Conservation Matters

A monthly column focused on conservation education, as the result of collaboration among several area conservation commissions and organizations. If your town's commission or conservation organization would like to contribute articles, please contact Jessica Tabolt Halm jesshalm78@gmail.com

Title: Climate Action by Land Conservation

Written By: L. Doner, Plymouth Conservation Commission

Most of us probably think about climate change in terms temperature, rain and sea level (the big three) and how these changes might affect us directly. Warmer winters mean shorter winter recreation seasons. Stronger rains mean floodplains will flood more often and reach higher levels. Sea level rise will increase storm-related damages along coastlines. In New England it also means ice storms when there used to be snowfall, extended intervals of road frost-heaving potholing, and seasonal road closures, and even droughts and forest fire when there used to be moist soils. These aspects of climate are different now than 10, 20 and 30 years ago because of record high levels of carbon dioxide in the atmosphere. This year it seems we've reached a point where many consider this a climate crisis or climate emergency and are calling for climate action. But what is climate action? We don't have the ability to stop the atmosphere from warming when the sun comes up, to stop seawater from expanding when it warms, or ice from melting into the oceans, so what action can we take?

Humans increase amounts of carbon naturally in the air mostly by using fossil fuels for energy. So one form of climate action is to reduce energy emissions with energy conservation programs, development of alternative energy sources that produce lesser amounts of carbon dioxide, and "cleaning" emissions from power plants, automobiles, and industry with enforcement through government regulations. But energy use is not the only thing that affects carbon levels in the air. Because of photosynthesis, when plants have green leaves, they remove carbon from the air in order to grow. When plants lose their leaves, the amount of atmospheric carbon increases again. In 1959, Dr. Keeling discovered that every single year, when leaves change color and drop to the ground in the northern forests of the US, Canada, Europe and Asia, the total amount of carbon in the air increases. And, when northern hemisphere forests leaf out again every spring, the total amount of carbon in the air decreases all over the world. This discovery amazed scientists and remains one of the most important discoveries about climate and plants today. Most of you will have seen this cycle in the Keeling curve (see figure) because it also shows how the amount of carbon dioxide in the air has increased year by year. But it is the cycle of rise and fall and rise again, in synch with the leaf-off and leaf-on times of our northern forests that tells us how critical land conservation is for climate change.

New Hampshire has a lot of trees (84% is forested land), but this is largely due to industry closures, farm abandonment and population movements out of the State. Most of the forest cover wasn't planned and, without land conservation, is not a necessary condition of the future. Further, land conservation is not just about the inherent ecosystem value of trees and other plants, but about the role of soils and soil layers. Dig into the dirt in a forest or meadow and you'll find black earth in the upper few inches, fading to brown lower down, and then to light brown or gray. The dark color in the upper part is mostly carbon, leftover material from all the leaves, needles, twigs and bark that fell to the ground. Some of this material decomposes on the surface and releases carbon back to the atmosphere, and some of it is reabsorbed by plant roots. But a lot of carbon is buried and becomes part of the soil where it remains for thousands of years. The thicker the dark layer in the soil, the more carbon is stored there. When a tree is cut down, it no longer takes carbon from the air nor adds carbon to the soil but it also promotes loss of soil carbon to the air.

According to the US Forest Service, an average acre of northern hardwoods forest contains 5500 trees, including 5300 saplings, 182 older trees, and 8 snags. Selective cuts on an acre might remove all mature trees, an average removal of 182 trees. By contrast, clear cutting the same acre effectively removes all

5500 trees (over 30 times more impact) since seedlings and saplings are crushed by falling trees and/or the tread of heavy equipment. In addition, with climate change, we've observed a measurable increase in heavy rain events, so the risk of soil erosion has increased. The canopy of branches, leaves and needles in dense forests creates a natural umbrella that softens the impact of every raindrop and protects the underlying soil from washing away. The roots of understory plants further act to cement and hold soil in place during heavy rains. With clear cutting, that protective umbrella and almost all understory plants (adapted to heavy shade) are lost. Furthermore, regrowth of cut forests depends on seeds stored in the soils. With clear cutting, the carbon and seeds stored in the upper soil layer are at risk of erosion with every rain storm. Once eroded, that soil carbon breaks down and is released into the atmosphere. By contrast, conserved forests have such tremendous value for their capacity to remove carbon from the air, and to store it in the land, that conserved forest acreage is being sold as a carbon offset for corporations and industries that cannot go carbon neutral. By selling the carbon offset, there is monetary value in leaving the land undisturbed.

But what about clear cutting to support a solar array that brings alternative energy to the region and reduces the need for fossil fuels? How do we assess the trade-off of carbon additions to the air caused by losing trees and soil versus carbon losses from less need for fossil fuels? This is where we sit today, making decisions in towns across New England on relative tradeoffs around energy and conservation. To really make that determination you need to do the math. How much carbon was generated in making those solar cells and transporting them to the site? Mining of the rare earth minerals that go into solar cells involves heavy machinery and results in a lot of forest loss in tropical regions of South America, Africa and Asia. Solar cells are now mostly made in China, shipped to the US and then trucked to New England. Once installed, solar panels are impermeable surfaces that enhance rain runoff and erosion of soils around each panel. Multiply this effect by every acre cleared for solar and you can begin to identify the real cost of clear-cutting forests for solar arrays. Solar is a good idea, but for it to be an effective climate action, it needs to be strategically located and rain runoff from the panels must be managed. Rooftops, lawns, empty parking areas, wastelands, and fences all offer surface areas for solar that don't create new losses to forest cover and soil carbon storage. Rain gardens and water diversions can be added to handle to runoff. By far the most important action any one of us can take, however, is to reduce our own individual energy demand. Use less fuel, buy fewer newly manufactured things, repair broken objects, recycle those that cannot be repaired. Solar and wind just doesn't have the capacity to replace fossil fuel if we don't also take these individual actions.

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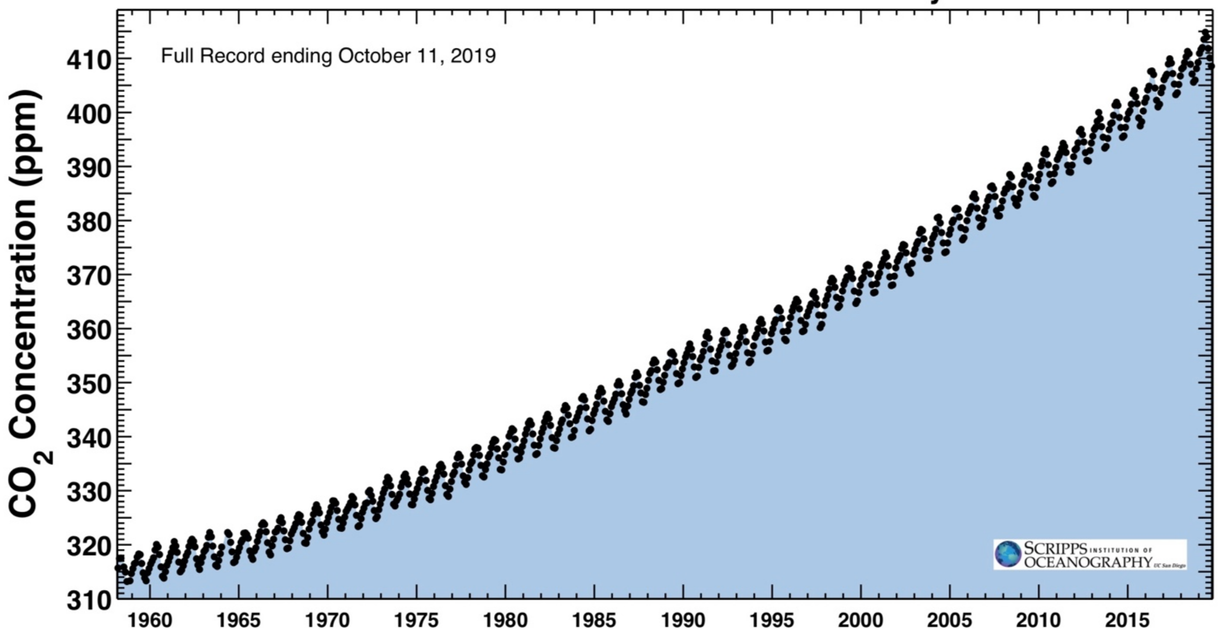
Carbon dioxide concentration at Mauna Loa Observatory



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