

## Fish Population Dynamics

**Course:** Water 353/553, Spring 2024, 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, TNR 322

**Instructor:** Joshua K. Raabe, PhD

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

**Office hours:** Monday, 11:00 AM - 12:00 PM; also by appointment (e-mail first) or just stop by my office whenever door is open; can also ask questions after class or email!

**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/658138>

**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 grading standard, have additional assignments, such as analyzing a different dataset and sharing results either in class or a recorded video. Assisting undergraduate students is strongly encouraged.

**Lecture Attendance:** I will take attendance on the first day and scientific paper discussions, and potentially for occasional bonus points. In-class activities and explanations will greatly aid in understanding materials and preparing for exams/quizzes.

**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 materials; exams are not cumulative although certain aspects and calculations will carry throughout the semester. Exams will be on Canvas with open resources (notes, internet, etc.), but taken in person in the computer lab and cannot receive materials from other people or interact with anyone during the exam. To allow for adequate time, each exam will be taken during our laboratory (exams 1-3) or during the final exam period (exam 4). 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 via email.

**Laboratory Attendance (10 points):** Laboratory attendance (1 point per lab) is required to ensure each student is understanding and completing materials, and so I can assist in a timely manner. Two labs can be missed without losing points, and attending 11 or 12 labs will result in one bonus point each. 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%

**Classroom Environment:** I want everyone to feel comfortable and willing to participate and will work to keep a positive classroom 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 to succeed, and 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 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://www3.uwsp.edu/dos/Documents/UWSP14-Final2019.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), 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. More information can be found:

<https://www3.uwsp.edu/emergency/Pages/emergency-procedures.aspx>

**Health situations:** The health and safety of our students, faculty and staff are top priorities. Please monitor your health, including your mental health. If you are truly not feeling well and/or may be contagious, please do not come to class, instead inform me, 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.**

## 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
22-Jan	Intro, Sampling Designs	Chapter 3, esp. bolded title sections	
24-Jan	Math & Stats (Recording)	Chapter 1, especially 1.1 - 1.4.1.2	Class & Entry Surveys
26-Jan	S. Designs, Math & Stats	Chapter 1, especially 1.1 - 1.4.1.2	
29-Jan	Math & Stats	Chapter 1, especially 1.1 - 1.4.1.2	Intro Lab*
31-Jan	Selectivity	7.1-7.3.5 and 9.3	
2-Feb	Selectivity & Catchability	7.1-7.3.5 and 9.3	
5-Feb	Catchability	7.1-7.3.5 and 9.3	Post Paper 1, Basic Stats Lab*
7-Feb	Catchability & P. Analysis	1.4.1.2- 1.4.1.3	
9-Feb	Power Analysis	1.4.1.2- 1.4.1.3	Comment Paper 1^, Sel. & Catch. Lab^
12-Feb	<b>Papers &amp; Review</b>		Discuss Paper 1, Exam 1*
14-Feb	Size Structure	Chapter 9, esp. 9.1, 9.2, 9.5, 9.6	
16-Feb	Size Structure	Chapter 9, esp. 9.1, 9.2, 9.5, 9.6	
19-Feb	Body Condition	Chapter 10	
21-Feb	Body Condition	Chapter 10	
23-Feb	Age & Growth	Chapter 5	
26-Feb	Age & Growth	Chapter 5	Size & Body Condition Lab*
28-Feb	Fecundity & Maturity		
1-Mar	Fecundity & Maturity		
4-Mar	Abundance	Review 7.1-7.3.5	Post Paper 2, Maturity & Growth Lab*
6-Mar	Abundance	8.1-8.4, Pine et al. 2003	
8-Mar	Abundance	8.1-8.4, Pine et al. 2003	Comment Paper 2^, Abund. Lab^
11-Mar	<b>Papers &amp; Review</b>		Discuss Paper 2, Exam 2*
13-Mar	Abundance	8.1-8.4, Pine et al. 2003	
15-Mar	Abundance (Recording)	8.1-8.4, Pine et al. 2003	
18-22 Mar	<b>NO LECTURES OR LAB THIS WEEK - SPRING BREAK!!!</b>		
25-Mar	Exponential Growth		
27-Mar	Exponential Growth		
29-Mar	Logistic Growth		
1-Apr	Logistic Growth		Abundance 2 Lab*
3-Apr	Mortality	Chapter 6	
5-Apr	Mortality	Chapter 6	
8-Apr	Mortality	Chapter 6	Post Paper 3, Pop. Growth Lab*
10-Apr	Movement & Migrations	Chapter 14	
12-Apr	Movement & Migrations	Chapter 14	Comment Paper 3^, Mortality Lab^
15-Apr	<b>Papers &amp; Review</b>		Discuss Paper 3, Exam 3*
17-Apr	Recruitment	Chapter 4 and 13.2.3.3	
19-Apr	Recruitment	Chapter 4 and 13.2.3.3	
22-Apr	Surplus Production	8.5 and 13.2.3.1	
24-Apr	Surplus Production	8.5 and 13.2.3.1	
26-Apr	Yield Per Recruit	13.2.3.2	
29-Apr	Yield Per Recruit	13.2.3.2	Recruitment Lab
1-May	Dynamic Pool YPR	13.2.3.2	
3-May	Harvest Management		Post Paper 4
6-May	Harvest Management		Surplus Production Lab
8-May	Community Metrics	Chapter 15	Comment Paper 4, Surveys
10-May	<b>Papers &amp; Review</b>		Discuss Paper 4, YPR Lab
15-May	<b>Exam 4, Monday, 8:00-10:00</b>		Exam 4

- Original, 1.11.2024

## Lecture & Lab Schedule

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

Week	Monday	Wednesday	Friday	Tuesday-Lab
22-Jan	Intro, Sampling Designs	Math & Stats (Recording)	S. Designs, Math & Stats	Math & Stats, Software
29-Jan	Math & Stats	Selectivity	Selectivity & Catchability	Basic Stats & Models
5-Feb	Catchability	Catchability & P. Analysis	Power Analysis	Selectivity & Catchability
12-Feb	<i>Papers &amp; Review</i>	Size Structure	Size Structure	<b>Exam 1</b>
19-Feb	Body Condition	Body Condition	Age & Growth	Size & Condition
26-Feb	Age & Growth	Fecundity & Maturity	Fecundity & Maturity	Growth & Maturity
4-Mar	Abundance	Abundance	Abundance	Abundance 1
11-Mar	<i>Papers &amp; Review</i>	Abundance	Abundance (Recording)	<b>Exam 2</b>
18-Mar	----- <b>NO LECTURES OR LAB - SPRING BREAK!!!</b> -----			
25-Mar	Exponential Growth	Exponential Growth	Logistic Growth	Abundance 2
1-Apr	Logistic Growth	Mortality	Mortality	Population Growth
8-Apr	Mortality	Movement & Migrations	Movement & Migrations	Mortality
15-Apr	<i>Papers &amp; Review</i>	Recruitment	Recruitment	<b>Exam 3</b>
22-Apr	Surplus Production	Surplus Production	Yield Per Recruit	Recruitment
29-Apr	Yield Per Recruit	Dynamic Pool YPR	Harvest Management	Surplus Production
6-May	Harvest Management	Community Metrics	<i>Papers &amp; Review</i>	YPR, Dynamic Pool
15-May	----- <b>Exam 4, Wednesday, May 15, 12:30-2:30</b> -----			

- *Original, 1.11.2024*