

# NAT\_R 8001: Decision Analysis for Research and Management of Natural Resources

## Fall 2025 DRAFT Syllabus

### Class Information:

NAT\_R 8001, Class number: 65119

1 Credit

1 day/wk (2 hr block) for 8 weeks (August 25 - October 17)

Time and location: Tuesdays 2-4pm, ABNR 210

### Instructor

Dr. Brielle Thompson, The School of Natural Resources

303G Anheuser-Busch Natural Resources building

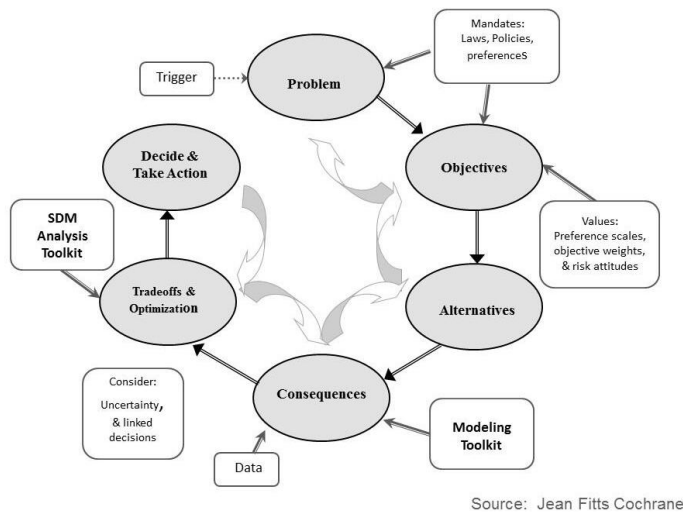
[brielle.thompson@missouri.edu](mailto:brielle.thompson@missouri.edu)

Instructor website: [https://briellekwarta19.github.io/personal\\_site](https://briellekwarta19.github.io/personal_site)

Course website: *Will be made available in August*

### Course Overview

Natural resource management involves making difficult decisions. Familiar natural resource problems may include decisions on how many acres of land must be protected, how an endangered species should be reintroduced, whether an agency should conduct more monitoring of an invasive species. The decision analysis field offers tools like Structured Decision Making (SDM) to help frame, structure, and identify solutions for such problems. Various Federal and State fish and wildlife agencies are increasingly using SDM to ensure a streamlined, fair, unbiased, repeatable, transparent, and organized decision-making process.



This class will introduce Decision analysis/SDM and its key components (**PrOACT**): **P**roblem framing-describing the natural resource management problem; **O**bjectives; articulating **O**bjectives; developing management **A**lternatives; using forecasting tools to evaluate the **C**onsequences, or outcomes, of alternatives, and using **T**radeoff methods to identify management alternatives when decisions involve multiple competing objectives.

Topics to be covered include decision structuring, influence diagramming, decision trees, optimization, multi-criteria decision analysis, value of information, and adaptive management.

Throughout the course the instructor will provide real-world case study examples and discuss how decision analysis may apply to graduate students' projects.

**Learning Objectives:**

- Identify the circumstances when Structured Decision Making could be useful
- Comprehend key principles of Structured Decision Making (e.g., ProACT, adaptive management)
- Understand graphical models of natural resource decisions (e.g., objective hierarchies, influence diagrams, decision trees)
- Identify tools that could be used for decision situations involving multiple objectives, uncertainty, risk, and repeated decisions
- Apply the ProACT process to graduate research topics with rapid prototyping

**Prerequisites:**

Graduate standing in natural or cultural resources or related field or instructor consent.

**Text:** selected papers; optional text is: *Structured Decision Making: Case Studies in Natural Resource Management*. Runge, M.C., Converse, S.J., Lyons, J.E., Smith, D.R.

**Format:**

The course will meet for a 2-hour block each week. The class will be a mix of lectures covering fundamental concepts and techniques, and student-led discussions on literature. The first portion of each class will be lecture based, and the final 45 minutes will involve student discussion on the readings assigned for each week. The final week will involve informal student presentations.

**Schedule (subject to change)**

<b>Week</b>	<b>Topic</b>	<b>ProACT Step</b>	<b>Readings</b>
<b>1</b>	- Motivation for Structured Decision Making - Problem framing for natural resource decisions <b>Tools discussed:</b> Problem framing equation	<b>Problem framing</b>	Keeney 2004
<b>2</b>	- Identifying and quantifying objectives for management decisions <b>Tools discussed:</b> Objectives hierarchy	<b>Objectives</b>	Conroy & Peterson 2013 Chapter 3, Aldridge & Colvin 2024
<b>3</b>	- Developing management alternatives and using models to identify the consequences of alternatives <b>Tools discussed:</b> Influence diagram, portfolios and strategy tables	<b>Alternatives, Consequences</b>	Lyons et al. 2020, Runge 2020
<b>4</b>	- Making tradeoffs amongst objectives <b>Tools discussed:</b> Multi-Criteria Decision Analysis, swing weighting	<b>Tradeoffs</b>	Converse 2020, Walshe & Slade 2020
<b>5</b>	- Decisions under uncertainty part 1 - <b>Tools discussed:</b> Decision trees, value of information	<b>Advanced topic</b>	Sepulveda et al. 2022, Canessa et al. 2015
<b>6</b>	- Decisions under uncertainty part 2 - <b>Tools discussed:</b> Adaptive management	<b>Advanced topic</b>	Moore et al. 2020, Thompson et al. 2025
<b>7</b>	- Dealing with risk - <b>Tools discussed:</b> risk profiles	<b>Advanced topic</b>	Runge & Converse 2020, Sells et al. 2020
<b>8</b>	<i>Rapid prototyping student presentation</i>	<b>All steps</b>	

### **Grading (100 total points)**

Final course letter grades will be based on the total accumulation of points earned in the three categories outlined below (total = 100 points). The grading scale for this course is:

A (4.0) = 90-100, B (3.0) = 80-89, C (2.0) = 70-79, D (1.0) = 60-69, F (0) = < 60.

Categories:

- A. *Participation*: 30 points
- B. *Discussion lead*: 40 points
- C. *Rapid prototyping*: 30 points

- A. *Participation*: 30 points (6 points per week– excluding week 1, 8, and discussion lead week, 5 weeks total). Please see the information below about the **absence policy** for this course.

#### **Participation grading per week (6 points)**

Point	Description
6	Contributed at least 3 times during the class period (contribution refers to either answering questions or providing follow-up questions)
5	Contributed at least 2 times during the class period
4	Contributed once during class period, and was actively engaged (active engagement refers to writing notes and being physically engaged)
3	Did not contribute, but was actively engaged
2	Absent, notified instructor, but did not provide discussion points (see <b>absence policy</b> )
1	Did not contribute and was not engaged
0	Absent and did not notify instructor

- B. *Discussion lead*: 40 points

During **one** week during weeks 2-7, in groups, students will be expected to lead a 45-minute discussion on the papers assigned for each week (see the **schedule** above). The discussion lead grading rubric is found at the end of the syllabus.

- C. *Rapid prototyping*: 30 points

During the final week of class, each student will be expected to informally discuss (~10 minutes) how components of decision analysis/ Structured Decision Making could be applied to their current graduate research project. The rapid prototyping grading rubric is found at the end of the syllabus.

### **Absences policy**

This course is heavily discussion-based. Regular attendance is crucial, and it is to be expected that you will attend the final week of class and the week you will be co-leading a discussion. For all other weeks, if you are unable to attend class due to illness, conferences, or other valid reasons, you will be expected to provide a 250–500-word synopsis of the weekly reading and provide specific insight that relates to your research, and provide 2 discussion questions. This will fulfill the requirements for participation that week.

### **Office hours**

I will hold weekly office hours 1x per week for an hour in my office, ABNR 303G (to be announced). I can be available for zoom meetings upon request (please give 24 hours in advance notice). In general, I will respond to any questions via email within 24 hours.

## **MU Policies and Services**

**Intellectual Pluralism:** The University community welcomes intellectual diversity and respects student rights. Students who have questions or concerns regarding the atmosphere in this class (including respect for diverse opinions) may contact the departmental chair or divisional director; the director of the [Office of Academic Integrity](#); the [MU Equity Office](#), or [equity@missouri.edu](mailto:equity@missouri.edu). All students will have the opportunity to submit an anonymous evaluation of the instructor(s) at the end of the course.

**Title IX:** University of Missouri policies prohibit discrimination on the basis of race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, pregnancy, age, genetic information, disability and protected veteran status. Discrimination includes any form of unequal treatment such as denial of opportunities, harassment, and violence. Sex-based violence includes rape, sexual assault, unwanted touching, stalking, dating/interpersonal violence, and sexual exploitation. If you experience discrimination, you are encouraged (but not required) to report the incident to the MU Office for Civil Rights & Title IX. Learn more about your rights and options at [civilrights.missouri.edu](http://civilrights.missouri.edu) or call 573-882-3880. You also may make an anonymous report online.

Students may also contact the Relationship & Sexual Violence Prevention (RSVP) Center, a confidential resource, for advocacy and other support related to rape or power-based personal violence at [rsvp@missouri.edu](mailto:rsvp@missouri.edu) or 573-882-6638, or go to [rsvp.missouri.edu](http://rsvp.missouri.edu). Both the [Office for Civil Rights & Title IX](#) and the [RSVP Center](#) can provide assistance to students who need help with academics, housing, or other issues.

**No Recording Allowed:** University of Missouri System Executive Order No. 38 lays out principles regarding the sanctity of classroom discussions at the university. The policy is described fully in [section 200.015](#) of the Collected Rules and Regulations. In this class, students may not make audio or video recordings of course activity, except students permitted to record as an accommodation under [section 240.040](#) of the Collected Rules. All other students who record and/or distribute audio or video recordings of class activity are subject to discipline in accordance with provisions of [section 200.020](#) of the Collected Rules and Regulations of the University of Missouri pertaining to student conduct matters. Those students who are permitted to record are not permitted to redistribute audio or video recordings of statements or comments from the course to individuals who are not students in the course without the express permission of the faculty member and of any students who are recorded. Students found to have violated this policy are subject to discipline in accordance with provisions of [section 200.020](#) of the Collected Rules and Regulations of the University of Missouri pertaining to student conduct matters.

**Academic Dishonesty:** The University strives to prepare students for lives of personal and professional integrity. Academic integrity is fundamental to the activities and principles of a university. All members of the academic community must be confident that each person's work has been responsibly and honorably acquired, developed, and presented. Any effort to gain an advantage not given to all students is dishonest whether or not the effort is successful. The academic community regards breaches of the academic integrity rules as extremely serious matters. Sanctions for such a breach may include academic sanctions from the instructor, including failing the course for any violation, to disciplinary sanctions ranging from probation to expulsion. When in doubt about plagiarism, paraphrasing, quoting, collaboration, or any other form of cheating, consult the course instructor.

### **Use of Generative AI:**

In this course, the use of GenAI software is permitted solely to ask questions of material described in class.

**Students with Disabilities:** If you anticipate barriers related to the format or requirements of this course, if you have emergency medical information to share with me, or if you need to make arrangements in case the building must be evacuated, please let me know as soon as possible.

If disability related accommodations are necessary (for example, a note taker, extended time on exams, captioning), please establish an accommodation plan with the [MU Disability Center](#), S5 Memorial Union, 573-882-4696, and then notify me of your eligibility for reasonable accommodations. For other MU resources for persons with disabilities, click on "Disability Resources" on the MU homepage.

**Student Support Statement:** Students can encounter challenges that may impact their performance in their academic programs. The School of Natural Resources (SNR) is committed to supporting students who encounter these challenges.

Any student who cannot afford groceries or access sufficient food to eat, or who lacks a safe and stable place to live is urged to contact Nicole Logue ([loguejn@missouri.edu](mailto:loguejn@missouri.edu)), 2500 MU Student Center, or contact staff in the SNR Office of Academic Programs (573-882-7045), 124 ABNR Bldg., for a list of resources and support. In addition, the MU Tiger Pantry (<https://tigerpantry.missouri.edu/>) is a free resource with a food pantry and personal care items, located at 1400 S Rock Quarry Rd #8.

The University of Missouri also provides health resources and financial counseling to help you during difficult times. These resources include:

- Student Health Center ([www.studenthealth.missouri.edu](http://www.studenthealth.missouri.edu) or 573-882-7481)
- Counseling Center ([www.counseling.missouri.edu](http://www.counseling.missouri.edu) or 573-882-6601)
- Psychological Services Clinic (<https://psychology.missouri.edu/psychological-services-clinic>; 573-882-4677)
- Student Financial Aid Office (<https://financialaid.missouri.edu/> or 573-882-7506)
- Office for Financial Success (<https://ofsmizzou.org/> or 573-882-2173)
- Missouri Crisis text line (Text HAND to 839863 or call 1-888-761-4357, available 24/7)

**Important Dates:**

- Last Day to drop a course without a grade **TBD**.
- Last Day to withdraw **TBD**.

For more general university policies see <https://provost.missouri.edu/faculty-affairs/syllabus-information/>

**NAT\_R 8001: Decision Analysis**  
**Discussion Lead Evaluation Rubric**  
 (40% of Final Grade)

Names: \_\_\_\_\_

Points Possible: 40

Grading Criteria	Descriptors	Points
Preparation	Demonstrates: good familiarity with article cooperation and collaboration among presenters	___/10
Discussion Techniques	Discussion techniques: engage students—motivating incorporate multiple techniques encourage all students to contribute guide but not dominate discussion summarize the discussion promote discussion of different viewpoints	___/10
Content & Discussion Questions	Questions asked: are thought-provoking are understandable refer to readings	___/10
Facilitation Skills	Facilitators demonstrate good facilitation skills: active listening paraphrasing summarizing redirecting the questions	___/5
Communication skills	Facilitators engage class through their: eye contact voice gestures classroom presence	___/5
	Total points	___/40

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**NAT\_R 8001: Decision Analysis**  
**Rapid Prototyping Evaluation Rubric**  
(30% of Final Grade)

Name: \_\_\_\_\_

Points Possible: 30

Grading Criteria	Descriptors	Points
Problem framing (Pr)	Provides a slide(s) on the problem framing step for the natural resource decision.	___/3
Objectives (O)	Provides a slide(s) on the objectives identified for the natural resource decision	___/3
Alternatives (A)	Provides a slide(s) on the alternatives developed for the natural resource decision (includes strategy table or portfolio table)	___/3
Consequences (C)	Provides a slide(s) that explains how models or experiments will be used to calculate the performance of the alternatives in terms of the objectives.	___/3
Tradeoffs (T)	Provides a slide(s) that explains how tradeoffs between objectives may be dealt with.	___/3
Advanced decision analysis tools	Provides a slide on how additional decision analysis tools could be incorporated to help make your natural resource decision (e.g., adaptive management, value of information, risk profiles)	___/3
Presentation timing	Presents within 7 minutes (saves 3 minutes for questions)	___/3
Slide organization	Identifies each step of PrOACT in the presentation and has appropriate visuals included	___/3
Delivery	Displayed good preparedness for this presentation and spoke clearly and engaged the audience	___/3
Attendance	Free points for attending the final day of class	___/3
	Total points	___/30

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