BAEN 673 / Modeling Small Watersheds

Assignment: HW #1
  - due in one week

Topics today
  - Global climate change
  - Course Objectives
  - SWAT
  - Uses of SWAT
Global Climate Change

Global Climate Change

- How much is the planet heating up?
- How much trouble are we in?
- Is there anything I can do?
- Will reducing meat in my diet help the climate?
- How much will the seas rise?
- Are the predictions reliable?
- Why do people question climate change?
- Will anyone benefit from global warming?
Course Objectives

• Develop an understanding of:
  – The modeling process
  – The components of a hydrologic model
  – The hydrologic processes that need to be simulated
  – Model calibration / validation
Course Objectives

• How to use the Soil Water Assessment Tool (SWAT)
  – For watershed analyses
    • Water movement
    • Chemical transport
  – Utilize the national GIS databases
    – DEMs (digital elevation models)
    – Soils
    – Land use / land cover
    – Weather
    – Stream Networks
Not the Course Objective

• To become GIS experts!
  – We just want to be familiar enough with GIS to be able to use it in model simulations

• GIS (Geographical Information System)
  – A system for storing and organizing spatial information
    • Used for information integration
SWAT

- Predicts impact of land management on
  - Water quantity / water quality
  - Sediment yield
  - Agricultural chemical transport
    - In surface runoff
    - Streams
    - Infiltration to shallow groundwater
SWAT (cont.)

• Large complex watersheds with:
  – Varying soils, land use, management conditions
  – Long term simulations

• Physically based model
  – Inputs require:
    • Weather, soil properties, topography, land use, land management, etc.
SWAT Model Used for Class

- ArcSWAT version 2012
  - Free software
  - Obtain from: [http://swat.tamu.edu/](http://swat.tamu.edu/)

- Several other versions of SWAT are also available
GIS Software

- GIS software is needed to run the SWAT model
- This class will use:
  - ArcGIS 10.1
    - From ESRI (Environmental Systems Research Institute)
    - ArcGIS Spatial Analyst is also needed
      - GIS extension
- MapWindows
  - Open source GIS can also be used with SWAT
  - Free GIS software
Computer Lab – Room 214 Scoates

- Computers have:
  - ArcSWAT 2012
  - ArcGIS 10.1
  - ArcGIS Spatial Analyst
TCEQ Water Quality Report

- Good overview of water quality issues in Texas
- Point vs. Non-point pollution
- Watershed approach
- Monitoring and collecting data
- The 303(d) list
The 303(d) list
- Identifies water with substandard water quality
- If a water body is on the 303(d) list then:
  - No new or expanded discharges of the listed pollutant allowed
  - TCEQ develops a restoration plan
  - New permit limits on pollutants may be required
    - Bosque River watershed ➔ phosphorus (P)

Implementation of non-point source best management practices (BMPs)
- Detention basins
- Vegetative filter strips
- Porous pavement
Figure 1: Major River Basins and Planning Areas in Texas

Partner Agencies and Their Regions:
- Red River Authority
- Sulphur River Basin Authority
- Northeast Texas Municipal Water District
- Sabine River Authority
- Angeline & Neches River Authority
- Lower Neches Valley Authority
- Trinity River Authority
- Houston-Galveston Area Council
- Brazos River Authority
- Lower Colorado River Authority
- Lavaca-Navidad River Authority
- Guadalupe-Brazos River Authority
- San Antonio River Authority
- Nueces River Authority
- International Boundary & Water Commission

River and Coastal Basins:
1. Canadian River Basin
2. Red River Basin
3. Sulphur River Basin
4. Cypress Creek Basin
5. Sabine River Basin
6. Neches River Basin
7. Neches-Trinity Coastal Basin
8. Trinity River Basin
9. Trinity-San Jacinto Coastal Basin
10. San Jacinto River Basin
11. San Jacinto-Brazos Coastal Basin
12. Brazos River Basin
13. Brazos-Corrido Coastal Basin
14. Colorado River Basin
15. Colorado-Lavaca Coastal Basin
16. Lavaca River Basin
17. Lavaca-Guadalupe Coastal Basin
18. Guadalupe River Basin
19. San Antonio River Basin
20. San Antonio–Nueces Coastal Basin
21. Nueces River Basin
22. Nueces–Rio Grande Coastal Basin
23. Rio Grande Basin
24. Bays and Estuaries
25. Gulf of Mexico Jurisdictional Area

Preserving and Improving Water Quality
Total Maximum Daily Loads (TMDLs)

- The goal of a TMDL is to restore the full use of a water body that has limited quality for one or more of its uses. Based on that target, the state and local stakeholders develop an implementation plan to reduce man-made sources of pollution within the watershed.
TCEQ Water Quality Report

- Watershed Protection Plans (WPPs)
- Stakeholders
Class Wrap-up

Assignment: HW #1
- due in one week
- Have a nice weekend!