

Assignments

Monday 30 August -- Meet in front of Science Building. Bus will leave at 1 pm. Don't be late!

Activity: Introduction to the Conard Environmental Research Area (CERA) and prairies

Assignments:

- *America's lost landscape: the tallgrass prairie* (DVD in Burling listening room)
- Chapter 1 of *Konza Prairie*
- Chapter 1 of *Biological Science*
- *Guide to flowering plant morphology* (Handout)
- *Common plant families of the prairie* (Handout)
- *Investigations* pp. 20-23 (Keeping a lab/field notebook)

Focus questions:

1. What factors influence the distribution of different types of prairies and savannahs in central North America? How are these ecosystems distinguished from others?
2. Why are plants (and other organisms) organized into taxonomic groups? On what bases can you distinguish between various common plant families of the prairie? Why are such features good indicators of phylogenetic relationships?
3. What are some features of good hypotheses? What are some features of good scientific tests of these hypotheses?
4. Please take notes on the film and be prepared to discuss how it presented the information and ideas behind the history of prairies and our motivation to do restoration. What do you think was done well? Were there surprising elements? How would the film be considered by a city dweller? a farmer? a Native American? a biologist?

Wednesday 1 Sept -- Meet at Science Building. Bus will leave at 1 pm. Don't be late!

Activity: Vegetation Sampling at CERA

Readings: Undertaking Investigations – pp. 10-12 of *Investigations*
An introduction to sampling: Vegetation analysis of prairies (Handout)

Focus questions:

1. What is the role of *description* in scientific investigations?
2. What is a *sample* and why is it important?
3. How would you distinguish between *haphazard*, *random* and *systematic* sampling methods? Under what circumstances would each be used?

Friday September 3 Meet in Science 1822 for lecture/discussion.

Reading: Chapter 2 of *Konza Prairie – A Tallgrass Natural History*
pp. 481-502; 548-553 in *Biological Science*

Focus questions:

1. What is the origin of limestone deposits and what can they tell us about the history of an area? How do paleoecologists reconstruct ancient communities for times when erosion was more common than deposition? What are the limitations of the fossil record?
2. How has the speed of climate change influenced the make-up of biological communities at Konza?
3. What were the impacts of humans on prairie communities? Why were they relatively large?
4. Describe the logic behind the three required components of natural selection. Make sure you can identify each component in the two case studies (*Mycobacterium*, finches).
5. Why is evolution said to have no "goal"? Why aren't all traits adaptive?

Assignments

Monday September 6

Activity: Field Trip to local prairie remnants and Prairie Learning Center – BRING YOUR FIELD NOTEBOOK

Readings (download from class webpage or e-reserve):

- [Smith, D.D. 1998. Iowa prairie: original extent and loss, preservation and recovery attempts. Jour. Iowa Acad. Sci. 105:94-108.](#)
- [Drobney, P. The phoenix people of sod corn country.](#)
- [Reichelt Unit of the Rock Creek State Park.](#) (Handout)

Focus questions:

- 1.. What are some of the difficulties in determining what "pre-settlement" conditions in Iowa were? Should ecological restoration depend on our knowledge of pre-settlement conditions?
2. Why does Smith (p. 106) argue that the goal of restoration espoused by Sayen is impossible for Iowa prairies? Do you agree? How would you describe the differences in values between the agricultural systems that broke the prairie, the educational and governmental systems that saved a tiny bit of prairie earlier in the century, and the groups working to bring back prairies now? What factors contribute to these differences? Is there a way to forge a compromise between these different values?
3. Describe Drobney's argument and motivation for prairie restoration. How does it emerge from her experience as a native Iowan of European ancestry? As a scientist?

Wednesday September 8th –

Activity: Vegetation sampling at CERA– leave at 1 pm from Science building. No reading assignment.

We will be concluding data gathering on variation in your focal plant species. See handout from last week.

Friday September 10th – Describing variation

Class will start at 1:15 in Science 1823.

Readings:

- *Investigations* pp. 41-43 (“Summary statistics”)

[Clark, P.J and F. C. Evans. 1954. Distance to Nearest Neighbor as a Measure of Spatial Relationships in Populations. Ecology 35: 445-453.](#) **Note concentrate on pp. 445 to 449 (first half column)!**

Class will begin at 1:15 in Science 1823.

Focus questions:

1. Describe in words what the meaning of the term *variance* is, when applied to a set of observations.
2. What can the *standard deviation* tell you about the dispersion of a set of observations?
3. What biological explanations might there be for a population to exhibit either a *clumped* or *overdispersed* spatial dispersion?

Assignments

Monday Sept 13 – Data analysis

Class will begin at 1:15 in Science 1823.

Activities: **Quiz I**, data analysis, searching the scientific literature, and discussion of patterns in biological communities.

Readings: Chapter 50 in *Biological Science*, Using the Scientific Literature (pp. 8-9 in *Investigations*), The Oral Presentation (pp. 39-40 in *Investigations*), Correlation analysis (pp. 56-57)

Assignments:

- Read a paper from *Tillers* (<http://www.grinnell.edu/academicbiology/cera/tillers>) using the tips from *Investigation*. Come to class prepared to discuss your observations/questions about the paper.
- Enter your group's data into a Minitab project file before class starts. Put the density and individual measurement data into separate worksheets.

Focus question: What factors influence the composition of communities at the *largest* spatial scale? Consider biotic, abiotic, and historical factors.

Wednesday Sept 15 – Oral presentations

Each group will prepare a 6-10 minute oral presentation, including a Powerpoint that includes not more than 8 slides. The presentation should do the following:

- Introduction – introduce your focal species and what is known about its ecology and distribution
- Methods – describe briefly how you sampled and what you measured
- Results – describe your analyses of the results including density and how it varies among samples, your estimate of dispersion, and the correlations between different traits you measured.
- Discussion – describe briefly at least one study of your species that you've found in the scientific literature
- Conclusion – suggest a further study of your species that is motivated by your investigations and/or your literature research.

I will be recording your presentations, so I can evaluate them carefully and give you useful feedback.

Friday Sept 17 – Community dynamics (lecture/discussion)

Class will begin at 1:15 in Science 1823.

Readings:

- Chapter 53.2-53.3 (*Community Structure and Dynamics*) in *Biological Science*
- Chapter 2 of *Konza Prairie – A Tallgrass Natural History*

Focus questions:

1. Describe mechanisms of *disturbance* that act at different spatial scales. Which of these are most important in prairies?
2. What is *succession*?
3. What is a *dynamic mosaic*?
4. Explain why counting the number of species in a community might not be the best way of measure "species diversity".

Assignments

Monday Sept 20

Meet at the Science Building at 1pm to drive to CERA.

Activity: Take data on burn/no burn experiment at CERA.

Readings: A Primer of Experimental Design [Handout]

- [Hulbert, L.C. 1969. Fire and litter effects in undisturbed bluestem prairie in Kansas. Ecology 50:874-877.](#) (download from website)
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Wednesday Sept 22

Meet at the Science Building at 1pm to drive to CERA.

Activity: Take data on burn/no burn experiment at CERA.

Individual assignment (emailed to me before 12 noon on September 22): Find a paper from the primary literature that is relevant to your burn experiment subject. Email me the following: a summary of the approach, findings and interpretation (one paragraph); a statement about the relevance of the study to your study (one paragraph).

Friday Sept 24

Class will begin at 1:15 pm in 1823.

Readings:

- The Scientific Paper (pp. 24-33 of *Investigations*)
- Anderson, R.C., T. Leahy and S.S. Dhillion. 1989. Numbers and biomass of selected insect groups on burned and unburned sand prairie. *Am. Midl. Nat.* 122:151-162.

Read this scientific paper and review the Hulbert paper from Monday with an eye towards both their *structure* and their *content*.

1. Hulbert's study was designed to tease apart different effects of fire on the prairie ecosystem. What are these different effects? Why did Hulbert's study incorporate experimental manipulations?
2. What are the possible mechanisms by which fire influences insect abundance? Why might different groups of insects respond differently to burning?
3. Criticize these two experiments -- were they designed well? How would you change the design of each? Did the authors do a good job conveying the results and their ? What follow-up study would you design to extend the investigations described in each of these papers?

Assignments

Monday Sept 27 – Data analysis; ecology of grasses

Meet at 1:15 in the lab.

Activities: **Quiz 2**; Data analysis of burn/no burn experiment; Lecture/Discussion

Readings:

- *Data Analysis* (pp. 13-14), *Data Presentation* (pp. 15-19), and *The t-test* (pp. 44-46) from *Investigations*
- Chapter 4 of *Konza Prairie*

Focus questions:

1. What features make grasses so successful in prairies?
2. How are grasses and other plants adapted to the presence of fire?
3. What is the significance of C3 vs. C4 metabolism in prairie plants? How does it help explain different species response to fire?
4. How does fire impact different parts of the ecosystem? Are the effects of fire always the same?
5. Develop a list of important prairie animals. Organize them by *taxonomic* group, then by *trophic level* (i.e., their position in the food web). What are some of the factors that influence the abundance of an animal species?

Wednesday 29 – Lecture/Discussion and Peer review of Methods and Results -- Meet at 1:15 in the lab.

Assignments:

- Research group: **Email me before 8 am** a document (*.doc or *.rtf) with your common *Methods* and *Results* sections including figures and tables (make sure to check your figures against the checklist on p. 17 of *Investigations*).
- Individual: **Email me before 12 noon** a list of three citations (scientific journal articles) that you think are relevant to your burn experiment paper. Give the complete citation in Grinnell College style (p. 31), and write a single paragraph for each explaining the relevance of the paper to your own.
- Reading: [Howe, H. 1999. Dominance, diversity, and grazing in tallgrass restoration. *Ecological Restoration* 17:59-66.](#)

Focus questions:

1. Compare and contrast the effects of grazing by small vs. large mammals on the diversity of tallgrass prairies. Why do small and large mammals have different effects on plant diversity? Given these effects, how would you manipulate grazers on a prairie to maximize species diversity?
2. Describe the relationship between species diversity and resource availability. Given this relationship, how would you manage a prairie to maximize species diversity?

Friday -- Peer review of paper draft -- Meet at 1:15 in the lab

Assignment: **Email me before NOON** a draft of your individual paper in *.doc or .rtf format (YOUR_NAME_Burn.doc or YOUR_NAME_Burn.rtf). Bring in to class a hard copy for your peer reviewer. It **MUST** be complete, i.e., you should have written something for each section of the paper. See *Investigations* for details on form and style. *Special reminder: The Methods and Results sections may be identical to those of your project partners. The remainder of the paper should reflect your individual effort.*

Assignments

Monday Oct 4 – Meet at the Science Building at 1pm to drive to CERA.

Assignment: **Email me before NOON** the final version of your individual paper in *.doc or .rtf format (YOUR_NAME_Burn.doc or YOUR_NAME_Burn.rtf). See *Investigations* for details on form and style. *Special reminder: The Methods and Results sections may be identical to those of your project partners. The remainder of the paper should reflect your individual effort.*

Activity: Brainstorming about group research projects.

Wednesday October 6 - Meet at the Science Building at 1pm to drive to CERA.

Activity: Project refinement

- (a) Individual assignment: Find a primary literature article relevant to the question you developed on Monday. Email me before noon a short summary (2 paragraphs) that describes the study and its relevance to your questions – bring a paper copy of the paper and your paragraphs for your project partners.

Friday October 8 -- Midterm Exam (in the lab)

The exam will cover all material from the beginning of the course. It will be a 50 minute exam, i.e, about 2.5 times the length of quizzes. However, I will allow you to work up to 75 minutes on it, so that time pressure is not a concern.

Assignments

Monday October 11. Meet at 1pm at the Science Building to travel to CERA

Assignments:

Group assignment: Find at least 3 *additional* resources from the primary literature that are relevant to your intended project. Read them, and then write up a single group report that lists the citation for each article or chapter, summarizes it, and reflects on its relevance for your study (i.e., did it give you new ideas or techniques, did it change how you are framing your question, did it answer some important question?). Email this to me before noon on Monday.

Individual assignment: Write out answers to the first 5 points on the “Investigation planning form” for your question in your field notebook before coming to lab.

Activity: We’ll spend the time as CERA further defining the scope of each group’s long-term project. Your time there could be spent examining potential field sites, working out experimental or sampling designs, talking with us about design or learning to use any equipment you’ll need. ***Please let us know by email before 8 am on Monday (sooner would be better) if you need special equipment.***

Wednesday October 13. Meet at 1pm at the Science Building to travel to CERA

Group assignment: Each group should email [brownj] a draft “Investigation Planning Form” (handout) by 12 noon. If you have special equipment needs, send those requests ASAP to both [brownj] and [Kolbe]

Activity: Continue developing project at CERA.

Note: I will be en route to field work in Hawaii on Thursday Oct 14 and likely unable to communicate electronically on Friday Oct 15th. Plan ahead to meet with me Monday-Wednesday about your project development!

Friday October 15. No class!

Group assignment (emailed to me before 4 pm): Prepare a formal, 3-4 page, proposal for your project:

Introduction -- Put your project into a larger context. What general issues in ecology, biology or restoration does it address? In other words, what makes it an interesting project? What specific questions does your project address? Use literature citations to support your arguments, and justify your hypotheses.

Methods -- What is the design of your project? Be as specific as you can about how you plan to set up experiments or observational studies, take data, analyze the data and interpret the results.

Schedule – Describe in detail how you will complete the project successfully (consult the syllabus for dates).

Literature -- Provide a bibliography of relevant resources, including ones you think are useful but not cited in the proposal. This may include reference books (textbooks, manuals, etc.), but should also include articles from scientific journals.

Assignments

Monday October 25

Activity: Continuation of projects at CERA. Leave from the Science Building at 1 pm. *Please let us me and Sue know by email if your group will not be going out to CERA or you will need special equipment.*

Wednesday October 27

Activity: Continuation of projects at CERA. Leave from the Science Building at 1 pm. *Please let us me and Sue know by email if your group will not be going out to CERA or you will need special equipment..*

Friday October 29 – Discussion of disturbance, grazing, and diversity

Please review the data figures in the last lecture handout (C3/C4 photosynthesis and fire effects)!

- Reading: [Howe, H. 1999. Dominance, diversity, and grazing in tallgrass restoration. *Ecological Restoration* 17:59-66.](#)

Please send me a *discussion question* about the reading by email before 9 am on Friday morning.

Assignments

Monday Nov 1 -- *Please send me by 8 am MONDAY* (by email) a progress report on your project, including the following details:

- (1) What has been accomplished to date. Have you changed your plans, as described in your proposal? If so, describe how these have changed. What data have you gathered so far? Any trends (perhaps you could start entering data)?
- (2) Your specific plans for Monday. Include in these plans a list of equipment you'll need. Make sure you let me know if you will NOT be going to CERA.
- (3) Your specific plans for Wednesday. Include in these plans a list of equipment you'll need. Make sure you let me know if you will NOT be going to CERA.

Activity: Continuation of projects at CERA. Leave from Science Building at 1 pm.

Wednesday November 3

Activity: Continuation of projects at CERA or on campus. Leave from Science Building at 1pm.

Friday November 5

Activity: Discussion of soils and nutrient cycling in Science 1823 at 1:15 pm.

Reading assignments: pp. 125-130 and Chapter 6 from *Konza Prairie*. Chapter 54 from *Biological Science*

Focus questions:

1. Describe how climate, topography, and organisms influence soil characteristics.
2. Describe how plants benefit from associations with fungi and bacteria in the soil.
3. Describe one way in which each of the following types of soil organisms influences the soil ecosystem: nematodes, earthworms, arthropods, and vertebrates.
4. Describe the water, carbon, and nitrogen cycles.

Assignments

Monday November 8 -- Each group should send me (by email) a progress report on your project by 8 am MONDAY.

Please send me by 8 am MONDAY (by email) a progress report on your project, including the following details:

- (1) What has been accomplished to date. Have you changed your plans, as described in your proposal? If so, describe how these have changed. What data have you gathered so far? Any trends (perhaps you could start entering data)?
- (2) Your specific plans for Monday. Include in these plans a list of equipment you'll need. Make sure you let me know if you will NOT be going to CERA.
- (3) Your specific plans for Wednesday. Include in these plans a list of equipment you'll need. Make sure you let me know if you will NOT be going to CERA.

Activity: Continuation of projects at CERA. Leave from Science Building at 1 pm.

Wednesday November 10

Activity: Continuation of projects at CERA. Leave from Science Building at 1 pm.

Thursday Nov. 11 -- 6:30-8:00 PM – Bio 150 Project Consultations

See separate sheet for specifics of this assignment.

Friday November 12

Readings: [Knapp et al. 1999. The keystone role of bison in North American Tallgrass Prairie. Bioscience 49: 39-50. \[download from website\].](#)

Please email me a question for class discussion by 11:59 pm on Thursday.

Assignments

Monday November 15 – Project work

Activity: Data gathering/analysis/writing on campus in 1822 and/or computer labs. Ant, bird, stream and greenhouse groups go to CERA at 1 pm.

Wednesday November 17 – Discussion, quiz and project work.

Activities: Finish Bison discussion. Then Quiz 3. Data gathering/analysis/writing on campus.

****Email me a draft of your group's *Methods and Results* section (including figures and tables) for ungraded review by the end of the class period.****

Friday November 19 – meet in Science 1823 at 1:15

Activity: Activity: Discussion of conservation and restoration research.

Reading: Chapter 9 of *Konza Prairie* (also go to the website at <http://climate.konza.ksu.edu/> and browse through ***Ongoing Projects*** for an update on current research on Konza) and Chapter 55 of *Biological Science*.

Focus questions:

1. How would you define the term *conservation biologist*? What questions do such people address and what techniques are used to test hypotheses?
2. What evolutionary and ecological principles underlie the ways that humans have impacted biodiversity? How are these effects studied and their importance evaluated?
3. Of the several reasons for preserving biodiversity listed in this chapter, which (if any) is the most persuasive? Explain your reasoning, or provide an alternative.
4. Do you see any distinctions or conflicts between the goals of *preservation* and *restoration*? What role should groups of scientists (including those at CERA and Konza LTER) play in setting conservation priorities?

Monday November 22

Writing workshop in 1822/23.

****Your first draft of your group project paper is due by 4pm Wednesday Nov 24 by email. (Note that class will NOT be held on Wednesday). This draft will be graded and count for ¼ of the project paper grade.****

Wednesday-Friday November 24-26

No class. Give thanks, you turkeys!

Assignments

Monday November 29 -- Meet in Science 1823 at 2:15 pm. * Note later start time!*

Readings:

1. Kinsey, J., R. Roberts, and R.F. Sayre. 1999. Prairie prospects: the aesthetics of plainness. Pp. 14-46 in *Recovering the prairie* (R.F. Sayre, ed.). U. of Wisc. Press, Madison, WI. [On electronic reserve – course password: r98py]
2. <http://www.grinnell.edu/files/downloads/222738%20Annabel%20Wimer.pdf>

Please submit a question for class discussion about either reading via email by 9 am. Make sure the question is one that will stimulate discussion of the reading!

We will also discuss the directions for peer reviews and distribute papers to reviewers.

4:15 pm Gallery talk (**Required**) -- Artist Stephen Longmire will speak about his photographic exhibition in the Faulconer Gallery, *Life and Death on the Prairie*. This project explores the ways a community can clash over the best use of a place. Mr. Longmire tells the story of a cemetery within a pristine prairie with stunning photographs, and in his new book from the Center for American Places.

7 pm Panel discussion (**Optional**) -- Stephen Longmire approaches the Rochester Cemetery as an outsider. On this panel he will be joined by members of the Rochester, Iowa, community to hear the issues they have had over the years concerning a space that is both a burial ground and a significant prairie remnant. They will look at how these can coexist and why tensions flare up.

Wednesday December 1 – Discussion with artist and reviewer meetings.

Meet at the Faulconer gallery at 1:15 pm, where we will meet for about an hour with Stephen Longmire.

Assignment: **Email me a copy** of your peer review by 12 noon, and bring a hard copy to class to give to the authors.

Friday December 3 -- FINAL VERSION OF YOUR GROUP PROJECT PAPER IS DUE by 12 noon by email

Reading assignment: *Investigations* (The Scientific Poster) -- Meet in Science 1823 at 1:15 pm. We will work on poster design.

Monday December 6 -- Meet at 1:15 in 1823. Each group should have a near-final draft (all elements present, proofread, good-looking etc.). We will spend the time peer reviewing and revising posters. Final versions of posters will be due at 4 pm.

Wednesday December 8 -- No class.

Thursday December 9 – Bio 150 poster session -- Attendance is required. -- All Bio 150 sections will participate a common public poster session, which will run from 11 AM to 12:45 in the 1st floor Science Elbow. *Lunch will be provided.*

Friday December 10

Meet in Science 1823 at 1:15 pm. Final discussion and course evaluation.