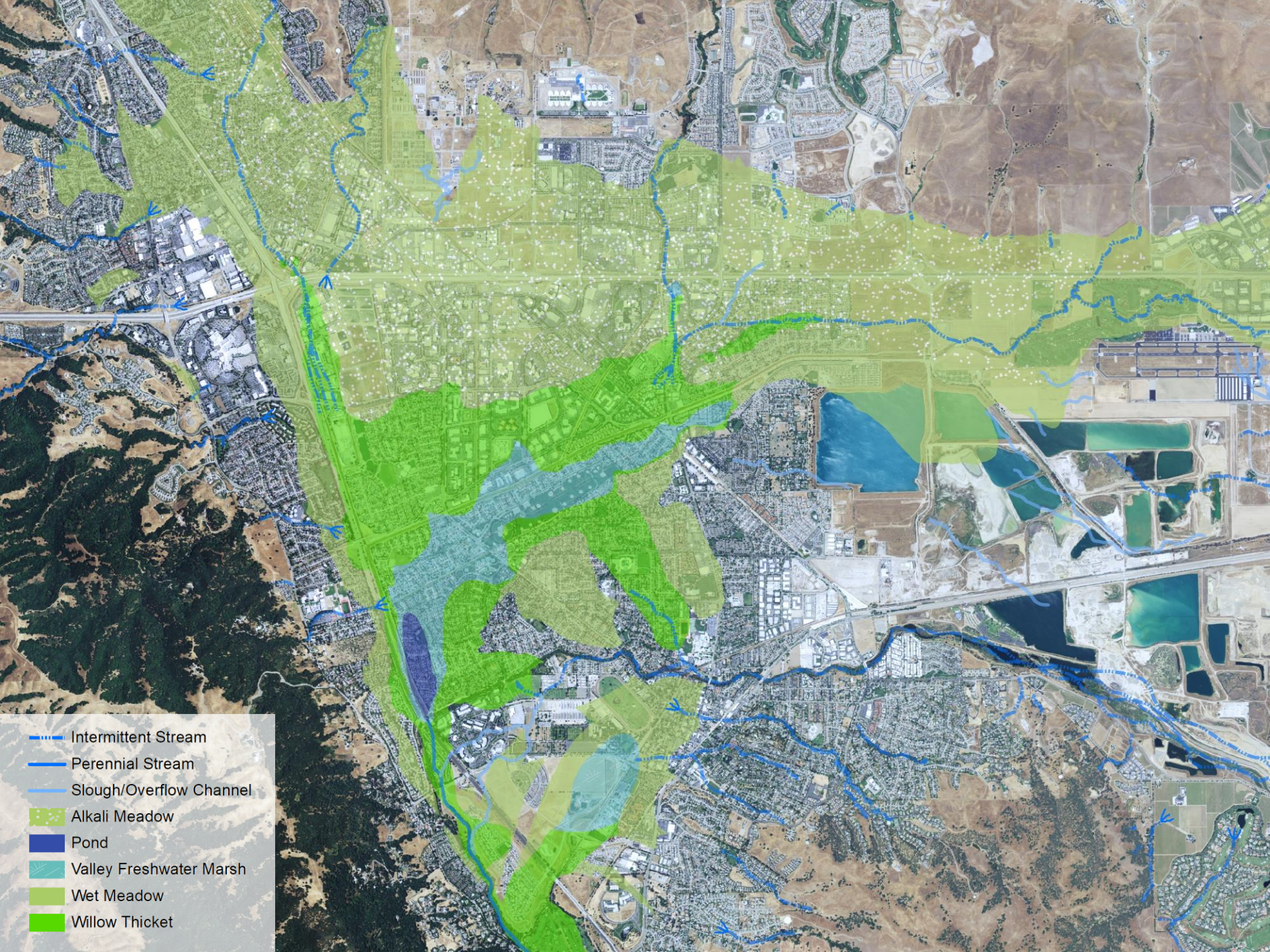
Allardt 1880
Courtesy of The Bancroft Library


Alameda Creek Watershed early 1800s


1853: “Entered thicket on… ‘Arroyo de la Laguna’, of which we crossed several channels” (Day 1853)
1851: “Thick willow swamp along banks of creek” (Howe 1851)
Intermittent Stream
Perennial Stream
Slough/Overflow Channel
Alkali Meadow
Pond
Valley Freshwater Marsh
Wet Meadow
Willow Thicket


Intermittent Stream
Perennial Stream
Slough/Overflow Channel
Alkali Meadow
Pond
Valley Freshwater Marsh
Wet Meadow
Willow Thicket




Intermittent Stream
Perennial Stream
Slough/Overflow Channel
Alkali Meadow
Pond
Valley Freshwater Marsh
Wet Meadow
Willow Thicket

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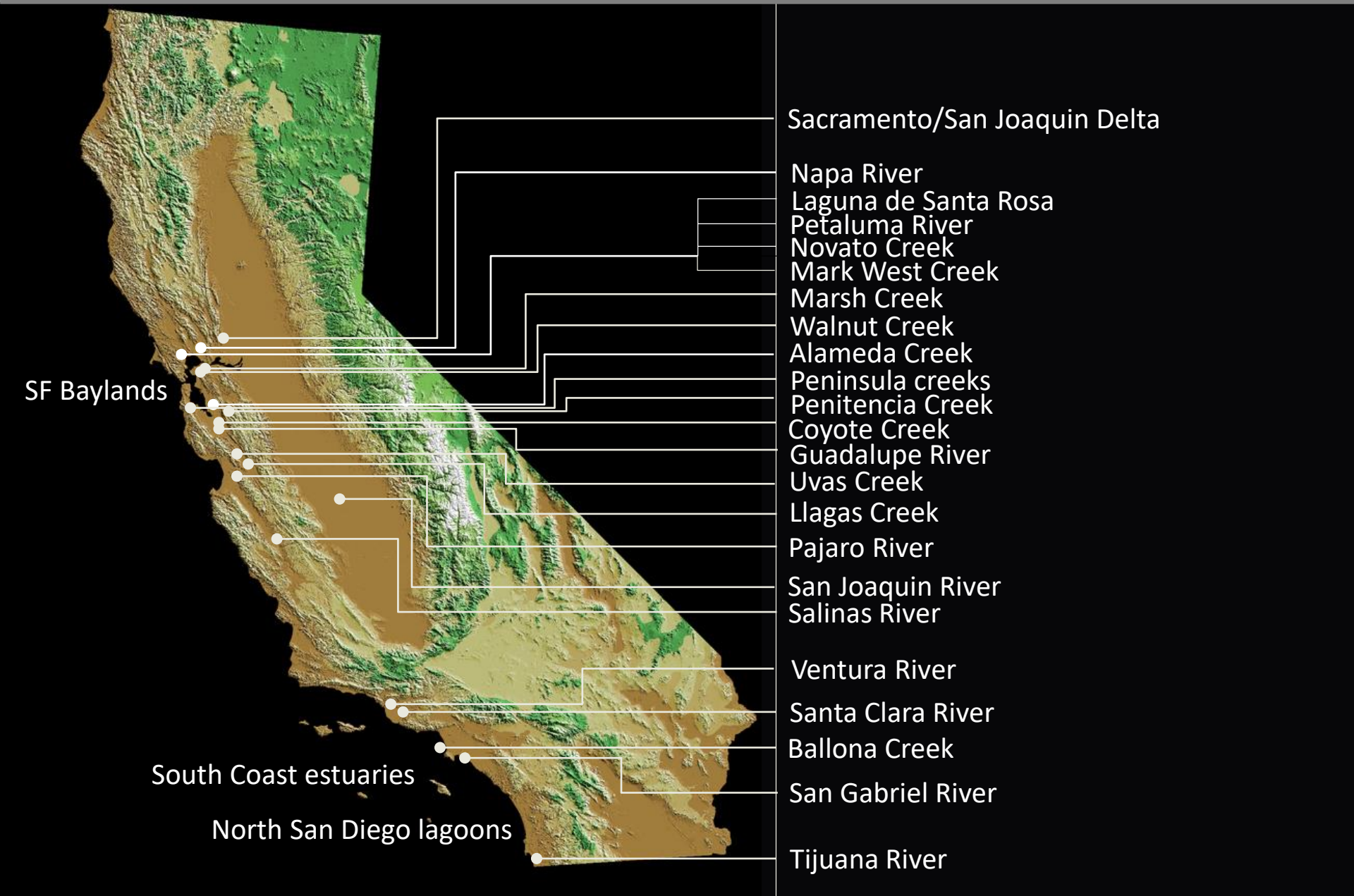
…the channel of the Laguna Creek, less than 30 years ago, followed a very **indefinite course** at a much higher elevation than at present…Since the clearing of Laguna channel the creek has worn its bed down at a rapid rate, the erosion having lowered the bed of this creek…**3 feet in 10 years**…

(Williams 1912)

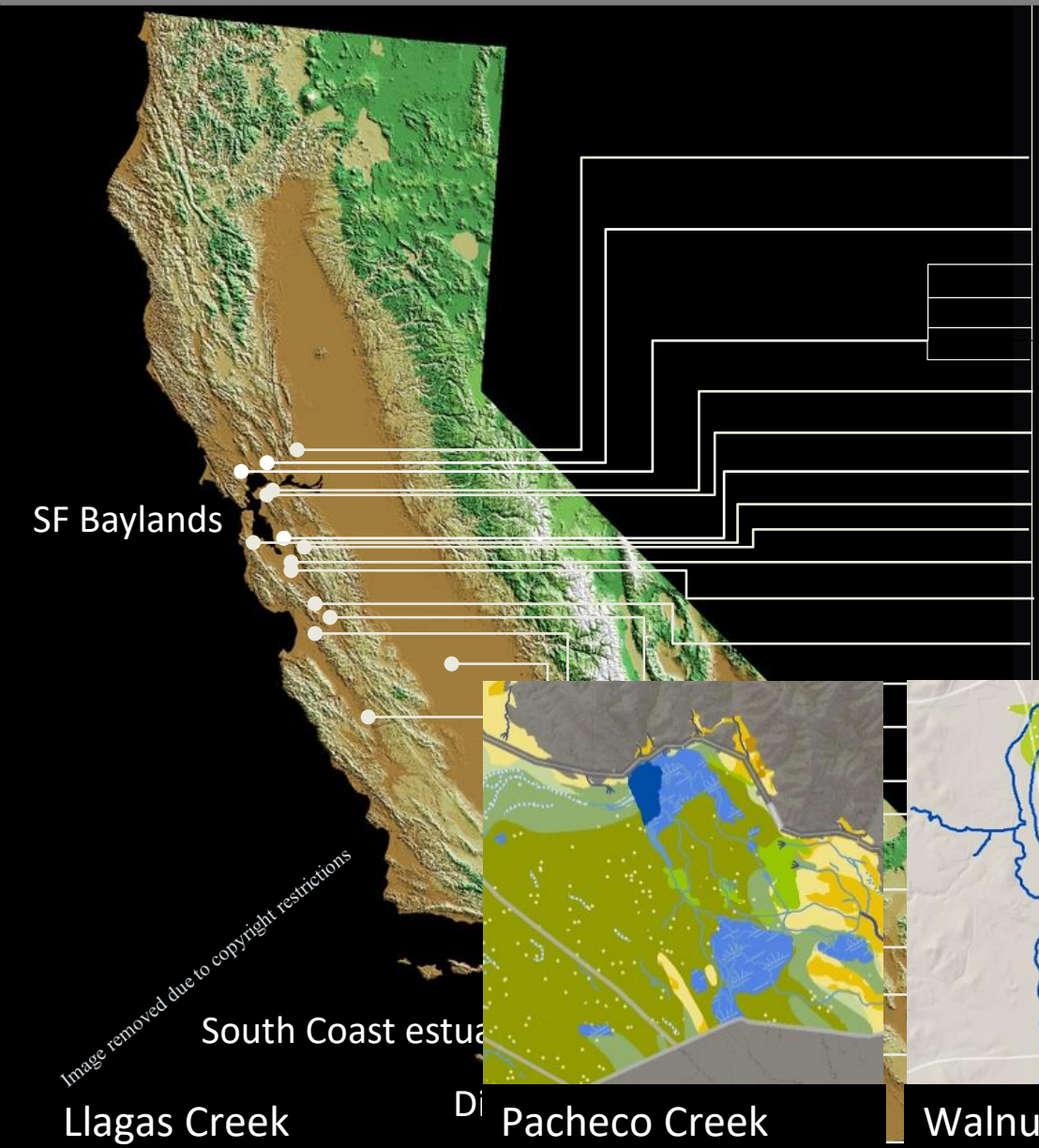
Photo by Julie Beagle

Photo by Julie Beagle

Historical Ecology Studies by SFEI and partners



Historical Ecology Studies by SFEI and partners



Sacramento/San Joaquin Delta

Napa River
Laguna de Santa Rosa
Petaluma River
Novato Creek
Mark West Creek
Marsh Creek
Walnut Creek
Alameda Creek
Peninsula creeks
Penitencia Creek
Coyote Creek
Guadalupe River
Uvas Creek

SF Baylands

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South Coast estua

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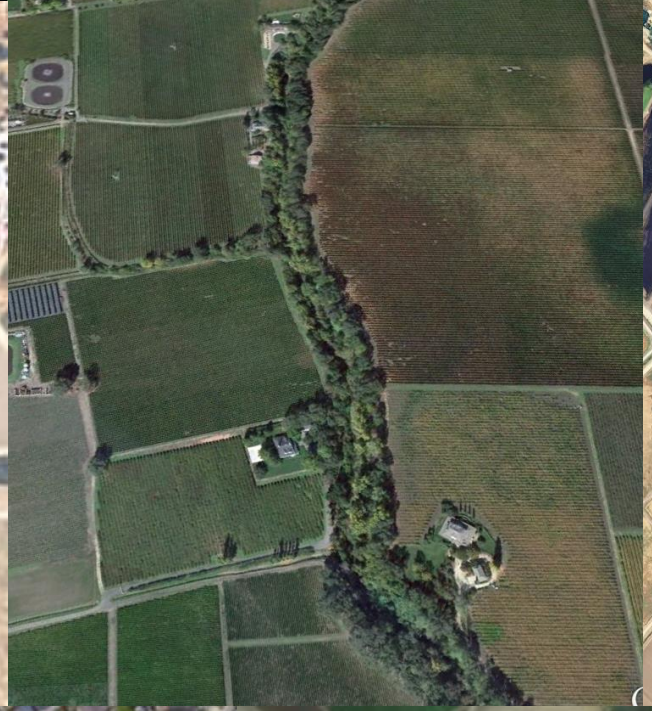
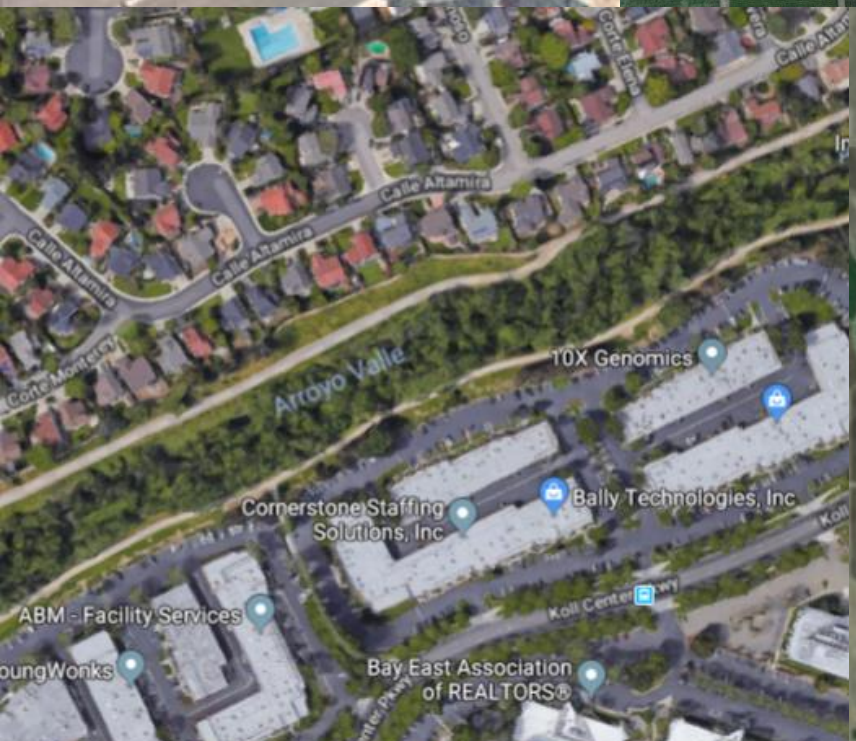
Llagas Creek

Pacheco Creek

Walnut Creek

San Joaquin River





Source: Google Earth

Summary

- Stage 0 part of diversity of California stream types historically
- Occupy particular low-gradient, high-groundwater settings
- Ecological oases; rare perennial wetland-slough mosaics; salmonid rearing, red-legged frog, neotropical migrants, waterfowl
- Many other ecosystem benefits: nutrient cycling, sediment storage, flood attenuation, etc
- Rapid conversion and homogenization to confined, single thread
- Not generally recognized as stream restoration opportunity and target

Thank You

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