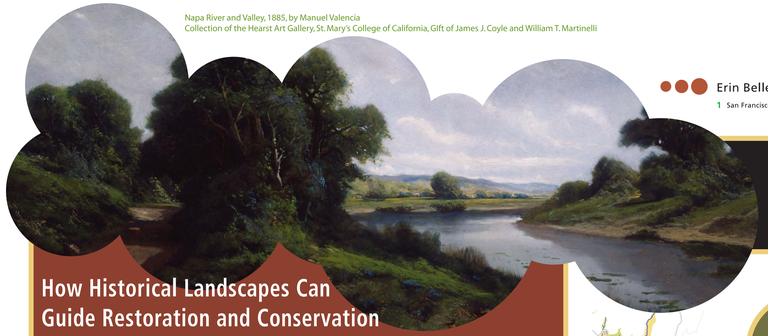

Napa River and Valley, 1885, by Manuel Valencia
Collection of the Hearst Art Gallery, St. Mary's College of California, Gift of James J. Coyle and William T. Martinelli

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Streams, Wetlands, and Woodlands in the Napa Valley: New Perspectives from Old Maps

How Historical Landscapes Can Guide Restoration and Conservation

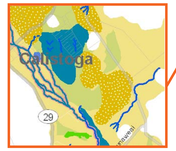
Historical records can provide valuable information about native habitats and landscapes, but are rarely available to scientists and managers for restoration efforts. Using methods developed over the previous decade, we compiled and synthesized a heterogeneous array of sources to reconstruct historical ecological and hydrogeomorphic characteristics of the Napa Valley. Taken together, early maps and surveys , landscape and aerial photography, and textual documents provide a robust picture of conditions in the valley prior to substantial Euro-American modification -- and how they have changed since that time.

Through these sources, we explored historically significant land cover types in the Napa Valley, such as valley oak savanna and valley freshwater wetlands. We also investigated changes in the character and extent of riparian corridor on the Napa valley floor. The preliminary results from these investigations are depicted here.

By identifying former ecological and hydrogeomorphic patterns in the Napa Valley, we provide a basis for evaluating landscape change and setting appropriate restoration targets, including the identification of residual features and under-recognized land cover types. By building a detailed picture of the past, we can develop a deeper appreciation local landscapes and the unique restoration opportunities they present.

"The marshy land can be made tillable land by drainage – with present condition it cannot be cultivated."

—VINES 1861



Wetlands: Mosaics of Freshwater Habitats

Freshwater wetlands in Napa Valley occurred in several distinct patterns. Large areas of wet meadow were common at the base of alluvial fans and behind the natural levees along Napa River. There were a few distinct areas of large perennial freshwater "tule marshes"; these were also associated with distinct topographic and edaphic controls. Vernal pool areas, alkali meadows, and willow groves were also distributed around the valley. These habitats generally occurred in association with each other, forming larger mosaics associated with gradients in topography and hydrology.

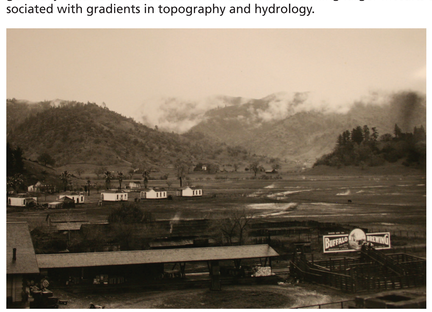
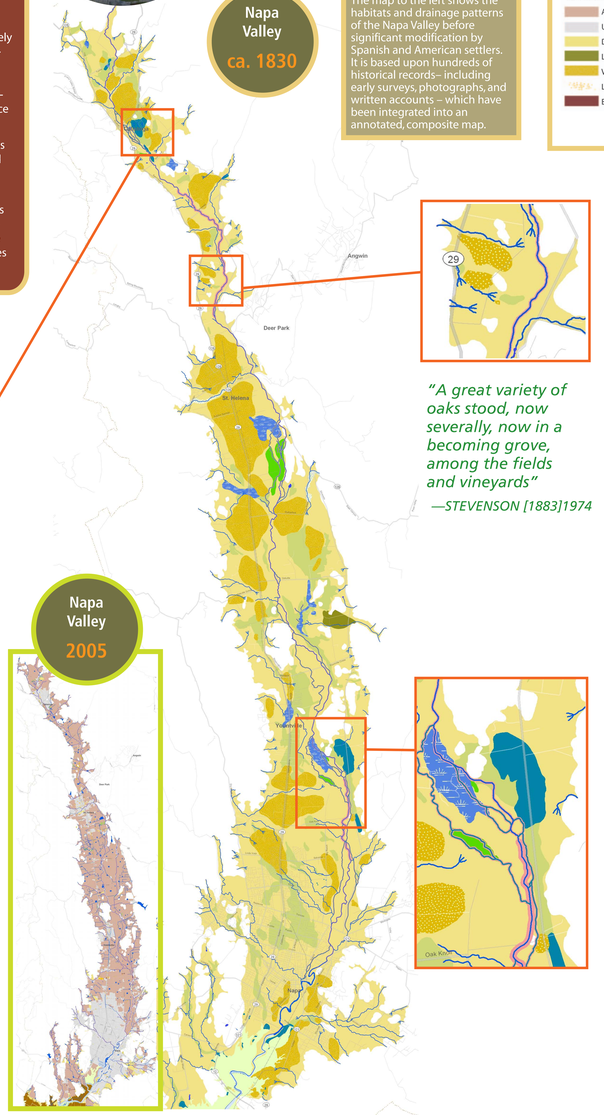


Figure 1
Steam spouts show the wetlands associated with Calistoga Hot Springs (note waterlogged ground and standing water to the right of the row of white houses). The thermal springs and surrounding area were described by Bartlett in the mid-1850s: "they [the springs] are in a plane near the base of a small hill of conglomerate rock; but owing to the wet and boggy condition of the valley, we were unable to approach within thirty feet of them. Columns of steam were rising from them on all sides." (Bartlett [1854]1965), Turrill and Miller, n.d [circa 1880]. Courtesy of the California Historical Society



The map to the left shows the habitats and drainage patterns of the Napa Valley before significant modification by Spanish and American settlers. It is based upon hundreds of historical records– including early surveys, photographs, and written accounts – which have been integrated into an annotated, composite map.

Terrestrial Habitats	Wetlands, Creeks, and Ponds	Bayland Habitats
Agriculture	Pond/Reservoir	Shallow Bay/Channel
Urban/Built-up/Vacant	Valley Freshwater Marsh	Tidal Flat
Dry Grassland	Alkali Meadow/Vernal Pool Area	Tidal Marsh
Live Oak Savanna	Wet Meadow	Diked Bayland
Valley Oak Savanna/Woodland	Willow Grove	
Large Valley Oaks (>1 m diameter)	Riparian	
Eucalyptus	Braided Channel	
	River/Creek	
	Floodplain Slough	

"A great variety of oaks stood, now severally, now in a becoming grove, among the fields and vineyards"

—STEVENSON [1883]1974

Woodlands: Deciphering the Patterns of Valley Oak Savanna

Scattered, stately valley oak trees were fundamental to the character of the Napa Valley, and were one of the most celebrated characteristics of the area in early accounts:

"The magnificent oaks are one great secret of Napa's beauty. Their rustling leaves and finely formed tops are the glory of the landscape scenery..." (Smith and Elliott 1878)

The landscape photograph at right, taken between 1900 and 1910, depicts the dispersed, open pattern of a typical valley oak savanna (<30% canopy cover, Allen-Diaz 1999). The trees dominated the valley landscape. Yet, almost paradoxically, they took up relatively little space. The valley was "studded with gigantic oaks, some of them evergreen [live oaks], though not so close together as to render it necessary to cut away to prepare the land for cultivation" (Bartlett 1965).

While the grand oak savannas are nearly gone, the natural spacing and distribution of the trees suggest a potential restoration approach. Similar patterns of scattered trees and occasional groves could be achieved through strategic reintroduction along roads, fence lines, and public spaces. Reintroduction should be focused on the several soil types that correlate with most of the historical trees (>50% of trees are associated with ~20% of the soil area). These efforts would build on a surprising number of surviving trees that have been maintained as shade trees or landscape elements in vineyards and private residences, and reverse the long-term decline in valley oak distribution.

Figure 2
Lyman Ranch/Mill Creek, ca. 1905. Courtesy of W.W. Lyman and Friends of the Napa River

Streams: Natural Variations in Channel Form and Riparian Function

This zoom-in just south of Yountville illustrates some of the variation in stream and riparian habitat along the main stem of Napa River. At upper left , the river is a single thread channel with narrow riparian corridor. In the middle of the graphic the river spreads into multiple shallow sloughs: mid 19th-century surveyors described finding no main channel to follow. Downstream, these floodplain wetlands coalesce into more well defined channels with a broad riparian forest (wider than 100 m).

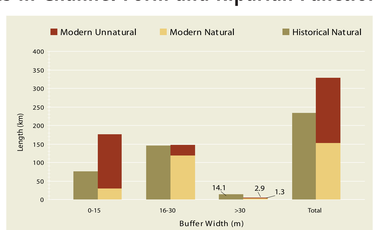


Figure 3
Changes in Riparian Extent, Napa watershed. A dramatic—and somewhat counterintuitive—shift has occurred in Napa Valley riparian habitat. Because of the expansion of the channel network to drain wetlands, there is actually much riparian habitat now than there was historically. But most of the riparian habitat now is very narrow, along artificial channels. Almost all the wide riparian habitat, which provides the critical habitat for riparian endemic species, has been removed.

Conclusions: Conceptual Models of Landscape Function and Change

The map of the historical landscape can be used to help understand the relationships between ecology and physical processes, which are harder to observe in the highly disturbed, contemporary landscape. In Napa, several distinct patterns emerge. These show how to focus restoration and conservation activities in places where they are supported by the persistent physical characteristics of the valley, such as alluvial topography, soils, relative depth to groundwater, and bedrock confinement.

> **This diagram** illustrates the basic relationships between the major habitat types mapped at left and the physical characteristics of the Napa Valley. Streams exit the canyons of the bedrock uplands onto relatively coarse alluvial fans. The gently sloping fans were typically occupied by valley oak savanna, such as the groves at Lyman Ranch. The fans grade into the fine soils of the flatter valley bottom, where wetlands such as the Calistoga Hot Springs are most commonly found.

While some of Napa Valley's larger creeks maintained well-defined channels that connected into the Napa River, many dissipated on the valley bottom or lower alluvial fan. At times of high flow, a high degree of seasonal surface water connectivity linked valley floor wetlands, discontinuous streams, and the Napa River; in the dry season, these features were mostly isolated.

> **While Napa River** is presently a relatively homogenous, single thread channel with a narrow adjacent riparian corridor, in earlier times there were distinct river reaches with differing function for fish and wildlife habitat, sediment transport or storage, and flood conveyance. The river responded to the surrounding landscape, spreading into floodplain wetlands where the valley was wide, changing course at confining topographic and geologic barriers, and picking up sediment and water at major tributary confluences.

These variations in historical stream function were related to basic physical characteristics of the valley floor that are relatively unchanging. They suggest different strategies and target functions may be appropriate for different reaches of the river.

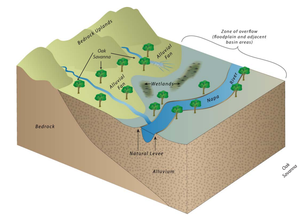


Figure 4
Relationships between Napa Valley habitats and valley floor morphology.

Figure 5
Distinct Napa River reaches, based on historical evidence

Acknowledgments
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