

**AGRONOMY 479  
WEED SCIENCE  
Spring 2020**

**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 10:00-10:50 a.m., Knoblauch 226  
Laboratory: T 8:00-9:50 a.m., Knoblauch 226 or AFL – Livestock Center Classroom

Prerequisites: AGRN 373 – Integrated Pest Management

Instructor: Dr. Mark Bernards  
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Office Hours: M 12:00-12:50 p.m.; T 11:00-11:50 a.m., W 2:00-2:50 a.m., Th 9:00-9:50 a.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 \$18.00 at <https://extension2.missouri.edu/ipm1007>).
2. Loux MM et al. 2020. Weed Control Guide for Ohio, Indiana and Illinois. Ohio State University Extension Publication 789. Available for purchase (\$18.50) at <http://estore.osu-extension.org/2018-Ohio-Indiana-and-Illinois-Weed-Control-Guide-P497.aspx>.

**Supplementary Resources:**

1. Ross MA, Lembi CA. 2009. Applied Weed Science – Including the Ecology and Management of Invasive Plants. Pearson-Prentice Hall, 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](http://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.*

**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](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](mailto: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 the 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. Create a weed management plan for a specific management area

##### Human Dimension

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

##### Caring

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

##### Learning to Learn

16. 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

<u>Probable Grade components</u>	<u>Portion</u>
Attendance	8%
Preparedness	3%
Assignments	39%
Quizzes/Exams	50%

## 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 (2 points per absence). 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.

**Preparedness:** A composite of preparedness for class and engagement in class and laboratory discussions and activities. Engagement means that you contribute to class discussions and activities. Preparedness may be assessed through Western Online quizzes or pop quizzes or writing assignments at the beginning of a class period.

**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 Jan 27
  - b. #2. Due Feb 10
  - c. #3. Due Feb 25
2. Group (2 students per group) Research Project and Presentation (320 pts). *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 Jan 30)
  - 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 17 (expected) (80 pts).
  - d. Contribution to the research team, based on instructor observations and team member assessment (100 pts).
3. Extension Weed Science Resources
4. Herbicide math
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 laboratory 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 #2-9, 13.

### VII. Probable Course Calendar

Date	Topic	Reading/Assignment
Jan 13	Introductions. Syllabus. Current issues in weed science – potential research topics	Review table of contents for peer review weed science publications
<b>Jan 14</b>	Reading Scientific Articles. Assign Research Groups. (Livestock Center). <i>Plant weeds for weed ID labs.</i>	Assigned article
Jan 15	What characteristics make a plant “weedy?”	AWS 1-8, 21-25
<b>Jan 20</b>	<b><i>Martin Luther King, Jr. holiday. No class</i></b>	
<b>Jan 21</b>	<b>Using library resources to find peer review articles. Research project idea approval. (Malpass Library)</b>	<b>Research project question formulated and approved by instructor.</b>
Jan 22	How do weeds interfere with desirable plant growth?	AWS 13-21.
Jan 27	Do plants know who their neighbors are and respond?	AWS 350-353. <b>Article Review 1 due.</b>
<b>Jan 28</b>	<b>Research proposal meetings with professor (scheduled with each research team).</b>	<b>Research Proposal Due.</b>
Jan 29	Life as a seed in the soil seed bank	AWS 26-32, posted material.
Feb 3	<i>Lec Quiz 1.</i> Principles of Weed Ecology to help weed managers	AWS 35-44
<b>Feb 4</b>	<b>Implement Research Projects (AFL).</b>	
Feb 5	<i>Review Lec Quiz 1.</i> What are the negative ecological impacts of invasive species?	AWS 7-10, 44-51
Feb 10	How do invasive weeds invade?	AWS 53-72; <b>Article Review 2 due.</b>
<b>Feb 11</b>	<b>Plant Biology Terminology Pictionary. Implement Research Projects 2 (AFL).</b>	<b>AWS 74-90. Plant Biology puzzle assignment due</b>
Feb 12	<b><i>Lincoln’s Birthday. No Class.</i></b>	
Feb 17	Integrated Weed Management	AWS 105-107, Suppl. (Ch. 6 from E-3065).
<b>Feb 18</b>	<b>Soils and Weed Management Jeopardy (AFL). <i>Weed seed collections. Weed ID.</i></b>	<b>AWS 91-97. Soils puzzle assignment due</b>
Feb 19	<i>Lec Quiz 2.</i> Biological management tactics	AWS 122-128, Suppl. (Ch. 9 from E-2931, Ch 5 from E-3065).
Feb 24	<i>Review Lec Quiz 2.</i> Cultural management tactics	AWS 118-122, Suppl. (Ch. 3 & 5-6 from E-2931, Ch 1-2 from E-3065)
<b>Feb 25</b>	<b>Guest Lecture: Weed Management in Organic Systems (AFL) by Gary McDonald. <i>Weed ID.</i></b>	<b>Article Review 3 due.</b>
Feb 26	Mechanical and Physical management tactics	AWS 110-118, Suppl. (Ch 4 & 7 from E-2931, Ch 4 from E-3065).
Mar 2	Online: Mechanical & Physical, cont.; Preventative management tactics	AWS 106-110, Suppl. (Ch 3 & 10 from E-2931, Ch 3 from E-3065)
<b>Mar 3</b>	<b><i>Online: Weed ID Quiz. (AFL). Weed ID. Plant trays for herbicide mechanism of action screen.</i></b>	

Mar 4	Online: Chemical Management	AWS 128-137, Suppl. (Ch 8 from E-2931).
<b>M 9-13</b>	<b>Spring Break.</b>	
Mar 16	Herbicide Chemistry & Herbicide History	AWS 137-141
<b>Mar 17</b>	<b>Weed ID Quiz. Weed ID and herbicide calculations (AFL)</b>	
Mar 18	<i>Lec Quiz 3.</i> Herbicide Fate in the environment 1	AWS 142-151
Mar 23	<i>Review Lec Quiz 3.</i> Herbicide Fate in the environment 2	AWS 181-189
<b>Mar 24</b>	<b>Weed ID Quiz. Weed Management Recommendations using Extension resources</b>	
Mar 25	Herbicide Fate in the environment 3	AWS 192-207
Mar 30	Plant metabolism of herbicides & plant-related selectivity	
<b>Mar 31</b>	<b>No Lab. Data analysis meetings with all authors (by appointment).</b>	<b>Research data summarized and organized</b>
Apr 1	<i>Lec Quiz 4.</i> Herbicide mode of action schemes	AWS 160-169, PWS pp. 8-18
Apr 6	<i>Review Lec Quiz 4.</i> Synthetic auxins and aromatic amino acid inhibitors	AWS 170-173, 226-239
<b>Apr 7</b>	<b>No Lab. Poster Review with all authors (by appointment).</b>	<b>Nearly finished poster</b>
Apr 8	Branched-chain amino acids, Carotenoid pigment inhibitors, Grass-specific lipid synthesis inhibitors, Photosystem II-inhibitors,	AWS 172-178, 239-270. <b>Final poster drafts due for printing.</b>
Apr 13	Photosystem I-, PPO-, Glutamine synthesis-inhibitors, Very-long chain fatty acid synthesis inhibitors, microtubule inhibitors	AWS 178-181, 271-291
<b>Apr 14</b>	Weed ID (AFL) <i>Apply herbicides for herbicide ID screen.</i>	<b>Weed Management Recommendations and calculations due.</b>
Apr 15	<b>Undergraduate Research Day. Student practice presenting posters during class time.</b>	
Apr 20	Herbicide resistance 1	AWS 209-218. <i>Take home herbicide mode of action quiz due.</i>
<b>Apr 21</b>	<b>Weed ID Quiz.</b> Herbicide ID, Weed ID, Troubleshooting (LC)	
Apr 22	Herbicide Resistance 2	AWS 218-225, suppl.
Apr 27	Weed Management Case Studies	
<b>Apr 28</b>	<b>Weed ID and Herbicide ID Exam</b>	
Apr 29	Weed Management Case Studies	
May 4	<b>FINAL EXAM, 10:00-11:50 a.m., KH226</b>	