

# Course Number: NR422 – GIS Application in Natural Resource Management

Department of Forest and Rangeland Stewardship

Warner College of Natural Resources

(Changes for the online portion of this class is marked red)

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Name:	Instructor Yu Wei	GTA Kira Deming
Office:		
Phone:	1-2959	
E-Mail:	Email: <a href="mailto:yu.wei@colostate.edu">yu.wei@colostate.edu</a>	Email: <a href="mailto:kdeming@rams.colostate.edu">kdeming@rams.colostate.edu</a>
Office Hours:	<b>Monday &amp; Wednesday: 10:00-11:00am</b> or by appointment <b>through Canvas</b> <b>Conference</b>	Thursday 1:00-3:00pm or by appointment <b>Office hours will be held via Google Hangouts</b>

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Term:	Spring 2020
Lectures:	Monday (video watching, after 03/25/2020) Wednesday (discussion and Q&A through <b>Canvas</b> <b>Conference, after 03/25/2020</b> ) 9:00 to 9:50am;
Computer Lab:	Friday 2:00 to 3:50am (online <b>through Canvas Conference</b> after 03/25/2020)
Course Credits:	Four credits

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## Course Overview

This class is designed to train students with a minor in GIS in Natural Resource Management to use GIS technologies to solve natural resource management problems.

1. Goals: Ability of independent problem solving using spatial/aspatial data management, SQL scripting, spatial analyses, and python-based GIS programming in natural resource management.
2. Objectives:
  - a. Student should demonstrate the ability to clearly identify natural resource management problems that can be studied through spatial analyses.
  - b. Student should design, select and conduct GIS analyses to address identified natural resource management problems, and effectively communicate with potential stakeholders about the spatial analysis results.
  - c. Student should demonstrate good understanding of key GIS concepts, spatial/aspatial database structures, data models, and geospatial analysis.
  - d. Student should demonstrate the ability to automate spatial data analysis using Modelbuilder, SQL and Python.
  - e. Student should be familiar with some basic GIS analysis methods (i.e. classification, hydrology, habitat, interpolation, network analysis) commonly used in natural resource management assessment, planning and management.
3. Software: We will use Microsoft Access, Python, Arcpy, ArcGIS Pro and ArcGIS 10.6 through this class.

### **Course Prerequisites**

1. This is NOT an introduction to GIS class; rather, it is a course focusing on using GIS to solve natural resource management problems; it emphasizes critical thinking in spatial data analysis and processing. Students should have taken either NR322/NR319 or obtained understanding of GIS concepts via other equivalent university/college GIS courses or professional experiences.
2. Fundamental experience of ArcGIS Desktop or ArcGIS Pro is expected.
3. Fundamental knowledge of spatial projections, datum, and data models is expected.
4. The review of GIS components and concepts will be brief and non-comprehensive.
5. Lab instructions may be topical instead of having detailed step-by-step instructions.

### **Lab Assignment Policy:**

Late assignment is subject to **10% penalty per day including weekends and holidays**. Lab turned in **more than four days late will not be accepted**. Some lab assignments may have a computer-based section and a non-computer-based section. Grades from both sections will be added together as the final grade of the lab assignment. Each lab will be weighted differently towards the final grade due to different workloads. General requirements for all lab reports are:

1. All maps MUST have the following elements as the minimum: data frame, title, legend, north arrow, and scale bar. Basic rules of cartography need to be followed (you should have learned it from your other Intro GIS courses). You will lose points by missing any of those elements.
2. All lab assignments need to be turned in through canvas; multiple files need to be zipped together before uploaded to Canvas.

### **Grades of "Incomplete":**

Per university policy, an instructor may assign temporary grade of Incomplete to a student who demonstrates that he or she could not complete the requirements of the course due to circumstances beyond the student's control and not reasonably foreseeable. A student must be passing a course at the time that an Incomplete is requested unless the instructor determines that there are extenuating circumstances to assign an Incomplete to a student who is not passing the course. When an instructor assigns an Incomplete, he or she shall specify in writing using the Department Incomplete Grade Form the requirements the student shall fulfill to complete the course as well as the reasons for granting an Incomplete when the student is not passing the course. The instructor shall retain a copy of this statement in his or her grade records and provide copies to the student and the department head or his or her designee. (Section I.6 of the *Academic Faculty and Administrative Professional Manual*)

### **Disability Access:**

Colorado State University is committed to providing reasonable accommodations for all persons with disabilities. Students with disabilities who need accommodations must first contact Resources for Disabled Students before requesting accommodations from the professor. Resources for Disabled Students (RDS; <http://rds.colostate.edu/home>) is located in room 100 of the General Services Building. Their phone is (970) 491-6385 (V/TDD). Students who need accommodations in this course must contact the professor at the beginning of the semester to discuss needed accommodations.

**Attendance Policy:** Participation in official University activities, e.g., an out-of-town athletic event, or special religious observances may provide a legitimate reason for an excused absence. Students are responsible for discussing this with the instructor at the beginning of the semester.

We will record a set of short videos and post them on the discussion board of Canvas. Students are required to watch those videos either during Monday's lecture time (9:00 to 9:50am) or during other time convenient for them. Students are encouraged to post their questions through the Discussion board or email to the instructor or TA. There will be a real time online discussion on Wednesday (9:00 to 9:50am) based on questions through the Canvas conference.

### **Professionalism Policy:**

Per university policy and classroom etiquette; mobile phones, iPods, *etc.* **must be silenced** during all classroom and lab lectures. Those not heeding this rule will be asked to leave the classroom/lab immediately so as to not disrupt the learning environment. Please arrive on time for all class meetings. Students who habitually disturb the class by talking, arriving late, *etc.*, and have been warned may suffer a reduction in their final class grade. When emailing the instructor or TA, please include your full name, CSU ID, and the course number in your email.

### **Term Project:**

One or multiple students (no more than three) should work together to select a term project topic, design a study plan, collect necessary data, conduct spatial analyses, and prepare a professional poster. The term project needs to focus on applying GIS techniques to solve a specific natural resource management problem. This project should demonstrate your ability to identify and design a spatial analysis problem, implement a variety of GIS concepts, theories and tools (i.e. geodatabase, SQL, geoprocessing models, python script, geostatistics *etc.*), and should lead to interesting and logical conclusion and discoveries. The due day of each intermediate project assignment is the Friday of the due week.

1. (7 points, group assignment) A digital version of the final poster (PDF or JPEG) will need to be submitted to Canvas. In addition, each group should create a discussion post that includes. 1) the digital poster and 2) a presentation transcript of no more than 640 words.
2. (2 points, individual assignment)) Each student will have three other posters to review. A review will contain the following:
  - a. An insight you had after reviewing the poster
  - b. Something the group did well
  - c. Something that could have been improved upon
  - d. A question you have for the group about the project.

Your comments should be constructive and well thought out (see below for examples of comment expectations). The final task is to post at least one thoughtful reply to a question someone asked about your project. Comment Expectations:

- **DO be detailed/specific.** For example, 'Some of the figures were hard to understand' vs. 'The first figure about xxx was difficult to understand because ...'
- **DO be constructive.** Give a suggestion for how something could be remedied or be made better. For example, 'Your poster was too wordy' vs. 'The methods section has a lot of text, I think numbers or bullet points could help'
- **DO be thoughtful.** You need to demonstrate that you looked at the poster and read the transcript. Simply giving generic comments will not receive full points. Ex. 'Really cool project, liked the figures. Nice job.' will not get you full points.
- **DO use good grammar, spelling, and punctuation.**
- **DO NOT just comment on just aesthetics.** You may comment on aesthetics, but do not only comment on them again and again.

- **DO NOT copy other comments.** If you wish to make a similar remark you must add your own thoughts to the comment. Ex. 'I agree with Joe that the first figure is hard to understand, but instead of changing the colors of the points, I think it maybe more helpful to change their shape.'

3. (1 points, group assignment) Your group's response to all comments

### **Academic Integrity:**

The Department of Forest and Rangeland Stewardship takes academic integrity seriously. At minimum, academic integrity means that no one will use another's work as their own. The CSU writing center defines plagiarism this way:

Plagiarism is the unauthorized or unacknowledged use of another person's academic or scholarly work. Done on purpose, it is cheating. Done accidentally, it is no less serious. Regardless of how it occurs, plagiarism is a theft of intellectual property and a violation of an ironclad rule demanding "credit be given where credit is due."

Source: (Writing Guides: Understanding Plagiarism.

<http://writing.colostate.edu/guides/researchsources/understandingplagiarism/plagiarismoverview.cfm>.

Accessed, May 25, 2012)

If you plagiarize in your work you could lose credit for the plagiarized work, fail the assignment, or fail the course. Each instance of plagiarism, classroom cheating, and other types of academic dishonesty will be addressed according to the principles published in the CSU General Catalog (see page seven, column two: <http://www.catalog.colostate.edu/FrontPDF/1.6POLICIES1112f.pdf>).

Of course, academic integrity means more than just avoiding plagiarism. It also involves doing your own reading and studying. It includes regular class attendance, careful consideration of all class materials, and engagement with the class and your fellow students. Academic integrity lies at the core of our common goal: to create an intellectually honest and rigorous community. Because academic integrity, and the personal and social integrity of which academic integrity is an integral part, is so central to our mission as students, teachers, scholars, and citizens, we will ask you sign the CSU Honor Pledge as part of completing all of our major assignments. While you will not be required to sign the honor pledge, we will ask each of you to write and sign the following statement on your papers and exams: "I have not given, received, or used any unauthorized assistance."

### **Final Exam (open book only for spring 2020)**

Final exam is comprehensive and based on materials from class handout, class exercise, lab exercise, assignment, lecture PowerPoint, discussion and review notes.

## Final Grade

<b>Assessment</b>	<b>Percent of Final Grade</b>
Labs and follow up exercises	50%
Term Project	20% (10% intermediate results; 10% poster and discussion)
Midterm Exam	10%
Final Exam (comprehensive)	20%

**Grading scale:** This class will use the standard CSU grading scale from Canvas.

Basic Letter Grade 90/80/70/60 Scheme		<a href="#">Select Another Scheme</a> ✕
Name:	Range:	
A+	100 %	to 96.67%
A	< 96.67 %	to 93.33%
A-	< 93.33 %	to 90.0%
B+	< 90.0 %	to 86.67%
B	< 86.67 %	to 83.33%
B-	< 83.33 %	to 80.0%
C+	< 80.0 %	to 76.67%
C	< 76.67 %	to 70.0%
D	< 70.0 %	to 60.0%
F	< 60.0 %	to 0.0%

## Course Schedule

Week Seq.	Technical Emphasis	Labs and follow up exercises	Project assignments
1	Relational database and SQL language	<b>Lab 1</b> , Relational database (10%)	Form a group, submit draft project title, with author(s), and 1-page description by the end of the third week. (2%)
2			
3			
4	Geodatabase, ESRI Model Builder, geoprocessing	<b>Lab 2</b> , Geodatabase in ArcGIS (5%)	Submit the detailed project outline (2-page) of the class project by the end of the 6 <sup>th</sup> week. (2%)
5		<b>Lab 3</b> , Vector data model, model builder, and land classification (6%)	
6			
7	Network analysis	Midterm exam (10%)	Draft poster due by the end of the 14 <sup>th</sup> week (6%).
8	Python programming	<b>Lab 4</b> , Network analysis (6%)	
9		<b>Lab 5</b> , Intro to Python programming and ArcPy (10%)	
10			
11			
12			
13	Watershed delineation	<b>Lab 6</b> , Watershed delineation (8%)	
14	Spatial interpolation	<b>Lab 7</b> , Intro to spatial interpretation (5%)	
15	Review and synthetization	<ul style="list-style-type: none"> <li>• Group assignment: final poster submitted to canvas (7%)</li> <li>• Individual assignment: constructive comments on other posters (2%)</li> <li>• Group assignment: Respond to comments (1%)</li> </ul>	
16		Online final exam (20%); during the final's week (online, comprehensive, open book)	

**Project outline needs to at least include (you can add other components or revise it as you see fit):**

- Introduction
  - Why do you choose this project?
  - Why is the problem important?
  - What have other people done to address this problem (citations)?
  - What are you going to do to address this problem (brief intro).
- Study site and data
  - Locations,
  - Base maps,
  - Other GIS layers needed for inputs,
  - Other information
- Methods
  - What type of analyses are you going to propose?
  - Specific tools, models, python code you might want to create
  - Are there any technical hurdles you can anticipate?

- Conclusion and Discussion
  - What test results are you expecting?
  - What are the weaknesses of your methods?

**Rubric used to evaluate poster:**

<b>Poster Name and Authors:</b>					
<b>Poster Title:</b>					
<b>Domain</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Relevance/importance – problem is relevant, well defined, and have clear objectives.					
Technical quality – soundness of methodology and conceptual framework					
Clarity of presentation – organized, clear conclusions, concise, comprehensive					
Visual impact – How effective is this poster visually? How valuable is each figure and graph in furthering viewers’ understanding of the research subject?					

**An example of poster layout:**

