

# Developing Linked Instream-Groundwater Models

Proposed in Support of Santa  
Margarita River Nutrient Initiative

August 30, 2012

# Need For Linked Models to Develop Site Specific Objectives

- “Get the loads right”
  - Nutrient Initiative will ultimately succeed or fail based on whether the models developed can accurately predict loading.
- Groundwater exchange with surface waters is potentially a large source
- Groundwater models exist
  - Stetson Engineers developed Modular 3-D Finite-Difference Groundwater Flow Model (MODFLOW) for Lower SMR Sub-basins
  - Geosciences developed GSFLOW for Upper SMR sub-basin
- Need additional data collection and resources to link groundwater models to surface water model

# Key Questions

## Primary questions:

- 1) What is the net contribution of groundwater to surface water nutrient loads in the River and tributaries?
- 2) What are the stream and subflow component of nutrient loading to the Santa Margarita River estuary?
- 3) What are the instream responses to nutrient loading?

## Secondary questions:

- 1) Can recycled water (via groundwater or surface water discharge) be used to augment river/estuary flow and improve water quality within the river/estuary?

# Design

Three components:

- 1) Select sites, install instrumentation, and collect ground and stream hydrologic and WQ data
- 2) Link groundwater models to instream models
  - water, salt, nutrients
- 3) Run linked models to determine fate and transport of nutrients, quantity of flows, and loading to estuary

# Options

## Option 1:

Link instream model to groundwater model for the lower SMR watershed (MODFLOW)

## Option 2:

Link instream model to GSFLOW (groundwater models for upper SMR watershed) and MODFLOW (lower SMR watershed) for comprehensive analysis

# Budget and Collaborators

**\* Assumes funding for SCCWRP in-stream modeling of SMR**

## **Preliminary Budget**

Field Labor: \$15-20K (Stetson)

Materials/Lab: \$15-20K (Stetson)

Modeling: \$35-45K (Stetson) \* Option 1

Modeling: \$45-60K (Geosciences) \* Option 2

Data Analysis and Manuscript Prep: \$15-20K (Stetson) + \$20K (SCCWRP)

Total Option1 ~\$85K this fiscal year, \$40K next, total 125K

Total Option2 ~\$125K this fiscal year, \$60K next, total 185K

## **Collaborators:**

Stetson Engineers, SCCWRP, Geosciences

# Products

## Technical

- Model output (to be used for SSO, TMDL, etc.)
- Technical report and manuscripts (Documentation summarizing methodology and results available for peer review)

## Institutional:

- Capacity for future analysis of scenarios for water management to meet seasonal objectives, including recycled water options
- Capacity for assessment of scenarios evaluating the effectiveness of LID, ag, et al. BMPs in enhancing water quality in the SMR and estuary.
- Provides tool for improving modeling for future iterations of Lower SMR Salt and Nutrient Management Plan.