Program Overview (and Evolution) of the USGS Texas Water Science Center – Data and Spatial Studies Section
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
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
TX-OK Geospatial Liaison

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• 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/
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

Future Conditions

Flooding

Instream Flows

Conservation

Invasives

Population Growth
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
Everything starts with data….

- Data Collection
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…

USGS
Where to begin? Real-time data!

- Around 9,500 streamgages nationwide...
- ... and more than 500 streamgages in Texas

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
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

- Can gain access to web services and XML
- Services are invoked with REST protocol
- Services from NWIS now include access to:
- Tips and Tutorials available
Who uses our data to tell a story?

RED RIVER NEAR GAINESVILLE

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  |

All Gages are operated by the U.S. Geological Survey
- Click for river height and streamflow readings
- Click for lakes operated by the Authority and the U.S. Army Corps of Engineers

Upper Brazos River Basin

Map showing the upper Brazos River Basin with various locations marked.

USGS

Graph created on 10/01/16

Latest observed value: 31.14 ft at 5:30 PM CDT 12-May-2015. Flood Stage is 25 ft.
About Evolution –
Started as the GIS Workgroup, now Data and Spatial Studies Section…
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
Documenting our path:

Three published USGS Fact Sheets:

- **2002-07** - [https://pubs.er.usgs.gov/publication/fs20073076](https://pubs.er.usgs.gov/publication/fs20073076)
- **2008-09** - [https://pubs.er.usgs.gov/publication/fs20093039](https://pubs.er.usgs.gov/publication/fs20093039)
- **2010-14** - [https://pubs.er.usgs.gov/publication/fs20143117](https://pubs.er.usgs.gov/publication/fs20143117)
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 map, web database
- CMS
- ESRI Flex API
- Proof of concept
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”
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.
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
Time for a quick demo?

http://nationalmap.gov/streamer/
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
- Map services
  - Map service for 1M hydrography base map
  - Released end of FY2015
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 webservice throughout!
Time for a quick demo?

http://nevada.usgs.gov/walkerbasinhidromapper/
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."
Data Restoration: The Comeback Story of Texas Geology Data Realized

Daniel K. Pearson
USGS Texas Water Science Center
CTPO Studies Chief
Austin, TX
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
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
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)**
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)
Explore Texas Geology

1. Double click! 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!
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”
Time for the demo!

http://txpub.usgs.gov/dss/texasgeology
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
Questions or comments?

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