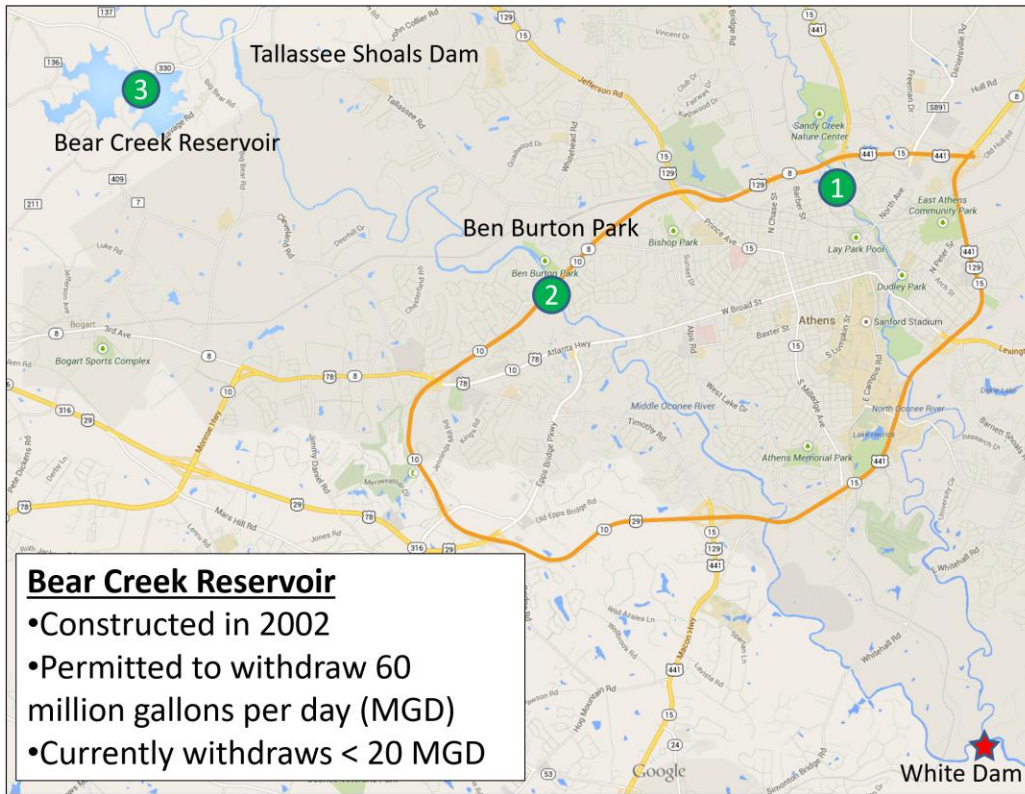
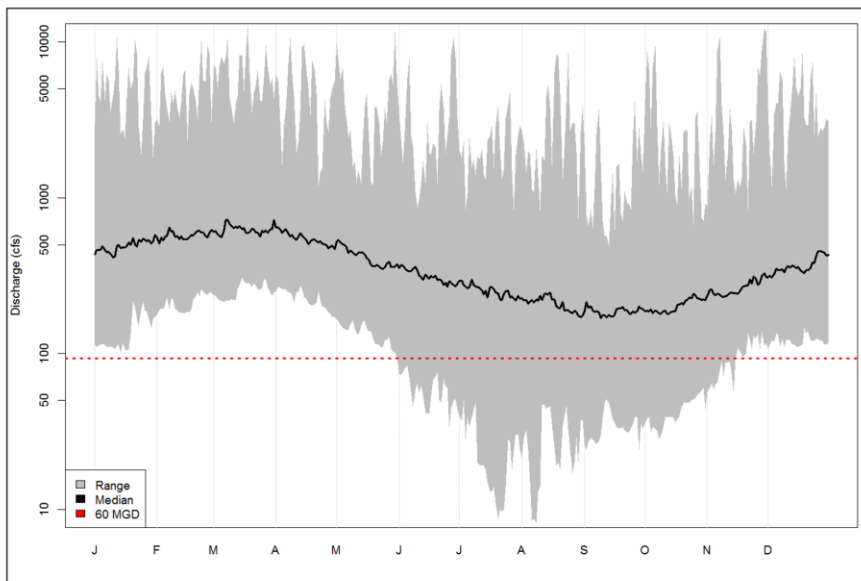


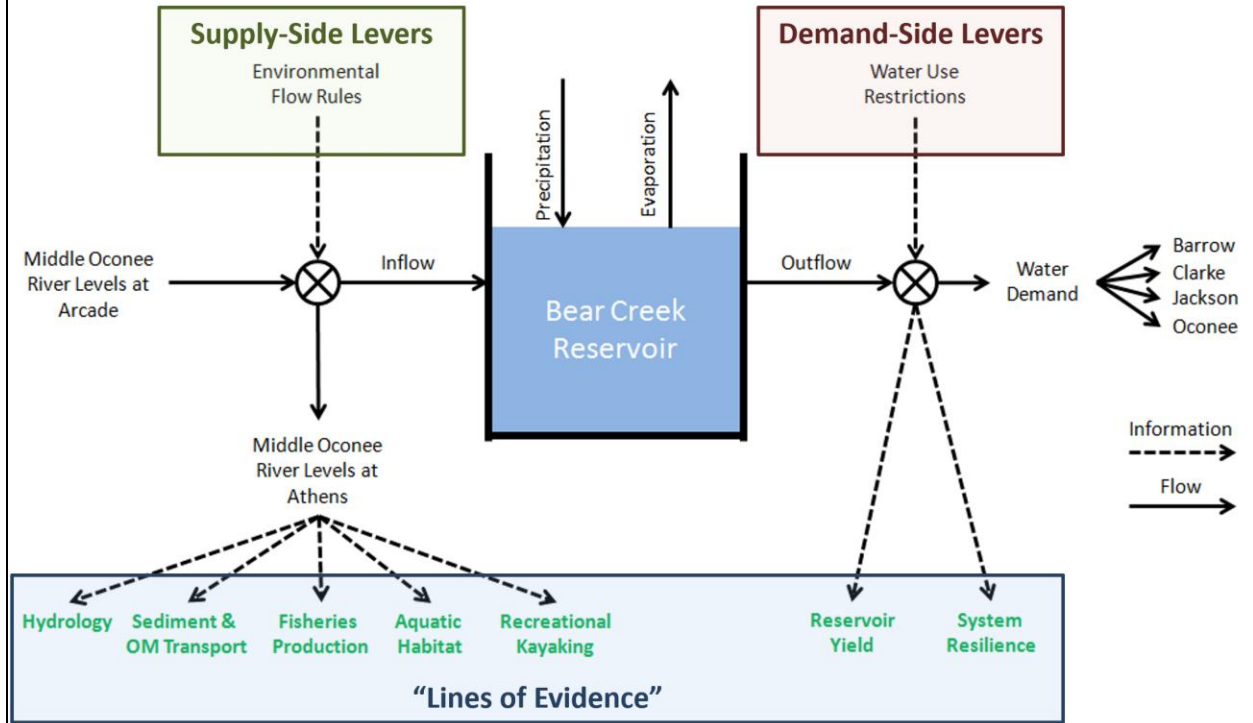
Day 3: Handout



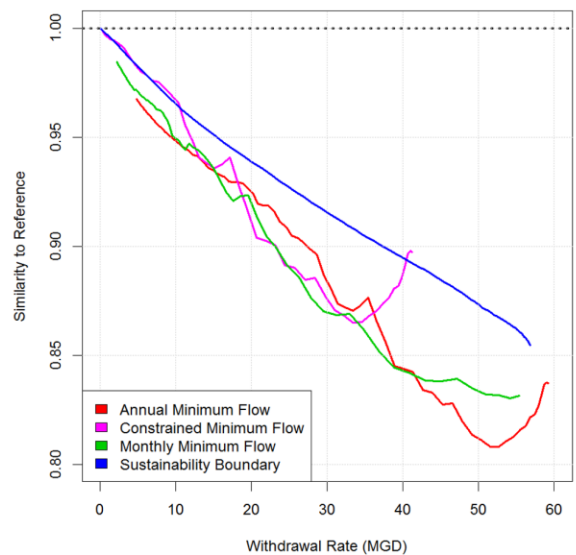
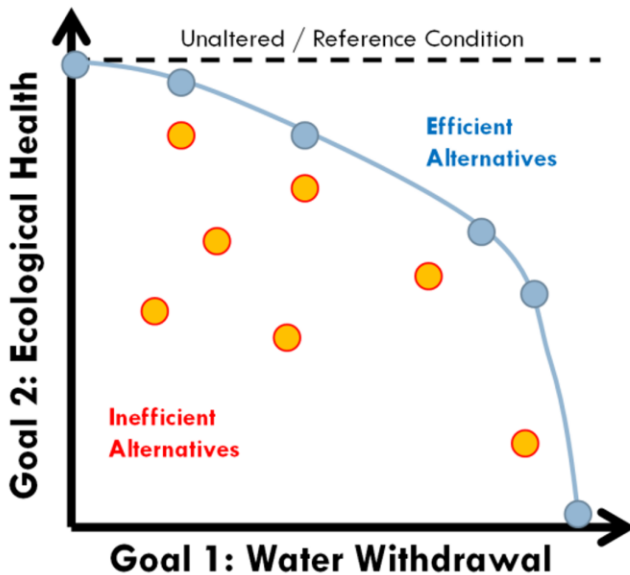
Can we withdraw the same volume of water with less environmental impact?



Can we meet municipal water demand with less environmental impact?



Making Trade-offs



Day 3: Hypothetical Class Project

Background (totally made up)

Athens Clarke County would like to invest in the Hunnicutt Creek watershed. The town anticipates significant growth in the area due to an upcoming change in zoning. You represent a local engineering and environmental consulting firm seeking a contract with the city to execute all site planning and stormwater management activities in the watershed. The city's request for proposals mentions the need to align with a range of community values, reduce exposure to natural hazards, and support thriving local ecosystems. The principals at your firm have given you one day and a team of 3-4 team members (an investment of ~\$5,000) to scope this watershed plan. The firm wants you to outline the basic components of the broader project so that a more detailed proposal can be written. By tomorrow morning, you need to develop a presentation that applies the PROACT framework to "tell the story" of the Hunnicutt Creek watershed. Some recommended tasks are below. You may not get to everything, and that's okay.

Problem Identification

- Explore the materials given as well as the system itself (hop in a van). Seek to build context relative to the SETS framing (social-ecological-technical systems).
 - Social context: What do you view as challenges this community is facing? Are any of those challenges caused or exacerbated by water issues?
 - Ecological context: What ecosystems are there? What are key hydrological processes? What organisms would you anticipate living here? Consider recording notes as a conceptual model.
 - Built context: Where is existing infrastructure? Is it performing as intended? What issues or hazards could be addressed by new features? How would new features interact?
- Collect sufficient notes to articulate a few problems or opportunities in the system. How are they different/similar to comparable systems elsewhere?
- As discussed, I don't believe in cookbooks, but the example statement may provide some key points to consider.

Problem statements: A "cookbook"?

A wants to do **X** to achieve **Y** over time **Z** in place **W** considering **B** and uncertainty in **C**.

- **A** = decision maker in charge of the decision
- **X** = action statement that indicates the scope of resources to be allocated
- **Y** = ultimate goal(s) to be achieved by doing "X"
- **Z** = temporal extent of the decision (planning horizon)
- **W** = spatial extent of the decision (refuge, management unit, etc.)
- **B** = potential constraints (legal, financial, and political)
- **C** = critically important uncertainties

Objective Setting

- Identify **at least three objectives** for watershed management.
- I find it helpful to work through Gregory and Keeney's four-step process.
 - Step 1: Write down the concerns you want to address.
 - Step 2: Convert the general concerns into specific, succinct objectives. Write objectives in verb-object format.
 - Step 3: Organize objectives. Separate the ends from the means. (Ask "Why?")
 - Step 4: Clarify what is meant by each objective.

- A few prompts they also suggest that might jar some thoughts lose...List problems and opportunities. Compose a wish list. Identify a best and worst outcome. Pros/cons of good/bad alternatives. Justify the project to the public.

Alternative Development

- Develop **at least four alternatives** for addressing water management challenges. Present a range of actions from conventional infrastructure to nature-based solutions.
- There should be clear alignment between your alternatives and objectives.
- Include a “no action” alternative. This is one of the four alternatives.
- When developing other alternatives, identify potential actions that could be applied (in a general sense). Mix and match actions to create logical sets (i.e., alternatives). Consider combinability and dependency. Make sure alternatives are substantially different in terms of philosophy, cost, and benefit. Iterate on your alternatives.

Consequences, Trade-offs, and Recommendation

- Develop a decision-matrix and an approach to assess each alternative relative to each objective. Come up with qualitative cost estimates to help compare actions.
- Think through the trade-offs associated with your alternative.
- Is there an alternative that rises to the top that you want to call your boss's attention to?

Notes for the Future

- Record any key pieces of information you felt limited by. Were there key uncertainties hindering decision making? Are there analyses that could fill gaps?

Outline a Monitoring Plan

If selected by the city and the project was built, how would you know it was successful? How would you track efficacy of outcomes? What qualitative and quantitative variables will you monitor? What is the experimental design (frequency, locations, etc.)? Who will conduct monitoring? How will data be archived and used?

Reporting

Compile information into a presentation format of your choosing. This could include slides, a poster, a narrative description, or anything else you deem appropriate.

Day 3: Exercise

Hunnicut Creek Conceptual Model

In teams of 3-4 people, develop a conceptual model of the watershed. The model can take any format (i.e., sketch, box-and-arrow, diagram), but it should seek to convey your understanding of the system and “tell the story” of the project. It may be constructive to use the steps for conceptual model development from Fischenich (2008). Discuss with your team how management objectives are featured in the model.

Steps for Conceptual Model Development (from Fischenich 2008)	How you addressed them relative to White Dam
1) State the model objectives.	
2) Bound the system of interest.	
3) Identify critical model components within the system of interest.	
4) Articulate the relationships among the components of interest.	
5) Represent the conceptual model.	
6) Describe an expected pattern of model behavior.	
7) Test, review, and revise as needed.	

