

Developing a Program to Prioritize the Purchase of Agricultural Easements to promote Floodplain Conservation Strategies along the Santa Clara River

2013 Group Project Proposal



Group Members:

Jon Montgomery

Lili Prah

Peter Shellenbarger

Whitney Wilkinson

Faculty Advisor:

Robert Wilkinson

Abstract

The goal of this project is to prevent structural flood control along the lower Santa Clara River by strategically purchasing agricultural easements within the 500-year floodplain. The lower Santa Clara River is one of the last major rivers in southern California without significant human alteration and channelization. This lack of alteration can largely be attributed to the agriculture industry that occupies the floodplain. The Santa Clara River's floodplain, which includes these agricultural lands, provides habitat for several threatened and endangered species. Population growth and urban sprawl, however, are increasing pressure to develop these agricultural lands near the river's floodplain that currently provide flood control without extensive use of levees. The Nature Conservancy (TNC), with assistance from a variety of stakeholders and interest groups, has secured funding to implement the Natural Floodplain Protection Program (NFPP). The goal of the NFPP is to acquire agricultural easements on key parcels within the Santa Clara River's 500-year floodplain to ensure the continuation of flood protection benefits that these agricultural lands provide, while also discouraging future development and levee construction. This project will prioritize the purchase of agricultural parcels by developing a model that incorporates land value, floodplain benefits, and other hydrological, ecological, political, and socioeconomic factors.

Table of Contents

Abstract	i
Glossary	1
Executive Summary	2
Project Objectives	3
Project Significance	4
Background Literature Review	6
History of the Santa Clara Watershed.....	6
Hydrology.....	7
Relevant Policies and Regulatory Authority	10
Conservation Status of the Watershed	12
Approach	14
Literature Review.....	14
Conceptual Model	14
Informational Interviews	15
Data Collection	15
Results and Analysis	16
Management Plan	17
Group Structure and Management.....	17
Expectations.....	17
Conflict Resolution	18
Client and Stakeholder Interaction	18
Deliverables	19
Milestones	20
Opportunities for links with outside advisors and professional community	22
Expected Budget	22
Budget Justification	22
References Cited	23

Glossary

FWG	Floodplain Working Group
GOD	Guidelines for Orderly Development
NFPP	Natural Floodplain Protection Program
NRCS	Natural Resources Conservation Service
SCGPT	Santa Clara Group Project Team
SCP	Santa Clara Parkway Project
SCREMP	Santa Clara River Enhancement and Management Plan
SOAR	Save Open Space and Agricultural Resources
TNC	The Nature Conservancy
UWCP	Upper Watershed Conservation Plan
USFWS	US Fish and Wildlife Service
VCRCD	Ventura County Resource Conservation District
VCWPD	Ventura County Watershed Protection District
CURB	City Urban Restriction Boundary

Executive Summary

The goal of this project is to prevent structural flood control, such as levees and channelization, along the lower Santa Clara River. Agricultural easements will be prioritized for purchase within the 500-year floodplain to prevent future development and structural flood control. The methodology for prioritizing parcels within the floodplain will account for land value, flood control benefits, climate change projections, and threat of development.

The Santa Clara River originates in the San Gabriel Mountains and runs 116 miles to the City of Ventura, where it flows into the Pacific Ocean. The Santa Clara River watershed lies within Los Angeles and Ventura Counties, with a majority of the upper watershed contained within both the Los Padres and the Angeles National Forests. The river is relatively undeveloped in comparison to the other major rivers in southern California. Agriculture along the lower Santa Clara River has been an important industry for several generations. The future of the river and the ecosystem services it provides are threatened by potential urban development and levee construction for flood control.

Recently, a group of local stakeholders and conservation groups have united their efforts in seeking to conserve the river's natural flood control benefits. The Floodplain Working Group (FWG), led by The Nature Conservancy (TNC), has come together to implement the Natural Floodplain Protection Plan (NFPP). The goal of the NFPP is to conserve critical parcels within the 500-year floodplain of the lower Santa Clara River to protect the ecosystem services of the natural floodplain by preventing future development and levee construction. TNC plans to purchase agricultural easements within the 500-year floodplain that would prevent future development while supporting the agriculture industry in Ventura County. Four and a half million dollars has been granted for the initial agricultural easement acquisitions. This group project will create the framework needed for purchase prioritization.

The project's approach to develop the prioritization framework will include a literature review, conceptual model development, data collection, and a multi-criteria decision analysis. Since agricultural easement programs are a relatively new floodplain conservation strategy, an extensive literature review of related programs will be conducted. Developing a conceptual model will inform data collection needed for parcel prioritization. This prioritization will be achieved using a multi-criteria decision analysis to score parcels within the 500-year floodplain for easement purchase. This framework will help TNC use the allotted funds most effectively in their goal of conserving the floodplain.

Project Objectives

- I. Literature review
 - Conduct a literature review investigating agricultural easement programs and alternative flood plain protection strategies
- II. Identification of potential prioritization factors
 - Become familiar with the local ecological, socioeconomic, and political drivers that influence development, floodplain management, and conservation in Santa Clara River Watershed to better inform the development of our prioritization model.
- III. Conceptual model development
 - Create a model that incorporates land value, flood control benefits, climate change projections, and any other potentially relevant factors that determine the lowest cost method of achieving flood control through the purchase of agricultural easements.
- IV. Prioritization Analysis
 - Use this model to conduct floodplain prioritization analysis on the lower Santa Clara River to make recommendations for the purchase of agricultural easements in the 500-year floodplain. Prioritized parcels will be scored based upon potential to protect the natural floodplain ecosystem services (flood control, water, agricultural land, habitat).
- V. Comparative Analysis
 - Use the results from our prioritization to conduct a comparative analysis with the conservation goals of other TNC projects in the Santa Clara River Watershed.

Project Significance

The Santa Clara River runs for 116 miles through Los Angeles and Ventura Counties in southern California. The river begins in the San Gabriel Mountains and runs west until it flows into the Pacific Ocean near the City of Ventura. The Santa Clara River watershed is of particular importance because of the critical ecosystem services it provides to the region. These services include economically significant flood control, irrigation water, productive agricultural land, and important habitat for many different plants and animals, including several threatened and endangered species. A key reason that the lower Santa Clara River system is able to provide these ecosystem services is that it has been left in a relatively natural state, meaning that it has avoided channelization and large-scale levee and dam development. As Ventura County grows, however, there is concern that this will change and increasing urbanization will result in a fundamental loss of ecosystem functions along with other services that the watershed provides.

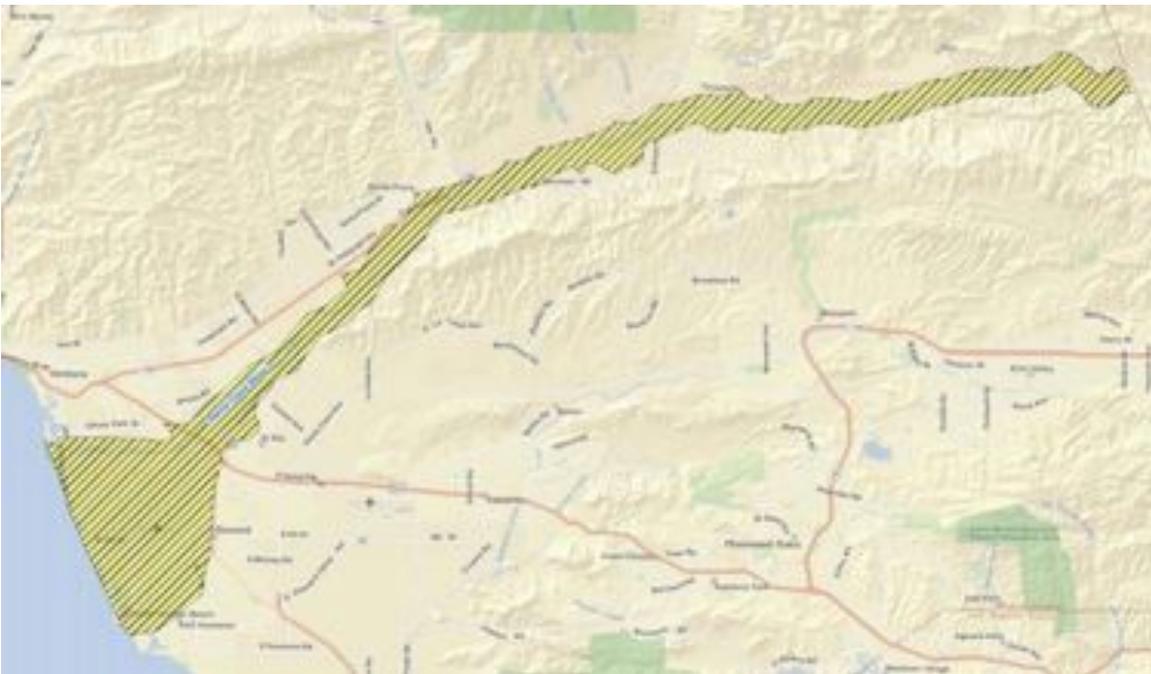


Figure 1. (DWRVC, 2011): 500-Year Floodplain of Lower Santa Clara River

This project will focus on the agricultural lands in the 500-year floodplain of the main stem of the lower Santa Clara River (west of the Ventura County line) (See Figure 1). The 500-year floodplain is defined as the flood extent that has a 0.2 percent (i.e. 1/500) chance of occurring every year (FEMA, 2012). Traditionally, the majority of this land has been used for high-value crops including citrus, strawberries, avocados, and celery. This tradition of agriculture, combined with favorable growing conditions, has made Ventura County the 10th largest agricultural producer in the United States (by total value of agricultural products sold) (USDA, 2007). Unfortunately, this agricultural tradition is now being threatened by increasing urbanization. The population of Ventura County continues to grow at a rate of about one percent per year with much of that growth occurring in urban areas (US Census Bureau, 2010). This population growth is

resulting in the conversion of floodplain agricultural land to urban development (e.g. the Bridges development in Fillmore and Adams Canyon in Santa Paula). Sprawl has been partially restricted by smart growth policies that include the Save Open Space and Agricultural Resources (SOAR) measure, a voter passed initiative, and the Guidelines for Orderly Development (GOD) in Ventura County. However, these initiatives have not prevented all development in the floodplain and agricultural lands are increasingly being converted to “ranchettes” and housing developments (TNC, 2008). Further, SOAR will need to be renewed by voters in 2020 to continue (SOAR, 2008).

This shift away from agriculture towards urban development will not only result in the loss of an important agricultural tradition, but will also result in the loss of the key ecosystem services discussed above. One of the most economically important of these services is flood control. A study conducted by the Ventura County Watershed Protection District (VCWPD) in 2011 found that protecting the 500-year floodplain from development and levee construction could result in the reduction of over \$1 billion in flood damages during a 500-year flood event, with much of the flood prevention occurring in the cities of Ventura and Oxnard (VCWPD, 2011). This study indicates that the agricultural lands on the 500-year floodplain are providing over \$1 billion in flood protection damage to the County of Ventura during a 500-year flood event and \$204 million during a 100-year flood event. This finding comes at a time when levees in Ventura County are becoming more expensive to maintain. In 2009, the VCWPD evaluated all of the Provisionally Accredited Levees (PALs) in the county. This evaluation found that 3 out of the 4 PALs on the Santa Clara River were not in compliance with the Federal Levee Certification Requirements and will require an investment of \$82.2 million to bring them into compliance (VCWPD, 2011). Because of the increasing costs of levee construction and the potential for flood control through non-structural and less expensive means, The Nature Conservancy (TNC), along with the VCWPD and its partners in the Floodplain Working Group (FWG) (the Ventura County Farm Bureau, the Ventura County Resource Conservation District, and the Natural Resource Conservation Service) have begun to investigate preserving agricultural land for flood control as an alternative strategy to levee construction and maintenance.

Our client, TNC, has committed \$4.5 million to purchasing agricultural easements in the 500-year floodplain to prevent further encroachment of urban development within the floodplain and the resulting levee construction. In this situation, agricultural easements will preclude any future development on the property in exchange for fair market compensation of those development rights. This will not only help ensure the continuation of the strong agricultural tradition of the area, but also result in millions of dollars of flood protection. Collaborating with TNC, VCWPD, and the FWG, the project team will prioritize important agricultural easements in the 500-year floodplain that will best achieve the goals of floodplain protection. Further, in accomplishing the primary goal of flood control, other elements of healthy ecosystem functioning will also be preserved along the river.

Background Literature Review

History of the Santa Clara Watershed

In the last 200 years, the Santa Clara River floodplain has undergone five distinct periods of human use and settlement: (1) pre-European colonization, (2) ranching and colonization, (3) irrigation and diversions, (4) dams and river modifications, and (5) urbanization (Stillwater Sciences, 2007). Each of these periods has had an important impact on the watershed's hydrology and land uses.

The first distinct historical period of the Santa Clara River watershed occurred prior to European colonization and ended with the arrival of the San Buenaventura mission in 1782. During this time the Ventureño Chumash occupied the lower Santa Clara River watershed and the Uto-Aztecan Tataviam inhabited the upper Santa Clara River watershed (Beller et al., 2011). The most significant land use by the Chumash consisted of using native plants in the watershed for food, shelter and other material goods. There is also speculation that the Chumash might have participated in the burning of coastal grassland as a way to create more food sources. While no direct evidence for this exists in Ventura County, the speculation exists because it has been shown that the Chumash of Santa Barbara County participated in this practice (Beller et al., 2011). Overall, the impacts of Native American settlements on the watershed are difficult to quantify and most likely negligible in comparison to those of post-European colonization.

The second distinct historical period of the Santa Clara River watershed was characterized by cattle and sheep ranching. It began in 1782 with the arrival of the San Buenaventura mission and ended in 1877 with a major drought event (Beller et al., 2011). During this period, there were several major drought events resulting in changing composition and density of ranching in the watershed (Beller et al., 2011). Ranching had varying effects on the watershed, depending upon varying livestock species populations, extent, and graze land location. Overall, ranching changed vegetation cover and hill slope erosion rates (Stillwater Sciences, 2007).

The third distinct historical period was defined by the shift from cattle and sheep ranching to agriculture. This shift came as a result of the large-scale ranching failures from the 1877 drought. This period lasted from 1877 to around 1955 (Stillwater Sciences, 2007). This shift initially began with the planting of lima beans, sugar beets, and barley. In the 1890s fruit and walnut trees began to replace these crops and increasingly became the dominant crops of the region. By 1920, citrus had become the dominant crop of the region (Beller et al., 2011). As agriculture began to intensify, so did the region's use of ground and river water. This increased demand manifested itself into the building of diversions throughout the Santa Clara River to irrigate agricultural lands. By the early 1900's, over 16,000 acres were irrigated by the Santa Clara River (Schwartzberg & Moore 1995). Levees and small dams were also built during this period, altering groundwater recharge and surface flow dynamics (Stillwater Sciences, 2007). This period helped establish the Santa Clara River floodplain as an important

agricultural force and sparked the push to manage the river for agricultural use.

The fourth distinct historical period is defined by river modification projects. This period lasted from 1955 to 1990 and is characterized by increased use of dams and river modifications such as diversions and levees (Stillwater Sciences, 2007). During this time the Santa Felicia dam was built in the Piru Creek watershed, additional levees and bank protection were built in the lower reaches of the Santa Clara River, and aggregate mining took place all along the floodplain. Overall, this resulted in decreased sediment fluxes and runoff flows, river incision, and river confinement (Stillwater Sciences, 2007).

The final distinct historical period is defined by urbanization of the watershed. Population growth and a prosperous agriculture industry have continued throughout the history of the watershed. However, development pressure has resulted in increased conversion of agricultural land to urban uses (Stillwater Sciences, 2007). This has had and will continue to have large effects on the watershed, in terms of both shifting dynamics of river hydrology and changing priorities on the landscape.

Hydrology

The Santa Clara River is one of the last major rivers in southern California that has avoided channelization, extensive development, and major loss of ecosystem functions. Other southern California rivers, such as the Los Angeles and Santa Ana Rivers, have had their channels and banks paved with concrete and include major levee systems to manage flood risk to the extensive adjacent development. The Santa Clara River Watershed drains an area of approximately 1,626 square miles, making it one of the largest watersheds on the southern California coast. It changes in elevation from sea level at the coast to 2,692 m (8,832 feet) in the San Gabriel Mountains (Stillwater Sciences, 2007) (Figure 2). The San Gabriel Mountains border the watershed to the east, and the Santa Ynez Mountains and Tehachapi Mountains to the north. The river is managed by multiple agencies including the State Department of Water Resources through the State Water Project (Piru and Castaic reservoirs), the State Water Resources Control Board, the Ventura County Watershed Protection District, and the Federal Emergency Management Administration (FEMA). In addition, Sespe Creek, a tributary to the Santa Clara River is designated as a National Wild and Scenic River. This program is administered and necessitates coordination among a myriad of federal agencies including the Bureau of Reclamation, US Forest Service, US Fish and Wildlife Service, and the National Parks Service (Interagency Wild and Scenic Rivers Coordinating Council, 1999).



Figure 2. (Stillwater Sciences, 2008): Santa Clara River Watershed

Flow and Sediment Load

Tectonic uplift in the region coupled with erodible geology and soil types has resulted in significant geological instability, contributing to high rates of erosion throughout the watershed. The Santa Clara River’s flow is highly variable because of the region’s semi-arid Mediterranean climate. In the rainy season (November through March) river flows increase, peak, and subside rapidly depending on the intensity of rainfall events. Total annual rainfall can vary greatly within a particular year and between years. This results in intermittent or non-existent flows in many tributaries during the summer months. In the main stem of the river, flow depends on the geologic conditions that govern groundwater-surface water interactions (Stillwater, 2007).

The lower Santa Clara River is supplemented by controlled flow releases from Piru Reservoir and Pyramid Lake. Despite this, large flow variability still exists because dams regulate only 34% of the watershed (Stillwater, 2007). This variability has influenced the evolution of species to be highly adapted to the watershed flow regime and permits the survival of a complex matrix of aquatic and riparian habitats in the watershed that support a number of endangered and threatened species, including a remnant run of endangered southern steelhead (*Oncorhynchus mykiss*) (NMFS, 2012). The episodic and extreme nature of flow in the Santa Clara River results in the majority of total sediment transport occurring in very short periods of time. This naturally

episodic sediment flux is an important factor in the reproduction, foraging behaviors, and life histories of many species (Stillwater, 2007).

Tributaries

Tributaries of the Santa Clara River include Santa Paula, Sespe, Hopper, Piru, Castaic, San Francisquito, and Bouquet Canyon Creeks (Figure 2). Approximately 85% of the flow that exits the mouth of the Santa Clara River comes from a combination of these tributaries and the upper Santa Clara River (URS, 2005). Numerous barrancas (small, generally incised tributary streams) and ephemeral creeks make up the remaining 15% of river flow. The flow regime in the tributaries is similar to the main river course, remaining relatively small except during high-intensity, short-duration storm events (Stillwater Sciences, 2008). Piru and Castaic Creeks are supplied in part by the State Water Project and store water in reservoirs behind the Santa Felicia and Castaic Dams respectively. The Bouquet Canyon Dam and reservoir provide water to the Los Angeles Aqueduct System (Barker, 1987).

Levees

Since the 1950's when major levee construction first began in Ventura County, there has been a progressive increase in the extent of bank protection along the Santa Clara River. At this time, 33% of the total length of the Santa Clara River has some form of bank protection (URS, 2005). Levees, a form of bank protection, act to confine high discharges and to significantly reduce the width of the river during large flood events. Levees are vulnerable to damage and scour during repeat large flood events (e.g., January and February 1969; January and February 2005). Recently, the perception of levees has changed and their apparent disadvantages have made the construction of new levees and the maintenance of existing ones less desirable. This is largely due to their ability to train the river course in unnatural alignments during flood events. Flood flows can be reflected off of levee walls, causing scour and erosion on an opposite unprotected bank. Additionally, because levees confine flood flows in channel, they increase the chance of bed erosion during flood events but can also promote extensive sediment deposition as the flood recedes. Levees are likely increasing rates of channel incision by confining flood events to a narrow path, rather than allowing overbank flooding to occur causing higher velocity and scour (Stillwater Sciences 2007). In the Santa Clara River, the net effect of levees is channel bed incision, which is made worse by channel knickpoint development and upstream migration caused by aggregate mining (Stillwater Sciences 2007).

An example of the costly nature of levee maintenance is the decertification of Levee Santa Clara River-1 (SCR-1) by the Army Corps of Engineers in 2009. Certification entails the Army Corps of Engineers or some other qualified engineer concluding that there is less than a one percent chance in any year that a flood will break through or wash over a levee. The SCR-1 Levee System is approximately 4.72 miles long and is located along the southeast bank of the Santa Clara River between Highway (Hwy) 101 and Saticoy in the City of Oxnard. The estimated cost of rehabilitation work required for recertification is \$45 million (Wenner, 2011). Because of the high costs of recertification,

the required work has not yet been conducted and these levees remain decertified (ACOE 2012).

Setback Levees

Additional flood-control projects such as setback levees have been proposed for the lower Santa Clara River. Setback levees are constructed at some distance away from the main river channel. This allows the natural state of the floodplain between the river's edge and the setback levee to recover (Mount, 1995). Setback Levees provide flood protection while still providing lateral connection between the river and its floodplain, thus allowing the river's natural sediment transport and flow to function in a more natural manner (Stillwater Sciences, 2011). Levee setback or removal can involve the active or passive removal of existing channel confining levees, construction of setback levees away from the river channel, recontouring the floodplain to bring the floodplain elevation closer to the channel elevation, and/or removal or modification of infrastructure (Stillwater Sciences, 2011).

Analysis conducted on the potential development of setback levees showed that siting levee setbacks on the North Bank and South Bank parcels would provide the most benefit on the Santa Clara River (Stillwater Sciences 2011). These parcels are within approximately six miles of the river mouth, would provide the most flood risk benefit, and include the largest extent of floodplain available for geomorphic and ecological restoration (Stillwater Sciences, 2011).

Aggregate Mining

Between the Second World War and the 1970's, the aggregate mining industry grew along the banks of the Santa Clara. However, these operations ceased in Ventura County in 1989 due to its impacts on the river such as river incision, which threatened to undermine bridges, irrigation facilities, and other infrastructure (Stillwater, 2007). Incision from mining-related activities is still visible in the channel today.

Relevant Policies and Regulatory Authority

The Ventura County Watershed Protection District (VCWPD), an independent management district that oversees watershed planning and management within Ventura County, has jurisdiction over the Santa Clara River Watershed in Ventura County. VCWPD is administered by its Board of Supervisors and oversees the implementation of county ordinances governing the protection and regulation of flood control facilities and watercourses. The VCWPD also administers floodplain management on behalf of Ventura County to ensure compliance with the National Flood Insurance Program. This includes permit review authority for structures and other developments built within or that include identified floodplains. For incorporated jurisdictions, each city designates a floodplain manager for its sphere of influence. The Cities with floodplain jurisdiction over the Santa Clara River are Ventura, Oxnard, Santa Paula, and Fillmore (VCWPD, 2011).

Urban Growth and Land-Use Policies

Two of the major urban growth policies in Ventura County are the Guidelines for Orderly Development (GOD) and the Save Open-space and Agricultural Resources (SOAR) initiative. GOD is the framework used by the county and its cities to work together in planning urban development projects. The guidelines encourage urban development within incorporated cities whenever possible (County of Ventura, 2009a).

SOAR is a voter-passed initiative meant to encourage smart growth within the county and its cities. First implemented in the City of Ventura in 1995, the main goal of the SOAR initiative is to keep urban development within clearly defined urban footprints delineated by City Urban Restriction Boundary (CURB) lines and to prevent sprawl outside those boundaries. This is accomplished by requiring any development or rezoning of lands outside the CURB lines to be authorized by voters. The SOAR initiative has been passed by Ventura County and 8 of its 10 cities, including the four major cities along the Santa Clara floodplain: Santa Paula, Fillmore, Oxnard, and Ventura. This means that in each of the cities changing of CURB lines must be approved by voters of that city, and rezoning of farmland in the county must be approved by a countywide ballot (SOAR, 2008).

While SOAR has been successful in many respects, it has some limitations in its ability to preserve open space and farmland. First, it has no way of addressing the threat of “ranchettes”, which is when single 10-acre farms are bought as a single parcel and converted from farmland to residential use without triggering a SOAR vote. Second, expansion of SOAR boundaries can be and have been approved by voters. In Santa Paula, for example, two major ballot initiatives to expand CURB lines have resulted in 8,000 acres being added for two major housing developments near the city. Finally, the SOAR initiatives throughout Ventura County will begin to expire in 2020, after which reauthorization must be procured to continue protection (SOAR, 2008).

There are two major land-use policies in Ventura County whose purposes are to protect farmland and open space: the Land Conservation Act (LCA) and Greenbelt agreements. The LCA, or Williamson Act, gives farmers tax breaks in exchange for keeping their land in agricultural production. Farmers enter a self-renewing contract for a period of at least 10 years. This means that a contract is always in its first year unless non-renewal of the contract is initiated at which point there would be 9 years left of the contract. In 2008, Ventura County had 128,900 acres in LCA, with a large portion of that near the Santa Clara River (County of Ventura 2009b).

Greenbelt agreements are made between the county board of supervisors and individual cities in Ventura County. These agreements encourage “greenbelts” between cities by preventing them from annexing any property within a greenbelt and forcing the county to restrict development to uses consistent with existing zoning. Greenbelt agreements exist along the Santa Clara River between the following cities: Ventura-Santa Paula, Santa Paula-Fillmore, and Fillmore-Piru (County of Ventura, 2010). While both LCA and Greenbelts discourage development between the cities along the lower

Santa Clara River, they both have inherent limitations that prevent complete protection in perpetuity of agricultural lands from urban sprawl.

Conservation Status of the Watershed

Since the Santa Clara River is one of the last unchannelized, natural rivers in southern California, the watershed has been targeted for conservation by many organizations. The watershed is home to over 117 endangered, threatened, or sensitive floral and faunal species (South Coast Wildlands, 2010). Most of the river's watershed is contained within the Los Padres National Forest, the Angeles National Forest, and the San Gabriel Mountains. Conservation efforts have been focused on the linkages between these protected areas, as well as the river itself.

The Coastal Conservancy and US Fish and Wildlife Service (USFWS) together developed the Santa Clara River Enhancement and Management Plan (SCREMP). SCREMP, driven by a diverse group of stakeholders and interest groups, served to guide the preservation and management of the river's 500-year floodplain. SCREMP has released recommendations on a variety of floodplain-related topics from public outreach to invasive species removal. With help from local agencies, many of SCREMP's recommendations have been implemented (Stillwater Sciences, 2008).

Another major conservation project headed by the California State Coastal Conservancy is the Santa Clara Parkway Project (SCP). For this project the Coastal Conservancy partnered with TNC, Friends of the Santa Clara and a group of local stakeholders. The goal of the SCP is to conserve and restore the riparian and aquatic habitats of the Santa Clara River while also providing enhanced floodplain protection (The Santa Clara River parkway). The Santa Clara River Parkway Floodplain Restoration Feasibility Study was created by Stillwater Sciences (2007 & 2008) to help aid the Coastal Conservancy and its partners in achieving their floodplain conservation goals. The Feasibility Study highlights a variety of conservation strategies such as invasive species removal, land acquisition, levee removal, and revegetation.

Along with the Coastal Conservancy, The Nature Conservancy has been heavily involved in conservation initiatives along the Santa Clara River and its watershed. Conserving the Santa Clara River watershed is a primary focus of TNC's LA/Ventura project. TNC has already purchased almost 3,000 acres along the river (Department of Water Resources [DWR], 2011).

Several documents have aided TNC's conservation goals for the Santa Clara River. A study from the Bren School (2000) examined endangered and threatened species habitat along the river and prioritized parcels for land acquisition using funds from the ARCO spill settlement (Court et al., 2000). In 2006, TNC published the Upper Watershed Conservation Plan (UWCP) for the Santa Clara River. In the UWCP, TNC highlighted the most important conservation targets, strategies, and threats. Conservation targets included six diverse vegetation communities, aquatic vertebrates, and wide-ranging terrestrial vertebrates. Land acquisition, invasive species removal,

and land-use planning are emphasized in the UWCP as the conservation strategies that are best fit for the Upper Watershed. These strategies were chosen based on their ability to conserve the identified conservation targets (The Nature Conservancy [TNC], 2006). Following the 2006 UWCP, TNC published the Conservation Plan for the Lower Santa Clara River Watershed and Surrounding Areas (LWCP) that also highlights important conservation targets and strategies (TNC, 2008).

As highlighted in the UWCP and LWC, TNC's main strategy for conservation along the Santa Clara River includes land acquisition and land-use planning. The Natural Floodplain Protection Project (NFPP) is the next stage in TNC's Santa Clara River Conservation initiative.

Approach

The Santa Clara Group Project Team (SCGPT) will be working with TNC to develop a model for prioritizing agricultural easements that promote floodplain conservation strategies along the Santa Clara River in Ventura County. The SCGPT will develop a prioritization model that uses biological, ecological, hydrological, social, economic, and historical parameters to identify parcels for agricultural easements promoting the ecosystem services of the natural floodplain. Through a literature review, conceptual modeling, informational interviews, and data collection, the SCGPT will create and run a prioritization model. This prioritization model will promote the ecosystem services of the 500-year floodplain on private lands by limiting levee construction. Analysis of results will allow the SCGPT to develop a scoring system for parcels that will indicate specific parcels that best provide natural floodplain management within the 500-year floodplain. Given TNC's initial project budget constraint of \$4.5 million, the results from this analysis will inform the organization on the best locations for easement purchases in the floodplain. The following steps will comprise the project approach:

Literature Review

A literature review will be performed to investigate the biological, ecological, hydrological, social, economic, and historical attributes of the Santa Clara River floodplain. Reviewing existing reports developed by TNC and affiliated groups will allow the SCGPT to create a model that best incorporates the parameters above.

The literature review will focus in detail on:

- Studies examining similar areas where agricultural easements have been successful in promoting floodplain conservation.
- Studies quantifying economic value of cropland and associated ecosystem services along the Santa Clara River and similar watersheds.
- Conservation plans and restoration studies for the Santa Clara River and similar ecosystems.
- Past and present hydrological analyses of the lower Santa Clara River.
- Alternative approaches to floodplain management other than agricultural easements.
- Studies focusing on the historical and predicted social, economic, and ecological impacts of large flooding events have on surrounding areas along the Santa Clara River.

Conceptual Model

The SCGPT will meet with external advisors with expertise in conservation, hydrology, environmental modeling, environmental policy, and environmental economics to develop a conceptual model to specify the type and extent of data needed to complete the deliverables of the project. Creating a conceptual model will enable the SCGPT to effectively search for appropriate data and will ultimately allow the team to prioritize easement parcels in the lower Santa Clara River.

Informational Interviews

Informational interviews with the Floodplain Working Group as well as state and local governments and agencies will be conducted to collect data for model development and analysis. The Flood Plain Working Group consists of the Ventura County Watershed Protection District (VCWPD), Ventura County Farm Bureau, Ventura County Resource Conservation District (VCRCD), Natural Resources Conservation Service (NRCS), and The Nature Conservancy (TNC). The team will interview the VCWPD and Ventura County Farm Bureau on the requirements and needs for levees along the lower Santa Clara River floodplain, other methods to protect infrastructure and investment along the floodplain, and ultimately identify ways to discourage the construction of levees within the 500-year floodplain. Additionally, information regarding current and future conservation efforts will be identified when contacting the VCRCD, NRCS, and TNC. With the insight from these informational interviews, the SCGPT hopes to understand how each member of the FWG and other local agencies make decisions regarding conservation and development given policy, resource, and budget constraints.

Data Collection

TNC has provided the SCGPT with data pertaining to:

- Current conservation land purchases along the Santa Clara River
- Future parcels that TNC is already considering for purchase to meet conservation goals (2008 Conservation Action Plan)
- Physical extent of 50-, 100-, and 500-year flooding events and their associated socioeconomic impacts along the lower Santa Clara River (Hydraulic Impact Analysis of Santa Clara River Floodplain Protection Program)
- Agricultural land value estimates in Ventura County for 2012 (Ag Land 2012 trends)

The SCGPT will collect and organize data pertaining to:

- Parcel land values from the Ventura County Assessor's Office
- Crop values for individual parcels along the 50-, 100-, and 500-year floodplain
- Sea-level rise prediction for the Santa Clara River
- Municipal boundaries along the Santa Clara River
- Cost of alternative floodplain management such as levee removal, setbacks, and reinforcement
- Guidelines and requirements for levee construction along the Santa Clara River
- Costs of past agricultural easements for parcels along the Santa Clara River
- Extent of parcels along the Santa Clara River that are located within the 500-year floodplain

Prioritization Modeling

With the assistance of external advisors, the SCGPT will develop a model for identifying prospective parcels for obtaining agricultural easements, taking into account the following parameters to determine the priority for acquisition:

- Cost of agricultural easements of parcels within the focus area
- Extent of the 500-year floodplain within each parcel

- Connectivity and spatial arrangement of parcels
- Prioritized land for development by Ventura County
- Sea-level rise and its impact on floodplain management
- Any additional relevant parameters that may arise

The SCGPT will run a multi-criteria decision analysis to prioritize the parcels in the watershed. From this analysis, the team will score identified parcels for TNC based on their potential for floodplain protection. Correctly weighting each parameter in the model is important and will allow the SCGPT to decipher how different floodplain characteristics ultimately influence prioritizing parcels in the region. These weights will be determined through analysis from literature reviews, informational interviews, and data collection by the SCGPT.

Results and Analysis

Results from the model will allow the SCGPT to score individual parcels along the lower Santa Clara River in terms of their potential to protect natural floodplain ecosystem services. Using an optimization program such as Solver, the SCGPT will present a map of scored parcels along the lower Santa Clara River. TNC will use this prioritization map to make informed decisions about which parcels to acquire. Additional analysis will be conducted by varying weights of parameters in the model, addressing overlap between our results and existing conservation projects in the area, and identifying overlap with urban growth boundaries. A sensitivity analysis varying easement cost and floodplain parameters may also be used to identify how prioritized parcels for agricultural easement purchases change related to cost and flooding events. Further analysis will be completed examining the linkages between existing conserved lands, migratory corridors for local species, habitat, and agricultural easements. This analysis will include the impact of agricultural easement purchases for floodplain management on existing TNC programs that already are purchasing land along the Santa Clara River for restoration and conservation. Economic comparisons will be conducted between floodplain easement methodology and traditional floodplain protection methods like levees.

Management Plan

Group Structure and Management

Faculty Advisor: Robert Wilkinson

External Advisors: Derek Booth, Frank Davis, & Charlie Kolstad

Group Members: Jon Montgomery, Lili Prah, Peter Shellenbarger, & Whitney Wilkinson

Client: The Nature Conservancy (LA/Ventura Project)

- E.J. Remson - Senior Program Manager
- Lily Verdone - Project Director
- Sophie Parker – Eco-regional Ecologist
- Josh Spies - Land Manager

Project Roles

Project Manager: Jon Montgomery

Project manager will help in keeping the group on track by setting deadlines and tracking progress. Project manager will schedule and plan agendas for meetings.

Financial Manager: Peter Shellenbarger

The financial manager will handle the group's financial needs and bookkeeping. An excel spreadsheet will be created and handled by the financial manager.

Web Manager: Whitney Wilkinson

The web manager will be the group's primary web designer, leading the task of website creation. After the website is created, the web manager will be responsible for updating and maintaining the group website.

Data Manager: Lili Prah

The data manager will take primary responsibilities related to the groups managerial data needs. The data manager will ensure that data is properly organized, remains secure, and is available as needed. As well, the data manager will be responsible for the group's email alias.

Expectations

Group Member Expectations

Group members are expected to attend all group meetings. If for some reason a group member cannot attend a group meeting, they will take appropriate measures to both inform other members prior to the meeting and review the missed meeting's material. Group members are expected to complete assigned tasks by the agreed upon deadlines.

Faculty Advisor Expectations

The Faculty advisor will attend weekly group meetings whenever possible and additional meetings at the request of the group.

Meeting Expectations

During the school year meetings will be held at least once a week and attended by all group members. Minutes will be recorded and distributed to all attendees by email afterwards.

Conflict Resolution

All group members will conduct themselves in an appropriate courteous manner during all group project functions. If any issues arise between project members and a resolution cannot be reached between the two parties the issue will be brought to the attention of the project manager. If the project manager cannot resolve the issue or is a party in the issue, the issue will be brought to the attention of the faculty advisor.

Client and Stakeholder Interaction

Any interaction with the client or other stakeholder will be conducted with the utmost professionalism and respect. All group members are to be informed of and included in all email communications with the client or stakeholders.

Deliverables

- I. Proposal**
This will include a clear summary of goals and objectives, planned approach, and a timeline in which to complete the project.
- II. Poster**
This will present the key concepts and findings behind our project
- III. Final Written Report**
This will include a stand-alone document that includes all relevant figures and maps as well as a robust and fully repeatable methodology. The report will also include a comprehensive literature review summarizing the relevant strategies and success stories from prior studies.
- IV. Data package**
This will include any relevant model and GIS data.

Milestones

Spring 2012		
Tasks	Approximate Start Date	Deadline
Proposal Draft	May 1st	May 24th
Peer Feedback	May 24th	May 31st
Final Draft of Proposal for Advisory Committee	May 31th	June 7th
Proposal Review Meeting with Faculty Advisors	N/A	June 14th, exact date TBD
1 Page Summary of Proposal Review Meeting due to Faculty Advisor	N/A	June 15th
Peer and Self Evaluations	N/A	June 15th
Final Proposal	May 31st	June 15th
Create Project Website	May 21st	June 15th
Tour Santa Clara River with TNC Staff	N/A	June 11th

Summer 2012		
Tasks	Approximate Start Date	Deadline
TNC Internships	June 18th	September 14th
Literature Review of Agricultural Easement Programs	June 18th	December 14th

Fall 2012		
Tasks	Approximate Start Date	Deadline
Develop Model	September 27th	October 31st
Progress Reviews	November 1st	November 9th
Written Progress Report	December 1st	December 14th
Peer/Self Evaluations	N/A	December 14th

Winter 2013		
Tasks	Approximate Start Date	Deadline
Draft of Final Report	November 1st	February 22nd
Project Defense	November 1st	February 22nd or March 1st
Presentation Program Abstract	February 22nd	March 8th
Final Report (pdf)	November 1st	March 22nd
Project Brief (pdf)	March 1st	March 22nd
Project Poster	February 1st	March 22nd
Peer, Self, and Advisor Evaluations	March	March 22nd

Spring 2013		
Tasks	Approximate Start Date	Deadline
Take Group Photo w/ Faculty Advisor to use in Final Presentation	N/A	1-2 weeks before presentation
Submit PowerPoint presentation to Faculty Advisor for review	N/A	1-2 weeks before presentation
Group Project Presentation	N/A	April 12th

Opportunities for links with outside advisors and professional community

Our external advisors will consist of Frank Davis, Derek Booth, and Charles Kolstad. We believe that each advisors expertise in their given field will be an invaluable asset to the team and help guide us throughout the project.

Our client, TNC, has provided us with data and resources pertaining to the Santa Clara River and surrounding communities. TNC's contacts with local government agencies and businesses along the watershed will assist the SCGPT in meeting its objectives. In addition, TNC has provided internships within the organization for two group members over the summer of 2012 in order accelerate the timeline of the project.

Expected Budget

Expenses	Amount (\$)
Final Poster/Presentation	\$300
Printing	\$200
Travel (Ventura)	\$400
Supplies	\$50
Software	\$200
Miscellaneous	\$350
Total	\$1,500

Internships with The Nature Conservancy (summer 2012): 2 with an estimated value of \$5,250 each.

Budget Justification

The Bren School has allotted our project a total of \$1,500. It is suggested that we set aside at least \$250 for our final poster/presentation and \$200 for printing. Travel expenses make up the biggest portion of our budget and consist of the group traveling to Ventura, CA to meet with our clients. Given the distance and price per mile (\$0.555 per mile) the group has set aside a budget of \$400 to allow for approximately 10 trips to the TNC office assuming one car is used. The smallest percentage of the budget has been set aside for supplies as a result of most of the project being done electronically. We have set aside \$200 in case we need to purchase optimization software for our model. The last section, miscellaneous, will act as a buffer for additional unexpected expenses involved with the project. The expected budget is uncertain; therefore the currently outlined budget allocation is subject to change as the project moves forward.

References Cited

ACOE (2012). Los Angeles District Army Corps of Engineers “Corps, County Announce Santa Clara River Levee Public Meeting.” Retrieved from:
<http://www.spl.usace.army.mil/Missions/CivilWorks/LeveeSafetyProgram.aspx>

American Society of Farm Managers and Rural Appraisers (2012). 2012 Trends in Agricultural Land and Land Values: California and Nevada.

Barker, M. (1987). “Pilot Program at Bouquet Canyon: Swimmers Test the Waters at Resrevior.” *Los Angeles Times*. June 16, 1987. Retrieved from:
http://articles.latimes.com/1987-06-16/local/me-7503_1_bouquet-canyon

Beller, EE, RM Grossinger, MN Salomon, SJ Dark, ED Stein, BK Orr, PW Downs, TR Longcore, GC Coffman, AA Whipple, RA Askevold, B Stanford, JR Beagle. (2011). Historical ecology of the lower Santa Clara River, Ventura River, and Oxnard Plain: an analysis of terrestrial, riverine, and coastal habitats. *Prepared for the State Coastal Conservancy. A report of SFEI’s Historical Ecology Program, SFEI Publication #641, San Francisco Estuary Institute, Oakland, CA.*

County of Ventura (2009a). Guidelines for Orderly Development. Retrieved from:
http://www.ventura.org/rma/planning/pdf/brochures/Guidelines_Orderly_Development.pdf

County of Ventura (2009b). Land Conservation Act (LCA) Program. Retrieved from:
<http://ventura.org/rma/planning/Programs/lca.html>

County of Ventura (2010). Greenbelt Program. Retrieved from:
<http://ventura.org/rma/planning/Programs/greenbelts.html>

Court, D., Glatzer, J., Hard, S., Keith, K., McDonald, J., Ogushi, F. (2000). Prioritizing sites along the Santa Clara River for conservation of threatened and endangered species. Bren School of Environmental Science & Management, University of California-Santa Barbara.

Department of Water Resources, Ventura County. (2011). Watersheds Coalition of Ventura County Proposition 84 IRWMP Implementation Grant, Attachment 3 - Work Plan.

FEMA (2012). Final Guidelines for Using Future-Conditions Hydrology. Retrieved from: http://www.fema.gov/plan/prevent/fhm/ft_futur.shtm

Interagency Wild and Scenic Rivers Coordinating Council (1999). “Implementing the Wild & Scenic Rivers Act: Authorities and Roles of Key Federal Agencies” *Report of the Interagency Wild and Scenic Rivers Coordinating Council*. US Forest Service. January 1999.

Mount, J. (1995). *California Rivers and Streams: The Conflict Between Fluvial Process and Land Use*. University of California Press, 376pp.

National Marine Fisheries Service [NMFS], (2012). "Southern California Steelhead Recovery Plan Summary." Retrieved from:
http://swr.nmfs.noaa.gov/recovery/SC_Steelhead/

Rivers.gov (2012). "Sespe Creek." *Wild and Scenic River, California*. Web. 23 May 2012. Retrieved from: <http://www.rivers.gov/wsr-sespe.html>

Schwartzberg BJ, Moore PA. 1995. Santa Clara River Enhancement and Management Plan Study: A history of the Santa Clara River. Prepared for the Santa Clara River Project steering committee.

Save Open-Space and Agricultural Resources (2008). At risk: Ventura County's open-space and farmlands. Retrieved from:
<http://www.soarusa.org/pdfs/At%20Risk%20Report.pdf>

South Coast Wildlands. (2010). Wildlands of the Santa Clara River watershed: restoring and maintaining the integrity and health of the river and its watershed.

Stillwater Sciences (2007). *Santa Clara River Parkway Floodplain Restoration Feasibility Study: Assessment of Geomorphic Processes for the Santa Clara River Watershed, Ventura and Los Angeles counties*. Berkeley, California

Stillwater Sciences (2008). *Santa Clara River Parkway Floodplain Restoration Feasibility Study*. Berkeley, California.

Stillwater Sciences (2011). Santa Clara River Parkway: Levee Setback Assessment of the Lower Santa Clara River, Ventura County, California. Prepared by Stillwater Sciences and cbec, Inc. for the California State Coastal Conservancy.

The Nature Conservancy. (2006). Santa Clara River upper watershed conservation plan.

The Nature Conservancy. (2008). Conservation plan for the lower Santa Clara river watershed and surrounding areas. Lacher, I., Corey, D.

The Santa Clara River Parkway. (2006). Retrieved from:
<http://www.santaclarariverparkway.org/>

United States Department of Agriculture, National Agricultural Statistics Service (2007). *2007 Census of Agriculture, County Profile: Ventura County, California*. Retrieved from:
http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/California/cp06111.pdf

United States Census Bureau. (2010). Ventura County, CA. *State and County Quick Facts*. From: <http://quickfacts.census.gov/qfd/states/06/06111.html>

URS Corporation (2005). *Water resources investigation: land use, infrastructure, hydrology, hydraulics, and water quality*. Santa Clara River Parkway Floodplain

Ventura County Watershed Protection District: Advance Planning Section (2011). *Hydraulic Impact Analysis of the Santa Clara River Floodplain Protection Program*.

Ventura County Watershed Protection District. (2011). *Watershed Protection District*. Retrieved from: http://portal.countyofventura.org/portal/page/portal/PUBLIC_WORKS/Watershed_Protection_District

Wenner G. (2011). "Oxnard's RiverPark Community might need flood insurance," *Ventura County Star*. Retrieved from: <http://www.vcstar.com/news/2011/oct/13/oxnards-riverpark-community-might-need-flood/?print=1>

Ventura County Watershed Protection District. (2011). Levee Certification Public Safety Project. Retrieved from: <http://www.vcwatershed.com/levee/>