Hydrologic Data Program Overview

Rio Grande Estuary, and Lower Laguna Madre Basin and Bay Area Stakeholder Committee (BBASC)

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Chief South Texas Program Office

USGS Texas Water Science Center
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San Antonio, TX 78249

U.S. Department of the Interior
U.S. Geological Survey

USGS Overview

- Department of Interior, founded in 1879
- Has 9,000 employees
- Offices in every state.
- Conducts interdisciplinary scientific monitoring, assessment, and research along 6 Science Themes

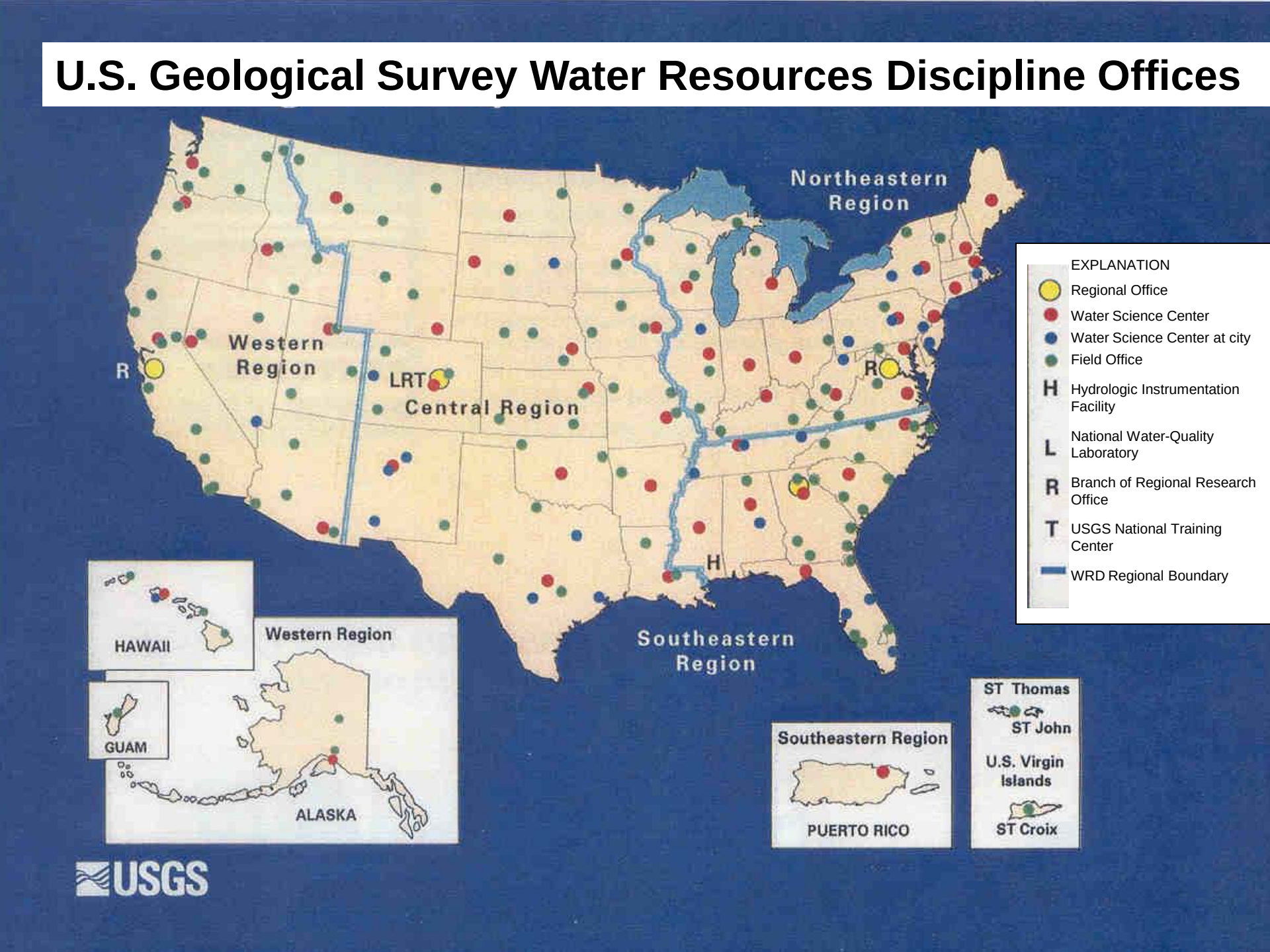
USGS

Mission Statement:

"The leader in providing relevant and reliable water science to meet the future needs of our Cooperators and the Nation."

Preeminent….Relevant….Reliable

U.S. Geological Survey Water Resources Discipline Offices



USGS: Six Science Themes

- Ecosystems
- Energy, Minerals and Environmental Health
- Core Science Systems
- Climate and Land-Use Change
- Natural Hazards
- Water

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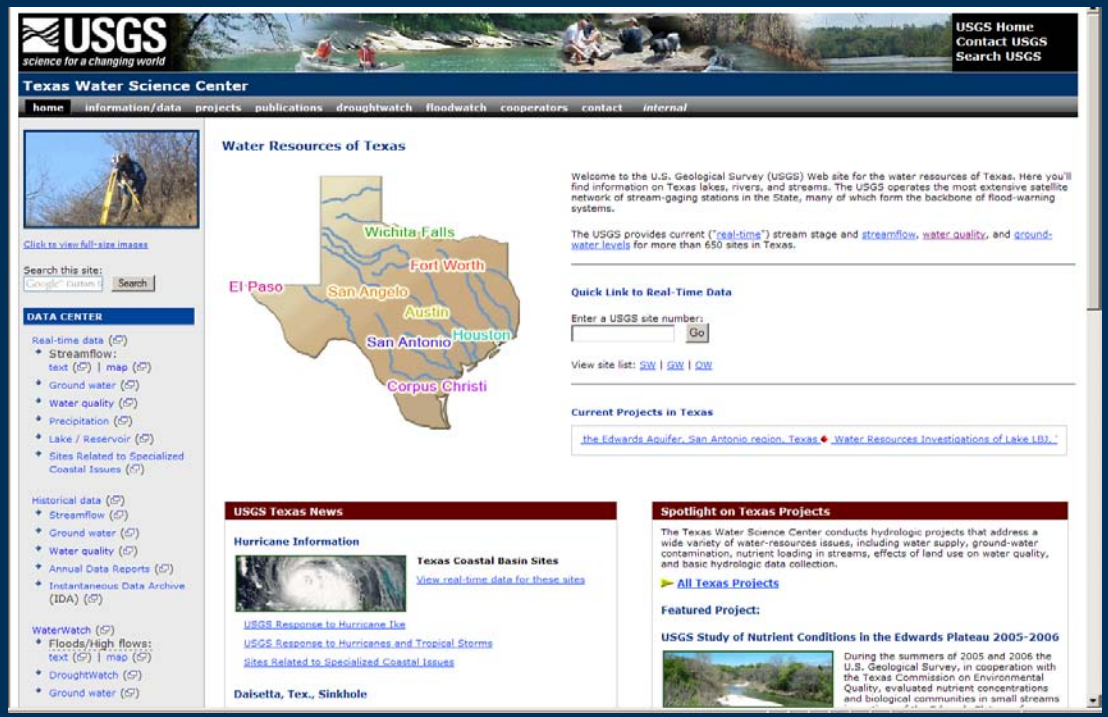
USGS Mission – Water Resources

USGS accomplishes this mission in cooperation with State, Local, and Other Federal Agencies.

Texas Staffing by Location

- Austin……..64
- San Antonio.....29
- Houston……..23
- Fort Worth……..20
- San Angelo……14
- Wichita Falls……7
- El Paso……..2
- Corpus Christi …1
- Lubbock……1



Multi-Disciplinary Expertise in Hydrology, Hydrogeology, and the Physical Sciences

Hydrologic Activities

- Water Availability – GW Modeling
- Salt Water Intrusion
- Aquifer Storage and Recovery
- Flood Frequency Analyses
- Land Use Effects – Watershed Modeling
- Contaminant Distribution and Transport
- Drinking Water Quality

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Surface-Water Activities

- Streamgaging
- Flood Warning
- Tidal Flux Variation
- Watershed Modeling
- H&H Modeling
- Bay and estuary ADCP measurements
- Time and Travel Investigations
- Gain/Loss Investigations
- Flood Frequency Analysis
- Historical Database/Archival

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USGS Real Time Water Monitoring

# Sites	Name
9,315	Gage height
7,460	Discharge
3,339	Precipitation
1,790	Water temperature
901	Ground-water Level
882	Specific conductance
815	Lake/Res elevation
492	Stream velocity
469	Dissolved oxygen
466	Air temperature
337	pH
323	Turbidity
179	Wind speed
159	Salinity
144	Wind direction

# Sites	Name
119	Reservoir storage
60	Soil temperature
52	Air pressure
50	Relative humidity
39	Soil moisture
25	Chlorophyll
19	Pressure, diss gases
15	Barometric pressure
14	Solar radiation
10	Sodium adsorption ratio
13	Tide elevation
7	Redox potential
5	NO2+NO3
5	Cyanobacteria

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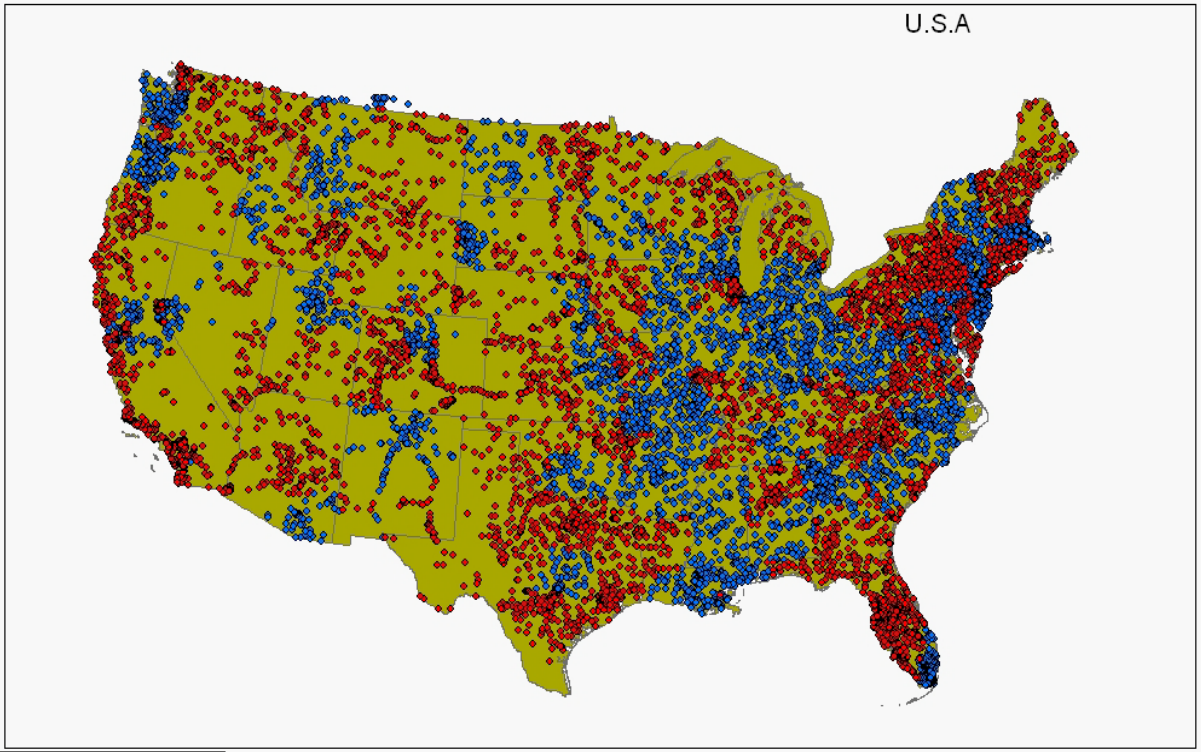
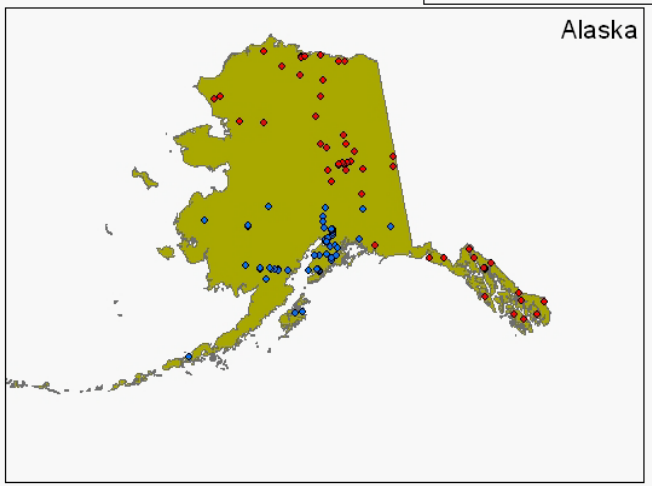
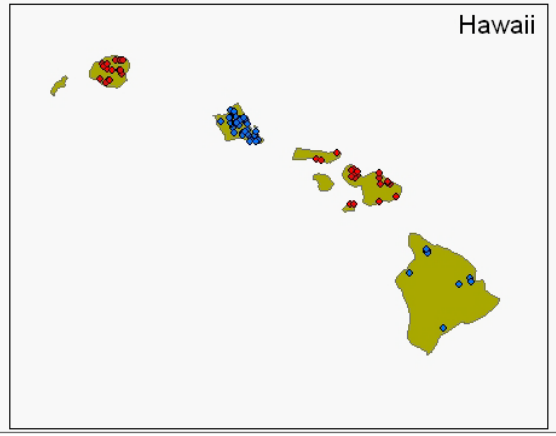
Real-time sites operating office in relation to location of NWIS Server.

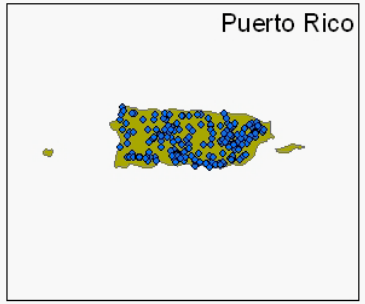
Real-time sites being operated from an office where NWIS:

- Server is remote
- Server is local



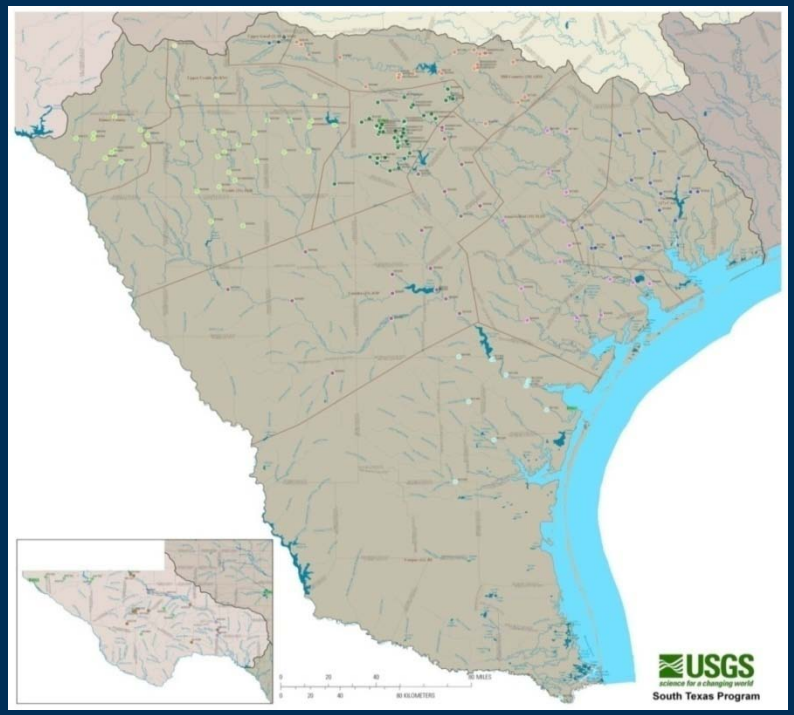






South Texas Program Office Real-time Monitoring Stations

- 160 - SW Stations
- 80- Rain gauges
- 24- GW Stations
- 25 - QW stations



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Water-Quality Science

- Age–Dating of Water
- Emerging Contaminant Studies
- Geochemical Modeling
- Long-term Monitoring
  - Total Maximum Daily Load (TMDL) Assessments
  - Trends Analysis
- Geospatial Database Development
- Real-Time Monitoring:
  Groundwater, Surface Water, Lakes and Reservoirs
- Regression Analysis and Real-Time Monitoring to Estimate Constituent Concentrations and Loads
- Water Quality Analysis at Part-Per-Billion Levels
- National Water Information System (NWISweb) Data Available Within 24 Hours of Receipt from Laboratory
- Stormwater Monitoring

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REAL-TIME WATER-QUALITY MONITORING

USGS Guidelines and Standard Procedures for Continuous Water-Quality Monitors

- Site and Water-Quality Monitor Selection
- Field Procedures
- Calibration of Continuous Water-Quality Monitors
- Record Computation
- Review and Data Reporting

Guidelines and Standard Procedures for Continuous Water-Quality Monitors: Station Operation, Record Computation, and Data Reporting: http://pubs.usgs.gov/tm/2006/tm1D3/

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Water Quality Analysis at Parts-Per-Billion Levels

- Nutrients
- Major Ions
- Carbon
- Suspended and Dissolved Trace Elements
- Suspended Sediment
- Pesticides
- VOCs
- Isotopes

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Hydrogeologic Activities

- Water-Level and Water-Quality Monitoring
- Recharge Studies
- Age Dating
- Transport of Contaminants
- Source Water Protection
- GW/SW Interactions
- Geophysical Investigations
- Geospatial Database Development

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Examples of Ongoing Studies

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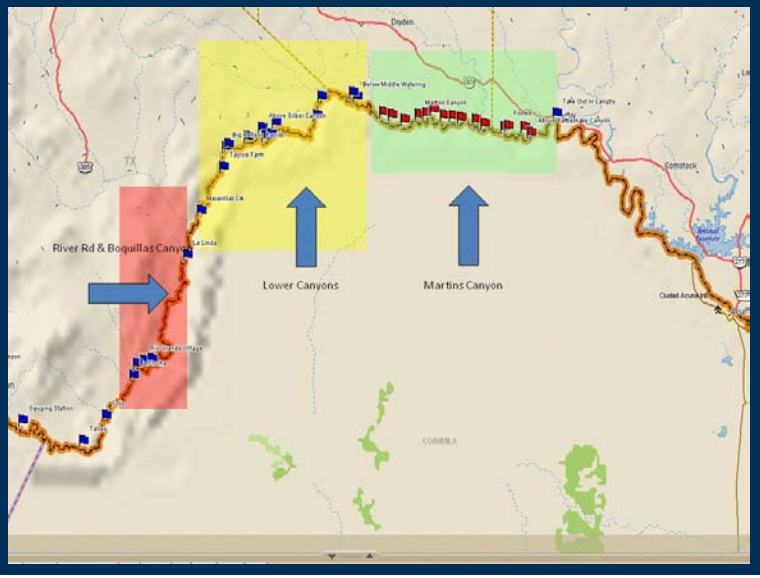
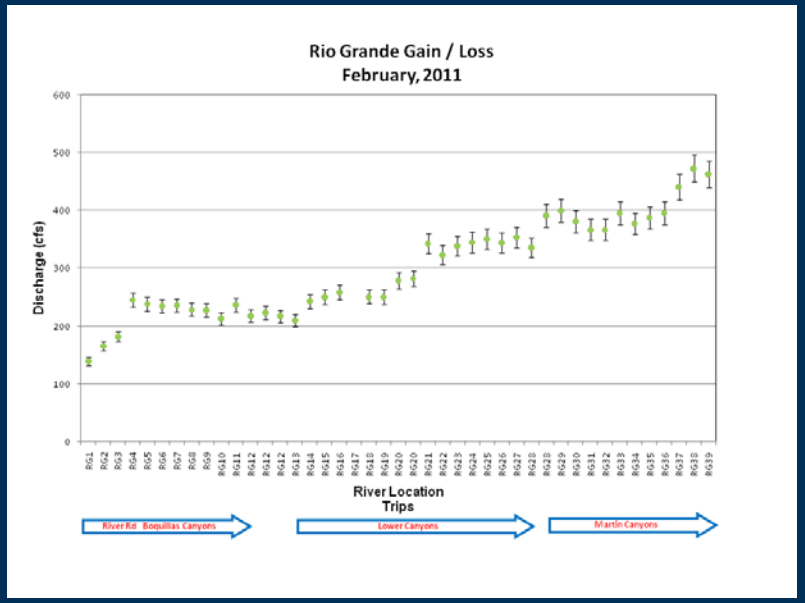
Rio Grande Gain Loss Study

- To evaluate and quantify groundwater contributions along the Rio Grande River from Johnson Ranch to Foster Ranch through the Big Bend National Park and the Rio Grande Wild and Scenic River, Tx.
- 87 synoptic G-L measurements over 15 days.
- 191 river miles





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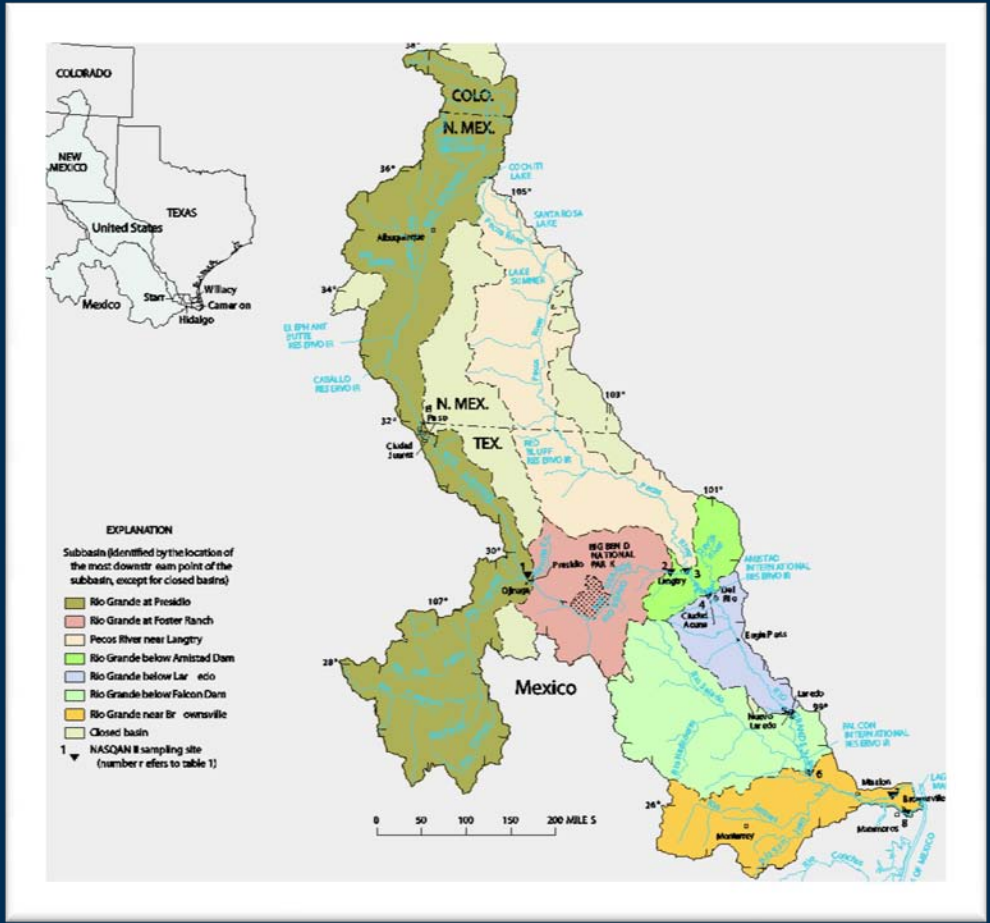
National Stream Quality Accounting Network (NASQAN)
http://water.usgs.gov/nasqan/



- Long-term national water-quality monitoring network to address transport of selected constituents from large rivers to coastal waters of the United States.
- Network designs include
  1) 1974-1995,
  2) 1996-2000,
  3) 2001-2007, and
  4) 2008-2013 (current).

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NASQAN IN TEXAS (2008-2013)

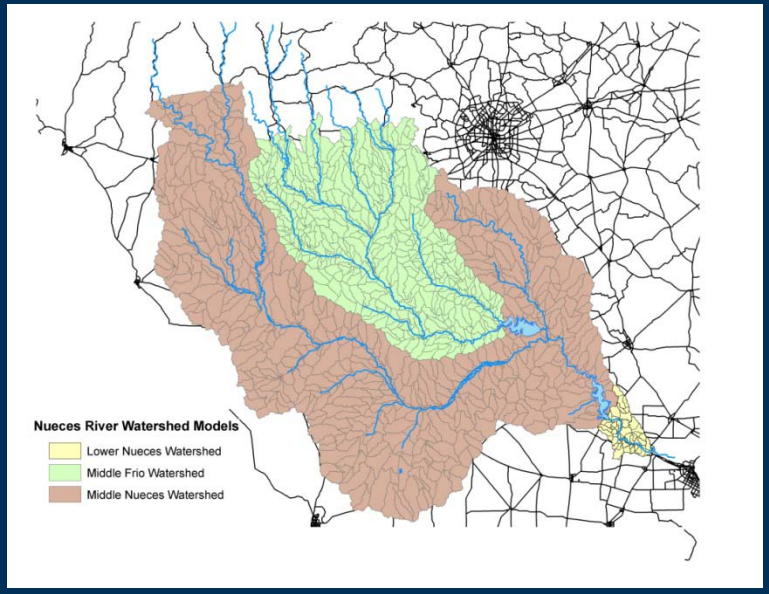
Single site - Rio Grande at Brownsville

Assess concentrations and loads to the Gulf of Mexico of:

- Nitrogen
- Phosphorus
- Carbon
- Silica
- Dissolved solids
- Selected pesticides
- Suspended sediment

Nueces Basin Watershed Modeling

- In cooperation with USACE, SAWS, San Antonio River Authority, City of Corpus Christi, Guadalupe-Blanco River Authority, and the Nueces River Authority.
- Develop HSPF models of the Nueces/Frio basin downstream of the Edwards aquifer recharge zone.
- Sediment modeling of the lower Nueces River, downstream of Lake Corpus Christi



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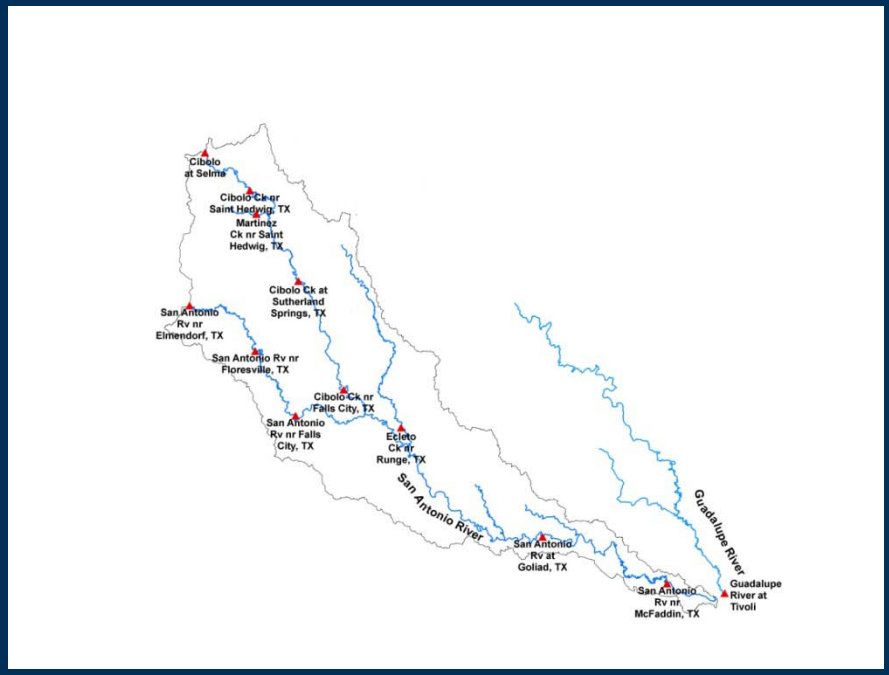
Lower San Antonio River Sediment

In cooperation with the San Antonio River Authority and Texas Water Development Board

- **Characterize sediment transport in the lower San Antonio River Basin**
- **Collect suspended and bed-load sediment at 12 sites on San Antonio River and Guadalupe River**
- **Update of watershed model to include sediment simulation**
- **FY11-14 Timeline for the study**



San Antonio/Guadalupe Rivers Sediment Collection Stations

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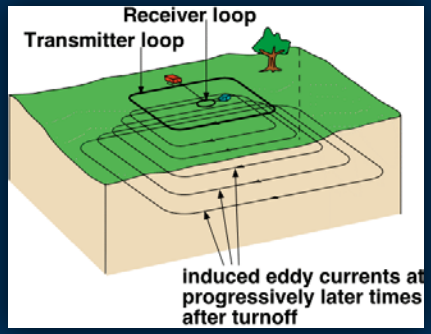
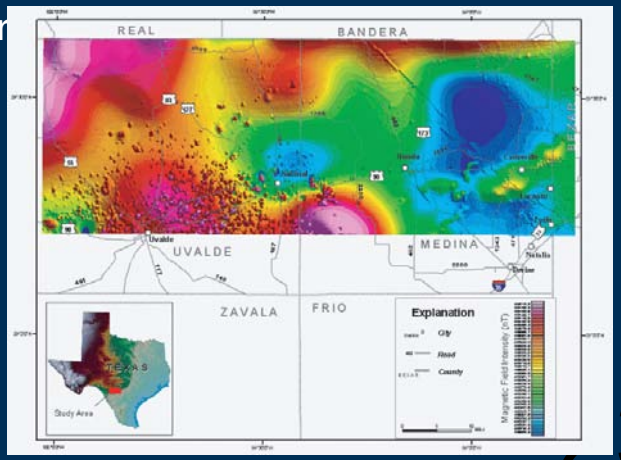
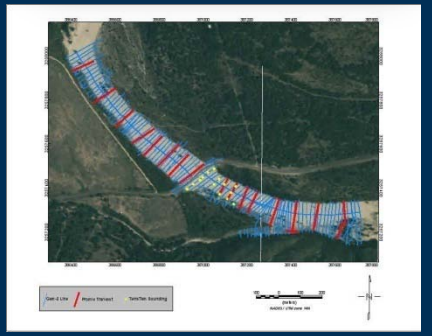
Current TXWSC Geophysical Capabilities

- **TXWSC Capabilities**
  - TDEM – Time-Domain Electro-magnetics
  - FDEM – Frequency-Domain Electro-magnetics
  - DC – Direct-Current Resistivity
  - CC – Capacitively Coupled Resistivity
  - MRS – Magnetic Resonance Soundings
  - Borehole Geophysics

- **USGS –Denver Capabilities**
  - HEM – Helicopter Electro-magnetics (FDEM and TD
  - CSAMT – Controlled Source Audio Magnetotellurics
  - GPR – Ground Penetrating Radar
  - Seismic Refraction and Reflectior
  - Gravity
  - Magnetics
  - IP – Induced Polarization
  - SP – Spontaneous Potential







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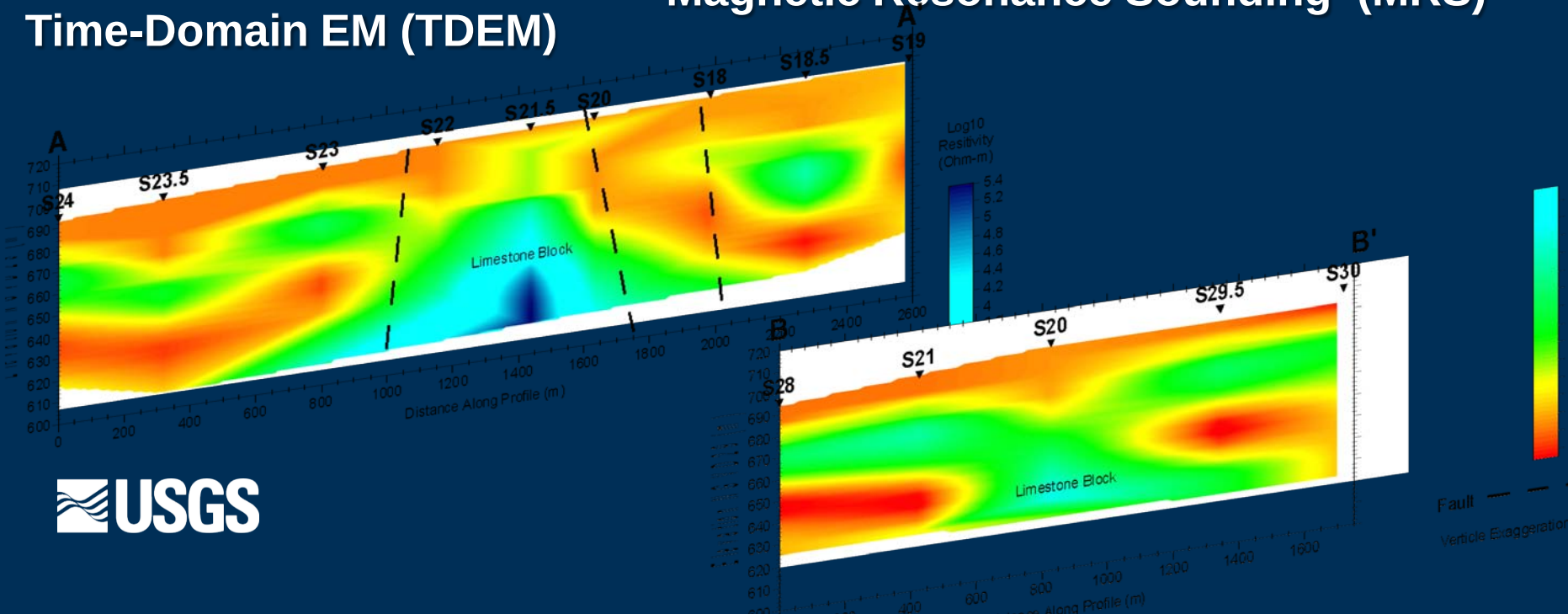
Surface Geophysics Capabilities

Time-Domain EM (TDEM)

Magnetic Resonance Sounding (MRS)



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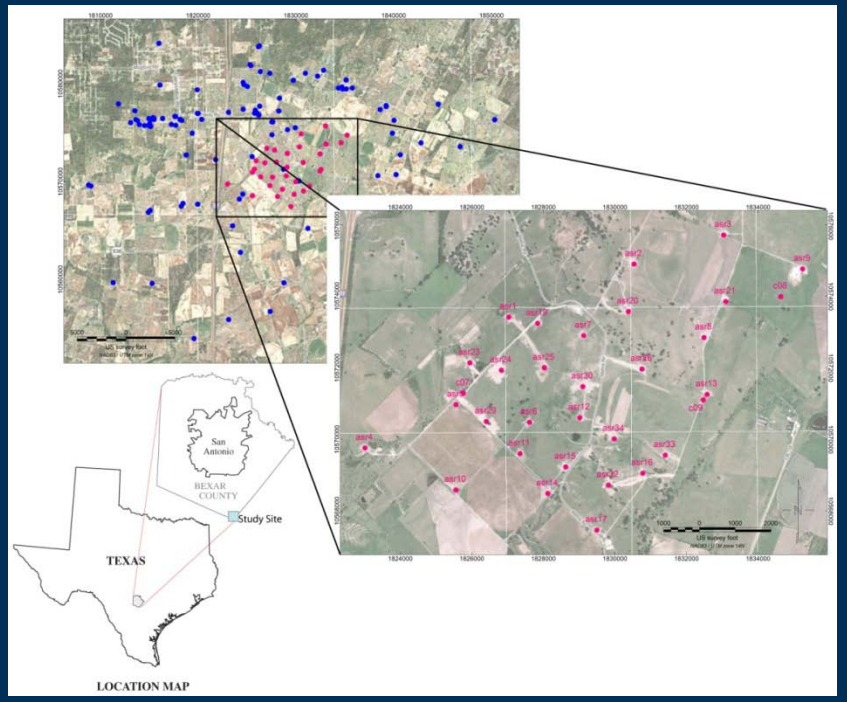
ASR **Geophysics – 3D Model**

- Compile previously collected borehole geophysical data .
- Develop geodatabase for 2-D and 3-D visualization and interpretation.
- Conduct gap analysis to determine data gaps for the development of a 3D hydrogeologic model of the site.



Pink circles represent well locations from the ASR site.

Blue circles represent other well locations in the area with available geophysical data.

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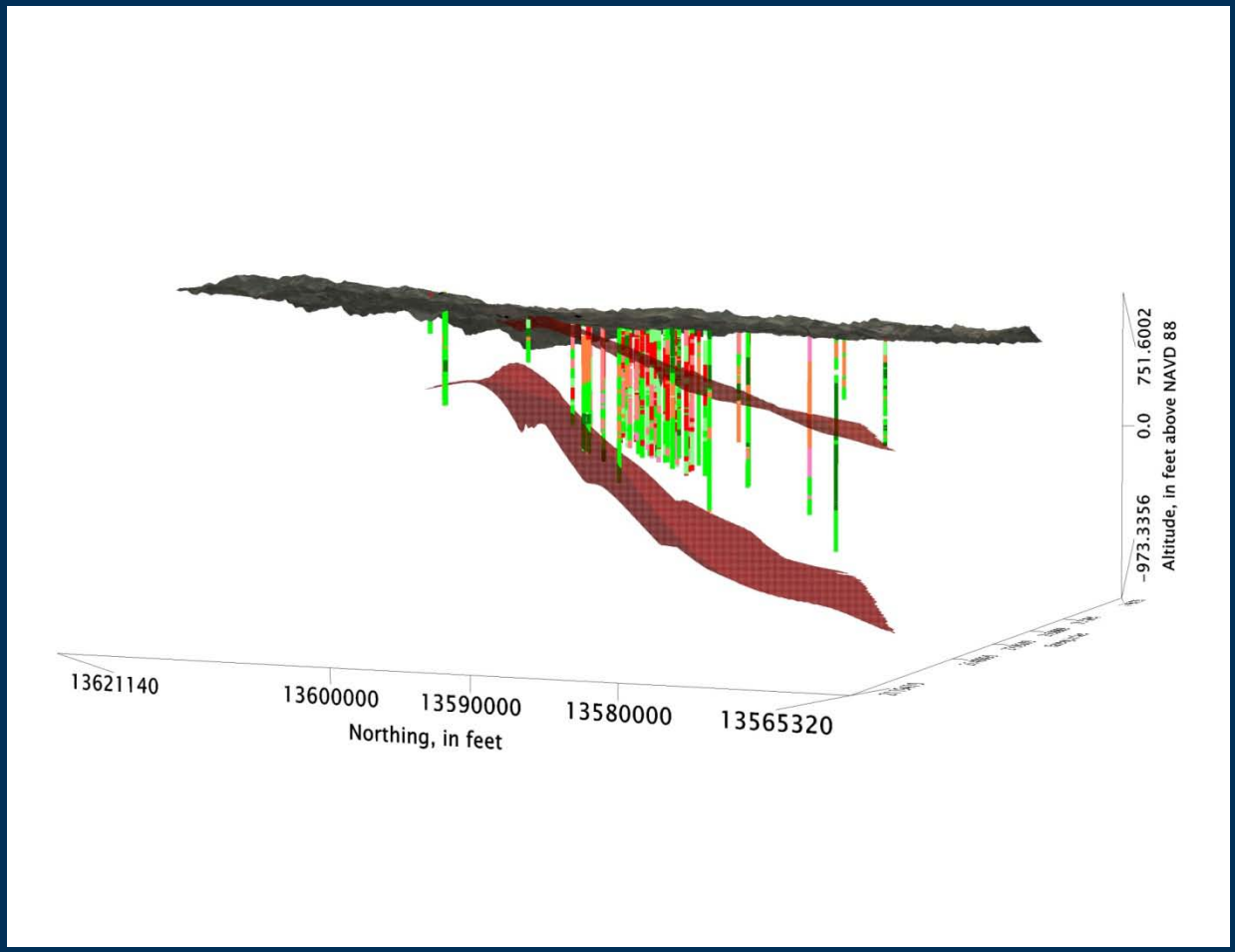

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3D View of Wells and Carrizo

San Antonio River Emerging Contaminants

In cooperation with the San Antonio River Authority

- **Water-quality sampling for Pharmaceuticals, Hormones, and other organic contaminants at 13 sites in San Antonio River Basin**
- **Two sets of synoptics samples: Spring 2011 and Fall/Winter 2011/2012**
- **FY11-13 Timeline for the study**

▲ Sampling Locations
● Water Recycling Plants

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science for a changing world

Flood Support

U.S. Department of the Interior
U.S. Geological Survey

USGS
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MAY 15 – 20, 2010 FLOOD FLOW MEASUREMENTS
USGS – SAN ANTONIO, TX.

Following the May 15 rain events there were more than 21 flow measurements at 16 different locations. These were made within portions of the Medina, Guadalupe, San Antonio, Lwr San Antonio, Lavaca, Coleto, Nueces, Atascosa, and Coastal Water Sheds.

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Questions?