

## **WEED ECOLOGY & MANAGEMENT**

PSE 403, 3 Credits

Fall 2005                      Monday, Wednesday & Friday, 11:00 – 11:50

Instructor: Eric Gallandt

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### **I. COURSE GOALS**

Weed Ecology & Management aims to familiarize students with fundamental aspects of weed biology that affect population and community dynamics and guide management principles. This class also aims to provide students depth and breadth of theory and applied examples of technical approaches to weed management, thereby establishing many possible tools to draw upon in efforts to manage weeds. Theory and examples will be drawn primarily from agronomic and horticultural cropping systems. By the end of the course students should be able to synthesize information regarding weed biology and technical control tactics into integrated weed management systems. They should be able to justify the system's components and describe its implementation, and evaluate the performance of the system based on congruence with the goals of integrated weed management, cropping system function, farming system sustainability, and environmental stewardship.

### **II. REQUIRED TEXT**

None.

Recommended: Liebman, M., C.L. Mohler and C.P. Staver (2001) Ecological Management of Agricultural Weeds. Cambridge University Press. 532 pgs.

### **III. REQUIRED READINGS**

A collection of readings have been selected and are available 108 Deering.

### **IV. COURSE POLICIES**

Readings: You are expected to complete assigned readings prior to the indicated class period. You should come to class prepared to discuss in detail the salient points of the readings.

Attendance/Participation: Attendance and participation in discussion related to reading and lecture materials is expected. You will be asked to summarize key points from readings and you should be prepared to discuss the experimental evidence supporting your arguments.

Absence During a Scheduled Exam: Unless prior approval is obtained, or extreme circumstances arise, makeup exams will not be scheduled.

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If you have a disability for which you may be requesting an accommodation, please contact either your instructor or Ann Smith, Coordinator of Services for Students with Disabilities (Onward Building, 581- 2319), as early as possible in the term.

## V. SYLLABUS

(subject to minor revision)

Date 2005	Lecture	Reading
9/7	<b>1. INTRODUCTION</b> Overview & Policies	
9/9	1.1 Global, Regional, Local Impact of Weeds	1.1 Bridges (1994) Impact of weeds on human endeavors
9/12	1.2 Need for Ecologically-Based Weed Mgt.	1.2 Liebman (2001) Weed management: a need for ecological approaches
9/14	1.3 Weed Life Cycles & Identification	1.3 Radosevich et al. (1997) Chapter 1 Weeds and weed science (pgs. 3-33)
9/16	<b>2. WEED BIOLOGY &amp; ECOLOGY</b> 2.1 Introduction to Plant Population Biology	2.1 Silvertown & Doust (1993) Chapter 1. Introduction
9/19	2.2 Invasive Species	2.2 Sakai et al (2001) The population biology of invasive species
9/21	2.3 Origins & Invasions	2.3 Cousens & Mortimer (1995) The dynamics of geographic range expansion
9/23	2.4 Dispersal & Local Spatial Dynamics	2.4 Cousens & Mortimer (1995) Dispersal within and between populations
9/26	2.5 Characteristics	2.5 Patterson (1985) Comparative ecophysiology of weeds and crops
9/28	2.6 Dormancy	2.6 Harper (1977) Chapter 3. Dormancy.
9/30	2.7 The Seed Bank	2.7 Harper (1977) Chapter 4. The Seedbank.
10/3	2.8 Germination & Establishment—Safe sites	2.8 Naylor (1985) Establishment and peri-establishment mortality
10/5	2.9 Perennial Weeds	2.9 Aldrich & Kremer (1997) Chapter 5. Reproduction from vegetative parts
10/7	2.10 Weed/Crop Interference	--
10/10	<b>fall break—no class</b>	--
10/12	2.11 Designing a competitive weed community	--
10/14	EXAM 1	--
10/17	<b>3. WEED MANAGEMENT</b> 3.1 A Historical Overview of Weed Management	3.1.1 Timmons (1970) A history of weed control in the United States and Canada 3.1.2 Lockhart et al (1990) The evolution of weed control in British agriculture
10/19	3.2 Introduction to Ecologically-Based Weed Management	3.2 Mohler (1996) Ecological bases for the cultural control of annual weeds
10/21	3.3 Physical Disturbance— Tillage & Cultivation	3.3 Mohler (2001) Mechanical management of weeds
10/24	3.4 "Vegetable Farmers and Their Weed Control Machines"	--
10/26	3.5 Residue Management/Allelopathy, Mulching	3.5 Teasdale (1996) Contribution of cover crops to weed management in sustainable agricultural systems
10/28	3.6 Biocontrol—Classical biocontrol relying on introduced insects or pathogens	3.6 Aldrich & Kremer (1997) Chapter 9. Biotic agents in weed management
10/31	3.7 Biocontrol—Seed predation	3.7 Crawley (1992) Seed predators and plant population dynamics
11/2	3.8 Biocontrol —Livestock Grazing	3.8 Staver (2001) Livestock grazing for weed management
11/4	3.9 Managing Competition	3.9 Mohler (2001) Enhancing the competitive ability of crops
11/7	3.10 Managing Competition—Intercropping	3.10 Liebman & Dyck (1993) Crop rotation and intercropping strategies for weed management
11/9	3.11 Managing Competition—Fertilization strategies	3.11 DiTomaso (1995) Approaches for improving crop competitiveness through the manipulation of fertilization strategies
11/11	EXAM 2	
11/14	<b>4. WEED MANAGEMENT—Herbicides</b> 4.1 Herbicides— Discovery, Application	4.1 Radosevich et al. (1997) Chapter 9. Herbicide use and application
11/16	4.2 Sprayer calibration	4.2.1 Anderson (1996) Chapter 11. Sprayer calibration and herbicide calculations 4.2.2 Zimdahl (1999) Chapter 15. Herbicide application
11/18	4.3 Herbicides— Entry, Transport, Plant Processes Affected	4.3 Radosevich et al. (1997) Chapter 10. Action and fate of herbicides
11/21	4.4 Herbicides—Mechanism of Action	--
11/23	<b>Thanksgiving break—no class</b>	--
11/25	<b>Thanksgiving break—no class</b>	--
11/28	4.5 Herbicides— Selectivity & Resistance; Engineering Resistance	--

11/30	4.6 Herbicides—Environmental Fate & Toxicological Risks	Zimdahl (1999) Chapter 17. Herbicides and the environment
12/2	Termination of Competitive Community Experiment	--
12/5	<b>5. INTEGRATED WEED MANAGEMENT</b>	
	5.1 Ecologically-Based Weed Management	5.1 Liebman and Gallandt (1997) Many little hammers
12/7	5.2 Crop Diversification	5.2 Liebman and Staver (2001) Crop diversification for weed management
12/9	5.3 Decision Aides — Ecological and Social Considerations	Norris (1999) Ecological implications of using thresholds for weed management Owen (1998) Producer attitudes and weed management
12/12	5.4 Weeds—Response to Management	
12/14	5.5 Towards a Higher Level of IWM	Cardina et al (1999) Development of weed IPM: levels of integration for weed management
12/16	Current Research	--
	Final Exam**	--

## Grades

Exams may include short answer questions and calculations drawing upon material from lecture, lab, and the class text. Emphasis, however, will be placed on essay questions and problem solving that will require synthesis of materials from lecture, lab, and assigned reading. Sets of essay questions will be distributed approximately one week before each exam date; subsets of questions will appear on the exams. Some exam questions may be distributed for completion outside of class.

First Drafts of Weed Biographies are Due October 7 although earlier submissions are encouraged. Following the return of an edited draft you will have two weeks to revise and resubmit papers for re-grading.

	Points
Exam 1	100
Exam 2	100
Final Exam	100
Weed Biography	150
Competitive Weed Community Contest—written and oral reports of rationale and results	100
Participation/in class discussion	50
<b>TOTAL:</b>	<b>600</b>

## Final Grades

Final grades will be based on the points earned as a percent of total points possible.

Grade	(%)	(%)	(%)	(%)			
A	95-100	B+	87-89	C+	77-79	D+	66-69
A-	90-95	B	83-86	C	73-76	D	60-65
		B-	80-82	C-	70-72		

## **Nationwide Weed Biography Collaboration**

**Weed Science Society of America and XID Services, Inc.**

### **INTRODUCTION**

XID Services, Inc. has created a number of computer-based random access weed identification keys that allow the user to input any available plant characteristic to help identify a weed specimen. The Weed Science Society of America (WSSA) has entered into an agreement with XID Services to produce a key of over 1400 weed species that are commonly found across North America. As part of this effort, WSSA and XID Services would like to include as much information on these weeds as possible. Since gathering this amount of information is well beyond the task of any one person, we will attempt to involve students in the weed science courses being taught at universities across the United States and Canada to accomplish this task. We encourage as many weed science classes as possible to participate in the Weed Biography exercise. Each participating student will select a weed of their choice on a “first come – first serve” basis and prepare a written paper as described below. Any non-copyrighted electronic images of the species are also welcome, but not required.

### ***Weed Biography Format***

Download the available Example Report to see the required format. The Weed Biographies should be written in the student’s own words, and be thorough but concise. Up to 5 pages, double spaced (12 pt. font, 1" margins) is appropriate, although longer (well written) papers will also be accepted.

### ***How to Sign Up?***

All the weed species available for the Weed Biography exercise are posted at the following website:

<http://weedecology.net/xid/>. Use the following

username: xid

password: weedreport

You can then browse the list of species. You may choose only species that are listed under “status” as “Open.” Students will be able to pick their weed species on a first come – first serve basis directly on the website. Only one student per species will be allowed. To select a species click on the arrow keys which are located at the far left of each species record. Fill in the requested information, noting that the report is “In Progress.”

### ***Student and Instructor Responsibilities***

Students and instructors are to work together to produce well-written Weed Biographies with high quality and accurate information. Sub-standard Weed Biographies will not be included in the XID database. The Weed Biography Subcommittee chairman (Rob Gallagher) will oversee the final editorial process, but it is fully expected that the individual instructors ensure that only high quality materials are being submitted for review. Any questions regarding this activity should be directed to Rob Gallagher at [gallagh@wsu.edu](mailto:gallagh@wsu.edu) or 509-335-2858.

### ***What’s in it for the Student and Instructor?***

The student and their respective instructor(s) will receive authorship for each Weed Biography that is included in the XID database. The WSSA and XID Services have agreed that any instructor submitting Weed Biographies for at least 10 different species would receive a 50% discount on the XID database of their choice. Any instructor submitting Weed Biographies for 20 or more different species will receive a 100% discount on the XID database of their choice.