Fire Ecology of the New Jersey Pine Barrens

Ecological and Historical Events that have shaped our Fire-Dependent Ecosystem

What is Fire Ecology?

- Concentrates on the origins of wildfire and its relationship to the ecosystem.
- Focuses on three concepts
  - **Fire Dependence**
    - Idea that plants rely on fire to make the environment more hospitable for their regeneration and growth
  - **Fire History**
    - How often fire occurs in a given geographical area
  - **Fire Regime**
    - The pattern, frequency, and intensity of wildfire in an area over a period of time

What are the Pine Barrens?

- The Pine Barrens is an *ecosystem*
- Made up of plants and animals and their non-living surroundings
- The *Pine Barrens* is a specific ecosystem in the northeastern US
- Areas are located on the flat sand and gravel of the Atlantic Coastal Plain
- Pine Barrens of New Jersey occupy 1.1 million acres
- Covers 22% of the state
- More than 50% of the Pine Barrens is permanently preserved

Is it Really Barren?

- 850 plant species and nearly 500 animal species documented

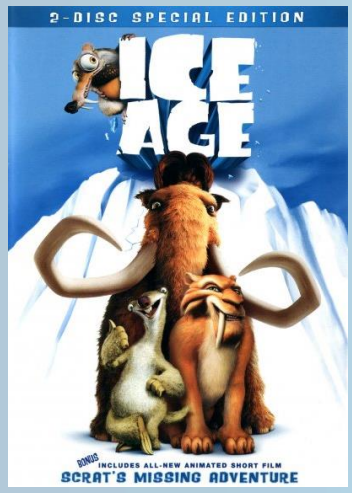
American Chaffseed

Swamp Pink

- Over 90 plant and 44 animal species threatened, endangered or of special concern

The Glaciation Timeline

Huronian
(2.4-2.1 bya)



Cryogenian
(850-635 mya)

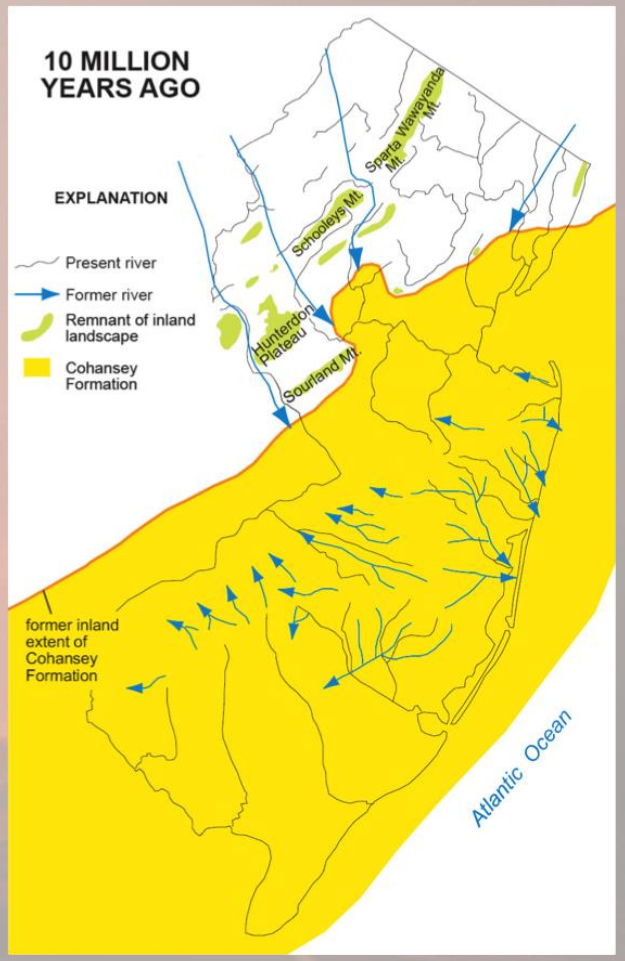
Andean-Saharan
(460-430 mya)

Karoo
(360-260 mya)

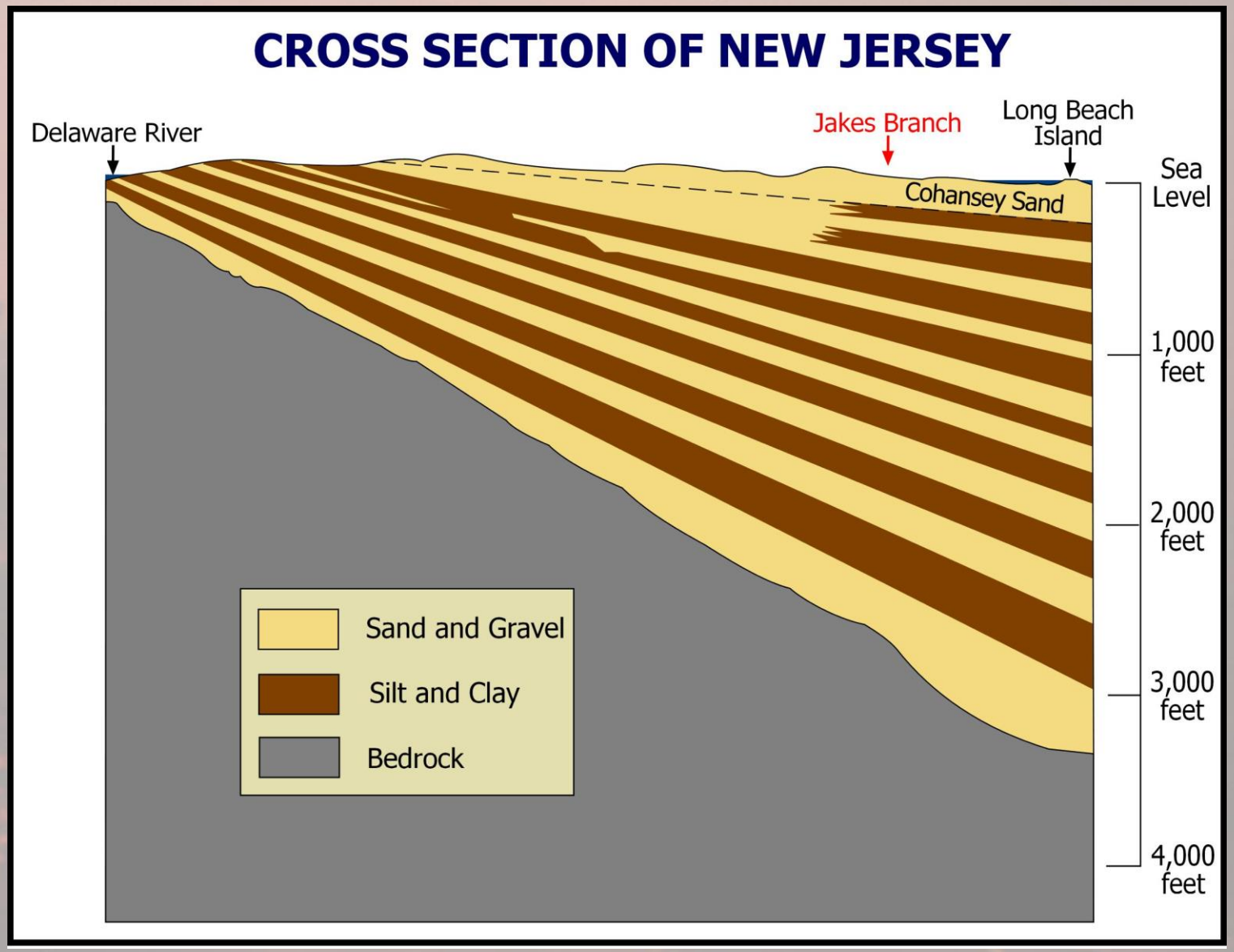
Quaternary
(2.6 mya-present)

Formation of the Pine Barrens

- Past ice ages alternately raised and lowered sea level many times
- Prehistoric rivers deposited sediment on the southern two-thirds of New Jersey
- Sediments first deposited 140 million years ago
- Alternating layers of coarse and fine sediment
- Cohansey Formation was deposited as beach sand and shallow ocean sediment
- Pine Barrens soil part of the Cohansey Formation
- Ice Age Pine Barrens was cold and windy with little vegetation
- Wind and water eroded the land



CROSS SECTION OF NEW JERSEY



Human History in the Pines

- Lenni Lenape created a network of trails
- May have set fires to improve hunting
- The first settlements dating to the 1680s were based on industry
- Early industries include: charcoaling and turpentine distilling, bog iron mining, clay mining, glass making, and paper making

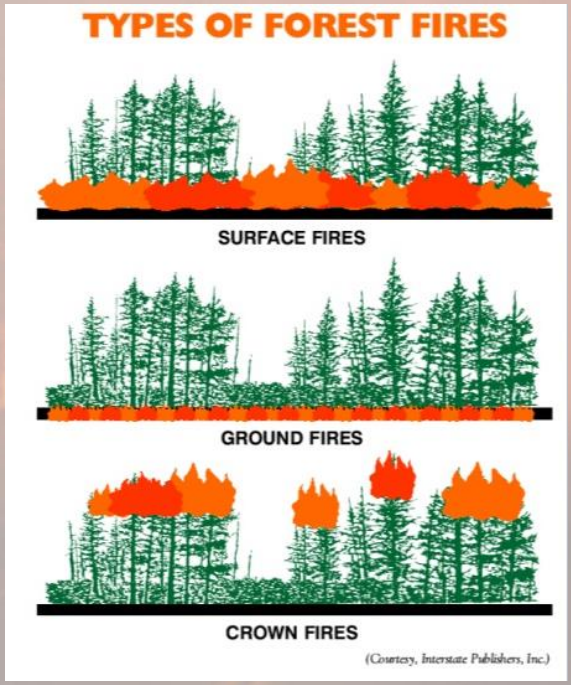
Fire is…

Destructive

- Wildfire: unwanted, unplanned or damaging

Natural

- Important Natural Shaping Force of the NJ Pinelands



Fire Intensity

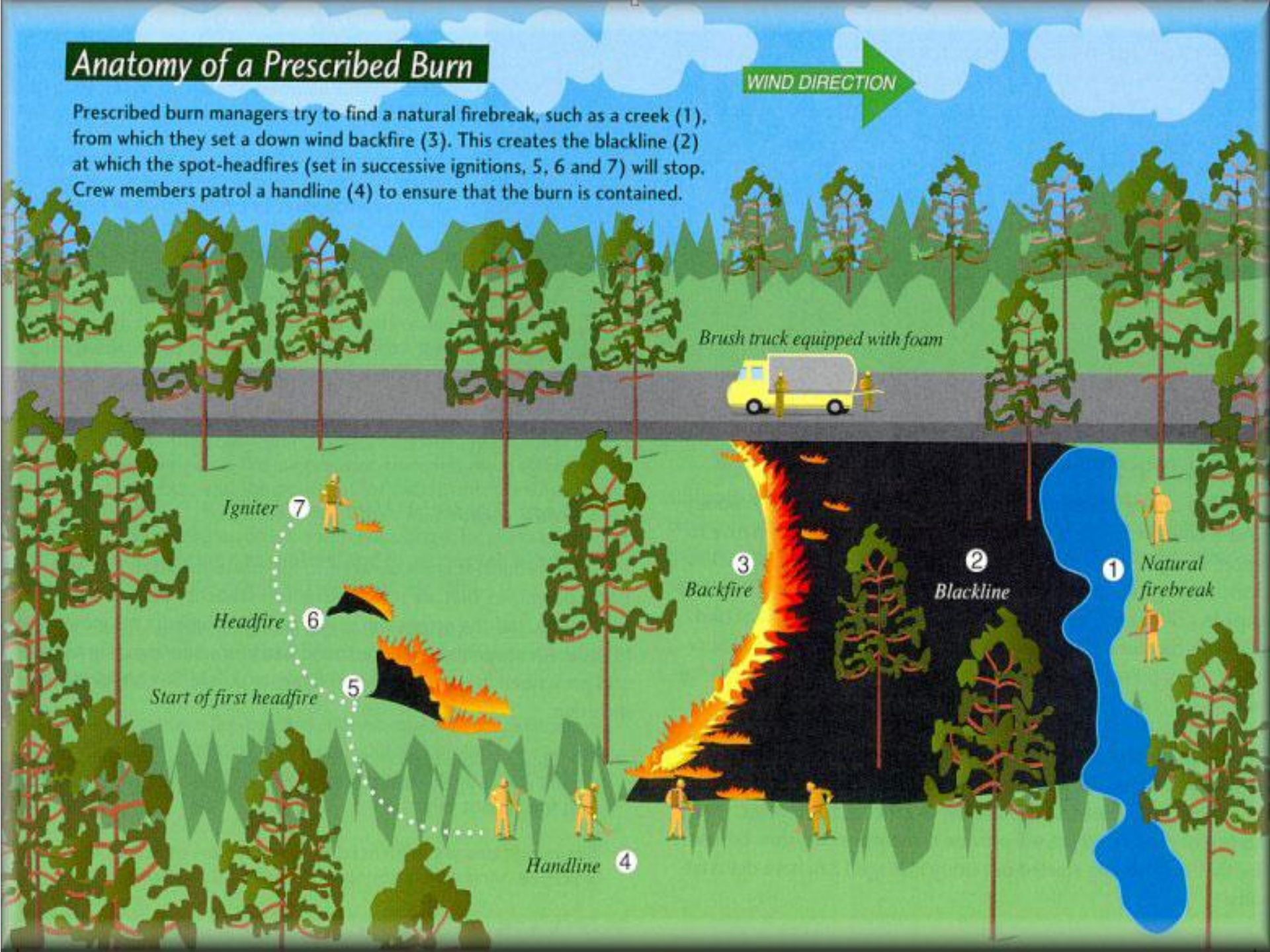
- Fire Intensity is the amount of energy or heat given off by a forest fire at a specific point in time.
- Prescribed burns eliminate the ladder fuels that allow the fire to move into the canopy, preventing crown fires
- Crown fires are destructive and dangerous

Fire Suppression

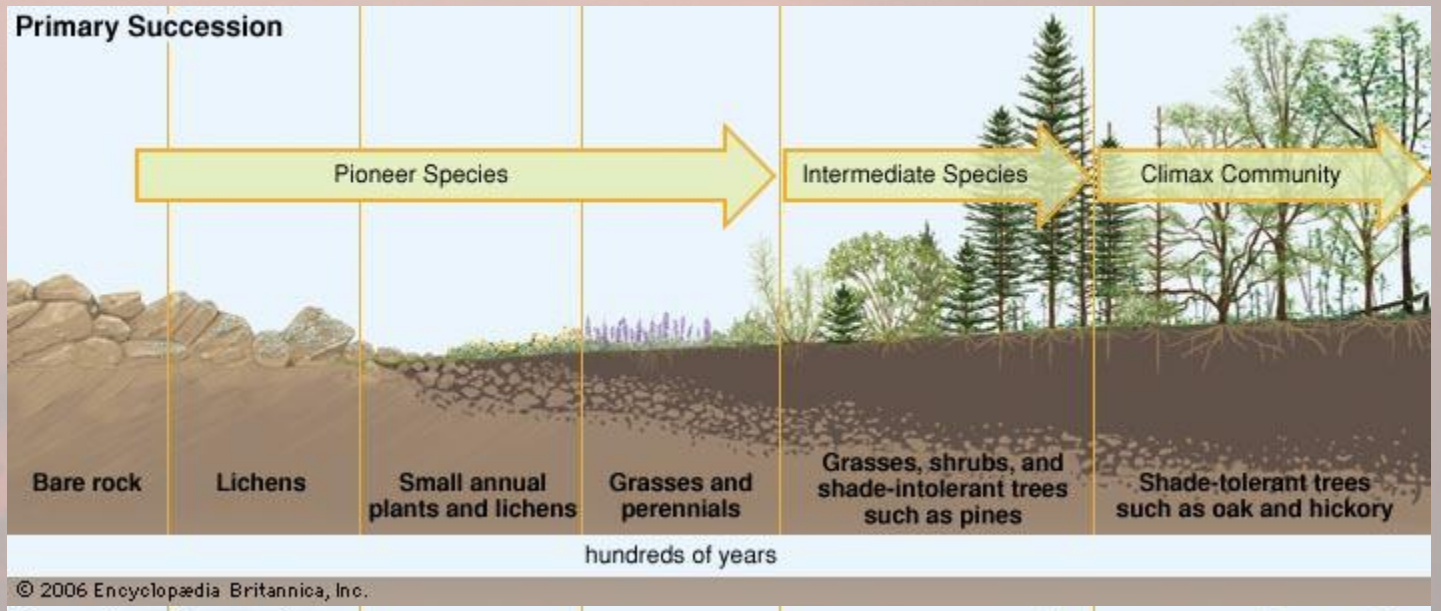
- Fire fighters put out fires and do not allow them to burn a large area
- Prescribed Burns
  - More frequent than natural fires (usually every 3-5 years)
  - Less intense fires that burn the surface of the ground and do not open the canopy

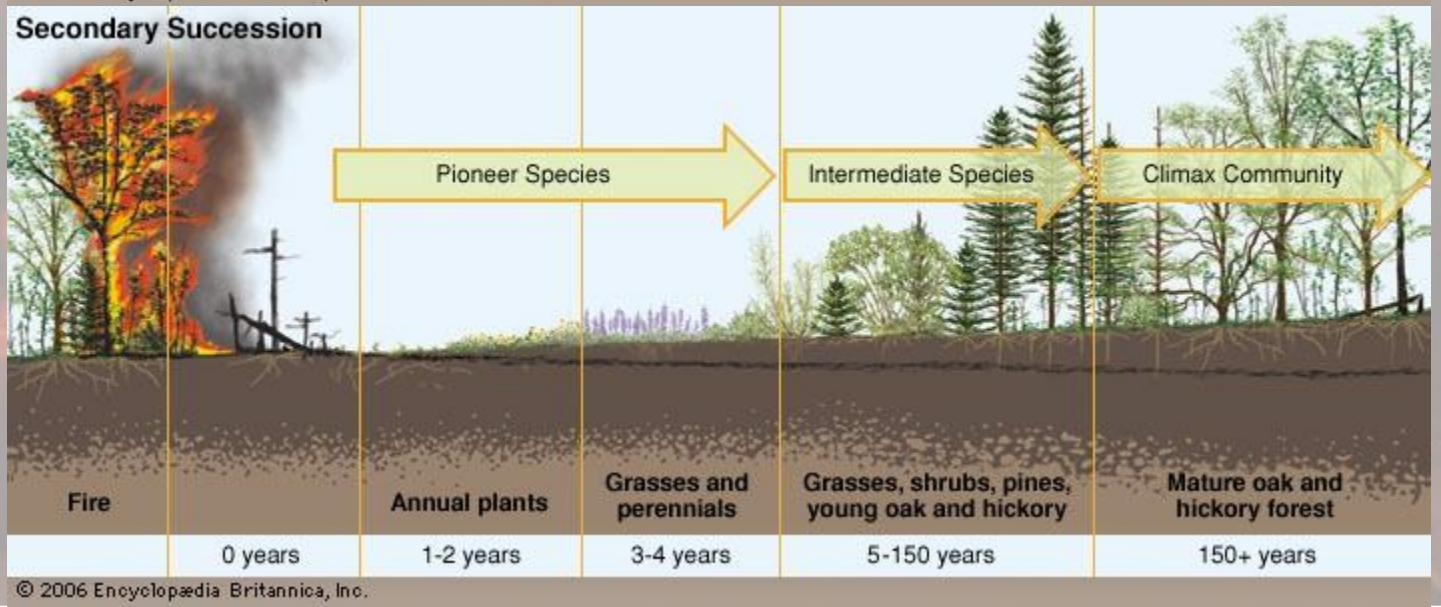
Anatomy of a Prescribed Burn

Prescribed burn managers try to find a natural firebreak, such as a creek (1), from which they set a down wind backfire (3). This creates the blackline (2) at which the spot-headfires (set in successive ignitions, 5, 6 and 7) will stop. Crew members patrol a handline (4) to ensure that the burn is contained.

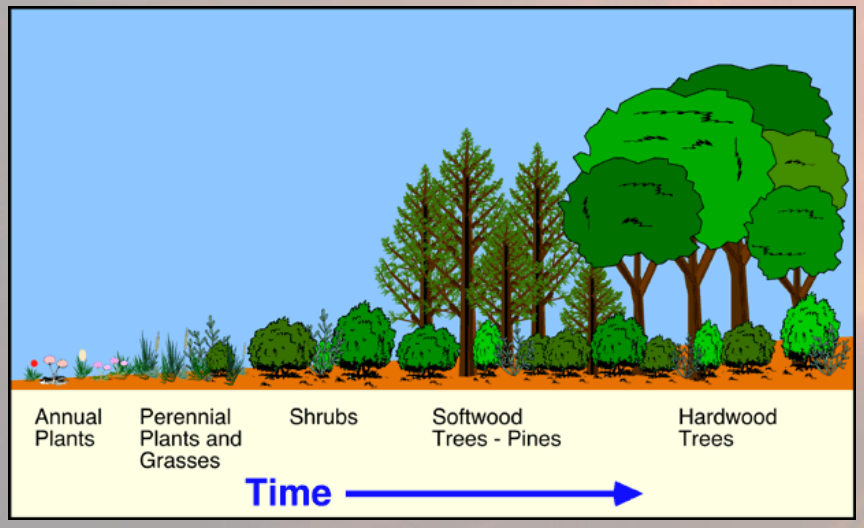


Succession ….What Is It?





Ecological Succession



- Regrowth after a disturbance occurs slowly and creates different habitats on the way to becoming a forest
- Sections of the forest are at different stages of succession due to different fires occurring at different times
- Successional stages provide different habitats and resources for wildlife.

Interaction Between Soil and Fire

- Effects of fire on soil are determined by:
  - Amount of heat released from burning biomass
  - Fire Intensity
  - Duration of fire/combustion
- The impact of these factors is measured as **Fire Severity**. It is defined in terms of:
  1. Length of time between burns and amount of fuel accumulated
  2. Fuel Properties
  3. How they impact fire location and behavior
  4. Heat Transfer in the soil

Physical, Chemical and Biological Impacts of Fire.

- Physical Impacts of fire include:
  - Breakdown of soil structure
  - Reduced moisture retention/capacity
  - Water repellency
    - All contribute to erosion
- Chemically:
  - Change in nutrient pools/cycling rate
  - Loss of elements
  - Loss of Organic matter
- Biologically:
  - Change/loss of microbial species
  - Reduction/loss of invertibrates
  - Loss of plant roots
- However, fire acts beneficially by:
  - Provides nutrients that would normally be locked away or slowly be released
  - Removes diseased plants
  - Creates new habitats and resets succession

Humans and Fire

- Urban/Wildland interface
  - Homes close to the forest will be in danger if there is a wildfire
  - People cause fires much more frequently than they would occur in nature

Jakes Branch Fire Timeline

June 2, 2002 through June 6, 2002

- Weather at 10:00 am on June 2, 2002:
  - 80˚
  - 54% humidity
  - Winds NW 12 mph
  - Moderate drought
- Smoke was first spotted by Cedar Bridge Fire Tower at 1:09 pm

Immediately after the fire was reported the humidity had dropped to 31% and wind gusts were exceeding 40 mph.

The first New Jersey Forest Fire Service (NJFFS) brush truck arrived at the fire within five minutes of its discovery.

Crews began lighting backfires along Double Trouble Road to burn the fuel between the fire and the Garden State Parkway.

The flames spread at a speed of 107 feet per minute, forcing initial attack crews to abandon the fire after only 16 minutes.

The Garden State Parkway was shut down at 1:31 pm because of thick smoke from the fire.

A NJFFS UH-1H Huey arrived at 1:50 pm and observed that the fire was almost to the Parkway.

One minute later the fire jumps Double Trouble Road. It has traveled nearly a mile in only 40 minutes.

The wind shifts and pushes the fire toward homes on Grand Central Parkway in Beachwood.

The fire reaches a home on Grand Central Parkway at 2:08 pm

More than 500 homes are evacuated in the anticipated path of the fire.

Shifting wind directions and spotfires ignited by embers make the fire dangerously unpredictable.

The wind shifts again, pushing the fire away from additional homes.

Even after the main fire had run out of fuel, firefighters continued to mop-up smoldering trees and logs in the fire's wake

Firefighting efforts continued, and the fire was not declared under control until June 5, 2002

The fire is declared out after heavy rains drench the fire on June 7th, 2002

Jakes Branch Fire Aftermath

An investigation into the fire found that it began on Double Trouble State Park property just to the west of Jakes Branch County Park.

The fire resulted from a campfire that was not extinguished.

Sadly, over 99% of the wildfires in New Jersey are caused by humans and could be prevented.

Only one home was lost, but many other homes as well as vehicles and other property damaged.

Some homes only narrowly escaped destruction.

If the fire had continued to spread, it could have wiped out the entire borough of Beachwood.

Three local teens who had lit the campfire were charged with arson for the Jakes Branch Fire.

A total of 1,277 acres were burned, including almost 3/4 of Jakes Branch County Park.

361 wildland firefighters and 65 vehicles from the NJFFS participated in fighting the fire, and firefighters from 52 fire companies in Monmouth and Ocean Counties helped protect homes.

But that's not the end of the story…Mother Nature can fix even the most destructive marks that we leave on the land.