

Gila-San Francisco Decision Support Tool

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

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>

The image displays a web browser window showing the Sandia National Laboratories Water Portal. The page title is "A Collaborative Water Monitoring, Modeling and Management Environment". The navigation bar includes links for home, site map, vision, portal tutorial, sites of interest, help, and literature. The main content area features a section titled "A Collaborative Water Monitoring, Modeling and Management Environment" by Karl Morak, dated 02-26-2007 09:36. Below this, a "Note" states: "There is public and restricted information on this site. You may view all public information without restriction." A "Collaborations:" section lists various international resource modeling projects, including the NM Office of the State Engineer, Our Global Water Future, Center for Strategic and International Studies, Arab Science & Technology Foundation, Iraq, Iraqi Water-Energy-Food Modeling, UNESCO-Amman, Navruz Transboundary Rivers Project, Central Asia, Water Quality Monitoring and Modeling, Jordan, Rio Grande/Rio Bravo Data and Modeling, US/Mexico, Middle Rio Grande Regional Water Planning, New Mexico, Groundwater Decision Support Modeling, University of Texas, Corps of Engineers & Willamette Partnership, Portland, and Upper Hondo Water Availability & Decision Support Model.

Overlaid on the bottom right of the browser window is a PowerSim Studio 7 Expert interface. The title bar reads "PowerSim Studio 7 Expert [C:\Documents and Settings\vtidwell\Desktop\GilaModel 20060308.sip *] : Shared Diagrams". The interface shows a complex simulation diagram for the Gila Model. Key components include: "MogollonCliff" (a blue circle), "GilaGila" (a blue circle), "Ag Diversion Gila to Redrock" (a blue circle), "Storage Gila to Redrock" (a blue circle), "Evap from River Gila to Redrock" (a blue circle), "ET from Riparian Veg" (a blue circle), "Diversion to Bill Evans Lake" (a blue circle), "Routed Flow Redrock" (a blue circle), "GilaRedrock Calc" (a blue circle), "Leakage Rate" (a blue circle), "Ditch Length" (a blue circle), "Seepage from ditches" (a blue circle), "Return flow to river Gila to Redrock" (a blue circle), "Ditch Loss Gila to Redrock" (a blue circle), "Shallow GW Gila to Redrock" (a blue circle), "Ag Irrigation Seepage Gila to Redrock" (a blue circle), "Irrigated Land Gila to Redrock" (a blue circle), "allow GW to flow are just e." (a blue circle), and "Initialize Reach Storage" (a blue circle). The diagram also shows various flow rates and storage values, such as "764.00 cfs", "2,127.39 AF", "0.00 cfs", "0.00 AF/da", "0.00 AF/da", "1.06 cfs", "1,237.60 AF", "770.05 AF", "914.34 cfs", and "764.00 cfs". The interface includes a "Reset Simulation (Ctrl+R)" button, a "Simulation 1" component, and a "Shared Diagrams" section. The bottom status bar shows the simulation is running at 12/31.

Information Sharing

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

gila san francisco
R I V E R B A S I N S

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

Introduction | Build Scenarios | Run the Model | View Results | Key Words | HELP

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.

Residential/Non-Residential

Introduction
Residential
Non-Residential
SI/Chama

Residential/Non-Residential

Category | Min | Set Value | Max | Current | Units

Convert Existing Non-Residential Property to Low-Flow Appliances | 0 | 100 | 0

Convert Existing Non-Residential Property to Water-saving | 0 | 100 | 0

Reduce Irrigated Acreage of Landscaping for New Non-Residential Property | 0 | 100 | 0

Reduction in Consumption by Landscaping | 0 | 50 | 50 %

Some % set on Residential control page

☐ Use Low-Flow Appliances in New Construction

☐ Use Water-saving for New Construction

Parks and Golf Courses

The City of Albuquerque has several non-potable water use and water re-use programs planned to reduce groundwater pumping by roughly 2500 AF/year when all the plans are fully implemented. These projects began coming on line in 2005 and should be complete by 2015. Choosing to implement the plan assumes the projects will continue towards completion and be operated as planned, and is a realistic option. If you choose "yes" then the model will phase 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 of parks and golf courses. This slider bar sets the rate at which park and golf course acreage grows with increasing population. For example, if you wish to reduce growth in golf course acreage, but continued growth in park acreage (at the same rate) is desired, then the slider bar to 50%. Components in this category assume that both acreages grow with increasing population, at the same rate, which is consistent with the City's long term plan. Use the slider bar to see the impact of population growth on the growth of parks and golf courses.

Interactive Map

Alpine, Luna, Glenwood, Fort Thomas, Safford, Duncan, Virden

Contents

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- Model
- Maps
- Extinct Species
- References
- Links
- Contacts

Water Model Tool

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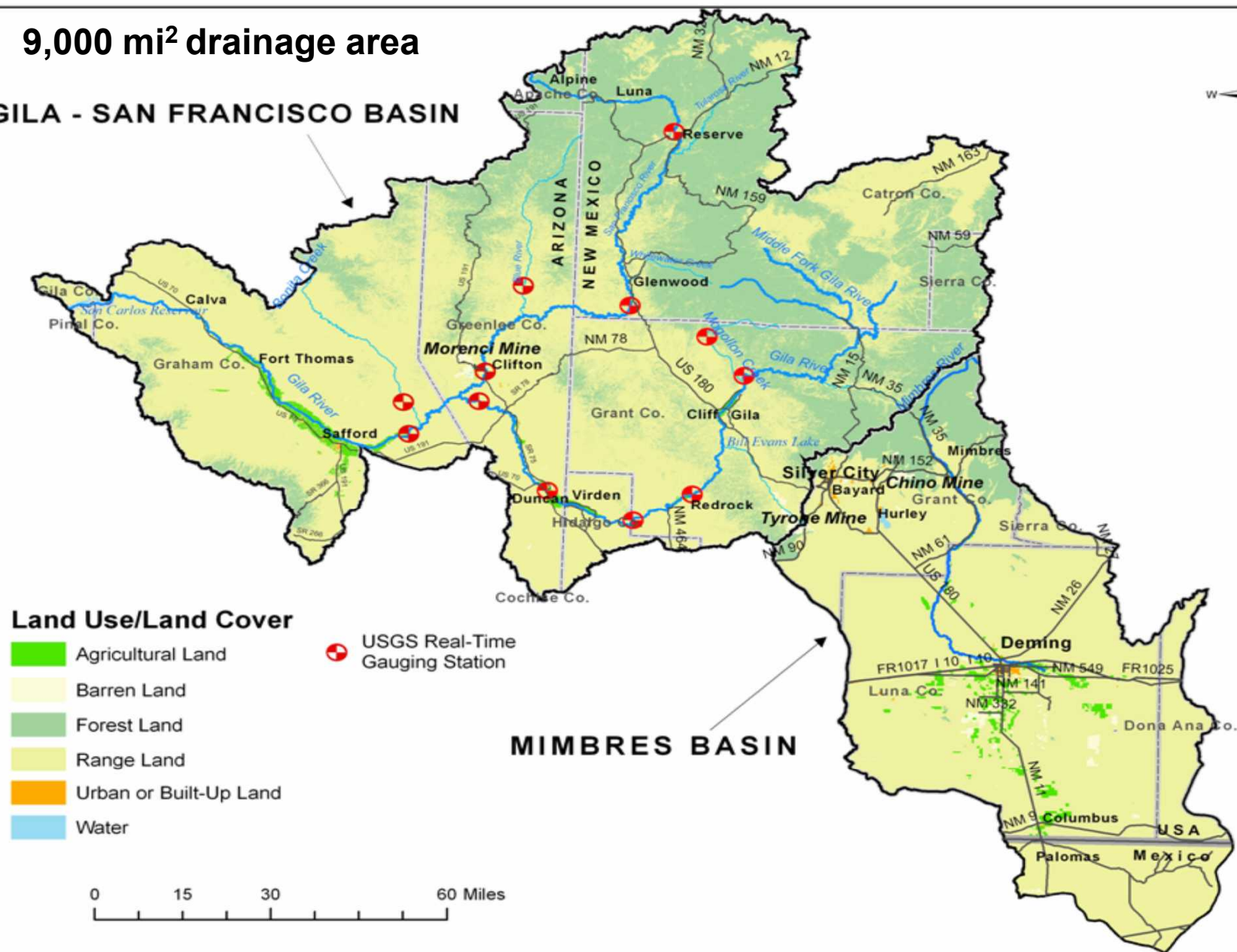
Model Components

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



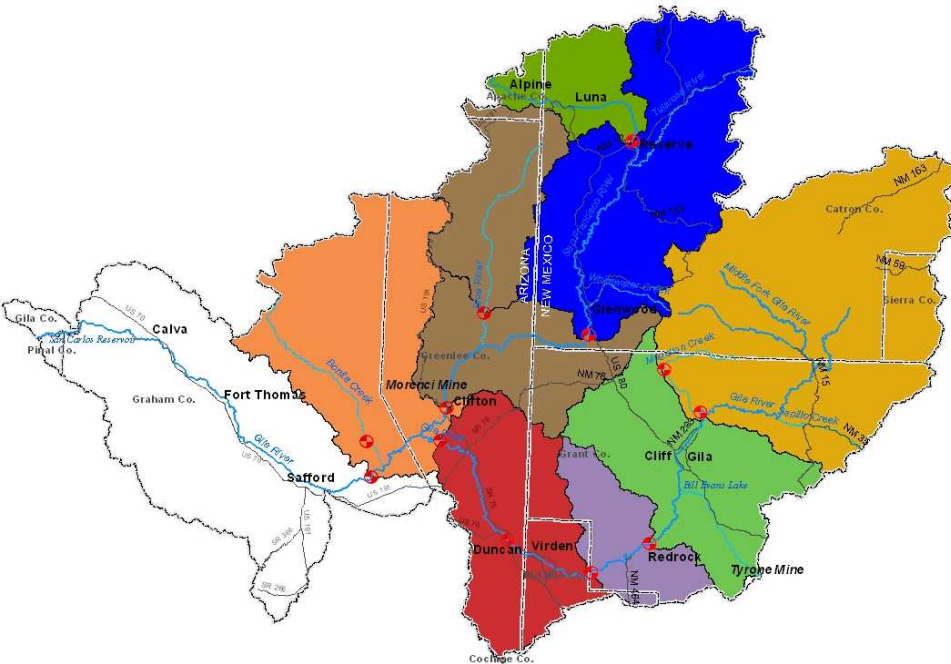
9,000 mi² drainage area

GILA - SAN FRANCISCO BASIN

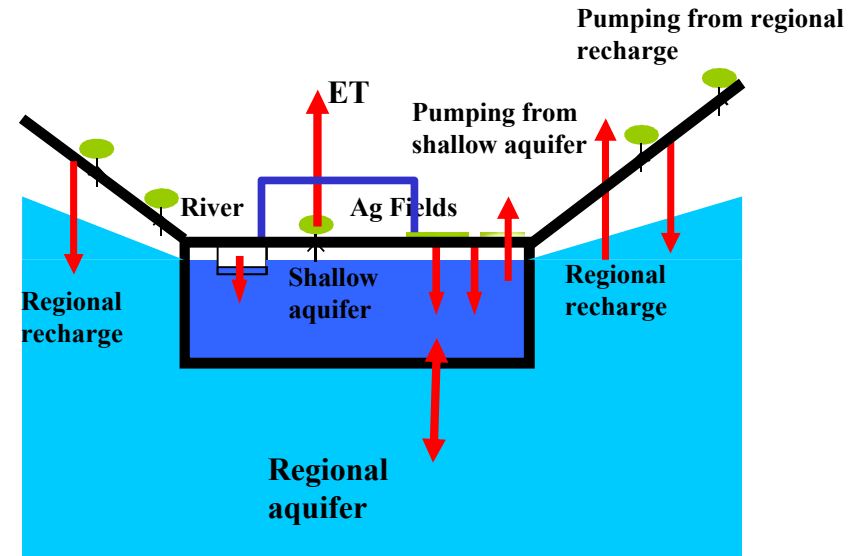


Surface and Ground Water Modules

- 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

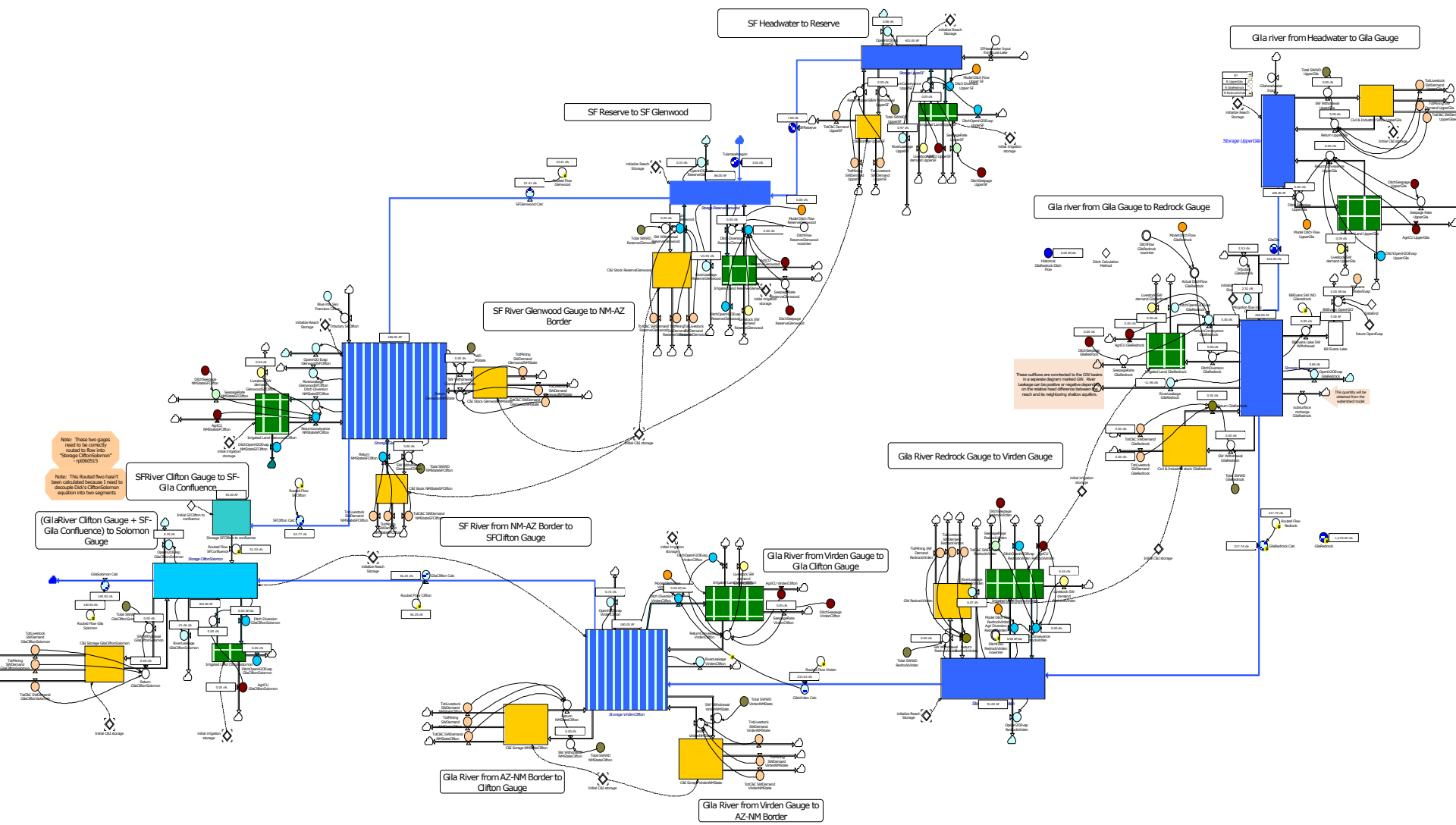
#5 <350 cfs

#1-30K San Carlos

#2 Bypass Flows

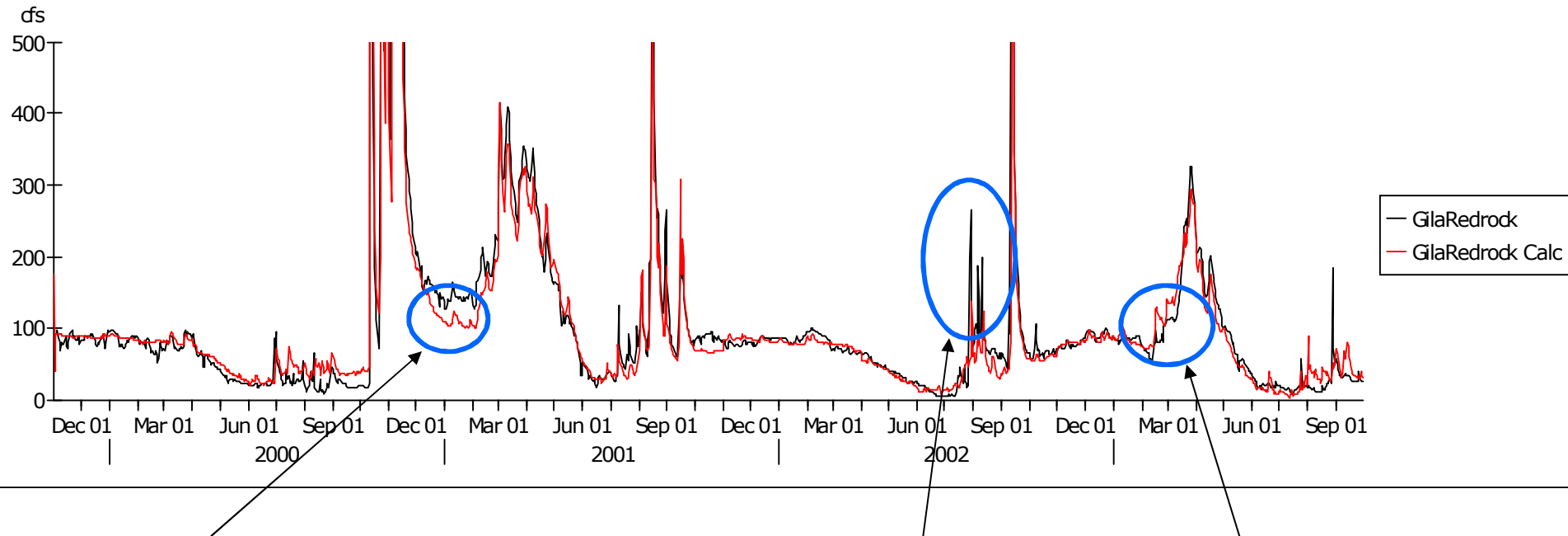


System Dynamics Model



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

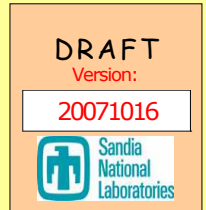
User Control



Model Homepage



Gila-San Francisco Decision Support Tool



**About this
Model**

Background

Maps

**Executive
Summary**

Climate

CUFA

Population

Agriculture

**Minimum
River
Flows**

**Mine
Leased
Water Rights**

**Pause
the
Model**

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

Return to Top

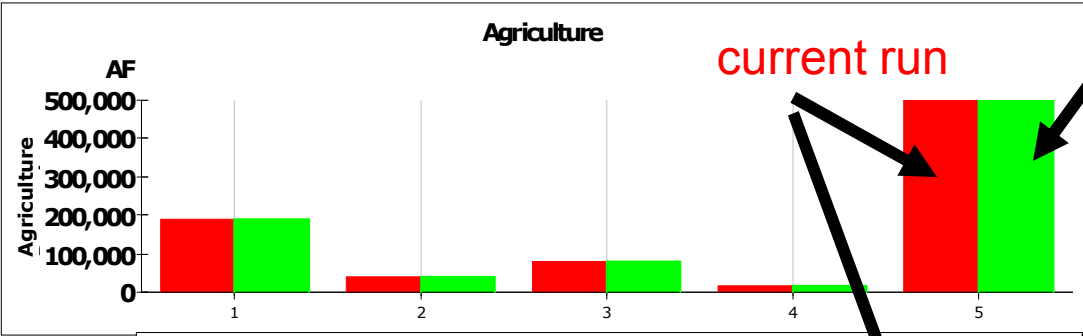
Projections of Water Supply & Demand

baseline run

DRAFT

Version:

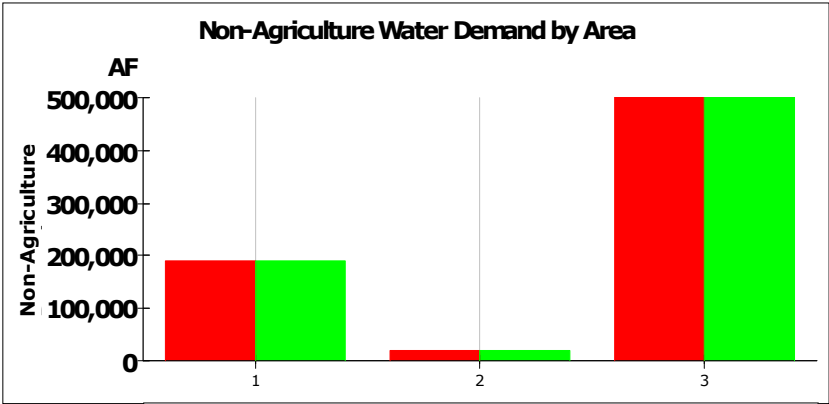
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Gila SW Ag	SF SW Ag	Gila GW Ag	SF GW Ag	Mimbres GW
188,475 AF	41,428 AF	81,525 AF	18,193 AF	559,504 AF
188,475 AF	41,428 AF	81,525 AF	18,193 AF	559,504 AF

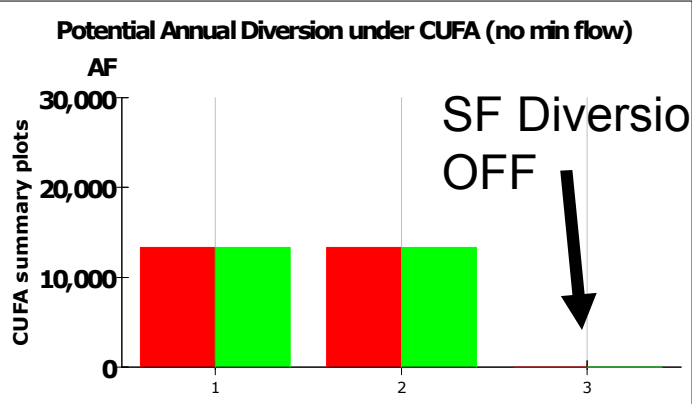
Baseline Summary is the 20-year summary based on default values of input parameters.

BASELINE SUMMARY



Gila Non-Ag	SF Non-Ag	Mimbres Non-Ag
189,532 AF	20,169 AF	608,663 AF
189,532 AF	20,169 AF	608,663 AF

BASELINE SUMMARY



Total	Potential Gila	Potential SF
13,333 AF	13,333 AF	0 AF
13,333 AF	13,333 AF	0 AF

Baseline Summary

20-year Summary – SF Diversion ON



GSF Basin SW Hydrology

GSF SW Irrigation Summary

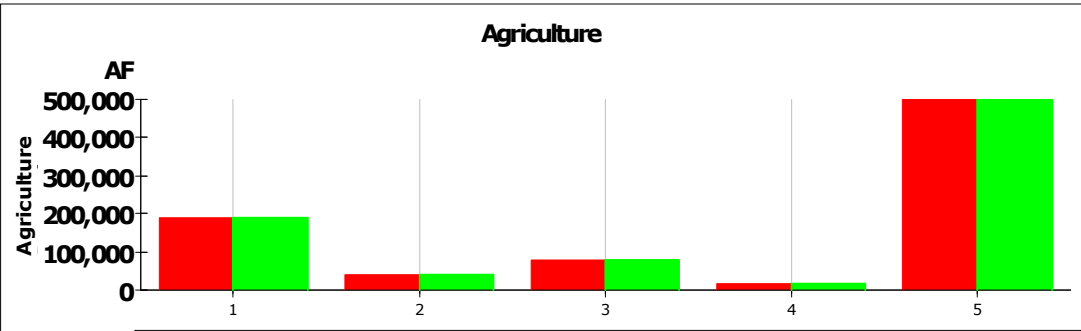
GSF GW Summary

Mimbres GW Summary

CUFA Summary

Return to Top

Projections of Water Supply & Demand



BASELINE SUMMARY

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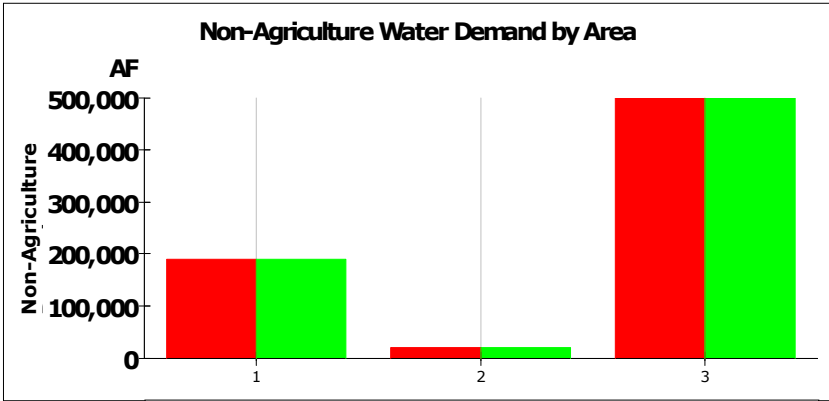
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DRAFT

Version:

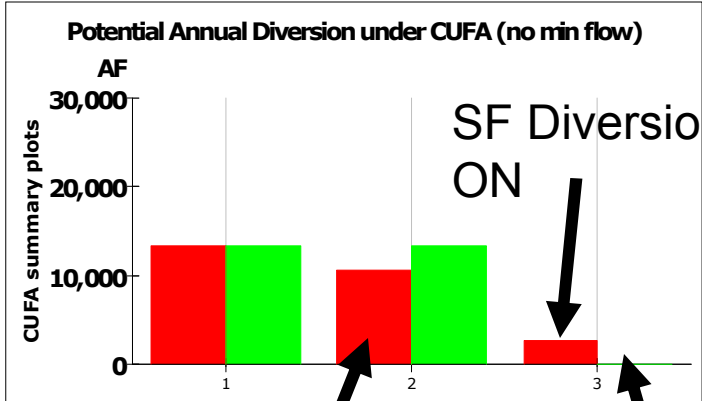
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BASELINE SUMMARY

Gila Non-Ag	SF Non-Ag	Mimbres Non-Ag
189,532 AF	20,169 AF	608,663 AF
189,532 AF	20,169 AF	608,663 AF



Baseline Summary

Total	Potential Gila	Potential SF
13,333 AF	10,558 AF	2,773 AF
13,333 AF	13,333 AF	0 AF

current run

baseline run

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,	
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

1

2

3

4

5

6

7

8

9

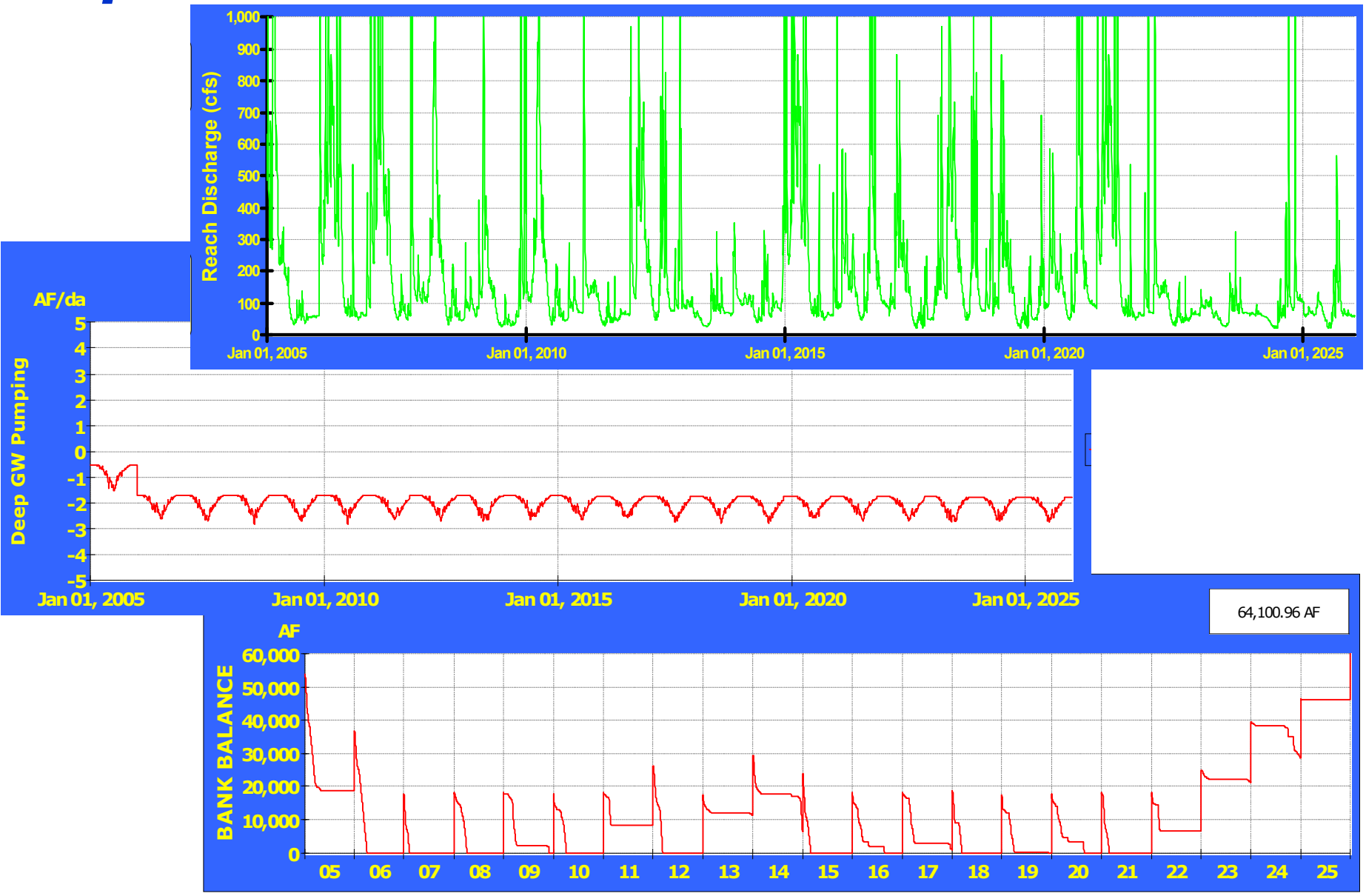
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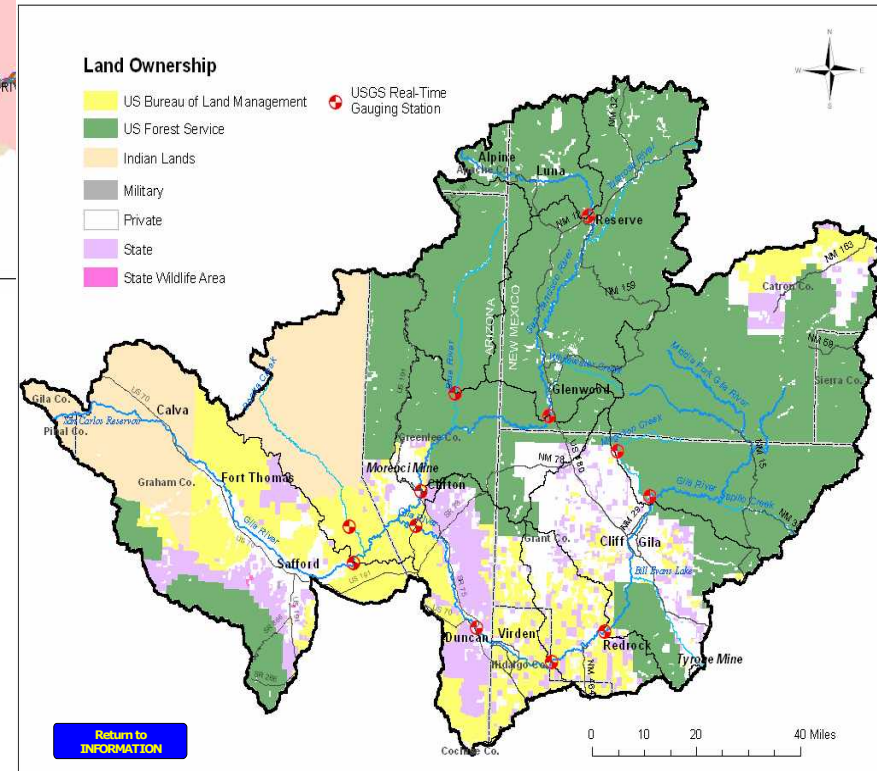
12

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 %
g Annual Rate	Total Volume	491	94 %
		0	100 %
		0	100 %
		0	100 %
857 acre	31,165 AF	2,645	66 %
,471 AF/year		5,242	32 %
454 AF/year	9,620 AF		

Graphs



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
 Vince Tidwell vctidwe@sandia.gov