A Group of Young Longleaf Pine Trees Growing in a Forest Opening

(bolded words in text indicate key words and concepts)

Student Information:

If you were to look at the longleaf forest from a bird's perspective, it would similar to a big piece of Swiss cheese. Over time, lightning, tornados, and hurricanes create "holes" in the forest by killing trees. It is only through the death of these older trees, that the younger forest can grow.

Teacher Information:

A quick glance across the longleaf pine forest may lead one to believe that all the trees are the same size. However, upon closer inspection tightly clustered patches of longleaf pine seedlings will be observed. Young longleaf pine seedlings actually take advantage of the forest openings created by the death of adult (**canopy**) trees to **regenerate**. These **disturbances** occur somewhat regularly. Lightning kills one or two adult trees frequently in the longleaf ecosystem while tornadoes and hurricanes may kill hundreds of trees infrequently. "Forest gaps" is the term that scientists give to these **forest openings**. This picture shows young longleaf pine trees accumulating in these **gaps**. The reason for this phenomenon is twofold. Adult longleaf pine trees drop seeds every few years. However, these living trees are also dropping pine needles every day. Pine needles burn very well. Small longleaf pine seedlings growing amongst all these pine needles have a difficult time becoming established because frequent ground fires sweeping through the forest burn them up. Because there would be less accumulation of pine needles in forest gaps, fires are unable to travel far into the opening-thus giving small seedlings a chance to grow. You will also note how the growth of these seedlings in these gaps appears to follow a "bell-shaped curve". The death of mature trees means that there is decreased **competition** and increased resources available for longleaf pine seedlings. Compared to "closed canopy" redwood, Douglas fir, or tropical rain forests, when walking through a longleaf pine forest you will immediately notice how open and sunny it appears. One would think that light would not be a limiting **resource** for seedlings. However, within these gaps light DOES increase as does soil moisture and soil nitrogen (all elements needed for longleaf pine seedlings to grow). The farther one travels into the gap, the more of these resources are available. Seedlings in a gap center are getting more light, soil moisture and nitrogen then ones growing at the edge-and thus are larger.

Some of the longleaf pine seedlings clumped together in this picture are observed in various stages of growth. Some longleaf pine seedlings are in the **grass stage**. The grass stage is a period when seedlings are not growing much aboveground and instead are putting on a tremendous root system below ground. In this stage, longleaf pine seedlings resemble a clump of grass-and hence the name. Longleaf seedlings are very resistant to fire at this stage. Trees may stay in the grass stage for several years until enough resources become available so they can grow in height. Other longleaf pine seedlings pictured are in the **rocket stage**. This is a stage when rapid height growth occurs in longleaf pine. For the rocket stage to start, excess resources must become available around the seedling. By growing fast, the tree is able to capture more resources then its neighbor, thus giving it an advantage. Also, rapid growth allows the tree to get its top above the frequent fires that move through the woods. Longleaf pine remains somewhat susceptible to fire when they leave the grass stage until they reach about 4 feet in height. Those trees that are stuck somewhere in between the two growth stages are usually thinned out by fire or stress over limited resources.

Key Words and Concepts: canopy, competition, disturbance, forest opening, gap, grass stage, regeneration, resource, rocket stage.