

Fish Population Dynamics

Course: Water 353/553, Spring 2023, 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: Monday, Wednesday, & Friday, 9:00-9:50, TNR 252

Laboratory: Tuesday, 2:00-3:50, CCC 307

Instructor: Joshua K. Raabe, PhD

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

Office hours: Monday, 11:00-12:45; also by appointment (e-mail first) or just stop by my office whenever door is open

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/570607>

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 an additional assignment, and be expected to assist undergraduate students.

Lecture Attendance: I will not take attendance for lectures, outside of the first day and scientific 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 (40 points): To encourage learning from real studies, four times 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).

Quizzes & Surveys (35 points): To encourage students to stay up to date on course materials, provide practice problems, and for me to receive feedback, there will be class surveys & content quizzes covering lecture materials on Canvas.

Exams (400 points): Four 100 point 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 will take the exam in the computer lab and 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 (10 points): Laboratory attendance (1 point per lab) is required to ensure that each student is understanding and completing lab materials, and so that I can assist in a timely manner. Given there are 10 points total, 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 (115 points): Each laboratory activity will have an associated assignment. 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
Exams (4)	400	A	558 - 600	93 - 100%
Papers (4)	40	A-	540 - 557	90 - 92.9%
Quizzes/Surveys	35	B+	522 - 539	87 - 89.9%
Lab Assignments	115	B	498 - 521	83 - 86.9%
Lab Attendance	10	B-	480 - 497	80 - 82.9%
Total	600	C+	462 - 479	77 - 79.9%
		C	438 - 461	73 - 76.9%
		C-	420 - 437	70 - 72.9%
		D+	402 - 419	67 - 69.9%
		D	360 - 401	60 - 66.9%
		F	≤ 359	≤ 59.9%

WATR 553: Graduate students will have additional assignments including analyzing a different dataset throughout the semester and sharing results either in class or a recorded video, and also will be held to a higher standard for grading.

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, 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 Resource Center (DRC) and provide proper documentation. For more information, please visit the DRC located in room 108 in the Collins Classroom Center (CCC) and the following link: <https://www.uwsp.edu/disability-resource-center/>

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 information: www.uwsp.edu/rmgt

Health situations including COVID-19: The health and safety of our students, faculty and staff are top priorities. Please monitor your health, including your mental health. If you are not feeling well or may be contagious, please do not come to class, instead rest up and if needed reach out to the appropriate medical personnel.

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.

All students, faculty and staff will follow the UWSP policies and guidelines pertaining to the COVID-19. See: <https://www.uwsp.edu/coronavirus/Pages/default.aspx>, or email covid@uwsp.edu.

Lecture, Reading, & Assignment Schedule

TENTATIVE topic, reading, and assignment schedule. Please check Canvas for these & other due dates, such as content quizzes not listed below. Note: * = Tuesday, ^ = Sunday.

Date	Topic	Reading	Assignment
23-Jan	Intro, Sampling Designs	Chapter 3, esp. bolded title sections	
25-Jan	Math & Stats	Chapter 1, especially 1.1 - 1.4.1.2	Class & Entry Surveys
27-Jan	Math & Stats	Chapter 1, especially 1.1 - 1.4.1.2	
30-Jan	Selectivity	Chapter 1, especially 1.1 - 1.4.1.2	Intro Lab*
1-Feb	Math & Stats (Recording)	7.1-7.3.5 and 9.3	
3-Feb	Selectivity & Catchability	7.1-7.3.5 and 9.3	
6-Feb	Catchability	7.1-7.3.5 and 9.3	Post Paper 1, Basic Stats Lab*
8-Feb	Power Analysis	1.4.1.2- 1.4.1.3	
10-Feb	Power Analysis	1.4.1.2- 1.4.1.3	Comment Paper 1^, Sel. & Catch. Lab^
13-Feb	Papers & Review		Discuss Paper 1, Exam 1*
15-Feb	Size Structure	Chapter 9, esp. 9.1, 9.2, 9.5, 9.6	
17-Feb	Size Structure	Chapter 9, esp. 9.1, 9.2, 9.5, 9.6	
20-Feb	Body Condition	Chapter 10	
22-Feb	Body Condition	Chapter 10	
24-Feb	Age & Growth	Chapter 5	
27-Feb	Age & Growth	Chapter 5	Size & Body Condition Lab*
1-Mar	Fecundity & Maturity		
3-Mar	Fecundity & Maturity		
6-Mar	Abundance	Review 7.1-7.3.5	Post Paper 2, Maturity & Growth Lab*
8-Mar	Abundance	8.1-8.4, Pine et al. 2003	
10-Mar	Abundance	8.1-8.4, Pine et al. 2003	Comment Paper 2^, Abund. Lab^
13-Mar	Papers & Review		Discuss Paper 2, Exam 2*
15-Mar	Abundance	8.1-8.4, Pine et al. 2003	
17-Mar	Abundance (Recording)	8.1-8.4, Pine et al. 2003	
20-24 Mar	NO LECTURES OR LAB THIS WEEK - SPRING BREAK!!!		
27-Mar	Exponential Growth		
29-Mar	Exponential Growth		
31-Mar	Logistic Growth		
3-Apr	Logistic Growth		Abundance 2 Lab*
5-Apr	Mortality	Chapter 6	
7-Apr	Mortality	Chapter 6	
10-Apr	Mortality	Chapter 6	Post Paper 3, Pop. Growth Lab*
12-Apr	Movement & Migrations	Chapter 14	
14-Apr	Movement & Migrations	Chapter 14	Comment Paper 3^, Mortality Lab^
17-Apr	Papers & Review		Discuss Paper 3, Exam 3*
19-Apr	Recruitment	Chapter 4 and 13.2.3.3	
21-Apr	Recruitment	Chapter 4 and 13.2.3.3	
24-Apr	Surplus Production	8.5 and 13.2.3.1	
26-Apr	Surplus Production	8.5 and 13.2.3.1	
28-Apr	Yield Per Recruit	13.2.3.2	
1-May	Yield Per Recruit	13.2.3.2	Recruitment Lab
3-May	Dynamic Pool YPR	13.2.3.2	
5-May	Harvest Management		Post Paper 4
8-May	Harvest Management		Surplus Production Lab
10-May	Community Metrics	Chapter 15	Comment Paper 4, Surveys
12-May	Papers & Review		Discuss Paper 4, YPR Lab
15-May	Exam 4, Monday, 8:00-10:00		Exam 4

Lecture & Lab Schedule

TENTATIVE lecture & lab schedule. I will consult the class regarding any major changes and please watch Canvas for changes & due dates.

Week	Monday	Wednesday	Friday	Tuesday-Lab
23-Jan	Intro, Sampling Designs	Math & Stats	Math & Stats	Math & Stats, Software
30-Jan	Selectivity	Math & Stats (Recording)	Selectivity & Catchability	Basic Stats
6-Feb	Catchability	Power Analysis	Power Analysis	Selectivity & Catchability
13-Feb	<i>Papers & Review</i>	Size Structure	Size Structure	Exam 1
20-Feb	Body Condition	Body Condition	Age & Growth	Size & Condition
27-Feb	Age & Growth	Fecundity & Maturity	Fecundity & Maturity	Growth & Maturity
6-Mar	Abundance	Abundance	Abundance	Abundance 1
13-Mar	<i>Papers & Review</i>	Abundance	Abundance (Recording)	Exam 2
20-Mar	----- NO LECTURES OR LAB - SPRING BREAK!!! -----			
27-Mar	Exponential Growth	Exponential Growth	Logistic Growth	Abundance 2
3-Apr	Logistic Growth	Mortality	Mortality	Population Growth
10-Apr	Mortality	Movement & Migrations	Movement & Migrations	Mortality
17-Apr	<i>Papers & Review</i>	Recruitment	Recruitment	Exam 3
24-Apr	Surplus Production	Surplus Production	Yield Per Recruit	Recruitment
1-May	Yield Per Recruit	Dynamic Pool YPR	Harvest Management	Surplus Production
8-May	Harvest Management	Community Metrics	<i>Papers & Review</i>	YPR, Dynamic Pool
15-May	----- Exam 4, Monday, May 15, 8:00-10:00 -----			