

Conservation Biology, EXAM II (100 points)  
02 November 2006

NAME: Key

Your exam will take place in two parts. The first will be a typical individual exam which should take you about 50 minutes. The second part will be about 25 minutes in groups of four students on a short set of additional questions. The score for your group exam will earn you additional points on your individual exam. See your syllabus for grading details.

1. Which of the following is **not** one of the five paradigms Van Dyke argues are foundations of conservation biology? [2 points]

- A. Island Biogeography
- B. Metapopulations
- C. Habitat Heterogeneity
- D. Conservation Genetics
- E. all of the above were listed by Van Dyke

2. Which variable is **not** needed to calculate equilibrium heterozygosity? [2 points]

- a. population size
- b. mutation rate
- c. birth rate
- d. all of the above are needed to calculate equilibrium heterozygosity
- e. none of the above are needed to calculate equilibrium heterozygosity

3. Approximately what percent of alien species become invasive? [2 points]

- a. 1%
- b. 5%
- c. 10%
- d. 25%
- e. 50%

4. The red wolf was presented in class as an example of: [2 points]

- a) bottleneck
- b) introgression
- c) inbreeding depression
- d) hybrid vigor
- e) none of the above

5. What 1971 treaty was innovative in protecting specific ecosystems as opposed to taxonomic groups? [2 points]

Ramsar Wetlands

6. Briefly distinguish among the following concepts with respect to definition and relevance to Conservation Biology: [6 points]

Small populations -- lots of potential problems from inbreeding, stochastic genetic and environmental events etc. However, some populations naturally small + seem to do fine

Declining populations -- most common signal to conservation biologists that something is amiss, usually caused by habitat loss

Bottlenecks -- in many populations, a severe drop in population size even though it may be temporary, can be harmful b/c leads to decreased genetic variation and is reduced chances of prolonged species or population persistence

rather open

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You work for a state agency given the responsibility of protecting the Arizona species listed on the Endangered Species Act. The managers of the Grand Canyon come to you for your professional opinion about the potential impacts on ESA species if the canyon is flooded more often and more severely. Use the data presented by Hans Werner Herrmann in class to make and defend a decision about whether or not to oppose increased flooding of the Grand Canyon. [10 points]

convince us.

HW said that data do not support Kanab amber snail and Niobrara ambersnail as being separate; the taxonomic nomenclature will have to be rewritten. Deciding whether this new, larger taxonomic group merits ESA status remains to be seen. Lots of information about origin, dispersal mechanisms, viability of small populations, metapopulation dynamics etc. still needs to be learned.

(KEB personally thinks KAS/NAS are not sufficient, given current knowledge, to stop ecosystem restoration via flooding.)

8. In what ways do the flora and fauna of continental and oceanic islands tend to differ, both in species richness and taxonomic representation? [5 points]

tends to represent mainland w/ all components

tends to represent good dispersers + may be numerically impoverished (# spp)

9. Give an example of a feedback cycle discussed in class that is relevant to conservation biology. Why is it a feedback cycle? [5 points]

explain

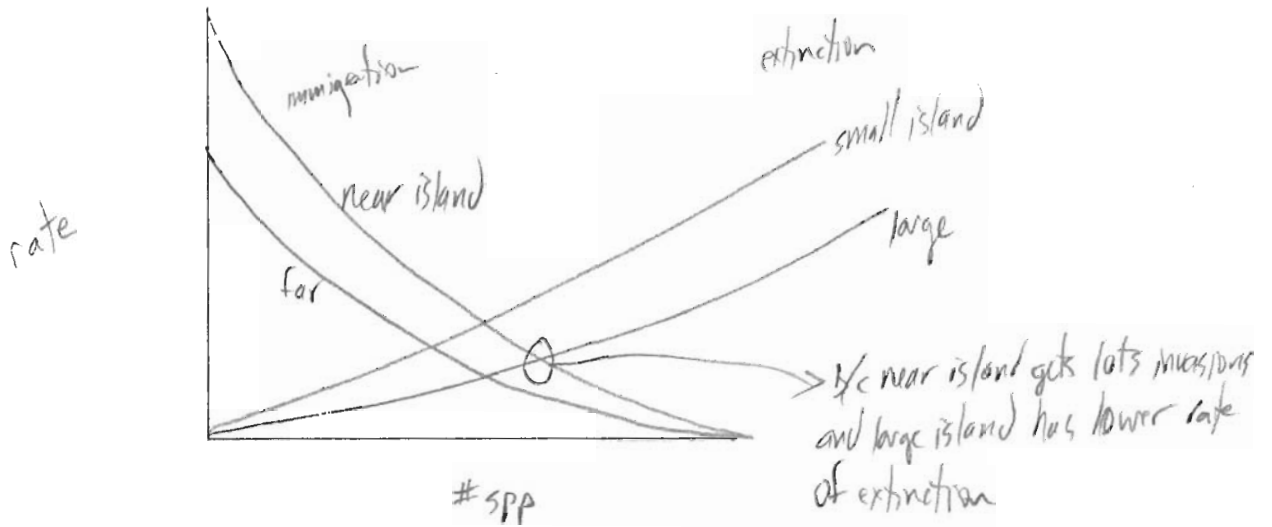
extinction vortex example  
runaway green house?

10. Draw a graph that explains the effects of both inbreeding depression and outbreeding depression on fitness. Be sure to label your axes. [6 points]



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Draw a graph of the Equilibrium Theory of Island Biogeography. Be sure to label your axes appropriately. Explain, from your graph, where you get the highest number of species at equilibrium. [8 points]



12. Describe one potential flaw in the Equilibrium Theory of Island Biogeography that detracts from the utility of this theory for conservation biologists. [3 points]

p123, in text

rescue effect, # spp on fragments not consistent w/ predictions, etc.  
 fragments not truly isolated, no predictions about which spp present

13. Describe two ecological impacts of invasive species other than spread of disease or hybridization. Give one example for each impact. [6 points]

interactions w/ native species (eg. competition, predation)  
 alteration of ecosystem fxn (eg. salt cedar + soil salinity + ... nutrient cycling  
 e.g. fire in buffel grass stands)

14. Why is a positive discount rate troubling to many conservation biologists? [3 points]

if the future is less valuable than the present then if we think out far enough all of biodiversity is worth 0 and we conclude we should consume today!

15. What does PVA stand for and how is it used in conservation biology? [5 points]

Population Viability Analysis - used to predict likelihood of persistence of a population out to some future date based on pop size, demographic estimates, certain habitat conditions, etc.

(useful bc allows educated guesses about best management practices)

16. Describe two characteristics that would make a biocontrol agent more likely to be successful in the eyes of a conservation biologist. [4 points]

- specialist on problem spp (NOT generalist)
- parasite or pathogen w/ short life cycle
- well studied

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7. Explain how and why different genes are suited to some conservation genetics questions but not others. Your answer should address both scale and the role of natural selection. [8 points]

mtDNA? to answer questions deep in time you need conservative portions of the genome that  $\Delta$  slowly; to answer question about recent events you need much more variable genetic material

most of the studied markers are neutral and will not tell you anything about adaptive changes. To assess adaptive genetic change is difficult, but may be important for appropriate habitat matching for reintroductions.

18. From the Walther et al. (2002) paper you read for class about global warming, explain the links between global climate change, phenology (define the term), and conservation. [5 points]

Timing of activity or development like breeding, nesting, flowering when phenology of say bird hatching and caterpillar emergence become uncoupled in time then species and ecosystems can be negatively impacted

19. Using the term "allele," explain the difference between heterozygosity and polymorphism. [5 points]

Polymorphism is  $>1$  allele for a gene in a population. More polymorphic loci may allow for greater future adaptability

two different alleles in a sexually reproducing individual often measured as average heterozygosity for a gene across a population.

20. The table below provides  $F_{ST}$  data and Slatkin's Migration Estimates collected by Dr. Seuss for four populations of truffle trees. If population C went extinct because of the threed trade, which population would you advise Dr. Seuss use to repopulate the habitat formerly occupied by population C? Why? [5 points]

	Population A	Population B	Population C	Population D
Population A	--	0.09	0.1	0.3
Population B	0.784	--	0.4	0.6
Population C	0.835	0.651	--	0.7
Population D	0.815	0.522	0.456	--

( $F_{ST}$  below the diagonal, Slatkin's Migration Estimates above the diagonal)

use D b/c  $F_{ST}$  closest to zero indicating more gene flow between C+D than between any other pair of populations. Migration estimate of 0.7 individuals is also highest for the C-D pair

21. Describe three traits of the river turtles studied by Ed Moll that were historically beneficial, allowing them to survive for more than 200 million years, but are now liabilities because of human-caused threats. [6 points]

large body size — large clutches avoid predators → lots of meat to eat  
 long life span — more reproductive events improved learning of habitat → remove reproductive ♀ from population has large neg. affect on population  
 nesting en masse — predator swamping → easy to harvest eggs + adults

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