Counting On Diversity

Auriel Fournier – Math and Stats Editor

Conservation is hard. In a perfect world it wouldn't be, we'd need to do something to conserve a species or landscape and we'd have the resources to do it. That rarely happens, not only are resources limited in one way or another but how we decide what to conserve and how to compare options is never simple. Even if we 'just' want to conserve species that live in a wetland we have to still define what that means, one way we do that is by talking about species diversity.

When we look across the landscape it is never simple. In most areas habitat is not large and intact, it’s patchy, and owned and valued by many different groups. These various groups, value different things, different uses of the land, different ways of evaluating success and conservation. Balancing these to achieve goals is hard. Some stakeholders care only about one group of species (e.g. fish) others want to be able to enjoy the landscape by hiking, or camping, others care more about intrinsic value, such as knowing habitat is being provided for an endangered species. All of these are valid, of course, but balancing them is challenging. Species diversity is often part of this equation, but as simple as diversity may sound, there are many ways of evaluating it.

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Does diversity mean as many species as possible? If so, what species are we interested in, birds, mammals, reptiles, plants, insects, spiders, fish (the list goes on). Do we want to conserve places that are strong holds for a few common or charismatic species or for rare or endangered species? How do we rank possible places to be conserved, by area, by number of species, by cost, by proximity to other properties? Conservation biology has been struggling with this its entire existence and uses metrics, or mathematical ways of assigning numbers and ranks based on what we value, to help guide our decisions.

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Often when we are trying to conserve land, or a species, or a habitat we put together a plan, a plan that identifies properties that we could possibly conserve, and then ranks them. Some ways of ranking properties value the number of species (20 species at property A, 12 at property B, 5 at property C and 13 at property C). Which is more valuable?

By one measure its property A, hands down, it has the most species, but what if property C has 5 species that aren't found on any other property? What if 3 are endangered? Hopefully before this process starts we can determine how we value things, but often that evolves over time and depends what groups we can bring to the table to help with the planning. How much money do we really have? Do we want the new area to be near other areas already being conserved? The answers to these questions are never easy or black and white. They depend on our goals and what the organization(s) conserving the land.

The difficulty is that an ecosystem is not a sum of its parts, 20 species and 19 species can be drastically different if that species provides some vital service to other species. These relationships are almost never as simple as counting, they are interrelated, depending on and competing with each other. With one species goes away another may rise and become dominant, or may fall away because they depended on the missing species. With other threats to species like climate change in the mix how losing 1 species will impact others can be hard to evaluate, even with the best models and data about a species. For most species the data we need to try and model possible scenarios simply doesn't exist. Mathematical models can help guide our decisions, they can help us evaluate choices, compare options, incorporate information about cost but they are only as good as the information we give them. That information is both the data we have about the system, and the information about how we value the system and its components. We can make the model value the presence of an endangered species above everything else, or we can optimize for area conserved, or for diversity of fish species, but before we use these tools we have to decide what we value, and while math can be difficult, deciding what we value is much, much harder.