Update of USDA Projects

Paso del Norte Watershed Council
May 4, 2018

Zhuping Sheng
Texas A&M AgriLife Research Center at El Paso

6/8/2018

Objective of USDA NIFA Project #1

- Title: Sustainable water resources for irrigated agriculture in a desert river basin facing climate change and competing demands: From characterization to solutions
- PI: William Hargrove
- UTEP, NMSU, MTU, TAMU, UNM, UACJ
- 2015-2020

1. Modeling of medium to long-term climate change, and short-term climate variability for the region
2. Improvement and integration of existing hydrology models, including upstream demands and flows, groundwater supplies and demands, surface-subsurface interactions, and water quality dynamics
3. Development of a spatially explicit, dynamic systems model with a front interface of variables and outputs that can be used in participatory stakeholder meetings

6/8/2018

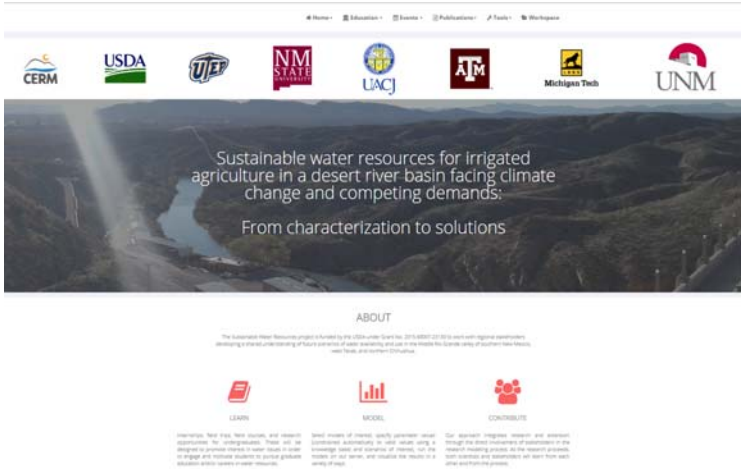
Objective of USDA-NIFA Project #2

- Title: Diversifying the Water Portfolio for Agricultural in the Rio Grande Basin
- PI: John Tracy
- TAMU – TWRI, AgriLife Research and Extension, NMWRRI
- 2017-2021

1. Evaluation of water sources, including nontraditional sources, for urban, agricultural and ecosystem use under changing climate, water management and demographics
2. Assessment of how nontraditional waters can be used to extend supplies through a combination of new management practices, crops and treatment technologies
3. Evaluation of economical methods for conserving water and improving the operation of irrigation systems at the district and field scale
4. Development of a system how integrating water conservation technologies and management practices into Basin water plans

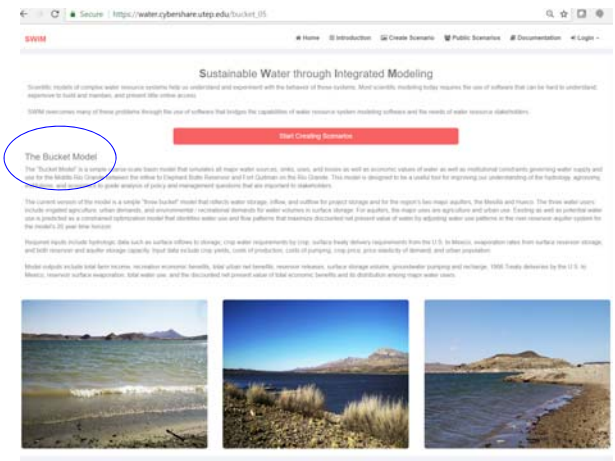
Update for Project #1

Workspace



https://water.cybershare.utep.edu/

Workspace: Scenarios



Bucket Model: Surface and Aquifer Storage

Inflows – outflows = change in storage

Reservoir "bucket"
Inputs: Inflow into reservoirs, precipitation on reservoirs
Outflows: Evaporation from reservoir surface, releases for agriculture, urban use, environmental use, delivery to Mexico

Aquifer "bucket"
Inputs: Inflow into aquifers
Outflows: pumping

(Mesilla and Hueco)

Ward & Mayer

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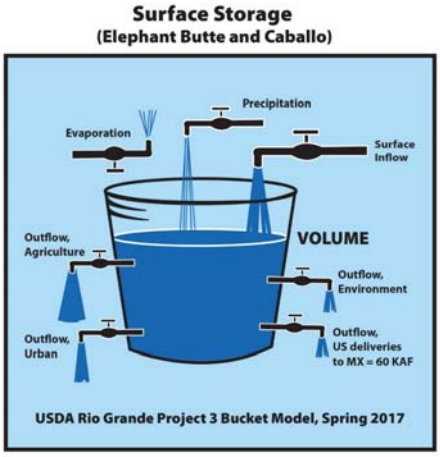
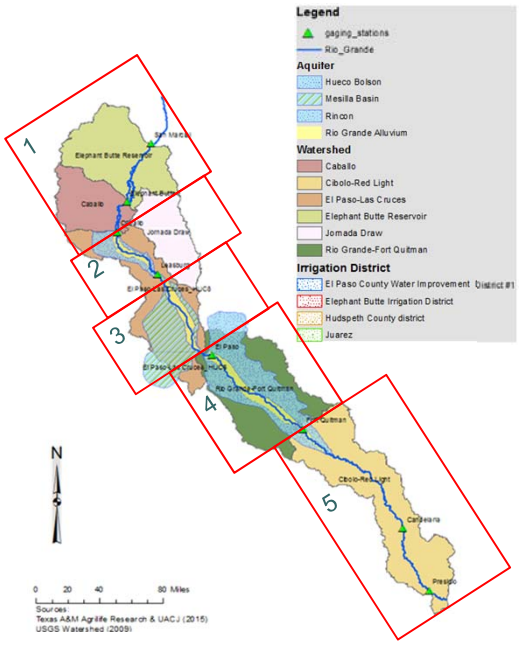


Image from Frank Ward; created by Ana Henke
Used with permission

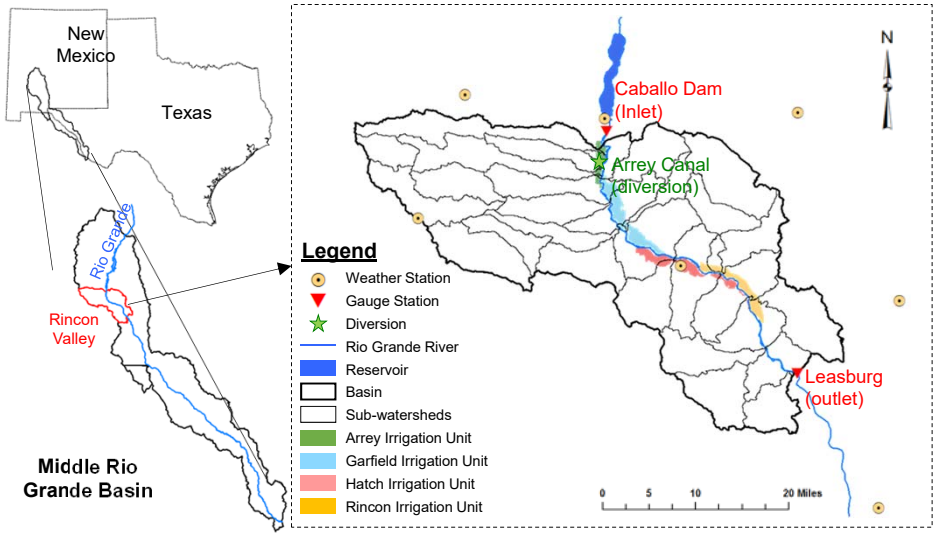
Study Area

- Whole Watershed Model
- Model 1- San Marcial to Caballo Dam
- Model 2- Caballo Dam to Leasburg
- Model 3- Leasburg to El Paso station
- Model 4- El Paso Station to Fort Quitman
- Model 5- Fort Quitman to Presidio station



SWAT Model (Rincon Valley)

- SWAT sub-watersheds (29) as HUC12
- Watershed area: 2,466km^2
- Annual Precipitation: 270.8mm
- Annual Max./Min. Temp.: 24.3℃ / 5.8℃



SWAT Model (Rincon Valley)

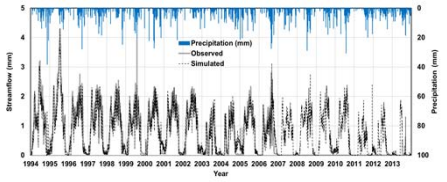
- CDL Land cover (Normal vs. Dry year): 14 crops

Alfalfa 40%, cotton 16%, pecans 15%, corn 11%

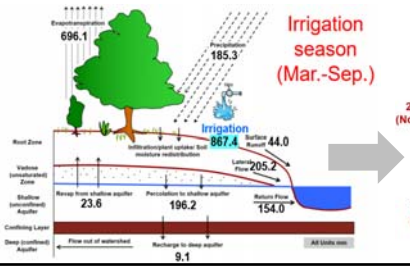
2008 (Normal year)

2011 (Dry year)

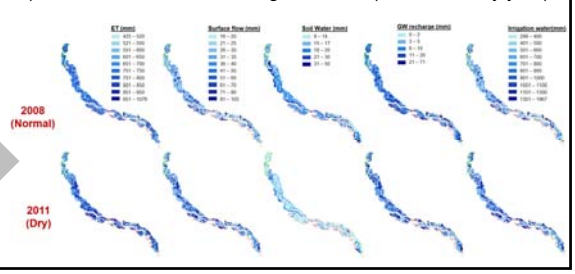
- Calibration of streamflow (20yrs: 1994-2013)



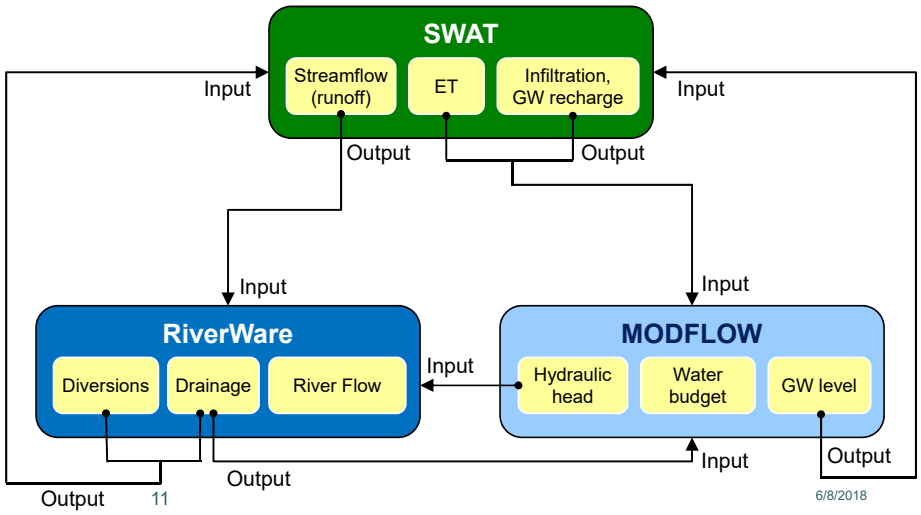
- Water Balance Analysis (20yrs: 1994-2013)



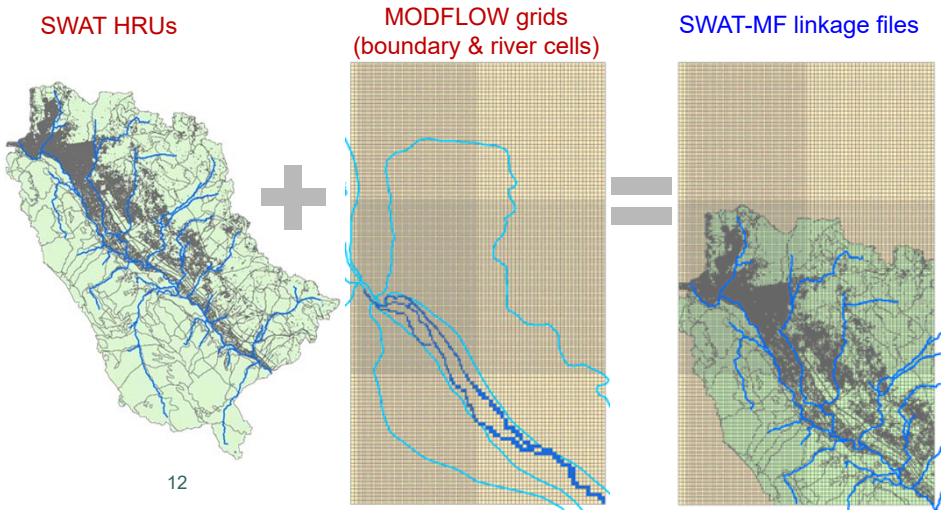
- Water Balance of Irrigation Units (Normal vs. Dry year)



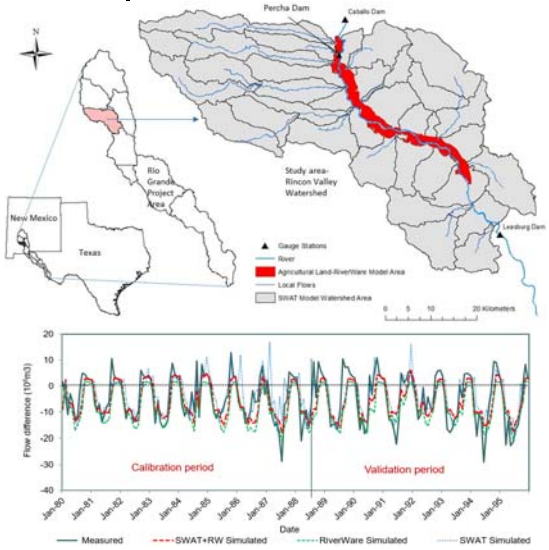
Linking Models

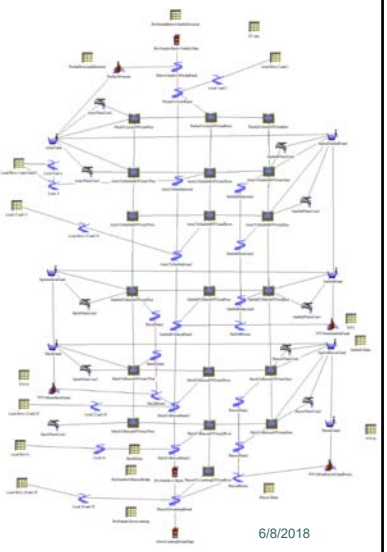


SWAT-MODFLOW (El Paso to Fort Quitman)



SWAT-RiverWare (Rincon Valley)





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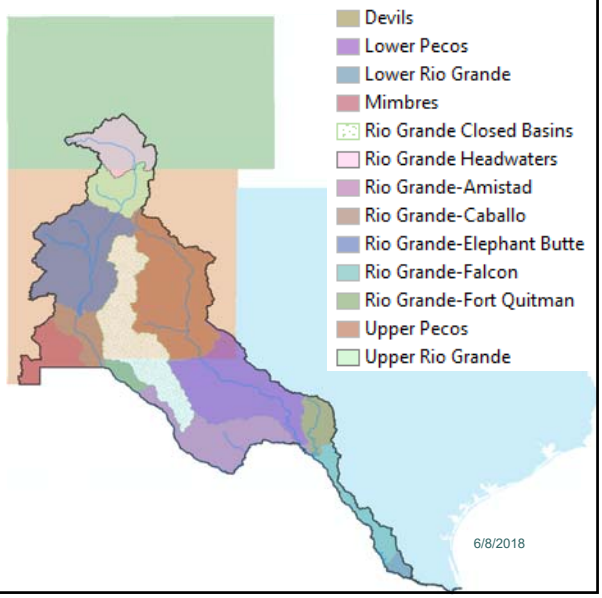
Update for Project #2

The Rio Grande Basin

- Agriculture consumes more than 85 % of available water
- Frequent drought, irrigation inefficiency
- About 97,000 sq. miles
- 13 sub basins



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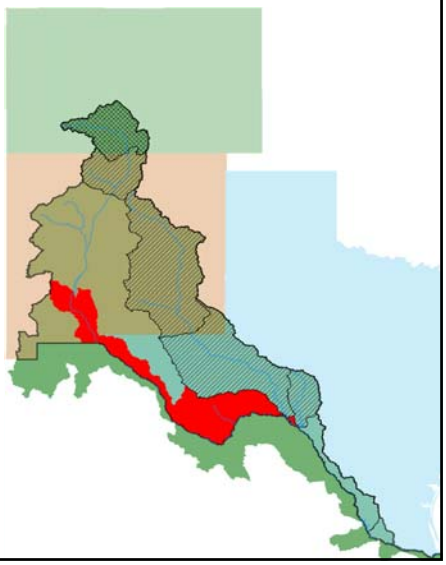
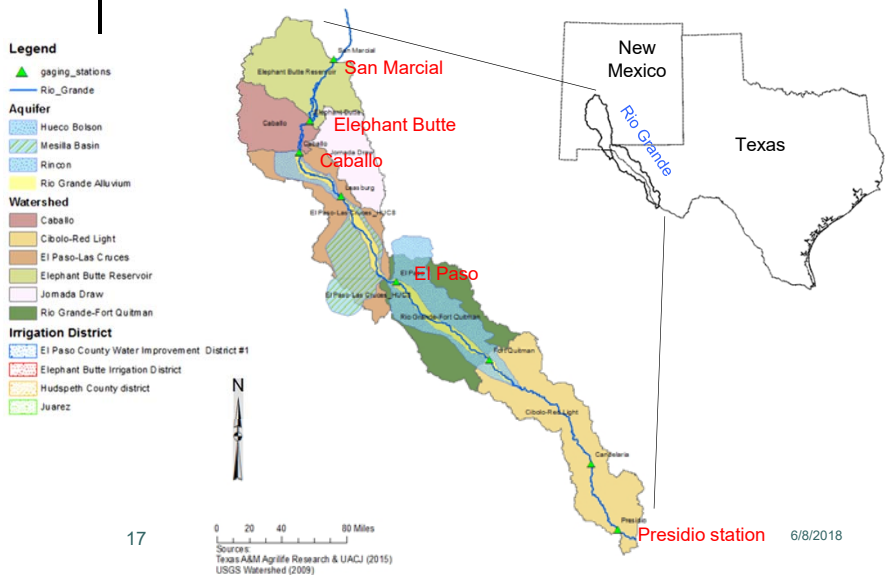
Hydrologic Model Building

- Sub basin by sub basin modeling approach
  - Size
  - Complexity
- Models built for (using HAWQS*)
  - Rio Grande Headwaters (calibrated)
  - Upper Rio Grande (underway)
  - Upper & lower Pecos
  - Devils
- Model being built
  - Rio Grande-Fort Quitman

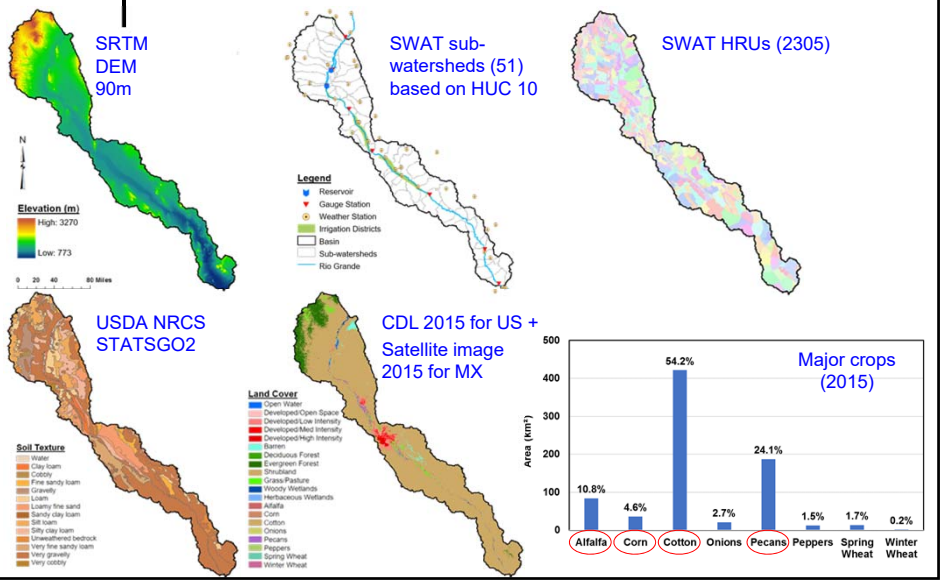
https://epahawqs.tamu.edu



Study Area (San Marcial to Presidio)

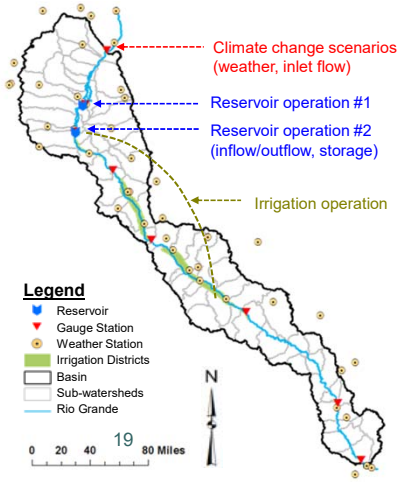


SWAT Model Setup

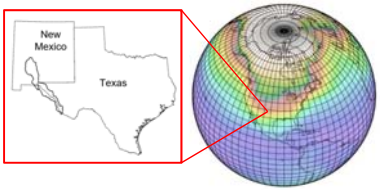


Planned Work

SWAT Model
(Watershed hydrologic modeling)



Climate change scenarios
(GCMs)



- ✓ Hydrological processes
  (flow, sediment, and water quality)
- ✓ Analyze potential water savings
  (improved irrigation scheduling, crop selection and use of innovative management practices)
- ✓ Climate change scenarios

Thank you!

- USDA – NIFA
- USDA – Hatch Project
- Dr. Sora Ahn
- …

zsheng@ag.tamu.edu
(915) 859-9111 ext. 226