

# The Napa River Flood Protection Project

## Creating Flood Protection and Restoring Geomorphic and Biological Processes



# Need for the Project:

The City of Napa has a long well-documented history of flooding  
- 22 significant flood events since 1862 and as recent as 2005



**Main Street, Napa 1940**



**Napa 1986**



**Napa 2005**

# Background

- Congress authorizes Flood Control Act of 1965 including a flood project for the Napa River but does not provide funding
- Needing matching local funds for federal funding, the County proposes a tax to fund a flood project in 1976 and 1977, voters reject measures
- After 1986 flood, interest in project is renewed and the Army Corps proposes a typical project design in the 1990's that involves deepening and straightening the river channel (eliminating the Oxbow), rip-rapping banks, and constructing a network of flood walls and levees
- Design is rejected and community, resource agencies, etc. express concern that widening and deepening river will lead to excess siltation, decreases in dissolved oxygen and a loss of wetland habitat
- Working over a span of two years a group of 40 agencies, organizations, and over 400 people come together (Chamber of Commerce, Sierra Club, Friends of the River, Farm Bureau, Land Trust, etc.) to develop and propose a new "*Living River*" design concept

# Principals of “Living River” design

- The Project should preserve/enhance habitat, water quality and natural geomorphic functions of the Napa River to the fullest extent possible, not precluding future restoration opportunities, and should remain self-sustaining.

## *Elements include:*

- Restoring the river to a state of geomorphic equilibrium by reconnecting the river to its historic flood plain, maintaining the natural slope and width of the river, and allowing the river to meander where possible
- Maintaining adequate flows and velocities for sediment transport, rather than relying on maintenance dredging to maintain channel capacity
- Design a project that minimizes the need for erosion control measures such as rock rip rap.
- Restore or create vegetative transition zones from the tidal mudflats to the upper floodplain terraces and re-establish riparian and wetland habitat

# Napa River Flood Protection Project

The Napa River Flood Project is redesigned and approved based on “Living River” principals, construction begins in 2000:

In addition to proving 100 year flood protection for downtown utilizing conventional elements such as flood walls, bypass culverts and channels, raising bridges, etc. the Project includes:

- Restoring over 1,200 acres of former agricultural and industrial land back into floodplain, riparian and wetland habitat by grading marsh & floodplain terraces, breaching levees and removing tide gates to reintroduce tidal influence; reconnecting the Napa River and Napa Creek to its former floodplains
- Napa Creek restoration elements include the addition of large woody debris fish habitat structures, reconnection to floodplain and the “day lighting” of over 150 linear feet of streambed; all within an urban setting
- The Project also includes a large scale monitoring and maintenance program that involves monitoring the hydraulics and flora and fauna in order to document change in restored areas



**Creation of marsh and floodplain terraces**



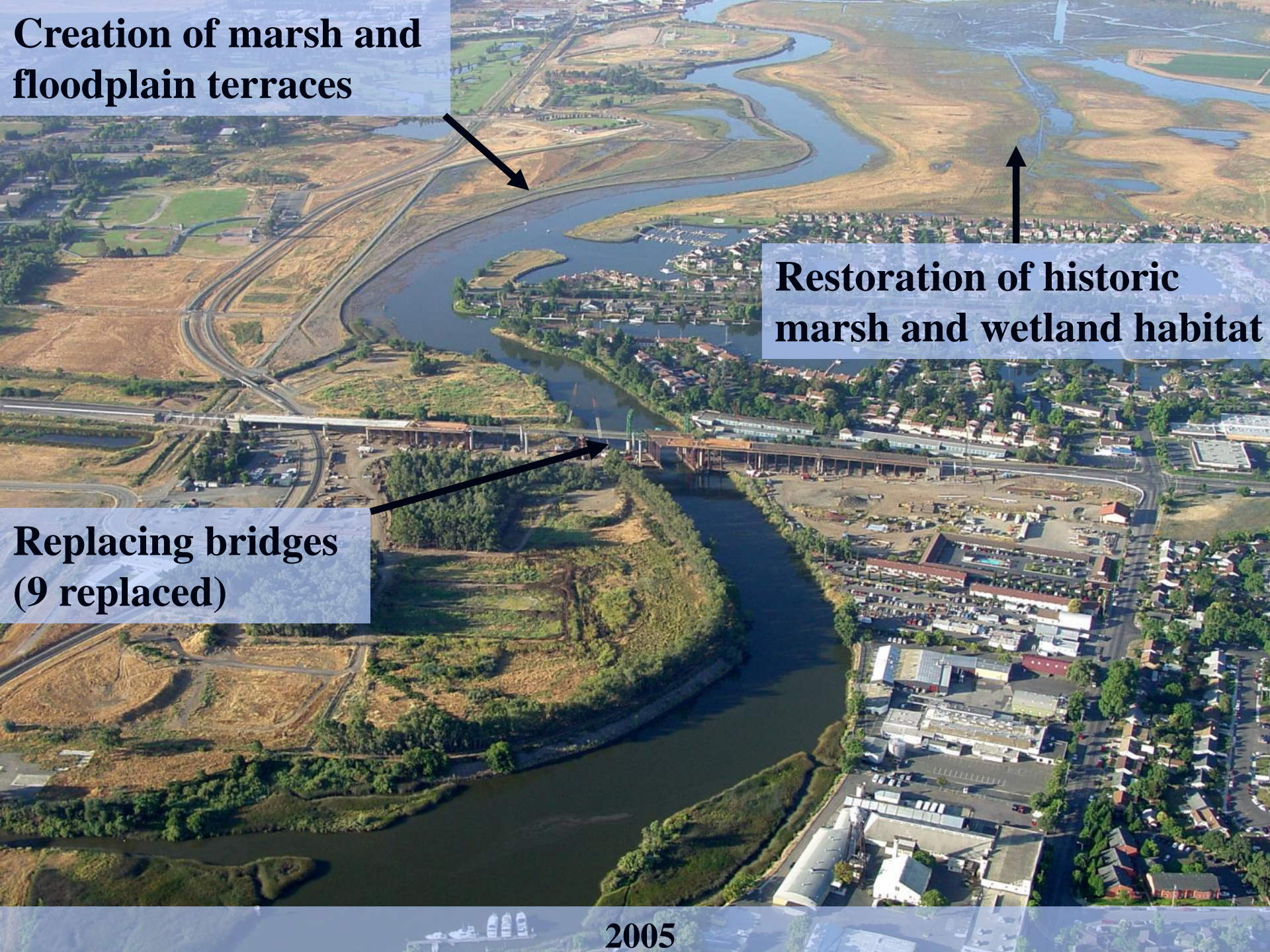
**Restoration of historic marsh and wetland habitat**



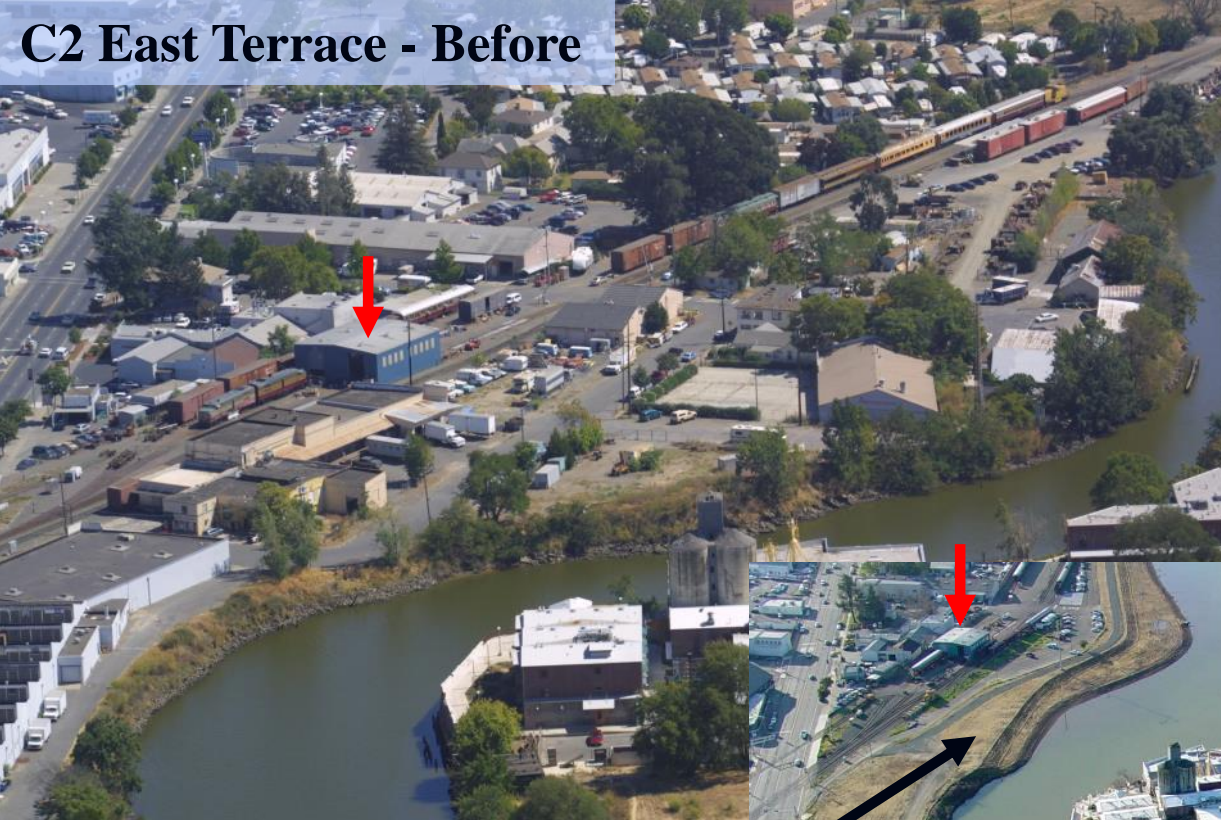
**Replacing bridges  
(9 replaced)**



**2005**



**C2 East Terrace - Before**



The creation of marsh and floodplain terraces included the removal of industrial infrastructure and contaminated soils; creating wildlife habitat and increasing flow capacity

**C2 East Terrace - After**



**Created marsh and floodplain terraces**

**Veterans Park Floodwall 2008**



**Veterans Park Floodwall 2014**



Creation of tidal marsh terraces below flood walls in urban reach of Project



2011



2011



## Napa Creek – Urban Reach

- Channel widened
- Twin bypass culverts for increased conveyance
- Stream bank slopes laid back to 3:1 or greater
- Large woody debris fish habitat structures installed
- 150 linear feet of stream “day lighted” (bridge removed)
- Invasive plant species removed, native riparian vegetation planted

2014





One of *many* large woody debris fish habitat structures installed in urban reach of the Project



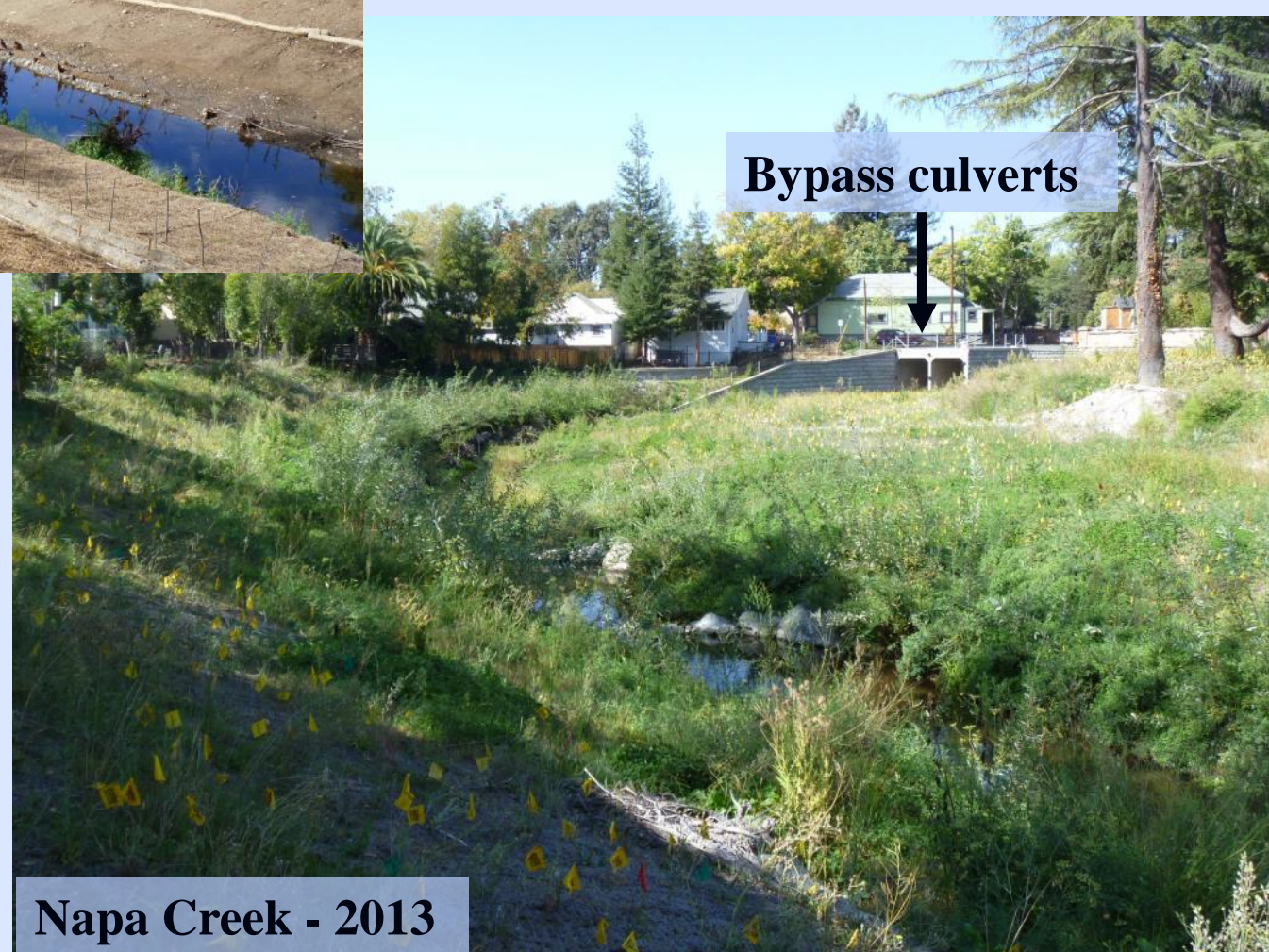
**Napa Creek - 2012**

**Napa Creek - 2013**



**Napa Creek - 2012**

Stream bank slopes laid back to 3:1 or greater, bypass culverts installed, all of which increased hydraulic conveyance and reconnected creek to floodplain while increasing riparian habitat in an urban creek

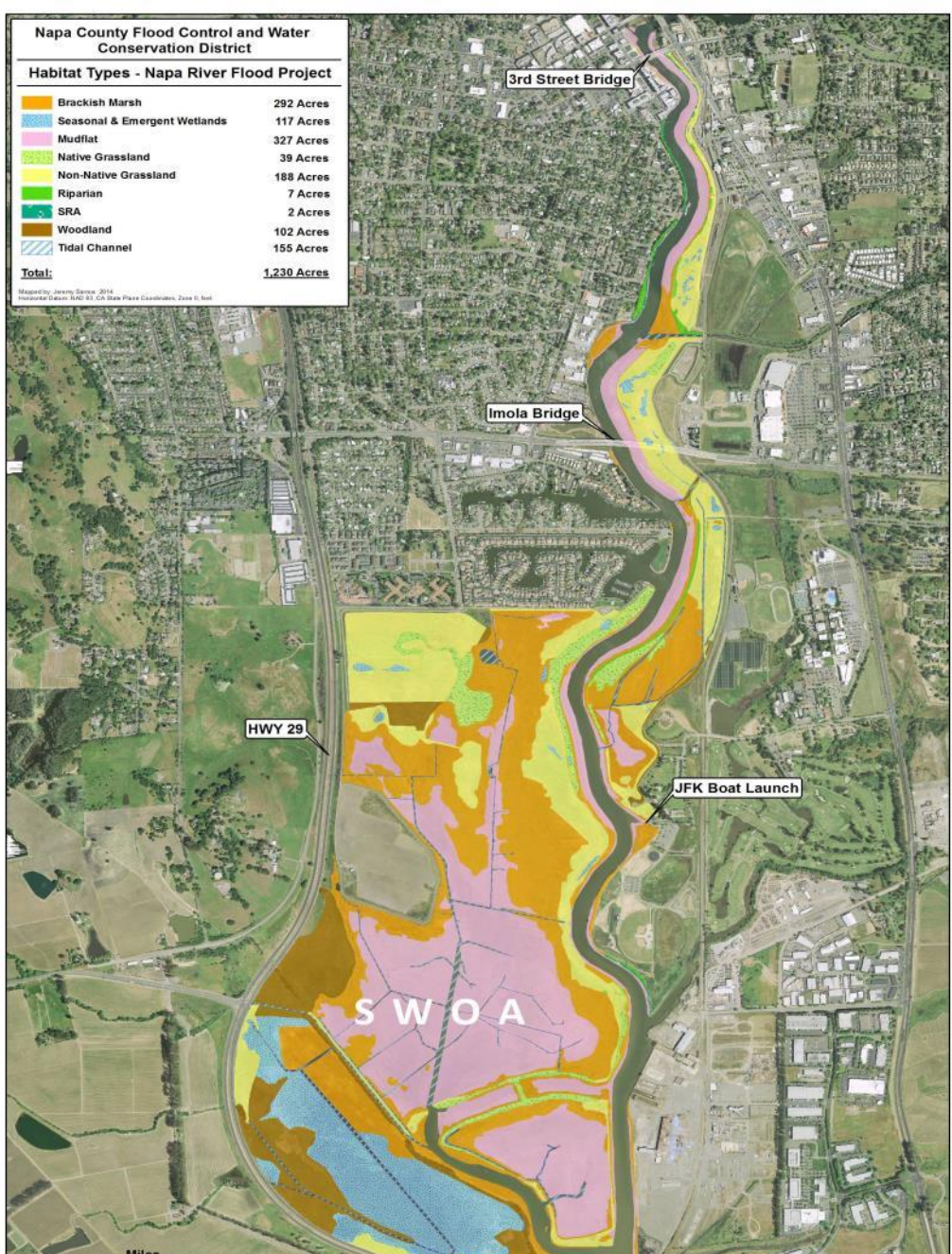


**Bypass culverts**

**Napa Creek - 2013**

# Monitoring

- Delineating habitat types through the use of high resolution aerial photography and ground-truthing along monitoring transects,
- Reoccupying 14 monitoring transects and 177 sample plots to survey vegetation coverage, composition, and change in restored areas
- Surveying extent of invasive plant species to guide management decisions,
- Storing data in GIS to document habitat extents, change over time, progress towards monitoring goals
- Fisheries and bird monitoring to track population trends and habitat utilization,
- Comparing channel design profile with current channel profile to determine rates of erosion/scour and deposition and changes in 100 year water surface elevation



**Current Habitat Types in South Wetlands Area**

2003



## South Wetlands Area

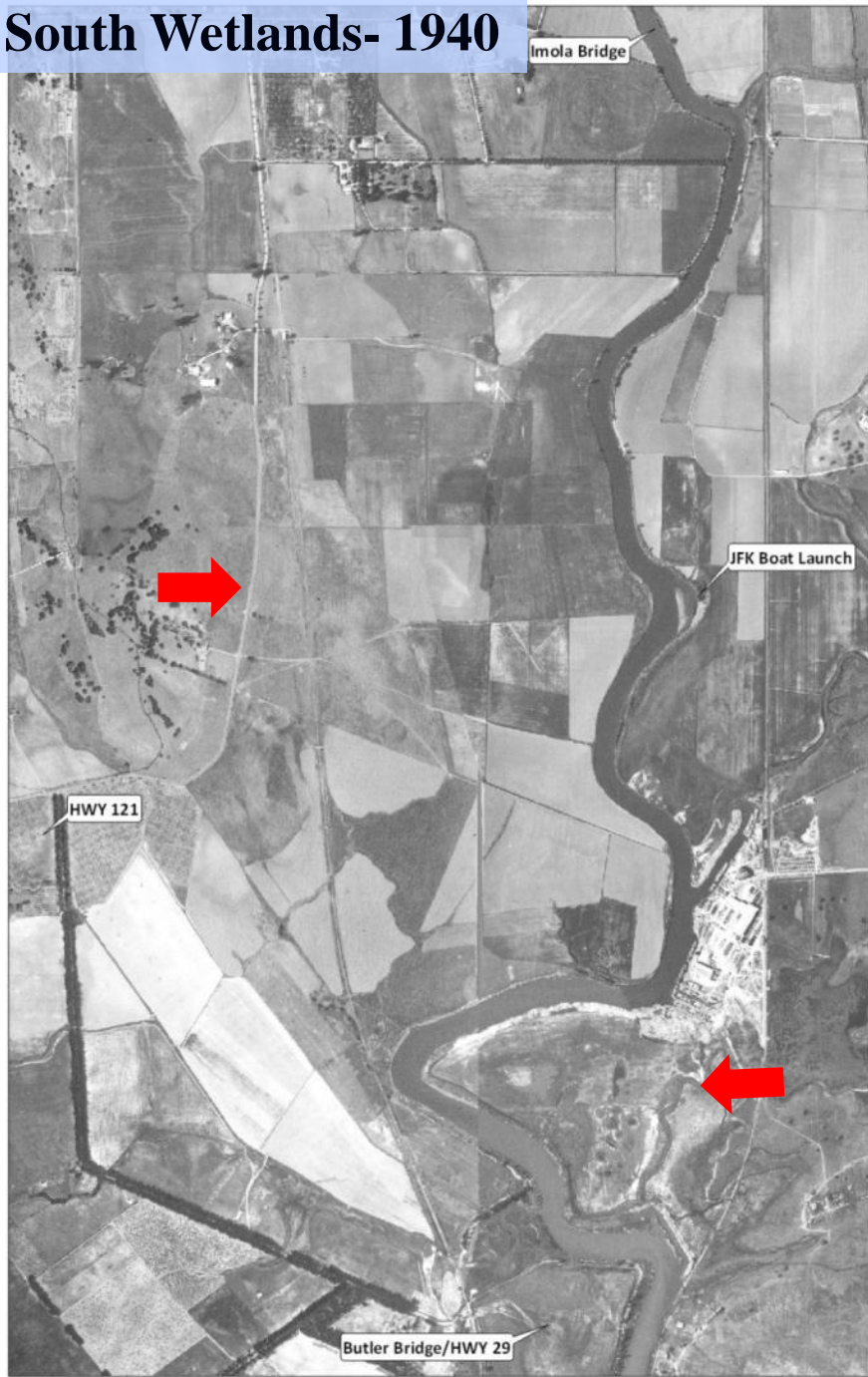
- Restored marsh and floodplain terraces
- Freshwater and brackish wetland habitat created
- Invasive plant species removed, native grassland, marsh and riparian vegetation planted
- Native flora and fauna returning “build it and they will come”
- Created/restored over 1,200 acres of habitat

2010

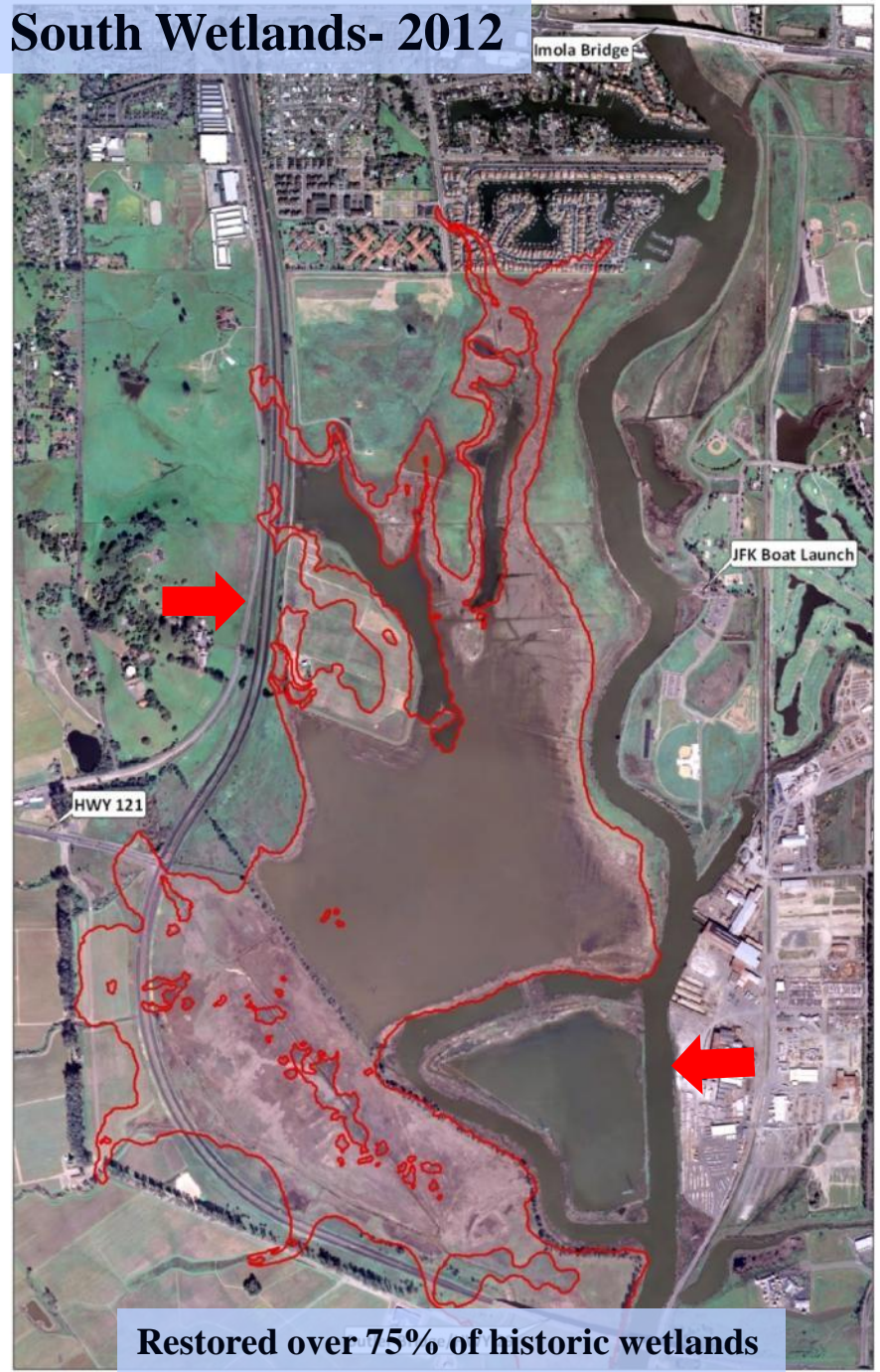


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# South Wetlands- 1940



# South Wetlands- 2012



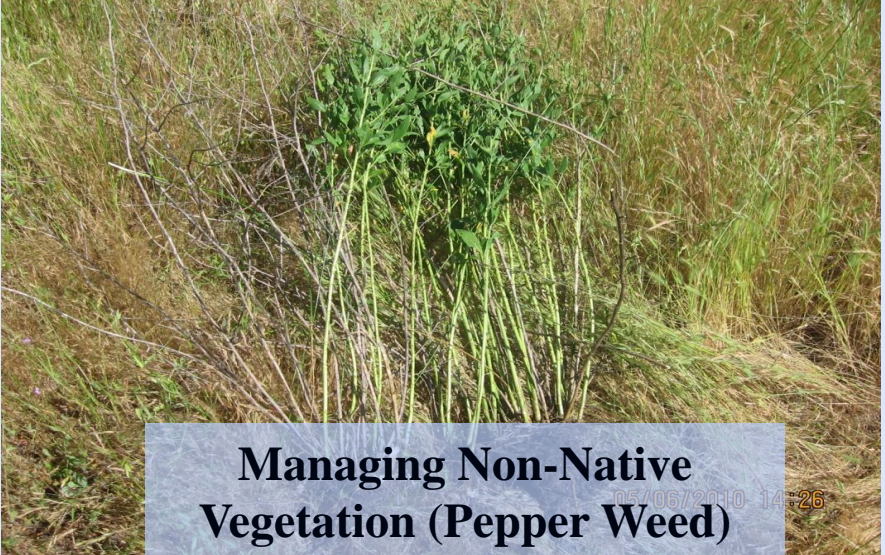
Restored over 75% of historic wetlands

# Monitoring Native Habitat & Vegetation Communities



**Mason's lilaeopsis**

**Population increase of rare plant  
4,810 ft<sup>2</sup> to 8,963 ft<sup>2</sup>**

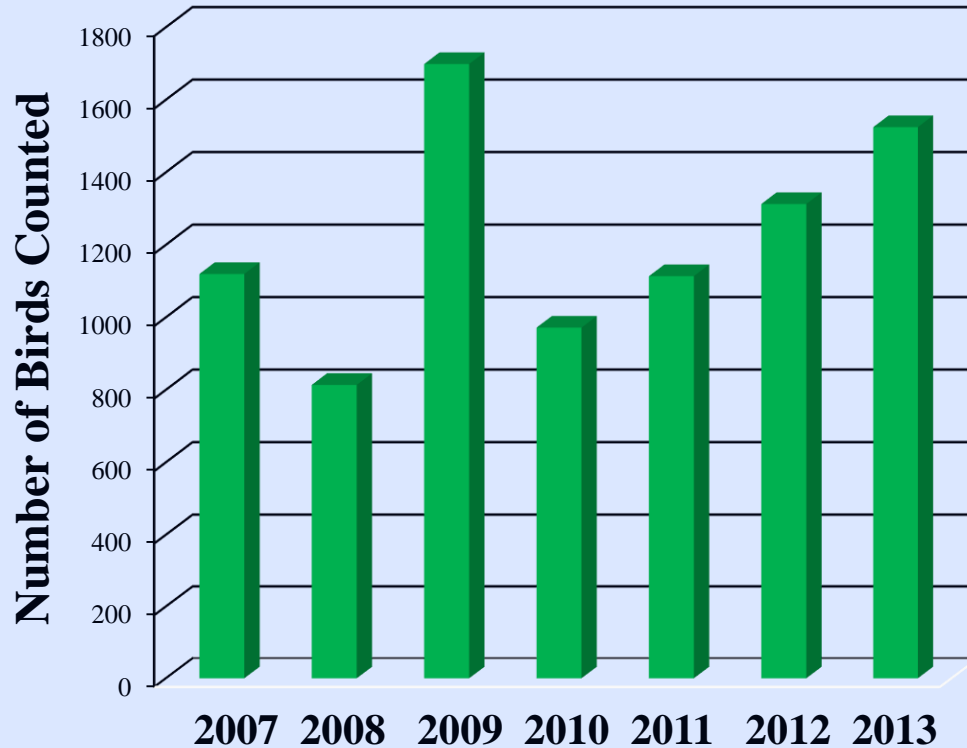


**Managing Non-Native  
Vegetation (Pepper Weed)**

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Bird monitoring conducted from May 2007 through December 2013 has documented 69 species of migratory and resident birds in the Project area.

**South Wetland Bird Surveys 2007-2012**



Fisheries monitoring has documented over 37 species of fish (20 of which are native, including Delta smelt and Central California Coast Steelhead) utilizing the aquatic habitat within the restored areas of the Project for foraging and reproduction.

Restoration of these areas and restoration actions associate with the Project as a whole has contributed significantly to larger regional restoration efforts including the Napa-Sonoma Marsh, Sear Point, and Hamilton Wetland Restoration Projects.



**Delta smelt**

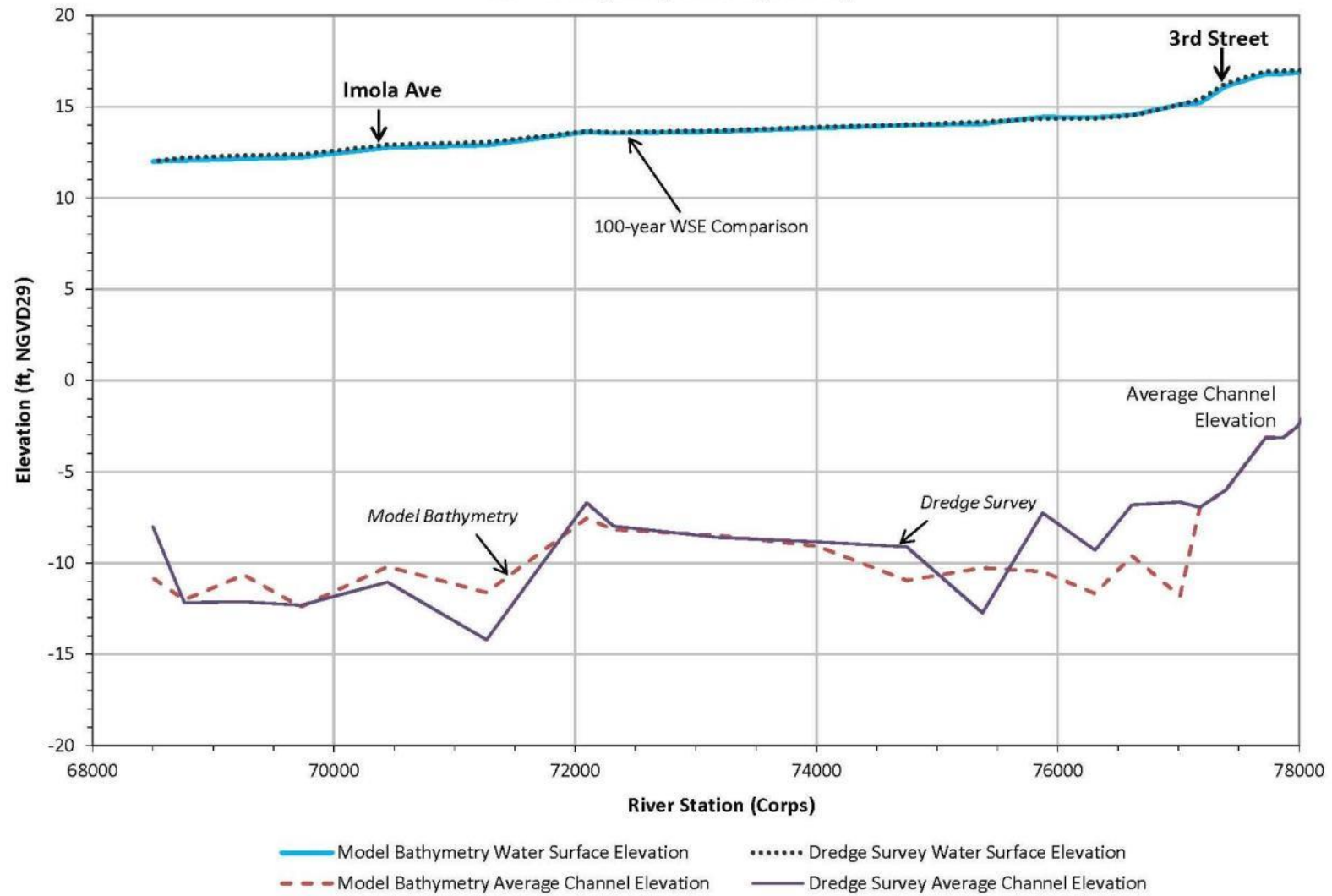


**Steelhead salmon**

Comparison of the original model bathymetry (1990's) vs. a 2012 dredge survey show only a 0.19 ft increase in the 100-year water surface elevation. Flows/velocities for sediment transport appear to be sufficient such that maintenance dredging is unnecessary to maintain channel capacity – one of the Living River original design goals.

Figure 1. Napa River 100-year Flood Profile Comparison (Interim with Bypass Conditions)

Model Bathymetry vs. Dredge Survey



Series of interpretive signs developed and installed in 2011 highlighting restoration and flood protection elements of Napa River Flood Project as well as ecology and tidal nature of river and cultural history of Napa



# Current Phase of Construction

Napa River Overflow

Bypass

Napa River

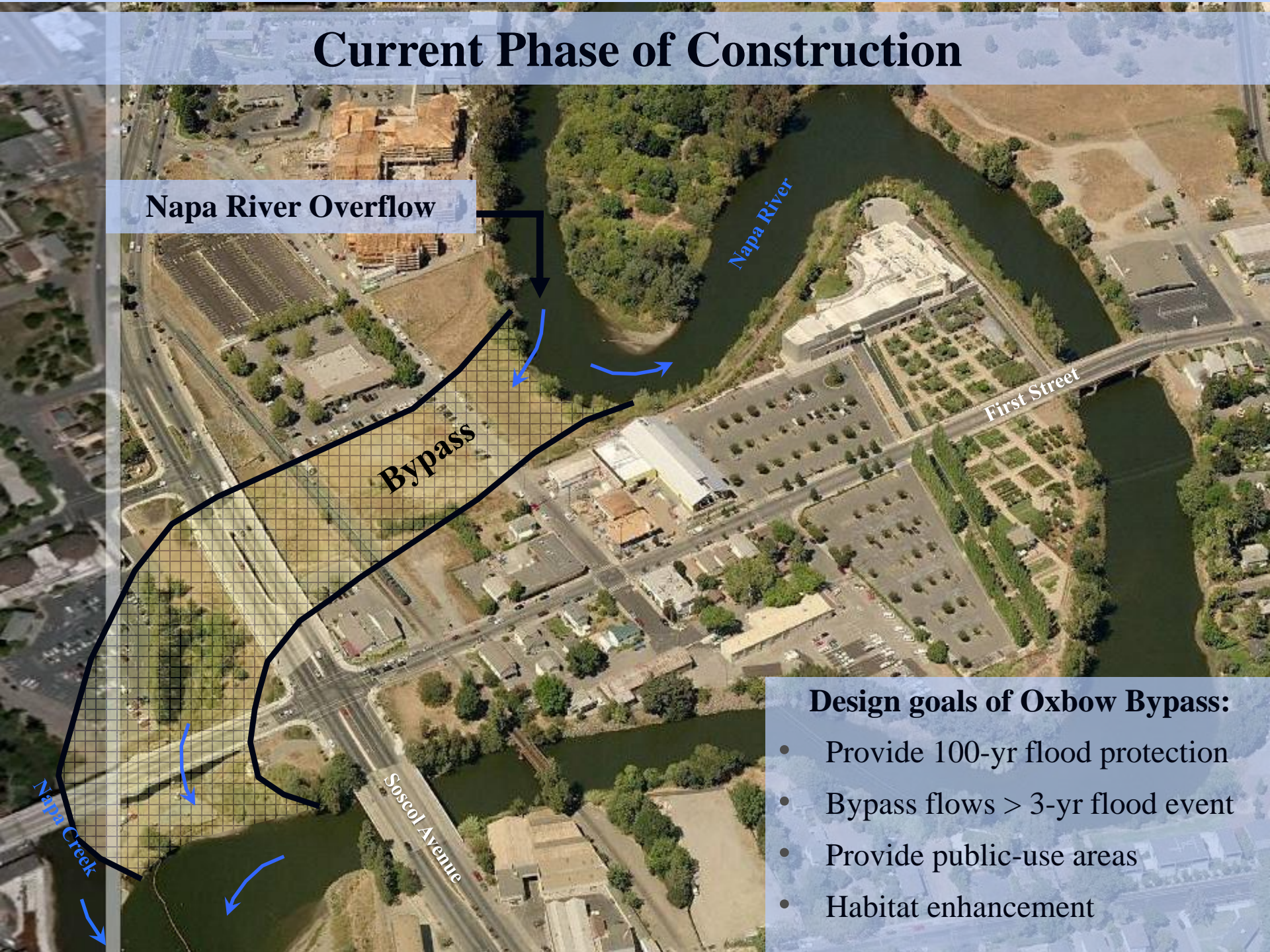
First Street

Soscol Avenue

Napa Creek

## Design goals of Oxbow Bypass:

- Provide 100-yr flood protection
- Bypass flows > 3-yr flood event
- Provide public-use areas
- Habitat enhancement



# In Summary..

- Utilizing an innovative “Living River” design approach the Napa River Flood Protection Project has been able to restore geomorphic riverine processes and expand wildlife habitat in addition to providing 100 year flood protection
- The Project has also stimulated considerable reinvestment and revitalization of downtown Napa



For more information: <http://www.countyofnapa.org/FloodDistrict/>