



Looking west toward Pillar Point

K. Ridolfi

AN INTRODUCTION TO THE *HISTORICAL ECOLOGY* OF THE **FITZGERALD MARINE RESERVE CCA**

A tool for developing an action plan for the Critical Coastal Areas program

Scattered throughout local and regional archives, historical information represents a valuable and often untapped resource for watershed management and coastal protection. Can an understanding of the historical landscape help us guide future landscape modifications? Can this understanding help re-establish native habitats and ecosystem function? How did natural and cultural processes shape the historic ecosystems that still persists as fragments in the current landscape?

This publication is intended as an introduction to how historical ecology can help local residents and resource managers understand current conditions and develop strategies for environmental recovery. The area encompassed by the Fitzgerald Marine Reserve Critical Coastal Area (CCA) has experienced substantial physical and ecological changes due to active coastal processes and the history of agricultural and urban development. Understanding this history can help identify opportunities to restore natural watershed function within the contemporary landscape, which in turn can help control

pollution sources. This document highlights areas of interest for potential restoration, focusing on three topics: salt marshes, stream networks, and freshwater wetlands. These opportunity areas will provide information for the stakeholders of the Fitzgerald Marine Reserve participating in the CCA Program pilot study to identify and prioritize actions that could improve watershed health. The CCA Program seeks to improve water quality along the California coast through the implementation of management measures to reduce the effects of diffuse sources of pollution, including urban and agricultural runoff.

For more information on the CCA program, please visit <http://www.coastal.ca.gov/nps/cca-nps.html>.



US Coast Survey hydrographic chart courtesy NOAA

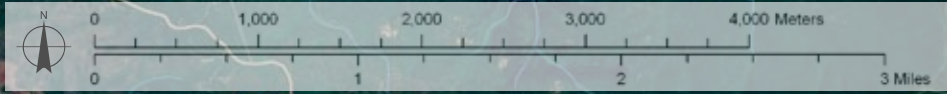


www.sfei.org

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FITZGERALD MARINE RESERVE CCA



OPPORTUNITY AREAS

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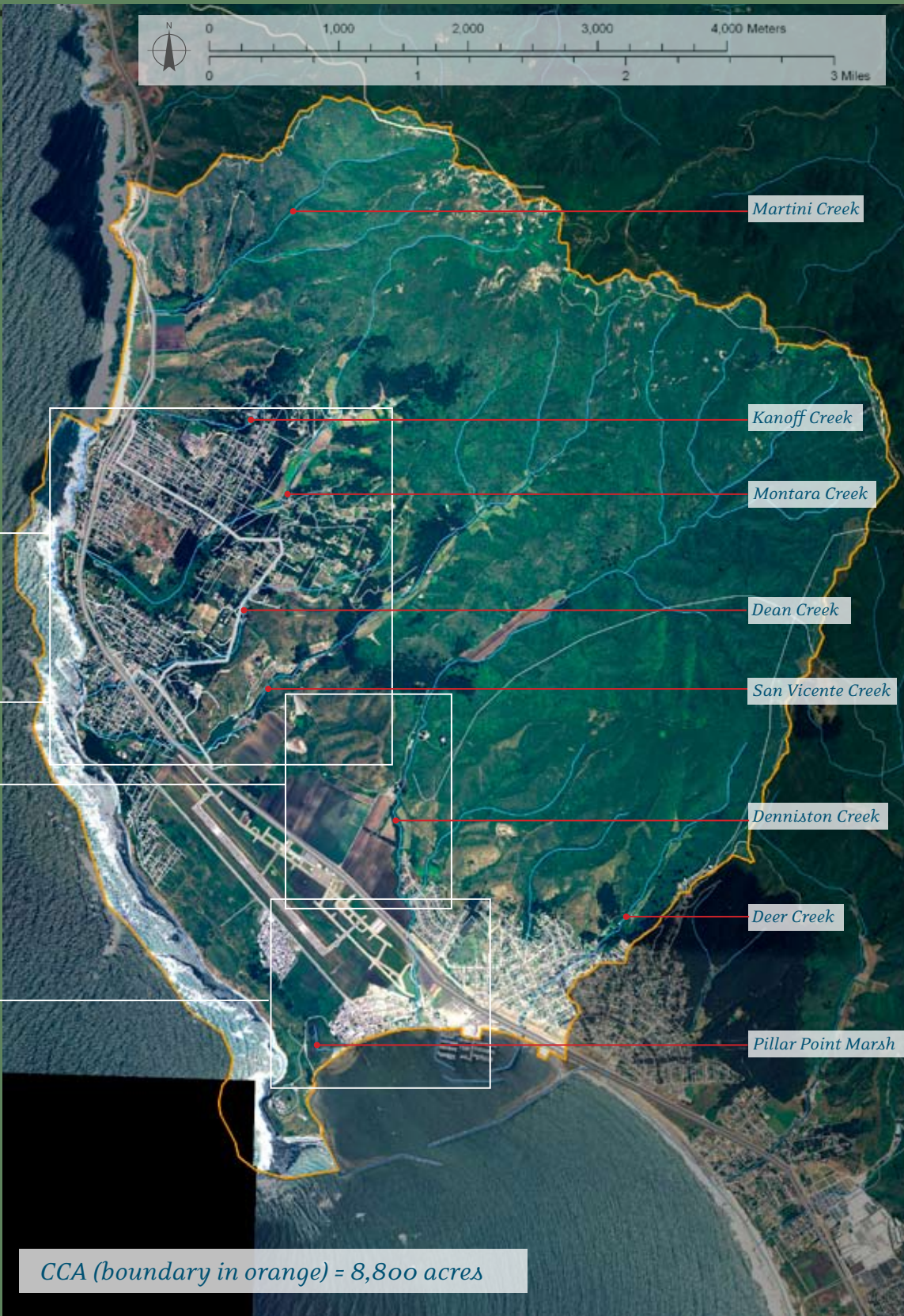
Freshwater wetlands
(Page 8)

2

Streams
(Page 6-7)

1

Salt Marshes
(Page 4-5)



CCA (boundary in orange) = 8,800 acres

Building a HISTORICAL ECOLOGY Project



DATA COLLECTION • Research begins with the acquisition of historical materials from a broad range of institutions, including local museums and historical societies, city and county archives, and regional libraries. Journals, diaries, and newspaper articles about the landscape and notable environmental features document

historical conditions. Early maps, surveys, and aerial photography provide the locations of historical features, such as streams, wetlands, and plant communities, as well as remaining property boundaries and roads that are valuable links to the contemporary landscape. Other important sources include landscape photography, sketches, and paintings.



DATA COMPILATION • Sources are drawn together for synthesis and analysis along the themes of historical vegetation types, channel geometry, seasonality, and land use. We

georeference early maps and aerial photography in a geographic information system (GIS), which allows historical evidence to be compared to modern conditions. We also extract and organize pertinent quotes from early land surveys and narrative sources

and, where possible, place them on maps of the past and present. This process of comparing multiple, independent sources of historical and modern information facilitates a detailed and accurate depiction of environmental change.

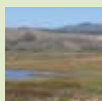


SYNTHESIS AND ANALYSIS • We rely heavily on GIS to synthesize the data into layers that represent historical landscape characteristics. Mapped features may include channels, perennial and seasonal wetlands, coastal

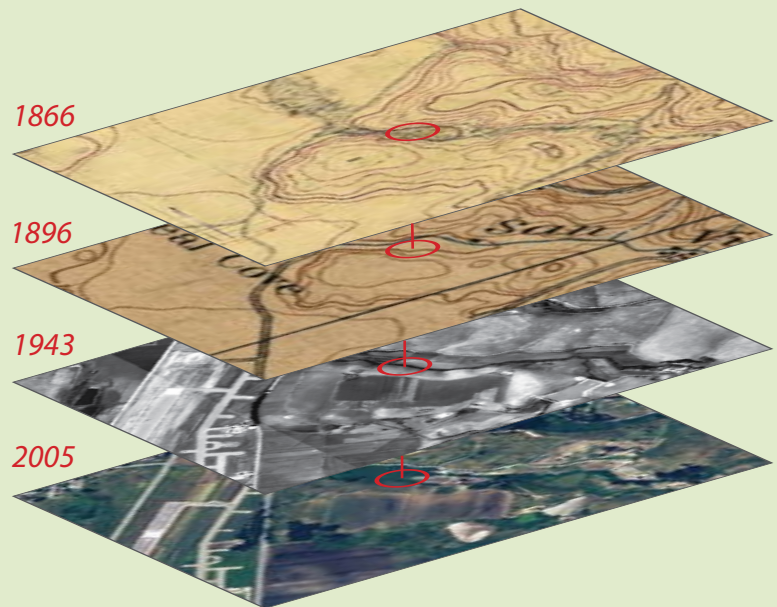
features, woodlands and savanna, and other habitats — each coded independently with their supporting sources and relative certainty level. A variety of methods are used to compare past and present landscapes, describing changes in habitat form and distribution. These depictions of habitat change are used by ecologists and other environmental scientists to describe changes in ecological functions, such as wildlife support. As a reliable map of the pre-modification landscape is developed, it begins to reveal the relationships between native habitats and physical gradients such as topography, salinity, and hydrology, providing a basis for identifying adaptive restoration and management strategies for the contemporary landscape.



REPORTS, GRAPHICS, AND PRESENTATIONS • The analysis is brought together into broadly accessible tools, including illustrated reports, websites (such as wetlandtracker.org), and maps. These present trends in habitat types and extent, discuss conceptual models and areas of interest for future environmental improvements, and provide direct access to many of the most significant historical data sources.



APPLICATIONS • Understanding the historical landscape and how it has changed over time can help address many of the challenges associated with managing and planning for the future of local watersheds. Historical ecology can help set priorities for restoring natural functions to local creeks, identify natural ways to reduce flood hazards, and reveal previously unrecognized conservation opportunities. The historical analysis often reveals ways to restore native habitats within our developed landscape for recreational benefits as well as wildlife conservation. Historical ecology can also reveal management constraints resulting from historical landscape changes, providing a more realistic basis for planning the future.



1 FITZGERALD MARINE RESERVE CCA SALT MARSHES

These pages show a preliminary investigation of the extent and character of the salt marshes that once existed at creek mouths along the Reserve. Pillar Point Marsh, the largest of the salt marshes, persists today and is home to threatened and endangered species such as the California red-legged frog (*Rana aurora draytonii*) and the Western snowy plover (*Charadrius alexandrinus nivosus*). Early cartography and surveys reveal that a similar system existed at the base of Denniston Creek. An important cartographic source, United States Coast Survey (USCS) topographic maps ("T-sheets," described below) provides an initial view of the historic marshes at Pillar Point and Denniston Creeks as well as hydrologic connections between upland and lowland systems. These perspectives can help establish a baseline from which to assess the impacts of modifications such as groundwater pumping, sedimentation, and increased drainage from urban areas, all of which affect water quality.

The 1861 USCS T-sheet (at right), which covers the Pillar Point area, depicts marsh complexes and channel networks along the coastline (Johnston 1861). Initiated in 1807 by the U.S. government, the Coast Survey maps provide an early and detailed cartographic depiction of the coastal landscape. The unprecedented use of geodetic surveying techniques - employing a common reference, or datum, to which all points are tied - produced remarkably accurate maps for the time period. Despite the absence of a standardized legend, T-sheets show hydrologic patterns and the distribution of coastal ecosystem types, which can be interpreted through a standard methodology (Grossinger and Askevold 2005).

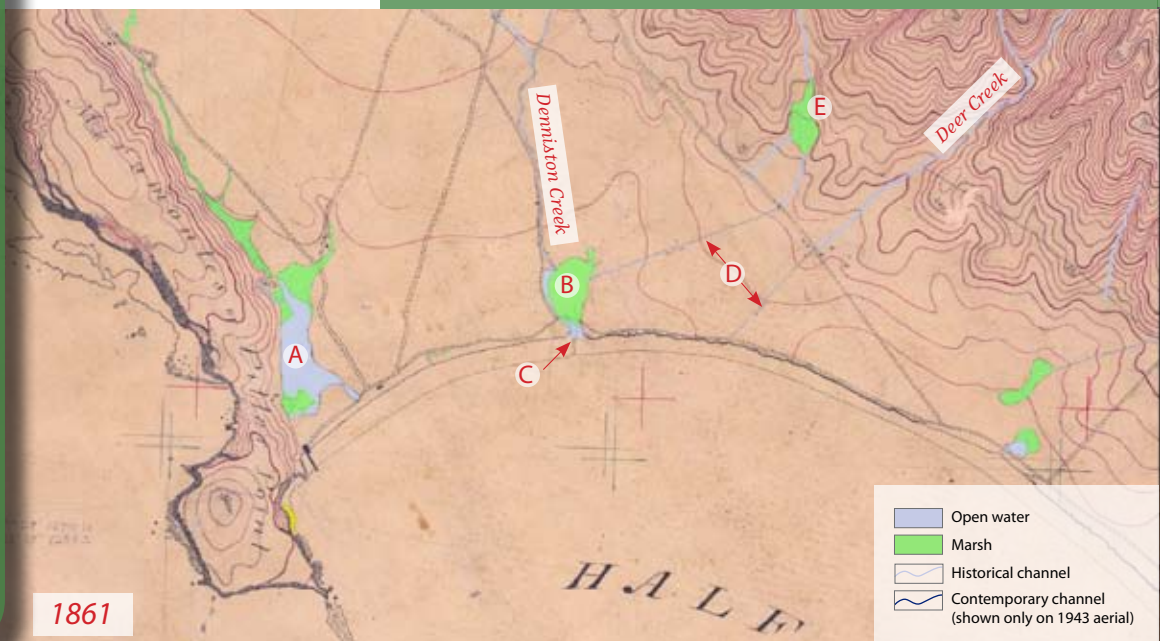
Pillar Point Marsh (shown below ca. 1940 and at right in 2005), persists today as a unique system within the Fitzgerald Marine Reserve CCA.



HalfMoonBayMemories.com

In the comparison below, the 1861 **Pillar Point Marsh** complex (A) contains more open water (approximately 10 acres) and a longer adjacent marsh than that shown in 1943 aerial photography (with approximately 4 acres of open water). In 1861, only the southernmost portion shows any emergent vegetation, suggesting a perennial water body. The open water transitions to emergent marsh (horizontal lines) approximately at the historic dam where West Point Ave. is today. US General Land Office (GLO) survey data adds another layer of information to help confirm the general character and location of the marshes and creek mouths. Surveyor C. C. Tracy (June, 1862) noted entering and leaving the "marsh" north of West Point Ave and commented on "wet, good grass," indicating a more continuous marsh complex than today.

The 1861 T-sheet also shows a wetland system at the **mouth of Denniston Creek** (B) (interpretation aided by 1863 USCS hydrographic map shown on p.1), the presence of which is supported by the "level marsh" noted by Tracy. The subtidal channel



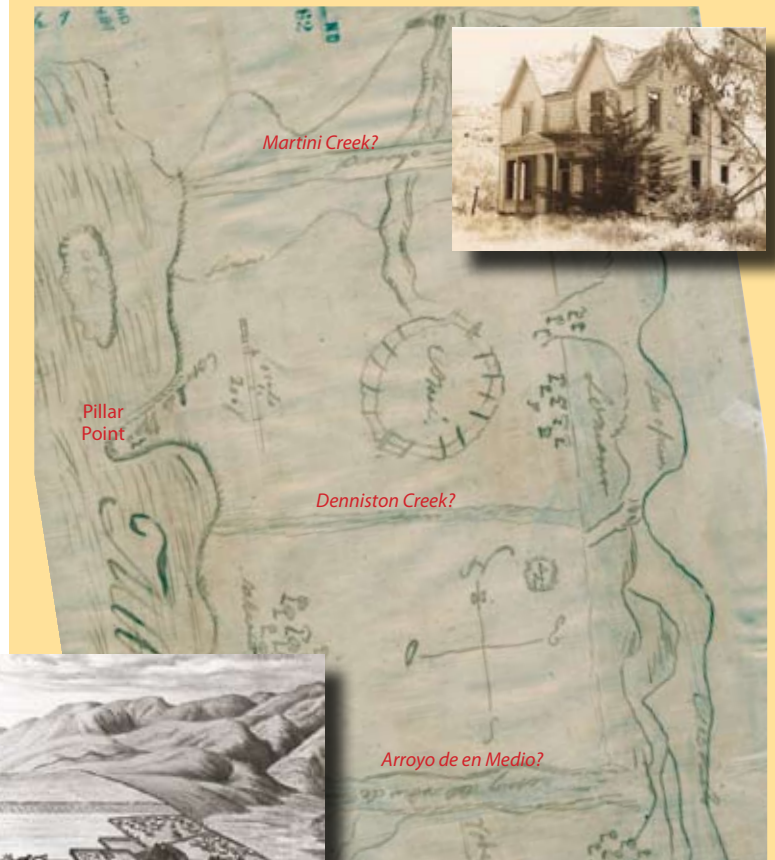
US Coast Survey map courtesy NOAA



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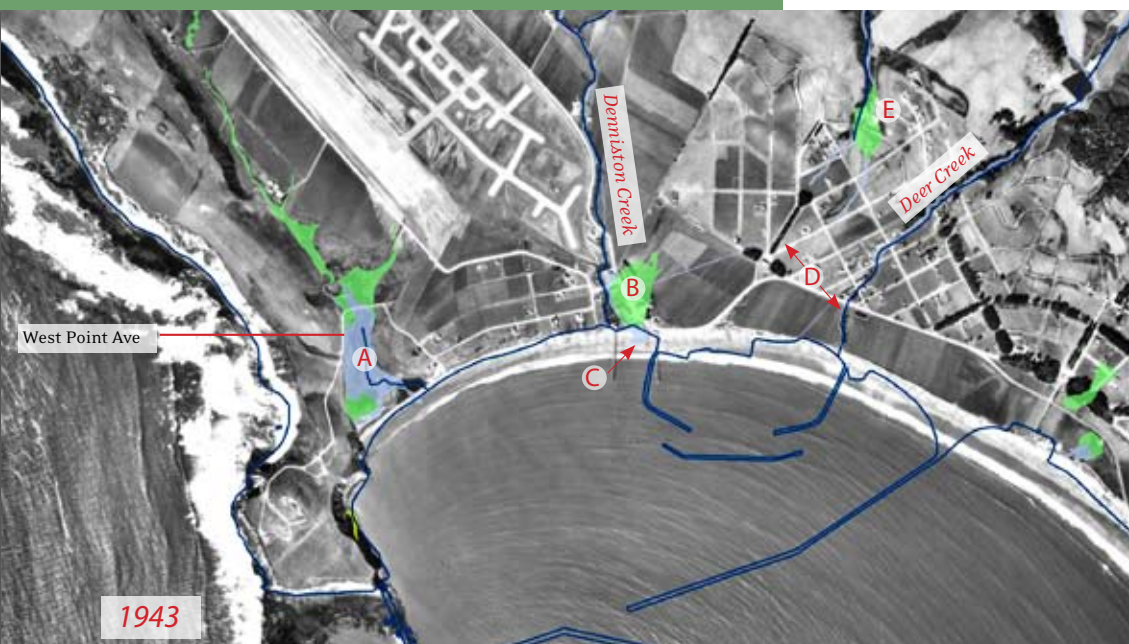
(C) drawn suggests that the marsh system may have been more consistently open to the ocean than Pillar Point Marsh. The 1943 aerials show the creek in roughly the same location as the T-sheet channel, but the marsh complex at the mouth of Denniston Creek appears to be largely absent. The inset oblique photographs show the mouth of Denniston Creek at the approximate time of the 1943 aerials in comparison to today.

Interestingly, the T-sheet already shows hydrologic modifications to the Denniston Creek watershed. A ditch (D) originates from a freshwater marsh (E) and connects to the Denniston Creek marsh; another connects to Deer Creek. This perhaps explains the drained appearance of the freshwater marsh in the 1943 aerial photography, which has since been replaced by dense vegetation. These ditches are early representations of the common trend toward increasing drainage density by connecting creeks that would have otherwise spread into marshes or alluvial fans (see pgs. 6-7).



Map courtesy The Bancroft Library, UC Berkeley; photograph Courtesy San Mateo County History Museum; oblique drawing courtesy HalfMoonBayMemories.com

The 1837 diseño map above of the **Rancho Corral de Tierra** land grant uses natural features to locate the boundaries of the rancho. The "arroyos" (creeks) and "lomarias" (hills) formed the "earthen corral" (a constructed corral is also shown) after which the grant was named. The map likely shows Martini Creek to the north, and Denniston Creek in the middle, close to Pillar Point. Francisco Guerrero received this grant from the Mexican government in 1839. The lithograph and photograph above shows his son Victor's homestead, which became the home of James Denniston in the mid-1800s.



Top. Courtesy HalfMoonBayMemories.com Bottom. Copyright (C) 2002-08 Kenneth & Gabrielle Adelman, California Coastal Records Project, www.Californiacoastline.org

2 FITZGERALD MARINE RESERVE CCA Stream Networks

The lowland streams have experienced a long history of change; first with ranching and agriculture, and later with the development of the communities of El Granada, Princeton-by-the-sea, Moss Beach, and Montara. Altered hydrographs and sediment input can impact stream characteristics such as width and depth, which in turn affect riparian vegetation. Map and narrative sources like those shown here can help build an understanding of historic stream network characteristics and inform interpretation of the current hydrologic regime. This, in turn, can be used to resolve sedimentation and erosion issues and help re-establish native species such as steelhead trout (*Oncorhynchus mykiss*).



US Coast Survey map courtesy NOAA

The images above and to the right illustrate hydrologic change over time: wetland complexes and multi-thread channels (1866), and discontinuous drainage networks (1896) shift to a highly modified system in 1943.

For streams like San Vicente Creek and Denniston Creek, which appear to have had sufficient flow to form distinct channels to the ocean (see quote below left), **complex, multi-thread reaches** are indicated in the 1861 T-sheet, in the locations highlighted above. This area (in white box above) on Denniston Creek was once known as “Three Bridges,” supporting the evidence of multiple channels (Cloud 1928). The San Vicente Creek reach is slightly different in that it is associated with a freshwater marsh complex (see p. 8).



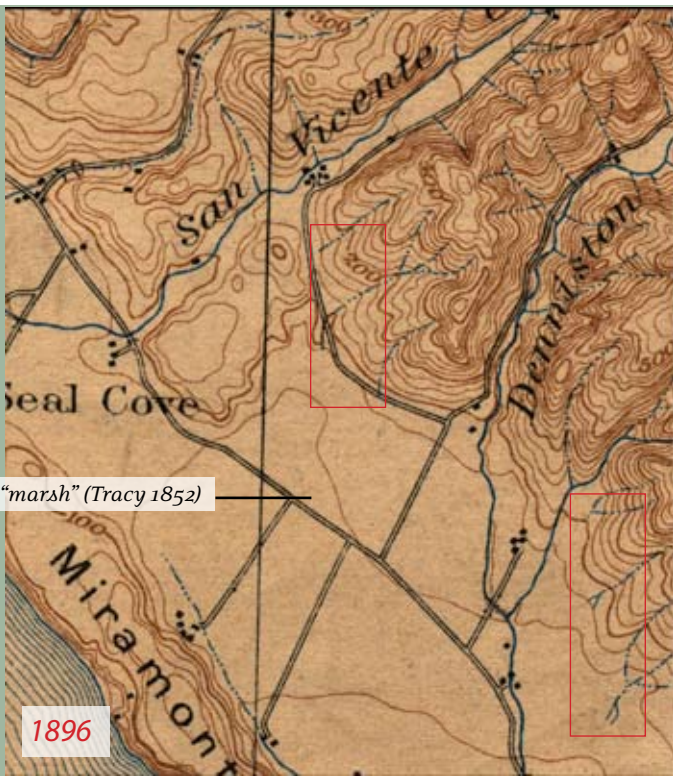
HalfMoonBayMemories.com

The example here shows information that can be used in comparison to contemporary stream channel widths. The red lines imposed on the modern imagery to the right point to locations of known creek width, as recorded by an 1859 survey.

WE BROKE CAMP AND WENT ALONG THE SHORE UNTIL, leaving the point with island rocks [Pillar Point] to the west of us, we passed over some knolls and across [several small] hollows with [rather] deep gulches full of water, at which we were delayed by [having to] throw small bridges over them [for the pack-train to cross on].

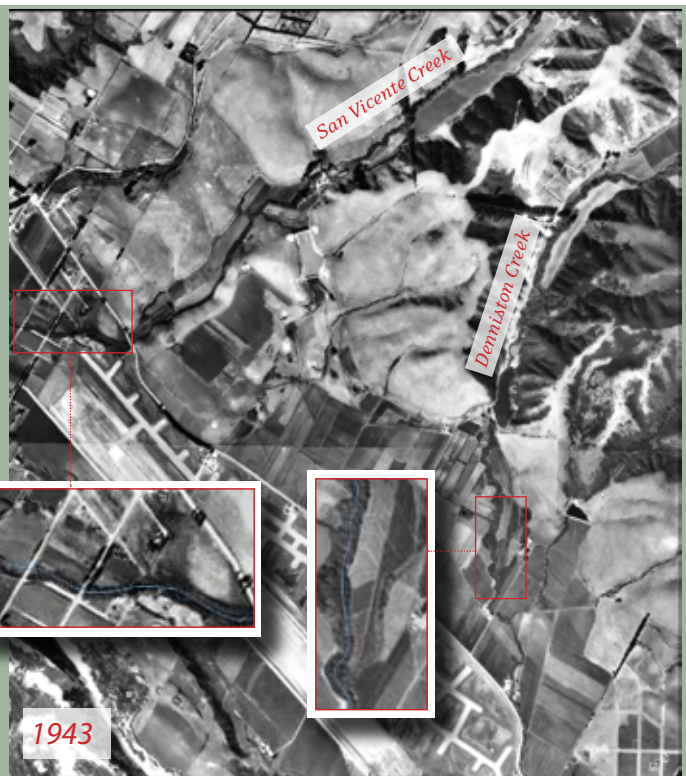
- COSTANSO 1769 in Stanger and Brown 1969





Courtesy the Earth Science & Map Library, UC Berkeley

The 1896 USGS map suggests a more **discontinuous drainage network** on some of the smaller local streams prior to hydrologic modifications, which is a commonly recognized pattern among California's historic streams. Small intermittent creeks (in red boxes above) emerging from the steep Montara Mountains lacked the energy to form well defined tributary channels as they encountered the relatively flat alluvial fans of the larger creeks. Instead, the channels dissipated like those shown in this 1896 USGS map. These networks were often associated with downstream wetlands. Although not depicted on the maps examined here, GLO surveyor C.C. Tracy reported entering and leaving a "marsh" along his line close to where Highway 1 is now.



Aerial imagery courtesy USDA

The 1943 aerial photography (overlain by contemporary steam mapping) shows a **highly modified drainage network**. While remnants of Denniston Creek's multiple channels persist, San Vicente is a clear single-channel system. The airport's construction resulted in significant hydromodification of the Denniston Creek and Pillar Point drainage networks. Where water historically drained toward Pillar Point marsh, it now appears directed more toward Denniston Creek through ditches. Such modification can also have the effect of connecting the small discontinuous creeks, like those shown in the 1896 map, to larger stream channels.



GLO field notes from William J. Lewis, 1859

"Mouth of creek 50 links [10 m] wide, comes from southeast."

"Creek, 10 links wide, course N86W."

"Creek, 20 links wide, course, S60W."

"Small spring, 5 links wide, course S.W."

"Creek, 25 links wide, course, S61W"

"Deep gulch 180 links [36 m] wide, comes from N55E."

"Creek 1 chain wide, comes from S59E."

The figure at left shows stream widths at various locations on San Vicente, Dean, and Montara Creeks, recorded by General Land Office (GLO) surveyor William J. Lewis. The GLO Public Land Survey established the 6-mile square townships we are familiar with today across the western U.S. and confirmed land grant boundaries. The GLO reached Half Moon Bay in the 1850s. The surveys contain valuable ecological information: surveyors noted up to four "bearing" trees (marked trees with azimuth and distance to identify the location of survey lines) at every mile and half-mile point (notably no trees were found in the Fitzgerald CCA), described distinctive features along their survey lines, such as creeks (including width information which is shown here), lakes, marshes, or areas of thick brush, and commented on general soils and land characteristics.

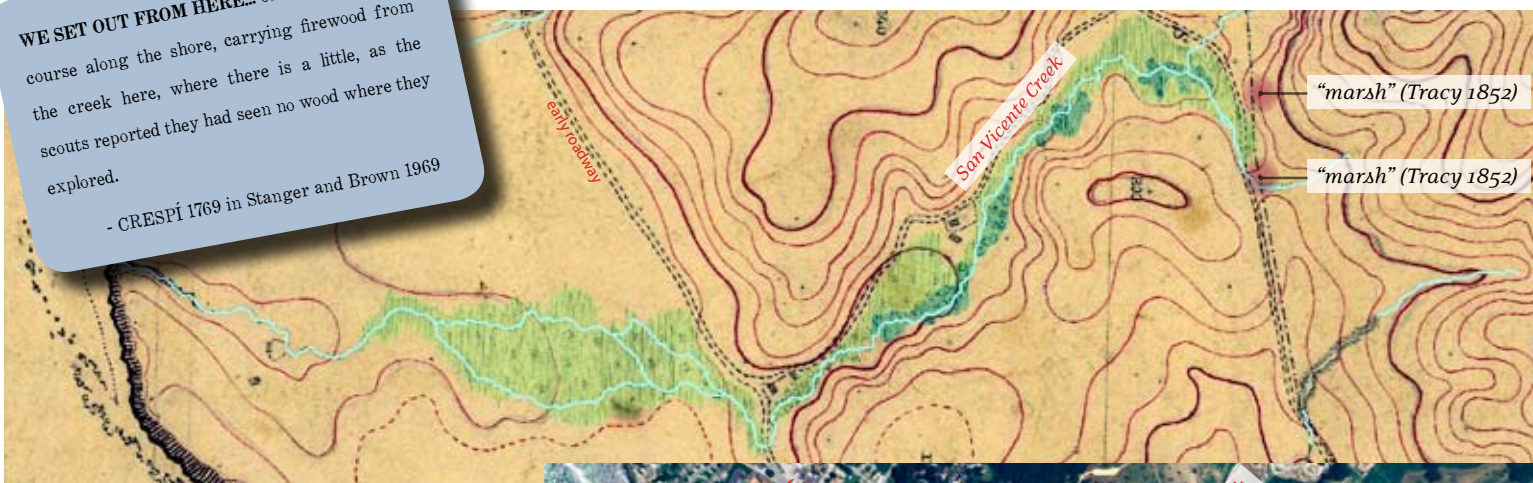
3 FITZGERALD MARINE RESERVE CCA *Freshwater Wetlands*

Historical sources point to possible opportunities for the restoration of once extensive freshwater wetlands and willow riparian forests along San Vicente and Montara creeks. Aided by further research, understanding the extent and character of these freshwater wetlands could inform efforts to improve water quality and reduce flood peaks. Also, species diversity within the area could be potentially supported through the re-introduction of these sensitive plant communities that are under-represented in the contemporary landscape.

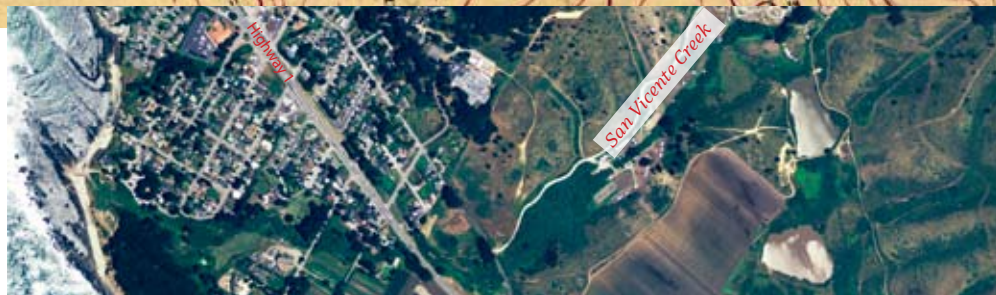


K. Ridolfi

WE SET OUT FROM HERE... on a northwesterly course along the shore, carrying firewood from the creek here, where there is a little, as the scouts reported they had seen no wood where they explored.
- CRESPI 1769 in Stanger and Brown 1969



The image from the 1866 USCS T-sheet shown above depicts **freshwater marsh (light green) merging into a willow riparian forest (dark green)** along San Vicente Creek's braided reaches on the flat alluvial fan at the base of the Montara hills. The map suggests both a broader and more open (covered with herbaceous vegetation) wetland environment than the riparian



Above, US Coast Survey map courtesy NOAA; imagery below courtesy USDA NAIP 2005

reaches found along San Vicente Creek today. GLO surveyor C. C. Tracy (1852) also noted marshes (see above) along his survey line that crossed the creek and passed close to where reservoirs sit today. A similar progression of marsh to willow riparian forest is suggested along Montara Creek upstream of Harte St. (not shown). Considering the water quality and flood control benefits of wetland and marsh complexes, areas where open space still exists next to stream channels may be important sites to consider for recovering elements of the historical systems. Areas along the San Vicente and Montara creeks may contain restoration and conservation opportunities for freshwater marshes and wet meadows.



In summary, historical ecology provides a tool for developing action plans for Critical Coastal Areas. Historical ecology research provides both technical information and an educational perspective that can help us recognize and respond to environmental

change. While this preview shows some of the types of analysis that could be useful for the Fitzgerald Marine Reserve CCA, much more historical information about the local landscape is available and remains to be compiled. For more information about historical ecology methods and resources, please go to www.sfei.org/HEP.