

Gila-San Francisco Decision Support Tool

SAND2007-6883P

**Vincent C. Tidwell, Amy Sun, Geoffrey T. Klise,
Will Peplinski and Jim Brainard**

*Sandia National Laboratories
Geohydrology Department
Albuquerque, New Mexico*

**Southwestern New Mexico Water Planning Workshop
Deming
October 26-27, 2007**

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Objective

- Our goal is to create an *interactive, real-time* decision support tool to explore:
 - Water availability relative to CUFA and ESA constraints.
 - Alternative approaches to utilizing water and funding.
- We want to de-mystify the complexity of the settlement language so that stakeholders and decision-makers are better informed.

Create an informed basis for decision making.

Collaborative Modeling Team

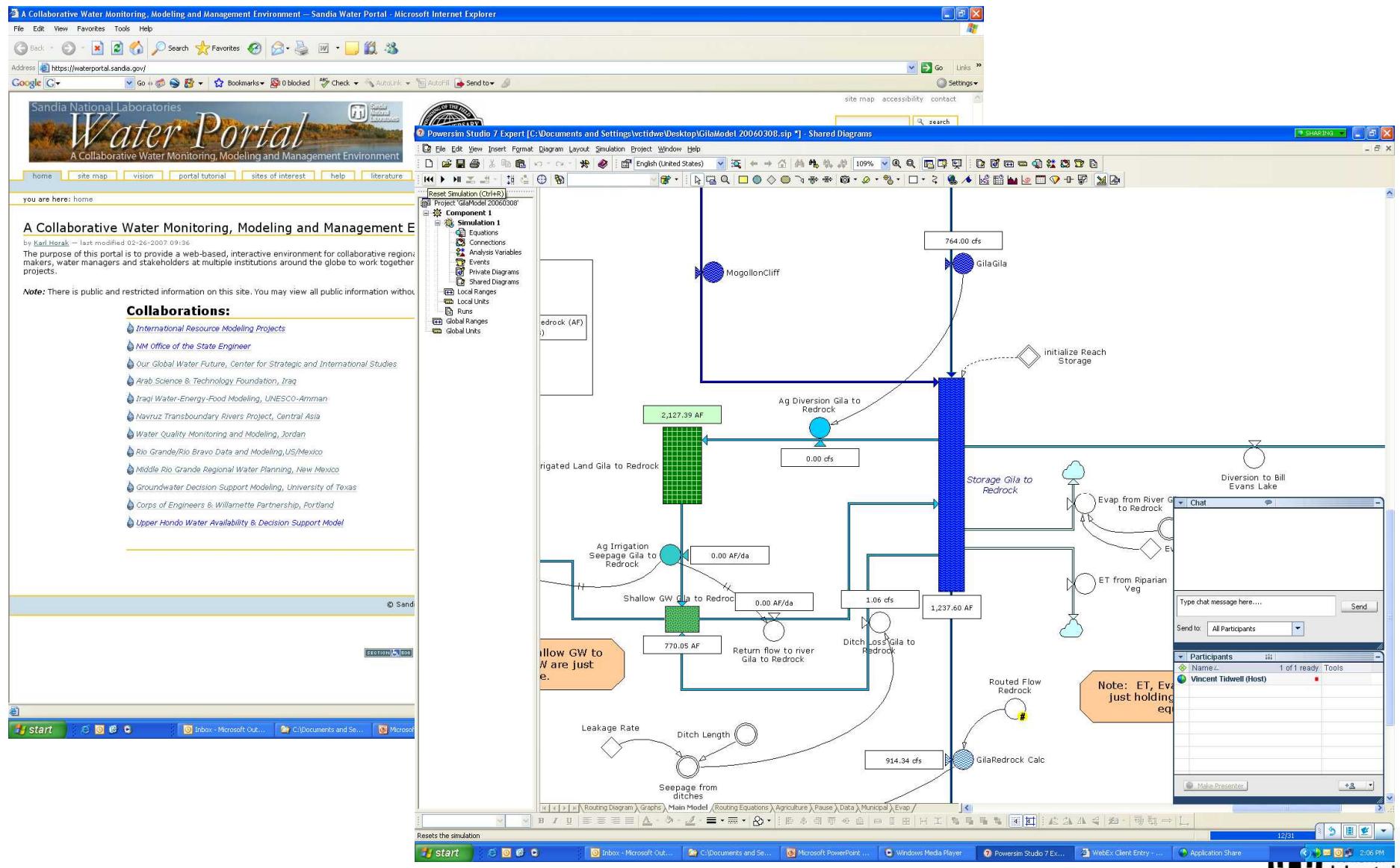
- Implemented an open and transparent model development process.
- Team began meeting in October 2005.
- Team met biweekly for roughly two hours.
- Model development process:
 - Team develops causal structure of model
 - Team identifies data
 - Sandia develops model
 - Team reviews model and output

Team Composition

- Bureau of Reclamation
- New Mexico Interstate Stream Commission
- US Fish and Wildlife Service
- Municipalities of Silver City and Deming
- Soil and Water Commission representatives from Grant, Catron, and Luna Counties
- The Nature Conservancy
- Gila Conservation Coalition
- Concerned Citizens
- Sandia National Laboratories

Meeting Venue

<http://waterportal.sandia.gov>



Information Sharing

<http://www.sandia.gov/gilasanfrancisco/index.html>

contents

- Home
- Introduction
- Methods
- Team
- Model
- Maps
- Extinct Species
- References
- Links
- Contacts

NM Office of
by zopemaster — last
The collaboration
Mexico. The project
Data
Documents
Models
Presentations
SNL Modeling T
Contact Inform

 Sandia
National
Laboratories

<http://www.sandia.gov/gilasanfrancisco/index.html>

gila san francisco
RIVER BASINS

Sandia National Laboratories is assisting the New Mexico Interstate Stream Commission by creating an interactive water supply model tool that will engage stakeholders and decision makers in developing plans for utilizing the water and funds made available through the 2004 Arizona Water Settlements Act.

Water Model Tool

Non-Residential

use the sliders below to convert percentages of existing and new non-residential properties to the various water saving measures.

A 100% change in some of these variables might not be realistic.

| Category | Min | Set Value | Max | Current | Delta |
|---|-----|-----------|-----|---------|-------|
| Convert Existing Non-Residential Property to Low-Flow Appliances | 0 | 0 | 100 | 0 | 0 |
| Convert Existing Non-Residential Property to Xeriscaping | 0 | 0 | 100 | 0 | 0 |
| Reduce Irrigated Area of Landscaping for New Non-Residential Properties | 0 | 0 | 100 | 0 | 0 |
| Refinement in Conservation by Non-Residential | 0 | 50 | 100 | 50 | 50 |

Use Low-Flow Appliances in New Construction
 Use Xeriscaping for New Construction

Books and GRF Courses

The City of Albuquerque has several non-potable water use and water re-use programs planned to reduce groundwater pumping by roughly 6500 acre-feet when all the plans are fully implemented. These projects began coming on line in 2003 and are expected to be completed by 2010. In the meantime, the projects will continue towards completion, and be operated as planned, and is a realistic plan. If you choose "Yes" then the model will share in the new programs along with the water savings, in accord with the City's long term plan.

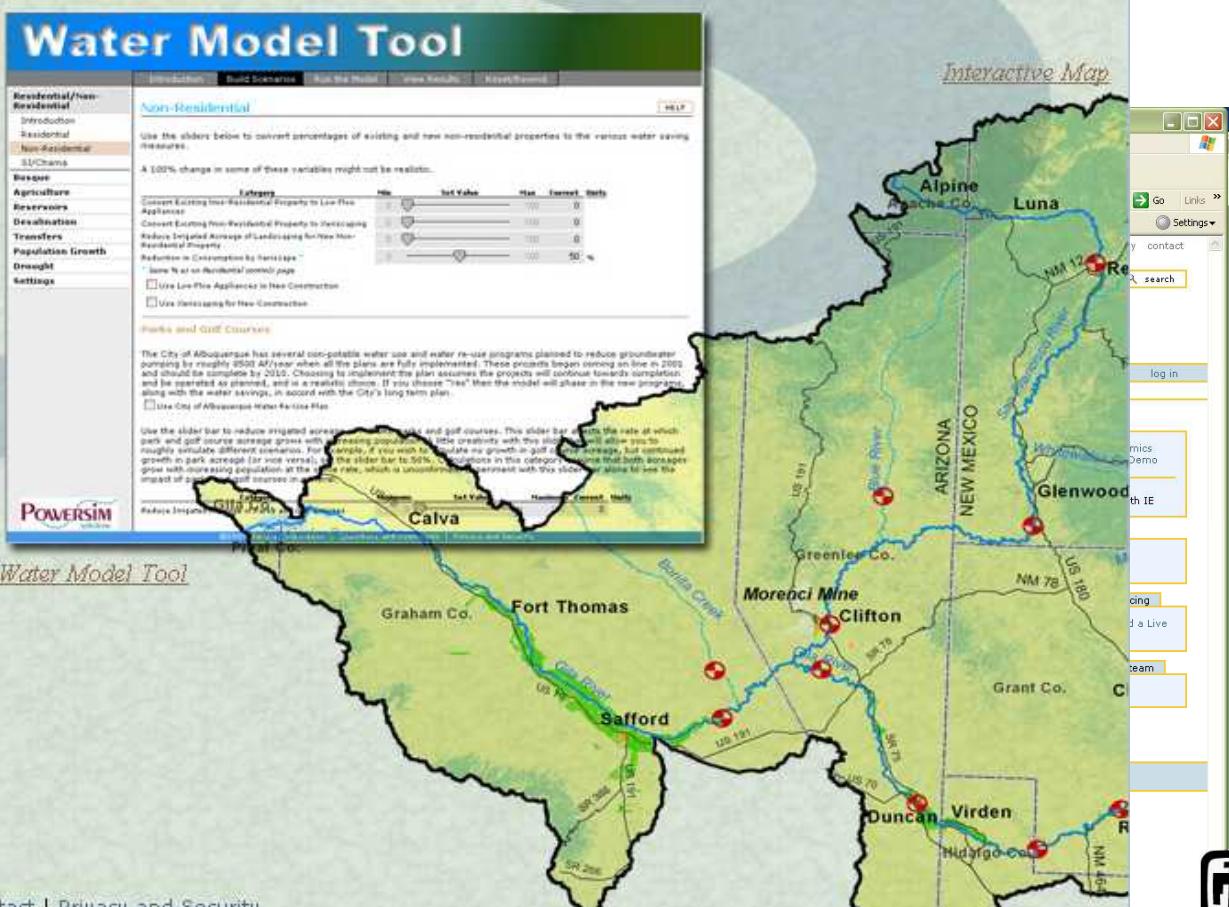
Use City of Albuquerque Water Re-use Plan

use the slider bar to reduce irrigated acreage in golf courses, parks, and golf courses. This slider bar controls the rate at which park and golf course acreage grows with increasing irrigation. The slider controls the rate at which the model will allow you to roughly simulate different scenarios. For example, if you wish to simulate no growth in golf course acreage, but continued growth in park acreage (or vice versa), move the slider bar to 50%. It is important to note that both acreages grow at the same rate, which is unavoidable. It is up to the user alone to see the effect of park and courses in the model.

Reduce Irrigated Acreage in Parks and Golf Courses

Water Model Tool

Interactive Map



Interactive Map

Go Links Settings search log in

GRF Demo

team

Sandia National Laboratories

Model Components

- Surface water hydrology
- Ground water hydrology
- Water demand
 - *Residential/commercial*
 - *Industrial/mining*
 - *Agricultural/livestock*
 - *Evaporative/riparian*
- Institutional constraints
 - *CUFA*
 - *Minimum Flow*



9,000 mi² drainage area

GILA - SAN FRANCISCO BASIN



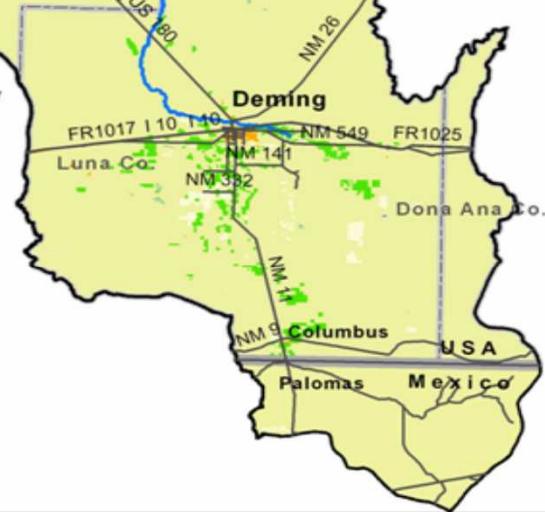
Land Use/Land Cover

- Agricultural Land
- Barren Land
- Forest Land
- Range Land
- Urban or Built-Up Land
- Water

USGS Real-Time
Gauging Station

MIMBRES BASIN

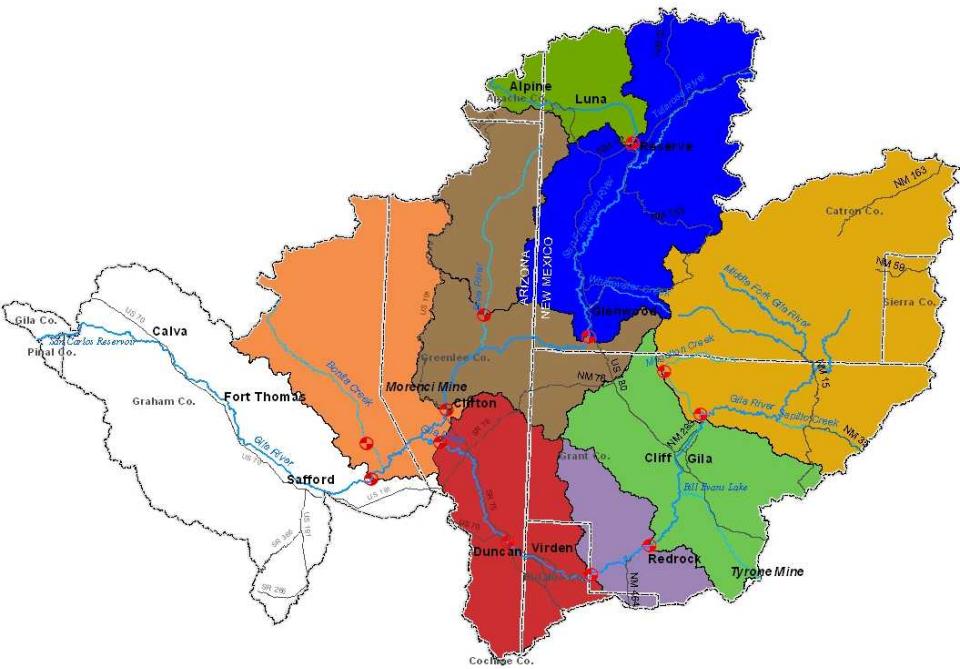
0 15 30 60 Miles



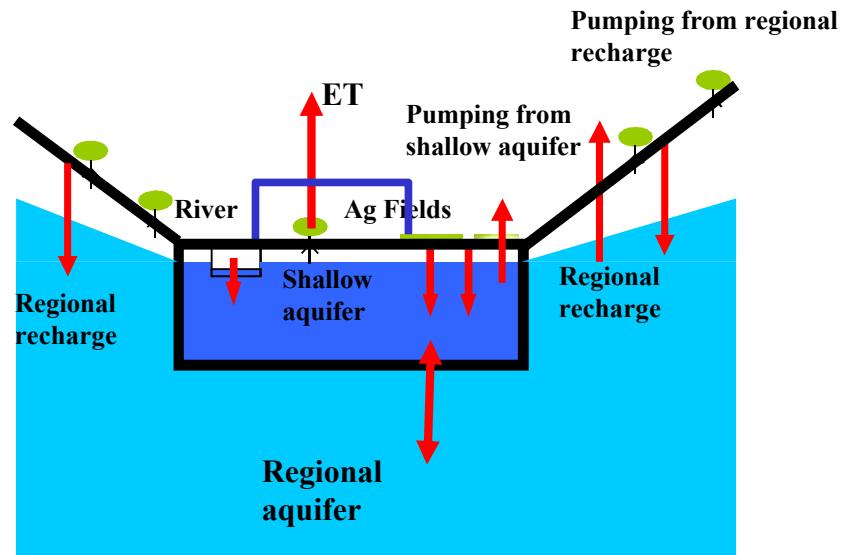
Sandia
National
Laboratories

Surface and Ground Water Modules

- Basin is broken up into 8 “reaches” defined by stream gauges in the Gila Basin

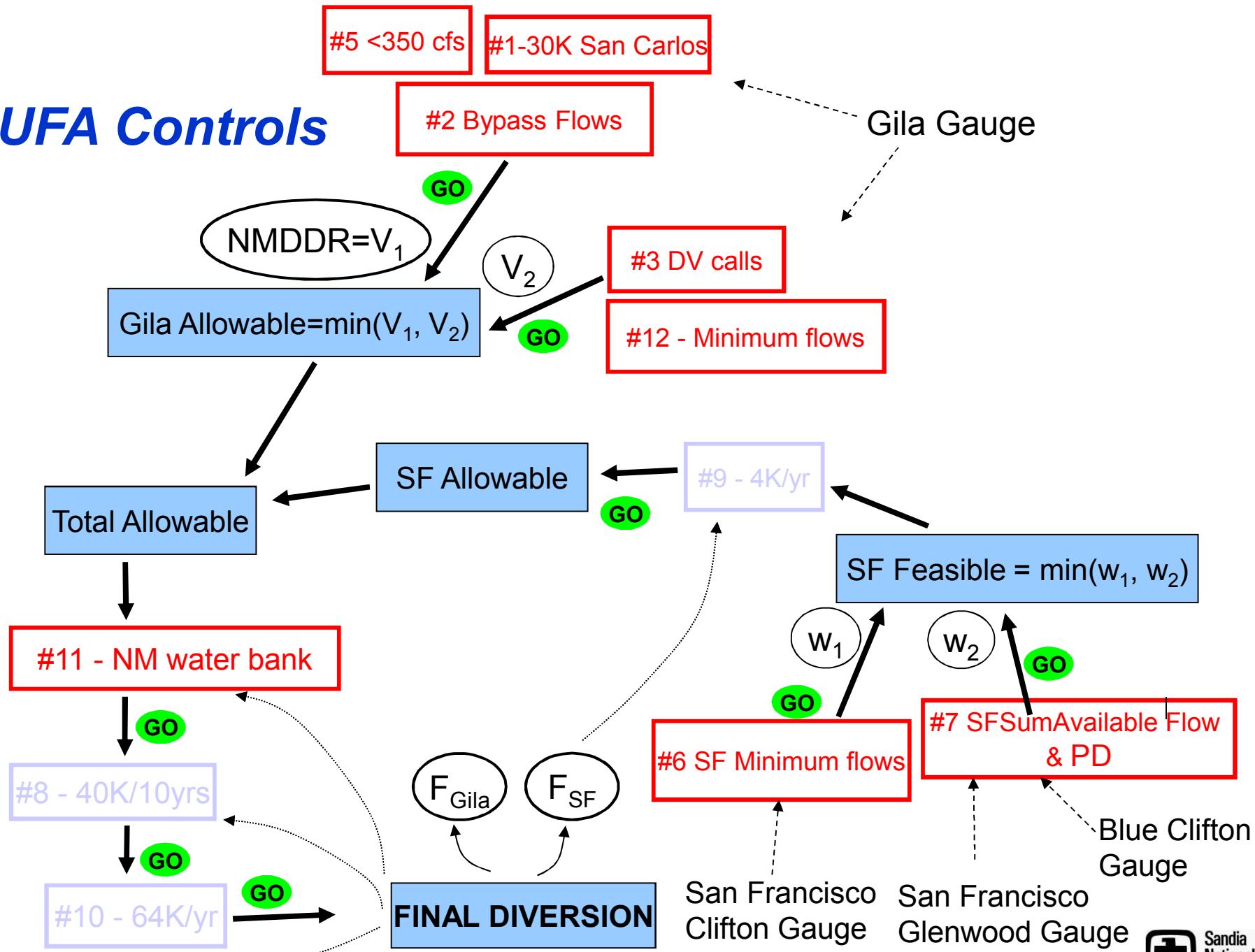


- The ground water component is broken up into a regional and fluvial aquifer per reach

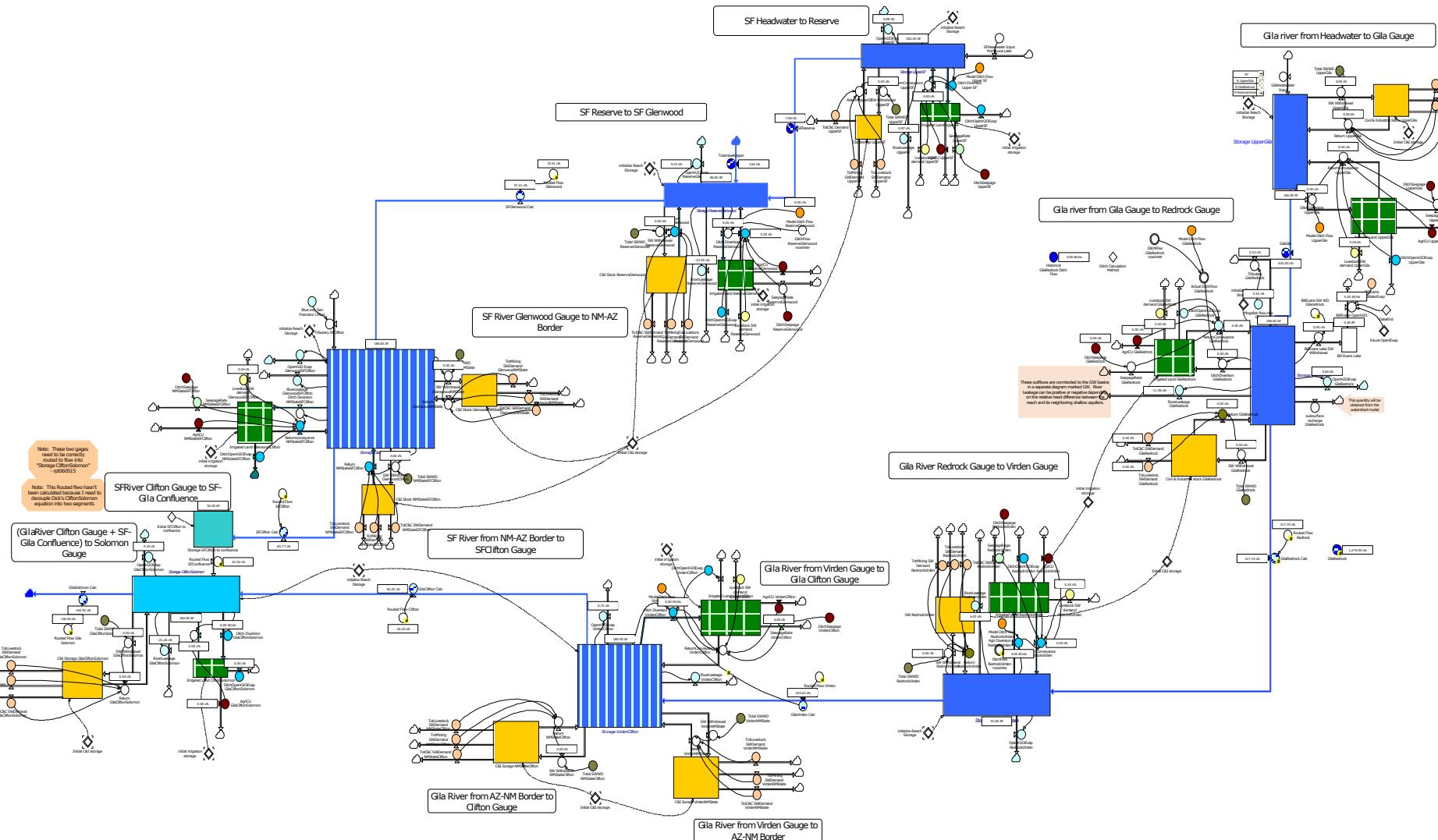


- Daily model with routed flows
- Calculated flows and river stage are “average” over that reach
- Model also can look at flows over sub-reach “critical regions”
- The model can account for:
 - Evaporative losses
 - Irrigation diversions and returns
 - Aquifer interaction
 - River leakage or gains

CUFA Controls

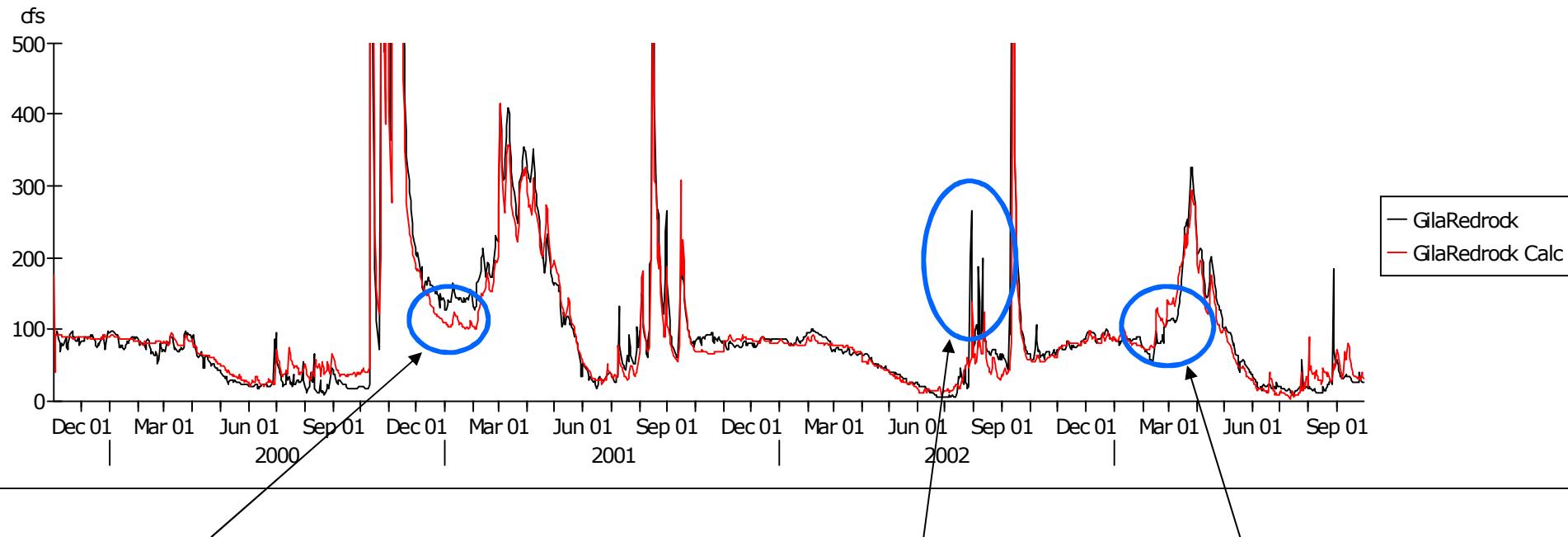


System Dynamics Model



Model Calibration

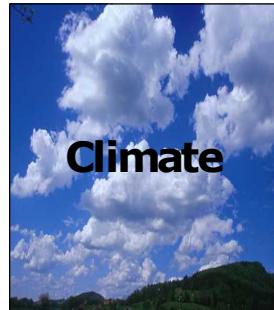
Calculated vs. Measured Gila Redrock Gage



- Dynamics between fluvial and regional aquifers may be causing this discrepancy

- Tributary contributions from summer monsoon events and snowmelt are missed

User Control



Executive
Summary



Model Homepage



Gila-San Francisco Decision Support Tool

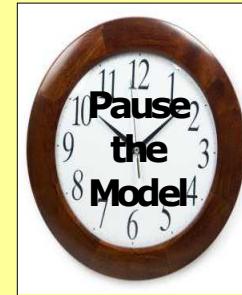
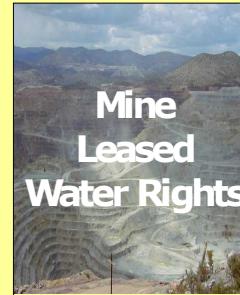
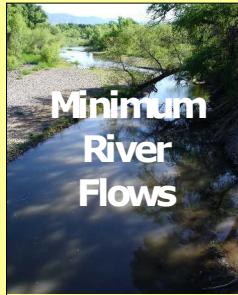
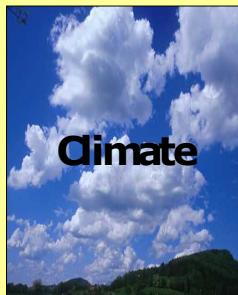


About this Model

Background

Maps

Executive Summary



The Gila San Francisco Decision Support Tool is a draft model that can not be used, disseminated, and applied without the consent of the Gila San Francisco Collaborative Modeling Team. It is a research tool that is intended for educating stakeholders, the interested public, and the modeling team. If you have any questions regarding the use of this tool, please contact Vince Tidwell, vctidwe@sandia.gov

20-year Summary – SF Diversion OFF



GSF Basin SW Hydrology

GSF SW Irrigation Summary

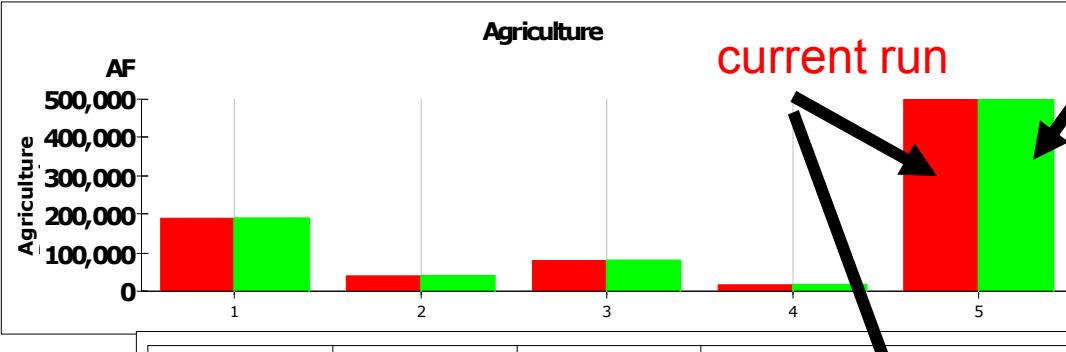
GSF GW Summary

Mimbres GW Summary

CUFA Summary

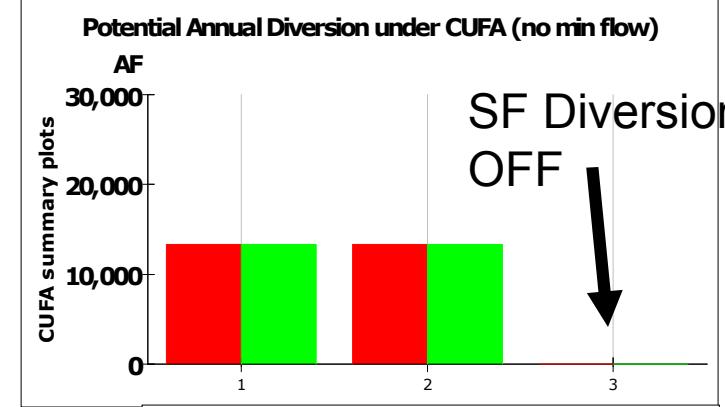
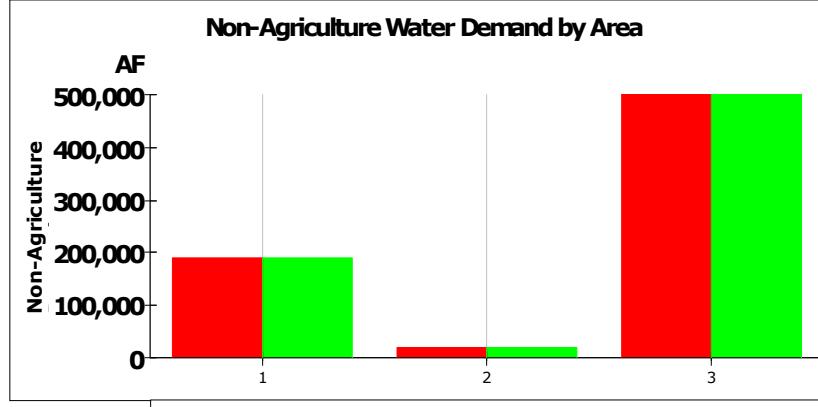
BASELINE SUMMARY

Projections of Water Supply & Demand



baseline run

DRAFT
Version: 20071016
 Sandia National Laboratories



[Return to Top](#)

20-year Summary – SF Diversion ON



GSF Basin SW Hydrology

GSF SW Irrigation Summary

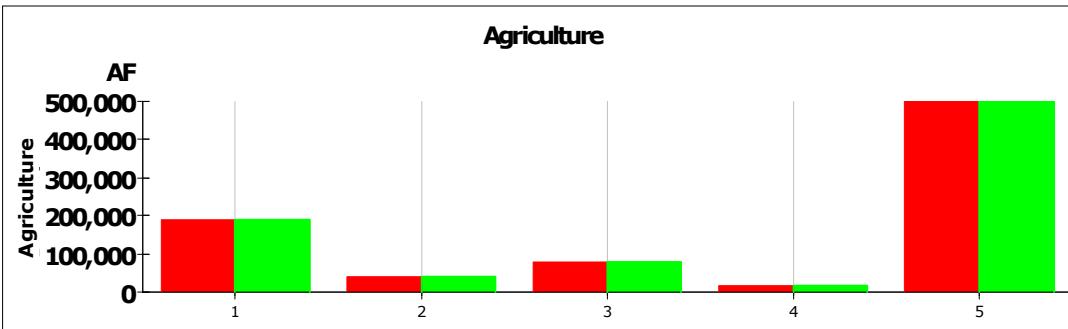
GSF GW Summary

Mimbres GW Summary

CUFA Summary

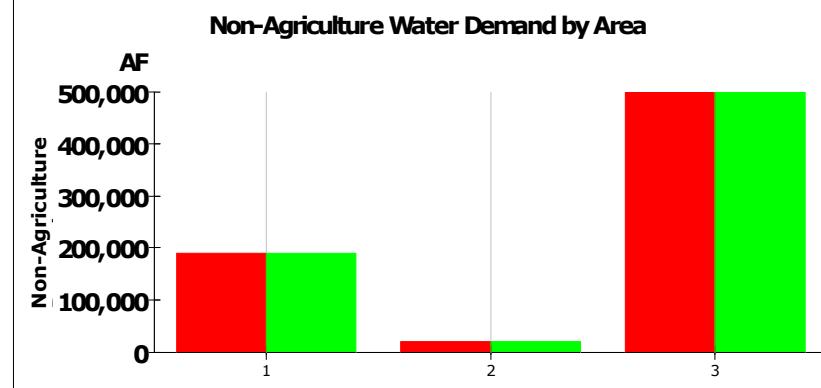
Projections of Water Supply & Demand

DRAFT
Version:
20071016
Sandia National Laboratories

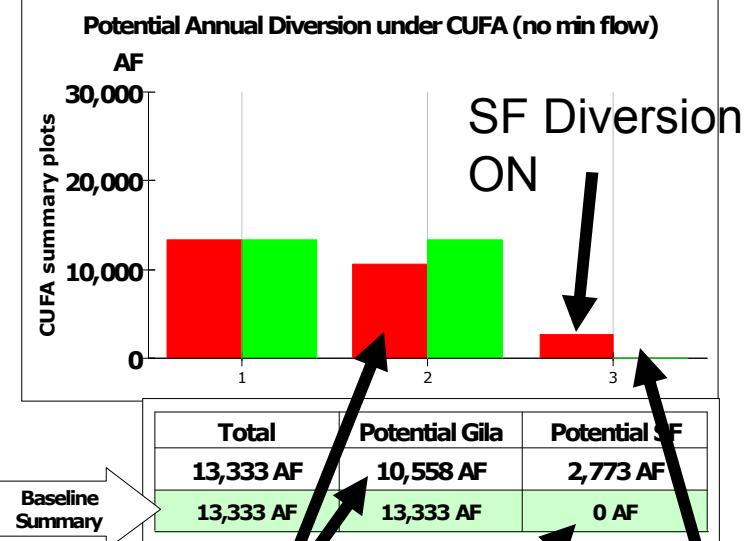


BASELINE SUMMARY

Baseline Summary is the 20-year summary based on default values of input parameters.



BASELINE SUMMARY



current run

baseline run

[Return to Top](#)

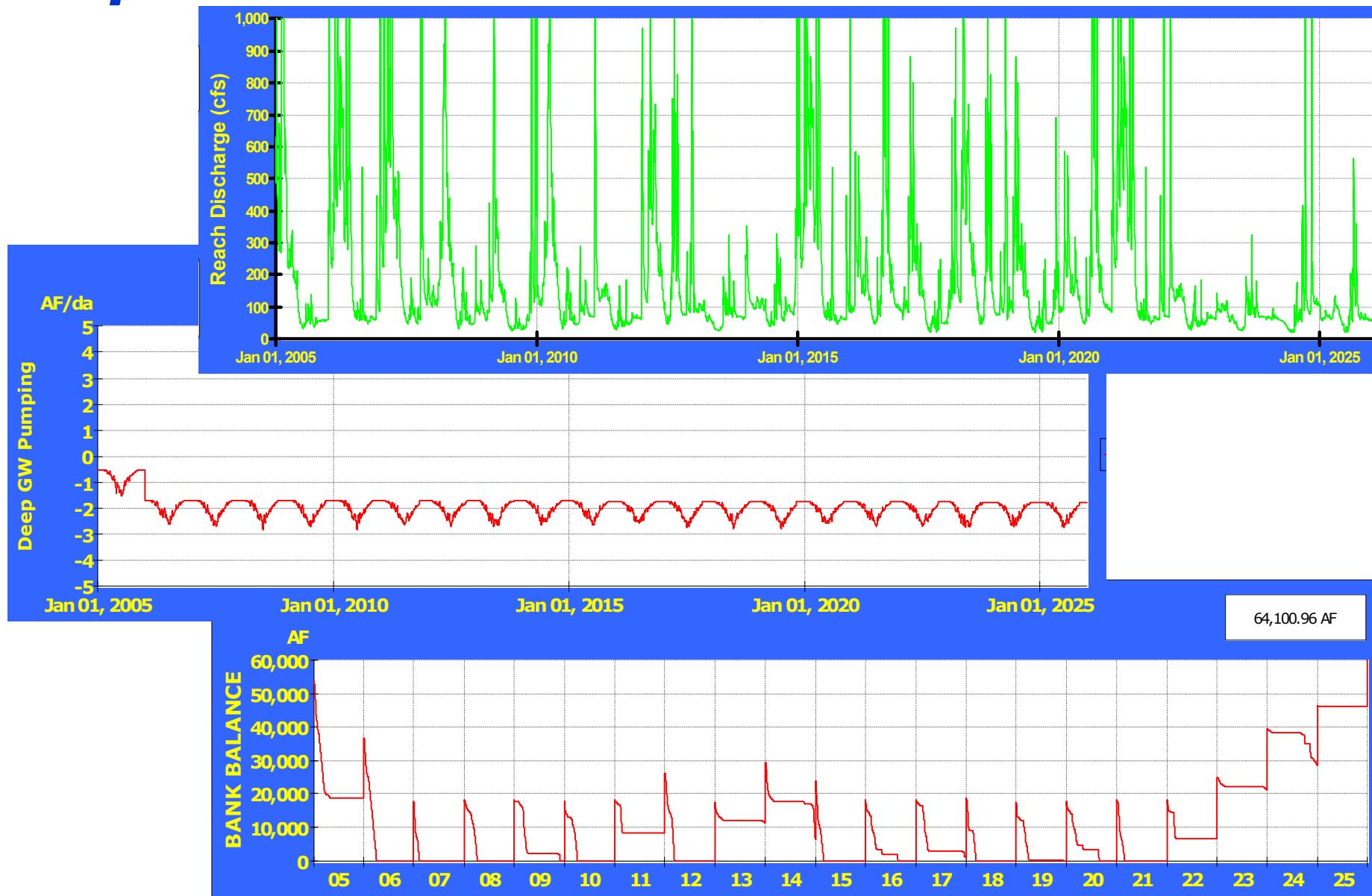
Tables

| Gila GW | Avg Annual Rate | Total Volume |
|-----------------|-----------------|--------------|
| Domestic Wells | 20 AF/year | 413 AF |
| DNC Wells | 1,818 AF/year | 35,483 AF |
| Municipality | 657 AF/year | 14,241 AF |
| GW to Mimbres | 951 AF/year | 17,865 AF |
| Commercial | 2,183 AF/year | |
| Livestock | 3,206 AF/year | |
| Mining | 392 AF/year | |
| Supplemental Ag | 4,692 AF/year | |

| | | | |
|--------------------|----------------|---------------------|---------------|
| Mimbres GW | Avg | | |
| Mimbres Irrigation | 24, | SF Diversion Rights | 2,315 AF/year |
| Mimbres Population | 13,929 AF/year | | 258,596 AF |
| Mimbres Industrial | 15,254 AF/year | | 320,316 AF |
| Mimbres Livestock | 1,416 AF/year | | 29,752 AF |

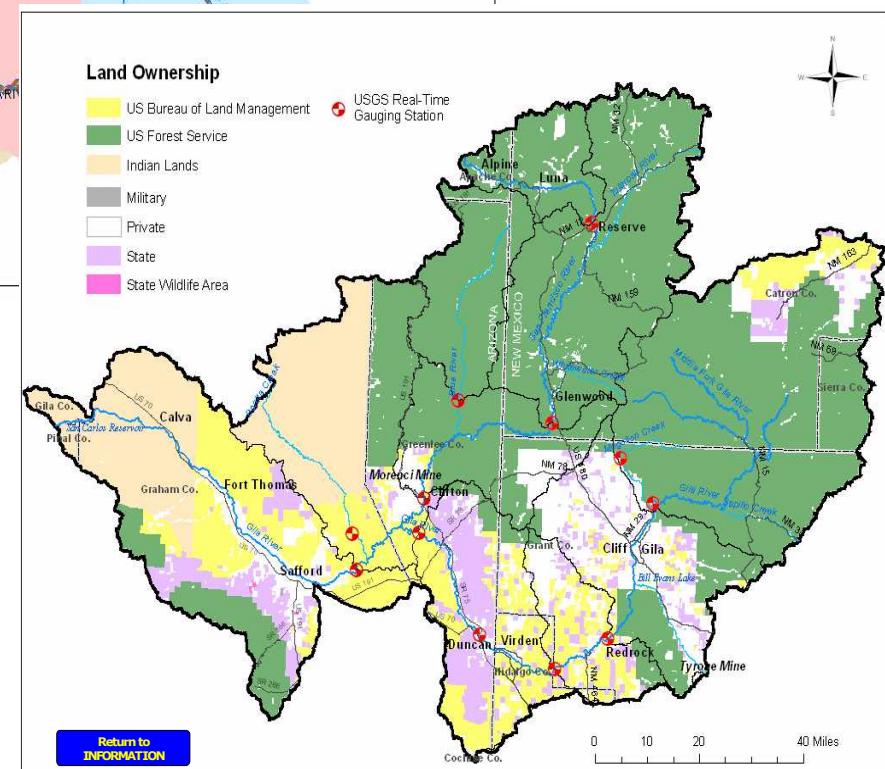
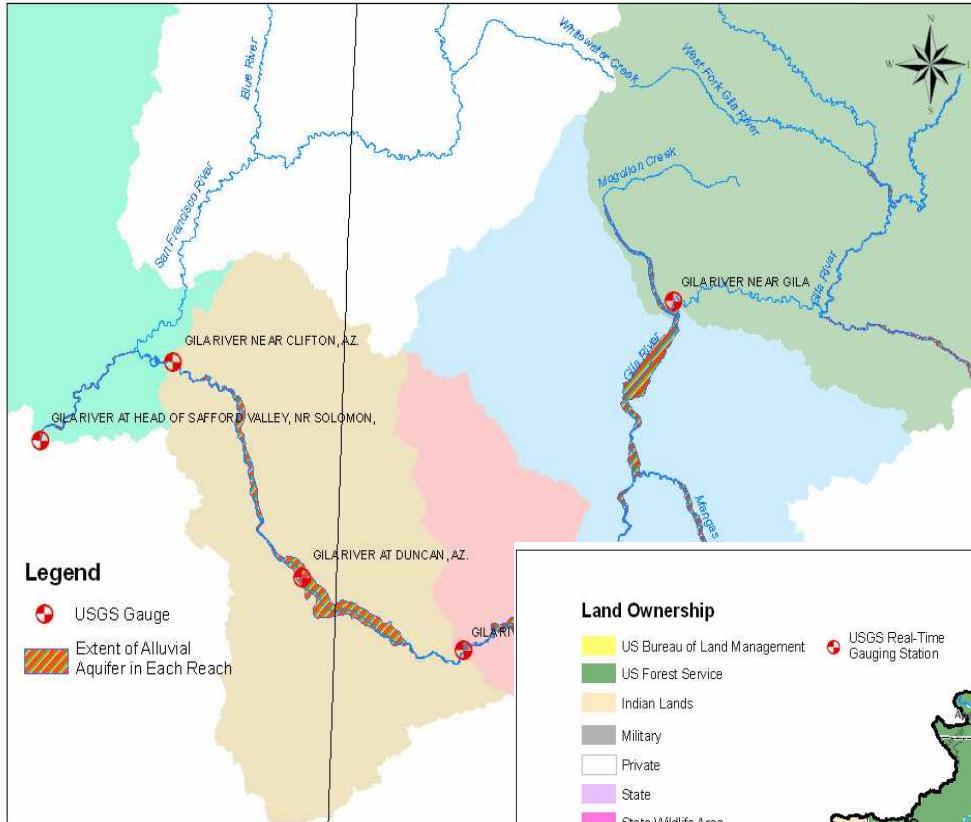
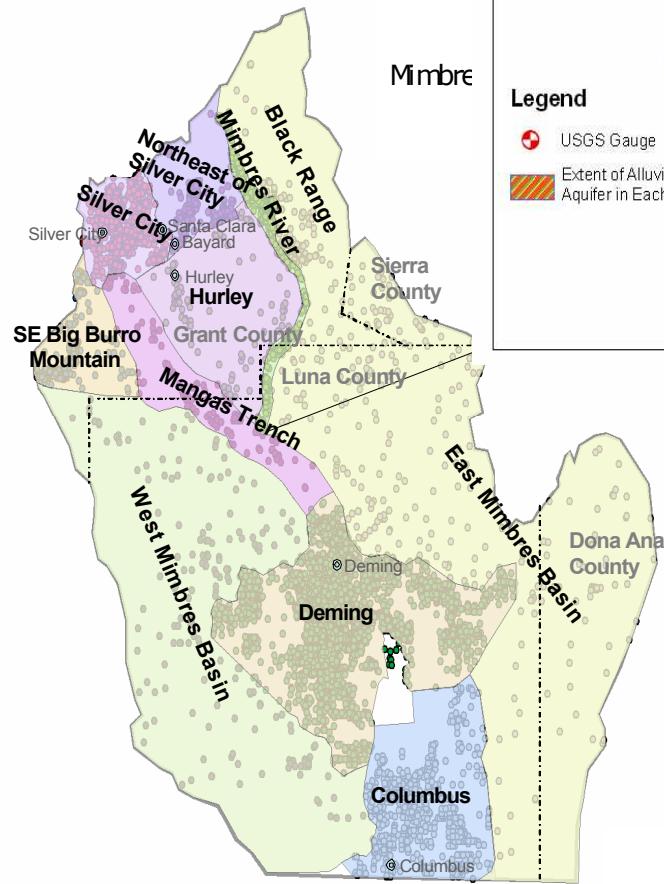
| 1 | 1 | 2026 | Tests | Days: 7,671 |
|---------------------------------|-------------------------------|---------|--------|-------------|
| Tests - ON or OFF | | | | |
| 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | | | |
| Test | Test | # False | % True | |
| Test 1 | San Carlos >= 30K AF | 766 | 90 % | |
| Test 2 | Sum of Flows > DDB | 4,410 | 43 % | |
| Test 3 | GilaVirden > 120% Call for DV | 335 | 96 % | |
| Test 4 | Sum of Diversions < DD Right | 0 | 100 % | |
| Test 5 | Allowable Diversion < 350 cfs | 860 | 89 % | |
| Test 6 | SF Clifton >= SF Minimum Flow | 5,100 | 34 % | |
| | | 491 | 94 % | |
| | | 0 | 100 % | |
| | | 0 | 100 % | |
| | | 0 | 100 % | |
| | | 2,645 | 66 % | |
| | | 5,242 | 32 % | |

Graphs



Gila Basin GW Alluvial Aquifer Boundary

Maps



NM Small Business Assistance Program

- Allows Sandia to spend a portion of New Mexico gross receipts tax on projects that support New Mexico Small Businesses.
- Requires small businesses to “sign-on” to project as a sponsor. It costs the business nothing.
- Projects are up to 3 years in duration.

Join The Collaborative Modeling Team!

- **Membership is voluntary.**
- **Participation is mandatory once joined.**
- **Meeting frequency is currently on an as-needed basis pending additional funding.**

Questions? [Amy Sun acsun@sandia.gov](mailto:Amy.Sun@Sandia.gov)

[Vince Tidwell vctidwe@sandia.gov](mailto:Vince.Tidwell@Sandia.gov)