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Historical Ecology of the lower Santa Clara River, Ventura River, and Oxnard Plain: an analysis of terrestrial, riverine, and coastal habitats

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REGIONAL SUMMARY

Great changes have swept through Ventura County over the past 250 years. Willows and live oaks have been cut down, and eucalyptus and other non-native street trees have been planted. Wetlands have been drained and cultivated. Creeks have been straightened and connected to larger streams. Rivers have been hydrologically and ecologically altered by levees, flow diversions, and timber cutting, and have lost floodplain area to farms and cities.

Despite these changes, lowland Ventura County retains substantial high quality ecological resources, particularly in comparison to other, more urbanized, areas of coastal southern California. The two major rivers in the region—the Ventura and the Santa Clara—possess significant restoration potential. The Santa Clara River has remained unchannelized and relatively unregulated by dams, and as a result has retained much of its former reachscale flow variability, geomorphic process, and riparian heterogeneity. The Ventura River, due in part to relatively limited urban development and floodplain encroachment, has also retained substantial portions of its former hydrologic and ecological patterns, despite the presence of Matilija and Casitas dams. Current management activities, such as the proposed removal of the dam and the Parkway projects ongoing on both rivers, recognize and take advantage of this potential.

This report documents the historical ecological and hydrological patterns and dynamics of the Ventura River valley, the lower Santa Clara River valley, the Oxnard Plain, and the Ventura County shoreline. To do so, we integrated hundreds of historical cartographic, textual, and visual accounts to create a heterogeneous but substantial dataset describing hydrologic, geomorphic, and riparian characteristics back to 1769—the date of the first non-native, land-based exploration of the region. These data were synthesized to provide detailed analysis of landscape-level pattern and process in the region prior to substantial Euro-American modifications, and to better understand the impacts of modifications over the past two and a half centuries. The goal of this process is to provide scientists and managers in Ventura County with detailed, readily accessible information about the region's historical ecological landscape, with particular focus on historical habitat patterns and riverine processes. (The report does not address the historical fauna of Ventura County in detail.)

Our findings reveal an ecologically diverse landscape, with vegetation and drainage patterns reflective of both underlying, long-term physical drivers and temporally and spatially dynamic processes. Valley floor habitats were relatively dry overall, with extensive open grasslands and scrublands predominating in the Santa Clara River valley, lower Ventura River valley, and large portions of the Oxnard Plain. Live oaks and sycamores colonized terraces in the Ventura River valley, in addition to many alluvial fan surfaces north of the Santa Clara River. With few exceptions (notably, Saticoy Springs), non-riparian wetlands were concentrated on the Oxnard Plain. This included coastal brackish and saline wetlands, freshwater ponds and marshes along the eastern foothills in the Calleguas Creek watershed, and (comprising the great majority of the total) the seasonal alkaline wetlands of the Oxnard Plain.

Wetland distribution on the plain has been largely shaped by the migration of the Santa Clara River over geologic time: the river deposited sediments that formed higher and drier zones above the alkaline lowland, which were colonized by grassland and scrub. This migration also created a pattern of coastal lagoon systems along the shoreline, leaving a legacy of perched and closed lagoons marking former river mouths (and separated from the ocean by dunes whose sediment was largely supplied by the river). At least three types of coastal estuarine systems are represented on the Ventura shoreline: seasonally or intermittently closing freshwater-brackish estuaries associated with the Santa Clara and Ventura river mouths, dune-dammed non-tidal lagoons associated with now-abandoned Santa Clara River mouths, and the large, more open wetland system at Mugu. These features formed a nearcontinuous sequence of coastal wetlands from Mugu Lagoon all the way to the Ventura River mouth: the eastern edge of the Ventura River floodplain was separated from the northwestern edge of the Santa Clara River floodplain (today's Ventura Marina area) by less than one mile.
Then as now, the Santa Clara River dominated the region; even its delta (the Oxnard Plain) was referred to as the lower Santa Clara River valley in the 19th century. Geologic and climatic parameters influenced the river's form and flow, creating a stream with reach-scale variability in channel morphology and the presence of summer surface water. In turn, these elements were linked to heterogeneous riparian patterns along the river, with nodes of broad willow-cottonwood riparian forest and in-channel wetlands separated by reaches characterized by scrub and patchy forest. As a result, riparian forest did not form a continuous corridor along the river, instead occurring in discrete patches corresponding to variations in groundwater-surface water interactions.

Like the Santa Clara, the Ventura River occupied a broad river corridor, with reach-scale variability in hydrology, morphology, and riparian patterns. The Ventura River also maintained large willow-cottonwood forests at its mouth, in addition to a dense riparian corridor along much of the perennial reaches. The intermittent reach of the river was characterized by in-channel live oaks, sycamores, and scrub on established bars and islands, a vegetation community not documented anywhere along the Santa Clara River mainstem.

The research described in this report is designed to provide insight into the Ventura County that once was. We have tried to bring our research alive such that current residents, scientists, and planners may inhabit—if briefly, and imaginatively—the landscape that early Chumash inhabited and later residents inherited. We document historical patterns, as well as the layers of use and modification accumulated over the past centuries, some of which is still evident today to the keen eye. We do not suggest that future restoration efforts should necessarily aim to recreate the former features discussed here, or that these

patterns should directly dictate what should or should not be done. Instead, this report seeks to provide insight into the dynamics and processes that shaped—and in many cases, continue to shape—the Ventura landscape, and to be a tool for understanding the past and imagining the future. It is a starting point for conversations about the goals and values of restoration, providing guidelines and framework for what may be desirable or possible.

The primary findings of this study are summarized below, as well as at the end of each relevant chapter. Management implications may be found at the end of each chapter. Taken together with an understanding of modern conditions, these findings can support scientists and managers working to identify restoration opportunities in the Ventura region.

Santa Clara River and Valley

1. The historical (early 1800s) Santa Clara River valley supported a diverse array of natural habitats, from the willow groves and wetlands of Saticoy Springs to the sycamores and oaks found on alluvial fans near Santa Paula and Fillmore (page 51). However, the valley floor was dominated by grassland and coastal sage scrub, with trees occurring singly or in stands and along creeks and rivers. Valley oaks were not documented in the Ventura County portion of the valley.

2. Most substantial freshwater wetland complexes occurred within the river corridor of the Santa Clara River, not on the valley floor (page 87). A rich array of aquatic habitats were found within the river corridor, including ponds, sloughs, and freshwater marshes in perennial reaches, and a suite of saline and brackish aquatic habitats associated with the estuary at the river mouth.

3. Prior to modification, most small tributaries did not connect to the Santa Clara River (page 76). With few exceptions, intermittent small creeks commonly sank into their alluvial fans before reaching the Santa Clara River, a characteristic common to many intermittent tributaries across California. Rather than maintaining defined channels all the way to the river, these creeks were connected hydrologically to the river through subsurface flow and poorly defined, transitory surface channels. Most of these creeks have now been connected to the Santa Clara River though constructed channels, increasing valley drainage density (that is, stream length per unit area).

4. From the late 19th to the early 20th century, the position of the Santa Clara River corridor remained relatively laterally stable (page 66). Inter-annual variability in the relative vegetation cover of the active channel and bottomlands is evident in the historical record, with widespread changes occurring after each major flood. However, our findings support the overall lateral stability of the river even through the St. Francis Dam break in 1928.

5. In the relatively recent geologic past, the lower Santa Clara River shifted its outlet from near Point Hueneme to its present location (page 71). While the date of this shift is not clear, it may have occurred in the past 200-500 years based on edaphic, ecological, and ethnographic evidence. This shift is reflected in historical alkalinity patterns on the Oxnard Plain (see page 177).

6. The Santa Clara River was an interrupted perennial stream, with alternating perennial and intermittent (summer dry) reaches (page 77). Only two intermittent reaches were clearly documented on

the river, near Saticoy and Piru (though additional intermittent reaches may have been present). The location of perennial reaches was informed by a variety of factors, including artesian influence, tributary inputs, valley narrowing, and geologic constraints. Many of these factors continue to affect surface flow patterns today.

7. The Santa Clara River supported a diverse mix of riparian species, including trees such as sycamore, live oak, willow, cottonwood, box elder, and alder; scrub species such as scalebroom, buckwheat, mulefat, golden-aster, sagebrush, black sage, and cactus; and understory species such as wild grape and wild blackberry (page 83).

8. Dense, persistent riparian forest and in-channel wetlands occurred in discrete patches along the Santa Clara River (page 85). Rather than a continuous corridor, willow-cottonwood riparian forest was found at a few notable locations along the river, corresponding with areas of rising or perched groundwater. Other reaches supported a different matrix of non-vegetated riverwash, willow scrub, mulefat, and alluvial scrub. This longitudinal heterogeneity tied to patterns in groundwatersurface water interactions suggests that different restoration targets are appropriate for different reaches. It suggests nodes for riparian forest restoration centered around former persistent wetland riparian areas, as well as a focus on maintaining the water resources (rising groundwater) that would support these habitats.

9. Alluvial scrub was a likely component of the driest portions of the Santa Clara River (page 92). While more research is needed, compiled data suggest that alluvial scrub is a more suitable riparian restoration target for drier reaches (notably the Piru reach) than riparian forest.

10. Live oaks and sycamores occurred frequently on the Santa Clara River river outer banks (page 85). Numerous live oaks and sycamores were documented on high banks on the edge of the river corridor. Live oaks and sycamores documented within the river corridor occurred largely in Santa Paula and Sespe creeks (likely on higher bars or islands) and as individuals within large areas of willow-cottonwood forest on the mainstem Santa Clara River.

Ventura River and Valley

1. The historical Ventura River valley supported a diverse array of natural habitats, including valley freshwater marsh, grassland, coastal sage scrub, oaks, and sycamores (page 124). While we were unable to map the valley floor in detail, our data indicate a broad transition from grassland in the lower valley (Avenue area) to predominantly oaks, sycamores, and scrub above Foster Park to Matilija Dam. As in the Santa Clara River valley, valley oaks were not documented anywhere in the valley. Only one wetland feature was documented on the valley floor within the study area (not including Mirror Lake).

2. Most substantial freshwater wetland complexes occurred within the Ventura River corridor. Aquatic habitats such as ponds, sloughs, and freshwater marshes were likely found in many perennial reaches (page 138), and a suite of saline and brackish aquatic habitats was associated with the estuary at the river mouth.

3. The Ventura River supported a broad range of riparian species, including trees such as sycamore, live oak, willow, cottonwood, box elder, alder, and walnut; understory species such as wild grape, wild rose, and wild blackberry; and mulefat and alluvial scrub species (page 138).

4. Unlike on the Santa Clara River, live oaks and sycamores were common within the river corridor of the Ventura River (page 138). While on the Santa Clara River live oaks and sycamores were almost exclusively found bordering the river's high (outer) bank, both trees were common on benches, bars, and islands in the Ventura River channel, particularly in the intermittent Oak View reach.

5. The Ventura River mouth has shifted location numerous times over the past several hundred years, from the hills west of the river mouth to Figueroa Street in Ventura. Many of these former river mouth areas are still susceptible to flooding (page 130). A brackish lagoon, formerly at the site of what is now the Derby Club across from Seaside Park, marked the route of one of these former river mouths.

6. The Ventura River was generally perennial for much of its length (page 135). The uppermost reach (below the present-day location of Matilija Dam) consistently supported year-round surface water, as did the lower half of the river (below the San Antonio Creek confluence). In contrast, the middle reach, through the western Ojai Valley and downstream of Oak View, was typically dry during the summer. The precise extent and location of summer water fluctuated in response to annual variations in rainfall and runoff.

Oxnard Plain

1. The Oxnard Plain supported a diverse array of habitats, from the freshwater wetlands and lakes of the lower Calleguas watershed to the alkali meadows and flats, grassland, coastal sage scrub, and chaparral of the broader plain (page 174). Just under half of the plain supported alkali meadows and alkali flats, with the remainder mostly covered by grassland and coastal sage scrub.

2. The distribution of these habitats reflected underlying physical processes and characteristics (page 163). Topography, soils, geology, and groundwater availability were primary factors in determining historical habitat distribution.

3. Few trees were found on the Oxnard Plain (page 174). Only a small number of trees were documented on the plain by 19th century observers, mostly sycamores (and one live oak) on the sand and sandy loam soils marking the former route of the Santa Clara River to Point Hueneme.

4. Few streams traversed the Oxnard Plain, particularly in its western portion (page 167). The plain was notable for its extremely low drainage density (only 1.7 miles of creek per square mile). The few creeks and barrancas that did cross the plain were almost exclusively discontinuous, sinking into coarse alluvium or spreading into and across seasonally wet alkaline areas. Large sloughs such as Revolon Slough (a former channel of the Santa Clara River) formed the backbone of drainage for the central plain.

5. Calleguas Creek did not maintain a defined channel across the Oxnard Plain, instead spreading into a broad wash around presentday Highway 101 before re-emerging downslope near Conejo Creek (page 168). The creek terminated in a lake and distributary system near the current location of CSU

Channel Islands. Calleguas Creek was hydrologically connected to Mugu Lagoon through shallow sloughs and sheet flow during floods.

6. Calleguas and Conejo creeks were intermittent on the Oxnard Plain (page 168). Though sources describe readily available water located below the surface in both creek beds, they are consistently described as dry for much of the year.

7. Sources document a concentration of perennial freshwater wetlands, ponds, and lakes along the eastern margin of the Oxnard Plain, particularly east of Conejo and Calleguas creeks (page 182). The majority of these wetlands occurred near the base of small alluvial valleys of creeks tributary to Calleguas and Conejo creeks, near contacts between alluvial deposits and the Conejo Volcanics of the western Santa Monica Mountains.

Ventura County Shoreline

1. A diversity of coastal systems characterized the Ventura shoreline, each with differing habitat patterns and hydrologic dynamics (page 191). The overall habitat distribution is well documented, though available historical sources only begin to indicate the range of coastal processes that created these patterns, from Mugu Lagoon to the backbarrier lagoons, dunes, salt flats, and tidal marshes of the Oxnard Plain.

2. Coastal wetland habitats covered about 4,300 acres, accounting for a large proportion of former Ventura County wetlands (page 191). Differences in freshwater input, extent of vegetative cover, and closure regime led to varying support functions for native fish and wildlife.

3. Three distinct types of coastal estuarine systems characterized the Ventura County shoreline: the freshwater-brackish, intermittently or seasonally closed estuaries of the Ventura and Santa Clara rivers; the non-tidal lagoon complexes marking former Santa Clara River mouths; and the large, more tidally-influenced wetland system at Mugu (page 191).

4. The Ventura and Santa Clara River estuaries were periodically open to the Pacific Ocean (page 194). Regular, seasonal cycles of closure were documented for the Santa Clara River mouth. The Ventura River mouth closed only occasionally (less frequently than the Santa Clara River), reflecting its greater historical volume of summer flow in the lowest reach, steeper channel gradient near the mouth, and lesser wave exposure.

5. The estuaries of both rivers also shared similar habitat mosaics (page 194). Both rivers had fairly compressed estuaries, with the relatively limited saline and brackish wetland habitat near their mouths bordered by extensive freshwater habitats, most notably the willow-cottonwood forest and wetland documented at both mouths.

6. McGrath Lake is a regionally significant feature, unique because of its persistence over the past centuries and its freshwater character (page 203). Though the lake has persisted, its location has shifted substantially since the mid-1850s; only a small portion of its current area overlaps with its historical extent.

7. An extensive suite of marsh, salt flats/pannes, and lagoons stretched from south of the Santa Clara River to the western edge of Mugu Lagoon (page 205). Prior to drainage and agricultural expansion, these systems were a significant component of the Ventura County shoreline. They exhibited a range of habitat patterns based on variable salinity gradients and hydrologic inputs, from the spring-fed brackish Laguna Hueneme to the hypersaline Salinas near Point Hueneme.

8. Mugu Lagoon was the largest wetland complex in Ventura County, and the site of a broad range of coastal wetland habitats, including salt and brackish marshes, large salt flats, and extensive tidal channel networks (page 225). Dominant habitat cover was tidal marsh. There is some indication that the complex formerly extended substantially further inland than currently recognized. Its acreage has been dramatically reduced.

9. Salt flats and high marsh transition zone were major components of Mugu Lagoon (page 228). These transitional, high elevation habitats were particularly characteristic of the semi-arid climatic setting (Ferren et al. 2007), and have been disproportionately lost from this system. These features likely provided breeding habitat for shorebirds such as least tern and snowy plover (as small present-day remnants still do), as well as an inland migration zone for tidal marsh transgression in response to naturally rising sea level in the past.

Full Text

ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/662_VenturaCo_HistoricalEcology.pdf