

Forest Succession

Forest Succession

- How forests work.
 - shade tolerance
 - pioneers
 - climax species
 - forest succession

Shade Tolerance

Pioneer Species: Used to describe species that are intolerant to very intolerant to shade. The first tree species to inhabit a site after a stand-replacing event. They are typically fast-growing, are characterized by open or low density crowns, and have a relatively short life span.

Climax Species: Used to describe the most shade tolerant tree species that are native to a particular region.

Almost all North American woods that are used for structural timbers are pioneers or intolerant to shade.

Relative Shade Tolerance of North American Tree Species

Eastern Deciduous Eastern Conifers Western Deciduous Western Conifers

Very Intolerant

Jack pine **Aspen** Alpine larch Quaking aspen
Longleaf pine Gray birch **W. larch** Cottonwood
Sand pine River birch Bristlecone pine Willow
E. redcedar Black locust Digger pine
Tamarack Post oak Foxtail pine
Turkey oak Whitebark pine
Blackjack oak
Willow

**Construction
lumber**

Structural timbers

Furniture wood

Relative Shade Tolerance of North American Tree Species

Eastern Deciduous Eastern Conifers Western Deciduous Western Conifers

Intolerant

Baldcypress **Paper birch** Juniper Madrone
Loblolly pine **Butternut** Bishop pine Bigleaf maple
Pitch pine Catalpa Coulter pine Oregon ash
Pond pine **Black cherry** Jeffrey pine Calif. w. oak
Red pine Chokeberry Knobcone pine Oregon w. oak
Shortleaf pine K. coffeytree Limber pine G. chinkapin
Slash pine Honeylocust **Lodgepole pine**
Virginia pine **Pecan** Pinion pine
 Persimmon **Ponderosa pine**
 Y. poplar
 Sycamore

**Construction
lumber**

Structural timbers

Furniture wood

Relative Shade Tolerance of North American Tree Species

Eastern Deciduous Eastern Conifers Western Deciduous Western Conifers

Intermediate

E. white pine **Ash** **Douglas fir** Red alder

Black spruce Basswood Monterey pine

Y. birch **Sugar pine**

Am. elm **W. white pine**

Hackberry Blue spruce

Silver maple Giant sequoia

Black oak Noble fir

N. red oak

S. red oak

White oak

**Construction
lumber**

Structural timbers

Furniture wood

Relative Shade Tolerance of North American Tree Species

Eastern Deciduous Eastern Conifers Western Deciduous Western Conifers

Tolerant

N. white cedar Rock elm **Cedar** Calif. laurel
Red spruce Blackgum Grand fir Canyon live
White spruce Sourwood Subalpine fir oak
Red maple Calif. red fir Tanoak
Hickory **White fir**

Redwood
Sitka spruce
Englemann sp.

**Construction
lumber**

Structural timbers

Furniture wood

Relative Shade Tolerance of North American Tree Species

Eastern Deciduous Eastern Conifers Western Deciduous Western Conifers

Very Tolerant

Balsam fir **Beech** **W. redcedar**

E. hemlock Hornbeam Silver fir

Dogwood **W. hemlock**

Holly Calif. Torreya

Hophornbeam Pacific yew

Sugar maple

**Construction
lumber**

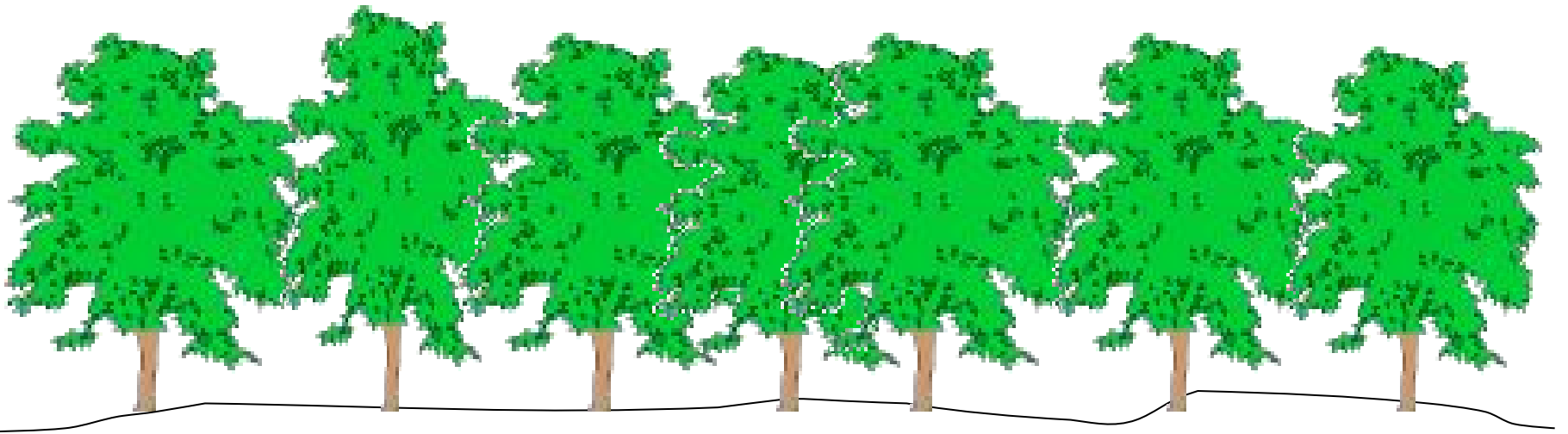
Structural timbers

Furniture wood

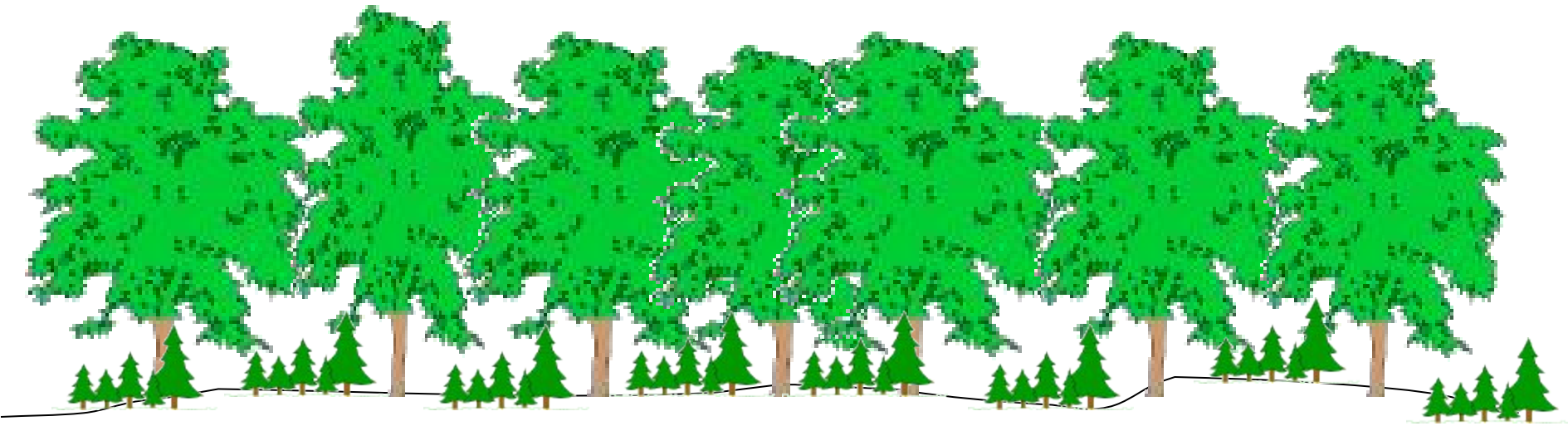
Forest Succession: The gradual supplanting of one community of plants by another, usually as a result of differences in shade tolerance.



Pioneer species quickly occupy a site following clearing.
They grow rapidly to compete with grasses and shrubs.




As the crowns of pioneer species close, seedlings from these trees are unable to survive in the resulting shade.



Different species that have a higher tolerance to shade soon become established beneath the pioneers.



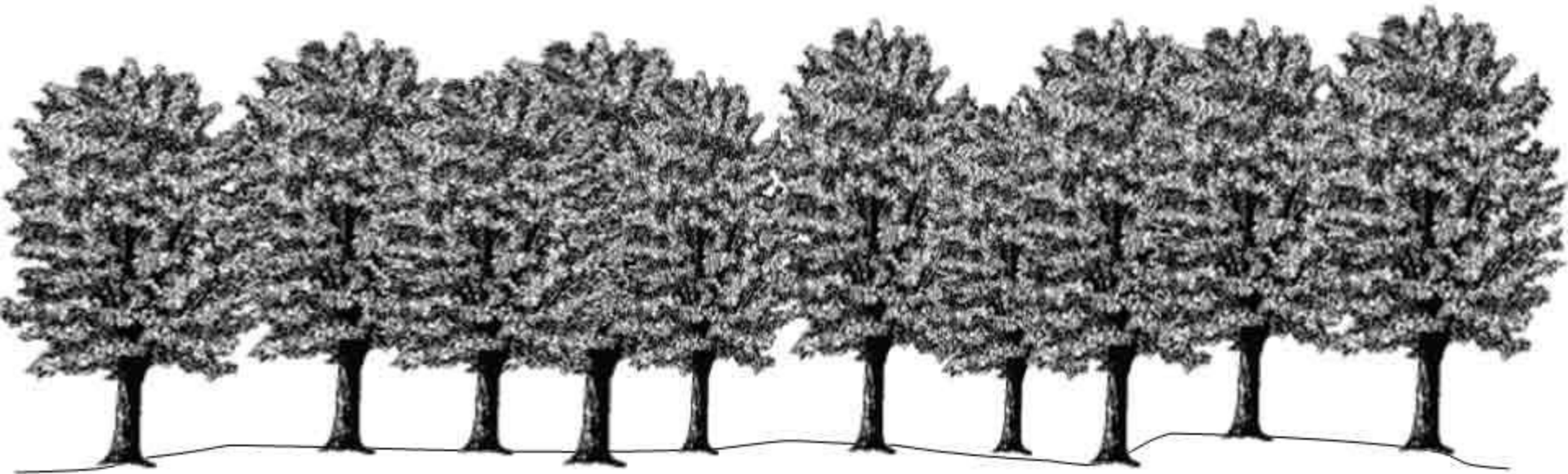
As the short-lived pioneers near the end of their life spans, the more tolerant trees in the forest understory begin to take over the site. The result is a major change in plant and animal species.



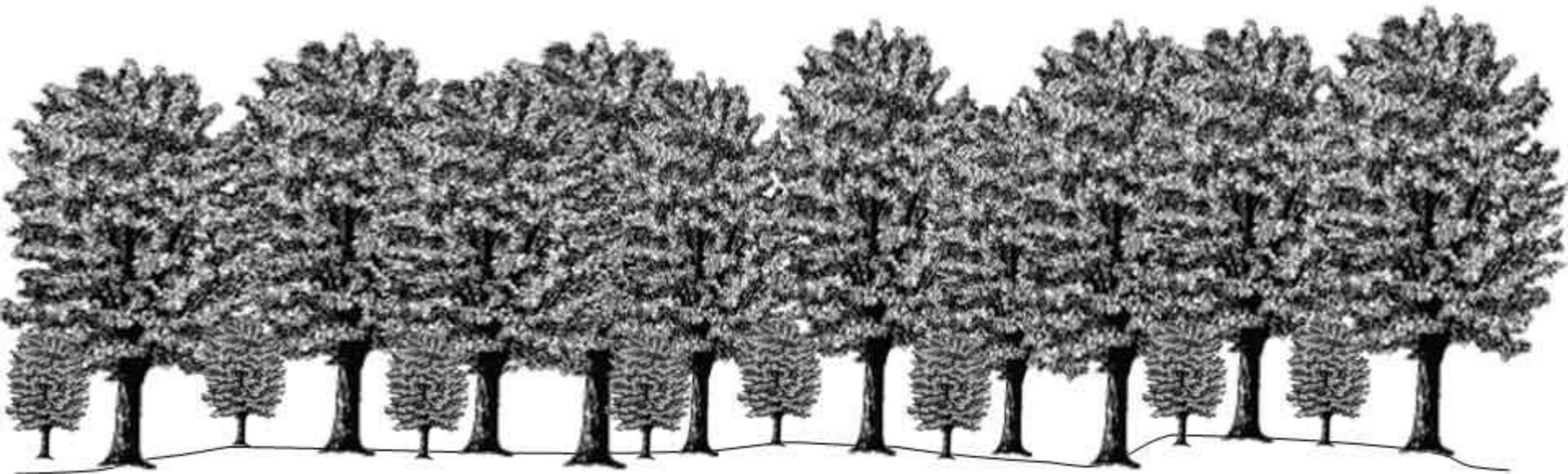
Spruce begins to take over an aspen dominated site in northern Minnesota as the short-lived pioneer aspen crowns thin with aging.



Beneath the second successional stage species, that often form thicker crowns than pioneers, new species that are even more shade tolerant become established.



The process of succession continues until the most shade-tolerant species suitable for the site (climax species) become established.



Seedlings of highly shade tolerant climax species thrive in the shade of their parents. Because of this, climax species will persist until disturbance sets back the succession process to the pioneer or some other stage.

Consider what happens following
the harvest of lodgepole pine in
the western U.S.



Clearcutting in Lodgepole pine - Montana.



The clearcut site looks barren immediately following harvest.

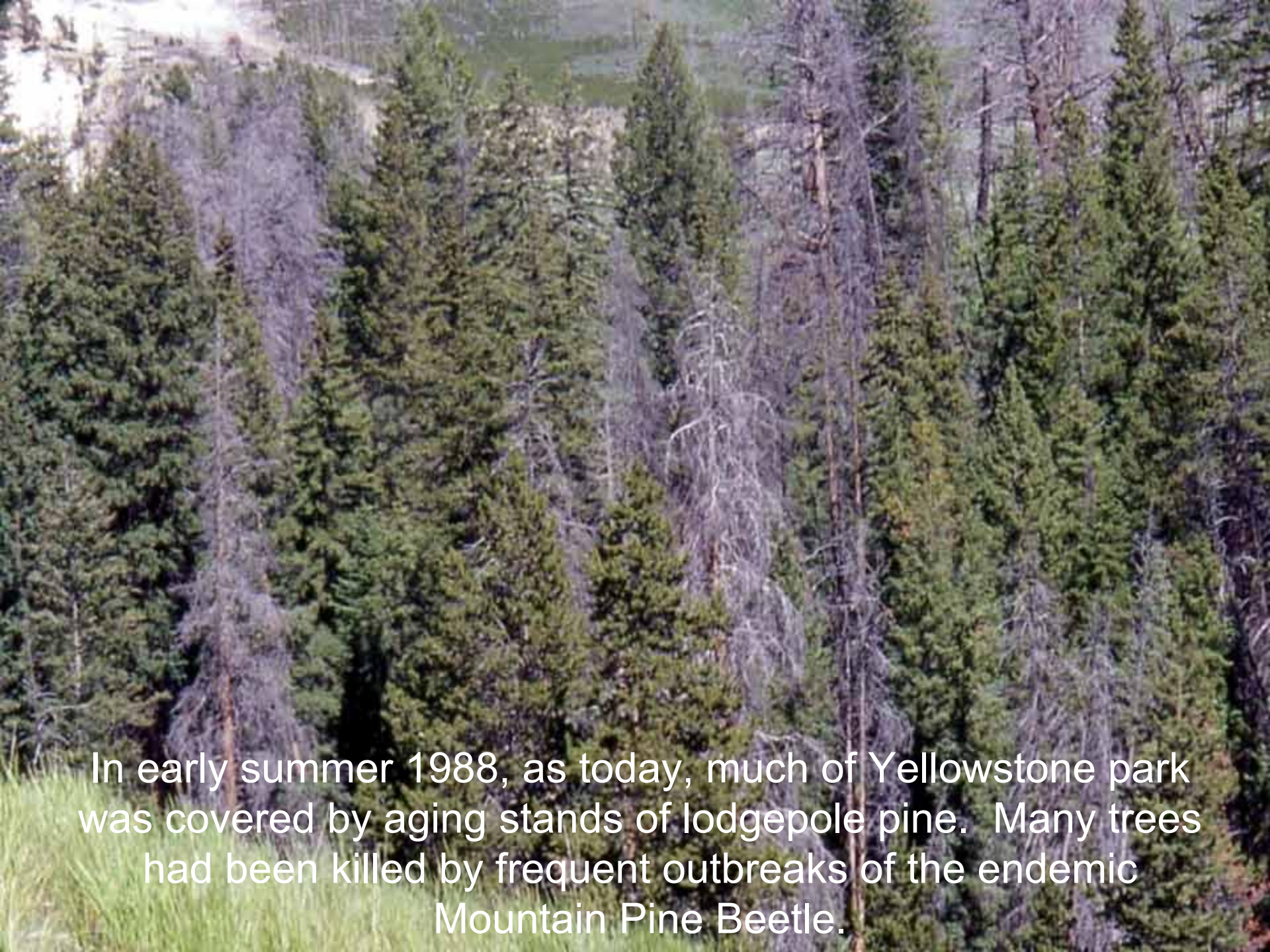


Similar area, two years following harvest, showing that grass has covered the site. Young pine seedlings are barely visible in the foreground.



At ten years following harvest young lodgepole pine trees, that have sprouted from seeds present in the soil and spread by wind and wildlife, are well established.

Compare this to developments following a clearcut by nature.



In early summer 1988, as today, much of Yellowstone park was covered by aging stands of lodgepole pine. Many trees had been killed by frequent outbreaks of the endemic Mountain Pine Beetle.



This condition led to the Great Yellowstone fire, 1988



Vast areas of lodgepole pine and other forest types were killed.



Eleven years later showed a landscape again dominated by lodgepole pine that had sprouted from seeds present in the soil.

Take a look at the commercial
harvest of aspen in Minnesota.



Clearcut harvesting in Minnesota aspen.



Aspen harvest site one year following clear-cut harvest.



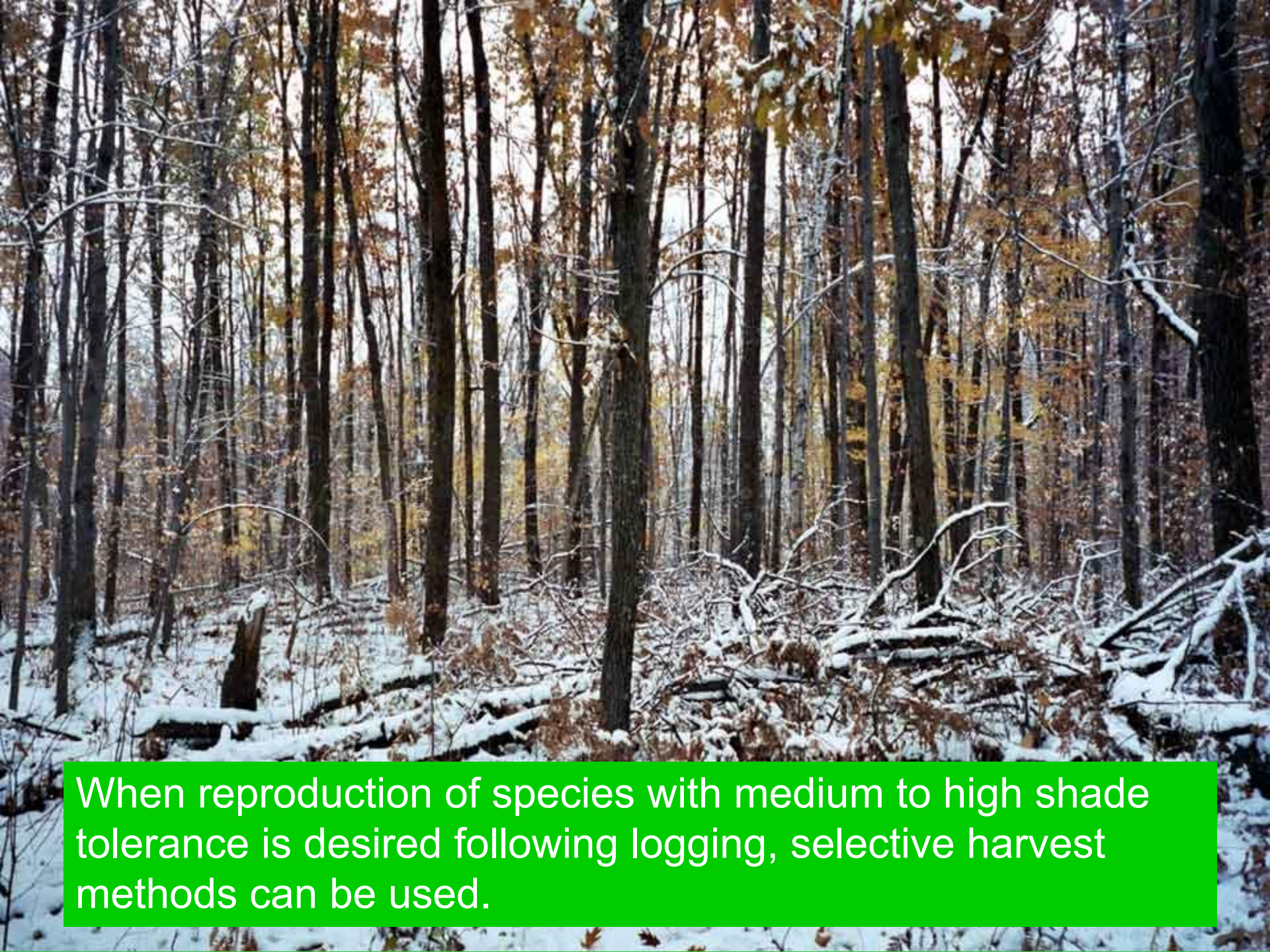
A good site several years following harvest. 50,000 to 100,000 stems per acre from stump sprouting.

Mature aspen
stand. 65-70
years old.
Approximately
200
stems/acre.



Question:

Assuming that
50,000 stems
occupied each
acre of the
harvested site
several years
following stand
establishment,
what happened
to the other
49,800 trees?

A photograph of a forest in winter. The ground is covered in a layer of snow, and many trees have lost their leaves, leaving bare branches. Some trees still have a few brown leaves. The trees are tall and thin, and the overall scene is a mix of white, brown, and grey.

When reproduction of species with medium to high shade tolerance is desired following logging, selective harvest methods can be used.

Question:

Based on what you have learned about forest succession and the kinds of trees that are most useful in producing structural timbers, why would anyone who cares anything about forests ever harvest by the clearcutting method?