



**MC459: Complexity, Uncertainty, and Wicked Problems in Science and Policy
STEPPs Capstone Fall 2008**

Course Information

Monday and Wednesday: 8:30 to 9:50
369L Case Hall (Seminar Room in North Case)
Course Web Page: <http://www.angel.msu.edu>

Instructor Information

Professor Daniel Kramer
Office: 370 North Case Hall
Phone: (517) 432-2199
Email: dbk@msu.edu
Office Hours:

- Monday 11 to 12
- Wednesday 1 to 2

The best way to reach me is during my office hours. I am also readily available by appointment. To set up an appointment, talk to me in class, leave a phone message or send me an email.

NOTE: I have a joint appointment with the Department of Fisheries and Wildlife so I spend roughly half my time in the Natural Resources Building.

Course Overview

"For every complex question there is a simple answer, and it is wrong." *H.L. Mencken*

"The significant problems we face cannot be solved at the same level of thinking we were at when we created them." *Albert Einstein*

"True genius lies in the capacity for evaluation of uncertain, hazardous and conflicting information." *Winston Churchill*

"Some problems are so complex that you have to be highly intelligent and well informed just to be undecided about them." *Laurence J. Peter*

"The only difference between a problem and a solution is that people understand the solution." *Charles Kettering*

"I am not young enough to know everything." *Oscar Wilde*

Some problems are more difficult to resolve than others. At the highest level of complexity and conflict, profound social and cultural values come into play. In these cases, the processes of defining shared values, common goals, desirable outcomes, and acceptable risks become political and social. Such problems are difficult even to formulate. Technical analyses alone, those which do not integrate social values and deliberation, are inadequate. Problems that do not lend themselves to easy formulation, much less easy solutions, are referred to as “wicked problems. In their seminal article, “Dilemmas in a General Theory of Planning,” Rittel and Webber list ten characteristics of wicked problems.

1. *There is no definitive formulation of a wicked problem. The information needed to understand the problem depends on one’s idea for solving the problem.*
2. *Wicked problems have no stopping rule (i.e. there is no clear solution end point). Stopping occurs when the solution is “good enough” or when financial, political, and social resources expire.*
3. *Solutions are not true or false but rather good or bad.*
4. *There are no immediate or ultimate tests for solutions to wicked problems.*
5. *Solutions to wicked problems are typically one-shot, and all solutions change the problem that you are trying to fix.*
6. *Solutions to wicked problems are neither enumerable nor mutually exclusive.*
7. *Every wicked problem is unique.*
8. *Every wicked problem can be considered a symptom of another problem. Problems are layered.*
9. *Because people formulate wicked problems differently, their solutions differ as well.*
10. *Problem solvers have no right to be wrong in the case of wicked problems (i.e. there is no scientific method for solving policy problems).*

This STEPPs capstone course focuses on wicked problems. Evidence of wicked problems comes from many disciplines - product designers, engineers, city planners, program managers, and policy makers. All warn that traditional methods of problem solving are not working and no apparent alternatives are in sight.

This course is divided into three sections. The first opens with an introduction to wicked problems, complexity, and uncertainty guided several scholarly articles. We then consider our capacity as citizens, analysts, and policy makers for dealing with problems plagued with great complexity and uncertainty. Thomas Homer-Dixon, in his book, ***The Ingenuity Gap***, asks whether we are up to the task of managing problems an increasingly uncertain and complex world.

The second section of this course is a series of case studies in which we consider specific problems (most related to the environment and or human health) beset with complexity, surprise, and uncertainty. First, we take up the problem of biotechnology and consider the likely social and political consequences of this new technology. Francis Fukuyama’s book, ***Our Posthuman Future: Consequences of the Biotechnology Revolution*** guides our discussion. Next, Yvette Baskin, in her book ***A Plague of Rats and Rubbervines*** introduces the problems created by the introduction of exotic species and the policy problem of dealing with these invasions. Our third case considers the potential environmental and human health problems created by the introduction of genetically

modified organisms (GMOs) into our food system. Kathleen Hart's book, ***Eating in the Dark***, examines the U.S. government's use of science, ties to industry, and their response to GMOs. Next, Mark Davis' book ***The Monster at Our Door: The Global Threat of Avian Flu*** considers complex and uncertain task of managing and anticipating the threat of global pandemics and their ecological underpinnings.

The last section of the course considers frameworks to dealing with wicked problems. In particular, we'll rely on Brian Walker's book, ***Resilience Thinking***, to present the concept of resilience. The paradigm of resilience suggests that our systems of governance and our societies must learn to be adaptive in order to manage complex and uncertain problems.

Course Objectives

- Students will have a good understanding of scientific uncertainty and common misconceptions of scientific uncertainty
- Students will have a good understanding of the nature of wicked problems
- Students will case familiarity with biotechnology, genetically modified organisms, invasive species, and bird flu
- Students will improve their oral and written, communication skills
- Students will improve their critical reading and summarization skills
- Students will gain a broad overview of the interaction between science and public policy with respect to addressing wicked problems
- Students will understand some of the key concepts and barriers that affect communication between scientists, professional experts and policy makers
- Students will examine the role of scientists, professionals and policy makers in public policy

Pedagogy and Discussion Leaders

Because this is a seminar, I share the responsibility of pedagogy with students. For each class period, one student will be responsible for preparing questions on the readings and posting them on ANGEL by **5 pm the day before class**. The discussion leader is also responsible for ***initiating and maintaining*** class discussions. Your efforts will constitute a major portion of your participation and collegiality grade. Below are some possible questions and suggestions to consider when preparing for your turn as discussion leader.

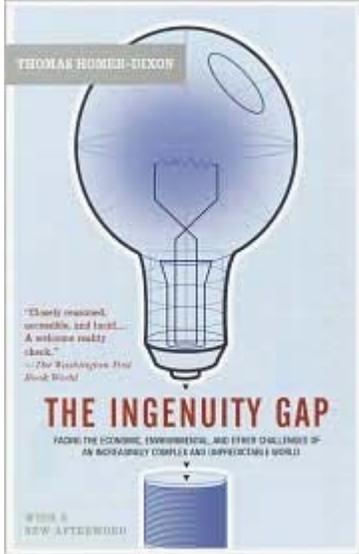
- *What questions capture the readings thesis or central idea?*
- *What particular quotations express the thesis?*
- *What are the key points in the flow of the argument? Do you agree or disagree with the key points?*
- *What are the key terms (i.e. new concepts, names, organizations) in the reading?*
- *What quotations are particularly important, interesting, provocative, or controversial?*
- *How does the perspective presented compare with previous readings?*
- *How do the central ideas in the reading relate to our own lives and experiences – those of students, those of us in the developed world, women, men etc.?*
- *How would you refute the arguments presented?*
- *What are the strengths and weaknesses of the reading?*
- *Are there issues that the author is ignoring which you think are relevant to the discussion?*

- *Does the reading have relevance for different times and places?*
- *Be provocative.*
- *Be challenging.*

Resources and Readings

Required Texts

Homer-Dixon, Thomas F. 2002. *The Ingenuity Gap: Facing the Economic, Environmental, and Other Challenges of an Increasingly Complex and Unpredictable Future*. Knopf Publishing Group. ISBN-13: 9780375713286. 496 pages.



Synopsis: *Despite all of society's advances, our problems proliferate. Wars abound, environmental degradation accelerates, economies topple overnight, and pandemics such as AIDS and tuberculosis continue to spread. The Internet and other media help to disseminate knowledge, but they've also created an "info-glut" and left us too little time to process it. What's more, advances in technology have made the world so bewilderingly fast-paced and complex that fewer people are able even to grasp the problems, let alone generate solutions. That space between the problems that arise and our ability to solve them is "the ingenuity gap," and as we careen towards an increasingly harried and hectic future, the gap seems only to widen.*

As he explores the possible consequences of this gap, Thomas Homer-Dixon offers an absorbing assessment of the state of the world and our ability to fix it. Culling from an astounding array of fields—from economics to evolution, political science to paleontology, computers to communications—he integrates his vast knowledge into an accessible and engaging argument. This is a book with profound implications for everyone that we can ill afford to ignore.

Fukuyama, Francis. 2003. *Our Posthuman Future: Consequences of the Biotechnology Revolution*. Picador. ISBN-10: 0312421710. 272 pages.

OUR POSTHUMAN FUTURE

CONSEQUENCES OF THE BIOTECHNOLOGY REVOLUTION



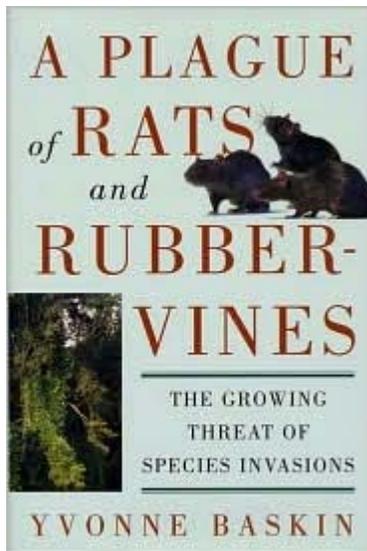
FRANCIS FUKUYAMA

Synopsis: In 1989, Francis Fukuyama made his now-famous pronouncement that because "the major alternatives to liberal democracy had exhausted themselves," history as we knew it had reached its end. Ten years later, he revised his argument: we hadn't reached the end of history, he wrote, because we hadn't yet reached the end of science. Arguing that the greatest advances still to come will be in the life sciences, Fukuyama now asks how the ability to modify human behavior will affect liberal democracy.

To reorient contemporary debate, Fukuyama underlines man's changing understanding of human nature through history: from Plato and Aristotle's belief that man had "natural ends" to the ideals of utopians and dictators of the modern age who sought to remake mankind of ideological ends. Fukuyama persuasively argues that the ultimate prize of the biotechnology revolution-intervention in the "germ-line", the ability to manipulate the DNA of all of one person's descendants-will have profound, and potentially terrible, consequences for our political order, even if undertaken by ordinary parents seeking to "improve" their children.

In Our Posthuman Future, our greatest social philosopher begins to describe the potential effects of our exploration on the foundation of liberal democracy: the belief that human beings are equal by nature.

Baskin, Yvonne. 2003. *A Plague of rats and rubber vines*. Island Press. SBN-13: 9780641922657. 330 pages.

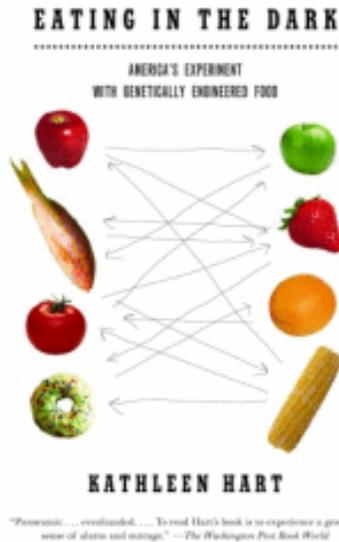


***Synopsis:** The human love of novelty and desire to make one place look like another, coupled with massive increases in global trade and transport, are creating a growing economic and ecological threat. The same forces that are rapidly "McDonaldizing" the world's diverse cultures are also driving us toward an era of monotonous, weedy, and uniformly impoverished landscapes. Unique plant and animal communities are slowly succumbing to the world's "rats and rubbervines" - animals like zebra mussels and feral pigs, and plants like kudzu and water hyacinth - that, once moved into new territory, can disrupt human enterprise and well-being as well as native habitats and biodiversity.*

*From songbird-eating snakes in Guam to cheatgrass in the Great Plains, "invasives" are wreaking havoc around the world. In *A Plague of Rats and Rubbervines*, widely published science writer Yvonne Baskin draws on extensive research to provide an engaging and authoritative overview of the problem of harmful invasive alien species. She takes the reader on a worldwide tour of grasslands, gardens, waterways, and forests, describing the troubles caused by exotic organisms that run amok in new settings and examining how commerce and travel on an increasingly connected planet are exacerbating this oldest of human-created problems. She offers examples of potential solutions and profiles dedicated individuals worldwide who are working tirelessly to protect the places and creatures they love.*

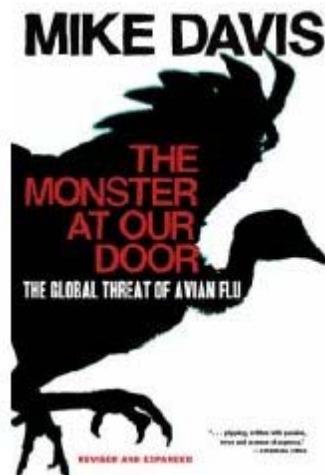
*While our attention is quick to focus on purposeful attempts to disrupt our lives and economies by releasing harmful biological agents, we often ignore equally serious but much more insidious threats, those that we inadvertently cause by our own seemingly harmless actions. *A Plague of Rats and Rubbervines* takes a compelling look at this underappreciated problem and sets forth positive suggestions for what we as consumers, gardeners, travelers, nurserymen, fishermen, pet owners, business people - indeed all of us who by our very local choices drive global commerce - can do to help.*

Hart, Kathleen. 2003. *Eating in the Dark: America's Experiment with Genetically Engineered Food*. Knopf Publishing Group. ISBN-13: 9780375724985. 352 pages.



Synopsis: *"Most Americans Eat Genetically Modified food on a daily basis. Yet many of us are barely aware that we're eating something that has been altered; food labels do not include information on ingredients that have been genetically modified, and the subject has received surprisingly little media coverage." "Even as genetically engineered foods spread throughout America, most consumers abroad have refused to eat them. Opposition to genetically engineered food is now beginning to surface in the United States, where biotechnology is becoming a major issue for the new century." Eating in the Dark tells the story of how these new foods, most of which are engineered either to produce or to withstand heavy doses of pesticides, quietly entered America's food supply. Kathleen Hart explores the potential of this new technology to enhance nutrition and cut farmers' expenses. She also reveals the process by which regulatory agencies decided to allow the biotechnology industry to sell its products without first submitting them to thorough testing for possible long-term threats to consumer health and the environment.*

Davis, Mike. 2006. *The Monster at our Door: The Global Threat of Avian Bird Flu*. The New Press. ISBN-10: 0805081917. 240 pages.

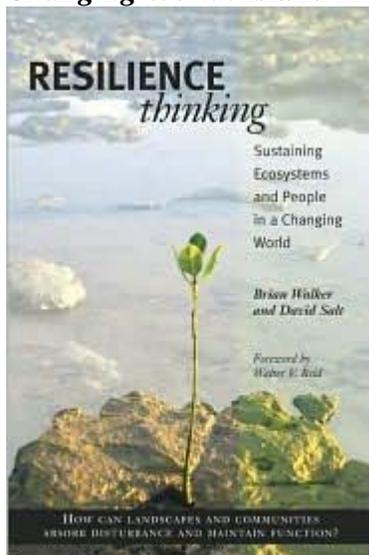


Synopsis: *A "brilliant" and "fascinating" investigation of the looming avian flu pandemic—and how we arrived at the brink of a global health catastrophe—The New York Times*

The virus known as H5N1 is now endemic among poultry and wild bird populations in East Asia. A flu strain of astonishing lethality, it has a talent for transforming itself to foil the human immune system—and kills two out of every three people it infects. The World Health Organization now warns that avian flu is on the verge of mutating into a super-contagious form that could travel at pandemic velocity, killing up to 100 million people within two years.

*In *The Monster at Our Door*, the first book to sound this alarm, our foremost urban and environmental critic reconstructs the scientific and political history of this viral apocalypse in the making, exposing the central roles played by burgeoning slums, the agribusiness and fast-food industries, and corrupt governments. Mike Davis tracks the avian flu crisis as the virus moves west and the world remains woefully unprepared to contain it. With drug companies unwilling to invest in essential vaccines, severe shortages persist, a scenario Davis compares to the sinking Titanic: there are virtually no lifesaving resources available to the poor, and precious few for the rich, too.*

Walker, Brian & David Salt. 2006. *Resilience Thinking: Sustaining Ecosystems and People in a Changing World*. Island Press. ISBN-10: 1597260932. 192 pages.



Synopsis: *Increasingly, cracks are appearing in the capacity of communities, ecosystems, and landscapes to provide the goods and services that sustain our planet's well-being. The response from most quarters has been for "more of the same" that created the situation in the first place: more control, more intensification, and greater efficiency.*

"Resilience thinking" offers a different way of understanding the world and a new approach to managing resources. It embraces human and natural systems as complex entities continually adapting through cycles of change, and seeks to understand the qualities of a system that must be maintained or enhanced in order to achieve sustainability. It explains why greater efficiency by itself cannot solve resource problems and offers a constructive alternative that opens up options rather than closing them down.

*In *Resilience Thinking*, scientist Brian Walker and science writer David Salt present an accessible introduction to the emerging paradigm of resilience. The book arose out of appeals from colleagues in science and industry for a plainly written account of what resilience is all about and how a*

resilience approach differs from current practices. Rather than complicated theory, the book offers a conceptual overview along with five case studies of resilience thinking in the real world. It is an engaging and important work for anyone interested in managing risk in a complex world.

Other Readings

All other readings including journal articles and newspaper articles to be handed out in class or posted on ANGEL.

Grading

Your grade will be based on the following tasks:

Participation and Collegiality:	20%
Response Paper #1:	20%
Response Paper #2:	20%
Response Paper #3:	20%
Abstract and Oral Presentation of Case Study	20%

Important Due Dates for Assignments

Response Paper #1	October 6
Response Paper #2	November 5
Response Paper #3	December 12
Abstract and Oral Presentation of Case Study	Nov. 24 & 26, Dec. 1 & 3

Evaluation Criteria for Written Work

- **3.4 to 4.0** – The student has written an ideal essay; ideal because it directly answered the question, supported its argument with accurate evidence, and it presented the argument in a well-organized, stylistically- and grammatically-correct format that followed the writing guidelines. A paper of this caliber shines with original thought and strong, relevant evidence presented in a clear, understandable format. It is obvious that the student has absorbed and thought through the material in a very sophisticated manner.
- **2.8 to 3.4** – The student has obviously read and understood the material and has offered an answerable question and a direct answer to the question with accurate evidence. It is weaker than it could have been because it leaves a few questions unanswered or overlooks a critical element of the problem. A paper in this grade range may contain an occasional spelling, grammatical, or stylistic error, but generally is quite sound.
- **2.2 to 2.8** – The student appears to have engaged with most of the relevant materials and has attempted to address the posed question, but has not written an answer that clearly, fully, or accurately answers the question. Any one of several elements may have gotten in the way of a good paper, including a lack of relevant evidence, a poorly organized paper, occasional oversimplifications, spelling, grammatical, or stylistic mistakes, or factual errors.
- **1.5 to 2.2** – The student has not directly answered the question and appears to have an incomplete grasp of the subject. Often, a paper of this quality will contain a number of oversimplifications of the material, grammatical and stylistic mistakes, and factual errors.

- **Below 1.5** – The student has submitted a paper that strays from the posed question and provides little accurate and relevant evidence. Generally, a paper that earns below a 1.5 will have poor organization, several spelling, grammatical, and stylistic mistakes, and it will fail to demonstrate an understanding of the issue.

Evaluation Criteria for Participation and Collegiality (Based on attendance, participation, collegiality, and effectiveness as discussion leader.)

Generally, I expect students to read all of every day's assigned readings, identify each reading's argument and assess its evidence, and bring to class questions and analyses of the readings for discussion.

- **4.0:** Students who earn a 4.0 are consistently excellent colleagues. They are always present and prepared for class, and they bring interesting and relevant questions and comments to bear on the subject material. They are equally good listeners and show a genuine interest in their fellow students' thoughts. These students have completely bought into the class and made it better through their contributions, energy, and hard work. ***Unexcused missed classes: 0 to 1.***
- **3.0:** A student who earns a 3.0 may have missed two or three classes throughout the semester but generally has been an active and enthusiastic participant in the course. Other students who earn a 3.0 may have been in class and prepared for class every day, but will have occasionally articulated ideas without reference to the direction of the conversation; that is, they actively participated in discussions without listening to their colleagues' previous statements. ***Unexcused missed classes: 2 to 3.***
- **2.0:** A student who earns a 2.0 is very much an average student. He or she will miss two or more classes throughout the semester or will come to class several times during the semester without having fully read and understood the assigned materials. Other such students will be prepared for class and will come to every class meeting, but will not fully participate in class activities and discussion; instead, they hold back, waiting for others to ask the tough questions or take the chance at making a mistake. Still other students who earn a 2.0 will occasionally dominate a class discussion and use rhetorical tactics that limit other students' participation. ***Unexcused missed classes: 3 to 4.***
- **Lower than 2.0:** Students who earn a 1.0 or a 0 in the participation and collegiality portion of their grade will have missed more than three classes or will have come to class several times without being fully prepared for the class meeting. In the class discussions and activities, lower than average colleagues will avoid participating or will occasionally attempt to dominate the discussions. ***Unexcused missed classes: greater than 4.***

Response Papers

Response papers are 5 to 6 page responses to one or two questions. Response papers will test your understanding of and ability to synthesize class readings, class discussions, documentary films, guest contributions, and student presentations. Think of the response papers as take-home essay exams with less breadth and more depth.

- Papers should be submitted electronically before class on the due date. NO PAPER COPIES.
- 5 to 6 double spaced pages, 12-point font, 1 inch margins all around.
- Punctuation, grammar, and source attribution should be near perfect.
- Papers should include a thesis statement, a “roadmap” of the paper’s organization, clear transitions, subheadings when appropriate, paragraphs with topic sentences, and a logical and coherent sequencing of ideas.
- Papers should be properly referenced. You should use abbreviated citations in the text of your paper using the following format – (Johnson and Wilson 2004). Sources should be fully cited in your list of references at the end of your paper using the following format.
Johnson, Tom and Bill Wilson. 2004. Collisions of Culture: Globalization and the Environment. *Journal of Globalization and the Environment*, volume 3(4): 15-34.
- I will consider the depth of understanding and creativity demonstrated in your papers.
- **Tip: Proofread, proofread, proofread**

Abstract and Oral Presentation of Case Study

Each student will provide an abstract and oral presentation of a “wicked problem” of interest to them. I expect you to discuss your ideas for the paper with me during my office hours. Your presentation should include discussions of 1) what makes your problem a wicked problem, 2) policy responses to date, and 3) suggestions for more effective policy responses given the inherent complexity of both the problem and solutions.

- Presentations should be illustrated using PowerPoint. Supplemental media including videos and radio broadcasts are also good.
- You should email me a half page abstract (less than 500 words) the day before your presentation. The abstract should provide an introduction to your topic and summaries of the key insights you will develop in your presentation.
- Presentations should be 15 to 20 minutes in length. In addition, each student will be allotted 10 minutes for questions and answers.
- Presentations should not be read. Note cards are fine as long as you are not reading from them.

Policies

Attendance

Attendance is required for this class. I understand that occasional emergencies (illness or family emergencies) may occur. In such cases, you should notify me before class begins that you cannot attend. If you don't speak to me in person, you can leave a voice mail or email message with your phone number and the reason you won't be attending class that day. You are responsible for finding out what you missed in class.

Classroom Conduct

Students whose behavior is disruptive either to the instructor or to other students will be asked to leave the class. Everyone's experience and opinions will be valued. Not everyone must agree, even with the instructor, however, differing points of view must be communicated respectfully.

Diversity

This course is intended for students with a variety of interests and backgrounds. The diversity of ethnicities, cultural backgrounds, races, perspectives, experience, and ways of addressing problems among students is one of the most enriching aspects of any course. I will encourage students to acknowledge classroom diversity by listening attentively and politely to one another especially when opinions of students differ.

Grading Grievances

Students with a grievance regarding grading should submit to me in writing the nature of their grievance and their proposed remedy within 48 hours of having received the returned assignment. I will then discuss the grievance with the student.

Late Work

Late work will be docked one full letter grade for every day (not class day) the work is late.

Scholastic Dishonesty (<http://www.vps.msu.edu/SpLife/reg3.htm#1.00>)

The principles of truth and honesty are fundamental to the educational process and the academic integrity of the University; therefore, no student shall:

- claim or submit the academic work of another as one's own.
- procure, provide, accept or use any materials containing questions or answers to any examination or assignment without proper authorization.
- complete or attempt to complete any assignment or examination for another individual without proper authorization.
- allow any examination or assignment to be completed for oneself, in part or in total, by another without proper authorization.
- alter, tamper with, appropriate, destroy or otherwise interfere with the research, resources, or other academic work of another person.
- fabricate or falsify data or results.

Students with Disabilities

Any student with a documented disability needing academic adjustments or accommodations is requested to speak with me during the first two weeks of class. All discussions will remain confidential. Such students also should contact *The Resource Center for Persons with Disabilities* (RCPD), 120 Bessey Hall, (517) 353-9642 and visit their web site at <http://www.rcpd.msu.edu/Home/>.

Course Readings and Calendar

Date	Day	Topic	Reading Assignment	Pages	Assignments Due
25-Aug	Monday		<i>Introductions</i>		
27-Aug	Wednesday	Wicked Problems	<i>Wicked Problems & Uncertainty</i> <i>Rittel & Webber - Dilemmas in a General Theory of Planning (15 pages)</i> <i>Pielke - Room for Doubt (1 page)</i> <i>May - Risk & Uncertainty (1 page)</i> <i>Jasanoff - Technologies of Humility (1 page)</i>	18	
1-Sep	Monday		NO CLASS: Labor Day		
3-Sep	Wednesday	Ingenuity Gap	<i>Homer-Dixon - Prologue and Chapters 1 & 2: Pages 1 to 70</i>	70	
8-Sep	Monday	Ingenuity Gap	<i>Homer-Dixon - Chapters 3 & 4: Pages 71 to 120</i>	50	
10-Sep	Wednesday	Ingenuity Gap	<i>Homer-Dixon - Chapters 5 to 7: Pages 121 to 190</i>	70	
15-Sep	Monday	Ingenuity Gap	<i>Homer-Dixon - Chapters 8 & 9: Pages 191 to 246</i>	78	
17-Sep	Wednesday	Ingenuity Gap	<i>Homer-Dixon - Chapters 10 & 11: Pages 247 to 312</i>	66	
22-Sep	Monday	Ingenuity Gap	<i>Homer-Dixon - Chapters 12 & 13: Pages 313 to 391</i>	79	
24-Sep	Wednesday	Biotechnology	<i>Fukuyama - Chapters 1 to 3: Pages 3 to 56</i>	54	
29-Sep	Monday	Biotechnology	<i>Fukuyama - Chapters 4 to 6: Pages 57 to 104</i>	48	
1-Oct	Wednesday	Biotechnology	<i>Fukuyama - Chapters 7 to 9: Pages 105 to 180</i>	76	
6-Oct	Monday	Biotechnology	<i>Fukuyama - Chapters 10 to 12: Pages 181 to 218</i>	37	Response Paper #1
8-Oct	Wednesday	Invasive Species	<i>Baskin - Chapters 1 to 3: Pages 1 to 70</i>	70	
13-Oct	Monday	Invasive Species	<i>Baskin - Chapters 4 & 5: Pages 71 to 124</i>	54	
15-Oct	Wednesday***	Invasive Species	<i>Baskin - Chapters 7, 11, & 12: Pages 147 to 172; 259 to 304</i>	71	
20-Oct	Monday	GMOs	<i>Hart - Prologue to Chapter 3: Pages 3 to 62</i>	60	
22-Oct	Wednesday	GMOs	<i>Hart - Chapters 4 to 7: Pages 63 to 137</i>	75	
27-Oct	Monday	GMOs	<i>Hart - Chapters 8 to 10: Pages 138 to 193</i>	56	
29-Oct	Wednesday	GMOs	<i>Hart - Chapters 11 & 12: Pages 194 to 224</i>	31	
3-Nov	Monday	GMOs	<i>Hart - Chapters 13 & 14: Pages 225 to 282</i>	57	
5-Nov	Wednesday	Bird Flu	<i>Davis - Preface to Chapter 5: Pages 3 to 68</i>	66	Response Paper #2
10-Nov	Monday	Bird Flu	<i>Davis - Chapters 6 to 10: Pages 69 to 138</i>	70	
12-Nov	Wednesday	Bird Flu	<i>Davis - Chapters 11 to 13: Pages 139 to 190</i>	62	
17-Nov	Monday	Resilience	<i>Walker - Chapters 1 to 3: Pages 1 to 73</i>	73	
19-Nov	Wednesday***	Resilience	<i>Walker - Chapters 4 to 6: Pages 74 to 154</i>	81	
24-Nov	Monday		STUDENT PRESENTATIONS**		
26-Nov	Wednesday		STUDENT PRESENTATIONS		
1-Dec	Monday		STUDENT PRESENTATIONS		
3-Dec	Wednesday		STUDENT PRESENTATIONS		
12-Dec	Friday		FINAL EXAM TIME: 7:45 to 9:45 am		Response Paper #3

**

Depending on the number of students, this might change
Possibility that class will be rescheduled to a different time