

ESP 375

Environmental Risk Assessment and Management

Instructor:

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OFFICE HOURS: Tuesdays: 10:00-12:00, Wednesdays: 10:00-12:00, or by appointment.

Meetings:

Wednesdays, 4:10–6:40, 235 John Mitchell Center

Course Materials:

- Rodricks, Joseph V., *Calculated Risks: Understanding the Toxicity and Human Health Risks of Chemicals in Our Environment* (New York: Cambridge University Press, 1992).
- U.S. Environmental Protection Agency, *Risk Assessment Guidance for Superfund (RAGS) Part A* (Available on-line at: <http://www.epa.gov/oswer/riskassessment/ragsa/index.htm>)
- U.S. Environmental Protection Agency, *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments - Interim Final* (Available on-line at: <http://www.epa.gov/oswer/riskassessment/ecorisk/ecorisk.htm>).
- Course overheads and selected readings are available through Blackboard.
- Assigned readings are available through Blackboard and electronic reserve: <http://docutek.ursus.maine.edu> (Password is **WAGESP375**)

Course Objectives:

1. Understand basic principles of toxicology
2. Understand the recognized federal framework for assessing risk of exposure to pollutants and contaminants for human health and ecological receptors
3. Obtain experience in preparing quantitative human health and qualitative ecological risk assessments
4. Understand the scientific, political, social, ethical, and economic dimensions of risk management

Introduction:

Risk assessment is the estimation of the probability of an agent to cause harm. Human health risk assessment focuses on humans whereas ecological risk assessment focuses on non-human ecological receptors. Whereas risk assessment is a scientific-based process, which is used in risk management, risk management is socio-political process. That is, based on the probability of harm, what should we do about the risk? In other words, how safe is safe enough based on who, what, where, and cost?

This course is an introduction to the field of environmental risk assessment and management, based on a widely recognized federal framework and various methodologies for evaluating risks from environmental contaminants and the decisionmaking process for managing such risks. The focus of this course is to provide students with an understanding of human health risk assessment as an organized, multidisciplinary approach to evaluating scientific data by studying basic toxicology and fate and transport of contaminants using generally accepted principles and terminology used in the field. We will also examine the limitations of current risk assessment methods. Students will also be introduced to the basics of ecological risk assessment. Finally, students will study the scientific, political, social, ethical, and economic dimensions of managing risks.

Topical Themes:

1. Course Introduction
2. Basic Toxicology
3. Human Health Risk Assessment
4. Ecological Risk Assessment
5. Risk Management

Scheduled Syllabus Outline:

Week	Date	Topic	Readings and Activities (in bold) Due
1	Sep. 7	<ul style="list-style-type: none"> • Course Introduction • Risk Assessment Primer • Regulatory Issues in Risk Assessment 	<ul style="list-style-type: none"> - Rodricks, 180-186 - Survey of Health Risk Assessment (Part I) - Risk, Science, and Democracy
2	Sep. 14	<ul style="list-style-type: none"> • Basics of Risk Assessment • Basics of Toxicology 	<ul style="list-style-type: none"> - Risk Assessment in the Federal Government - Rodricks, 1-37, 44-48, 65-144
3	Sep. 21	<ul style="list-style-type: none"> • QUIZ #1 • Data Collection – Field Trip 	<ul style="list-style-type: none"> - Glossary of Terms <p>Quiz</p>
4	Sep. 28	<ul style="list-style-type: none"> • Site Characterization/Hazard Identification • Toxicity Assessment 	<ul style="list-style-type: none"> - RAGS, Chapter 4 - Rodricks, 158-179
5	Oct. 5	Exposure Assessment	<ul style="list-style-type: none"> - Survey of Health Risk Assessment (Part II) - RAGS, Chapter 6
6	Oct. 12	Risk Characterization	<ul style="list-style-type: none"> - RAGS, Chapter 8 - Human Health Risk Assessment (CS) <p>Case Study Abstract I</p>
7	Oct. 19	Risk Perception-Video Love Canal	<ul style="list-style-type: none"> - Informing and Educating the Public About Risk <p>Problem Set</p>

Week	Date	Topic	Readings and Activities (in bold) Due
8	Oct. 26	Risk Perception Risk Communication	- Hamburger Hell - Assessing the Risk of an LNG Terminal (CS) Case Study Abstract 2
9	Nov. 2	QUIZ #2	Case Study of a highly dioxin contaminated sports field (CS) Quiz Case Study Abstract 3
10	Nov. 9	Ecological Risk Assessment	Ecological Risk Assessment Guidance for Superfund Human Health Risk Assessment Worksheet
11	Nov. 16	Ecological Risk Assessment	- A Review of Ecological Assessment Case Studies from a Risk Assessment Perspective (CS) Case Study Abstract 4
Nov. 23 – No Class – Thanksgiving Break			
12	Nov. 30	Risk Management	- Risk Analysis: Understanding “How Safe is Safe Enough?” - Use of Precautionary Assumptions
13	Dec. 7	Risk Management	- ASARCO (CS) Case Study Abstract 5 - Land Use and Remedy Selection (CS) Case Study Abstract 6
14	Dec. 14	Risk Management Debate Improving Risk Assessment and Course Conclusion	- Ecological Risk Assessment Worksheet (Due) - Debate Preparation
	TBA	Final Exam	

CS = case study

Assignments:

1. Quiz #1
Basics of toxicology
2. Case Study Abstracts
Each written abstract must have the following:
 - One-page abstract of the case study discussing background, purpose, findings, and relevance.
 - Five detailed discussion questions (they must be relevant and open-ended)
 - Table with two columns (weaknesses, strengths)
3. Problem Set
This problem set addresses some essential calculations for quantitative human health risk assessments.
4. Human Health Risk Assessment Worksheet
Based on Assignment 3, each student will perform a mini human health risk assessment—a worksheet—based on a handout provided by the instructor.
5. Quiz #2
Risk assessment basics, terms, and concepts.
6. Ecological Risk Assessment Worksheet
Each student will perform a mini ecological risk assessment—a worksheet—based on a handout provided by the instructor.
7. Quiz #3
Ecological risk assessment basics, terms, and concepts.
8. Risk Management Debate Simulation
Students will be broken into four teams: responsible party, affected public, environmental organization, and public health agency. Each team will be provided with the case and unique, supplemental information. The teams will debate each other as a means to their preferred risk management outcome.
9. Final Exam
The final exam will be a comprehensive final exam.

Assigned Readings:

A Review of Ecological Assessment Case Studies from a Risk Assessment Perspective, EPA/630/R-92/005, U.S. Environmental Protection Agency, Washington, DC, May 1993.

Assessing the Risk of an LNG Terminal, Keeney, Ralph L.; Kulkuarni, Ram B.; and Nair Keshavan in "Readings in Risk, ed. Theodore S. Glickman and Michael Gough, Resources for the Future, Washington, DC, 1990.

Case Study of A Highly Dioxin Contaminated Sports Field: Environmental Risk Assessment and Human Exposure, Fiedler, Heidelore; Hutzinger, Otto; Lau, Christopher, Cikryt, Peter, and Jamshid Hosseinpour, *Journal of Hazardous Materials*, 43(1995)217:227.

Glossary of Terms Related to Health, Exposure, and Risk Assessment. Air Risk Information Support Center, U.S. Environmental Protection Agency, Washington, DC, March 1989.

Hamburger Hell: Better Risk Communication for Better Health, in *Mad Cows and Mother's Milk: The Perils of Poor Risk Communication* (Montreal: McGill-Queen's University Press, 1997), pp. 77-98.

Human Health Risk Assessment: A Case Study Involving Heavy Metal Soil Contamination After the Flooding of the River Meuse during the Winter of 1993-1994, Albering, Harma J.; Van Leusen, Sandra M.; Moonen, Edwin J.C.; Hoogewerff, Jurian A.; and Jos C.S. Kleinjans" *Environmental Health Perspectives*, Vol. 107, Number 1, January 1999, pp. 37-43.

Informing and Educating the Public About Risk, in *The Perception of Risk*, Paul Slovic, ed. (London: Earthscan Publications, 2000), pp. 182-192.

Land Use and Remedy Selection: Experience from the Field – The Abex Site, Jan Mazurek and Robert Hersh, Discussion Paper 97-26, Resources for the Future, Washington, DC, July 1997.

Risk Analysis: Understanding "How Safe is Safe Enough?" Stephen L. Derby and Ralph Keeney, in ed. Theodore S. Glickman and Michael Gough, Resources for the Future, Washington, DC, 1990.

Risk Assessment in the Federal Government. Managing the Process (Washington, DC: National Academy Press, 1983) pp. 17-50.

Risk, Science, and Democracy, Ruckelshaus, William D, *Issues in Science and Technology*, Vol. 1, No. 3 (Spring 1985), pp., 29-38.

Survey of Health Risk Assessment (Part I) in *The Risk Assessment of Environmental and Human Health Hazards: A Textbook of Case Studies*, Dennis J. Paustenbach, ed. (New York: John Wiley & Sons, 1989), pp. 27-40.

Survey of Health Risk Assessment (Part II) in *The Risk Assessment of Environmental and Human Health Hazards: A Textbook of Case Studies*, Dennis J. Paustenbach, ed. (New York: John Wiley & Sons, 1989), pp. 43-61.

Use of Precautionary Assumptions in Health Risk Assessments and Benefits Estimates, GAO-01-55, General Accounting Office, Washington, DC, October 2000.

Course Policies:

GRADING

You will be graded based on your performance throughout the course. Not only are you expected to come to class, you are expected to contribute to discussions; it is your responsibility to yourself, to your fellow classmates, and to me. If you miss class, obtain the notes from a classmate and keep up on the readings. If you become confused about lecture or reading material (or intrigued) stop by during my office hours, make an appointment, call, or email me.

The grading values are:

Attendance	15 pts
Quiz #1	10 pts
Quiz #2	10 pts
Case Study Abstracts (6)	30 pts
Problem Set	10 pts
Human Health Risk Assessment Worksheet	40 pts
Ecological Risk Assessment Worksheet	25 pts
Risk Management Debate Simulation	20 pts
Final Exam	40 pts
TOTAL	200 pts

Attendance and participation count toward your grade. I reserve the right to employ additional quizzes on the readings as part of this grade if I feel it is necessary (i.e., I will use quizzes on the readings if it is apparent you are not completing the reading).

MISSED CLASSES, LATE ASSIGNMENTS, ETC.

There are no make-up quizzes or exams unless the need for one is discussed prior to the scheduled exam time and even then, it is at my discretion that a make-up exam or quiz is allowed.

Late assignments are not accepted unless it is arranged in advance or it is necessary due to a documented emergency. However, acceptance of a late assignment is at my discretion.

Remember that if you miss a class in which there is a quiz or an in-class assignment, your grade will be affected twice (attendance and quiz scores). Thus, it is imperative to contact me with problems before they arise. I have voice mail and email so I can be contacted day or night (note: both voice mail and email time and date your message.) If you start to feel like you are falling behind or are having difficulty, see me immediately.

INCOMPLETES

I recognize that life presents unexpected surprises and an incomplete is sometimes a necessary choice. I will only give an incomplete for reasons that arise in the last two weeks of the semester. If you need to take an incomplete, you must meet with me before the end of the semester. According to University guidelines, if you take an incomplete, you must complete the course by the end of the following semester or your grade automatically becomes an F.

THE AMERICANS WITH DISABILITIES ACT

The Americans with Disabilities Act of 1992 is a federal law mandating the elimination of discrimination against persons with disabilities. If you need course adaptations or accommodations, please make an appointment to see me as soon as possible. Only students who are registered with the Office of Academic Support for Students with Disabilities (237 Luther Bonney, 780-4706) are eligible for accommodation. Students experience difficulty in courses for a variety of reasons. For problems in writing skills and time management, make an appointment to see a student tutor at the Academic Support Center, 242 Luther Bonney (780-4470). Help is also available through the Counseling Center, 106 Payson Smith (780-4050). In addition, the Learning Centers in Portland, 253 Luther Bonney Hall (780-4228) and Gorham, Costello Sports Complex (228-8224) offer a series of academic workshops.