2007 Maine Beaches Conference
The Future of Maine's Changing Beaches:
Diverse Interests and Common Goals

Welcome, by Peter Slovinsky, Maine Geological Survey

Mr. Slovinsky noted many changes along Maine's beaches that will be explored during the sessions and the many different interests represented by the stakeholders present, as captured in the conference title. He asked if the beaches will be here in the future for the surfers, fishing industry, land owners, swimmers, etc.

Volunteers in the Beach Profile Monitoring and Maine Healthy Beaches Programs were recognized and honored, as were the conference's sponsoring organizations and agencies

Opening Remarks, by President James Ortiz, Southern Maine Community College

President Ortiz noted that SMCC is a very appropriate venue for this conference – *we are on the beach*. He recalled that when he interviewed at SMCC, his wife saw the beach and said, *We're moving here*.

He described how SMCC has changed in a way that can't be seen – availability for conferences and other similar activities. SMCC has also changed what they do. They recently received an award from EPA for excellence in environment. National Science Foundation has invited SMCC to attend meeting in Charlestown, SC; the only invitee in New England. And the Marine Science Department is connecting with the community and ecosystems through partnership with the Southern Maine Beach Profile Monitoring and Maine Healthy Beaches Programs.

Plenary Session I

Moderator: Christine Feurt, Wells National Estuarine Research Reserve
Ms. Feurt Introduced keynote speaker, Cameron Wake. Dr. Wake studies regional climate and environmental change through the analysis of ice cores and instrumental records. Currently, he is leading research programs to reconstruct climate change using ice cores recovered from glaciers on the Tibetan Plateau and in the Canadian Arctic. Dr. Wake is also involved in the AIRMAP project, which seeks to improve understanding of New England's changing climate and air quality. He leads the related INHALE project that is investigating the links between air quality and human health in New England. As part of the Northeast Climate Impact Assessment, he is the co-lead on two research papers and a series of reports detailing past and future climate

change in the U.S. Northeast. Dr. Wake teaches several classes at UNH, including Global Environmental Change, Earth System Science, and Climate and Health. Dr. Wake received a bachelor of science degree from the University of Ottawa, a master's degree from Wilfrid Laurier University, and a doctorate in geochemical systems from the University of New Hampshire. Dr. Wake's presentation is Climate Change in the Northeast: Past, Present, and Future. Climate across the northeastern United States has been warming over the past three to four decades. The decisions we make over the next few years regarding how we produce our energy will determine the climate future generations experience across the Northeast.

Climate Change in the Northeast: Past. Present, and Future, by Cameron Wake, Research Associate Professor, University of New Hampshire

Regional Climate change

Dr. Wake explained that climate change is not new and that we have a responsibility to do address levels of carbon emissions. Our children's future depend upon the decisions we make now regarding means of energy production and use. Future climate is in our hands.

Dr. Wake studies past atmospheric conditions through ice cores where samples of atmosphere get trapped and cannot escape. Then the cores are crushed, the air is sucked out air and the gases are measured.

These studies reveal that the climate displays natural variability. During warm periods, more CO2 is present; in cold, less CO2. During glacial periods, there is less CO2. Levels of CO2 have been shown to vary between 200 – 300 parts per million (ppm). Currently, the average is 380 ppm in the atmosphere. With higher CO2 levels, we are and will experience higher temperatures. If we were to continue on our current path, by end of century CO2 levels will likely reach 1000 ppm which will lead to catastrophic climate change.

Global Temperatures at Meteorological Stations from 1880 – 2005
Since 1980 there has been constant climbing of temperature which is not due to anything but CO2. Solar and volcanic forces have remained constant. Only heat trapping gases can explain it.

Sources of CO2 Emissions: The data provided in the presentation was from 2001 in which the US is the major source, but in most recent findings, China has just surpassed the USA.

Winter temperatures in the Northeast 1900 – 2002: 2.3 degrees F warming over 103 years; 4.3 degrees in 33 years. Warming is consistent across the entire Northeast, with in some locations having increases of 7-9 degrees between 1970 and 2002. Northeast also experiencing extreme rain events, with more rain in

fewer events, although the total amount of precipitation has not much changed: 3.4 inch increase over 103 years; 4.4 inch decrease over 33 years. The data provided in this set doesn't include the last 18 months. The data also shows a tremendous decrease in days with snow on the ground between 1970 and 2002. In 2002 there was an average of 30 days less than in 1970. Average ice out days have also become earlier: 4.5 days earlier over 81 years and 8.0 days earlier over 36 years. Lake Champlain's ice in dates have also become later by 14 days over 190 years. During that time period the lake has not frozen over 33 times, with 54% of those times being since 1970. Likewise, sea surface temperatures have risen 1.1 degree F over last 103 years.

Relative Sea Level Rise in the Northeast 1856 – 2005: 17 -18 inch rise. Our coast continues to sink, making us more vulnerable to coastal hazards.

Northeast Climate Impacts Assessment
This project is a collaboration between the Union of Concerned Scientists and 40 independent scientists, covering Maine to Pennsylvania. Findings can be viewed at www.climatechoices.org. Most uncertainty depends upon what we will do. Look at future forecasts.

Projecting Future Climate Change for the Northeast: Greenhouse Gas Emission Scenarios

- Highest scenario – 9 billion people burning fossil fuels, emissions will continue rising
- Moderate scenario - 9 billion using new energy sources, emissions will rise and then level out
- Lowest scenario - gradual temperature change in 100 years, but low enough that the relative change would be greater change in last 30 in the Northeast.

Precipitation
Winter temperatures have been warming fastest at 1.3 degrees per decade since the 1070's. Winter precipitation (in the form of both snow and rain falling in winter months) has been increasing over the past few decades, and is projected to continue increasing, with slightly larger changes under the higher-emissions scenario than the lower-emissions scenario. Little change is expected in summer rainfall, although projections are highly variable. The most significant trend has been in the type of precipitation that falls. As winter temperatures rise, more precipitation is falling as rain and less as snow.

Heavy rainfall events are becoming more frequent across the Northeast. Under both emissions scenarios, rainfall is expected to become more intense and periods of heavy rainfall are expected to become more frequent.

Even if emissions are lowered, a 3.5 – 6.5 degree increase will occur. By between 2070 and 2099, if we don't make right decisions, Maine summers will feel like those in Virginia, where 18 days a year reach 100 degrees F. If we make appropriate choices, it will feel like New Hampshire with six days that reach 100 degrees F. Under a continued high emissions scenario, there would be a 50% reduction in the number of snow-cover days. And in even with low emissions, snow-cover days would be reduced by 25%. Emissions scenarios will also greatly impact sea levels. Higher emissions is likely to yield an eight to 33 inch rise, low emissions a four to 21 inch rise. These estimates do not include the potential for additional increases due to more rapid melting of major polar ice sheets.

Conclusions

Climate is already changing across the Northeast. Over the next few decades, similar changes expected under both emissions scenarios. By mid-century, most changes are greater under the higher scenario. By late-century, under the higher-emissions scenario many changes are almost twice those seen under lower emissions, including: winters warming by 8 -12°F and summers by 6 -14°F, with dramatic increases in extreme heat in cities.

Additional research to be published focusing on impacts to:

- Human Health
- Coastal Infrastructure
- Forests
- Marine Resources
- Agriculture
- Winter Recreation

Changes are happening in short time frames of less than a decade: Short time:

- Greenland ice sheet wasn't melting 10 years ago
- More melting more water, lubricating ice-sheet
- If it melts 10 - 20 feet of sea level rise.

Focus on ….

- Take path less traveled
- Turn risk into opportunity.

What can you do?

As a Consumer-Citizen

- Carbon calculator
  www.epa.gov/climatechange/emissions/ind_calculator.html
- Strategies
  carbonchallenge.sr.unh.edu/
- Stay educated
  www.realclimate.org/
  www.climatechoices.org/

www.cleanair-coolplanet.org/

Question and Answer Period

Q. How does increase in temperature related to the Clean Air Act?
A. They focused on SO2 (sulfur dioxide) and acid rain associated primarily with industrial emissions. Sixty to 70,000 people die each year as a result of air pollution. SO2 only lasts in atmosphere for a short time.

Q. What percent of global warming due to methane?
A. Twenty-five to 33% maybe. It persists in the atmosphere for ten to twelve years.

Q. Three to 33 inches of sea level rise?
A. These estimates are low because polar ice sheet melt has not been considered in these figures. But we will see more in the Northeast.

Q. What happens if the Gulf Stream shifts? Would the result be warmer or colder here in Maine?
A. We don't know. The last time the Gulf Stream shifted there was less CO2 in the atmosphere, so we can't be sure what will happen.

Q. Bottled water? Is this an environmentally sustainable option?
A. No, we shouldn't use it

Q. Is there evidence of changing seasons?

A. Winters are shorter, but snows are coming later. Spring is coming earlier.

Q. Is anyone studying potential shifts in population?

A. This is not Wake's area of expertise. But there might be a major shift.

Q. Is nuclear power a possibility?

A. We have trouble getting permits for septic systems, why should nuclear power plants permitted when waste disposal options are unresolved?
There is talk of building smaller, less dangerous power plants – but not these have not been developed. How do we make them terror proof?

Q. What about wind power?
A. The wind debate a false debate. We can invest in wind power and adjust to the minor aesthetic issues or we live with the trade offs of fossil fuel dependency– pollution, asthma, global warming, uncontrolled climate change.