

Fish Population Dynamics

Course: Water 353/553, Spring 2021, 4 credits

Description: Mathematical analysis of fish population dynamics and demographics. Use of sampling and models for estimating survival, growth, recruitment, and abundance in fish populations.

Lectures: Tuesday, Thursday, & Friday, 9:00-9:50, online (live and pre-recorded)
<https://uwsp.zoom.us/j/96239390857?pwd=c3B1cHNGQ0dRajhXeG9RZ0xINkNiZz09>
Passcode: **705300**

Laboratory: Tuesday, 2:00-3:50, TNR 322 or 356 or online
<https://uwsp.zoom.us/j/91874666486?pwd=b3dQY1IOLzkzS0lubkhhL2hyQTMxQT09>
Passcode: **286347**

Instructor: Joshua K. Raabe, PhD

Contact Information: jraabe@uwsp.edu, TNR 174, 715-346-2689 (office phone)

Office hours: Wednesday, 9:00-11:00 (online); also by appointment (e-mail first)
<https://uwsp.zoom.us/j/94350764366>

Goal: My overall goal is for students to understand why studying population dynamics is important and to develop basic skills to answer applied fisheries and ecological questions.

Objectives: By the end of the semester, students should be able to:

1. Describe the key concepts of population dynamics
2. Explain how and why different methods are used to answer questions
3. Run basic models and statistics in computer software
4. Interpret output from basic models and statistics

Communication: Students are expected to routinely check their UWSP e-mail and Canvas course site for updates and materials.

Canvas: <https://uwstp.instructure.com/courses/374576>

Text: Guy, C. S., and M. L. Brown. 2007. Analysis and interpretation of freshwater fisheries data. American Fisheries Society, Bethesda, Maryland. (Text Rental)

Additional Materials: Additional lecture and lab materials will be available on Canvas. Students may view handouts online or print on their own. Text and handouts should be read *prior* to attending lecture and lab. Computers are provided for use in the lab.

WATR 553: Graduate students will be held to a higher standard for grading, have additional tasks/assignments, and be expected to assist undergraduate students.

Lecture Attendance: Lectures will be a mixture of live (synchronous) and pre-recorded (asynchronous); I will inform in advance which type and also post lectures notes. I will not take attendance for live lectures, outside of paper discussion days. However, I have noticed that your success in this course will likely be related to the amount of time you invest in preparation and your extent of classroom discussions and activities.

Scientific Papers: To encourage learning from real studies, four times (40 points total) over the course of the semester each student will find a peer-reviewed scientific paper related to specific topics, upload a PDF of the article and a short summary to Canvas (7 points), post under another student's paper (1 point) and discuss in class (2 points).

Content Quizzes: To encourage students to stay up to date on course materials, provide practice problems, and for me to determine if certain materials were not explained well, there will be content quizzes covering lecture materials on Canvas (30 points total).

Exams: Four 100 point in-class exams will each cover one-fourth of the lecture & lab material; exams are not cumulative although certain aspects and calculations will carry throughout the semester. To allow for adequate time, each exam will be taken: 1., during a 2-hour laboratory (optional review during normal class period prior to exam) or 2., during the final exam period. These will be online with open resources (notes, internet, etc.) and additional time will be provided. However, you cannot receive materials from other people or interact with anyone during the exam. Each exam must be taken at the scheduled time or a score of zero will be assigned. Illness or family emergency may be cause for re-scheduling an exam, but only if you notify me *prior* to the exam period (email and voice-mail have date and time stamps).

Laboratory Attendance: Laboratory attendance is required to ensure that each student is understanding and completing lab materials, and so that I can assist in a timely manner. Each lab will be worth 1 point, with a total of 10 points. This means two labs can be missed without losing any points, and if you attend all labs you will receive two bonus points. Expect all labs to go to 3:50.

Laboratory Assignments: Laboratory assignments will occur throughout the semester and be *worth 120 points*. All labs should be completed, as they will relate to topics covered on the exams. The assignments will require you to complete analyses and interpret the results. You may need to do additional research to answer questions.

Assignments should be submitted onto Canvas by 11:59 PM on the due date. ***All assignments will be deducted 10% for each day late (e.g., 1 point/day for 10 point assignment)***, so please submit in a timely manner to avoid reductions or a score of zero.

Grade Breakdown: Grades will be determined based on student’s total points at the end of the semester. Participation and effort can be factored in for the student’s benefit.

| Category | Points | Grade | Points | Percentage |
|--------------|------------|-------|------------|---------------|
| Lecture | | A | 558 - 600 | 93 - 100% |
| Exams (4) | 400 | A- | 540 - 557 | 90 - 92.9% |
| Papers (4) | 40 | B+ | 522 - 539 | 87 - 89.9% |
| Quizzes | 30 | B | 498 - 521 | 83 - 86.9% |
| Lab | | B- | 480 - 497 | 80 - 82.9% |
| Surveys (2) | 5 | C+ | 462 - 479 | 77 - 79.9% |
| Attendance | 10 | C | 438 - 461 | 73 - 76.9% |
| Assignments | 115 | C- | 420 - 437 | 70 - 72.9% |
| | | D+ | 402 - 419 | 67 - 69.9% |
| | | D | 360 - 401 | 60 - 66.9% |
| Total | 600 | F | ≤ 359 | $\leq 59.9\%$ |

Classroom Environment: I want everyone to feel comfortable and willing to participate in this course and will work to keep a positive classroom/online environment. Please contact me if you have any issues with a classmate or me. In addition, UWSP values a safe, honest, respectful, and inviting learning environment. In order to ensure that each student has the opportunity to succeed, they developed a set of expectations for all students and instructors, known as the *Rights and Responsibilities* document:

<http://www.uwsp.edu/dos/Documents/Right%20and%20Responsibilities.pdf>

Student Feedback: To help improve this course and my teaching throughout the semester, I will ask for feedback during class periods, through surveys, and you can always talk to / email me or you can provide *anonymous* feedback through an online survey (link below and also on Canvas). I will try to incorporate all constructive, well-stated suggestions and critiques. I also greatly appreciate completed UWSP course evaluations at the end of the semester.

<https://www.surveymonkey.com/r/HZCL85X>

Academic Integrity: I expect all students to strictly adhere to the high level of conduct and academic integrity at UWSP. All forms of plagiarism, cheating, and academic dishonesty are prohibited; violations will follow UWSP procedures. I reserve the right to use plagiarism software on assignments. The minimum penalty for a violation of academic integrity is failure (score of zero) of the assignment, but penalties can be stricter. For more information, please see the UWSP “Student Academic Standards and Disciplinary Procedures” section of the *Rights and Responsibilities*, Chapter 14:

https://www.uwsp.edu/acadaff/Orientation/AcademicMisconductRulesAndProcedures_booklet.pdf

Disability Policy: If you are a student with disabilities, please contact me at the beginning of the semester. We will work together to accommodate any disabilities according to UWSP policies and the Americans with Disabilities Act (ADA), a federal law requiring educational institutions to provide reasonable accommodations for students with disabilities. Students must register with UWSP Disability and Assistive Technology Center and provide proper documentation. For more information, please visit the links below and the Disability and Assistive Technology Center, located on the 6th floor of the Learning Resource Center (the Library).

<http://www4.uwsp.edu/special/disability/>

Safety Procedures: *Medical emergency:* call 911 or use the hallway red emergency phone, offer assistance if trained and willing, guide emergency responders to victim. *Tornado warning:* remain in our room until advised otherwise. *Fire alarm:* calmly evacuate building, meet in courtyard near library stairs, notify me or emergency command personnel of any missing individuals. *Active shooter:* Run/Escape, Hide, Fight. If trapped hide, lock doors, turn off lights, spread out and remain quiet. Follow instructions of emergency responders. Additional details and information:

www.uwsp.edu/rmgt

Face Coverings: At all UW-Stevens Point campus locations, the wearing of face coverings is mandatory in all buildings, including classrooms, laboratories, studios, and other instructional spaces. Any student with a condition that impacts their use of a face covering should contact the [Disability and Assistive Technology Center](#) to discuss accommodations in classes. Please note that unless everyone is wearing a face covering, in-person classes cannot take place. This is university policy and not up to the discretion of individual instructors. Failure to adhere to this requirement could result in formal withdrawal from the course.

Other Guidance:

- Please monitor your own health each day using [this screening tool](#). If you are not feeling well or believe you have been exposed to COVID-19, do not come to class; email your instructor and contact Student Health Service (715-346-4646).
 - As with any type of absence, students are expected to communicate their need to be absent and complete the course requirements as outlined in the syllabus.
- Maintain a minimum of 6 feet of physical distance from others whenever possible.
- Do not congregate in groups before or after class; stagger your arrival and departure from the classroom, lab, or meeting room.
- Wash your hands or use hand sanitizer regularly and avoid touching your face.
- Please maintain these same healthy practices outside the classroom.

Lecture & Lab Schedule

This is a **TENTATIVE** lecture & lab schedule. I will consult the class regarding any major changes and inform of minor changes along with updating on Canvas.

| Week | Tuesday | Thursday | Friday | Tuesday-Lab |
|--------|---------------------------------------------------------|-----------------------|-----------------------|----------------------------|
| 25-Jan | Intro, Sampling Designs | Math & Stats | Math & Stats | Math & Stats, Software |
| 1-Feb | Math & Stats | Selectivity | Catchability | Basic Stats |
| 8-Feb | Catchability | Power Analysis | Power Analysis | Selectivity & Catchability |
| 15-Feb | <i>Review</i> | Size Structure | Size Structure | Exam 1 |
| 22-Feb | Body Condition | Body Condition | Age & Growth | Size & Condition |
| 1-Mar | Age & Growth | Fecundity & Maturity | Fecundity & Maturity | Growth & Maturity |
| 8-Mar | Abundance | Abundance | Abundance | Abundance 1 |
| 15-Mar | <i>Review</i> | Abundance | Abundance | Exam 2 |
| 22-Mar | ----- NO LECTURES OR LAB - SPRING BREAK!!! ----- | | | |
| 29-Mar | Exponential Growth | Exponential Growth | Logistic Growth | Abundance 2 |
| 5-Apr | Logistic Growth | Mortality | Mortality | Population Growth |
| 12-Apr | Mortality | Movement & Migrations | Movement & Migrations | Mortality |
| 19-Apr | <i>Review</i> | Recruitment | Recruitment | Exam 3 |
| 26-Apr | Surplus Production | Surplus Production | Yield Per Recruit | Recruitment |
| 3-May | Yield Per Recruit | Dynamic Pool YPR | Harvest Management | Surplus Production |
| 10-May | Harvest Management | Community Metrics | <i>Review</i> | YPR, Dynamic Pool |
| 17-May | ----- Exam 4, Monday, May 17, 8:00-10:00 ----- | | | |

- *Original, 1.19.2021*

Lecture, Reading, & Assignment Schedule

This is a **TENTATIVE** topic, reading, and assignment schedule that may change during the semester. I will inform the class of changes and make updates clear on Canvas.

| Date | Topic | Reading | Assignment |
|-----------|-------------------------------------------------------|---------------------------------------|-------------------------------------|
| 26-Jan | Intro, Sampling Designs | Chapter 3, esp. bolded title sections | Entry Survey |
| 28-Jan | Math & Stats | Chapter 1, especially 1.1 - 1.4.1.2 | |
| 29-Jan | Math & Stats | Chapter 1, especially 1.1 - 1.4.1.2 | |
| 2-Feb | Math & Stats | Chapter 1, especially 1.1 - 1.4.1.2 | Intro Lab |
| 4-Feb | Gear Selectivity | 7.1-7.3.5 and 9.3 | Post Art. 1 |
| 5-Feb | Catchability | 7.1-7.3.5 and 9.3 | |
| 9-Feb | Catchability | 7.1-7.3.5 and 9.3 | Math & Stats Lab |
| 11-Feb | Power Analysis | 1.4.1.2- 1.4.1.3 | |
| 12-Feb | Power Analysis | 1.4.1.2- 1.4.1.3 | Discuss Art. 1, Select & Catch Lab |
| 16-Feb | Review (Exam 1) | | Exam 1 |
| 18-Feb | Size Structure | Chapter 9, esp. 9.1, 9.2, 9.5, 9.6 | |
| 19-Feb | Size Structure | Chapter 9, esp. 9.1, 9.2, 9.5, 9.6 | |
| 23-Feb | Body Condition | Chapter 10 | |
| 25-Feb | Body Condition | Chapter 10 | |
| 26-Feb | Age & Growth | Chapter 5 | |
| 2-Mar | Age & Growth | Chapter 5 | Size & Condition Lab |
| 4-Mar | Fecundity & Maturity | | Post Art. 2 |
| 5-Mar | Fecundity & Maturity | | |
| 9-Mar | Abundance | Review 7.1-7.3.5 | Growth, Fecundity, & Maturity Lab |
| 11-Mar | Abundance | 8.1-8.4, Pine et al. 2003 | |
| 12-Mar | Abundance | 8.1-8.4, Pine et al. 2003 | Discuss Art. 2, Abundance 1 Lab |
| 16-Mar | Review (Exam 2) | | Exam 2 |
| 18-Mar | Abundance | 8.1-8.4, Pine et al. 2003 | |
| 19-Mar | Abundance | 8.1-8.4, Pine et al. 2003 | |
| 22-26 Mar | NO LECTURES OR LAB THIS WEEK - SPRING BREAK!!! | | |
| 30-Mar | Exponential Growth | | |
| 1-Apr | Exponential Growth | | |
| 2-Apr | Logistic Growth | | |
| 6-Apr | Logistic Growth | | Abundance 2 Lab |
| 8-Apr | Mortality | Chapter 6 | Post Art. 3 |
| 9-Apr | Mortality | Chapter 6 | |
| 13-Apr | Mortality | Chapter 6 | Population Growth Lab |
| 15-Apr | Movement & Migrations | Chapter 14 | |
| 16-Apr | Movement & Migrations | Chapter 14 | Discuss Art. 3, Mortality Lab |
| 20-Apr | Review (Exam 3) | | Exam 3 |
| 22-Apr | Recruitment | Chapter 4 and 13.2.3.3 | |
| 23-Apr | Recruitment | Chapter 4 and 13.2.3.3 | |
| 27-Apr | Surplus Production | 8.5 and 13.2.3.1 | |
| 29-Apr | Surplus Production | 8.5 and 13.2.3.1 | |
| 30-Apr | Yield Per Recruit | 13.2.3.2 | |
| 4-May | Yield Per Recruit | 13.2.3.2 | Recruitment Lab |
| 6-May | Dynamic Pool YPR | 13.2.3.2 | Post Art. 4 |
| 7-May | Fisheries Management | | |
| 11-May | Harvest Management | | Surplus Production Lab, Exit Survey |
| 13-May | Community Metrics | Chapter 15 | |
| 14-May | Review (Exam 4) | | Discuss Art. 4, YPR Lab |
| 17-May | Exam 4, Monday, 8:00-10:00 | | Exam 4 |

- Original, 1.19.2021