Conservation Biology 565 -- Spring 2007 – FINAL EXAM Part II – In Class

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DON'T FORGET TO WRITE YOUR NAME ABOVE!!
SAVE YOUR FILE WITH YOUR LAST NAME AS THE BEGINNING OF THE FILE NAME!!

*Take up to **1.5 hrs** to complete this exam.*

***Directions**: This exam is **OPEN** book, **OPEN** notes, **OPEN** web, and **OPEN** mind. You must **ACKNOWLEDGE** your sources if you consult sources to find the answer (that is sources other than class materials and lectures)! These are supposed to be SHORT answer.*
*There are **10** questions—answer as many as you can in **1.5** hrs. You will receive up to **5** pts for each answer, for a total possible score of **50**. Good luck, have fun, and **LEARN**.*

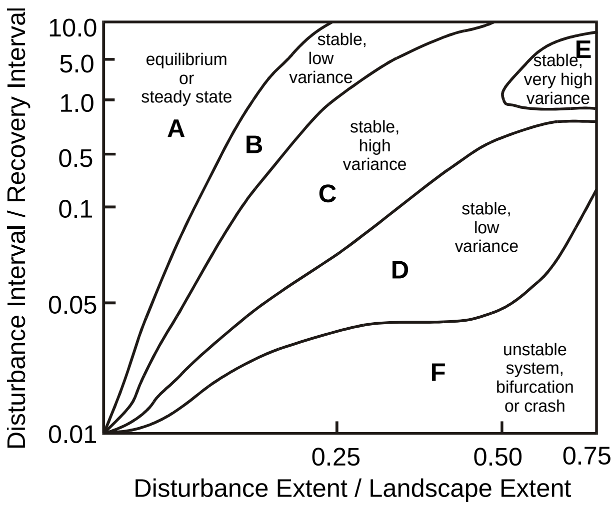
1a. What does the figure below tell us about how to define Minimum Dynamic Area?

The minimum dynamic area is that needed for disturbance regimes to create stable patch dynamics on the landscape. The MDA can be found by finding the disturbance extent/landscape extent that does not yield state F (unstable system/crash).

1b. Which part of the figure comes closest to Quantitative Equilibrium (you can write on the figure)?
This is shifting mosaic/steady state equilibrium – the distribution of age states across the landscape is constant. This only occurs in the region marked A (equilibrium/steady state).

1c. Which part of the figure refers to Qualitative Equilibrium (you can write on the figure)?
This is persistence equilibrium – all species and stages are always present but their abundance may fluctuate considerably. This only happens at low levels of variance, since at high levels, disturbance intensity and extent is likely high enough to reset succession in most areas. Thus, quantitative equilibrium would only occur in the upper left part of the graph, where disturbance/recovery interval is high and disturbance/landscape extent is low.

1d. How does the diagram relate to the "natural range of variability" concept?
The natural range of variability is the concept of qualitative equilibrium for a landscape – the range of spatial and temporal variability they would have had under historic disturbance regimes. However, By looking at the respective areas of each of these regions on the graph, we can see what amount of the time a landscape spends at each of these states. A landscape spends most of its time in equilibrium/steady state or at stable/low variance (A+D), so if we looked at a graph of disturbance intensity over time we would see very little variability. However, stable-high variance (C) and stable-very high variance (E) have smaller areas – these represent major disturbances and/or catastrophic events that occur very infrequently.



2. Describe the most important problem with Spatial Reference as part of reference information in restoration.
A spatial reference is a different place at the same time that is used as a guide for what we want an area to look like after it has been restored. The problem is that the spatial reference will never have the exact environmental conditions or species composition as the area we want to restore.

3a. Give an example in which fuel treatment affects future fire behavior.
Ecosystem: A low-elevation ponderosa pine ecosystem naturally has low-intensity ground fires. However, once fire suppression has occurred and the canopy has become very dense, the large amount of ladder fuels can make fires more intense.

Fire regime type (e.g., by frequency, intensity): Reducing fuel load and eliminating fire suppression in a dense ponderosa pine forest increases fire frequency and decreases intensity. The result of this fuel treatment is to make conditions better for small, frequent ground fires rather than hot, infrequent crown fires, which is the natural condition in an open ponderosa pine ecosystem.

3b. Given an example in which fuel treatment does not affect future fire behavior.
Ecosystem: One in which abundant ladder fuels and dense trees/shrubs naturally occur and climate is a strong governing factor in fire behavior. An example of such an ecosystem is spruce-fir forest.

Fire regime type: It is usually too moist for fires to burn spruce-fir forests, but on the infrequent occasion when the climate is especially dry, there is plenty of fuel to create high-intensity fires.

4. How do the predictions of Assembly Rules differ from the predictions of the original and simplest form of the predictions of island biogeography?
Island biogeography predicted that species turnover would occur at equilibrium and there would be random species assemblages. However, Diamond said that certain combinations of species were more stable than others, and that their order of arrival would influence which species would establish. These assembly rules predict a non-random assembly of communities, unlike island biogeography, which predicts a random assembly of communities.

5. We covered 6 hypotheses for fragmentation experiments. List what you consider to be the most important underlying scientific basis for each of the 6 (in 5a-5f):
5a. Species richness increases with area: Wog-Wog study with millipedes and frogs

5b. Species abundance and density increases with area: Biological dynamics (Bierregaard and Lovejoy). Also, Terborgh et al – in predator-free forest fragments, species abundance increased for species able to persist on small islands.

5c. Inter-species interactions modified: Jennersten 1988, pollinator/plant interaction was altered due to fragmentation

5d. Edge effect influences ecosystem services: biological dynamics (Bierregaard et al 1992)

5e. Corridors enhance movement: Collinge 1995 in Colorado grassland

5f. Connectivity increases richness: Collinge 1995 in Colorado grassland

6. Consider richness as a community attribute that is hypothesized to influence species invasions. Two opposing ideas are that "rich get richer" and "richness is negatively correlated with invasion".
6a. What kind of evidence supports the "rich get richer" idea?
Stohlgren 2003: diversity hotspots are more invasible when looking at multiple spatial scales
Rebecca Brown 2002: exotic species richness increased as native species richness increased, at two different spatial scales.

6b. What kind of evidence supports the "richness is negatively correlated with invasion" idea?
Farglone and Tilman 2005 – invader biomass declined when species richness increased.
Levine 2000 – in grasses, species-rich areas had less invasion.

Stachowicz 1999 – more species make more efficient use of space, and thus lower community invasibility.

7. Give examples of natural rarity under the 2 Pillars of Ecological Explanation.

7a. Pillar 1: Niche differences: rare species may be at a high trophic level (large carnivores), have narrow niches (specialists such as pandas), live under rare conditions (cave-dwelling fish and invertebrates), have a different innate biology (that might allow them to live under a narrow niche), or are vulnerable to natural biological change (either due to living under rare conditions or having narrow niches).

7b. Pillar 2: Spatial and temporal constraint: rare species are rare because the climate has changed, leaving them in refuges (cold-climate flora living in the Great Smokies – in this case, climate change has also placed upon them a historical limit). Or, species can have poor dispersal relative to habitat dispersion (salamanders).

8. How do you use Gst to design an ex situ conservation strategy?

To have a good ex situ conservation strategy, we want to select a range of individuals from a population and populations under different environmental conditions that give the highest value of Gst. This is because 1) the proportion of total alleles within a population is correlated with Gst, so to maintain high genetic diversity in a population, we need to have a high Gst. Also, 2) since we would want to maintain population diversity under low gene flow conditions (since the ex situ population would be largely isolated from natural populations), we need a high value of Gst, which would require a larger number of populations to maintain 95% of the species' genetic diversity.

9. Give two examples in which unwanted selection occurs for an ex situ population:

9a. If too small a number of individuals are taken from the wild, a founder effect can occur where the genetic diversity of the ex situ population is not representative of the wild, in situ population. This is a part of Thread 6 (conservation as sampling). Unwanted selection can occur immediately as a result of sampling if the sample size is not large enough to capture all of the species' genetic variability.

9b. The different environment where the ex situ population lives can exert different selective pressures than exist in the range of the natural population, causing unwanted selection over a longer period of time. Also, even if both environmental conditions could be exactly the same, random genetic drift would still occur to make the genetic composition of the ex situ population diverge from that of the wild population.

10a. Why are the feasible goals of restoration scale-dependent?

The restoration of large-scale areas is dependent on the success of smaller-scale restoration projects that occur within that larger scale. For example, it may be feasible to restore a 100 m wide stream corridor to a more pristine condition, but to restore an entire watershed to the same condition, we need to restore many such stream corridors. That would take a long time.

10b. How is this related to the Two Triangles idea for the scope of conservation biology?

Ran out of time