The climate is warming in the arctic at twice the rate of the rest of the globe creating a longer growing season and increased plant growth, which captures atmospheric carbon, and thawing permafrost, which releases carbon into the atmosphere. WHRC Assistant Scientist Sue Natali and colleagues engineered first-of-a-kind warming experiments in the field to determine net gains or losses in carbon emissions. The study entitled “Permafrost degradation stimulates carbon loss from experimentally warmed tundra,” published in the journal Ecology found that growing season gains do not offset carbon emissions from permafrost thaw.

What You Don’t Know Can Hurt You

When the “idiot” light on your car’s dashboard glows red, there are two solutions: add oil or water to take care of the over-heating engine, or disconnect the idiot light. Both solutions have the immediate effect of eliminating the warning.

Data made available through the long-term monitoring of the environment are analogous. They show these days that the surface air temperature of the Earth is heating, that sea-level is rising, and that the concentration of carbon dioxide in the atmosphere is increasing. All of these changes are evidence of a changing climate. And more than a few people are suggesting that we cut back on such monitoring. After all, cutting back saves money - but it also will eliminate the warning.

As preposterous as this may seem, we actually are cutting back on monitoring the environment. Ralph Keeling, who inherited the Scripps Institution of Oceanography’s carbon monitoring program, and supplemented it with measurements of the oxygen concentration, is facing budget cuts unlike any he’s experienced previously. NOAA’s program that monitors carbon dioxide concentrations around the globe is also experiencing budget cuts, as are other monitoring programs, whether conducted on the ground, at sea, or from space.

The problem is worse. Government spending now covers less than half of the initial global monitoring program, and the money provided is from constantly threatened and exponentially more competitive research budgets rather than from dedicated programs. Long-term, continuous, and standardized data are apparently not appreciated by the government or the public. Instead, the collection of such data relies on the ingenuity and dedication of a few individual scientists.Monitoring changes in the land is the work of the Woods Hole Research Center. Our scientists have been working across the globe for decades consistently measuring, mapping and modeling the impacts of land use change on the globe for decades consistently measuring, mapping and modeling the impacts of land use change on the globe. Our work and that of Ralph Keeling and NOAA provides the evidence of a changing climate which is imperative to the development of strategies for adaptation and mitigation.
Arctic Permafrost Thaw: No Upside

WHRC in the News

Fossil Free Core investment strategy adopted

Last month, WHRC’s Board of Directors voted unanimously to adopt a fossil free investment strategy. Prior to this decision, WHRC had already moved to divest itself of exposure to all companies listed on Bill McKibben’s 350.org list (http://gofossilfree.org/companies/), but has now taken the added step of becoming 100% divested of all fossil fuel holdings through Trillium Asset Management’s Fossil Free Core strategy, including energy or utility sector companies where applicable. Trillium Asset Management is the oldest investment advisor focused exclusively on sustainable and responsible investment (SRI).

Team WHRC to Participate in Climate Ride

WHRC has been granted beneficiary status for Climate Ride, a nonprofit that organizes five multi-day events per year to raise awareness and funds for environmental, sustainability, and active transport causes. Participants in any of the five events can select WHRC to receive their donations. WHRC’s Director of External Affairs Eunice Youmans will ride the 300 miles from New York City to Washington, D.C. in September on behalf of TEAM WHRC. Donate now to help Eunice increase awareness about climate change and the important work that WHRC continues to do. To help sponsor Eunice’s ride, click here: http://bike.climateride.org/index.cfmfuseaction=donorDrive.participant&participantID=2814

Scientists estimate that within the next century permafrost could decline by up to 50%. As these frozen soils continue to thaw, the resulting greenhouse gas emissions will drive changes in weather patterns, sea levels and agricultural production that could have catastrophic impacts on human populations on a global scale.

The arctic landscape is not homogenous and the high levels of variation in vegetation and soil composition affect both carbon concentrations and rates of thaw. There is limited accounting of how much carbon is stored in these frozen soils or the rate at which it will be released. The “greening” of the arctic further complicates carbon accounting in that the warming climate creates a longer growing season, which captures more atmospheric carbon, possibly offsetting emissions from permafrost thaw.

A recent project by Dr. Susan Natali and colleagues engineered first-of-a-kind permafrost warming experiments in the field to determine net gains or losses in carbon emissions on an ecosystem level. The three-year long project warmed air and soil and thawed permafrost to measure warming effects on CO₂ uptake by plants and release by plants and microbes. The study found that growing season gains do not offset carbon emissions from permafrost thaw.

Dr. Natali hopes to access more remote areas of the Arctic to work toward more precise carbon estimates and to understand how different ecosystem components affect permafrost thaw vulnerabilities. For her, the Arctic is a beautiful, exciting, and challenging place to do research.

Dr. Susan Natali joined WHRC’s Arctic team as an Assistant Scientist in 2012 to continue her research on permafrost.

Formed over 10,000 years ago and rich in carbon, permafrost covers one quarter of the Northern Hemisphere and contains varying amounts of ice, rocks, bones, sand, plant bits, and even whole tree limbs, in addition to soil. Because climate change affects the Arctic at twice the rate of the rest of the globe, the warmer temperatures are quickly thawing permafrost which causes the release of carbon and methane into the atmosphere, thereby creating a “positive feedback loop” of more warming that leads to greater permafrost thaw. Scientists estimate that within the next century permafrost could decline by up to 50%. As these frozen soils continue to thaw, the resulting greenhouse gas emissions will drive changes in weather patterns, sea levels and agricultural production that could have catastrophic impacts on human populations on a global scale.

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Student researchers Sarah Ludwig and Ellen Squires collect methane gas samples at Dr. Natali’s warming and drying experiment in Alaska.
Assistant Scientists Wayne Walker and Alessandro Baccini have been awarded two grants from the Governors’ Climate and Forests Fund (GCF) (www.gcffund.org) to assist Brazilian and Peruvian state government partners to measure and track forest carbon stocks as part of incentive-based emission reduction mechanisms.

As the largest expanse of tropical rainforest in the world, the Amazon plays an integral role in the global carbon balance. With one-fifth of global carbon dioxide emissions resulting from deforestation and degradation, Brazil has made great strides in reducing deforestation rates by 80% in the last decade, but forest measuring and monitoring must continue. Amazonia, which spans nine countries, remains threatened by mining and petroleum interests, agricultural expansion, road building, and infrastructure development. 25% of this great tropical forest lies within largely unrecognized boundaries of indigenous lands. In these areas, economic pressures combine with industrial interests and geographic isolation to decimate forests.

The recent successes in Brazil have been attributed to greater overall awareness and the consistent monitoring and evaluation of standing forests. The GCF grants build on the earlier capacity-building work of Drs. Walker and Baccini who have combined remote sensing and field training to provide indigenous communities and government partners across Amazonia with the skills and knowledge to measure and monitor carbon stocks over time. This approach is unique in that the scientists do not rely exclusively on government partners; instead they obtain indigenous knowledge and buy-in to execute much of the field-based monitoring.

The efforts of Drs. Walker and Baccini in Amazonia are part of WHRC’s global carbon monitoring program. WHRC scientists have been working on a global scale and at a landscape level for decades, measuring, mapping, and modeling the impacts of land-use change on the global carbon cycle. Please support our scientists’ efforts, such as the training of indigenous communities in the use of remote sensing technology and field measurements, to help improve the health of our planet.
IS SCIENCE THE ENEMY?

The “conservatives” who cut the budgets want to continue exploiting air, water and land for profit. They consider scientists and data the enemy. Canada’s Harper administration is running full tilt into tar sands, firing their scientists and closing programs that might interfere. This is not benign. The scientists being fired have great experience built over long careers in government. Some of their programs, such as the experimental lakes, have spanned years of research to reach valuable new information, all of which is lost at the whims of corrupt corporate interests.

If the climatic disruption is allowed to run its course, the final product is clear enough: a scorched and barren earth, sterile land with steaming oceanic sewage pools and a remnant human population struggling to find succor on a blistering impoverished landscape.

The prospect makes our mission far more serious than most have realized or most in the corporate world will ever be able to admit. Scientific knowledge and protection of the structure and function of the biosphere is essential if governments and economic systems are to function. Corrupt corporate interests at work in the US are the reasons WHRC must have heavy non-governmental financing and a spirited defense of scholarship to supplement governmental grants. Our friends have to realize this and join, intellectually and financially.

–George M. Woodwell, WHRC Founder