

## **ANALYSIS OVERVIEW**

This document gives you an overview of some of the data analyses that we'll be doing once you're done compiling the data. You will likely do the data analyses as a class, so we don't need to take you step by step through each one of them. Still, you may find it easier to compile the data if you understand why we're collecting all this information. In addition, knowing what analyses are planned might give you some ideas about additional analyses you'd like your class to carry out. This list is to some extent just a starting point.

### **ANALYSIS 1: What landscape factors best explain species richness and the presence/absence of individual species?**

The landscape data spreadsheet contains a number of variables that may be related to amphibian species richness and the presence of individual species: for example, habitat richness, the density of roads, whether or not a wetland is isolated, etc. We will compare different statistical models (i.e., combinations of variables) to find the one that is most closely associated with species richness and the presence/absence of individual species. This is not as easy as it sounds (there are an awful lot of possible combinations) but we'll come up with a plausible subset to compare.

When we perform this analysis, we may find (for example) that species richness in your state is most closely related to forest cover and habitat diversity. Or, we might find that road density and the proportion of developed area are most closely related to amphibian species richness (this latter relationship would presumably be negative). Either way, determining which factors are most closely associated with species richness is useful for knowing what makes a good site (or a bad site) for amphibians and for amphibian conservation. In addition, it will be interesting to see whether or not the variables that are important in your state are also important in other states.

### **ANALYSIS 2: Are the negative effects of roads on amphibians more associated with the number of roads in the landscape or with the local volume of car traffic?**

The goal for the first analysis is to combine variables to find the combination that best explains amphibian richness and presence/absence. However, by directly comparing particular models, we can test some specific hypotheses about landscape factors. For example, which has a bigger effect on amphibians, the volume of local traffic (which may kill frogs by running them over), or the density of roads in the landscape (which may contribute to habitat fragmentation)? By comparing a model that includes only traffic to a model that includes only road density, we should be able to examine this issue.

### **ANALYSIS 3: Are roads particularly bad for amphibian populations when they separate wetlands from uplands?**

Roads can contribute to habitat fragmentation in a couple of different ways. For one, they can restrict movement between populations – effects of road density are likely measuring (at least in part) this effect. However, roads can also divide wetlands from terrestrial habitats within a population and thus make it difficult for frogs to move between the different habitats they need for their life cycle. This effect is sometimes referred to as “habitat split.”

We can test for habitat split by comparing amphibian richness and presence/absence at sites where a road separates wetland from forest (WRF\_config = Y) to sites where roads are present but where wetland and forest habitats are not split (WRF\_config = N). By controlling statistically for the total amount of forest and roads in the landscape, we can ask if habitat split matters independent of the amount of forest and roads in a landscape.

### **ANALYSIS 4: Are amphibians more sensitive to the amount of different kinds of habitats in the landscape or to the particular arrangement of those habitats?**

What do you need to know to predict whether a site will be good for amphibians? Is it sufficient to know broad characteristics of the landscape (e.g. proportion wetland, proportion forest), or does one need to know the details of how habitats are arranged? Put another way, which is more important for amphibians, habitat loss or habitat fragmentation?

A number of variables that we are compiling are broad descriptors of the landscape – road density, wetland area, proportion forest, developed, agriculture. Other variables indicate landscape configuration – wetland isolation, wetland adjacent to forest, the WRF, WDF, and WAF configuration variables. We can compare a model containing only the landscape descriptors to a model containing only landscape configuration variables (and one containing both) to see which variables best explain amphibian species richness and presence/absence.

**OTHER ANALYSES:** Your class may decide to explore modifications of the above analyses or analyses that aren’t even listed. We’ve sketched out some ideas here, but we definitely haven’t thought of everything. You may think of potential problems with these analyses and you may think of ways of looking at the data that we haven’t considered. If you do have thoughts about the analyses, make sure to tell your instructor!