

Ecological Succession Lab  
Warner Park Nature Center  
Teacher Guide

**Objectives for Ecological Succession Lab**

- Collect data on biotic and abiotic factors within different successional stages of the forest ecosystem.
- Recognize the differences between primary and secondary succession.
- Compare and discuss how species diversity is impacted by succession within the forest ecosystem.
- Investigate and identify natural and human disturbances and discuss impacts and alternatives.
- Evaluate the resiliency of the observed ecosystem and discuss factors that can prevent restoration after disturbance.

**Video Outline**

**Video length: 21min. Total approximate time to complete lab: 30-40min.**

Introduction

- Students are encouraged to observe abiotic and biotic factors as we hike to the study plots
- Ecological Succession is introduced
- Lab questions are introduced: 1) how does succession influence species diversity 2) how resilient is this forest ecosystem after a disturbance
- Primary vs Secondary succession is briefly introduced

Data Collection

- Naturalists measure abiotic data and observe all plant species (and total numbers) in an early secondary successional plot and a late secondary successional plot
- Students record all of this data on their plot sampling data form
- Explanations of DBH are provided

Data Review

- Students are given 4 questions to answer based on the data they have collected, observations they have made, and prior knowledge/experience:
  1. What are some conclusions you can make about how abiotic and biotic factors influence succession? What are some correlations that you observe?
  2. What would happen if a large tree fell in a late successional area of the forest?
  3. What other natural or human disturbances might occur in this forest?
  4. How does succession influence species diversity in this forest ecosystem?
- 4 additional videos are shown to assist with questions (and for final question). Videos include a disturbed area, a review of the emerald ash borer, an area over-run with exotics, and a review of animal diversity in the park

Discussion

Students are given the final question: How resilient is this forest? Video ends.

This question is meant to be discussed in class and facilitated by the teacher. Information is provided below.

Conclusion

There is no conclusion on the video, but it is suggested that teachers ask the questions provided in the background information.

## Background information for Discussion and Conclusion

What are some conclusions you can make about how abiotic and biotic factors influence succession?

What would happen if a large tree fell in the late successional area of the forest?

- Students should compare available sunlight and temperature to what type of plants dominate (sun-loving herbaceous, early successional trees like tulip poplar, etc)
- As trees grow larger, available sunlight is reduced which creates changes in the animal and plant community, etc.
- If a large tree fell in the woods, canopy would open, herbaceous plants would start to grow, early successional shrubs and trees, etc. Point out the following if the students do not:
  - Look again at your data plots. The small trees/shrubs can help us make predictions about what will happen if a disturbance occurred. If you have beech and maple saplings coming up, then those species stand to be dominant in the future and deductions can be made based on our current knowledge of beech/maple forests. But what would happen if most of the saplings and undergrowth are privet or honeysuckle? A shift to exotics appears probable once the current canopy dies out.
- Relate this back to the definition of succession. Mature, late successional ecosystems are not in a permanent state of equilibrium, but in a constant state of change – an ongoing struggle for enough light, nutrients, food, space as disturbances occur. We now talk about the stability of an ecosystem in terms of resilience.

What other natural or human disturbances might occur in this forest?

Ice storms, fires, floods, landslides, insect infestations, etc.

How does succession influence species diversity in this forest ecosystem?

Point out the following if the students do not:

- We now think the process of succession produces differing levels of diversity depending on the temperature and rainfall of the region. So in some areas, the number of species increases as succession proceeds, and in others late-successional communities have fewer species than early successional communities.
- The “intermediate disturbance hypothesis” predicts that ecosystems experiencing intermediate levels of disturbance will favor a higher diversity of species than those with low or high levels. In a forest ecosystem, sun-loving species can continue to thrive where-ever there is a disturbance, thus increasing overall diversity.
- In a mature forest ecosystem, there are more vertical niches to take advantage of, so you would expect a higher diversity.
- Also consider seasonal diversity – early spring woodland wildflowers for example

So how resilient is this ecosystem?

Consider and point out if students do not:

- Biologically diverse communities are more productive (in terms of biomass production) and are more stable than less diverse communities when disturbed.
- Discuss how biodiversity is affected by exotic species, like the chestnut blight (past) and the emerald ash borer (current). In the past, this forest ecosystem was dominated by the American Chestnut. All of these trees eventually died due to the chestnut blight, an exotic invasive fungus. So the forest was not able to restore itself. Now we have the Emerald Ash Borer that is going to take out all Ash Trees in Davidson county in our lifetime.
- Discuss effects of climate change. Consider effects of drought and fire in the Smoky Mtns last fall

## Conclusion

What can you do to support diversity within an ecosystem?

- Don't plant exotics!
- Volunteer for exotic pulls at Warner Park Nature Center