Gathering Data to Assess Your Watershed

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Presentation Goals:

- What data do you need?
- Where do you find the data?
- How do you get info from TCEQ and other agencies?
- This session will examine
  1) materials from Chapters 5-6 of the *Handbook*;
  2) how GIS may be used for watershed analysis, source identification and watershed characterization;
  3) sources of data in Texas and how best to obtain it.
Useful Types of Data

- Physical and Natural Features
  - Watershed Boundaries
  - Hydrology
  - Topography
  - Soils
  - Climate
  - Habitat
  - Wildlife

- Land Use and Population Characteristics
  - Land use and Land Cover
  - Existing Management Practices
  - Demographics

- Waterbody Conditions
  - Water Quality Standards
  - 305(b) report & 303(d) list
  - TMDL reports
  - Source Water Assessments
Useful Types of Data

- Pollutant Sources
  - Point Sources (PS)
  - Nonpoint Sources (NPS)

Information from Local Governments

- County and City Planning Offices
  - Master Plans
  - Local Ordinances and
  - Stormwater Pollution Prevention Plans

- Environmental Depts.
  - Water Quality Data
  - Recycling Programs

- Economic Development
  - Census Data & Demographics
  - Tax Records
**Information from Local Governments**

- Water and Sanitation Dept.
  - Stormwater plans
  - Maps of water and sewer
- Public Health Department
  - OSSF permits and violations
  - Records of outbreaks
- Transportation Dept.
  - Transportation master plan
  - Permits
  - Road & bridge construction

**Information from Local Governments**

- Soil & Water Conservation Districts and USDA NRCS
  - Agricultural Land Use Information
  - Soil Surveys
  - Erosion Control Information
  - Flood Control Structures
- Council of Governments
  - Data & Information Including GIS Layers
  - Grant Funding Programs
Data from State Agencies

- Texas State Soil & Water Conservation Board (TSSWCB)
  - Water Quality Management Plans
  - Poultry CAFOs
  - Brush Control Program
  - Silviculture (Forestry)

- Texas A&M Forest Service (TFS)
  - Forest Management and Sustainable Forestry
  - Urban Forestry and Pest Management
  - Fire and Emergency Response

Data from State Agencies

- Texas Commission on Environmental Quality (TCEQ)
  - Water Main Page: [http://www.tceq.texas.gov/agency/water_main.html](http://www.tceq.texas.gov/agency/water_main.html)
  - 305b reports and 303d Lists
  - Previous reports such as TMDLs, waste load reports, source water protection and any other studies
Data from State Agencies

- Texas Parks and Wildlife Data (TPWD)
  - Wildlife Data, Deer Counts and Endangered Species
  - Ecoregions and Habitat Data
  - Kills and Spills Data
- Texas Water Development Board (TWDB)
  - Ground Water/Well Data
  - Water and Wastewater Planning and Assessments
  - Population Projections
  - TNRIS

Data from State Agencies

- Railroad Commission (RRC)
  - Oil and Gas Well Data, Orphaned/Abandoned Wells
- Texas Natural Resources Information System (TNRIS)
  - Source of Geographic Information of Texas
  - Website: http://www.tnris.org/
  - Aerial Photos
  - Satellite Imagery
  - Electronic or Paper Maps
Data from Federal Agencies

- Environmental Protection Agency (EPA)
  - Enforcement and Compliance History Online
  - Permit Compliance System
- US Fish and Wildlife Service (USFWS)
  - Wildlife and Endangered/Threatened Species
  - Wetlands and Habitat

Data from Federal Agencies

- US Department of Agriculture (USDA)
  - Agricultural Census Data
- USDA Natural Resources Conservation Service (NRCS)
  - Soils Data
  - Agricultural Management and Plans
- USDA Farm Service Agency (FSA)
  - Farm and Crop Information
Data from Federal Agencies
- US Geological Survey
  - Real time and historical water data
    - Stream Flow Data
    - Groundwater Data
    - Water Quality
    - Precipitation
    - Lake/Reservoir
    - Geology and Topography
  - Water Website - http://water.usgs.gov/
  - Texas Website - http://tx.usgs.gov/

Maps of the Watershed
- Determine the boundaries of the watershed
- Determine counties and municipalities
- Partner with someone with GIS if you do not have the capability yourself
HUCs and Subwatersheds

- Determine the 8-digit hydrologic unit code (HUC) for the watershed
- If you do not know your HUC, visit EPA’s “Surf your Watershed” website (http://cfpub.epa.gov/surf/locate/index.cfm) to find it.
- NRCS Watershed Boundary Dataset is available at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/water/watersheds/dataset/?&cid=nrcsc143_021623
- Newly released 12 digit HUC watershed boundaries will be available

Topography

- Derives slopes of stream segments and watershed areas to identify unstable areas and to characterize segments or subwatersheds to model
- Evaluate altitude changes
Hydrology

- Identify locations of waterbodies
- Many databases are organized or referenced by HUC. GIS coverages are available in EPA’s BASINS modeling system [www.epa.gov/ost/basins/](http://www.epa.gov/ost/basins/) or USGS [http://water.usgs.gov/GIS/huc.html](http://water.usgs.gov/GIS/huc.html)
- Identify the spatial relationship of waterbodies and how their connected
- How water flows through the watershed

Soils

- Soil characteristics will help identify high erosion prone areas, poor drainage & runoff
- STATSGO: State Soil Geographic Database, generalize the detailed soil maps at a scale of 1:250,000
- SSURGO: Soil Survey Geographic Database, at scale of 1:12,000 to 1:63,360, the most detailed level of soil mapping
  [http://soils.usda.gov/survey/online_surveys/texas/](http://soils.usda.gov/survey/online_surveys/texas/)
Climate

- Determine climate conditions for your watershed including annual rainfall amounts, runoff, and evaporation amounts.
- Will help understand what drives the rainfall-runoff processes in watershed models.
- Online sites of weather data:
  - [Weather Underground](http://www.wunderground.com)

Land Use & Land Cover

- Land Use data can be obtained as GIS coverages from:
- May be obtained from local and regional agencies such as Counties or Council of Govts.
- Land Use data can also be updated from aerial photographs, satellite images and ground surveys.
Google Earth Tour of Watershed

Habitat

- Habitat Conservation Plans
- Fish and Wildlife
- Endangered or Threatened species
- Natural Heritage Program
Demographics

- Demographic data includes information on the people in the watershed such as:
  - Persons or families,
  - Commuting patterns,
  - Household structure
  - Age, Gender, and Race
  - Economic conditions
  - Employment and
  - Education

Water Quality Standards

- The standards establish explicit water quality goals throughout the state.
- Set to maintain the quality of water in the state of Texas consistent with public health and enjoyment, protection of aquatic life, and the operation of existing industries and economic development of the state.
Water Quality Reports

- Determine locations of concerns and impairments within the watershed
- Find any reports completed on the watershed by others:
  - Water Quality Standards
  - 305(b) report & 303 (d) list
  - TMDL Reports
  - Source Water Assessments
  - Fish Kill Reports
  - TCEQ, TPWD, RRC, Counties, TWDB, River Authority, Universities

Water Quality Data

- Water Quality Data in tabular form can be obtained from:
  - River Authorities are generally CRP - http://www.tceq.texas.gov/waterquality/clean-rivers/partners.html
Biannual 305(b) State Water Quality Report

- Under Section 305(b) of the Clean Water Act, states are required to prepare a report describing the status of the water quality every two years.
- If your watershed has been monitored than the report should have:
  - Status of use support with descriptions of significant water quality impairments
  - Identification of problem parameters for impaired waters, along with potential sources of stressors
  - Priority for TMDL development

303(d) List of Impaired Waters

- 2010 Texas 303(d) List
303(d) List of Impaired Waters

- Identify known pollutant impairments
- Identify geographic extent of impaired segments
- Identify potential causes and sources of impairments

Existing TMDL Reports & Source Water Assessments

- TMDLs provide information on:
  - watershed characteristics,
  - waterbody conditions,
  - sources, and
  - pollutant loads

- Source Water Assessments provide:
  - Identify water supply areas to be protected
  - Identify potential sources of contamination to the water supply

http://www.tceq.texas.gov/drinkingwater/SWAP/index_swa.html
Point Source Pollutant Sources

- Point Source
- Permitted Discharges
  - Wastewater Treatment Plants
  - Industrial Facilities
  - Confined Animal Feeding Operation
- Stormwater Permit

WWTP Permit Limits

Table 4. Revised Table 3.3 in YPPE wastewater discharge permit in Flat Creek Watershed.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Type of Discharge</th>
<th>Maximum Flow Rate</th>
<th>Permit Number</th>
<th>Utilization Date</th>
<th>Discharge Date</th>
<th>A. Oil Discharged to Permit</th>
<th>B. Oil Discharged to Permit</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOLY</td>
<td>UV</td>
<td>0.169</td>
<td>WWK03210601</td>
<td>01/01/2010</td>
<td>01/01/2015</td>
<td>no limit in one place</td>
<td>no monitoring required in other place</td>
</tr>
<tr>
<td>NOH</td>
<td>UV</td>
<td>0.142</td>
<td>WWK03210601</td>
<td>01/01/2010</td>
<td>01/01/2015</td>
<td>no limit in one place</td>
<td>no monitoring required in other place</td>
</tr>
<tr>
<td>NOH</td>
<td>UV</td>
<td>0.115</td>
<td>WWK03210601</td>
<td>01/01/2010</td>
<td>01/01/2015</td>
<td>no limit in one place</td>
<td>no monitoring required in other place</td>
</tr>
</tbody>
</table>

1. Language in "Other Requirements" - The permits are hereby placed on notice that the Executive Director of the TCEQ will be initiating submittal and/or changes to permit documents that may result in weekly effluent limits and monitoring requirements for the facility.
2. Language in "Definitions" references only as the arithmetic average of all effluent samples as required by the permit within a period of one calendar month consisting of at least four consecutive samples.
Nonpoint Sources - Livestock

- Livestock Sources
  - If Local USDA information is not available, use the Census of Agriculture to find information about the number and type of animal units per county.

Nonpoint Sources - Cropland

- Cropland Sources
  - Contact the local USDA to obtain information about types of crops and their management. The Census of Agriculture can provide crop types and fertilizer and chemical applications.
  - [www.agcensus.usda.gov](http://www.agcensus.usda.gov)
  - Land use coverages can identify cropland areas
Nonpoint Sources - Urban

- Urban Sources
  - Impervious coverage information is typically used to characterize the density of and potential loading from urban areas
  - Urban areas are typically sources of pet wastes, lawn fertilizers, and pollutants from car maintenance in the stormwater runoff.

Nonpoint Sources – Onsite Sewage Facility

- On-site Sewage Facility
  - Local agencies can provide estimates of the total numbers for an area or the county and violations.
  - County level data can also be found from the Census Bureau for the 1990 Census at [http://quickfacts.census.gov](http://quickfacts.census.gov)
  - The National Small Flows Clearinghouse has a wealth of information on Septic Systems on the website: [www.nesc.wvu.edu/wastewater.cfm](http://www.nesc.wvu.edu/wastewater.cfm)
  - TAMU Biological and Agricultural Engineering [http://ossf.tamu.edu/](http://ossf.tamu.edu/)
Nonpoint Sources – Silviculture

- Silviculture Sources
  - Bureau of Land Management has an Amarillo Field Office:
  - Texas Forest Service website:
    http://txforestswebsite.tamu.edu/main/default.aspx
  - Texas State Soil and Water Conservation Board
    http://www.tsswcb.texas.gov/
  - All of these agencies can help you identify areas of silvicultural activity and management

Nonpoint Sources - Wildlife

- Determine the types of wildlife to identify areas for protection
- Determine if there are any endangered or threatened species
- Local and State Parks and Wildlife Offices may be able to provide you wildlife species and distribution
- Maps indicate RMUs for Deer survey data by TPWD
Endangered Species Contacts: Texas Ecological Services Field Offices

- **Arlington**
  711 Stadium Dr. Ste 252
  Arlington, TX 76011
  Telephone: 817-277-1100

- **Austin**
  Compass Bank Bldg, 10711 Burnet Rd, Ste 200
  Austin, TX 78758
  Telephone: 512-490-0057

- **Corpus Christi**
  c/o Corpus Christi State Univ, Unit 5837, 6300 Ocean Dr., Corpus Christi, TX 78412
  Telephone: 512-994-9005

- **Clear Lake**
  17629 El Camino Real, Ste 211
  Houston, TX 77058
  Telephone: 281-286-8282

- USFWS website for Texas T&E Species:

- TPWD website for Texas T&E Species:
Nonpoint Sources – Feral Hogs (Non-Domestic Animals)

- Texas Department of Agriculture (TDA)
- Texas AgriLife Extension Service
  [http://feralhogs.tamu.edu/](http://feralhogs.tamu.edu/)
- Texas Wildlife Services
  [http://agrilife.org/txwildlifeservices/](http://agrilife.org/txwildlifeservices/)
- Texas Animal Health Commission:
  [http://www.tahc.state.tx.us/](http://www.tahc.state.tx.us/)
- Plum Creek Website:
  [http://pcwp.tamu.edu/FeralHogs](http://pcwp.tamu.edu/FeralHogs)

Identifying Data Gaps & Collecting Additional Data
How much data is enough?

- One of biggest challenges
- Always more data to collect
- Must balance:
  - Resources
  - Ability to reasonably characterize watershed
  - Need to keep process moving forward

First Step – Conduct Data Review

- Evaluate data you’ve compiled & assess:
  - If you have the right types of data to identify causes and sources
  - The quality of the data
Identify Data Gaps

- **Informational Data Gaps:** Does my data include all types of info needed?
  - Flow data
  - Baseline water quality or biological data
- **Temporal Data Gaps:** Does my data cover the time periods needed?
  - “Old data” (conditions have changed)
  - Season or hydrologic condition
- **Spatial Data Gaps:** Does my data provide good spatial coverage of the watershed?
  - Poor spatial coverage
  - Underrepresentation of specific areas

Determine Acceptability Of Data

- Evaluate
  - Data quality
  - Measurement quality
Evaluating Data Quality

- Main questions:
  - What were the goals of the monitoring activity? Were they consistent with yours?
  - What types of data were collected? Are they relevant to your needs?
  - How were the data collected? Were the sites selected randomly or targeted?

Evaluating Measurement Quality

- Collected under QAPP?
- Analyzed by certified lab?
- Age of data? Analysis methods different from today’s?
- Is quality known?

**IF NOT**
Consider data qualitative (anecdotal evidence)
Step 3 – Decide if new data needed

- Compare your available resources against your tasks:
  - Can we identify & quantify water quality problems in the watershed?
  - Can we quantify pollutant loads?
  - Can we link water quality impairments to specific sources/source areas?
  - Do we know enough to select & target mgt measures to reduce pollutant loads & address water quality impairments?

Step 4 - Design Sampling Plan

- Guidance on Choosing a Sampling Design for Environmental Data Collection
  - EPA QA/G-5S
  - http://www.epa.gov/quality/qa_docs.html
- Assess type, quantity & quality of data needed
- Consider your available resources
Steps in Designing Sampling Plans

1. Select Monitoring Design
2. Develop Data Quality Objectives
3. Develop Measurement Quality Objectives & Performance Criteria
4. Develop Plan for Data Management
5. Develop QAPP

Step 4 - Design Sampling Plan

- Focus on immediate data collection needs for completing watershed characterization
  - Monitoring to define water quality problems
  - Assess compliance with standards
  - Define critical areas
- Consider long-term monitoring needs
  - Elements developed here can be modified or expanded for the WPP monitoring component
Step 5 – Collect New Data

- Data collection techniques
  - Watershed Overview/Visual Assessment
  - Physical Characterization
  - Geomorphic Assessment
  - Hydrological Assessments
  - Water Quality Assessment
  - Assessment of Habitat Quality
  - Biological Assessment

Watershed Survey / “Visual Assessment”

- Walk, drive, and/or boat the watershed
- Observe and photograph water and land conditions
- Identify & verify pollutants & sources
- GREAT for familiarizing stakeholders with watershed
- Protocols Available:
  - NRCS Visual Stream Assessment Protocol