AGRONOMY 479
WEED SCIENCE
Spring 2023

I. General Information

AGRN 479G (Weed Science) is a 3 credit hour course that covers the identification, biology and distribution of weeds; weed interference of desirable plant growth; herbicide classification, use and environmental fate; appropriate application of chemical, cultural, biological and mechanical weed control methods.

Lecture: MW 8:00-8:50 a.m., Knoblauch 226
Laboratory: Tu 8:00-9:50 a.m., Knoblauch 226 or AFL – Livestock Center Classroom

Prerequisites: AGRN 373 – Integrated Pest Management

Instructor: Dr. Mark Bernards
Knoblauch Hall 321
Mobile: 309-313-5917
Email: ml-bernards@wiu.edu

Office Hours: M, Th 11:00-11:50 a.m.; T, Th 1:00-1:50 p.m. or by appointment.

Required Texts:

1. Bradley KW, Bish M. 2016. Practical Weed Science for the Field Scout. University of Missouri Extension, Columbia, MO. (*Available for $37.00 at https://extension2.missouri.edu/ipm1007*).
2. Loux MM et al. 2023. Weed Control Guide for Ohio, Indiana Illinois and Missouri. Ohio State University Extension Publication 789. Available for purchase ($29.50) at https://extensionpubs.osu.edu/2023-weed-control-guide-for-ohio-indiana-illinois-and-missouri/

Supplementary Resources:

1. Ross MA, Lembi CA. 2009. Applied Weed Science – Including the Ecology and Management of Invasive Plants. Pearson-Prentice Hill, Upper Saddle River, New Jersey.
2. Bryson CT, DeFelice MS. 2010. Weeds of the Midwestern United States and Central Canada. University of Georgia Press, Athens, Georgia.
3. Davis A. et al. 2005. Integrated Weed Management: “One Year’s Seeding . . .” Michigan State University Extension Bulletin E-2931.
4. Taylor E, Renner K, Sprague C. 2008. Integrated Weed Management: Fine Tuning the System. Michigan State University Extension Bulletin E-3605.
5. Stubbendieck JL, Coffin MJ Landholt LM. 2003. Weeds of the Great Plains. Nebraska Department of Agriculture, Lincoln, NE
6. Uva RH, Neal JC, DiTomaso JM. 1997. Weeds of the Northeast. Cornell University Press, Ithaca, NY.
7. http://wssa.net
8. http://www.weedscience.org
9. http://integratedweedmanagement.org

II. University Policies and Expectations

Student rights and responsibilities: A complete description is available at www.wiu.edu/provost/students.

Disruptive Student Policy: Students who interfere with normal class function or the ability of other students to learn may be asked to leave the class for the day. For repeated offenses, a student may be removed from the course. Details may be found at: http://www.wiu.edu/vpas/policies/disrupst.php

Academic Integrity: http://www.wiu.edu/policies/acintegrity.php Western Illinois University, like all communities, functions best when its members treat one another with honesty, fairness, respect, and trust. . . It is the student's responsibility to be informed and to abide by all University regulations and policies on Academic Integrity. Plagiarism, cheating, and other forms of academic dishonesty constitute a serious violation of University conduct regulations. Students who engage in dishonesty in any form shall be charged with academic dishonesty. . . Any student, faculty member, or staff person who has witnessed an apparent act of student academic dishonesty, or has information that reasonably leads to the conclusion that such an act has occurred or has been attempted, has an ethical responsibility for reporting said act(s).

The policy for AGRN 479: Any confirmed act of academic dishonesty (especially plagiarism, cheating, copying another student's assignment or allowing another student to copy your work) will result in the loss of all points associated with that assignment, and may result in an "F" for the course. Acts of academic dishonesty are reported to the WIU Registrar and become part of a student's academic record.

Equal Opportunity: http://www.wiu.edu/policies/affirmact.php Western Illinois University complies fully with all applicable federal and state nondiscrimination laws, orders, and regulations. The University is committed to providing equal opportunity and an educational and work environment for its students, faculty, and staff that is free from discrimination based on sex, race, color, sexual orientation, gender identity and gender expression, religion, age, marital status, national origin, disability, or veteran status.

Sex-Discrimination and Misconduct: University values, Title IX, and other federal and state laws prohibit sex discrimination, including sexual assault/misconduct, dating/domestic violence, and stalking. If you, or someone you know, has been the victim of any of these offenses, we encourage you to report this to the Title IX Coordinator at 309-298-1977 or anonymously online at: http://www.wiu.edu/equal_opportunity_and_access/request_form/index.php. If you disclose an incident to a faculty member, the faculty member must notify the Title IX Coordinator. The complete Title IX policy is available at: http://www.wiu.edu/vpas/policies/titleIX.php

Disabilities: Students with disabilities: In accordance with University values and disability law, students with disabilities may request academic accommodations where there are aspects of a course that result in barriers to inclusion or accurate assessment of achievement. To file an official request for disability-related accommodations, please contact the Disability Resource Center at 309-298-2512, disability@wiu.edu or in 143 Memorial Hall. Please notify the instructor as soon as possible to ensure that this course is accessible to you in a timely manner.

Education Majors: The changes within the Illinois State Teaching License requirements, students are required to receive a grade of a "C-" or better in this course in order to meet state requirements.

III. Course Expectations and Policies

1. Live the Golden Rule. Treat others with respect and courtesy in your conversation and actions. Turn off and put away electronic devices (smart watches, phones, tablet computers, laptop computers, etc.) during the class period unless directed to use them for class activities. Inappropriate use of an electronic device will result in loss of participation points for that day.
2. Show up. Attendance and punctuality is expected. Notify the instructor in advance if you have any reason to miss a class period through the O.A.R.S system (http://wiu.edu/oars). A minimum of 24 h notice (email or phone) is required if there is any cause to miss a quiz or exam. If you do miss a class, do not ask the instructor "Did I miss anything important?" It is your responsibility to make arrangements to get the information you missed and to make up any missed assignments.
3. Participate. Be prepared for class discussions by completing readings, answering questions, taking notes, asking questions, and working effectively with other students on lecture and laboratory activities.
4. Study. You should plan to spend a minimum of 5 hours outside of class each week to master the material. Reading assignments relating to each lecture/lab will be particularly beneficial.

5. Complete assignments. Assignments not turned in on the assigned date may have 10% of the total potential points deducted for each day after the due date. The instructor will generally return exams and assignments within 1 week.
6. The use of tobacco is prohibited in Knoblauch Hall, nor is it allowed during sessions at the AFL.
7. Students must wear sturdy, close-toed to participate in lab sessions at the AFL. The wearing of long pants is required in the greenhouse.

Two dismissals due to disruptive or unprofessional behavior will result in a permanent disbarment from the course and a final grade of "F" will be assigned.

IV. Course Objectives

Foundational Knowledge

1. Identify approximately 75 weed species, describe their basic biology and list their Latin binomial name
2. Explain what factors contribute to the "weediness" and invasive potential of a species
3. Explain how and when weeds interfere with the growth of desirable species
4. Describe factors that affect herbicide activity, movement, and fate in soil
5. Describe how herbicides enter and move within a plant
6. Define selectivity as it relates to herbicides
7. Describe how 11 herbicide mechanisms of action affect plant growth and development
8. Explain how plants may evolve resistance to herbicides and common mechanisms of resistance

Application

9. Identify appropriate non-herbicide techniques for managing weeds based on the biology of the weed species
10. Select herbicides appropriate for weed management in a specific cropping system, and calculate proper rates to apply those herbicides
11. Diagnose herbicide injury and symptomology for eleven herbicide mechanisms of action

Integration

12. Use data (charts/figures/tables) from publications to understand weed interference and management
13. Create a weed management plan for a specific management area

Human Dimension

14. Explain how to manage to prevent and to mitigate herbicide resistance

Caring

15. Appreciate the diversity of plants
16. Be committed to a life of judicious pesticide use

Learning to Learn

17. Plan, implement, analyze and report an experiment related to weed biology or management

V. Grading

Grading Scale

Percentage	Grade	Percentage	Grade
93.0-100	A	73.0-76.9	C
90.0-92.9	A-	70.0-72.9	C-
87.0-89.9	B+	67.0-69.9	D+
83.0-86.9	B	63.0-66.9	D
80.0-82.9	B-	60.0-62.9	D-
77.0-79.9	C+	<59.9	F

Probable Grade components	Portion
Attendance	7%
Self-Assessment	15%
Assignments	33%
Quizzes/Exams	45%

VI. Learning Assessment

Attendance: Attending class is expected and will improve your ability to learn the material and to contribute to the classroom community. Each student will be allowed 2 "vacation" days (for funerals, interviews, oversleeping, etc). More than 2 "vacation" absences will result in the loss of attendance percentage points (1.4% of your final grade per absence up to 7%). Absence for WIU-sanctioned activities (i.e., team travel, presenting at conferences, etc.) will not count against "vacation" days. Absence due to illness will be evaluated on a case-by-case basis and will not count against the vacation days. Students who accumulate 9 or more "vacation days" will NOT receive a passing grade.

Self-Assessment: Students will be asked to assess their performance in the class for the following criteria: 1) contribution to a healthy classroom community; 2) improvement in knowledge/skills/ability to address course objectives; 3) disciplined effort to fulfill class requirements (readings, assignments, etc.). Assessments will be administered at the beginning, mid-term and conclusion of the semester.

Assignments: Various assignments will be given throughout the semester to help you achieve the course objectives. Major assignments will include:

1. Scientific article reviews (50 points each). You will be asked to write three reviews during the semester. You will be required to identify peer review articles from one of the following journals (Weed Science, Weed Research, Weed Technology, Weed Biology and Management, Invasive Plant Science and Management, or Pest Management Science) that relate to your research project. A rubric for this assignment is posted at Western Online.
    a. #1. Due Feb 1
    b. #2. Due Feb 15
    c. #3. Due Mar 1
2. Group Research Project and Presentation (320 pts). There will be 2 students per group. *Rubrics available at Western Online.*
    a. Formulate a hypothesis and research question related to weed science and prepare a research proposal that includes rationale, a list of related references, and detailed instructions for project implementation and measurements (80 pts, due Feb 4)
    b. Work as a cohesive research team to implement and maintain treatments and take measurements for an experiment conducted in the WIU School of Agriculture Greenhouses (60 pts).
    c. Submit a title and abstract and prepare a research poster and assist in its presentation at the Undergraduate Research Day in April (80 pts).
    d. Contribution to the research team, based on instructor observations and team member assessment (100 pts).
3. Extension Weed Management Resources
4. Herbicide Calculations
5. Weed Management Plan and Herbicide Recommendations

Quizzes/Exams:

1. Lab quizzes/exams: A quiz will be given many laboratory periods that will review material covered in previous lab sessions. In addition, there will be a Weed ID exam in which you will be asked to identify species by common name, Latin binomial and/or life cycle.
2. Lecture quizzes: Quizzes will be given approximately every three weeks and will review material covered in the lectures. The quizzes will include multiple choice, true-false, fill in the blank, and short essay questions.
3. Final exam: The final will assess your ability to answer the course objectives #2-11, 13.
4.

VII. Probable Course Calendar

Date	Topic	Reading/Assignment Due
Jan 17	Introductions. Syllabus Review. Self-assessment 1. Reading Scientific Articles. Current issues in weed science. Assign Research Groups. *Plant weeds in greenhouse.*	Ball (2014) *Assignment: Review table of contents for peer review weed science publications*
Jan 18	What characteristics make a plant "weedy?"	AWS 1-8, 21-25.
Jan 23	How do weeds interfere with desirable plant growth?	AWS 13-21. **Review of Weed Science Topics Due.**
Jan 24	**Using library resources to find peer review articles. Research project idea approval.**	**Research project question formulated and approved by instructor.**
Jan 25	Do plants know who their neighbors are and respond?	AWS 350-353.
Jan 30	Life as a seed in the soil seed bank	AWS 26-32, posted material.
Jan 31	**Research proposal meetings with professor (scheduled with each research team).**	**Research Proposal Due.**
Feb 1	Principles of Weed Ecology to help weed managers	AWS 35-44. **Article Review 1 due.**
Feb 6	***Lec Quiz 1*.**	
Feb 7	**Implement Research Projects.**	
Feb 8	*Review Lec Quiz 1.* What are the negative ecological impacts of invasive species?	AWS 7-10, 44-51,
Feb 13	*No Class. Lincoln's Birthday celebrated.*	
Feb 14	Plant Biology Terminology Pictionary. **Implement Research Projects 2 (if needed).** *Plant weeds for herbicide symptomology screen*	AWS 74-90. **Plant Biology puzzle assignment due**
Feb 15	How do invasive weeds invade?	AWS 7-10, 53-72. **Article Review 2 due.**
Feb 20	Integrated Weed Management / Preventative Weed Management	Loux 1-22, AWS 105-110, Ch 3 & 10 from E-2931, Ch. 3 & 6 from E-3065
Feb 21	Soils and Weed Management Jeopardy (AFL). *Weed seed collections (20-25 species).* Weed ID in greenhouse. *Plant weeds in greenhouse.*	AWS 91-97. **Soils puzzle assignment due**
Feb 22	Mechanical and Physical management tactics	AWS 110-118, Ch 4 & 7 from E-2931, Ch 4 from E-3065
Feb 27	***Lec Quiz 2.***	
Feb 28	Tentative Guest Lecture: Weed Management in Organic Systems (AFL) by Gary McDonald. Weed ID in greenhouse. Plant crops for herbicide symptomology.	PWSFS 92-126
Mar 1	*Review Lec Quiz 2.* Cultural management tactics	AWS 118-122, Ch. 3, 5 & 6 from E-2931, Ch 1 & 2 from E-3065. **Article Review 3 due.**
Mar 6	Biological management tactics. *Self-assessment 2.*	AWS 122-128, Ch. 9 from E-2931, Ch 5 from E-3065
Mar 7	***Weed ID Quiz 1***. Herbicide calculations.	PWSFS 92-126
Mar 8	Chemical Management	AWS 128-141, Ch 8 from E-2931.
Mar 13-17	**No Class. Spring Break.** *Spray slow and medium acting herbicides for symptomology screen.*	
Mar 20	Herbicide Mode of Action Scheme, Synthetic auxins and aromatic amino acid inhibitors. *Spray rapidly acting herbicides for symptomology screen.*	AWS 170-173, 226-239
Mar 21	Weed Management Recommendations using Extension resources. Herbicide Symptomology 1.	**Herbicide Calculations due.** PWSFS 92-126

Date	Topic	Reading/Assignment Due
Mar 22	Branched-chain amino acids, Carotenoid pigment inhibitors, Grass-specific lipid synthesis inhibitors, Photosystem II-inhibitors,	AWS 172-178, 239-270.
Mar 27	Photosystem I-, PPO-, Glutamine synthesis-inhibitors, Very-long chain fatty acid synthesis inhibitors, microtubule inhibitors	AWS 178-181, 271-291
Mar 28	***Weed & Herbicide ID Quiz.*** Weed ID. Herbicide Symptomology 2.	**Extension Weed Management Resources due.**
Mar 29	Herbicide Fate in the environment 1.	AWS 142-151, 192-207
Apr 3	Herbicide Fate in the environment 2	AWS 142-151, 192-207
Apr 4	**No Lab. Data analysis meetings with all authors (by appointment).**	**Research data summarized and organized**
Apr 5	Plant metabolism of herbicides & plant-related selectivity 1	AWS 160-169, 179-191. ***Take home herbicide mode of action quiz due.***
Apr 10	Plant metabolism of herbicides & plant-related selectivity 2	AWS 160-169, 179-191
Apr 11	**No Lab. Poster Review with all authors (by appointment).**	**Final poster drafts due for printing**
Apr 12	**Lec Quiz 3** (covering Cultural, Biological, & Chemical Management, Herbicide Fate, and Plant metabolism of herbicides lectures)	
Apr 17	*Review Lec Quiz 3.* Herbicide Resistance 1	AWS 209-225.
Apr 18	***Weed ID Quiz***. Weed ID.	
Apr 19	**Undergraduate Research Day. Student practice presenting posters during class time.**	
Apr 24	Herbicide Resistance 2	AWS 209-225, suppl.
Apr 25	***Weed ID Quiz 4.*** Weed ID	
Apr 26	Herbicide Resistance 3	AWS 209-225, suppl.
May 1	Weed Management Case Studies	
May 2	*Weed and Herbicide ID Exam*	
May 3	Weed Management Case Studies, *Self-Assessment 3*	**Weed Management Recommendations and calculations due**
May 8	**FINAL EXAM, 8:00-9:50 a.m., KH226**	