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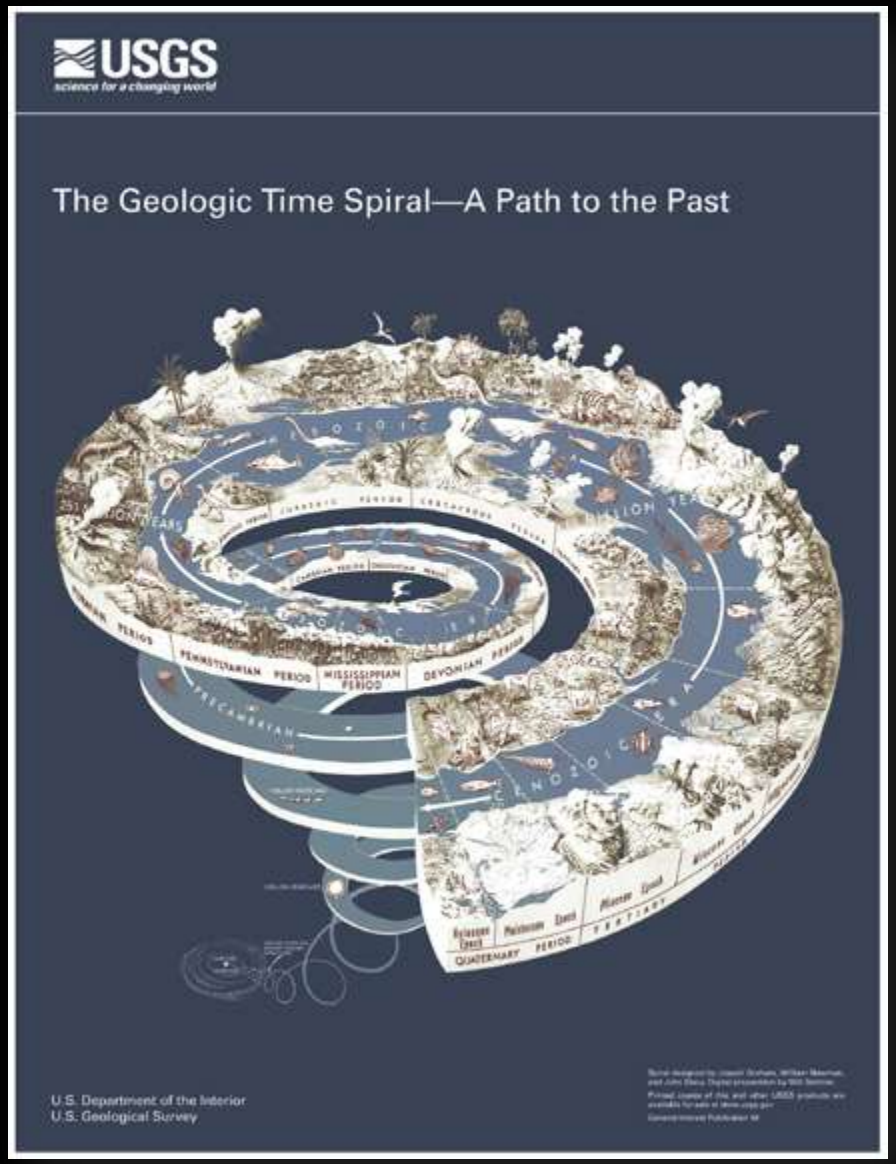
Program Overview (and Evolution) of the USGS Texas Water Science Center – Data and Spatial Studies Section



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

NCTCOG Regional GIS Meeting
May 13, 2015

Personal goals and philosophical takeaways…

- Need to recognize that all data tells a story
- In order to communicate highly technical information it is important simplify our science for public consumption
- Listen and engage partners and stakeholders
- Essential for USGS to evolve with technologies that allow us to deliver of data, information and tools

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Introduction to USGS

- Dept. of Interior - Founded in 1879
- Six Science Mission Areas
  - Water Resources
  - Ecosystems
  - Energy, Minerals and Environmental Health
  - Core Science Systems
  - Climate and Land-Use Change
  - Natural Hazards
- Nationwide about 9,000 employees
- Conduct interdisciplinary scientific monitoring, assessment, and research… distribute that information to the public

- Federal Agency
- Scientific Mission
- Non-Regulatory

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TX-OK Geospatial Liaison

- Claire DeVaughan
  - cdevaugh@usgs.gov
  - 512-927-3583
- Leverage funding across organizations to provide significant cost savings, reduce redundancy in geospatial data acquisition and stewardship, and ensure availability of common base data to a broad range of users and applications.
- http://liaisons.usgs.gov/geospatial/Texas/

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Water Resources Mission –

…to provide hydrologic information and understanding needed by others to achieve the best use and management of the Nation's water resources. **USGS accomplishes this mission in cooperation with State, Local, and Other Federal Agencies.**

“In cooperation with…..”

- Work with over 100 municipalities, river authorities, groundwater districts, local, state, and Federal agencies

Water in the News (Topics)

AQUIFER DEPLETION

ENDANGERED SPECIES

ENERGY PRODUCTION

WATER QUALITY

FLOODING

FUTURE CONDITIONS

CONSERVATION

INSTREAM FLOWS

INVASIVES

POPULATION GROWTH

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Water in the News (May 2015)

- **Current Conditions – Drought?**
  - Central Texas waterlogged: Heavy rains replace drought danger with flood risk Waco Tribune
  - Texas Historic drought is almost over San Antonio Express
  - What the Trinity River near downtown Dallas looks like a few feet above 'minor' flood stage Dallas Morning News
- **Water Availability**
  - Texas lawmakers look into creation of statewide water grid, trading market El Paso Times

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Everything starts with data….

- Data Collection

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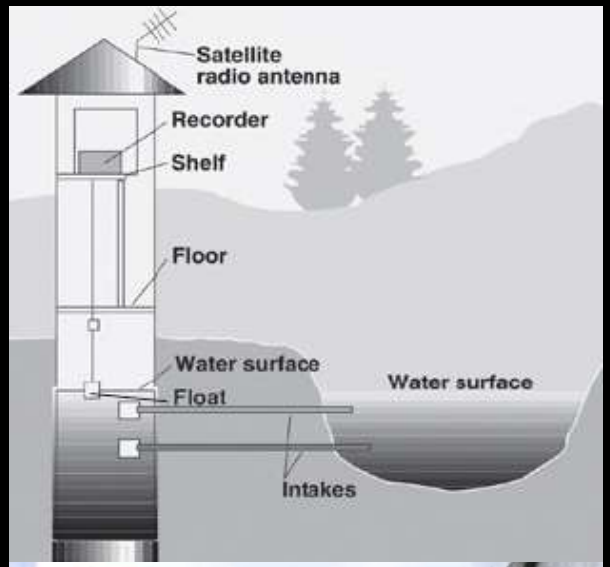
What is a streamgage?

- Usually mounted on bridges
- Contains instruments that measure/record amount of water flowing in river – discharge
- Stage, water quality, levels
- Captured every 15 minutes
- From gage to satellite to web…



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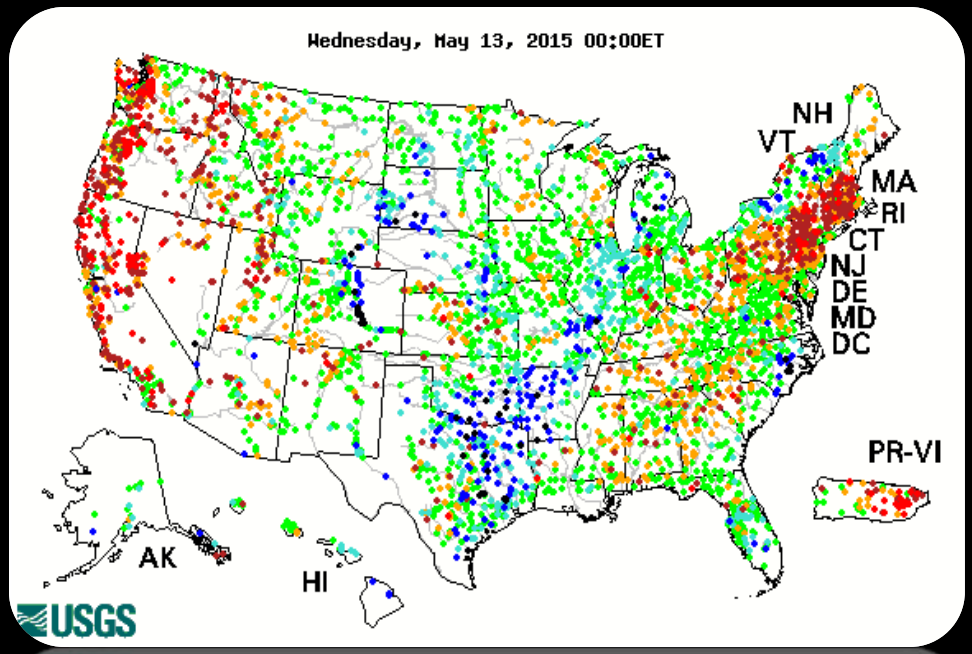
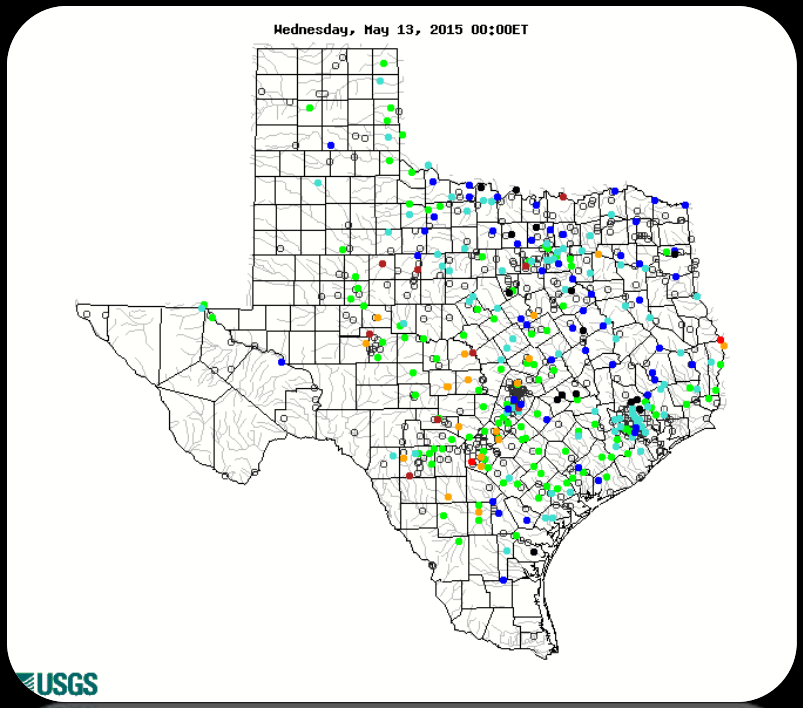
Where to begin? Real-time data!



Around 9,500 streamgages nationwide…



… and more than 500 streamgages in Texas

Source: http://waterwatch.usgs.gov/

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Why so important? Halloween 2013 Onion Creek at US183, Austin, TX

Historical Peak 2013 The day after…..

NOAA – AHPS Major Flood 24ft, 40.15ft on 10/31/13
Previous historical peak was measured 38ft, 1921

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Where do I get Water Data?

- National Water Information System (NWIS)
- NWIS is the National repository for water data coming from USGS
- Data related to surface water, groundwater, water quality and water use.
- Map of all sites, current conditions and site information (historical and active)
- Download data in tabular form

- http://waterdata.usgs.gov/nwis

USGS Water Web Services

- http://waterservices.usgs.gov/
- Can gain access to web services and XML
- Services are invoked with REST protocol
- Services from NWIS now include access to:
  - *Statistics Web Service*, *Instantaneous Values Web Service*, Site Service, *Daily Values Service*, Water Quality Web Service, Groundwater Levels Web Service
- Tips and Tutorials available

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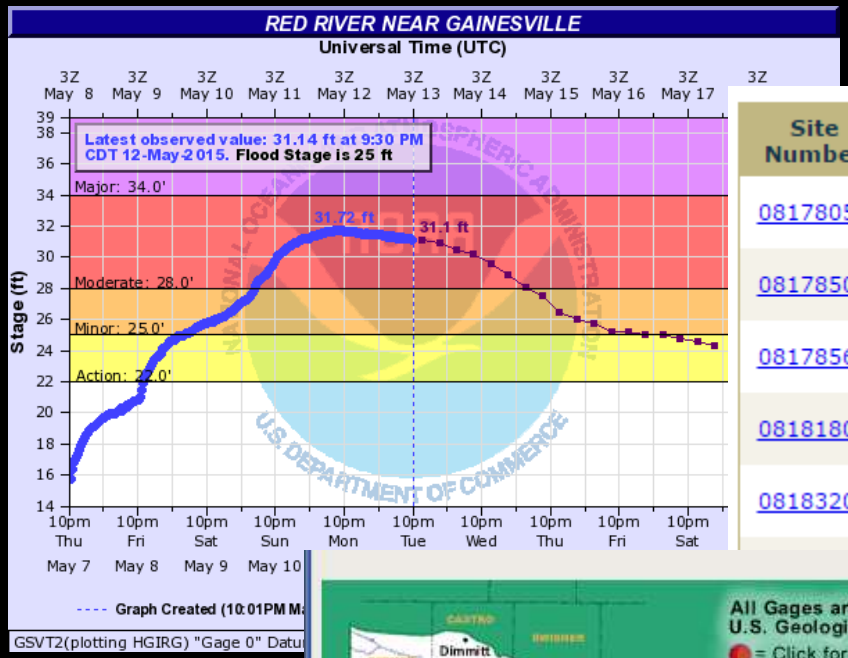
Who uses our data to tell a story?



Site Number	USGS Station Name	Flow Sample Time	Flow Volume
08178050	San Antonio River at Mitchell Street, San Antonio, TX	05/12 at 9:30 PM	13 ft³/s
08178504	San Pedro Creek at Probandt, San Antonio, TX	05/12 at 9:30 PM	2.8 ft³/s
08178565	San Antonio River at Loop 410, San Antonio, TX	05/12 at 9:15 PM	32 ft³/s
08181800	San Antonio River near Elmendorf, TX	05/12 at 9:30 PM	329 ft³/s
08183200	San Antonio River near Floresville, TX	05/12 at 10:00 PM	328 ft³/s
		05/12 at 9:15 PM	320 ft³/s
		05/12 at 9:15 PM	88 ft³/s
		05/12 at 10:00 PM	600 ft³/s

not currently available

not necessarily correspond to the
onal data to help you determine

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About Evolution –
Started as the GIS Workgroup, now Data and Spatial Studies Section…

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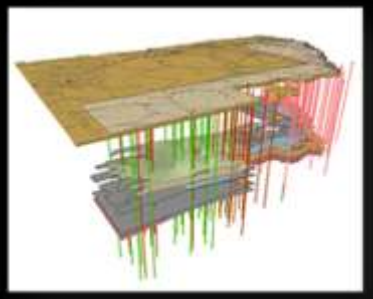
U.S. Geological Survey

Data and Spatial Studies Section

- Majority in Austin, 1 in San Antonio
- Currently 8 FTEs and 2 student (5 Geographers, 2 IT Specialists, 2 Hydrologist)



- Moved data production shop to Section dedicated to geospatial data manipulation and visualization over the web
- One of few teams within USGS Water Resources
- Investment within the last 5 years

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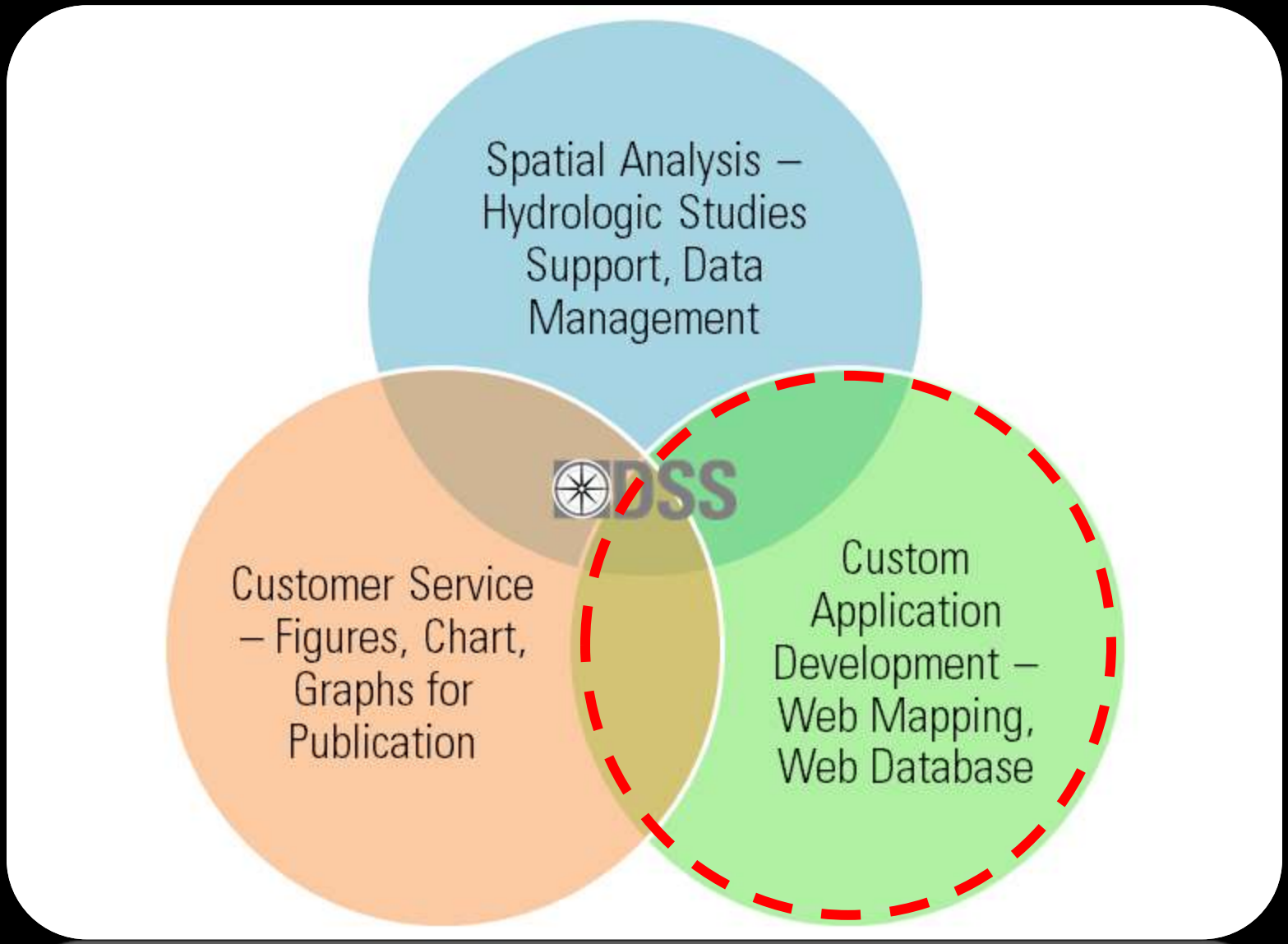
Spatial Analysis – Hydrologic Studies Support, Data Management
DSS
Customer Service – Figures, Chart, Graphs for Publication
Custom Application Development – Web Mapping, Web Database

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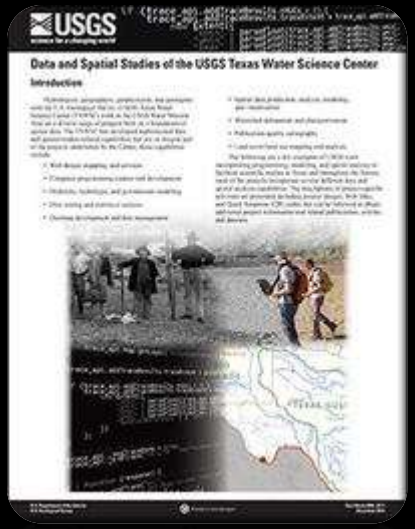
Documenting our path:

Three published USGS Fact Sheets:

- 2002-07 - https://pubs.er.usgs.gov/publication/fs20073076
- 2008-09 - https://pubs.er.usgs.gov/publication/fs20093039
- 2010-14 - https://pubs.er.usgs.gov/publication/fs20143117



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About Data Delivery --

For me…. “Life is about: Where you started, where you are and where you’re going to be.” -- J. Valvano

Where we started…. 2009

- "Web Application to Access U.S. Army Corps of Engineers Civil Works and Restoration Projects Information for the Rio Grande Basin, Southern Colorado, New Mexico, and Texas"
- Web map, web database
- CMS
- ESRI Flex API
- Proof of concept

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Where we are… Streamer 2013-Current

- Team – Florence Thompson, Joseph Vrabel, Deanna Terry, Victoria Stengel, Sally Holl, DSS
- Released in July 2013 - A Dynamic Web Mapping Application for Navigating America's Major Rivers From Your Computer
- Traces the Nation's major rivers upstream and downstream via Hydro 1M networked hydrography
- "Simple, clean and modern"

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Streamer

In addition to stream navigation, with Streamer you can also:

- search for and area of interest by specifying stream or place name, lat/long,
- enter site number for a USGS streamflow gaging station,
- find out the names of streams and waterbodies,
- create concise or detailed reports for your upstream and downstream traces,
- learn about current or historic streamflow at thousands of locations

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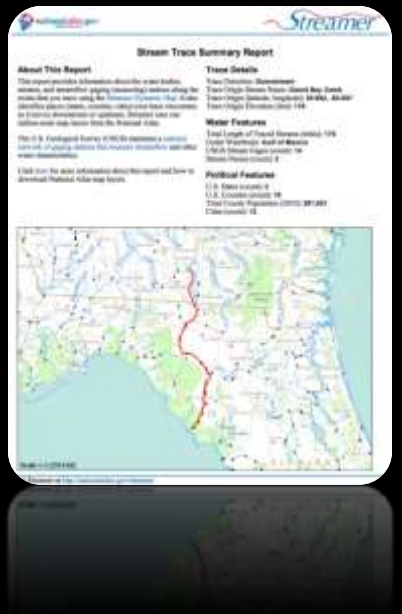
Public response

- Released July 2013
- 200K unique users, trace 3.5 billion miles of streams
- Intended for use by the public (K-12, Universities, State, Federal and Local Agencies)
- Event-based potential
  - Boulder floods of 2013
  - Elk River (WV) chemical spill
  - Arizona floods in 2014
- 30+ articles written about Streamer



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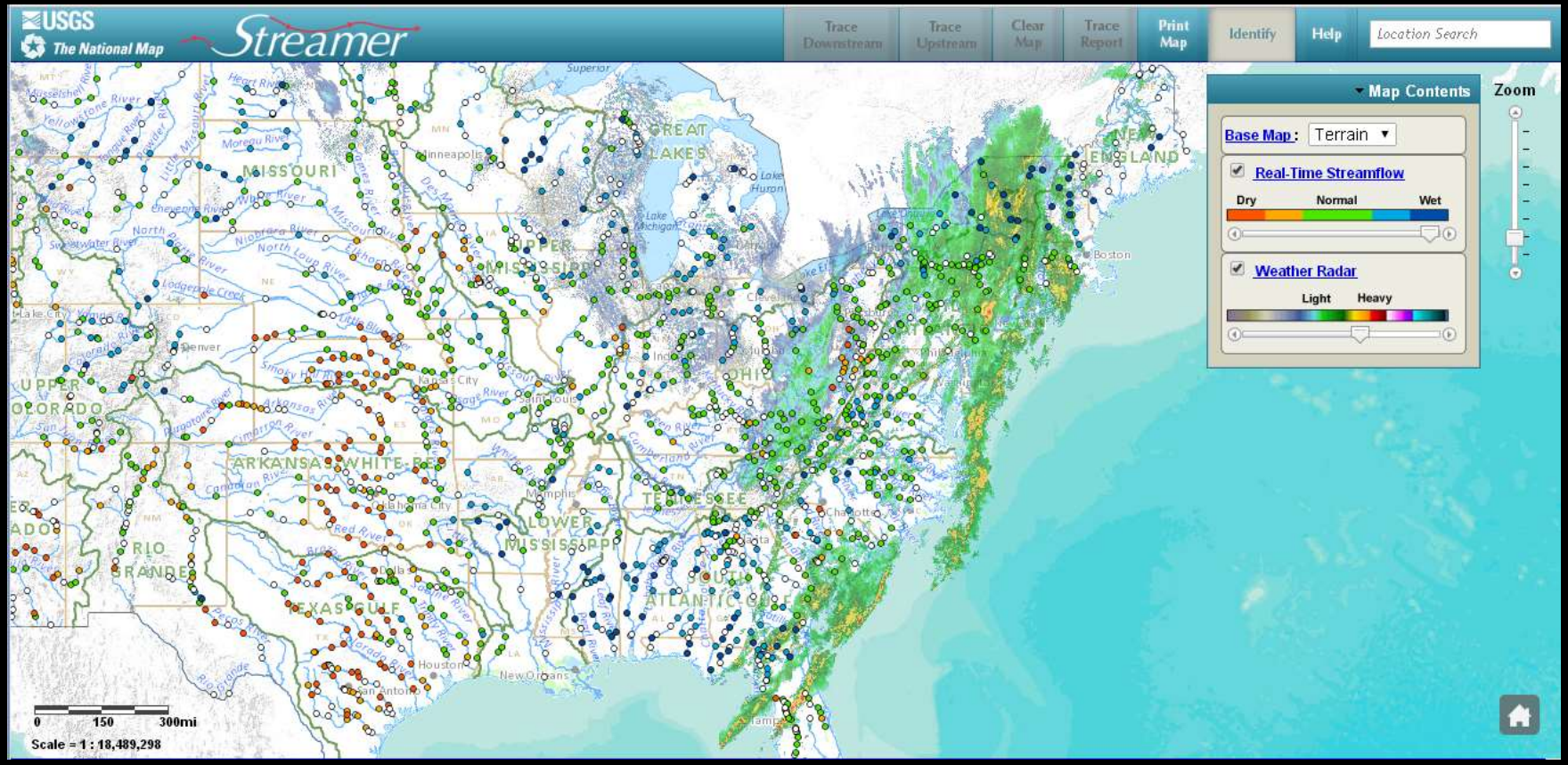
Time for a quick demo?



http://nationalmap.gov/streamer/

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Value added? Yes.

- Team – Joe Vrabel, Florence Thompson
- Series of derivative products have come from the initial phase of development! Share it!
- Search API
  - Core requirement in the development of Streamer was to be able to search using GNIS
  - http://txpub.usgs.gov/dss/search_api/
- Map services
  - Map service for 1M hydrography base map
  - Released end of FY2015

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Walker Basin Hydro Mapper

- **Team – NVWSC, Florence Thompson, Joseph Vrabel, Deanna Terry, Victoria Stengel, DSS**
- **Streamer approach using local-scale data for closed basin on NV/CA border**
- **Infographic approach on homepage with full-frame mapping application (animation), plus dynamic stacked hydrographs for visualizing multiple site locations at once.**
- **Use NWIS webservices throughout!**

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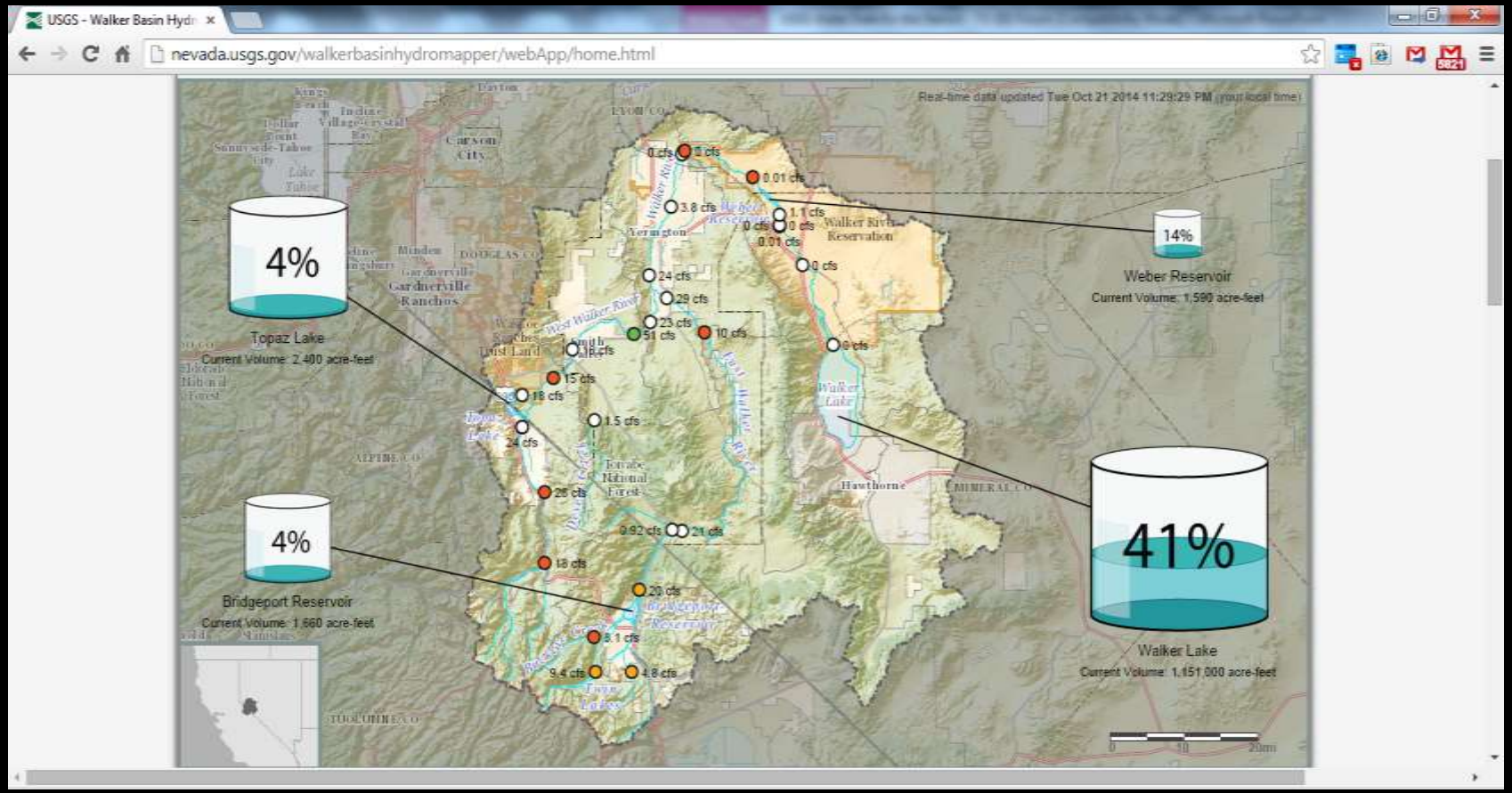
click here to view interactive map

Time for a quick demo?



http://nevada.usgs.gov/walkerbasinhydromapper/

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Supporting the USGS Mission

- "Web-based solutions, like the Walker Basin Hydro Mapper, help provide an interactive and easily understandable framework for a massive amount of water data to be presented in a clear and concise way," said Joy Morris, Director of the National Fish and Wildlife Foundation's Walker Basin Restoration Program. "Using this approach for visualization and presentation of data simplifies the science for easy consumption by the public and stakeholders alike."

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Data Restoration: The Comeback Story of Texas Geology Data Realized

Daniel K. Pearson
USGS Texas Water Science Center
CTPO Studies Chief
Austin, TX

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

The Original Source - GAT

- The Texas Geologic Atlas Project was first cited in the 1961 UTBEG Annual Report
- 38 Geologic Atlas of Texas (GAT) hardcopy map sheets in the series – 1:250,000
- Production involved the work of 28 BEG geologists and many other geologists, seven cartographers, and several editors
- The last GAT sheet was published in 1987, map sheets remain best seller from UTBEG

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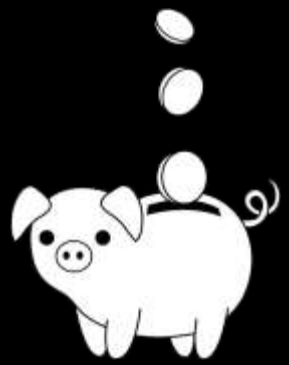
The Investment

- **TGIC/GAT Workgroup (2001-02)**
  - **Inventory, standards, funding, data custodian**
- **Strategic Mapping Program established in 1997 by Senate Bill 1 to develop consistent statewide digital data layers**
- **Geology was not one of the core layers, but the GIS Community in Texas realized the need**
- **…and so it was in the early days**



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Data Production: Simplified

- **Phase I** (2002-2004): Produced library of 38 ESRI personal geodatabases representing the original 38 BEG Geologic Atlas of Texas map sheets.
- **Phase II** (2005-2006): Development of a statewide dataset, combining the 38 individual geodatabases into one containing more than 145,000 geologic features. ***Interpretive, new product.*** **Captured all GAT booklet information (Age, Description)

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Deliverable provided to TNRIS

- January 2006, the result of this effort was a statewide compilation of surficial geologic data housed in a single geodatabase containing:
  - 117,000 Rock Unit polygons
  - 16,000 Member Formations (polygon and line)
  - 11,000 Faults
  - 554 unique geologic symbols for the Seamless dataset
- Various sheet unique geologic formations (Vents, Dikes, Collapse Structures, others)

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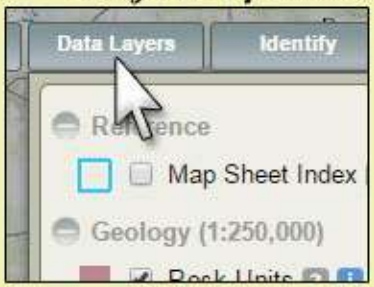
Explore Texas Geology

1 Zoom in to your area of interest

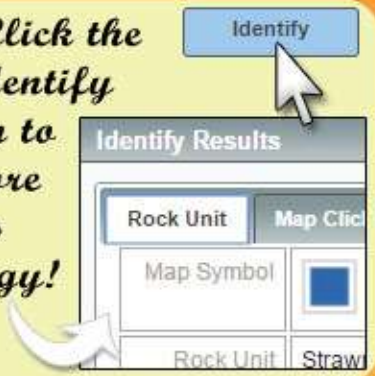
-OR-

Search for a specific location

2 Turn on Data Layers of interest



3 Click the identify button to Explore Texas Geology!



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Purpose, scope, future

- Statewide, 1:250K this is the highest resolution available
- Audience – General Public, K-12, Universities, Industry, Natural Resource Developers, more
- To be able to provide baseline descriptions about surface geology and rock age via web browser in one-stop-shop
- Share the “Story of Texas Geology”

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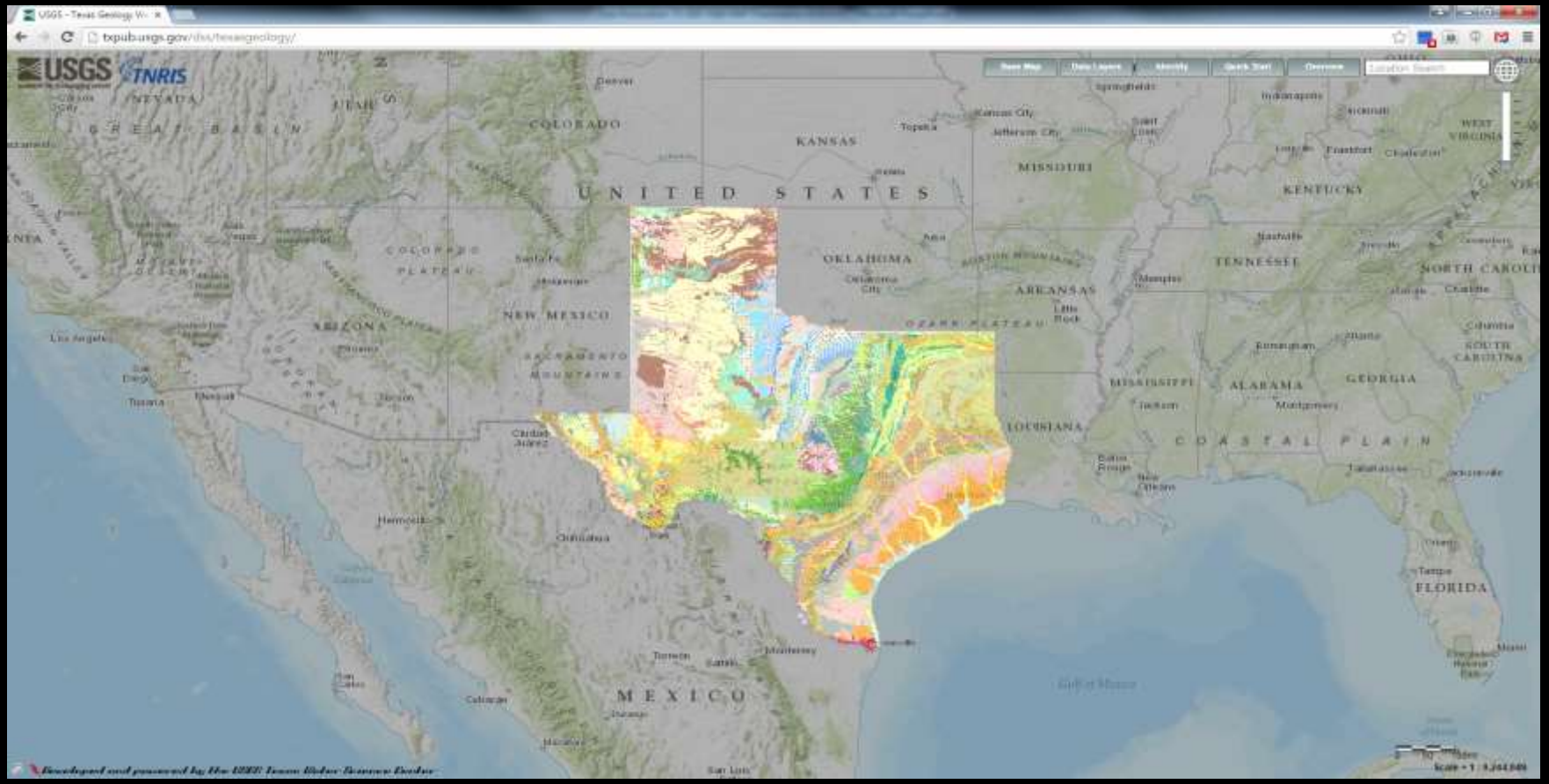
Time for the demo!



http://txpub.usgs.gov/dss/texasgeology

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Upcoming Release – May 2015

- **USGS Top Story!**
- **National and State Press Release with TNRIS partnership**
- **Application release + updated webpage on TXWSC homepage to support**
- ***"Interactive Geologic Map of Texas Now Available For Online Viewing:*** *Find Extinct Volcanoes, Oil and Gas Formations, and Where Dinosaurs Roamed"*
- **Dev Credit: Joe Vrabel, Florence Thompson**

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Questions or comments?

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