

## **We Are All Connected**

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In the summer of 2014, there was a massive system of forest fires in the state of Washington. Battling winds and thunderstorms, firefighters had their hands full trying to contain any of it. Unbelievably during the fires, we here at Lake Sunapee could smell smoke and had hazy skies from those fires. The Carlton Forest Fire had become the largest forest fire in Washington's history, in which (at the time of this writing) over half a million gallons of water have been dropped, the fire covers over 250,000 acres, and many people are out of power or much worse, 150 families have lost their homes to the fires. The fires are thought to have started from lightning storms. At the same time, there are wildfires in other western states, Greece, Sri Lanka, India, and Canada.

According to NH DES' Air Resources Division, NH still receives over 90% of its air pollution from out of state sources. NH has taken steps to reduce pollution on a local level, and some mid-western states now have limits on their coal fired plant emissions. Others such as Pennsylvania, Virginia, and West Virginia do not. Our air quality folks and EPA are working with those states to set limits on polluting emissions. This would help to reduce problem deposits such as mercury that still rain down on NH.

Ozone and fine particles also get transported to NH on wind currents. At <http://www2.des.state.nh.us/airdata/default.asp> you can see the latest data. Over most of NH, the levels are "moderate", meaning the Air Quality Index (AQI) is 51-100. If you want better air, go to the White Mountains, where it is "good", with AQI of less than 50.

Climate change is already occurring here in New Hampshire and around the world. Local records indicate that spring is arriving earlier, summers are growing hotter and winters are becoming warmer, on average, and less snowy. As stated in the Sustainability Report from the Department of Environmental Services (DES), these changes will impact our aquatic resources. Some species may not be able to tolerate the warmer water temperatures. Storm events are expected to continue to be more severe and frequent, contributing greater volumes of nutrient laden waters into our lakes and rivers.

This relates to what researchers have recently reported in Europe. Lisa Borre, a GLEON scientist, recently attended an international freshwater science conference, at which presentations were made on the current impacts of climate change on freshwater bodies including lakes. In Europe they are seeing evidence of more rapid aging of lakes due to increased water temperatures. This in turn increases algal growth and blooms. High temperatures also encourage greater release of nutrients such as phosphorus in the water, which again exacerbates the algal situation.

Climate change also has well documented impacts on fish populations. According to her blog, in Europe, the aquatic food web is being disrupted. In recent decades, the types of fish and their populations have changed. Warmer lakes favor smaller, fast growing and rapidly reproducing fish. Dr. Erik Jeppesen, one of the presenters from Denmark, explained that the

new populations in the food web include "good guys" and "bad guys". The "bad guy" fish eat zooplankton that would have kept phytoplankton under control. The "good guy" fish eat smaller fish, keeping them under control. So the new trend means conditions are evolving that encourage more small fish and more algal communities.

Temperature and nutrients create a double whammy--that is they work together to age lakes much faster than the presence of one or the other. So locally, we should try even more ardently to reduce the nutrients getting into our lakes and streams, and "globally" get serious about reducing the globe's temperature i.e. carbon emissions.

To quote Dr. Jeppesen, "even though we humans may change our minds from day to day about whether climate change is real, depending on how hot or cold the weather is outside, the lakes and their biological communities are feeling it. They know global warming is real. The fish know it's getting warmer.