Sustainable Water Use in the Ventura River Watershed

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INTRODUCTION

The Ventura River Watershed is one of the few watersheds in Southern California that does not import water. Local residents, farms, businesses, and ecosystems are entirely dependent on local resources to meet their water needs Because there is a limited amount of water available each year, these groups are in competition for a finite resource. Population growth, land use changes, and climate change could cause an increase in water demand or a decrease in water availability. With water already in limited supply, these changes may result in unmet water demand for residents or local ecosystems.

This study sought to address the long-term sustainability of local water resources in the Ventura River Watershed. A comprehensive water budget was created to quantify water supply and demand, and a number of water management strategies were investigated to study their impacts on water availability. The impacts of climate and land use change on water resources were also examined. Finally, the strategies were combined in a set of suites to investigate the ability of the water management strategies to offset potential water shortages resulting from future climate and land use change scenarios.

Project Objectives

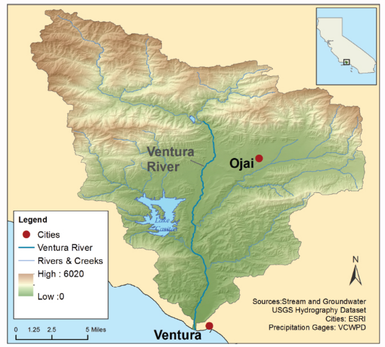
1. Integrate existing water budgets for the Ventura River Watershed into one comprehensive model.

2. Determine levels of water use that meet human needs while allowing for healthy, functioning ecosystems within the Ventura River stream network.

3. Evaluate the effects of climate change and land use change on the water budget within the watershed.

4. Use the comprehensive model to identify actionable water resource projects in accordance with the priorities of the Ventura River Watershed Council.

5. Propose a set of recommendations to the Ventura River Watershed Council to secure Proposition 84 funding, increasing water availability, and improving ecosystem function within the watershed.



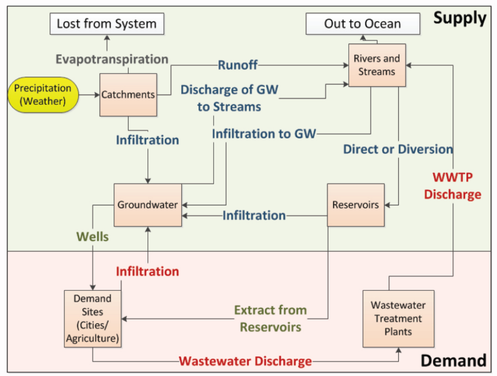
WEAP MODEL

The Water Evaluation and Planning (WEAP) System was used to create a water budget model of the Ventura River Watershed.

The WEAP model encompasses both demand and supply components of water resources. Including supply and demand components enabled this study to determine how changes in water availability and changes in end-user behavior affect the water budget

The combination of both supply and demand side components enables the consideration of a wide-range of options for meeting water management goals.

A simplified conceptual diagram of the WEAP System is shown on the right.



EVALUATION CRITERIA

1. Ability to Decrease Water Demand
The ability of a strategy to reduce demand and assist urban water purveyors to meet a 20% reduction by 2020 as mandaged by California State Senate Bill 7x7.

2. Ability to Increase Water Supply
The ability of a water management strategy to increase water supply, primarily by increasing groundwater infiltration.

3. Cost-effectiveness
The net cost per acre-foot of total water saved, either by decreased demand or increased supply.

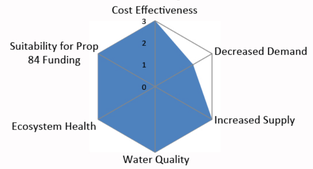
4. Ability to Improve Ecosystem Health
The ability of a water management strategy to increase average monthly flow in the Live Reach of the Ventura River from below 12 cfs to above 12 cfs, the recommended flow level in dry months for steelhead trout.

5. Ability to Improve Water Quality
The ability of a water management strategy to reduce nitrogen and phosphorous loading in the Ventura River.

6. Suitability for Proposition 84 Funding
The suitability of a water management strategy to receive funding from California's Proposition 84.

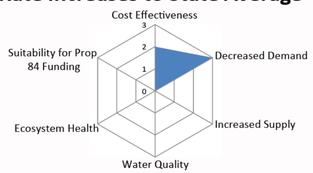
RESULTS

Ocean Friendly Gardens



Greywater

Rate Increases to State Average



Infiltration Basins

Evaluation Criteria	Ocean Friendly Gardens	Greywater Systems	Infiltration Basins	Water Rate Increases
Decreased Demand	870 AF / year	350 AF / year	None	1500 AF / year
Increased Supply	270 AF / year	Insignificant	280 AF / year	None
Cost-Effectiveness	Cost of $40 / AF to Consumers	Benefit of $50 / AF to Consumers	Cost of $90 / AF to Municipalities	Cost of $160 / AF to Consumers
Improved Ecosystem Health	21% of Dry Months	11% of Dry Months	Insignificant	None
Improved Water Quality	1300 lbs N / year; 140 lbs P / year	Insignificant	60 lbs N / year; 10 lbs P / year	None
Suitability for Prop. 84 Funding	Meets 4 out of 12 State Objectives	Meets 2 out of 12 State Objectives	Meets 4 out of 12 State Objectives	Not Applicable

Each water management strategy was given a score from 0 - 3 for each evaluation criteria. 0 indicates no significant results for the criteria, 3 is the top score.

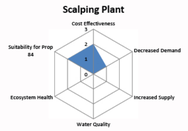
The top four scenarios (above) received high scores for several criteria.Consumer-oriented strategies, such as Ocean Friendly Gardens and Greywater, score well across a number of criteria.

Decentralized infiltration basins are cost-effective mechanisms for increasing supply, and increasing water rates to match the state average results in a substantial decrease in demand.

The cost-effectiveness of Ocean Friendly Gardens, Greywater, and Infiltration Basins could be increased dramatically through funding from Proposition 84 or by offsets from local water rate adjustments.

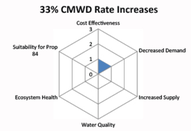
Additional water management strategies considered in this study were found to be less effective overall.

Scalping Plant



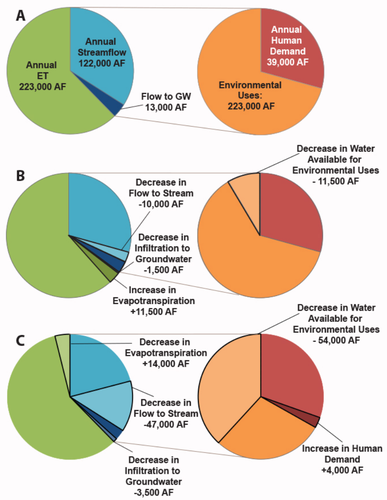
San Antonio Spreading Grounds

33% CMWD Rate Increases



Pervious Streets

WATER BUDGETS AND SCENARIO SUITES



A. Water Budget: Baseline Scenario
~358,000 AF/yr Precipitation

Under baseline climate conditions, the Ventura River Watershed receives an average of 358,000 AF of precipitation annually. Only water that flows into the stream network or groundwater system is available for human uses.

B. Water Budget: Temperature Increase Scenario
~358,000 AF/yr Precipitation

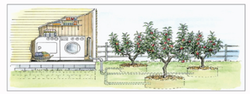
In the "Temperature Increase" scenario, a 4 degree celsius warming by the year 2099. Precipitation was unchanged, but average annual evapotranspiration increase by 11,500 AF. Water that evapotranspirates is not available for human or other environmental uses. Because human demand remains the same, the water available for environmental uses will likely decrease by 11,500 AF.

C. Water Budget: Worst Case Scenario
~294,000 AF/yr Precipitation

Under the "Worst Case" scenario, a 4 degree celsius warming was combined with a 20% precipitation decrease and a conversion of 50% of orange orchards to raspberries, a crop with greater water demands. hIn this scenario, only 294,000 AF of precipitation falls annually. The decreased supply and increased human demand reduces water availabiltiy for environmental uses by 54,000 AF.

WATER MANAGEMENT STRATEGIES

Ocean Friendly Gardens replace lawns with rain gardens and low-water plants. Rain gardens capture runoff, reducing pollution and increasing groundwater infiltration. Low-water plants reduce demand, saving homeowners money on water and maintenance.



Greywater Systems reuse indoor residential water to irrigate lawns and gardens, reducing urban water demand. Laundry-to-lawn greywater systems are an inexpensive option that use just washing machine water to supply water for irrigation.

Decentralized Infiltration Basins capture stormwater runoff from urban areas and allow it to infiltrate into groundwater. The basins can be located near parking lots, streets, or any area with a large number of impervious surfaces.

Urban Water Rate Increases incentivize conservation and decrease urban water demand. Although the state average for 15 hundred cubic feet (HCF) of water is $2.50 per HCF, it is just $0.86 per HCF for residential customers of Casitas Municipal Water District, the largest water purveyors in the watershed.

A **Scalping Plant** in the City of Ojai could be used to treat wastewater for irrigating golf courses, decreasing the use of potable water for irrigation needs. Although the Ojai Valley Sanitary District wastewater plant generates reclaimed water, it is at a lower elevation far from the City of Ojai, so pumping reclaimed water to the area is economically infeasible

The San Antonio Creek Spreading Grounds diverts water from San Antonio Creek during high flows and allows it to infiltrate into the Ojai Groundwater Basin. The spreading grounds received money for construction from Proposition 50, and it is now under construction.

CLIMATE AND LAND USE CHANGE SCENARIOS

Crop Conversions from orange orchards to raspberry fields are possible as the Asian Citrus Psyllid spreads into the region, threatening citrus crops. Because raspberries have greater water demands than oranges, the conversion could increase demand.

Temperature Increases and **Changes in Precipitation** could alter local water supplies. Although the exact amount of temperature and precipitation changes that will result from climate change is unknown, this study examined a range of options. Our study examined how a temperature increase of 4° C (7.2° F) by the year 2099 would impact local water resources. Using WEAP, we modeled annual precipitation increasing by 10% or 20% and decreasing by 10% and 20% from 2010 - 2099.

RECOMMENDATIONS

1. Encourage widespread adoption of Ocean Friendly Gardens and Greywater Systems in single-family homes throughout the watershed to decrease urban water demand, increase groundwater supplies, improve ecosystem health, and improve water quality.

2. Implement a program to install decentralized Infiltration Basins to capture stormwater runoff from urban areas within the watershed to increase groundwater supplies and improve water quality.

3. Increase Casitas Municipal Water District and Meiners Oaks Water District residential water rates to the state average to encourage water conservation and significantly decrease urban water demand.

4. Take advantage of Proposition 84 funding to increase the cost-effectiveness of Ocean Friendly Gardens, Greywater Systems, and Infiltration Basins.

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