

## Fish Population Dynamics

**Course:** Water 353/553, Spring 2020, 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, TNR 252

**Laboratory:** Tuesday, 2:00-3:50, TNR 322, Advanced Computer Lab (ACL)

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

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

**Office hours:** Wednesday, 9:00-11:00; by appointment (e-mail first); or if 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/280098>

**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.

**Lecture Attendance:** I will not take attendance for lectures, outside of paper discussion days. However, I have noticed that the quality of your educational experience and success in this course will be directly related to the amount of time you invest in preparation and your extent of classroom discussions and activities. I will post lecture notes onto Canvas after class, but not in-class activities.

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

**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).

**Exams:** Four 100-point in-class exams will each cover one-fourth of the lecture & lab material; the final exam is not comprehensive. 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. Each exam must be taken at the scheduled time or a score of zero will be assigned. Illness, family emergency, or scheduling issues 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:** To ensure each student is understanding and completing lab materials, attendance is required and worth 1 point per lab. Lab attendance is worth 10 points, with two potential bonus points for attending all labs. Please contact me prior to a lab period if there is an emergency or major conflict. Expect all labs to go to 3:50.

**Laboratory Assignments:** Laboratory assignments will occur throughout the semester and be *worth 145 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 15% for each day late (e.g., 1.5 points/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 from lecture exams and laboratory at the end of the semester. The table below shows point totals broken down by category and associated grades with +/- determinations. Participation and effort can be factored in for the student’s benefit in final course grade.

Category	Points	Grade	Points	Percentage
Lecture		A	558 - 600	93 - 100%
Exam 1	100	A-	540 - 557	90 - 92.9%
Exam 2	100	B+	522 - 539	87 - 89.9%
Exam 3	100	B	498 - 521	83 - 86.9%
Exam 4	100	B-	480 - 497	80 - 82.9%
Papers	40	C+	462 - 479	77 - 79.9%
		C	438 - 461	73 - 76.9%
Lab		C-	420 - 437	70 - 72.9%
Surveys	10	D+	402 - 419	67 - 69.9%
Assignments	140	D	360 - 401	60 - 66.9%
Attendance	10	F	≤ 359	≤ 59.9%
Total	600			

**Classroom Environment:** I want everyone to feel comfortable and willing to participate in this course 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. 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. Additional information:

<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](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](http://www.uwsp.edu/rmgt)

## 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 also update this schedule on Canvas.

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

## 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
20-Jan	Intro, Sampling Designs	Math & Stats	Math & Stats	Math & Stats, Software
27-Jan	Math & Stats	Selectivity	Catchability	Basic Stats
3-Feb	Catchability	<b>No Lecture - WI AFS</b>	Size Structure	Selectivity & Catchability
10-Feb	Body Condition	Body Condition	Power Analysis	Size & Condition
17-Feb	<i>Review</i>	Age & Growth	Age & Growth	<b>Exam 1</b>
24-Feb	Age & Growth	Fecundity & Maturity	Fecundity & Maturity	Growth & Maturity
2-Mar	Abundance	Abundance	Abundance	Abundance 1
9-Mar	<i>Review</i>	Abundance	<b>No lecture</b>	<b>Exam 2</b>
16-Mar	----- <b>NO LECTURES OR LAB - SPRING BREAK!!!</b> -----			
23-Mar	Abundance	Exponential Growth	Exponential Growth	Abundance 2
30-Mar	Logistic Growth	Logistic Growth	Mortality	Population Growth
6-Apr	Mortality	Mortality	Community Metrics	Mortality
13-Apr	<i>Review</i>	Recruitment	Recruitment	<b>Exam 3</b>
20-Apr	Movement & Migrations	Movement & Migrations	Surplus Production	Recruitment
27-Apr	Surplus Production	Yield Per Recruit	Yield Per Recruit	Surplus Production
4-May	Dynamic Pool YPR	Harvest Management	Harvest Management	YPR, Dynamic Pool
13-May	----- <b>Exam 4, Wednesday, May 13, 12:30-2:30</b> -----			

- *Original, 1.13.2020*