BIOE 521 Conservation Biology

CWP = Mills, Conservation of Wildlife Populations,

RFDS = Wickham & Grolemund, R for Data Science

Week *and HW due that Friday*	***Remote Lecture & primary papers***	***In Class Lecture & CWP Reading***	***R Exercise & RFDS Reading***
Human population growth and resource use			
1 Aug 17/19/21	Cohen 1995. Population growth and the earth's human carrying capacity. Science 269: 341-346. Nekola et al. 2013 TREE 28:127-130	Population growth models **CWP** CH 1, 11 UN 2019 world and regional human population projections	**RFDS** 1, 2, 3.1-3.6 Tour of R Studio ***Exercise****: Using plots to understand US census data* Data for census exercise.
2 Aug 24/26/28 R census plotting exercise due	Vitousek et al. 1986. Human appropriation of the products of photosynthesis. *BioScience 36*: 368-373. Rojstaczer et al. 2001. Human appropriation of photosynthesis products. *Science*, *294*: 2549-2552.	Human resource consumption: fossil fuels and TNPP **CWP** CH 5, 6 (pages 114-125)	**RFDS** 3.7 – 3.10, 4 ***Exercise:*** *Mapping the Human Footprint Index with ggplot2 using coord_quickmap()*
Biodiversity: How many species exist? What are current extinction rates? Are they unusual?			
3 Aug 31/Sep 2/4 R HFI mapping exercise due	Pimm et al. 1995. The future of biodiversity. *Science* 269: 347-350. Mora et al. 2011. How many species are there on earth and in the ocean? *PLoS Biology* 9:1-8 e1001127	How many species exist? Describing Patterns of diversity. **CWP** CH 13	**RFDS** 5, 6, 27 ***Exercise****: Data wrangling with dplyr to summarize (and plot) differences in group size between species and habitats*
4 Mon off, Sep 9/11 Wrangling group size data exercise due	Rosenberg et al. 2019. Decline of the North American avifauna. *Science* 366: 120-124. Estes et al. 2011. Trophic downgrading of planet Earth. *Science*: *333*301-306. (Wed/Fri)	What are current and historic extinction rates? (Wed/Fri)	**RFDS** 7 (On your own)

Designing and interpreting field studies: estimating population density and demographic rates			
5 Sep 14/16/18 Written summary of Rosenberg et al. methods, results, strengths, weaknesses due	Who lives and dies? extending ordinary least squares regression to generalized linear models and glm()	Mean, variance, OLS regression using lm() **CWP** CH 2	**RFDS** 8, 9 ***Exercise****: Hypothesis testing for effects on group size using regression models*
6 Sep 21/23/25 Hypothesis testing exercise due	Chandler 2014 Distance sampling analysis in unmarked. CRAN, Vienna, Austria.	Unbiased estimates of population size: accounting for detection with distance sampling **CWP** CH 4	Statement of hypotheses (models) to be compared, sampling design and methods to apply distance sampling to test effects on magpie density ***Example code***: model selection and multimodel inference using AIC, as template for magpie analysis
7 Sep 28/30/Oct 2 Written hypotheses (i.e., models), sampling design & methods for magpie study due	Rosenblatt et al. 2014. Detecting declines of apex carnivores and evaluating their causes: An example with Zambian lions. *Biological Conservation* 180, 176-186.	Unbiased estimates of survival rates: accounting for detection with mark-recapture	**RFDS** 10, 11 ***Example code***: CJS model of apparent survival in dippers using RMark (nothing turned in) Magpie data collection ***Example code***: distance sampling for puku in unmarked, as template for magpie analysis
8 Oct 5/7/9 Results for analysis of effects on magpie density due	USFWS 2017. Removing the Greater Yellowstone Ecosystem Population of Grizzly Bears From the Federal List of Endangered and Threatened Wildlife. Federal Register 82:30502-30508 (up to "recovery planning…")	Age- and stage-structured population growth models: Leslie projection matrix **CWP** CH 7, 12	**RFDS** 12, 13, 21 ***Example code****:* PVA with multiple projection matrices for Mountain Golden Heather ***Exercise****: count-based PVA for YGB*

Genetic issues in conservation: speciation and the ESA, hybridization, inbreeding			
9 Oct 12/14/16 YGB PVA exercise due	US Endangered Species Act (through page 14) USFWS Distinct Population Segment policy from Federal Register	Speciation and the ESA **CWP** CH 3	**RFDS** 17,18 ***Exercise****: Piped data processing with high throughput genetic sequencing data*
10 Oct 19/21/23 Piped genetic data processing exercise due	Allendorf et al. 2001. The problems with hybrids: setting conservation guidelines. *Trends Ecol Evol* 16: 613-622.	Hybridization	**RFDS** 19 ***Exercise****: Creating functions to avoid repetition (and error)*
11 Oct 26/28/30 Coding functions exercise due	Keller & Waller. 2002. Inbreeding effects in wild populations. *Trends Ecol Evol* 17: 230-241. Caro & Laurenson 1994. Ecological and genetic factors in conservation: a cautionary tale. *Science* 263:485-486.	Inbreeding **CWP** CH 9	**RFDS** None
Connectivity: island biogeography, isolation by resistance			
12 Nov 2/4/6 Nov 3: Vote.	Simberloff & Wilson 1969. Experimental zoogeography of islands: the colonization of empty islands. *Ecology* 50, 278-296.	Island Biogeography **CWP** CH 10	**RFDS** 21
13 Wed off, Nov 9/13 Paper due	McRae, B. H. (2006). Isolation by resistance. *Evolution* 60, 1551-1561. Creel et al. 2019. Carnivores, competition and genetic connectivity in the Anthropocene. *Scientific Reports* 9, 16339 *Mon/Fri*	Isolation by distance and by resistance *Mon/Fri*	**RFDS** 28 (On your own)
Graduate student presentations			
14 Nov 16/18			**RFDS** 29 (On your own)