**Stakeholder Driven Data Analysis to Improve Water Sustainability in NM (BIO 502/EPS 545/GEOG 499) Syllabus**

**Course Overview:**

This course is designed for graduate students who wish to gain greater experience with hands-on data analysis in transdisciplinary research. Transdisciplinary research is ﻿an approach that addresses societal problems by means of interdisciplinary collaboration as well as collaboration between researchers and extra-academic stakeholders.

This inquiry-based course features student-led projects in partnership with stakeholders and practitioners of water resource management in New Mexico. Students will apply data analysis tools to datasets provided by stakeholders or which are publicly available to address questions pertinent to improving water management in New Mexico.

Statistical approaches will be tailored to the questions posed by student-stakeholder teams but may include model selection procedures and multi-model inference, community composition analyses, structural equation modeling, tools for remote sensing data, analysis of time series and spatially distributed data, and network analyses. Projects will each result in a final in-class presentation, with the end goal of producing deliverables to stakeholders in the form of a technical report and plain language summary.

**Student Learning Objectives:**

The broad learning objectives of this class are to (1) advance your data analysis skills in R, (2) learn about water resource management and sustainability in New Mexico, and (3) meet and learn how to work with water resource management stakeholders. Specifically, by the end of this course, students will be able to:

* Work with stakeholders to craft and answer research questions that will support a more sustainable water future for New Mexico
* Be broadly conversational in the water management challenges NM faces and who the players are
* Be an expert in the water management challenges your project addresses
* Understand the challenges and opportunities of stakeholder-driven research
* Understand when to apply different statistical approaches to data
* Apply at least one statistical analysis approach at the level of an expert
* Manage reproducible and version-controlled workflows with R and Github
* Write a technical report describing the project and results for stakeholders
* Write a plain-language summary describing the project and results for the communities the project serves

**Instructor: Teaching Assistant:**

Alex Webster Michael Mann

email: awebster2@unm.edu email: mimann@unm.edu

**Meeting time and location:**

Class meets Tue./Thur. 9:30am – 10:45am, Zoom discussion

Zoom link (use for all class meetings): <https://unm.zoom.us/j/____>

**Grading:**

Grades for this variable credit course will be based on (1) class attendance and participation via Zoom sessions, (2) final reproducible analysis via R code and dataset(s) submitted to the instructor (3) providing a technical report and plain language summary on their project to stakeholders.

**Schedule**

**Overview:**

* **Weeks 1–4:** Meet stakeholders, pick your project, and get crash-course in NM water
* **Weeks 5–7:** Understand your data, research statistical approaches, design approach
* **Weeks 8–11**: Execute approach and write draft 1 of report
* **Weeks 12–16:** Revise and complete report

**Synchronous participation expectations:**

* **Weeks 1–4:** Attend all meetings unless arranged otherwise with instructor.
* **Weeks 5–16:** At minimum, attend 1 open lab per week for long enough to check in with instructor and TA about project and R skills. More attendance is strongly encouraged!

**Asynchronous participation expectations:**

* Complete assigned readings and ~1 R tutorial per week (as relevant for your project).
* Turn in intermediate products to instructor, TA, and stakeholder for feedback.
* Correspond with stakeholder by email and/or meetings throughout semester.

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| **Date** | **Class Activities** | **Homework Due** |
| **Jan. 19** | * Introductions * Lecture 1: (AJW)   + Class logistics   + Data Openness and FAIR   + Data Privacy and CARE   + How to pick a data analysis approach overview   + Beginner R self-learning objectives for weeks 2-4 |  |
| **Jan. 21** | * Lecture 2:   + Stakeholder-driven research/stakeholder & community engagement panel (TG, KZ, LS, BW, LT) | * Read * Read “Water Matters!” Part I |
| **Jan. 26** | * Lecture 3:   + Stakeholder presentations (KE, MW) | * Work on beginner R tutorials * Watch Day 1 of NM Water Dialogue |
| **Jan. 28** | * Lecture 4:   + NM Water Data Initiative overview presentation (ST)   + Stakeholder presentations (TG/ST, LC) | * Work on beginner R tutorials * Watch Day 2 morning of NM Water Dialogue |
| **Feb. 2** | * Lecture 5:   + Stakeholder presentations (GH, KZ) | * Download data from NM Water Data, make a plot of it in R, turn in plot * Watch Day 2 afternoon of NM Water Dialogue |
| **Feb. 4** | * Lecture 6:   + Stakeholder presentations (LH, BP, LS?) |  |
| **Feb. 9** | * ***Final project selections announced*** * Lecture 7**:**    + R and Github – beyond the basics | * **BY Feb 8:** Complete poll of top 3 project choices * Complete beginner R tutorials |
| **Feb. 11** | * Lecture 8**:**    + How to construct hypotheses and do data exploration (AJW) | * Email stakeholder: notify, ask for meeting, data, background reading * Set up RProject, Github, and GitKraken |
| **Feb. 16** | * Open lab | * Turn in write-up of your questions and hypotheses * Start data exploration |
| **Feb. 18** | * Open lab | * Email stakeholder: share refined questions and hypotheses, invite feedback * Start data exploration |
| **Feb. 23** | * Open lab |  |
| **Feb. 25** | * Open lab |  |
| **March 2** | * Open lab |  |
| **March 4** | * Open lab | * Turn in report on data exploration, refined questions/hypos, statistical approach |
| **March 9** | * Open lab |  |
| **March 11** | * Open lab * ***Initial report comments returned*** |  |
| Spring Break | | |
| **March 23** | * Lecture 9:   + How to write a technical report and plain language summary (AJW) |  |
| **March 25** | * Open lab |  |
| **March 30** | * Open lab |  |
| **April 1** | * Open lab |  |
| **April 6** | * Open lab |  |
| **April 8** | * Open lab | * Turn in Draft 1 technical reports |
| **April 13** | * Open lab |  |
| **April 15** | * Open lab |  |
| **April 20** | * Short (~5 min) presentations |  |
| **April 22** | * Short (~5 min) presentations * ***Draft 1 technical report comments returned*** |  |
| **April 27** | * Open lab |  |
| **April 29** | * Open lab |  |
| **May 4** | * Open lab |  |
| **May 6** | * Open lab |  |
| **May 11** | UNM Exam Week | |
| **May 13** |  | * **Final technical reports due** |