Observed Climate Change and the Negligible Global Effect of Greenhouse-gas Emission Limits in the State of New Hampshire
Summary for Policy Makers

In December 2007, New Hampshire Governor John Lynch signed an Executive Order calling for the establishment of a “Task Force to develop a Climate Change Action Plan” for the state of New Hampshire. The Task Force’s Climate Action Plan is due to the governor by September 1, 2008 and is to include a recommendation of “quantified goals for reductions of [New Hampshire’s] greenhouse gases” as well as “specific regulatory, voluntary and policy actions” that the state should consider to achieve the emissions reductions goals.

Conspicuously missing from the Task Force’s objectives, however, are three major areas of importance: 1) a careful review of the state’s climate history and its impacts with regard to how the state’s climate has changed, how the state’s economy has responded to any changes, and whether or not the changes bear any resemblance of changes expected from human-caused “global warming,” 2) a quantification of the state’s emissions reductions efforts on the course of future climate change, either globally, regionally, or locally, and 3) an assessment of the impacts of any proposed greenhouse gas reduction measures on the state’s economy.

The likely reason that such analyses are not required of the Task Force is that they would show that there has been little “global warming”-related change to New Hampshire’s climate; that New Hampshire’s economy has well adapted to those natural changes that have occurred; that actions to reduce greenhouse gases in New Hampshire will have no impact on the course of future climate; and that such actions will significantly harm many of the state’s economic sectors.

In this report, we provide the analyses that should have been required of the Task Force. We find that what natural climate changes that have taken place in New Hampshire during the past century have been well adapted to by its residents and climate-dependent industries. Sensitivity to high temperatures has likely declined, tourist-related proceeds are rising, and New Hampshire’s farmers are adapting to a changing market place.

We also demonstrate how greenhouse emissions limitations to “affect climate” would be fruitless and harmful. In fact, even a complete cessation of all carbon dioxide emissions originating in New Hampshire would be subsumed by global greenhouse gas emissions increases (primarily from China and India) in only one week’s time, and would produce no detectable or scientifically meaningful impact on local, regional, or global climate. Unfortunately, the same cannot be said of the economic consequences of greenhouse gas emissions’ legislation — estimated to be large and negative for New Hampshire residents, families, workers and voters.
Observed climate change in New Hampshire

**Annual temperature:** Over the course of the past 113 years, the statewide average annual temperature in New Hampshire has risen by about 2ºF. However, the temperature rise has not occurred as a smooth, upward trend over the past century or so, but rather as a series of warming periods interspersed with times of cooling. For instance, the state experienced a cooling of about 2ºF from about 1910 to 1925, followed then by a rapid warm-up peaking in the early-to-mid 1950s. During that time, the statewide average temperature rose by nearly 3ºF. This warming was followed by about two decades of falling temperatures ending in the early-to-mid 1970s. Since 1975, statewide average temperatures have warmed by about 1.5ºF. Temperatures averaged over recent years have been just a bit warmer than temperatures during the 1950s. The temperature history of New Hampshire during the past century or so demonstrates that multi-decadal temperature swings well characterize the climate variability of New Hampshire.

**New Hampshire annual temperatures, 1895-2007**

**Annual mean temperatures**

![Figure 1](http://www.ncdc.noaa.gov/oa/climate/research/cag3/nh.html)

*Figure 1.* New Hampshire’s long-term statewide annual average temperature history, 1895-2007 (available from the National Climatic Data Center, [http://www.ncdc.noaa.gov/oa/climate/research/cag3/nh.html](http://www.ncdc.noaa.gov/oa/climate/research/cag3/nh.html)).
Seasonal temperatures: When we break New Hampshire’s temperature history into the four seasons of the year, we find that most of the long-term warming has occurred during the winter season. During the other three seasons, spring, summer, and fall the overall warming has been much less. And in all 4 seasons, temperatures in recent years are in no way unusual when properly set against the known climate history of the state. In fact, during the 1950s—more than a half-century ago, temperatures in most seasons were not very different than today’s. All together, there is no evidence of unprecedented “climate change.”

**New Hampshire seasonal temperatures, 1895-2007**

 сезонal mean temperatures

![Graphs showing seasonal temperature trends from 1895 to 2007](image)

**Figure 2.** Seasonal statewide average temperature history of New Hampshire (available from the National Climatic Data Center, [http://www.ncdc.noaa.gov/oa/climate/research/cag3/nh.html](http://www.ncdc.noaa.gov/oa/climate/research/cag3/nh.html)).

It is worthwhile to note that the long-term temperature increase recorded in New Hampshire (~2.0°F) is somewhat greater than the temperature increase observed in other surrounding states and in the Northeast as a whole. For instance, taken together, the average temperature change for the Northeast (MD, PA, NY, NJ, CT, RI, MA, VT, NH, ME) from 1895-2007 has been less than 1°F, and most of that was caused by the unusually cool first several decades of the 20th century. Since
1930, a period of more than 75 years, there has been no overall temperature change in the Northeast. Recent temperatures are little different from temperatures in the region during the late 1940s and early 1950s—a period more than 50 years ago.

The variation of temperature changes in this small region of the northeastern United States is likely a reflection of a combination of influences including local changes in land utilization in the vicinity of the individual observing stations, regional landscape changes, additions and losses to the observing network over time, and influences of variations in the regional and hemispheric atmospheric circulation patterns.

New England annual temperatures

1895-2007

1930-2007

Figure 3. The long-term annual average temperature history of the Northeastern United States (available from the National Climatic Data Center, http://www.ncdc.noaa.gov/oa/climate/research/cag3/nt.html).

As a backdrop to state temperatures, it should be considered that average global temperatures have been in decline in recent years, and are currently sharply below normal. This hardly portends planetary catastrophes being prophesied by some.
Precipitation:
Since consistent record-keeping began in 1895, there has been little long-term change in the amount of total precipitation that New Hampshire receives in a year’s time. Instead of being characterized by a long-term trend, the observed precipitation history of New Hampshire is dominated by year-to-year variations. Two recent years, 2005 and 2006 were the wettest two years since the beginning of the record. But conditions have returned closer to normal since then.

*New Hampshire annual precipitation*

*Figure 4.* New Hampshire’s long-term statewide annual total precipitation history, 1895-2007 (available from the National Climatic Data Center, [http://www.ncdc.noaa.gov/oa/climate/research/cag3/nh.html](http://www.ncdc.noaa.gov/oa/climate/research/cag3/nh.html)).
Drought: During the past 113 years, there has been no long-term trend in statewide incidence of drought in New Hampshire. In fact, instances of drought have had the tendency to be less frequent and less severe during the most recent decades, than in the prior historical period.

![New Hampshire drought severity, 1895-2007](image)

**Figure 5.** New Hampshire statewide average monthly Palmer Drought Severity Index (PDSI), 1907-2007 (Data Source: National Climatic Data Center).

According to records compiled by the National Climatic Data Center, statewide monthly average Palmer Drought Severity Index values—a standard measure of moisture conditions that takes into account both inputs from precipitation and losses from evaporation—show no long-term trend. The period of record is dominated by short term variations, although some longer-term signals are present, such as the extended period of drought in the early 1940s and again in the early 1960s. The wet period during recent years is quite remarkable in the context of the historical record, although indications are that the moisture conditions across New Hampshire are beginning to return back into the normal range. There is no indication the frequency or intensity of drought conditions has increased as temperatures have increased across the state in recent decades.
Climate Impacts in New Hampshire

Tourism
Tourism in New Hampshire is a year-round industry that brings in more than 10 billion dollars annually, ranking it as the second leading export activity in the state (behind manufacturing). Summer and fall are the dominant tourist seasons, combining for just under two-thirds of the more than 34 million visitor trips made into New Hampshire in 2007. Visits during the spring and winter seasons make up about 20% and 18% respectively of the annual total. Together, tourists directly spend more than 4 billion dollars per year in New Hampshire (the rest of the state’s tourist income arises from indirect spending, tax revenue, and direct and indirect tourist-related jobs, etc.) which makes up about 8% of the state’s gross domestic product (Goss, 2007a; New Hampshire Division of Travel and Tourism Development).

Tourists come to New Hampshire for a variety of reasons, many of which include a visit to the “great outdoors.” The state boasts 42 state parks with more than 6,000 miles of trails for hiking, backpacking, and mountain bike riding. In the winter months, the White Mountains offer some of the best skiing in the Northeast. During spring, people take advantage of the numerous trails throughout the state, and in the summer, watersports are the main attraction. New Hampshire’s 1,300 lakes invite vacationers to swim, fish, boat, or just enjoy the area. During autumn leaf change, New Hampshire draws vast numbers of travelers enjoying the state’s world-renowned, spectacular fall color.

Concern is often raised that a future climate change might transform New Hampshire into a place that is less attractive to tourists and thus significantly impact the state’s economy.

Ski Industry
For instance, alarms are sounded that warmer winters will devastate the state’s skiing industry.

A five-year old study (Hamilton et al., 2003) claims that many small-time, small scale ski resorts in the state have closed down during the past 30 years because snow conditions had not been favorable enough to support their continued operations. The economic dynamics include the displacement of the mom-and-pop operations, without chairlifts, that dominated the scene in the 1950s and 1960s. Over time these were replaced by large-scale resorts with extensive, customer-preferred lift systems and increased snowmaking capability that assure skiing opportunities even in winters with sparse natural snow. Some enterprising operators have also added year-round family attractions — activities during the
non-winter seasons that attract visitors and supplement wintertime ski operations. Now, some gondolas that carry winter skiers are summer-employed, taking sightseers to the summits where winter’s snow-covered slopes are transform into warm-season trails for hiking, horseback riding and mountain biking. Thus, successful New Hampshire ski resorts have transformed into four-season attractions.

**Distribution of New Hampshire Ski Resorts**

*Figure 6. Distribution of ski slopes in New Hampshire over time. Notice how the prevalence of small ski operations without chair lifts in the southern part of the state has given way to larger operations in more northerly (and mountainous) locations as the ski industry has adapted to changing climate conditions. (Source: Hamilton et al., 2003)*
Another 4-year old study claims that both total snowfall and the proportion of precipitation that falls as snow in New Hampshire has been in decline in recent decades (Huntington et al. 2004; Scott and Kaiser, 2004).

But this was due to the past dominance of El Ninos at a 3-to-1 ratio over La Ninas during the recent 1979-1998 warm phase of the Pacific Decadal Oscillation (PDO). It is well known that El Ninos encourage more southerly storm tracks, bearing heavier snowfall for more southerly cities like Boston and New York; and less snow for northern New York and most of northern New England.

This was augmented by a return to the warm mode in the Atlantic in 1995 which favored Atlantic “blocking,” conducive to east coast cold and snow events.

Thus, due to a string El Nino-induced winter storms, from 1992/93 to 2004/05 Boston had the snowiest period in records dating back to the 1860s, including 5 of the top dozen snowiest winters.

New York City snow records dating back to the 1870s show that during the recent decade the “Big Apple” had for the first time over 40 inches of snow, four years in a row. In the last 5 year period, both New York and Boston broke records for single snowstorm totals.

However, this past year the PDO apparently turned back sharply colder and a La Nina brought back the more northerly storm tracks with a vengeance.

New all-time snow records were set throughout northern New England down to just about Concord, NH. Even Concord experienced an all-time record snowy winter period (December to February); the entire season being second only to that of 1873-74. Also near the border with northern New Hampshire, St. Johnsbury, Vermont set a new record for seasonal snow of 139.1 inches – breaking the prior record set in 1968-69. Records there extend back to 1894.

To their delight, numerous ski operators reported the best skiing season ever with ideal conditions for all the important holiday skiing periods.
If indeed the PDO has turned back cold as NASA JPL scientists and others now believe, there will be more La Ninás and more heavy winter snows in the future for northern New England area ski resorts, including New Hampshire.

Skiing in New Hampshire is far from dead or threatened.

**Fall Foliage**

Another perceived concern about New Hampshire’s tourism trade is that temperature increases will change the state’s forest make-up and mute its spectacular fall foliage displays. Some point to the *perceived* lack of brilliance of the fall 2004 foliage display as indication that this impact is already well underway. But little scientific evidence exists to support this notion. In fact, while annual temperatures have risen in New Hampshire over the last century or so, combined temperatures during September and October—the months most critical to fall foliage displays—have not changed much at all).

**New Hampshire Autumn Temperatures**

![Image of temperature graph]

*Figure 7. New Hampshire statewide fall (September through November) average temperatures, 1895-2007. (Available from the National Climatic Data Center, http://www.ncdc.noaa.gov/oa/climate/research/cag3/nh.html).*
Further, there is no evidence that the tree species make-up of New Hampshire’s forests is trending in a manner that would be detrimental to fall foliage displays. According to the U.S. Department of Agriculture’s Forest Service, in a survey of New Hampshire’s forest species changes from 1983 to 1997, they found that there has been an increase in volume of both red maples and sugar maples—the two major species that are responsible for the brilliant reds that characterize New Hampshire’s fall display and the species often cited as being particularly vulnerable to climate changes.

Consequently, fall climate conditions together with the forest make-up should be currently combining to produce the same type of, or even better, spectacular foliage displays that have characterized New Hampshire’s autumns for hundreds of years past.

**New Hampshire Forest Species Make-up**

<table>
<thead>
<tr>
<th>Tree Type</th>
<th>1983 Volume</th>
<th>1997 Volume</th>
<th>Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White pine</td>
<td></td>
<td></td>
<td>+6%</td>
</tr>
<tr>
<td>Red maple</td>
<td></td>
<td></td>
<td>+6%</td>
</tr>
<tr>
<td>Hemlock</td>
<td></td>
<td></td>
<td>+38%</td>
</tr>
<tr>
<td>Red oak</td>
<td></td>
<td></td>
<td>+19%</td>
</tr>
<tr>
<td>Sugar maple</td>
<td></td>
<td></td>
<td>+10%</td>
</tr>
<tr>
<td>Spruce</td>
<td></td>
<td></td>
<td>-22%</td>
</tr>
<tr>
<td>Paper birch</td>
<td>-15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow birch</td>
<td>-3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beech</td>
<td>+5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balsam fir</td>
<td>-22%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ash</td>
<td>+7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspen</td>
<td>-20%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Figure 8. Volume of trees in New Hampshire’s forests, as surveyed in 1983 and in 1997 (source: USDA)*

One area where humans have been making a noticeable impact on New Hampshire’s forests is through the process of urban expansion. While New Hampshire remains the 2nd most forested of the 50 states (in terms of percentage of forested land) with 84% of the state covered in forests, it is also losing forest to urban development at a rate that is above the national average. Between 1990 and 2000, the amount of land categorized as “urban” by the U.S. Census Bureau in New Hampshire expanded by 417 km2 (1.7%) — a rate that was the 11th fastest in
the nation. Of this 417 km², 256km² (61.3%) was previously in forest (Nowak et al., 2005). This urbanization pattern – not CO₂ emissions – is a more likely reason for the “exaggerated” winter warming in New Hampshire temperature records (when the urban heat island is most effective) relative to the cooler records of more rural Vermont and New Hampshire.

None-the-less, despite an urban encroachment on the state’s natural areas, visitors keep seeking out New Hampshire as a travel destination. Instead of declining tourism, as temperatures across the state have warmed during the past several decades, the tourism industry in New Hampshire is flourishing. Put another way, for New Hampshire tourism, mildly warmer temperatures is not “climate catastrophe,” but rather “climate improvement”! Since 1990, tourism spending has been steadily growing. In 2007, tourists directly spent 4.35 billion dollars, doubling the 2.19 billion dollars spent in 1990.

*New Hampshire Direct Tourist Spending*

![Figure 9. Direct spending by tourists in New Hampshire, 1990-2006 (data from Goss, 2007a; New Hampshire Division of Travel and Tourism Development)](image)

Again, the wide array of activities that New Hampshire has to offer, along with appropriate adaptations, assures that no matter what the weather, New Hampshire has something to attract a variety of visitors. As the consistent rise in tourist spending attests, recent climate trends in New Hampshire are certainly not causing a decline in total tourism numbers, but more likely are contributing towards the growing number of people who seek out New Hampshire destinations for both single day and extended overnight trips.
Agriculture

According to a report for the New Hampshire Department of Agriculture, direct spending related to agriculture in the year 2006 was 935 million dollars which amounted to 1.8% of the state’s Gross Domestic Product (Goss, 2007b). This contribution comes not only from direct agricultural product sales, but also, in large part, from agricultural-related tourism activities—fairs, farm visits, scenic drives, etc. Farming in New Hampshire takes place on approximately 7% of the state’s land area (about a half million acres). It is primarily practiced on a small-scale, family level, producing a diverse variety of products in farms spread all across the state. It has become an integral part of promoting New Hampshire’s environmental quality, scenic beauty and cultural activities. And while it has been practiced in New Hampshire for about 375 years, it is not an old-fashioned, quaint pastime, but instead represents a lively business venture that must respond to the market demands of the 21st century.

The agricultural industry in New Hampshire has been keeping up with the times. Between the years 2002 and 2005, a small decline of 6.5% in traditional sales of agricultural products was more than made up for by a significant increase in agricultural tourism—spending at agriculture fairs was up 4.5%, spending by tourists making trips for agricultural purchases increased by 15% and tourist spending during scenic drives through agricultural areas increased by 27% over these three years. In terms of total economic impact, agriculture increased by about 10% from 2002 to 2005 with more farmers making sales directly to New Hampshire households and tourists and growing crops more intensely (Goss, 2007b).

The largest pressure on New Hampshire’s farmers is not coming from climate variability. The changes in climate that have been observed in New Hampshire have been ones generally beneficial to the state’s farmers. Warming in late fall and early spring serves to extend the growing season while precipitation has been ample enough to offset any increased evaporative losses during the slightly warmer summers. On top of these favorable climate changes, increasing levels of atmospheric carbon dioxide—a plant fertilizer—should be acting to promote crop growth and virility, another benefit to New Hampshire’s agricultural industry.

Negative impact on New Hampshire’s farmers is coming from rapidly rising property values and urban growth pressure. A report by the New Hampshire Department of Agriculture reports that farm profitability has been declining, not as a result of decreasing farm earnings, but rather from a rapid increase in the value of farm real estate as the state’s top-quality farmland is increasingly threatened by development. To help protect its more than 3,400 farm operations, the state created the New Hampshire Farm Viability Task Force in 2005 to “study and recommend policy and actions to promote the strength and vitality of the state’s
agricultural sector, in recognition of its role in the state’s food system, economy, and environment.” The Task Force developed a host of recommendations that included, among others, improving direct marketing efforts, removing burdensome legislation, and making conservation of farmland a high priority – including encouraging the state to annually buy permanent conservation easements that protect agricultural land. Nowhere in the report does the task force concern itself with the issue of climate or climate change.

Quite obviously, New Hampshire farmers are adapting to new market pressures as best as they can. Little, if any of this strategy involves climate change. New Hampshire’s farmers will change and improve their practices to make best use of the situation that faces them. All indications are that New Hampshire’s agriculture industry is strong and growing, with no indication of reversing course.

**Sea Level Rise**

As New Hampshire is unique in having the smallest ocean shoreline of any state, it is also unique in having the least amount of coastal area with elevations below 1.5 meters (42.4 km2) and below 3 meters (62.4 km2) (Titus and Richman, 2001) that may be prone to ocean flooding from rising seas. Further, since its primary population centers are not located along the shore, an increase in sea level will generally not impart a large impact in New Hampshire.

However, despite having the smallest shoreline of any coastal state (18 miles), the potential impacts of future sea level rise are often cited by professional activists as being a significant threat to New Hampshire.

Over the course of the past 100 years, New Hampshire’s coastline has experienced a *relative* sea-level rise of the same order of magnitude as the one forecast to occur during the next 50 years because of warming temperatures: around seven inches.

The *relative* sea level along the New Hampshire coast has changed due to a combination of the *land slightly sinking* and the ocean slightly rising (Aubrey and Emery, 1991). New Hampshire’s residents have successfully adapted to this change and should be able to adapt to a change of similar magnitude in the future.

According to the 2007 *Fourth Assessment Report* (AR4) on climate change published by the U.N.’s Intergovernmental Panel on Climate Change (IPCC), the potential sea level rise over the course of the 21st century lies between 7 and 23 inches, depending of the total amount of global warming that occurs.¹ The IPCC

---

¹ The sensitivity of temperature change in response to changes in atmospheric CO₂ concentration is hotly disputed in the broad scientific literature. See *Climate Sensitivity Reconsidered*: [http://www.aps.org/units/fps/newsletters/200807/monckton.cfm](http://www.aps.org/units/fps/newsletters/200807/monckton.cfm)
links a lower sea level rise with lower future warming. The “consensus” warming rate of the earth is 0.18°C per decade, which is near the low end of the IPCC range of projected warming for the 21st century from 0.11 to 0.64°C per decade. Therefore, since we observe that the warming rate is tracking near the low end of the IPCC projections, we should also expect that the rate of sea level rise should track near the low end of the range given by the IPCC—in this case, a future rise much closer to 7 inches than to 23 inches. Thus, the reasonably expected rate of sea level rise in the coming decades is not much different to the rate of sea level rise that New Hampshire coastlines have been experiencing for more than a century—and have adapted to, if even noticed.

**Sea Level Rise Projections**

![Sea Level Rise Projections](image)

*Figure 10. Range of sea level rise projections (and their individual components) for the year 2100 made by the IPCC AR4 for its six primary emissions scenarios.*

There are a few alarmists who argue that sea level rise will accelerate precipitously in the future and raise the level of the ocean to such a degree that it inundates portions of coastal Washington and other low-lying areas around the world and they clamor that the IPCC was far too conservative in its projections. However, these rather alarmist views are not based upon the most reliable scientific information, ignoring our best understanding of how a warmer world will impact ice loss/gain on Greenland and Antarctica, and correspondingly
influence global sea level. It is a fact, that all of the extant models of the future of Antarctica indicate that a warmer climate leads to more snowfall (the majority of which remains for hundreds to thousands of years due to extreme interior cold) which acts to slow the rate of global sea level rise (because the water remains trapped in ice and snow). New data suggest that the increasing rate of ice loss from Greenland observed over the past few years has started to decline (Howat et al., 2007).

Another recent study reported that the Greenland ice sheet mass balance actually grows about 2 inches per year. At any rate, the Greenland ice sheet survived each of the previous three interglacial periods, each of which was 5 degrees Celsius warmer than the present. It survived atmospheric CO₂ concentrations of up to 1000 ppmv (compared with today’s 385 ppmv). It last melted 850,000 years ago, when humankind did not exist and could not have caused the melting.

Again, scenarios of disastrous rises in sea level are predicated on Antarctica and Greenland losing massive amounts of snow and ice in a very short period of time—an occurrence with zero likelihood.

In fact, one author of the IPCC AR4 chapter dealing with sea level rise projections, Dr. Richard Alley, recently testified before the House Committee on Science and Technology concerning the state of scientific knowledge of accelerating sea level rise and pressure to exaggerate what is known about it. Dr. Alley told the Committee:

This document [the IPCC AR4] works very, very hard to be an assessment of what is known scientifically and what is well-founded in the refereed

---

2 http://scienceandpublicpolicy.org/sppi_originals/current_issues_in_climate_science_focus_on_the_poles.html
literature and when we come up to that cliff and look over and say we don’t have a foundation right now, we have to tell you that, and on this particular issue, the trend of acceleration of this flow with warming we don’t have a good assessed scientific foundation right now. [emphasis added]

Thus, the IPCC projections of future sea level rise, which average only about 15 inches for the next 100 years, stand as the best projections that can be made based upon our current level of scientific understanding. These projections are far less severe that the alarming projections of many feet of sea level rise that have been made by a few individuals whose extremist views lie far outside of the scientific consensus.³

³Moerner (2004), who has studied sea level throughout his distinguished, 30-year professional career and is recognized as the world’s foremost expert, says there is no basis even for the UN’s best estimate of a 0.43 m (17 in) rise in sea level to 2100. His best estimate is that there will be little increase above that which was observed in the 20th century – just 8 inches.
Coastal Storms
New Hampshire is commonly impacted by storms called nor’easters that can strike the northeast United States, producing large amounts of rain and/or snow, strong winds, and high waves. These storms occur predominantly during the fall, winter, and spring seasons of any given year. And every couple of years, a nor’easter will become severe enough to cause widespread coastal flooding, beach erosion, and damage to coastal properties.

**Frequency of Winter Storms in New England**

![Graph showing the frequency of winter storms in New England from 1955 to 1995](image)

*Figure 11. The frequency of winter storms in the northeastern United States has undergone periods of multiyear variability, but exhibits no real trend (source: Hirsch et al., 2000).*

A recent study into the climatology of nor’easters (Hirsch et al., 2000) examined the overall trend in the frequency of northeastern coastal storms events over the last half-century and found that no trend existed, instead, there were some multiyear periods that experienced an above-average number of storms, and other periods that were impacted by a lower than normal number of storm occurrences. That variation is part of the natural climate variability. The study also investigated the temporal history of the intensity of these storms by examining the central pressure and maximum wind speed of the storms. Again, no overall trend was evident in either of these intensity measures, although multiyear variations were again evident. The decades of the 1980s was marked by a tendency for weaker storms, which has since given way to a return to more normal intensities. There is no indication that coastal storms are becoming systematically stronger or more frequent.
New Hampshire will always be susceptible to severe winter storms because of its position in the circulation pattern of the Northern Hemisphere. There is no indication, however, that the variability in the frequency or strength of these storms has been directly tied to anthropogenic climate changes.

**Public Health**

Some claims have been made that rising temperatures will lead to adverse human health effects on New Hampshire’s population by increasing heat-related illnesses, reducing air-quality, and hastening the spread of vector-borne, “tropical” diseases. But such claims ignore our best scientific understanding of these issues.

**Heatwaves:** In general, heat-related mortality rates have been on the decline across the United States since at least the early 1960s. This fact holds true for major cities in the Northeast.

In a series of studies, Davis et al. (2003ab) focused on heat-related mortality during the summertime and the trends during the past 40 years or so. Davis et al. (2000b) found that in the vast majority of major cities across the United States, the population’s sensitivity to extremely high temperatures has been declining over time despite a general rise in summertime temperatures. This desensitization is attributed to better medical practices, increased access to air-conditioning, and improved community response programs.

While there were no New Hampshire cities that were included in the Davis et al. studies, it should be expected that locations in New Hampshire should behave in a similar manner as those of other nearby northeastern cities. As is evident in the figure below, populations in the northeastern U.S. are becoming more immune to the harsh impacts of extreme high temperatures.

Each of the bars of the illustration above represents the annual number of heat-related deaths in 28 major cities across the United States. There should be three bars for each city, representing, from left to right, the decades of the 1970s, 1980s and 1990. For nearly all cities, the number of heat-related deaths is declining (the bars are get smaller). In some cities, there is not a bar present at all in the 1990s. This indicates that there are no statistically distinguishable heat-related deaths during that decade (the most recent one studied)—meaning that the population of those cities has become nearly completely adapted to heat waves. This adaptation is most likely a result of improvements in medical technology, access to air-conditioned homes, cars, and offices, increased public awareness of potentially dangerous weather situations, and proactive responses of municipalities during extreme weather events.
Heat-related mortality trends across the U.S.

Figure 12. Annual average excess summer mortality due to high temperatures, broken down by decade, for 28 major cities across the United States. For each city each of the three bars represents the average mortality during successive decades (left bar 1964-66 + 1973-1979; middle bar 1980-1989, right bar 1990-1998). Bars of different color indicate a statistically significant difference. No bar at all means that no temperature/mortality relationship could be found during that decade/city combination (taken from Davis et al., 2003b).

If temperatures continue to warm in the future and excessive heat events become more common, there is every reason to expect that adaptations will continue lessening their impact on the general population — unless waste, futile mitigation policies increase electricity costs beyond the means of the most vulnerable, particularly the elderly and poor.

Vector-borne Disease: An outbreak of the West Nile Virus, a mosquito-borne “tropical” disease began in the United States during the summer of 1999 in the New York City metropolitan area. This was the first occurrence of this rather rare disease in the Western Hemisphere. Since then, the disease has spread across most
of the United States. Its initial occurrence during a particularly warm period, and the string of relatively warm winters and summers since then have led some to wonder if this was a case of global warming leading to the spreading of this disease into regions where it normally did not occur. But, the facts do not bear out this scenario.

**Spread of the West Nile Virus across the United States after its Introduction in New York City in 1999**


Anyone who spends much time outside in New Hampshire realizes that mosquitoes and mosquito bites are a common companion in the warm seasons. In fact, applications of mosquito repellent are a necessity when spending time outdoors in the evening near any of the state’s many bodies of water. And, as any traveler knows, New Hampshire is not unique in its mosquito population; mosquitoes are found throughout the United States. The reason that West Nile fever had never before occurred in North America is that it had never been introduced before, not because mosquitoes did not thrive before 1999.
The rapid spread of West Nile Virus across the U.S. and Canada is not a sign that temperatures are progressively warming. Rather, it is a sign that the existing environment is primed for the virus. In the infected territories, mean temperature has a range more than 40ºF. The virus can thrive from the tropics to the tundra of the Arctic — anywhere with a resident mosquito population. The already-resident mosquito populations of New Hampshire are appropriate hosts for the West Nile virus — as they are in every other state.

Another disease of concern in the Northeast is Lyme disease. Lyme disease was first recognized in the United States in the 1970s, and now accounts for more than 95 percent of reported vector-borne illnesses in the U.S. More than 21,000 new cases are reported each year — more than double the rate reported 15 years ago.

The increased rate of actual disease occurrence has falsely been linked to ongoing climate changes and suggestions follow that future climate conditions will further increase the spread of Lyme disease. Leading specialists have found the opposite to be true: “Mean temperatures show weak and inconsistent correlations with incidence.” Incidents are instead related to New England farmlands returning to forests near homes, creating “edge habitat” and an explosion in deer populations which carry the black-leg tick. Lyme disease is not a problem in the warmer Southern states.

Put differently, alarmist claims ignore the fact that during the 1950s — a period that was nearly as warm as today in New Hampshire and across New England — Lyme disease was not even present. Also, during the 20th century, New England experienced a large forest regrowth as the primary region of farming in the United States migrated from the East to the Midwest. Large expanses of land that were once farmland during the late 1800s were left to return to woodlands — the ideal habitat for white-tailed deer, an important species in the cycle of Lyme disease. A greater deer population has led to a greater tick population and greater incidences of Lyme disease.
The best way to combat vector-borne diseases such as West Nile or Lyme disease is through direct application of the best available technologies. Fanciful strategies aimed at “changing the climate” are ill-equipped to modify the patterns of vector-borne disease.

Impacts of climate-mitigation measures in the state of New Hampshire

Globally, in 2003, humankind emitted 25,780 million metric tons of carbon dioxide (mmtCO₂: EIA, 2007a), of which emissions from New Hampshire accounted for 20.5 mmtCO₂, or a mere 0.08% (EIA, 2007b). The proportion of manmade CO₂ emissions from New Hampshire will decrease over the 21st century as the rapid demand for power in developing countries such as China and India rapidly outpaces the growth of New Hampshire’s CO₂ emissions (EIA, 2007b).

During the past 5 years, global emissions of CO₂ from human activity have increased at an average rate of 3.5%/yr (EIA, 2007a), meaning that the annual increase of anthropogenic global CO₂ emissions is more than 40 times greater than New Hampshire’s total emissions. This means that even a complete cessation of all CO₂ emissions in New Hampshire will be completely subsumed by global emissions growth in just a bit more than one week’s time! In fact, China alone adds more than 20 New Hampshires-worth of new emissions to its total emissions each and every year. Clearly, given the magnitude of the global emissions and global emission growth, regulations prescribing a reduction, rather than a complete cessation, of New Hampshire’s CO₂ emissions will have absolutely no effect on global climate.

Wigley (1998) examined the climate impact of adherence to the emissions controls agreed under the Kyoto Protocol by participating nations, and found that, if all developed countries meet their commitments in 2010 and maintain them through 2100, with a mid-range sensitivity of surface temperature to changes in CO₂, the amount of warming “saved” by the Kyoto Protocol would be 0.07°C by 2050 and 0.15°C by 2100. The global sea level rise “saved” would be 2.6 cm, or one inch. Even a complete cessation of CO₂ emissions in New Hampshire is only a tiny fraction of the worldwide reductions assumed in Dr. Wigley’s global analysis, so its impact on future trends in global temperature and sea level will be only a minuscule fraction of the negligible effects calculated by Dr. Wigley.

To demonstrate the futility of emissions regulations in New Hampshire, we apply Dr. Wigley’s results to the state, assuming that the ratio of U.S. CO₂ emissions to those of the developed countries which have agreed to limits under the Kyoto
Protocol remains constant at 39% (25% of global emissions) throughout the 21st century. We also assume that developing countries such as China and India continue to emit at an increasing rate. Consequently, the annual proportion of global CO2 emissions from human activity that is contributed by human activity in the United States will decline. Finally, we assume that the proportion of total U.S. CO2 emissions in New Hampshire – now 0.35% – remains constant throughout the 21st century. With these assumptions, we generate the following table derived from Wigley’s (1998) mid-range emissions scenario (which itself is based upon the IPCC’s scenario “IS92a”):

### Table 1

**Projected annual CO2 emissions (mmtCO2)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Global emissions: Wigley, 1998</th>
<th>Developed countries: Wigley, 1998</th>
<th>U.S. (39% of developed countries)</th>
<th>New Hampshire (0.35% of U.S.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>26,609</td>
<td>14,934</td>
<td>5,795</td>
<td>21</td>
</tr>
<tr>
<td>2025</td>
<td>41,276</td>
<td>18,308</td>
<td>7,103</td>
<td>25</td>
</tr>
<tr>
<td>2050</td>
<td>50,809</td>
<td>18,308</td>
<td>7,103</td>
<td>25</td>
</tr>
<tr>
<td>2100</td>
<td>75,376</td>
<td>21,534</td>
<td>8,355</td>
<td>29</td>
</tr>
</tbody>
</table>

*Note: Developed countries’ emissions, according to Wigley’s assumptions, do not change between 2025 and 2050: neither does total U.S. or New Hampshire emissions.*

In Table 2, we compare the total CO2 emissions saving that would result if New Hampshire’s CO2 emissions were completely halted by 2025 with the emissions savings assumed by Wigley (1998) if all nations met their Kyoto commitments by 2010, and then held their emissions constant throughout the rest of the century. This scenario is “Kyoto Const.”

### Table 2

**Projected annual CO2 emissions savings (mmtCO2)**

<table>
<thead>
<tr>
<th>Year</th>
<th>New Hampshire</th>
<th>Kyoto Const.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2025</td>
<td>25</td>
<td>4,697</td>
</tr>
<tr>
<td>2050</td>
<td>25</td>
<td>4,697</td>
</tr>
<tr>
<td>2100</td>
<td>29</td>
<td>7,924</td>
</tr>
</tbody>
</table>

Table 3 shows the proportion of the total emissions reductions in Wigley’s (1998) case that would be contributed by a complete halt of all New Hampshire’s CO2 emissions (calculated as column 2 in Table 2 divided by column 3 in Table 2).
# Table 3

**New Hampshire’ percentage of emissions savings**

<table>
<thead>
<tr>
<th>Year</th>
<th>New Hampshire</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0.0%</td>
</tr>
<tr>
<td>2025</td>
<td>0.5%</td>
</tr>
<tr>
<td>2050</td>
<td>0.5%</td>
</tr>
<tr>
<td>2100</td>
<td>0.4%</td>
</tr>
</tbody>
</table>

Using the percentages in Table 3, and assuming that temperature change scales in proportion to CO₂ emissions, we calculate the global temperature savings that will result from the complete cessation of anthropogenic CO₂ emissions in New Hampshire:

# Table 4

**Projected global temperature savings (°C)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Kyoto Const</th>
<th>New Hampshire</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2025</td>
<td>0.03</td>
<td>0.0002</td>
</tr>
<tr>
<td>2050</td>
<td>0.07</td>
<td>0.0004</td>
</tr>
<tr>
<td>2100</td>
<td>0.15</td>
<td>0.0006</td>
</tr>
</tbody>
</table>

Accordingly, a cessation of all of New Hampshire’s CO₂ emissions would result in a climatically-irrelevant and undetectable global temperature reduction by the year 2100 of less than one thousandths of a degree Celsius. This number is so low that it is equivalent to zero. Results for sea-level rise are also negligible:

# Table 5

**Projected global sea-level rise savings (cm)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Kyoto Const</th>
<th>New Hampshire</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2025</td>
<td>0.2</td>
<td>0.001</td>
</tr>
<tr>
<td>2050</td>
<td>0.9</td>
<td>0.005</td>
</tr>
<tr>
<td>2100</td>
<td>2.6</td>
<td>0.01</td>
</tr>
</tbody>
</table>

A complete cessation of all anthropogenic emissions from New Hampshire will result in a global sea-level rise savings by the year 2100 of an estimated 0.01 cm, or less than one hundredths of an inch. Again, this value is climatically irrelevant and virtually zero.
Even if the entire Western world were to close down its economies completely and revert to the Stone Age, without even the ability to light fires, the growth in emissions from China and India would replace our entire emissions in little more than a decade. In this context, any cuts in emissions from New Hampshire would be extravagantly pointless. New Hampshire’s carbon dioxide emissions, in their sum total, effectively do not impact world climate in any way whatsoever.

Costs of Federal Legislation

And what would be the potential costs to New Hampshire of legislative actions designed to cap greenhouse gas emissions? An analysis was recently completed by the Science Applications International Corporation (SAIC), under contract from the American Council for Capital Formation and the National Association of Manufacturers (ACCF and NAM), using the National Energy Modeling System (NEMS); the same model employed by the US Energy Information Agency to examine the economic impacts.

For a complete description of their findings please visit: http://www.accf.org/pdf/NAM/fullstudy031208.pdf

To summarize, SAIC found that by the year 2020, average annual household income in New Hampshire would decline by $1,157 to $3,749 and by the year 2030 the decline would increase to between $5,040 and $9,190. The state would stand to lose between 5,000 and 8,000 jobs by 2020 and between 13,000 and 18,000 jobs by 2030. At the same time gas prices could increase by more than $5 a gallon by the year 2030 and the states’ Gross Domestic Product could decline by then by as much as $2.9 billion/yr.

And all this economic hardship would come with absolutely no detectable impact on the course of future climate. This is the epitome of a scenario of all pain and no gain.

New Hampshire Scientists Reject UN’s Global Warming Claims

At least 125 New Hampshire scientists have petitioned the US government that the UN’s human-caused global warming hypothesis is “without scientific validity and that government action on the basis of this hypothesis would unnecessarily and counterproductively damage both human prosperity and the natural environment of the Earth.”

They are joined by over 31,072 Americans with university degrees in science – including 9,021 PhDs.

The petition and entire list of US signers can be found here: http://www.petitionproject.org/index.html

Names of the New Hampshire scientists who signed the petition can be viewed here: http://petitionproject.org/gwdatabase/Signers_BY_State.html

Questions about this survey should be addressed to the petition organizers.
References


