Protecting Your Forest from Climate Change

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Climate change is already impacting our forests and the situation is ongoing. As a landowner, there are management tools that you can use to help reduce the likelihood that climate change will cause serious harm to your forest.

What is Climate Change?

Carbon dioxide is a major component of our greenhouse gas atmosphere, in which the gases in the atmosphere act like a blanket around the Earth. As sunlight passes through the atmosphere, it strikes the ground and is radiated back from the ground as heat. Without an atmosphere, the heat would be radiated back into space and, after night falls, the Earth would be as cold as the moon (about 300 degrees below zero). But these greenhouse gases trap most of the heat and keep it from radiating back into space.

However, too much of a good thing can be bad. In the mid-1850s, society began to shift from using wood to coal and eventually to petroleum as a primary source of fuel. These fossil fuels are largely composed of combustible carbon that is emitted as carbon dioxide when the fuels are burned. Since the beginning of the industrial revolution, the amount of carbon dioxide has increased from 280 parts per million (ppm) to over 380 ppm in 2009. This is an increase of almost 40 percent.

In 2007, the International Panel on Climate Change (IPCC) released the latest comprehensive report on climate change. The report states that the rate and degree of climate change will depend on what we as a collective world decide to do about releasing greenhouse gases. There are basically three options: we can continue to contribute greenhouse gases into the atmosphere at the current rate; we can take various actions to reduce greenhouse gas emissions; or we can actually increase greenhouse gas emissions. Depending on the course of action, average air temperature in the U.S. could rise between 2 and 4 degrees Celcius by 2100. During this time, precipitation in the U.S. may vary with some areas seeing increases and other areas seeing decreases in total annual precipitation. Air temperatures could continue to rise beyond that date if nothing is done to combat the problem. These changes in climate will have significant impacts on our nation's forests.

The Impacts of Climate Change

Wildfires

A few years ago, Tony Westerling published a paper in the journal Science stating that when the weather turns hot and dry, there is a greater chance of having wildfires. A combination of reduced national forest timber harvesting and aggressive fire prevention (Smokey the Bear has been very successful) over the past several decades

has resulted in a large build up of fuels across the nation. Now climate change has begun to change the patterns of precipitation and air temperature is rising. Both of these factors increase fire risk, especially when combined with increased fuel loading.

Historically, controlled burning (especially in the southern U.S.) was one of the tools that land managers used to reduce fuels build-up (while also reducing unwanted forest species competition and releasing nutrients back into the soil), but tighter regulations of clean air and visibility standards have reduced the opportunities for controlled burning. Forest ownership fragmentation has reduced the average parcel size, making it more difficult to hold a commercially attractive timber harvest. One top of it all, stumpage prices have been down, further reducing logging interest in forest thinning.

But all is not lost. Changes in the tree species planted or regenerated following a harvest is an increasingly popular option for reducing wild fire risks. Many species are fire adapted, such as the oaks, longleaf, and ponderosa pines. Unfortunately, some of these fire adapted species were selected less often in recent decades in favor of slightly faster growing stock (e.g. loblolly pines in the southern U.S.). Now with the increase in fire occurrence and risk, landowners are returning to the cultivation and planting of these naturally fire resistant choices.

Insect Outbreaks

Another likely impact of climate change will be on insect outbreaks. Often, minimum winter air temperatures regulate the northern range of an insect species and the number of insect generations is partially controlled by the monthly air temperature; generally, the longer it is warmer, the more insect generation cycles are possible each year. As climate change has extended the growing season, the length of the bug season has increased with it.

The good news is that many of the same management practices used to control insect outbreaks will continue to work under a changing climate. Early detection, removal, and burning of infested trees in outbreak areas, restricting transport of infested wood and wood products, aerial spraying, and the use of pheromones will all continue to play an important role in controlling insect damage.

Because of climate change, landowners may wish to decrease forest stocking density either through increased stand planting or increased thinning. Tree resin production is one of the principal deterrents of wood boring insect colonization. Climate change may reduce water availability and tree photosynthates, which in turn could lead to a reduction in tree resin production. By reducing forest stocking, the amount of water, nutrients, and sunlight for each tree increases, thus improving the forest vigor and the ability of the forest to withstand insect attacks.

Recreational Land Use

Changes in the timing and intensity of

precipitation will also impact recreational use of land. Since the early 1900s, the proportion of precipitation that occurs in the form of intense rain (i.e. more than 2 inches within a 24 hour period) has increased by over 30 percent. Landowners know well that such a gully washer can muddy up a creek or stream. This eroded soil flowing into the waterways can cover fish eggs, clog gills, and kill the aquatic insects on which the fish feed.

Again, traditional management practices for controlling soil erosion and stream sedimentation will be useful. The use of down slope brush barriers, buffer strips, culverts and bridge mats at stream crossings, and broad based dips will all help to reduce climate change impacts. However, additional measures may be necessary, such as relocating some trails and roadways for streams. These areas may not currently be contributing sediment, but under the more intensive precipitation conditions associated with a change in climate, they may become sources of sediment in the future.

Conclusion

Unfortunately, the dire news regarding climate change will not fade away anytime soon. However, through aggressive measures to combat continued greenhouse gas emissions and preparations for associated global warming impacts, we and our forests will persevere. As land managers there is very little we can do to impact the stresses, but there is often much we can do to minimize the impact that those stresses will have on the forests in our charge. ◆