Dead trees and the dead wood cycle

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Introduction

A common misconception about forest would be that a “ healthy forest” should have only have trees that are alive or growing. This “ healthy” forest should be rid of dead trees as they would cause harm to the forest and/or perhaps spread disease of sorts. This misunderstanding originated from our lack of understanding of forests and trees. Dead trees play a crucial role in sustaining biodiversity within forests. They provide the forest with nutrients, a habitat for forest animals, rivers, soil, along with many other benefits covered in this paper. To highlight all the importance’s of dead or decaying trees this report will be broken down to sections

After defining exactly what constitutes as a dead trees, we will go in depth into the dead wood cycle. Following that will go into analyzing the benefits of dead trees that include and but not limited to[1];

- Hold moisture for the soil throughout arid seasons.
- Provide a location for necessary bacteria to survive
- Provide a home for small mammal dens and bird nests;
- Improving the soil by accumulation of organic matter.
- Offer a seed bed for redeveloping trees.

- scavenging spot for several insectivorous animals such as woodpeckers;
- food, protection, shelter, cover, and suitable climate for thousands of tiny organisms

Then role of dead wood in the ecosystem and finally we will conclude the report by stating important facts about the significant biodiversity found because of deadwood.

Definition of dead trees and decaying trees

Common sense would provide that dead or decaying trees are those trees that are no longer alive. However this is more of a definition of the different kinds of dead tress you could potentially encounter in a forest. We will analyze each kind and separate them from the others

Coarse Woody Debris

Coarse woody debrisis used to describe fallen deadtrees orthe leftovers of bulkybranches left either in the forest or in the rivers. There is a minimum size required for woody debris to be defined as " coarse", which is around 20cm in diameter. This also includes dead or decaying stumps[2].

Coarse woody debris are caused by ordinary tree death, illness, andbugs, as well as disastrous events such aswildfires, tornados, hurricaneand floods[3]. Old forests still contain dead trees and woodland remnants are still where they had fallen. These are recycled to nourish fresh vegetation and establishes the perfect woodland in relations of reprocessing and the renewal of fallen trees. As a matter of fact almost 30% of all biomass contained in a forest are from dead trees[4].

Large Woody Debris

Sticks, logs, and branches all are considered large woody debris. Wood that fall into streams and rivers are also believed to be large woody debris. This debris can affect how the water flows in and how strong or weak the channel is. This flow affects how much erosion goes on and thus affects how rivers and other water channels are shaped[5].

Large woody debris are important for all its effects on forest management as well as channel streams. The debris is one of the most important factors in the formation of pools and ponds[5]. As these pools and ponds are formed animals, such as salmon, frogs, and other small fishes. Large woody debris is an important source of biodiversity because if these ponds and or pools were not created a lot of these animals would be washed away. The frogs and other animals that nourish off these fish would lose a feeding ground. The measure of scrubbing and erosion is determined by the relation of the span of the wood, to the deepness of the watercourse, and how deep the piece is dug in[6].

Snags

Snags could be defined as coarse woody debris, however they operate in a slightly different way and can be identified in different ways. Snags costs of either standing, dead, or dying trees. Whereas coarse woody debris is usually fallen debris, snags are still standing. Both can, however, refer to dead or decaying trees/debris. Snags are also often missing their tops or most, if not all, of their branches[7].

Dead wood cycling

Dead wood cycling is the procedure of when the components of wood, enter the forest ecosystem through death, followed by decomposition and then reuse. Many components and functions of the forest are affected during the changes in trees. These changes are the most important physical features of forest.[8]Most forest ecosystems in general contain a large amounts of organic matter within the dead wood. It is reported that 17% of all ecosystem organic matter was found within coarse woody debris and snags at costal ecosystems[8].

The cycle begins with the death of the stem. Usually the death is slow, however in special cases such as lightning strikes, floods, hurricanes or other storms the death is immediate. The larger the tree the longer their period to die. Snags usually take a long time to be utilized by other living trees. A lot of factors contribute to this including, rooting, moisture, nutrients, slop of the ground, how the tree died and the species of trees. All of these factors also affect how long the snag, coarse woody debris, or large woody debris[9].

The utilization of dead snags differs dependent on provincial and geographical ecological conditions. Forests that are troubled by procedures other than lumber jacking, the trees ultimately become dead wood. However the trees that die and continue to stand upright end up becoming part of the snag component of the forest. More lush sites usually have superior snags. Snag thickness reduces and useful life increases with the snag size[9].

Coarse woody debris work differently. After the tree dies it enters the ecosystem either directly through a fall. This could be the death from a fall of living trees or through tree death and the eventual fall of upright dead branches. The biomass and ecologically sustainability of the coarse woody debris also depends on the species of trees. For example coniferous (cone bearing trees) ecosystems hold more bio mass than coniferous ecosystems (used up parts that proceed to fall off.) Biomass is coarse woody debris is also effected by how moist it is. The more moisture there is the more it is able to sustain other organism increasing biodiversity. There is more biomass existent on older trees that younger ones. This is usually due to the nutrients and the size of older trees[10].

Benefits

There are a lot of benefits created but all forms of dead trees. Most of the benefits overlap however this report will separate some of the distinct benefits created by each individual type of dead tree. To make this part as thorough as possible, some benefits will also be separated to each respective function and cause.

Coarse woody debris

The benefits of coarse woody debris are huge. They are one the most important factors in sustaining biodiversity in the forest. Usually there is an accumulation of long-term organic matter, which is contributed by how well decayed the wood is. The size also adds to the accumulation of organic matter and that results in decayed wood that has high in carbon constituents. The soil and ability to carry moisture greatly improved by the carbon[11]. To ensure biodivesity, the protection of productive potential in forest soil should be maintaned. This would ensure a contiuous supply of organic materials that live off the moisture in the debris[11].

Fungus Root tip association

There is a special relationship is between ectomycorrhizal activity (a symbiotic relationship) and coarse woody debris. This fungi is key for the healthy growth of conifer trees and needs moisture to survive during dry periods. The moisture is provided during the state of decay of wood[11]. During the summer months, the moisture contents found in coarse woody debris was around 250% of the dry weight. All this moisture store was then used for dry spells throughout the year to ensure refugia and ectomycorrhizal fungi. The larger the piece, the more moisture would be stored. This does not completely replace the moisture and nutrition needs, but if there is enough wood, it would be a significant source of moisture[12].

Fixation of nitrogen in forests due to coarse woody material

Forests growth, specifically in boreal forests, is limited to the amount of nitrogen available in the air and usually is limited in forests. The general theory behind the limit is the slow mineralization of organic soil nitrogen. However since nitrogen is such an important part of forest growth it is crucial to ensure that there is enough nitrogen in the air for the flora[13]. There are 4 sources of nitrogen in the forest[12]:

1. Nitrogen fixing bacteria that reside in roots (also called associative nitrogen fixation)

2. Nitrogen fixing bacteria that occur in soil and plants (called non symbiotic nitrogen fixation)
3. Nitrogen collected from lightning, dust, pollen, and other air pollutants.
4. Nitrogen fixation from roots from certain species (red alder)

The most efficient source is nitrogen fixation from species such as the red alder. Unfortunately, after many years of fire suppression, only some forests contain such species[14]. These forests then rely mostly on non-symbiotic sources of nitrogen, which occur from bacteria found on coarse woody debris. The debris allows bacteria to live due to the heavy moisture contained within the wood, and is an important contributor to nitrogen. There is also a relationship between fungus and nitrogen fixing algae. The algae are self-sustaining however the fungi provide a very firm home for the algae. This fungus survives during the dry sells due to the moisture found on the coarse woody debris

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