

Physical and Ecological Characteristics of the Historical Baylands of South San Francisco Bay

The context for environmental restoration

Robin Grossinger¹, Josh Collins¹, Chuck Striplen¹, Thomas Burns², Elise Brewster³, Christopher Richard⁴, Elianna Strode⁵
¹San Francisco Estuary Institute, ²GIS Mapping and Analysis, ³Brewster Design Arts, ⁴Oakland Museum of California, ⁵Santa Clara University

Introduction

The reclamation of South San Francisco Bay's tidal marshlands during the 19th and 20th centuries has resulted in little living memory of how these systems looked and functioned. Fortunately, substantial information can be recovered through the discovery and analysis of historical materials. The recovered understanding can help inform ecological planning in the South Bay by illustrating larger patterns of tidal hydrology, identifying important historical ecological components of the South Bay marshlands, and providing engineering-level technical specifications for restoration design.

Accuracy of Historical Maps



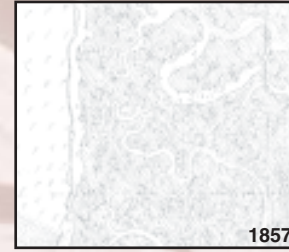
Modern photo of channel bank
 Historical map of same bank
 (Less than 50 ft difference)

When carefully georectified, the historical United States Coast Survey (USCS) maps of the South Bay align to corresponding modern remnant features with a high degree of accuracy. This ArcMap graphic shows the correspondence between a "ghost channel" in a modern salt pond and the cartographic representation circa 1857, indicating the accuracy of both the original mapping and the georectification procedure. Modern remnants of the tidal marsh channel network may provide the template for marsh restoration in some baylands.

Historical maps reveal the larger ecosystem context for remnant "ghost channels."



1993



1857

The USCS maps of the South Bay, produced during the 1850s and 1890s, provide unusually detailed early representations of tidal marshland and other wetland features. We developed a two-step process to transform these historical documents into a modern data/projection system with a high degree of accuracy, while avoiding distortions associated with "warping" or "rubber-sheeting." The process utilizes a careful interpretation of the original coordinate system grid, and a locally-derived adjustment to correct for apparent cartographic bias. Early direct overhead aerial photography (circa 1939) and other sources provide comparative data to assess the accuracy of these early maps.

Development of modern salt ponds from the historical tidal marsh landscape



1857

1878

1896

Near the mouth of Alameda Creek

Historical marsh features appear to have been the origin of many of the early Euro-American salt pond complexes. Management for salt production most likely converted these features from seasonally variable salinities to more consistently saline environments. The historical character and landscape position of the original features provides evidence for the integration of modern salt ponds into the larger tidal marsh ecosystem.

Current Status

Several lines of investigation are being undertaken to provide a better understanding of the vast intertidal, or baylands, ecosystems that dominated the region prior to Euro-American settlement.

Historical Tidal Marsh Maps Project *March 2004*
 High-resolution, georectified images of the earliest accurate maps of the South Bay baylands -- the "T-sheets" of the United States Coast Survey -- are being developed as vectorized files for use in GIS, providing public access to these important historical sources.

Oakland Museum Poster *October 2004*
 SFEI is producing a detailed graphic illustration of South Bay baylands change-through-time, using the USCS "T-sheets" and other historical materials. This poster will be available to the public as part of the Oakland Museum of California's Creek and Watershed map series.

Next Steps

Analysis of Tidal Hydrology
 The georectified and vectorized historical "T-sheets," and an understanding of their strengths and weaknesses, will establish a dataset for analyzing the pre-disturbance characteristics of South Bay tidal marshlands. Given the absence of large marshland patches in the South Bay presently, historical data can be developed to describe appropriate large-scale tidal channel patterns, and estimate tidal prism and channel density for restoring marshlands.

Identification of Cultural and Ecological Resource Opportunities
 The historical maps not only reveal a landscape of remarkable ecological and cultural diversity, but also suggest specific sites and approaches for restoring elements of this complex system. Historical data document the locations of some of the less well-recognized characteristics of the historical baylands ecosystem (such as natural, shallow salt-producing ponds; channel-side mudflats providing substantial habitat within tidal marshlands; and ecotonal transitions to vernal pools and alkali flats) and their relationship to indigenous cultural features such as shellmounds and village sites. Overlaying these data with modern aerial photography indicates the places to look for remnant features that could serve as valuable components for restoration design and education.

Public Education
 This highly visual, dramatic information about the history of salt ponds and marshlands provides a compelling way to engage the public in the ongoing process of managing the South Bay baylands. We hope to make these materials available through the Oakland Museum poster, a web site, and other formats.

Acknowledgments
 We would like to thank Santa Clara Valley Water District, City of San Jose, Alameda County Flood Control and Water Conservation District, City of Milpitas, and USFWS San Francisco Bay Fund for contributing to these efforts. We would also like to thank Howard Shellhammer, Peter Baye, Alan Brown, Brian Collins, and Matthew Booker for helpful discussions.



Contact: robin@sfei.org

Background Image: 1939 Aerial photography of mostly undiked tidal marshland near Drawbridge (Courtesy of UCB and UCSB)