

## Study guide for Final exam

There will be a few (about 10) review questions on major material, with 1 or 2 questions on each of:

- evolutionary forces
- abiotic processes, global climate & biomes
- climate change
- demography
- exponential population growth
- density dependence
- competition
- niches

Approximately 30 questions on the new material:

How can a prey population experience an increase in predation, but have no change in its population growth rate ( $\lambda$ )? What is the basic distinction between additive and compensatory mortality? What is the distinction between compensation by 'substitution of risk' and 'demographic compensation'? How do changes in the reproduction of deer after a harvest was instituted reveal demographic compensation? How does a plot of survival rates vs kill rate reveal the difference between additive and compensatory mortality?

Draw a graphical harvest model by plotting density-dependent recruitment as a function of population size, then adding an offtake curve to the plot. Understand the differences between the offtake curve for a fixed effort harvest and a fixed quota harvest. Understand how these two curves predict the equilibrium population size, and the difference between stable and unstable equilibrium points. What is MSY? If the density-dependent recruitment curve is symmetrical (as with the Lotka-Volterra model of linear density dependence, what population size yields MSY? With a fixed effort harvest, how does offtake relate to population size, and what does this imply about trade-offs between policies that maximize harvest and policies that maximize population size?

Explain the Lotka-Volterra predator-prey model, algebraically and graphically? How do you use the L-V Equations to derive zero isoclines, and what predictions do they make? What are the assumptions of the LV model? Do we see the predicted cycles in lab experiments that meet the assumptions of the model? When you modify the LV model to allow for density-dependent growth of the prey, what changes about the predictions?

What are predator numeric and functional responses, and how can they be combined to measure total offtake? What are type 1, 2 and 3 functional responses? What sort of species have type 1 functional responses? What processes explain the shape of type 2 & 3 functional responses? What are the 3 main classes of numeric responses? How can an inverse numeric response occur? Explain how a predator with a type 2 functional response can mimic fixed quota harvesting, and a predator with a type 3 functional response can mimic fixed effort harvesting.

Understand how species richness and even-ness can be combined in measures of community diversity like Shannon's Index or Simpson's Index

What evidence suggests that productivity promotes community diversity? How does the 'intermediate Disturbance hypothesis explain community diversity? How are productivity and disturbance effects combined in the productivity-disturbance-balance hypothesis?

What do resistance and resilience measure about stability? What does MacArthur's hypothesis about 'functional redundancy' predict about the relationship between community diversity and stability? What did May's model based on randomly assembled community matrices predict? What do empirical studies suggest about the relationship between a community's diversity and variability in its productivity?