

ESM 211: Applied Population Ecology

Bruce E. Kendall

Winter 2017

E-mail: kendall@bren.ucsb.edu

Office Hours: By appointment, Tue. & Thu. PM

Office: 4514 Bren Hall

Web: bit.ly/2gkbvi1

Class Hours: TR 10:00-11:15 p.m.

Class Room: 1424 Bren Hall

Course Description

Population ecology is the science that helps us understand why abundances and densities of a particular species vary in space and time. In the face of environmental change, a species of conservation concern might start declining in abundance, or an unwanted species might start increasing. In this course you will learn to use the tools of population ecology to

1. Detect population trends
2. Diagnose the causes of population trends
3. Project future population trends and states, including extinction
4. Establish effective conservation objectives
5. Identify promising management actions to reverse undesirable trends

Readings

There is no textbook for this course; I will post both required readings and reference material to the GauchoSpace page. I may assign a book for later in the course; it will be easy to read and you'll have time to order it on Amazon.

Here are two texts that you may find useful:

Mills, L. S. (2012). *Conservation of Wildlife Populations: Demography, Genetics, and Management*. 2nd ed. Wiley-Blackwell, p. 342.

Morris, W. F. and D. F. Doak (2002). *Quantitative conservation biology: Theory and practice of population viability analysis*. Sunderland, MA: Sinauer Associates.

Grading

- 20% of your grade will be determined by your attendance and participation in class. Chronic absences or failure to do the class preparation will cost you here.
- 80% of your grade will be determined by a class project (see below).

Class project

Your primary graded work for this course will be a class project, in which you will apply the tools we learn in class to a particular species that interests you. This could be a species of current or potential conservation concern, an invasive species, or a harvested species. You may work individually or in groups of two.

An ideal species for this project should have:

- Data on abundance through time (ideally with some estimate of measurement uncertainty)
- Information on its ecology (habitat needs, what it eats, predators, social interactions, etc.)
- Information on its life history (age/size at maturity, longevity, reproductive system, etc.)
- Quantitative information on age- or size-dependent demography and growth
- A well-defined conservation objective.

You will have various components that you will turn in and get feedback on along the way:

1. A description of the species, management problem, and data availability.
2. An analysis of population trends
3. A demographic analysis of the species
4. Projections of the future of the population under one or more scenarios
5. A final report that links the previous analyses, and potentially additional ones, to evaluate potential management actions

Computing

We will be using two software platforms in this class. In addition to work you may do at home, we will sometimes meet in the GIS lab to work through some exercises together, and we will sometimes do some quick work in class. To facilitate the latter, *please bring your laptop to class if you normally bring it to campus*; if you do not have one, or do not normally lug it around, please make arrangements with a classmate to sit with them during these exercises.

R

If you are a Bren MESM student you are very familiar with this! If you are another sort of student, and don't have much R experience, please read some online tutorials (there are many).

If you use Rstudio, I recommend downloading the most recent version. Version 1.0 (released in Fall 2016) has lots of new useful features.

I recommend updating your version of R to 3.3.2—this is what will be on the Bren computers. Also update your packages (in Rstudio, use **Tools** → **Check for Package Updates...** [on Mac]).

You will be using a variety of packages to do the exercises, so make sure you know what to do when you get a message that says `Error in library(foo) : there is no package called 'foo'`.

In addition, I have a package on Github that has some useful functions and visualizations that we will use from time to time. To install this, do the following:

1. Make sure that you have the `devtools` package installed, and if not, install it.

2. Paste the following line into your console:

```
devtools::install_github("BruceKendall/PVA")
```

3. Use `library(PVA)` to load the package

I may update the package from time to time, in which case I'll warn you to download and install the new version.

On a Bren computer, you will need to install the PVA package into your user directory using

```
devtools::install_github("BruceKendall/PVA", args="-l 'H:/R/win-library/3.3'")
```

Vortex

Vortex is a windows program for doing demographic PVA. It will be installed on the Bren computers; if you have a windows computer (or run a windows VM on your mac), you can download the current version from <http://www.vortex10.org/Vortex10.aspx>.

Preparing for class

1. Visit the Gauchospace page for special instructions, readings, etc.
2. **Do the readings** For most classes I will post reading assignments on Gauchospace. Please read these before class, as we will often spend some time discussing them. I know this is a busy time for Group Project, so I will keep these short and/or light. *I highly recommend the first part of svmiller.com/blog/2014/09/taking-good-notes/ for useful advice on effective reading.*
3. **Do computational pre-activities** For the labs I will post detailed instructions in advance. So that we may spend the lab involved in more substantive issues around interpretation, please spend some time running through the mechanics (downloading data, executing commands, etc.), and email me with any places where you are having difficulty getting things to run. Also make note of the parts of the planned lab where you find either the concepts or the computation unclear—this will be a good topic of discussion in class.
4. Check for updates of the PVA package using the `install_github` command above (I will ususally send an announcement of changes, but might forget sometimes)

I will make every effort to get material for a given week posted by Friday of the preceding week. If I'm late, I'll send an email when the material is up.

During class

Class will be a mixture of discussion, lecture, and computer demonstrations. I generally won't provide lecture notes in advance, but for more technical sessions I will post my notes after class. If you need advice on notetaking see the later part of svmiller.com/blog/2014/09/taking-good-notes/

For labs, or for classes where I've announced in advance that we'll be doing interactive computer demos, please get your computers ready (logging in, making sure you have the required files from Gauchospace, starting Rstudio, etc.).

If you're ready to start on time I'll let you go on time.

Attendance

Showing up is 80 percent of life – Woody Allen, [via Marshall Brickman](#)

Of course, ESM 211 is not life, and you will face other constraints (e.g., illness) and opportunities (e.g., an interview for your dream job) that will take you away from class. But I don't work from a textbook, and there is a fair amount of interactive work that will happen in class, so "making up" a missed class is not something easily done.

If you miss class, please:

- Send me an email (in advance, if possible). Don't tell me in person, as I will forget!
- Look to the GauchoSpace page for any relevant printed material, and talk to your classmates to find out what happened in class.

Office hours

I encourage you to talk to me outside of class about any questions you may have on material from class, or to dig deeper into some topics. I no longer set formal office hours, as I find that students don't come to them. If you want to meet, send me an email proposing some times, or catch me after class.

- Best times for me are Tuesday and Thursday afternoons.
- I am a part-time administrator in the Graduate Division, with an office in Cheadle Hall. Generally, I will be at Cheadle on Wednesdays, and on parts of Mondays and Fridays. If those are the only times you can meet, I may ask you to come to my Cheadle office.
- If you have access to the UCSB Google calendar, you can look to see when I have meetings scheduled, which will facilitate scheduling via email. But it doesn't show when I am at Bren vs. Cheadle.

Email

If you send me an email, put "ESM 211" in the subject or body—I have a filter that will flag that and help it stand out in my ever-full inbox.

Tentative Class Schedule

The definitive schedule will be on [Gauchospace](#), which will also include links to readings and lecture notes from previous sessions.

Week 01, 01/08 - 01/12: Course Intro; Population Trends

Week 02, 01/15 - 01/19: Population Trends Lab; Population Monitoring

Week 03, 01/22 - 01/26: Population Regulation; Hazards of Rarity; Diagnosing Declines

Week 04, 01/29 - 02/02: Extrapolating Extinction Risk; ESA and Recovery Plans

Week 05, 02/05 - 02/09: Demography and Life History

Week 06, 02/12 - 02/16: Matrix Population Models; Sensitivity Analysis

Week 07, 02/19 - 02/23: Labs: Matrix Models; Vortex

Week 08, 02/26 - 03/02: Movement: Dispersal and Spread

Week 09, 03/05 - 03/09: Invasive Species; Metapopulations

Week 10, 03/12 - 03/16: Genetics and Evolution