I. Course Information:

Meeting: Section 001 – Mondays 1:30-2:20 pm (AGH 009)
Day/Time/Location: Section 002 – Wednesdays 1:30-2:20 pm (AGH 009)
Section 003 – Fridays 1:30-2:20 pm (AGH 009)

Instructor: Dr. Scott Loss
Email: scott.loss@okstate.edu
Office Phone: 405-744-4607
Office Hours: Wednesdays 12-1 pm or by appointment
Office Location: AGH 544

II. Course Materials:

There is no text book. We will read from a combination of journal articles and other relevant science, management, and policy materials. All readings will be posted to the course Brightspace page.

III. Course Description:

Understanding the implications of a changing world is necessary for student success in all aspects of Natural Resource Ecology and Management. Because climate change is arguably the greatest human-related challenge affecting natural resource management and conservation now and into the future, much of the class will focus on the ecological impacts and management of climate change. However, global change also consists of other impacts that humans have on earth’s species, ecosystems, and landscapes (e.g., land use and land cover change, invasion of non-native species, pollution, emergence of infectious diseases that affect plants, animals, and humans, etc.). This class will provide scientific evidence related to the causes and consequences of global change with a focus on interactions between climate change and other global changes (e.g., how will climate change influence biological invasions?). Students will collaboratively learn about global change impacts on species, communities, and ecosystems, and approaches to managing natural resources under the uncertainty of a changing planet.

How this class relates to Fish, Forest, Range, and Wildlife resources

This class is part of the NREM core curriculum, taken by all NREM students. In particular, this class covers the effects and management of human-caused global changes, including climate change, on all types of natural resources of interest to NREM students, including the small sample of examples below:

Range resources:

- How increasing severity and frequency of weather extremes (e.g., drought) associated with climate change are influencing disturbance regimes (e.g., fire) and invasive species (e.g., cheatgrass, *Sericea lespideza*, eastern redcedar) that impact rangeland ecology, management, and conservation
- How land cover change (e.g., woody plant encroachment) is impacting rangelands across the planet and is likely feeding back to influence the global climate system
Forest resources:

- How increasing severity and frequency of weather extremes (e.g., drought and storm-caused windthrow) associated with climate change are influencing disturbance regimes (e.g., fire) and invasive species (e.g., wood boring beetles) that impact forest ecology, management, and conservation
- How trees and forests themselves provide an important record of past climate histories that inform our understanding of current and future climate change (e.g., dendrochronology and interpretation of the record of tree pollen deposited in glaciers and marine and lake sediments)

Wildlife resources:

- How wildlife (including animals and populations and communities of wildlife species) are responding to climate change (and other global changes affecting terrestrial environments) via genetic adaptation, changes in behavior and migration, and latitudinal and altitudinal range shifts
- How population management efforts (including habitat management and regulated harvests) are being adjusted and planned in response to global change-related effects that threaten persistence of wildlife species and the recreational, aesthetic, and ecosystem benefits they provide

Fish resources:

- How fish (including fish and populations and communities of fish species) are responding to climate change (and other global changes affecting aquatic environments) via genetic adaptation, changes in behavior and migration, and in some cases shifts in range distributions
- How population management efforts (including habitat management and regulated harvests) are being adjusted and planned in response to global change-related effects that threaten persistence of fish species and the recreational, aesthetic, and ecosystem benefits they provide

IV. Course Objectives:

1. Upon course completion, students will be able understand, apply, and analyze the following concepts and to understand and apply management approaches related to global change:
   - Climate change is arguably the greatest and most complex natural resource management challenge of our time, yet global change is more than just climate change; it also includes among other things: land use changes, invasions of non-native species, pollution, and infectious disease emergence. Many of these components of global change interact and feedback on one another.
   - Although climate change has occurred for the entire existence of the earth, current climate change is unprecedented in its rate and is also different from previous change in that it is human-caused and it threatens the stability of human societies and natural systems on an unprecedented scale.
   - Adaptation to climate change and other types of global change will require adjustments to current paradigms of resource management, including explicit consideration of uncertainty about the future and revisiting and revising goals, objectives, and approaches in light of future changes.
   - Public policy is critical to solving the problems associated with climate change and other global changes. Existing policies may need to be adapted and new policies will need to be developed.

2. Students will gain exposure to and learn how to read, understand, and apply information in modern/emerging studies of global change causes, impacts, and management through weekly student-led discussions of peer-reviewed journal publications and real-world natural resource management plans that include climate change adaptation and management strategies.
V. Teaching Approach:

The course will be taught at the senior level with the expectation that students have already learned much about natural resource ecology and management in previous courses, and thus will be able to apply this expertise and skillset to the future challenges associated with human-caused global change. The course will start with several lectures on the basics of climate change to ensure a common knowledge and background on this topic. The remainder of the course will consist of discussion of current topics relevant to components, causes, and consequences of climate change and other types of global change. The discussions will be largely student led; except for the first few discussion periods, I will assign 2-5 students to collaboratively lead each discussion. The goal of the course will be to prepare students to think flexibly and creatively about how global change influences management of natural resources.

VI. Assignments

1) Article responses: Each week we will discuss the motivations, methods, results, and implications of recent papers about global change. Before most discussions, students will submit a response consisting of: (1) a 1-paragraph summary of the paper (in the student’s own words, not just a rewording of the paper’s abstract), (2) a 1-2 paragraph reflection on how the material in the paper applies to natural resource ecology & management in at least one way, and (3) at least two thoughtful discussion questions related to the paper (questions may be used for the week’s in-class discussion and thus should be “discussion-starter” questions not just questions asking for factual information or clarification of the paper). The length of the response (not including questions) should be around 1 page, based on double-spaced, 12-point Times New Roman font, and 1-inch margins.

Responses will be graded on a 10-point scale based on: (1) completeness in addressing all three of the above requirements, (2) accuracy of the article summary, (3) the level of thought/insight put into considering applications of the reading’s subject matter to natural resource ecology and management, (4) consideration of the available scientific evidence when stating opinions and personal conclusions, and (5) the level of insight and curiosity displayed by the discussion questions. Because the response assignment is designed to give students a chance to develop their ideas and ensure they come to class prepared to discuss the paper, a failure to turn in a response by the beginning of the week’s class period will result in zero credit. Responses turned in late will be proportionally reduced by 20% for every day they are late (i.e., a response turned in ≥5 days late automatically receives a 0% score).

2) Student-led Discussions: Each student will get a chance to co-lead one of the weekly paper discussions with 1 or more fellow students; the schedule of and expectations for student-led discussions will be provided prior to the first student-led discussion.

3) Final Group Presentation: Near the end of the semester, students will be assigned into groups (these will be different groups than assigned for the student led discussions). At the end of the semester, each group will make a presentation giving a detailed example of how an agency (municipal, state, tribal, or federal), corporation, or non-profit/non-government organization is incorporating climate change into their activities. The focus of the presentation should be on the conservation and natural resource management implications of the activity, even if the institution chosen is a corporation. For example, Coca-Cola is taking a variety of actions related to managing their supply chain (the sugar cane crop in many tropical parts of the world) to buffer against the impacts of climate change; however, these activities also have ecological benefits and implications. Each presentation will be ~10 minutes with 5 minutes for class discussion, and a detailed grading rubric will be provided.
VII. Evaluation:

Grade structure is A-F and depends on the level of mastery and understanding of course content.

Grading scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Percentage Range</th>
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<tbody>
<tr>
<td>A</td>
<td>Superior, substantial mastery of course content</td>
<td>90% to 100%</td>
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<tr>
<td>B</td>
<td>Good, excellent understanding of course content</td>
<td>80% to 90%</td>
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<tr>
<td>C</td>
<td>Average, understands course content</td>
<td>70% to 80%</td>
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<tr>
<td>D</td>
<td>Minimal, some increased knowledge</td>
<td>60% to 70%</td>
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<tr>
<td>F</td>
<td>Failing, lack of effort, no change in knowledge</td>
<td>&lt; 60%</td>
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Components of grade:

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
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<tbody>
<tr>
<td>Attendance</td>
<td>20%</td>
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<td>Respectful participation and contribution to discussions</td>
<td>25%</td>
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<td>Article responses</td>
<td>25%</td>
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<tr>
<td>Student Led Discussion</td>
<td>15%</td>
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<tr>
<td>Final Group Presentation</td>
<td>15%</td>
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Attendance Policy and Other Expectations:

Attendance and tardiness: Because this is primarily a discussion course, attendance and on-time arrival to class are critical. After one absence of any type, all absences will result in proportionally reduced attendance scores. This approach recognizes that things come up and that students must occasionally miss class, and it also removes the need for me to make arbitrary decisions about what constitutes an excusable absence.

Weekly Expectations: Read the assigned reading, submit your written response prior to the class meeting time, and be prepared for and participate respectfully in class discussions. I will regularly communicate via email (official class communication is via your @okstate.edu account), and all course materials will be posted on the course Brightspace page. All written assignments will be submitted via Dropbox folders on the course Brightspace page. I expect all students to regularly check university email and use the Brightspace page.

Academic Misconduct: Although I encourage discussion and exchange of ideas among students, plagiarism will not be tolerated. The article responses must be your original writing, and for the group presentation, you must cite references for facts and ideas that are not your own. Formal citations are not required for the article responses, but are allowed. If it is determined that a student has engaged in plagiarism, including copying material from external sources or their fellow students, he or she will at minimum be given a zero score for the assignment and, depending on the infraction, may face additional sanctions (e.g., from the instructor and/or from the University, according to the OSU Student Code of Conduct; for further details see: studentconduct.okstate.edu/code).

Disabilities or special needs: Students with disabilities or special needs requiring accommodation are urged to notify the instructor of this circumstance during or soon after the first week of class. You should also contact OSU Student Disability Services to ensure accommodations: 405-744-7116 (phone).
### VIII. Course Calendar
(I reserve the right to revise the calendar)

<table>
<thead>
<tr>
<th>Week #</th>
<th>Date</th>
<th>Topic</th>
<th>Reading/Due</th>
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<tbody>
<tr>
<td>1</td>
<td>Jan 14 (M)</td>
<td>- Course syllabus &amp; intro to global change</td>
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<td></td>
<td>Jan 16 (W)</td>
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<td>Jan 18 (F)</td>
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<td>2</td>
<td>Jan 23 (W)</td>
<td><strong>No Class Mon, Jan 21st (MLK Day)</strong> Lecture/Discussion:</td>
<td><strong>Read: IPCC “headlines”</strong></td>
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<td></td>
<td>Jan 25 (F)</td>
<td>- Historic, recent &amp; future climate change</td>
<td><strong>Optional: Scan Chapters 1-2 in Newman et al. book (pages 1-47)</strong></td>
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<td></td>
<td>Jan 28 (M)</td>
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<tr>
<td>3</td>
<td>Jan 30 (W)</td>
<td>Lecture/Discussion:</td>
<td><strong>Anderegg et al. 2010 – focus on first 2 pages (response due)</strong></td>
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<td>Feb 1 (F)</td>
<td>- Controversies &amp; myths re: climate change</td>
<td><strong>Optional: read paper’s methods section</strong></td>
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<td>Feb 4 (M)</td>
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<td>4</td>
<td>Feb 6 (W)</td>
<td>Lecture/Discussion:</td>
<td><strong>Grimm et al. 2013 (response due)</strong></td>
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<td>Feb 8 (F)</td>
<td>- Ecological impacts of climate change</td>
<td><strong>Optional: scan EPA doc for Oklahoma</strong></td>
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<td>Feb 11 (M)</td>
<td>- Climate change issues in Oklahoma</td>
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<td>Assign dates for student-led discussions</td>
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<td>5</td>
<td>Feb 18 (M)</td>
<td><strong>No Class Wed, Feb 13th and Fri, Feb 15th (Loss Research Travel)</strong></td>
<td><strong>Corlett 2015 (response due)</strong></td>
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<td>Feb 20 (W)</td>
<td>Student Led Discussion:</td>
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<td>Feb 22 (F)</td>
<td>- The Anthropocene concept</td>
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<td>6</td>
<td>Feb 25 (M)</td>
<td>Student Led Discussion:</td>
<td><strong>Highlights of National Fish, Wildlife, and Plants Climate Change Adaptation Strategy (response due)</strong></td>
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<td></td>
<td>Feb 27 (W)</td>
<td>- Introduction to Climate Change Adaptation</td>
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<td>Mar 1 (F)</td>
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<td>Mar 6 (W)</td>
<td>- Managing bird populations under climate change (The Audubon report)</td>
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<td>Mar 8 (F)</td>
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<td>8</td>
<td>Mar 11 (M)</td>
<td>Student Led Discussion:</td>
<td><strong>Loss et al. 2011</strong></td>
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<td>Mar 13 (W)</td>
<td>- Assisted Colonization as a climate change adaptation approach for animals and plants</td>
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<td>Mar 15 (F)</td>
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<td>9</td>
<td>Mar 18-22</td>
<td><strong>Spring Break</strong></td>
<td><strong>No Class</strong></td>
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<td>10</td>
<td>Mar 25 (M)</td>
<td>Video/Discussion:</td>
<td><strong>No reading or response due</strong></td>
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<td>Mar 27 (W)</td>
<td>Indigenous perspectives on climate change</td>
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<td>Mar 29 (F)</td>
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<td>11</td>
<td>Apr 1 (M)</td>
<td>Student Led Discussion:</td>
<td><strong>Oklahoma State Wildlife Action Plan (response due)</strong></td>
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<td>Apr 3 (W)</td>
<td>- Climate change adaptation in state agency resource management plans</td>
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<td>Apr 5 (F)</td>
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<td>12</td>
<td>Apr 8 (M)</td>
<td>Student Led Discussion:</td>
<td><strong>Reading TBD (response due)</strong></td>
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<td>Apr 10 (W)</td>
<td>Topic TBD with student feedback</td>
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<td>Apr 12 (F)</td>
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<td>13</td>
<td>Apr 15 (M)</td>
<td>Student Led Discussion:</td>
<td><strong>Reading TBD</strong></td>
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<td>Apr 17 (W)</td>
<td>Topic TBD with student feedback</td>
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<td>Apr 19 (F)</td>
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<td>14</td>
<td>Apr 22 (M)</td>
<td><strong>Final Projects Due: 3 Group presentations</strong></td>
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<td>Apr 24 (W)</td>
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<td>Apr 26 (F)</td>
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<td>15</td>
<td>Apr 29 (M)</td>
<td><strong>Final Projects Due: 3 Group presentations</strong></td>
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<td>May 1 (W)</td>
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<td>May 3 (F)</td>
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<tr>
<td>16</td>
<td>May 6-10</td>
<td><strong>FINALS WEEK</strong></td>
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