



Sustainable Water Use in the Ventura River Watershed



Ryan Gardner, Naheed Iqbal, Austin Love,
Brenda Ponton, Jake Sahl, Dan Yocum
Advisor: Dr. Arturo Keller

Bren School of Environmental Science & Management
April 25, 2013

Project Objectives

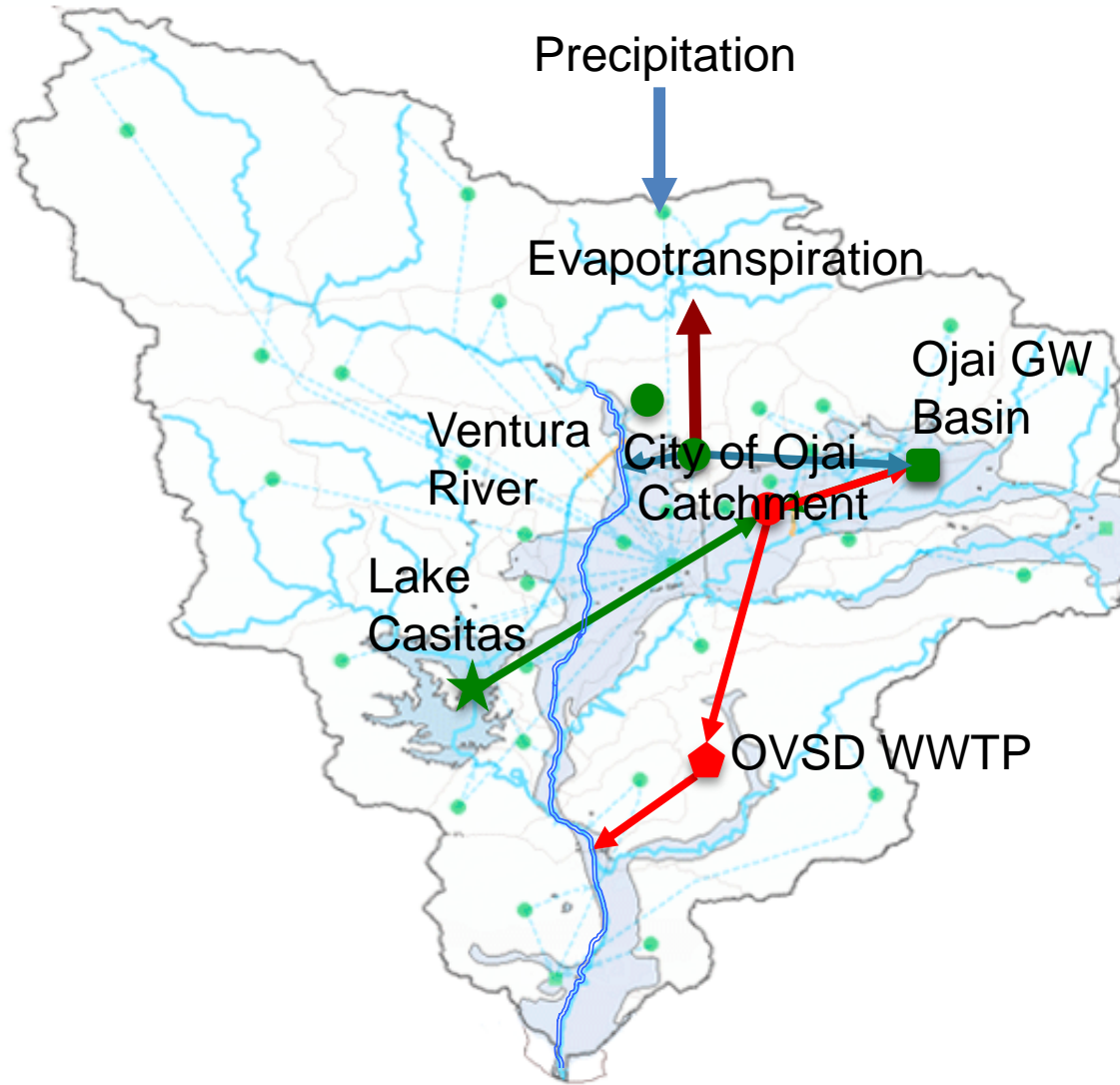
- 1) Create a comprehensive watershed model
- 2) Evaluate the effects of climate change and land use change on the water budget
- 3) Identify actionable water resource management projects
- 4) Propose a set of recommendations relevant to securing Proposition 84 funding, increasing water availability, and improving ecosystem function

Current/Previous Work

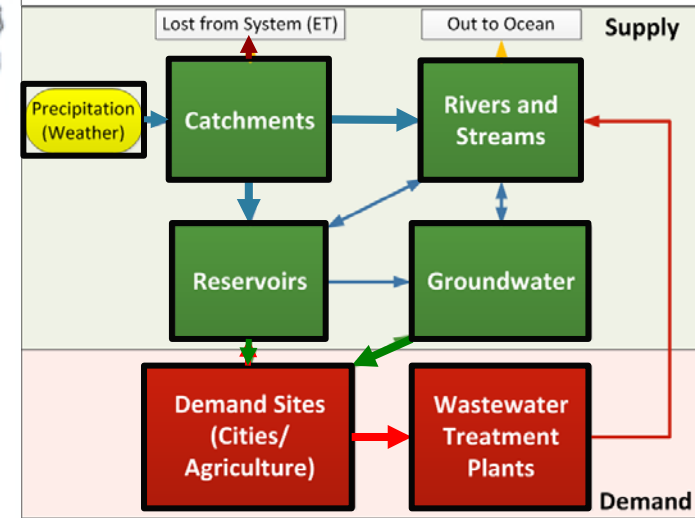
- Cardno Entrix Report
- Hydrologic Studies
 - HSPF Model (Tetra Tech), Groundwater Studies (DBS&A)
- Urban Watershed Management Plans
 - CMWD, GSWC, VRCWD
- NMFS Steelhead Studies
- Proposition 84 Grants
 - Watersheds Coalition of Ventura County
- Watershed Management Plan
 - Ventura River Watershed Council

Building the WEAP Model:

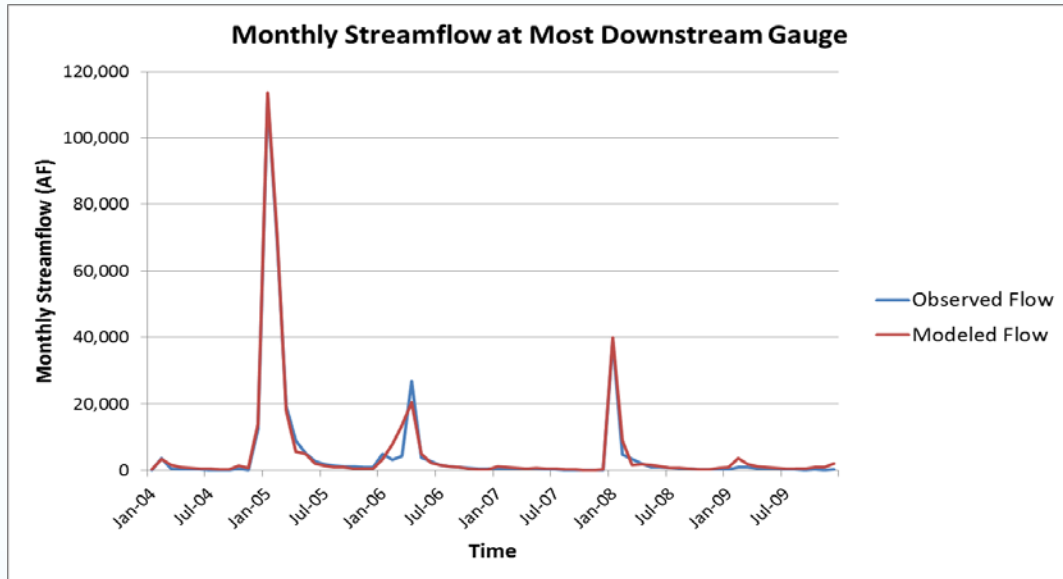
Ventura River
~~Demands~~
Watershed



Model Components

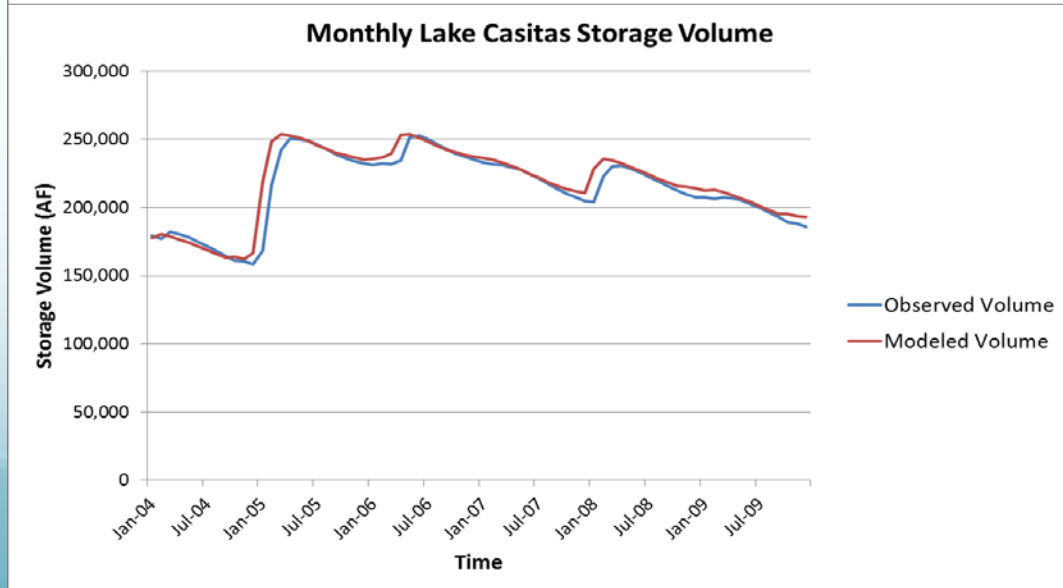


WEAP Model Calibration



Nash-Sutcliffe Value

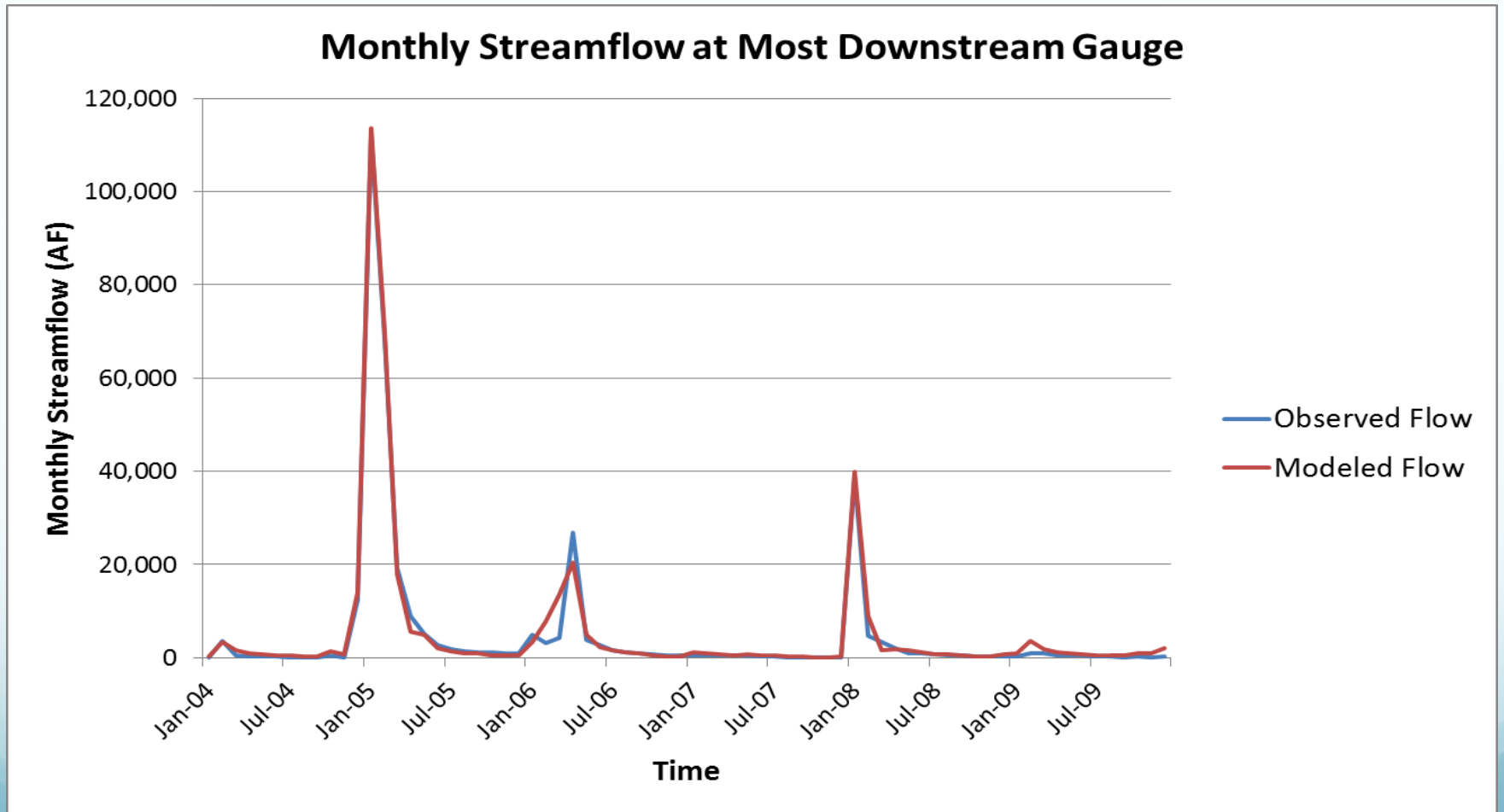
0.98



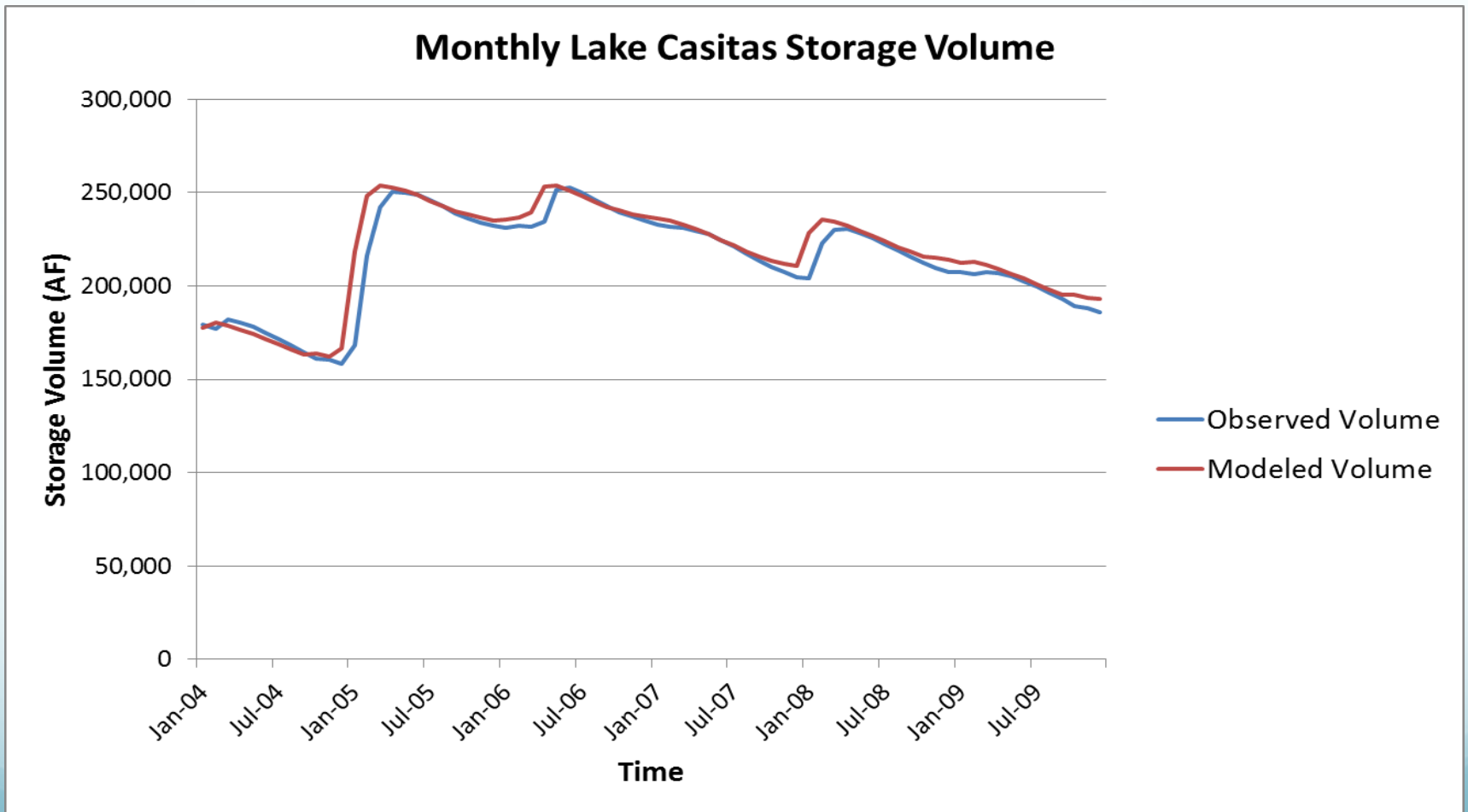
Nash-Sutcliffe Value

0.89

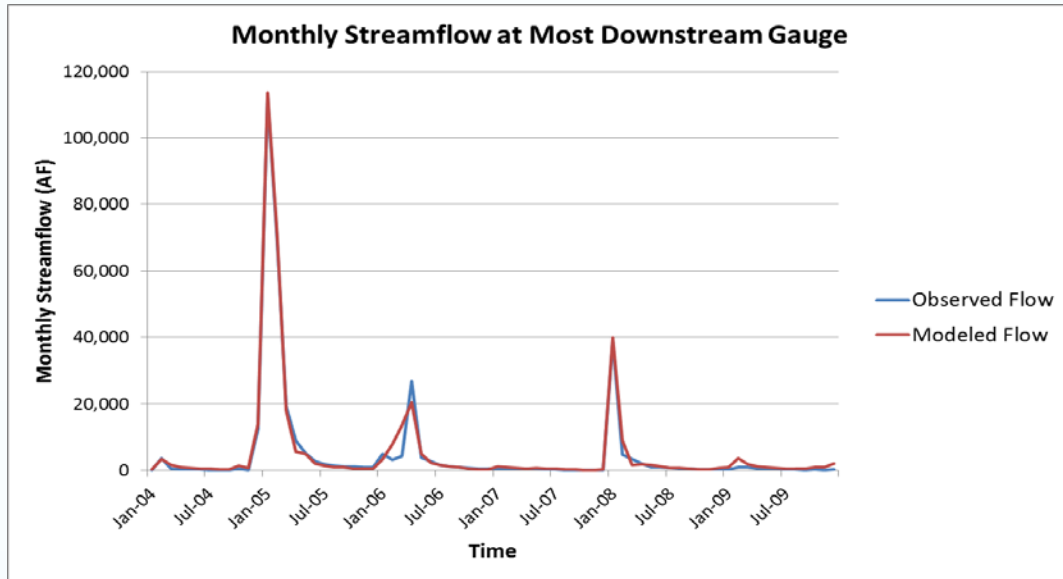
WEAP Model Calibration



WEAP Model Calibration

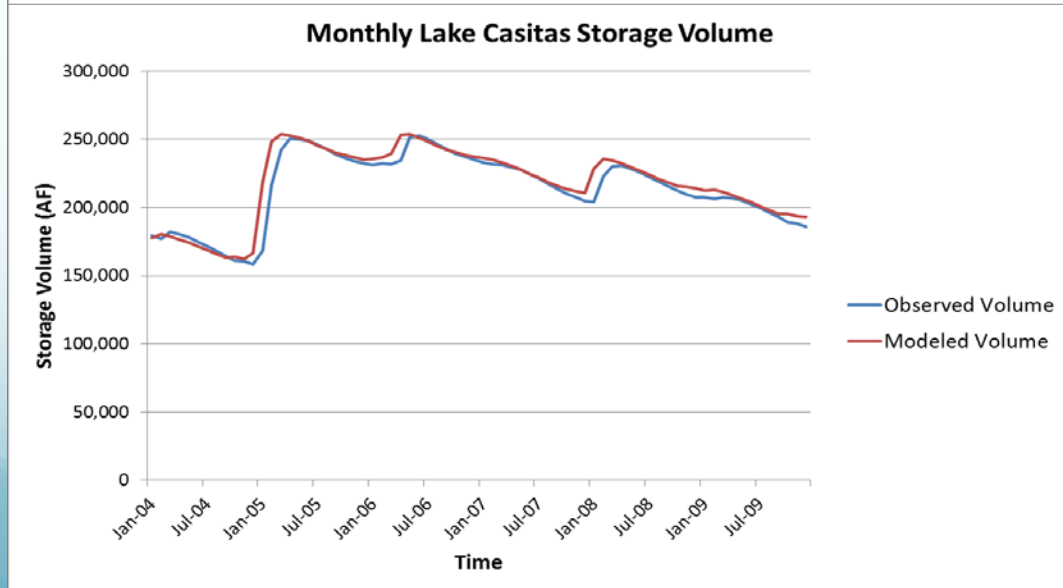


WEAP Model Calibration



Nash-Sutcliffe Value

0.98

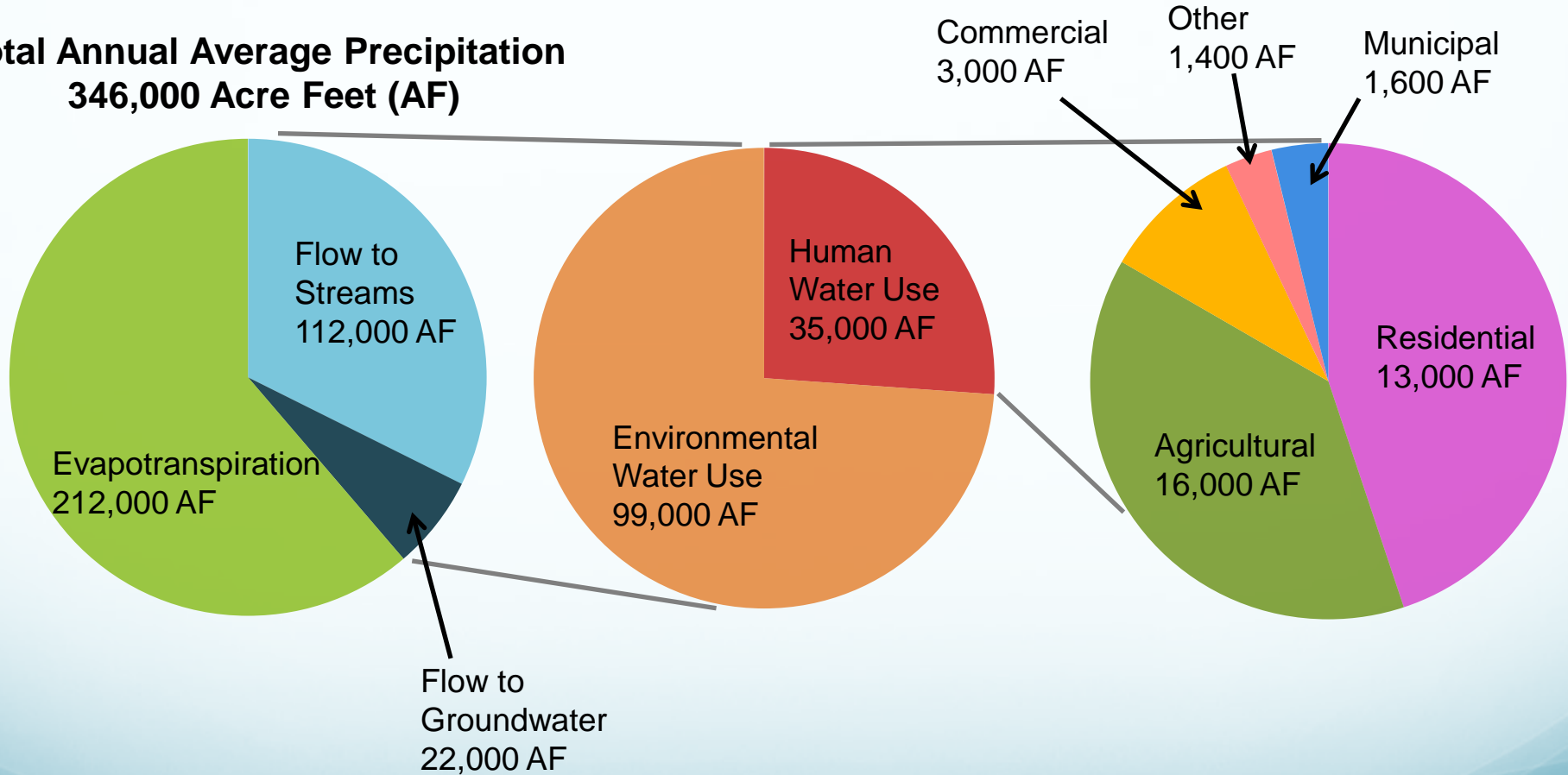


Nash-Sutcliffe Value

0.89

Water Budget from WEAP

Total Annual Average Precipitation
346,000 Acre Feet (AF)



WEAP Model Handoff

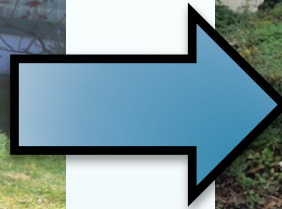
- Tool for water resource management planners
- WEAP Model Training
 - Date TBD
- Uncertainties and Limitations w/ WEAP Model
 - Calibration period
 - Groundwater
 - Climate Data

Scenarios Evaluated

- Ocean Friendly Gardens
- Greywater Systems
- Water Rate Increases
- Infiltration Basins
- Scalping Plant
- Pervious Streets
- Land Use Change
- Climate Change

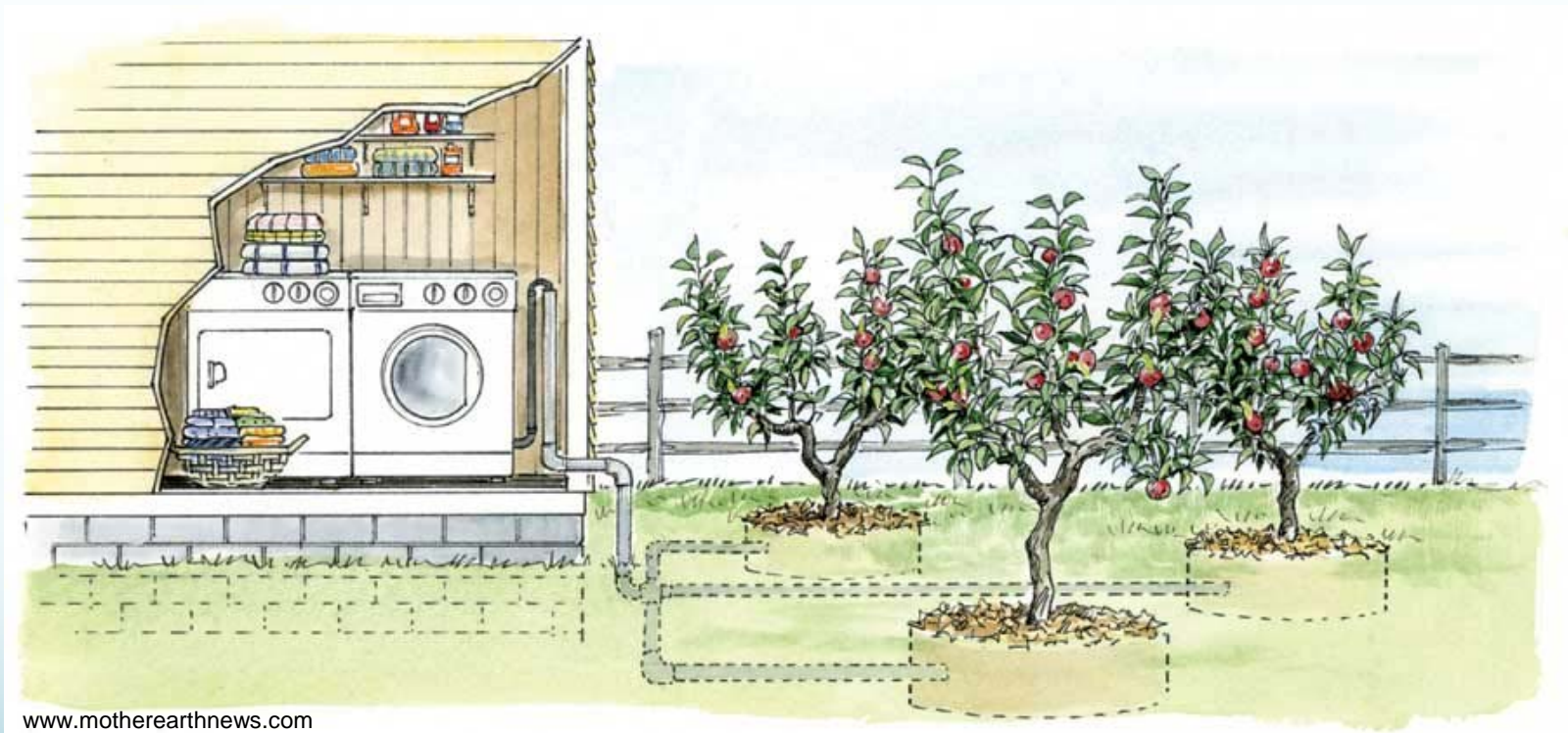
Ocean Friendly Gardens

- Converting lawns to ocean friendly gardens conserves water and infiltrates runoff onsite with rain gardens



Laundry to Landscape Greywater Systems

- Reuse washing machine water outside



Infiltration Basins

- Constructed basins to capture runoff

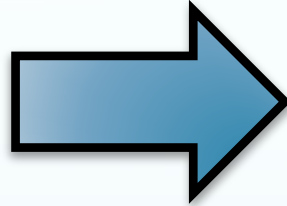


Water Rate Changes

- Increased lowest water rates in the watershed to California average

\$0.86

Lowest Average
per HCF



\$2.50

State Average
per HCF

Results – Ocean Friendly Gardens

Evaluation Criteria	Value
---------------------	-------

- State Water Project
 - \$1450/AF
- Desalination Plant
 - \$2000/AF

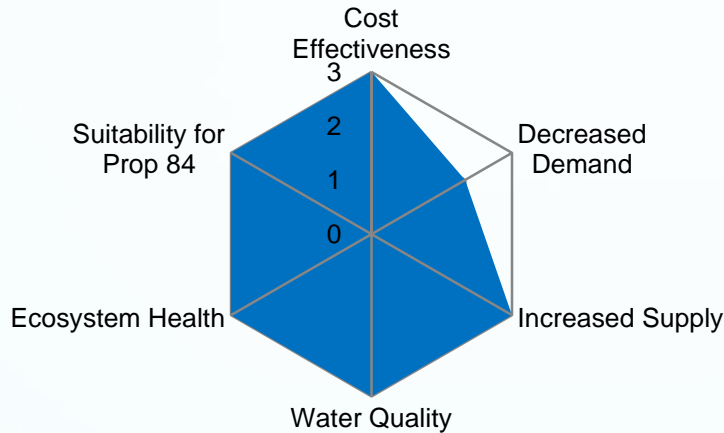
All Results

	Decreased Demand	Increased Supply	Cost-Effectiveness	Improved Ecosystem Health	Improved Water Quality	Prop. 84 Criteria
Ocean Friendly Gardens	870 AF/yr	270 AF/yr	Cost of \$40/AF to Consumers	6 Positive Events	1,300 lbs N/yr; 140 lbs P/yr	4
Green Roofs	None	None	Cost of \$100/AF to Municipalities	Insignificant	720 lbs N/yr; 90 lbs P/yr	3
SA Spreading Grounds	None	380 AF/yr	Cost of \$160/AF to Municipalities	Insignificant	Insignificant	2

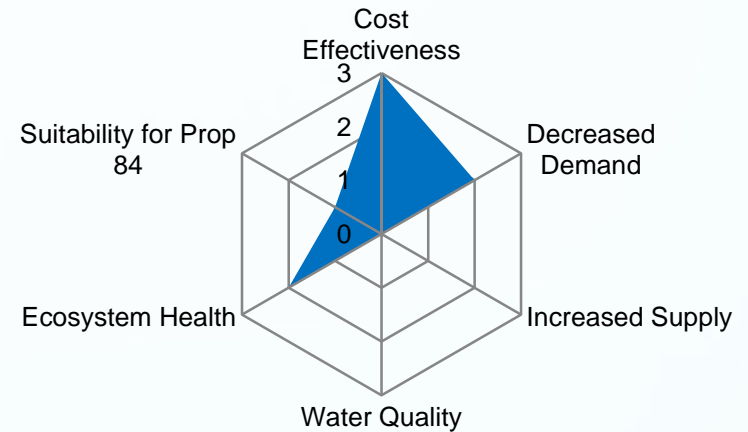
- The water management strategies were sorted for each criteria
- Each strategy was given a score from 0-3
 - 3 – High
 - 2 – Medium
 - 1 – Low
 - 0 – No significant results

Results for Top Performing Strategies

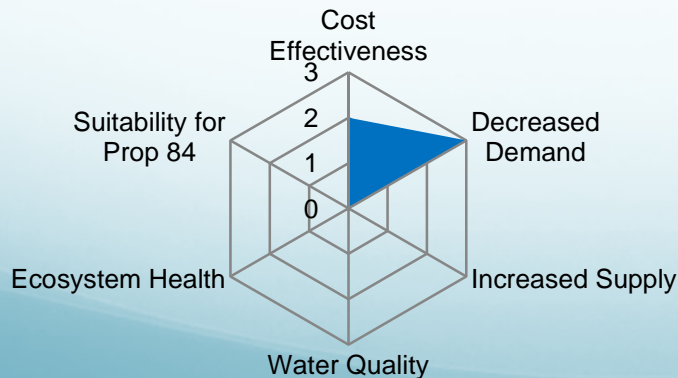
Ocean Friendly Gardens



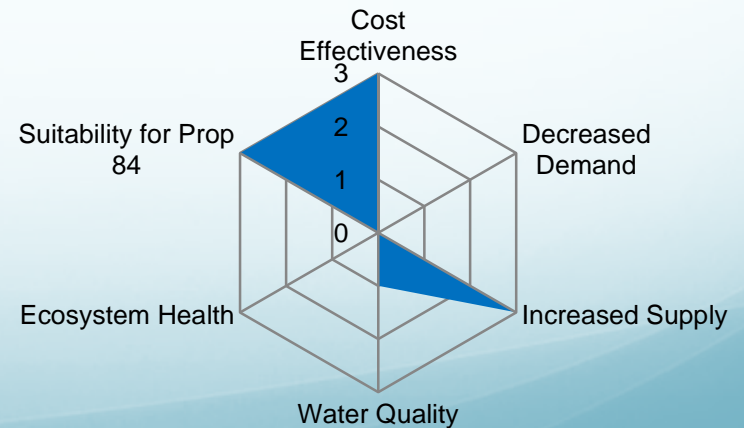
Greywater



Rate Increases to State Average

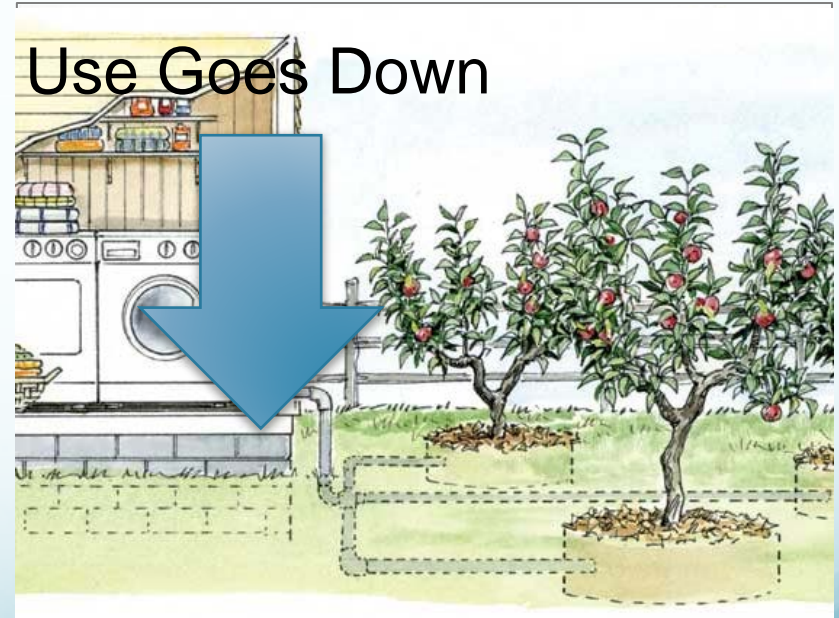


Infiltration Basins



Recommendations

- Encourage widespread adoption of certified drip irrigation systems to capture water systems off



Acknowledgments

- Special thanks to the Ventura River Watershed Council for their support and guidance throughout this project!!!
- Contact us: **VenturaRiver@lists.bren.ucsb.edu**
- Full report available at: **bren.ucsb.edu/~venturariver/**



The Ventura River Watershed Council and a few good Bren students