

There are four questions on this exam. They are of equal credit. Do all four questions. For the first three questions, prepare a 2-page typed theme paper. For the fourth question use ArcGIS to prepare the map and tables requested. *Staple all four solutions together in the order of the questions*, and turn in the result to the CEE secretary in EC211 by 5PM on Friday, December 14. This is a take-home exam. You are honor bound not to discuss this exam with your colleagues in the class. Your answers should be the result of your work and thought alone. Be assured that if essentially the same idea appears in answers from more than one person, it is fairly easy to recognize that when the grading is being done. If that happens, it is not clear from whom the idea originated and who is just using somebody else's knowledge. So, keep your ideas to yourself!

The term papers that you choose to describe in answering Questions 1 and 2 should be mutually exclusive, that is, if you focus on a particular term paper in answering one of the questions, don't focus on the same paper when answering the other question. The Texas class term project listing can be found at:

<http://www.ce.utexas.edu/prof/MAIDMENT/giswr2001/docs/termprojlist.htm>

The Utah class term project listing can be found at:

<http://ceefs.cee.usu.edu/dtarb/giswr/>

You can use projects from either location in preparing your answers.

What I am looking for in grading your answers is:

- **Knowledge of the facts.** Make sure you lay out the facts of what has actually been done before you start offering opinions about what could have or should have been done. This particularly applies to the discussion of term papers. Make sure you discuss what was actually done in the term paper not just about the general subject itself.
- **Thoughtful evaluation.** How do you evaluate the advantages and limitations of the principles, methods and data that have been used? How does the knowledge you've learned in this class relate to the world around us? I am looking for a sense of reflection here, of seeing you set individual situations and facts in a larger context in an intelligent way.

Questions

1. Summarize and Critique a GIS in Water Resources Application

Choose a single term paper (not your own!) that you think is interesting and effective. Summarize the content of the paper, describing the nature of the problem examined by the author, how the investigation was carried out, and what results were achieved. Explain why this paper appeals to you. Why is the problem it addresses important? What insights or new knowledge does this paper contribute? What makes the investigation described by this paper an effective implementation of GIS technology? What makes the

presentation of the paper effective in terms of communication? How could the paper have been improved? What are the advantages and limitations of the methods used in the paper?

2. Compare and Contrast Two Applications Dealing with the same Theme

Choose two term papers that deal with the same or similar themes or topics. These papers should be different than the paper you chose to answer Question 1, and neither of them should be your own term paper. Briefly summarize the contents of the papers (the problem examined, the method of analysis, the results achieved). Compare and contrast the approaches to the problem that the two papers took. Which technical approach do you think was more effective? Why? Which paper does a more effective job of communicating its results? Why? Suppose you were undertaking a study of this same subject. Having studied these two papers, what have you learned about how to go about your investigation effectively? What would you do differently from what the authors of these papers did?

3. Geospatial data infrastructure

In this class you have learned about and been exposed to National data sets from a variety of sources. Collectively these represent an infrastructure that serves as a basis for water resources. Write a 2-page assessment of this data infrastructure and the role of GIS technology in advancing water resources practice based on this infrastructure, focusing in particular on the National Elevation Dataset and the National Hydrography Dataset, and adding discussion about other national datasets as you consider appropriate. Comment on deficiencies and limitations of the national geospatial data available. What problems remain to be solved? What advances do you think can be made within the next year? What problems remain so far out of reach that they are unlikely to be solved for a number of years? Where is progress limited by lack of knowledge and understanding rather than technology.

4. Basemap data analysis.

As a recent GIS in Water Resources graduate you are employed by a consulting company bidding on a project to assess the impacts of global climate change on the water resources of the state of New Hampshire. This study is to be based on data from the USGS Hydro-Climatic data network of streamflow stations. To assist the preparation of your bid you have been assigned to do the following.

1. Prepare a base map showing
 - The outline of the state of New Hampshire
 - 8 digit hydrologic cataloging units (HUC's) that lie partly or fully within New Hampshire
 - HCDN streamflow stations that lie within New Hampshire

- The map should be neatly prepared with scale and North symbol and in UTM coordinates with an appropriate zone for New Hampshire.
2. A table listing the 8 digit HUC's that lie partly or fully within New Hampshire giving the area of each and the fraction of area that lies within New Hampshire.
 3. A table listing the HCDN streamflow stations that lie within New Hampshire giving: Name, Number, Years of Record, and Drainage Area.
 4. Make an assessment of the data noting any items whose location accuracy is questionable.

The data available for you to use is in the zip file

<http://www.ce.utexas.edu/prof/maidment/giswr2001/docs/gisfinal.zip> available online. [USU location for this file is <http://ceefs.cee.usu.edu/dtarb/giswr/gisfinal.zip>] You should not need to use any data not provided in this zip file. The zip file contains:

- **states.shp**. A shapefile giving states within the U.S.
- **huc01_250k.e00**. The Arc/Info interchange format file giving HUC's for region 1, including New Hampshire, obtained from <http://water.usgs.gov/lookup/getspatial?huc250k>
- **Stations in Region 01.txt**. A text file listing HCDN stations in region 1, including New Hampshire, obtained from <http://water.usgs.gov/pubs/wri/wri934076/>
- **Stations.xls** An Excel file with the station locations prepared from Region01.txt

The metadata on the huc01_250k data reports the following Spatial Reference Information:

Horizontal_Coordinate_System_Definition:
Planar:
Map_Projection:
Map_Projection_Name: Albers Conical Equal Area
Albers_Conical_Equal_Area:
Standard_Parallel: 29.5
Standard_Parallel: 45.5
Longitude_of_Central_Meridian: -96
Latitude_of_Projection_Origin: 23
False_Easting: 0.0
False_Northing: 0.0
Planar_Coordinate_Information:
Planar_Coordinate_Encoding_Method: coordinate pair
Coordinate_Representation:
Abcissa_Resolution: 1.0
Ordinate_Resolution: 1.0
Planar_Distance_Units: METERS
Geodetic_Model:
Horizontal_Datum_Name: Unknown
Ellipsoid_Name: Clarke 1866
Semi-major_Axis: 6378206.4
Denominator_of_Flattening_Ratio: 294.98