Weaver COMPANIES™

Environmental Tools to Enable Better Project Planning and Construction

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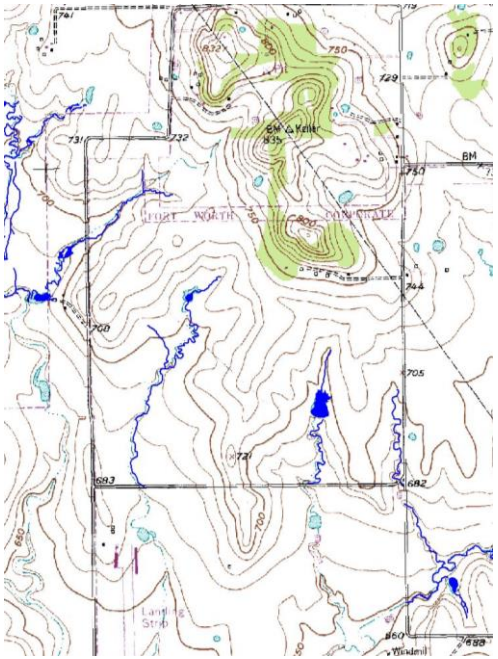
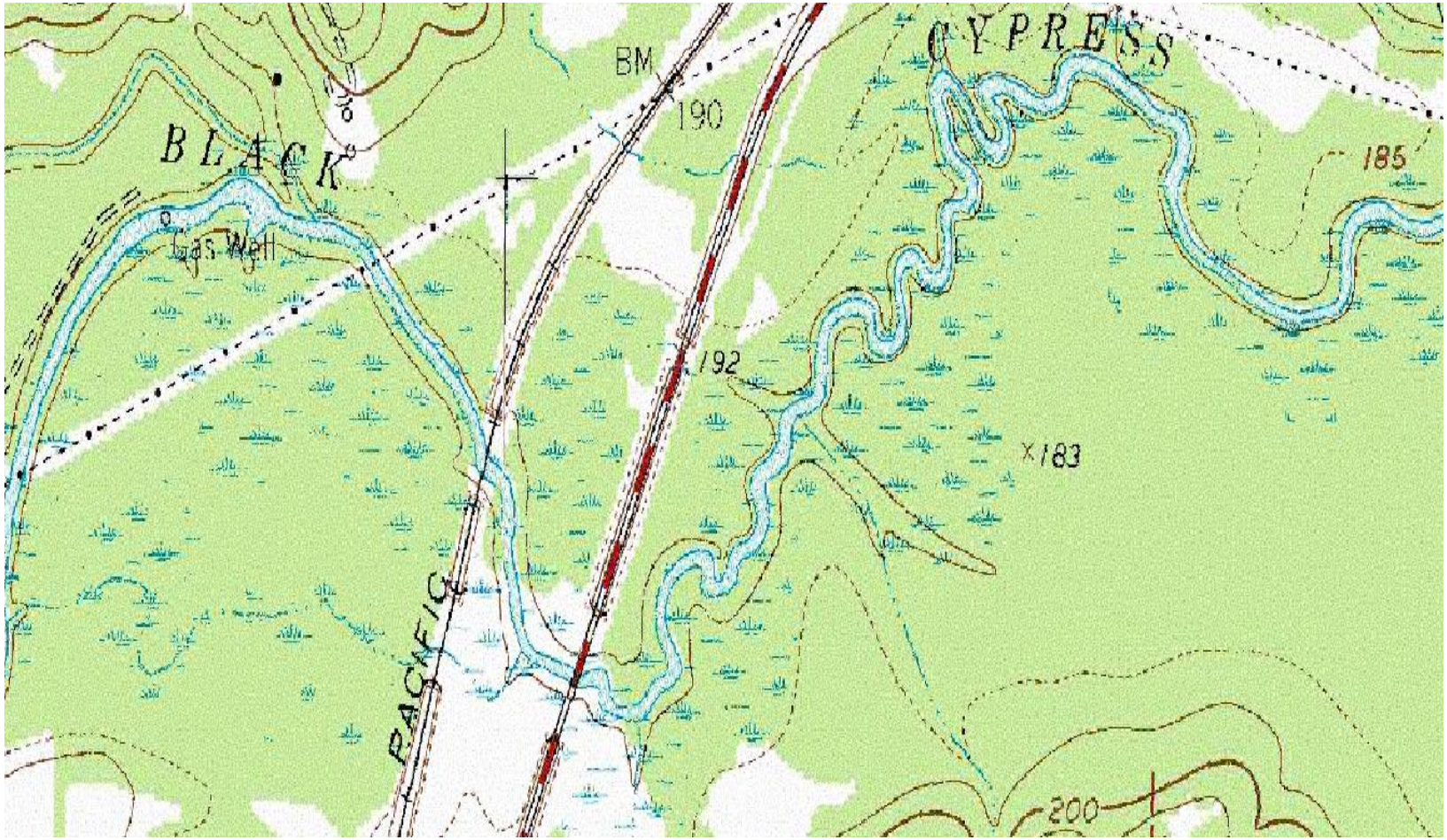
This Morning's Focus

- Environmental tools
- Case study
- Questions

USGS topographic maps

- Provides maps of key features
  - Contours
  - Streams, wetlands, open water
  - Land features
- Issues
  - Can be dated
  - Not a regulatory definition



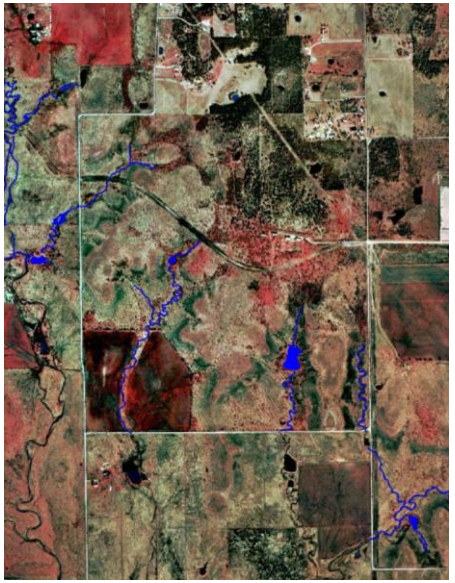

CYPRESS
BM
190
BLACK
Gas Well
185
192
X183
PACIFIC
200

Soil survey maps

- **Produced by Natural Resources Conservation Service**
- **Can be found at**
  - https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
- **Location specific**
- **Hydric soils**
- **Ecological areas**
  - Range sites

Aerial photography

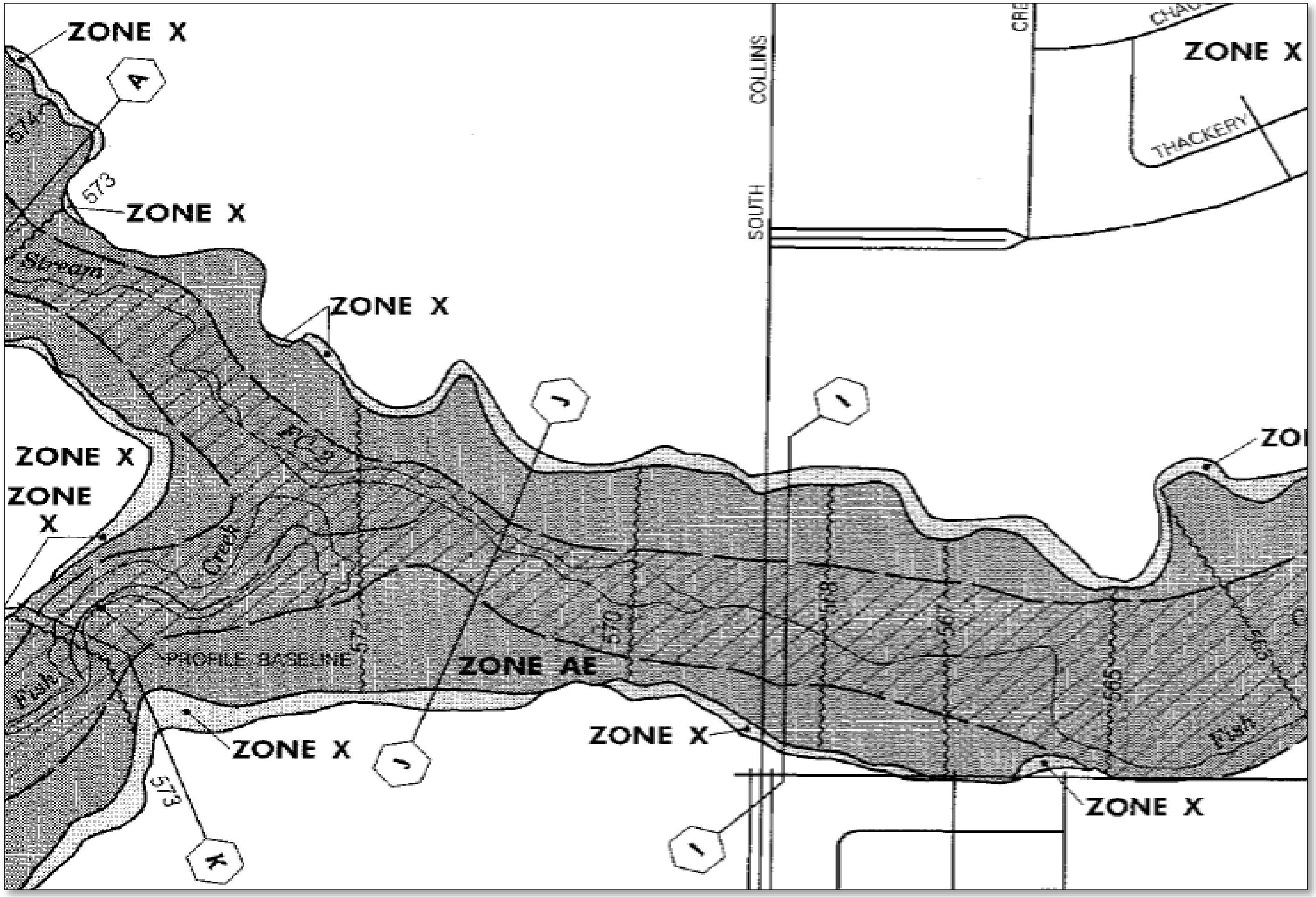
- **Various sources**
  - Google Earth
  - Driving apps
  - Environmental compliance databases
- **Benefits**
  - Allow for “forensic delineation”
  - Can assist in identifying key features
- **Issues**
  - Dated
  - Clarity
  - Not a substitute for field assessment



Floodplains

- **Mapping managed by the Federal Emergency Management Agency**
  - https://msc.fema.gov/portal/home
- **Apps are available for field work**
- **Items to identify**
  - Floodplain
  - Floodway

Floodplains



Protected species

- **Source**
  - Information, Planning and Conservation System
  - https://ecos.fws.gov/ipac/
- **Assist in determining whether threatened and endangered species, designated critical habitat, proposed critical habitat, migratory birds and other natural resources may be affected by project**
- **Summarizes distribution of important biological resources such as wetlands, refuges, critical habitat, etc.**
- **Get a preliminary or official USFWS species list**

- **Benefits**
  - Location specific
  - Fairly up-to-date information
- **Issues**
  - Can be used as tool to assist, not substitute for field work

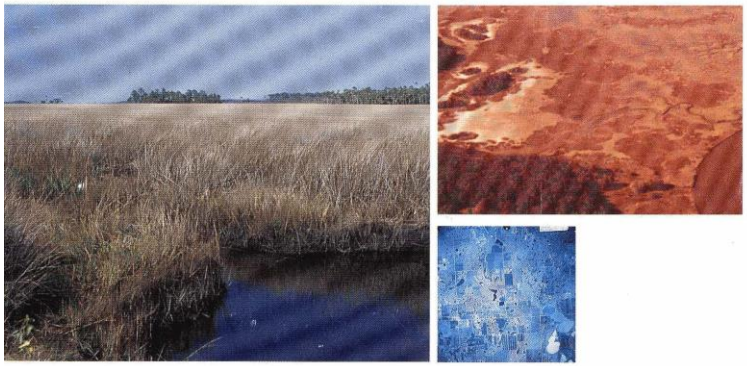
National Wetland Inventory maps

- **Based off USGS topographic maps**
- **Used Cowardin classification system**
- **Source**
  - https://www.fws.gov/wetlands/data/mapper.html

- **Benefits**
  - Useful tool for toolbox
- **Issues**
  - Does not map regulatory waterbodies
  - Can be dated
  - Mapping accuracy low

FWS/OBS-79/31
DECEMBER 1979
Reprinted 1992

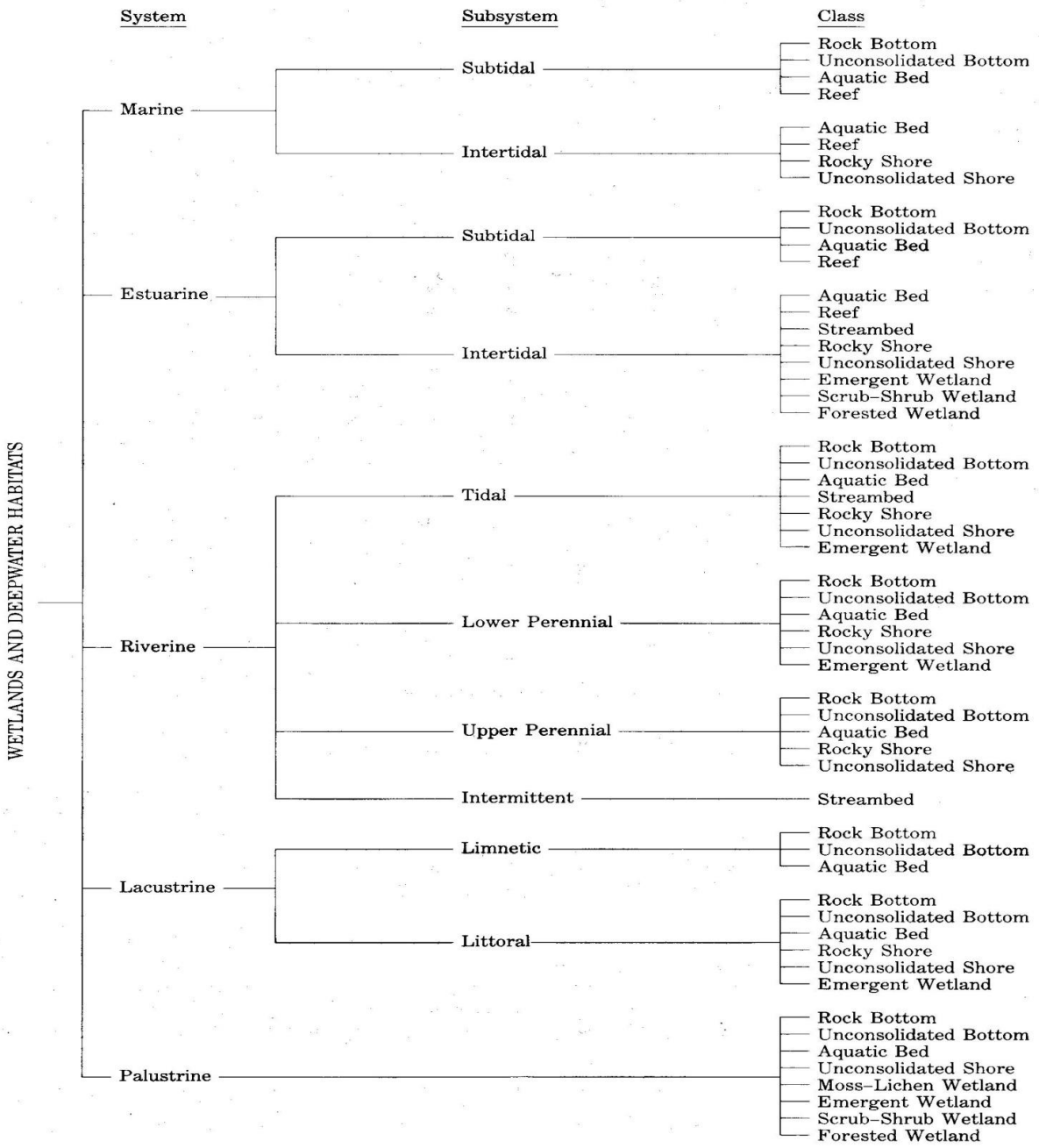
Classification of Wetlands and Deepwater Habitats of the United States



U.S. Department of the Interior
Fish and Wildlife Service

NWI maps - disclaimer

- **There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies.**


WETLANDS AND DEEPWATER HABITATS
System
Subsystem
Class
Marine
Subtidal
Rock Bottom
Unconsolidated Bottom
Aquatic Bed
Reef
Intertidal
Aquatic Bed
Reef
Rocky Shore
Unconsolidated Shore
Estuarine
Subtidal
Rock Bottom
Unconsolidated Bottom
Aquatic Bed
Reef
Intertidal
Aquatic Bed
Reef
Streambed
Rocky Shore
Unconsolidated Shore
Emergent Wetland
Scrub–Shrub Wetland
Forested Wetland
Riverine
Tidal
Rock Bottom
Unconsolidated Bottom
Aquatic Bed
Streambed
Rocky Shore
Unconsolidated Shore
Emergent Wetland
Lower Perennial
Rock Bottom
Unconsolidated Bottom
Aquatic Bed
Rocky Shore
Unconsolidated Shore
Emergent Wetland
Upper Perennial
Rock Bottom
Unconsolidated Bottom
Aquatic Bed
Rocky Shore
Unconsolidated Shore
Intermittent
Streambed
Lacustrine
Limnetic
Rock Bottom
Unconsolidated Bottom
Aquatic Bed
Littoral
Rock Bottom
Unconsolidated Bottom
Aquatic Bed
Rocky Shore
Unconsolidated Shore
Emergent Wetland
Palustrine
Rock Bottom
Unconsolidated Bottom
Aquatic Bed
Unconsolidated Shore
Moss–Lichen Wetland
Emergent Wetland
Scrub–Shrub Wetland
Forested Wetland

Case Study

- **Funded partially by Devon Energy Corp.**
- **Work performed by University of North Texas and Carter & Burgess staff**

Early Screening Concept

- **Can prevent unnecessary delays**
  - Permitting (General or Individual Permit)
  - Moving a well site late in the establishment period

Source: McKone, Huff, Alexander, Hutson and Stevens. Presentation at 2005 Regional Wetlands Technical Conference, Atlantic City, New Jersey

Early Screening

- **Method for predicting occurrence of waters of the U.S.**
  - Adequately identify waters of the U.S.
  - Separate waters of the U.S. from non-waters
  - Provide rapid assessment of proposed drilling sites and pipeline routes

Comparison Methods

- **Model**
  - SPOT imagery
  - Digital soil data
  - Digital elevation models
  - Digital ortho photography
  - Cost – $0.01/acre
- **Office delineation**
  - One-meter resolution color-infrared aerial photographs
  - U.S.G.S. Topographic Maps
  - Cost - $0.52/acre

Results

	Model	Office Delineations
Positive Prediction	69.0%	84%
False Positive Prediction	28.8 %	15%
False Negative Prediction	2.1%	1%
Cost	$0.01 per acre	$0.52 per acre

Summary

- **Lots of good tools for your planning toolbox**
- **New sources are constantly being updated/added**
  - Make sure your using up-to-date sources
- **Be cautious in relying only on remote sensing tools**
  - “boots on the ground” is the only way to definitively assess an area

Questions?