

# Successional Forests

## Using INaturalist

NWACC Campus Biodiversity

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Principles of Biology, EMPACTS Project

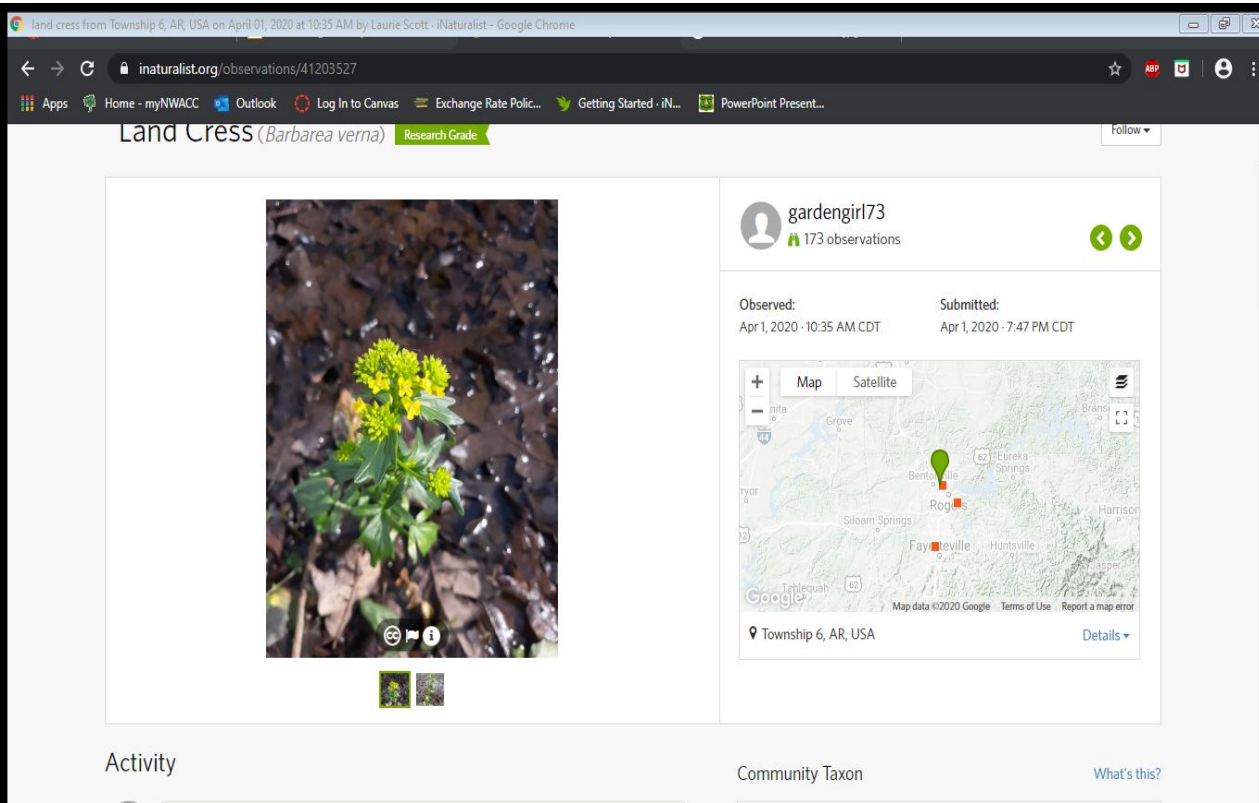
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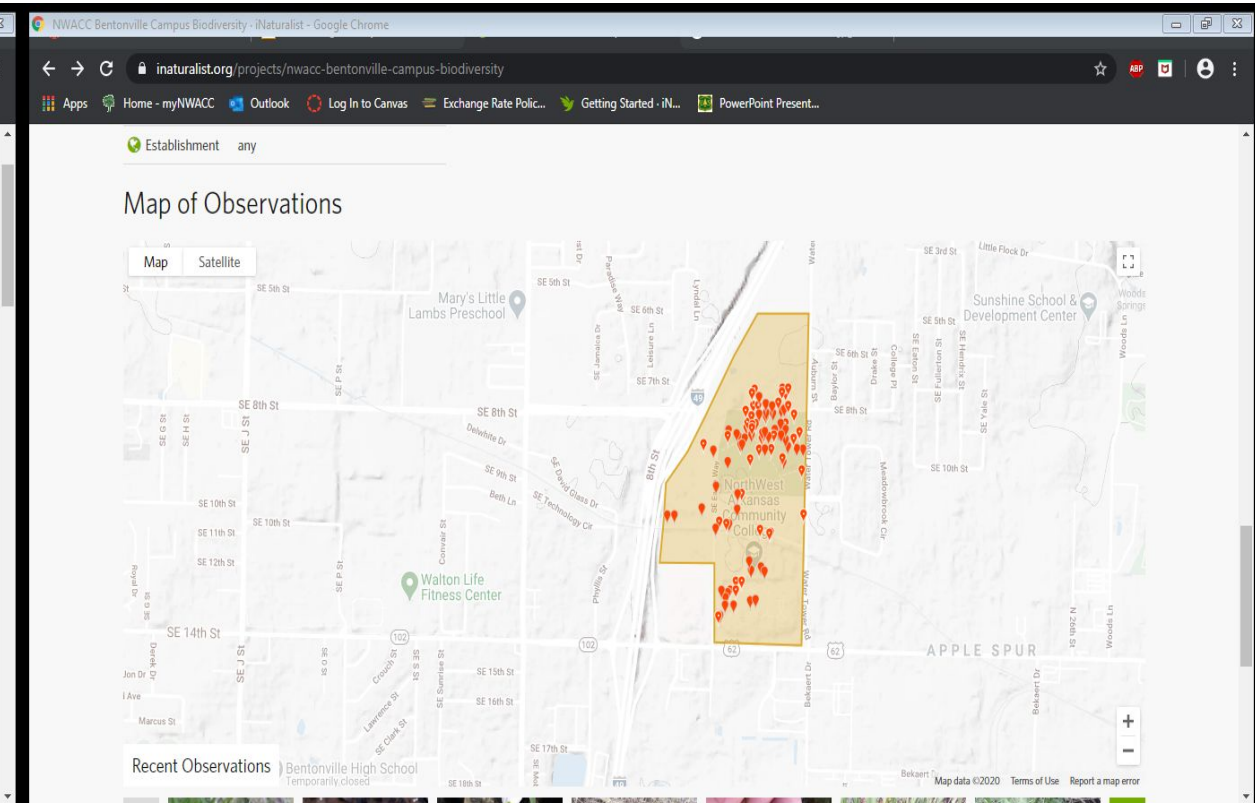
# NWACC Bentonville Campus Biodiversity created by nwacckurtis on August 18 2019

This project includes campus grounds and the NWACC Outdoor Living Laboratory at the Bentonville Arkansas campus.

Over 250 observations, 150 species, and 442 identifications are captured in the application . It helps students and teachers learning the biodiversity of NWACC surrounding areas.



This screenshot shows an iNaturalist observation page for a Land Cress (*Barbarea verna*). The observation was made by user 'gardengirl73' on April 1, 2020, at 10:35 AM CDT. The photo shows a small plant with bright yellow flowers growing in a mulched area. The user has 173 other observations. The location is identified as Township 6, AR, USA. The page includes a map showing the location in Bentonville, Arkansas, and a 'Details' link.



This screenshot shows the project page for 'NWACC Bentonville Campus Biodiversity' on iNaturalist. The page features a 'Map of Observations' showing a large number of red observation pins clustered around the NWACC campus in Bentonville, Arkansas. The map includes street names and landmarks such as Mary's Little Lambs Preschool, Walton Life Fitness Center, and NorthWest Arkansas Community College. The project is established by 'nwacckurtis' and is currently active.

# iNaturalist

The iNaturalist is online social network which is collection of localized websites and are fully connected to the global iNaturalist community. It helps people sharing biodiversity information online enabling to learn and explore the nature. People have access to coordinates from their local areas that are automatically obscured from public view. It also helps to protect threatened species.

It is also a crowdsourced species identification system and an organism occurrence recording tool. User can use the tool to record their own observations, get help with identifications, collaborate with others to collect this kind of information for a common purpose, or access the observational data collected by iNaturalist users.

Anyone with smartphones/computers with internet can easily use this application. It helps in keeping track of their own observations, maps, calendars, and journals as well as get help in identifying their observations. It is globally connected and supported by different local and international supporters such as: Map, National Geographic, Global Biodiversity informatics facility, and over 750,000 scientists and naturalists are engaged in it. It is very reliable to get help in learning about nature.

It is one of the best learning tools to get engage students, teachers, and researchers in many schools and colleges.



# Successional Forest

- Forest succession occurs through gradual and natural process of supplanting of plant community and species types that live in an area.
- Succession process usually takes over time:
  - It can be few years to many decades
- Types:
  - **Primary and Secondary**
  - **Shade Tolerance and Shade Intolerance.**
- It can be set back to any stage through outside disturbances
- Disturbance can be anything that interrupt the natural succession. Example; fire, flood, parasitic insects, and volcanic activities.

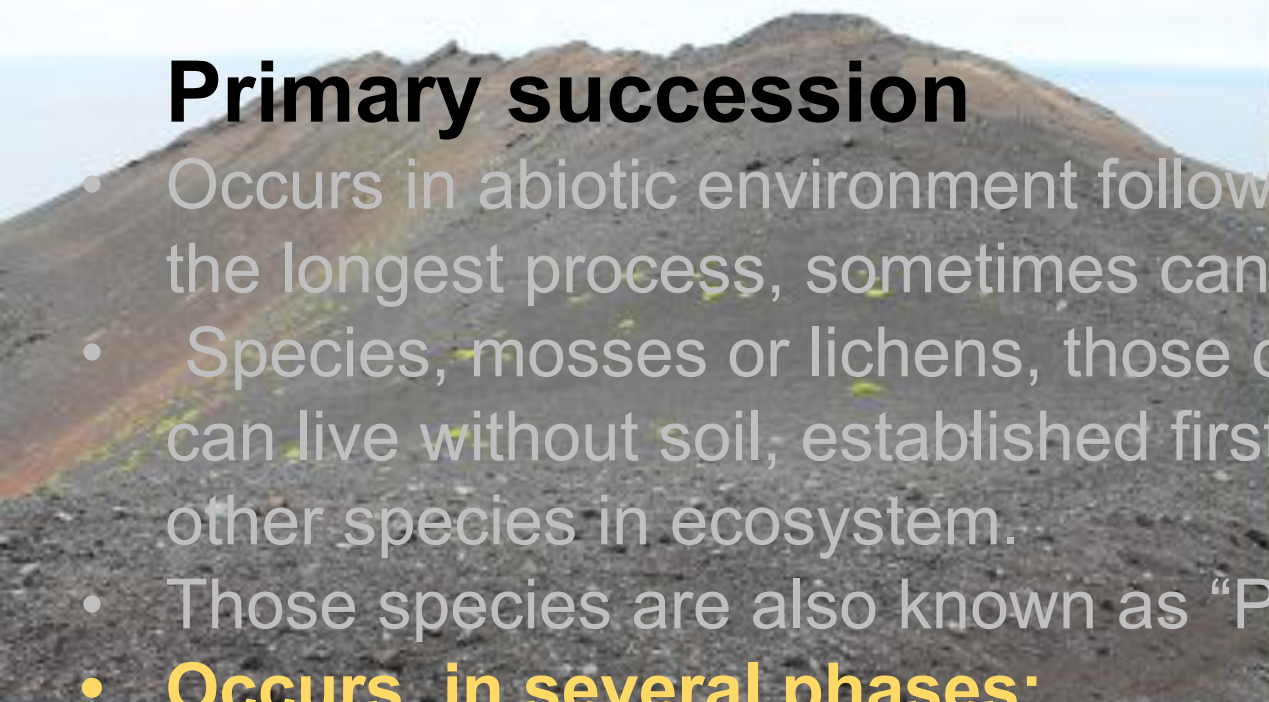


# Primary succession

- Occurs in abiotic environment followed by catastrophic disturbance. It is the longest process, sometimes can take up to thousands of years.
- Species, mosses or lichens, those can tolerate harsh environment or can live without soil, established first making favorable environment other species in ecosystem.
- Those species are also known as “Pioneer” or “Opportunistic” species.

- **Occurs in several phases:**

- **Barren land**
- **pioneer species**
- **Grass**
- **shrubs**
- **Plants**
- **shade intolerant plants**
- **shade tolerant plants**
- **climax).**





# Secondary succession

- Occurs in area where major disturbance, such as wildfire, deforestation, or clearing, happened leaving some form of life not destroyed.
- It is influenced by pre-disturbance conditions such as soil, seed, organic remains and residuals. So succession period is much faster than primary succession.
- Pioneer plants for example: Raspberry, heaths, graminoids.
- Phases:
  - Grass
  - Plants
  - Trees
  - climax



## Shade Intolerance

- As pioneer species are capable to germinate and grow in direct sunlight.
- Once they form closed canopy, seedlings from them are unable to develop due to lack of direct sunlight.

## Shade Tolerance

- Species having higher tolerance to shade established under the pioneers.
- Interesting thing is the process of taking place by high shade tolerance species keep repeating which result major changes in ecosystem.



A landscape photograph showing several large, leafless trees in the foreground and middle ground. In the background, a fire is burning, with thick white smoke rising and partially obscuring the sky. The ground is covered with dry grass and fallen leaves. The overall scene suggests a natural disturbance event like a controlled burn or wildfire in a wooded area.

## **Environmental Service: includes both biotic and abiotic**

- **Plant succession occurs based on competition, site fertility, temperature, water availability for growth and seedling establishment, and the effects of PAR conditions.**
- **Species competitiveness is based on its responsiveness to stress tolerant; shade tolerant and shade intolerant.**
- **Several process may occur depending on flow of energy, nutrients, water, disturbances (fire, landslide, windthrow, diseases, insects).**



# Primary producers



Lichens



MOSS



Fungi



Algae

# Secondary producers



Raspberry



Heaths



Graminoid



## Primary Consumers



## Secondary Consumers

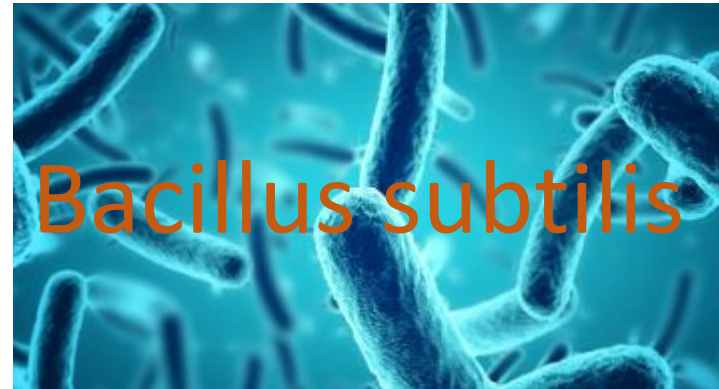




# Decomposers

They break down organic material to forms that can be assimilated by producers

Eelworms





# MAP: NWACC Living Laboratory



LL10

LL9

LL8

Successional Forest

LL7

LL2

Wetland

LL1

LL6

post Oak Flatwoods

LL5

LL3

LL4



# Monitoring Point for Succession Forest: LL8, LL9, and LL10

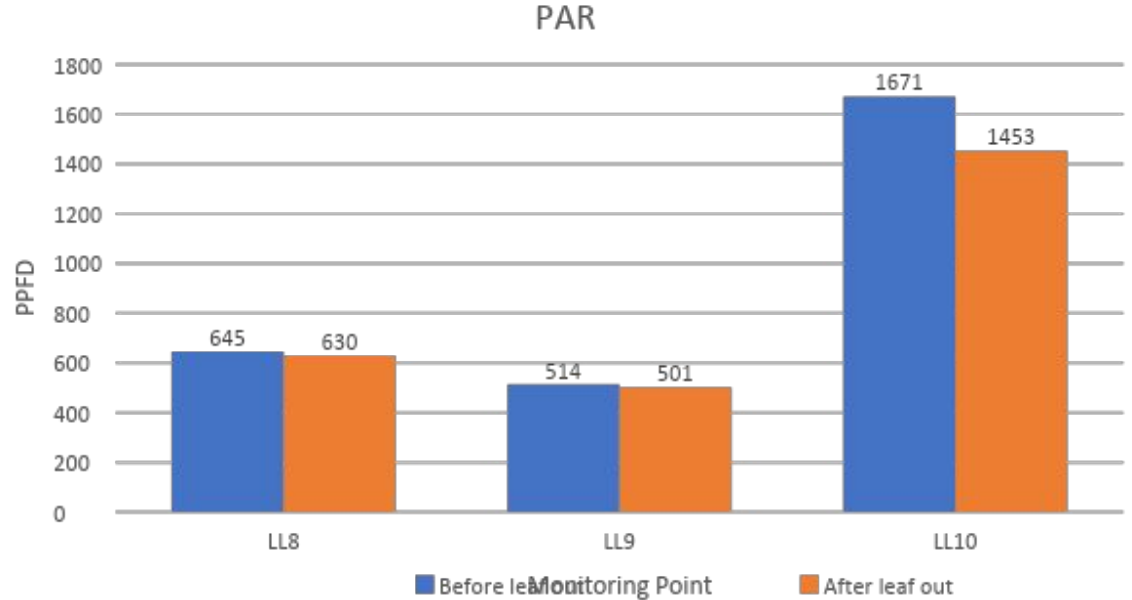
2020 Spring Plant Biology EMPACTS Photosynthetically Active Radiation Study

PPFD average over 60 seconds  
( $\mu\text{mol m}^{-2} \text{s}^{-1}$ ) = micromoles/m<sup>2</sup>/sec

Monitoring Point	3/7/2020	4/15/2020
LL1	1284	1401
LL2 (12 in. depth)	728	726
LL2 (24 in. depth)	377	365
LL3	1226	1103
LL4	1273	1209
LL5	570	547
LL6	1236	1360
LL7	783	720
LL8	645	630
LL9	514	501
LL10	1671	1453

PAR = Photosynthetically Active Radiation

PPFD = Photosynthetic Photon Flux Density (PPFD)



At point LL8 PPF decreased by 2.33%, at point LL9 PPF decrease by 2.53%, and at point LL10 PPF decrease by 13.05%



## **Conclusion:**

From the chart analysis we can conclude that after leaf out, the density for forest increase which tend to decrease the light intensity. More leaves cause to increase shade and less light passes through the shade. This cause to grow of shade tolerance plants. This continue to keep happening that shade tolerance plants keep replacing the shade intolerance plants.

Besides the natural ways of phasing out of plants community such as: volcanic eruption, lightning, flooding, and land sliding, human activities like; deforestation, fire, and mining are also the cause for forest succession. Pioneer plants makes the soil favorable for other plant species to grow. Forest succession process, duration, and phases can vary depending on region along with availability of resources such as water, sunlight, type of soil, and intensity of plant species.

Forest succession is never ending important process on which the whole ecosystem is relied on.



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