Spring 2017 Advanced Environmental Geomatics 11:372:462

Case Study: Raritan River Hydrological Observatory

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course website on sakai.rutgers.edu

The class will examine issues related to establishing a real-time hydrologic observation system for the Raritan river watershed that includes real-time in situ sensing systems coupled with spatially distributed watershed simulation and flood inundation modeling. The class will strengthen project planning/implementation and written/oral/graphic/web communication skills

Course Meets Tuesdays and Fridays 10:55-12:15 pm in ENR 237

Class Goals and objectives:

Given an open-ended problem, it is the course's goal that students will be expected to:

1) Identify components of a spatial problem;
2) Develop a proposal that identifies the analytical approaches, tools, data, etc. needed to address the spatial problem;
3) Be able to execute an acceptable solution;
4) Be able to evaluate the results and assess how to improve the outcome in the future.

Class format:

The class will be taught in a practicum format with an emphasis on student-driven learning through practical hands-on individual and group projects. The class will culminate in a web-based product and a public presentation of the results to a larger audience of students, faculty and staff.

Course Work/Grading:

Individual Project 1: Annotated Bibliography and Literature Review. Each student will develop an annotated bibliography along with a 3 page synthesis based on a topic selected from the UCGIS BoK. http://gistbok.ucgis.org/ **Due date: March 7**

Individual Project 2: Accessing Water Quality Data. Each student will access and graph real-time water quality data from a USGS gaging station. **Due date: Jan 24**

Individual Project 3: Calibrating and running SWAT. Each student will use ARCGIS SWAT to calibrate, model and validate water quality/quality for a selected basin. **Due date: Feb 3**

Individual Project 4: Simulating Land Use change using SWAT. Each student will use ARCGIS SWAT to model the implications of land use change on water quality/quality for a selected basin. **Due date: Feb 10**

Individual Project 5: Flood Inundation Modeling. Each student will be responsible for developing a flood inundation model using ArcModelBuilder. **Due date: March 7**

Team Project. Each student will participate in one team project. **Due Date: Apr 7**

> **1: Map Cross-section of Raritan River at Boathouse.** Use available technology to map river cross-section to support flood inundation modeling.
>
> **2: Map River Channel Bathymetry using REMUS.** Deploy the side-scan sonar REMUS to map bathymetry of Raritan River in New Brunswick area.
>
> **3: NJFloodMapper.** Incorporate the flood inundation map library and real-time water level data into NJFloodMapper.
>
> **4: RRRTHO web page.** Design and develop an interactive web application for the Raritan River Real-Time Hydrological Observatory (RRRTHO).

Class Project: Design an expanded RRRTHO. Design an expansion of the RRRTHO into the basin's headwaters that incorporates new/future sensor/wireless communication technology and involves the existing USGS and watershed association data collection programs. Due Date: Apr 28

Deliverables:

1) Individual/group project reports outlining objectives, methods, and results.
2) Completed geospatial model/analysis outputs including documentation
3) Final report on class project in both hard-copy and web-based format
4) Public Presentation
5) Self-critique of your contributions to group and class projects

Course Expectations: In addition to completing the skills-building assignments, I expect that the class will undertake a rigorous investigation of the issues surrounding hydrological monitoring and spatially distributed watershed modeling. As a tangible outcome of the course, I expect the class to develop a professional quality web-based report and public presentation.

I also expect that the students in the class will contribute not only to the course work, but also to the course itself. Specifically, students should participate actively in class discussions and decisions and provide guidance throughout the semester for the selection of speakers and topics.

Tentative Schedule

Since the students are asked to help design the process and agenda for the semester, it is expected that THIS SCHEDULE WILL CHANGE.

January 17	Class logistics & Lecture: Real-time Hydrological Observatory – What is it?
Jan 20	In-Class Workshop: Accessing Water Quality Data.
Jan 24	In-Class Workshop: Water Quality Data Results
Jan 27	In-Class Workshop: Basics of Watershed Modeling & ArcHydro Tools
Jan 31	In-Class Workshop: Basics of Watershed Modeling & SWAT
Feb 3	In-Class Workshop: Parameterizing (BASINS) & Calibrating SWAT
Feb 7	In-Class WorkDay: SWAT simulations
Feb 10	In-Class WorkDay: SWAT simulations
Feb 14	In-Class WorkDay: SWAT Simulations
Feb 17	In-Class WorkDay: SWAT Simulations
Feb 20	In-Class WorkDay: SWAT Simulations
Feb 24	In-Class Presentations: SWAT Results
Feb 28	In-Class Work Day: GeoProcessing and ModelBuilder
Mar 3	In-Class Work Day: Flood Inundation Modeling
Mar 7	Flood Inundation Modeling results
Mar 10	Discuss Team Projects
Mar 14-17	Spring Break
Mar 21	Team Project Work Day
Mar 24	Boat trip on Raritan: Meet at Class of 1912 Boat House
Mar 28	Team Work Day
Mar 31	Team Work Day
Apr 4	Team Work Day
Apr 7	Team reports
Apr 11	Discuss Class Project
Apr 14	Class Project Work Day
Apr 18	Class Project Work Day
Apr 21	Class Project Work Day
Apr 25	Presentation Rehearsal
Apr 28	Final Presentation

Readings: The following is an initial list of readings with due date.

January 17

McKibben. 2016. Smartest Lake on Earth Adirondack Life. 36-41.

CBEO Project Team. 2008. Prototype System for Multidisciplinary Shared Cyberinfrastructure: Chesapeake Bay Environmental Observatory. JOURNAL OF HYDROLOGIC ENGINEERING 960-970.

Goodall et al. 2008. A first approach to web services for the National Water Information System. Environmental Modelling and Software 22:404-411

January 27

Beven. Topmodel Fact Sheet.
http://cnrfiles.uwsp.edu/turyk/database/Development/MJB/private/Thesis/JournalArticles/not%20added%20yet/600r05149topmodel.pdf

Chapter 6 Simulation of Runoff Generation in Hydrologic Models
http://hydrology.usu.edu/RRP/userdata/4/87/ch6.pdf

January 31

Guo and Correa. 2013. The Impacts of Green Infrastructure on Flood Level Reduction for the Raritan River: Modeling Assessment. ASCE World Environmental and Water Resources Congress 2013. 367-376.

Guo et al. 2014. RISK ANALYSIS FOR FLOOD MITIGATION ON THE RARITAN. 6th International conference on Flood management. Sao Paulo Brazil. 1-2.

Van Loon et al., 2016. Drought in the Anthropocene. NATURE GEOSCIENCE | VOL 9 | 89-91 | www.nature.com/naturegeoscience

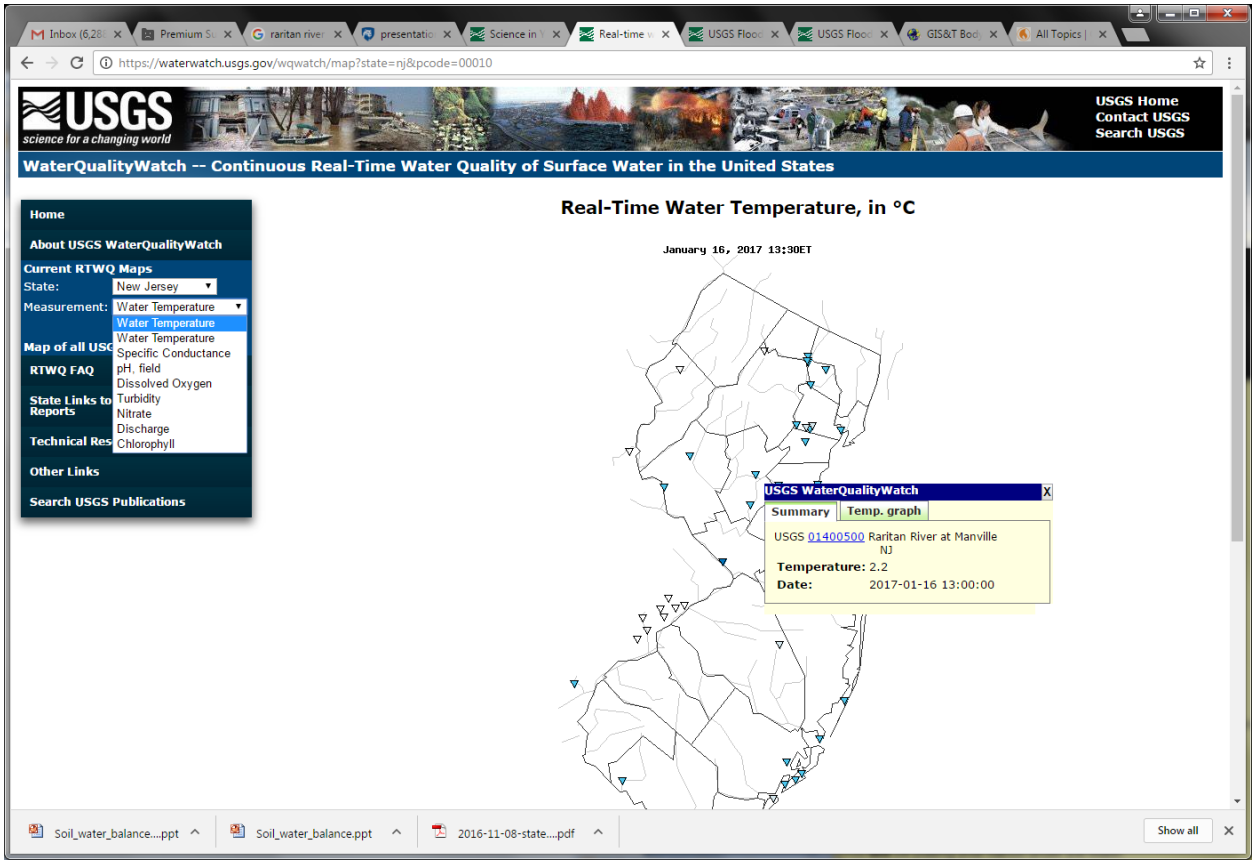
Other resources

Building Models for GIS Analysis Using ArcGIS 10

http://www.geography-site.co.uk/pages/skills/fieldwork/fluvial/cross.html

https://waterwatch.usgs.gov/wqwatch/map?state=nj&pcode=00010

https://water.usgs.gov/osw/flood_inundation/science/index.html


https://waterwatch.usgs.gov/wqwatch/map?state=nj&pcode=00010
USGS
science for a changing world
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WaterQualityWatch -- Continuous Real-Time Water Quality of Surface Water in the United States
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Current RTWQ Maps
State:
New Jersey
Measurement:
Water Temperature
Water Temperature
Water Temperature
Specific Conductance
pH, field
Dissolved Oxygen
Turbidity
Nitrate
Discharge
Chlorophyll
Map of all USG
RTWQ FAQ
State Links to Reports
Technical Res
Other Links
Search USGS Publications
Real-Time Water Temperature, in °C
January 16, 2017 13:30ET
USGS WaterQualityWatch
Summary
Temp. graph
USGS 01400500 Raritan River at Manville NJ
Temperature: 2.2
Date: 2017-01-16 13:00:00
Soil_water_balance....ppt
Soil_water_balance.ppt
2016-11-08-state....pdf
Show all