Community Ecology – Part 2: Succession

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*Number in outline corresponds to slide number the PowerPoint presentation.

1. Community Ecology Part 2
- **a.** Now that we have the basics of interactions and structure of a community down, let's look at how communities change over time in response to changes and disturbances that occur in that habitat.

2. Ecological Succession
- **a.** Succession is the term used to describe how a community changes over time. Typically new succession events begin with some sort of disturbance that dramatically changes the landscape. Thereby immediately impacting the species that are a part of the community.

- **b.** When that disturbance is sufficiently large, the community in question can become completely different than the one that was in place before the disturbance. As a community gets older and more established, the species found in that community will change over time based on the new conditions of the habitat. This is because as the conditions change, some species become less suited for the habitat and get squeezed out by one that is well suited.

3. Succession Terminology
- **a.** There are two important terms you must know in regards to ecological succession. Pioneer species and climax community. Climax community is simple defined as the community that was in place immediately before a disturbance disrupted it. Pioneer species are the first forms of life that move into an area after the habitat has been disrupted.

4. Pioneer Species
- **a.** Not every type of organism is well suited to be a pioneer species. There are certain traits that favor this lifestyle. They must have a fast growth rate, and frequent reproductive events, and short life span.
- **a.** Pioneer species must be tolerant of harsh conditions and capable of surviving in an habitat that has a very limited amount of nutrients readily available.
- **b.** Often times, PS have unique ways of acquiring nutrients that are not typical of other species, such as the ability to obtain nutrients directly from the atmosphere.
- **c.** They cannot be plant species for example, that have an extensive root system or very specific and narrow conditions ht it can survive in. Lichen and moss are primary examples of species that can grow in almost every type of habitat. They don't' require soil or large amounts of water (Often these are not easily available in a newly immerging community).

5. Primary Succession
- **a.** There are two types of successional events, of which we will talk about in turn, starting with primary succession. Primary succession results from a disturbance that was so intense the community was completely wiped out, with no vestiges of the species that used to live there. Types of disturbances that can trigger a primary would things like volcanic eruptions, landslides or floods, depending on the severity of these events. In most cases, such as volcanic eruptions, there is not even any soil left in the area, which lends to the need for species that don't require soil to survive, such as moss and lichen.
- **b.** An example of human caused primary succession happened in 1986 in Ukraine. One of the most notorious nuclear disasters in human history, that wiped out practically all life within close to a 4 mile radius of the nuclear plant poisoned water soil and air, killed over a million people and have lasting effects for at least 100 years after the accident. Although the area has started to recover and see new plants and animals move in, the radioactivity in the area is still high enough to prevent any real permanence and health of any life that moves into the area.

6. Secondary Succession
   a. Secondary succession is not as dramatic. This type of succession is caused by disturbances of a lesser degree such as fires, earthquakes, and human activities such as agricultural practices, logging, and urbanization. Secondary succession usually follows a disturbance of an existing community that removes or damages the vegetation, but does not remove, destroy, or cover the soil.
   b. Pioneer species in this type of successional event are likely to be plant species that have roots or seeds that survived the disturbance. This means that, typically speaking, unlike primary succession events, communities that come out of a secondary succession are most likely going to be the community that was in place before the disturbance.

7. Time Frames
   a. The time progression of each type of successional event is really variable depending upon the circumstances surrounding the disturbance, but for the most part, primary succession takes much, much longer than secondary succession. This is because there is a lot that needs to happen after a primary event to make the habitat suitable for habitation by a wide variety of species. In most cases, even soil needs to be replenished before any more than lichen can grow there.
   b. The process of soil development happens by two processes. Firstly, the pioneer species that grow, reproduce and die quickly are a major contributor to soil production. Secondly, the carcasses of organisms, such as insects and spiders, get blown in by the wind, but quickly die from lack of food will also contribute to soil buildup.

8. Disturbances
   a. As you can see there are many types of disturbances that can lead to succession events. If it has a large impact on the community, that impact will lead to change.

9. Community Stability
   a. Succession events can really be measured in terms of how stable a community is. And stability, in turn, is a measurement of biodiversity and species richness. The intermediate disturbance hypothesis is the idea that there are three aspects that influence the stability of a community in relation to disturbances that alter the landscape. How intense the disturbance, how often they occur and the amount of time that has passed since the last.
   b. For all three aspects, a community is considered to be most stable when all of these aspects are not at either extreme. In other words, Species richness greatest between disturbances of moderate intensity and frequency. An example of a community that benefits from secondary disturbances would be a redwood forest in northern California. Certain species of redwood trees, such as the giant sequoia, actually require the intense heat of a forest fire to activate seeds and trigger germination events.