

CLIMATE

Climate is the sum of the prevailing weather conditions of a place over a period of time and is comprised of all the features associated with weather, such as temperature, wind patterns, precipitation, and storms. Since the agricultural revolution, the human influence on the natural world including climate has accelerated.

A clear majority of respected and responsible scientists and community leaders agree that climate change is occurring and that humans are responsible for warming the planet at a rate that has never been experienced in human history. Within the past century, the average global temperature has increased by 0.8° Celsius. However, only very recently has it been possible to detect even minute shifts in either temperature or biological response to the warming trend. Even then, natural variation and evolutionary change make it very difficult to state with absolute certainty that any particular local trend is a result of global climate change.

This report will provide more questions than answers but will identify local biological and social factors where scientists have predicted that significant change will occur in the future. The Muskoka Watershed Council will continue to monitor these factors and report on trends in future report cards.

Climate Classification

The climate of a place includes measurable environmental factors that affect all forms of life. Physical components of meteorology that may be useful in describing climate include insolation (incoming solar radiation), infrared radiation, atmospheric pressure, wind, relative humidity, temperature, cloud cover, fog, [smog](#), precipitation type and intensity, evaporation, transpiration, and the incidence of cyclones, anticyclones, and frontal passages. Many of these parameters are not included for general climatic descriptions because measurements of them have not been widely available. W. Koppen developed a simple climate classification system based on local terrestrial plant life, temperature and precipitation seventy years ago.⁵²

Koppen's climatic zones are defined by temperature and precipitation averaged both over the whole year and by individual months. These parameters have been measured for many years in many places allowing Koppen's system to be applied worldwide. For our region the current climate is described as Dfb.

- D stands for a snowy climate (with sufficient heat and moisture for the growth of high trunked trees) and the warmest month mean temperature over 10° C and coldest month mean under -3° C.
- f stands for sufficient precipitation in all months.
- b stands for warmest months average temperature under 22° C and at least four months with over 10° C.

A Dfb climate may be described as a cold, snowy forest climate, moist all year with warm summers. Located in central and eastern parts of continents of middle latitudes, Dfb is in the battleground of polar and tropical air masses. Seasonal contrasts are strong and weather highly variable. Ample precipitation throughout the year is increased in summer by invading maritime tropical air masses. Cold winters are dominated by modified continental air masses.⁵³

The Parry Sound/Muskoka/Haliburton area has enjoyed this temperate climate for thousands of years and continues to do so. At this point we are experiencing fluctuations in weather but the overall climate of the area remains as a 'cold, snowy forest climate'. Scientists and meteorologists have not predicted if global warming will significantly alter this basic climatic classification.

⁵² Strahler, Physical Geography (4th ed.), Wiley, New York (1975)

⁵³ibid

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History of Climate Change

Prior to the ice ages of the past 600 thousand years, the climate of our region was warmer than now for a period of at least 250 million years. Evidence for this is in the fossil records of the sedimentary rocks just to the south that were not destroyed by the grinding of glaciers.

Trying to piece together the climate record during and after the retreat of the last continental glacier has led investigators to many varied sources. They include both continental and alpine glaciers, pollen deposits in bogs, tree rings, isotopes and archaeological data⁵⁴. Since the most recent ice sheet began to retreat 13,000 years Before Present (B.P.), Earth's climate warmed gradually to a maximum around 4000 B.P. when sea level was two to seven metres higher than present levels. Pollen deposits in bogs indicate that the spruce forest belt (the arctic tree line) moved north, keeping close to the edge of the retreating ice. By 4000 B.P. the spruce forest was 250 to 300 km farther north than its present limits, and temperatures averaged 3°C warmer in Keewatin at 61 latitude. Hardwood forests also advanced 300 km farther north due to the warmer climate.⁵⁵

During the past 4000 years, average temperatures have varied 2 to 3 C in the northern hemisphere. Examples of these variations, the warmth of the thirteenth century followed by the cold regime of the Little Ice Age (1550 to 1700 A.D.) are well documented in European records of alpine glaciers retreating and advancing, length of winters, growing seasons, and duration of ice in northern ports. Since 1900 a significant warming trend has been occurring.⁵⁶ In the Algonquin region however, this warming trend during the past 2000 years has not altered the forest community appreciably.⁵⁷

Given that climate is always changing and there have been warm periods in the past, why is there concern about the current warming trend? The climate change we are seeing today differs from previous climate change in both its rate and its magnitude.

Human Influence On Climate Change

Since the industrial revolution, human activity has caused a warming of the Earth's atmosphere that has been accelerating along with its population and consumption of fossil fuels (peat, coal, petroleum and natural gas).

According to a clear majority of respected and responsible earth scientists, the recent rapid warming is caused not by changes in the sun's energy output, as it has been in the past, but increases in [concentrations](#) of greenhouse gases: water vapour, carbon dioxide, methane, nitrous oxides and a few human made compounds. Without these special gases, that trap infrared radiation near the Earth's surface it would be too frigid for life as we know it to exist. As a result of burning fossil fuels, and as shown in Figure 1, concentrations have increased 30% for carbon dioxide. In addition, methane has increased by 145 per cent and nitrous oxide by 15 per cent.⁵⁸

⁵⁴ Lamb, H.H., 1995, *Climate, History and the Modern World*, Methuen, London.

⁵⁵ *ibid*

⁵⁶ *ibid*

⁵⁷ Cwynar, L.C. 1977 The Recent Fire History of Barron Township, Algonquin Park, On. *Can. J. Bot.* 56: 10-21.

⁵⁸ Government of Canada, Environment Canada, *Climate Change Overview*, *The Science of Climate Change* http://www.ec.gc.ca/climate/overview_science-e.html

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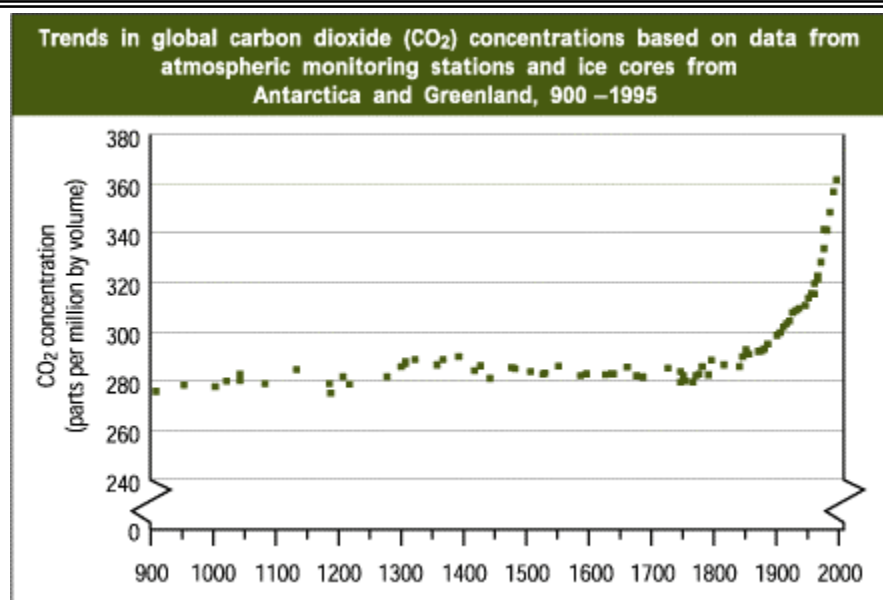


Figure 1: Trends in Global Carbon Dioxide Concentrations⁵⁹

Another factor causing increased concentrations of carbon dioxide and methane is the increasing worldwide human destruction of forests and wetlands that absorb and store them. Increased development in Muskoka may lead to the loss of both wetlands and forests and continued vigilance, through the development approval process is required to protect these important resources.

Warming is not spread evenly over the continents, but rather greater warming has occurred at higher latitudes than near the tropics and there is greater warming on land masses than in the oceans. People and animals such as polar bears that inhabit the northland have experienced recent disruptive changes due to late freezing and early melting of winter roads and shrinking of the ice pack. Scientists agree that the warming will continue even if fossil fuel consumption is reduced, and if the current trend to consume more continues. The rate of warming may cause significantly more catastrophes within the next decades. Unfortunately, no one is able to predict exact consequences, but informed predictions about how such rapid warming may affect life on Earth can be made.

On the global scale, the following natural consequences will continue to increase: melting of alpine and polar continental glaciers of Greenland and Antarctica, rising oceans levels, expanding deserts in some places (Australia and Africa), shifting pole ward of warmer climates along with there associated plants and animals, increasing in intensity and frequency of catastrophic weather events such as hurricanes, severe thunderstorms and their damaging tornados, downbursts, hail and cloud bursts as well as more surprising weather such as ice storms and wind storms. Many animals, including humans will continue to have difficulty adapting to change; plant and animal populations in some areas will plummet while in others will rise as changes in their habitat occur.

Watershed Implications

Climate change impacts in our [watershed](#) are likely to be subtle and gradual. From 1895 to 1999, annual mean temperatures have increased by only 0.7°C for the southern portion of the Great Lakes and St. Lawrence basin, which includes Muskoka/Haliburton/Parry Sound. From 1948 to 2005, a warming trend of 0.5°C has been recorded. Total precipitation has increased from 1895 to 1995. However, an extension of a trend for the period 1996 to 2005 is inconclusive. Since 1860, annual water levels in the Great Lakes have only fluctuated about 2 m from measured maximum and minimum levels. Recently,

⁵⁹ Government of Canada, Environment Canada [Climate Change and Severe Weather](http://www.ec.gc.ca/TKEI/cc_weather/cc_e.cfm)
http://www.ec.gc.ca/TKEI/cc_weather/cc_e.cfm

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lake levels dropped dramatically from highs in 1997 and remained low through to 2001, as a result of exceptionally hot and dry conditions.⁶⁰

Climate change will have ecological, social and economic impacts on the local watersheds. Scientists do not understand all the possible implications but some changes and stresses are already being documented not only across Canada and the world but also in Muskoka. Some data that may be interesting to track over time that will be influenced by global warming include: data for freeze up and break up of local lakes and rivers; first and last days for golfing; severe weather events such as wind storms, hail and tornados, flooding and freezing rain; the return of migratory birds, siting of birds and animals that usually live farther south. A brief summary of some key factors is presented below.

Wildlife

It is difficult to predict the specific impacts that climate change will have on the wildlife of an area, as each species will react differently and in a site-specific manner. More research is required to understand all the relationships involved.

In general, the northern limit of species ranges tend to be determined by abiotic factors such as temperature where as the southern boundary is usually defined by biotic factors such as competition and parasites. Therefore, the southern boundary tends to be more fluid and change more quickly than the northern boundary. This may result in some species getting 'squeezed out' if they cannot adapt and migrate northward fast enough.

Species that will tend to be successful as change occurs will be those that are able to adapt quickly and are generalists. They will likely have high reproductive rate, be capable of long migrations, colonize rapidly, be tolerant of people, and survive in a broad range of environmental conditions. Species that are easily identified in this category are squirrels, raccoon, beaver and skunks; often considered urban pests.

Scientists have identified several local species that are expected to be directly impacted by a warming climate. These species can be tracked over time as indicators of change in the natural system as climate changes.

Moose – Moose will be impacted as deer moved up into the traditional moose territory. Deer carry a disease that impacts the brain and is fatal to moose although it is manageable in the deer population. Moose will also be impacted if changing precipitation results in heavier snowfall, which tends to produce larger wolf packs, which, in turn, have a higher kill success on moose.

Blacklegged Tick – The black-legged tick is the carrier of lyme disease. Traditionally found only in warmer, more southern areas this pest is beginning to move north. Populations of the insect are already established in southern Ontario and it is predicted that they will be in all parts of Muskoka by 2020.

Eastern Bluebird – It is possible that eastern bluebirds may become more prevalent in Muskoka as more habitat is created through fire and development. With warmer temperatures, these little creatures may find the area very welcoming.

Turtles – Many species of turtles are already under stress due to habitat loss and transportation corridors. Climate change will add to that stress. The sex of turtles is temperature dependent. Eggs incubated

⁶⁰ Tina Tin Hydrological Changes in the Great Lakes – St. Lawrence Basin under Climate Change and Impacts on Hydropower Generation in Implications of a 2°C global temperature rise on Canada's water resources Athabasca River and oil sands development Great Lakes and hydropower production http://wwf.ca/AboutWWF/WhatWeDo/ConservationPrograms/GlobalWarming/reports/WWF_2degCanada_WaterReport.pdf

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above a pivotal temperature of about 30° C develop into females and those below about 30° C develop into males. Warmer temperatures could result in a gender imbalance in many species of turtles.⁶¹

Changing climate has also resulted in changes in the timing of breeding for several animals. There has been an advance in the birthing date for red squirrels of 18 days since the 1950's. Because they have a head start each spring, red squirrels now out-compete other similar rodents and are bigger and healthier by the following winter. This genetic shift may result in a shift in squirrel composition.

Tree swallows are also breeding nine days earlier than thirty years ago. The concern with the early breeding of some birds is that they are then out of phase with insects that serve as food. In these cases, the bird may suffer and become more vulnerable to other stresses, such as parasites and sudden cold temperature.

Warmer temperatures will mean that some species at their southern limit will not survive. A recent study of the non-migratory Canada jay or grey jay in the northern part of the watershed illustrates the stress that some local species are already facing. Grey jays have always been a common sight in the Algonquin and Huntsville portions of the watershed, however, their population has dropped by 50 percent in the last 25 years.⁶² Grey jays store food in the trunks of trees where it will freeze in the fall and winter and be available in late winter and early spring, when it is needed to feed the young. However, with warmer temperatures, their hoards are rotting and the grey jay is dying out in the southern part of its range, including Muskoka.

Forestry

A general trend toward warmer conditions combined with increasing levels of carbon dioxide could increase forest growth in Canada. It could take decades, or even centuries, however, before forests adjust to new climatic conditions. Climate models predict that tree species would have to migrate at a rate of 3.6km/yr to adapt to climate change. Historically, using [paleo core](#) analysis, trees have never migrated more than 1 km/yr. During this period of adjustment, the [boreal forest](#) in particular could be more vulnerable to insects and diseases, forest fires, and competition from unwanted species, and the forestry industry will have to adapt to new climatic conditions. The rate of change, as well as the number and severity of extreme events, will dramatically affect the magnitude of impacts and our ability to cope with them.

Most of Muskoka is situated at the northern limit of the temperate mixed hardwood forest of south central Ontario while some of the higher country in the northern part of the watershed supports boreal species such as black spruce. As the climate warms it is predicted that there will be a shifting northward of the ecological zones, however, there will likely be variation in the change depending on individual site characteristics.

As noted above, we can expect a gradual change in our forests and their associated plants and animals. Already local foresters are indicating that both beech and maple are becoming stressed and when replanting occurs, drought tolerant species like black cherry, red oak, white ash and white pine are favoured. It is likely that northern species such as black spruce will eventually disappear from the landscape.⁶³ However, in general, the landscape will remain forested and support a variety of common hardwood and softwood species.

Damage to seed crops will also add stress to the forest [ecosystem](#). When a severe weather event such as wind, hail or heavy rains takes down seed prematurely, natural regeneration will not occur. In addition,

⁶¹ Lovich, J.E. Turtles and Global Climate Change, United States Geological Service and Department of Biology University of California, Riverside, 2003.

<http://geochange.er.usgs.gov/sw/impacts/biology/turtles/>

⁶² Waite, T.A; Strickland, D, Climate Change and the Demographic demise of a Hording Bird Living on the Edge, in [Proceedings of the Royal Society B](#).

⁶³ Peet, Tyler, Forester, Haliburton Forest and Wildlife reserve presented at Climate Change and Your Woodlot Stewardship Session Kinark Outdoor Centre, Cararvon, May 25, 2007

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immature seed cannot be collected and grown in local nurseries to supply replanting needs. Pollen may also be washed out of the system prematurely limiting seed production.

It is unclear as to how our local forests will adapt to climate change and the multiple stressors being experienced. Although the climate may be more amenable to the growth of some trees, there is some concern that many essential nutrients, such as calcium, have been washed out of the native soils as a result of acid rain. The combination of all these stresses along with development, and invasive species and parasites, may be catastrophic to the forest and subsequently to the tourism and recreation, and forestry industries that rely on them.⁶⁴

Fisheries

A warming by a few degrees in average temperature to well managed aquatic ecosystems will have subtle and not catastrophic effects on their health. The lakes within the watershed will continue to turn over due to freeze up in winter and warm up in spring. This annual cycle is the most significant factor that determines the kind of fish and other aquatic plants and animals that thrive here. History shows that human interference such as [acid precipitation](#), other poisons, increased nutrient levels, suspended solids and habitat destruction especially along shorelines are likely far more detrimental to aquatic ecosystems than what global warming will likely cause.

Climate change will, however, affect both the productivity of fish populations and how they are distributed throughout our lakes and streams. Changes to water temperature, currents, water quality, food supply, and predators could all have effects on fish populations.

The freshwater fishery is mostly a subsistence and recreational fishery. Change to the distribution of highly prized species would have an effect on the recreation fishery industry, with possible losses occurring in some areas and gains in other areas. In general, as lake and stream temperatures warm, species at their warmer southern limit will either die or migrate northward to more favourable habitats. Cool and cold-water freshwater fish populations, including species such as trout, whitefish, and grayling, could be reduced in many lakes and streams on the Canadian Shield due to declining water levels and flow and reductions in nutrient loading and recycling.

Freshwater fish species that currently live at the northern limit, or cold-water limit, of their preferred habitats in larger lakes will likely benefit from warmer water temperatures, experiencing increased survival and growth.

Growth rates, age of sexual maturity, and distribution of some marine fish species are sensitive to water temperatures. Cooler temperatures could typically result in delayed spawning and a shift in distribution southward, while warmer temperatures could result in earlier spawning and a shift in distribution to the north.

The composition of the fish population in Muskoka is changing with the introduction of warm water fish species like bass and the cold-water fish species like trout experiencing stress.

Preliminary work undertaken by Dr. David Evans of the Ministry of Natural Resources indicates that warming temperatures may negatively impact some lake trout populations in the watershed.⁶⁵ Dr. Evans' study indicates that warming and drought will result in reduced export of Dissolved Organic Carbon (DOC) to lakes with increased transparency and light resulting in greater thermocline depth and reduced volume of habitat for cold-water species.

Earlier springs and protracted falls will result in extended thermal stratification and greater oxygen depletion in the bottom waters of lakes leading to reduced habitat quality for lake trout. Earlier and extended spring mixing in small lakes with greater whole-lake warming and increased temperatures in the

⁶⁴ Watmough, S.A., Dillon, P.J. Calcium losses from a forested catchment in south central Ontario, Canada. *Environmental Science and Technology* 37: 3085-3089 (2003).

⁶⁵ Evans D.O., Implications of Climate Change for Lake Trout Fisheries in Ontario, A talk given at the A.D. Latorell Conservation Symposium, Alliston, Ontario, November 16, 2006

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bottom of lakes will result in increased plant decay further reducing the amount of available oxygen in the bottom waters of lakes.

Based on temperature and precipitation records for the last 70 years from the Muskoka Airport, Dr Evans identified that both the annual temperature and annual precipitation has increased, however, the increases are seasonally influenced which has a further negative impact on sensitive lake trout. His research indicated that there has been an increase in temperature of 0.243 °C in March but that average temperatures in October are cooler by -0.326 °C. He noted that there was no change in the average summer temperature. Dr. Evans noted that average precipitation in May had increased by 0.148/mm/day/decade and in October, the increase was 0.152 mm/day/decade. No change was noted during March, July or December, however, the snow depth during March has been reduced.

The main concern for lake trout with this shift in temperature and precipitation appears to be earlier stratification of the lake, warmer waters at the bottom of the lake and increased oxygen depletion during the summer. These changes put a significant stress on the juvenile population as it forces the young up into the waters occupied by the adults who tend to cannibalize the population.

On the other hand, the bass population appears to be thriving in lakes such as Lake Muskoka. As bass tournaments are a large tourist draw, this shift in fish populations may have a positive economic spin-off.

Health

It is predicted that climate change could affect the health of Canadians due to higher temperatures, more frequent storms, and increases in air pollution episodes. Changes in the transmission of insect- or water-borne diseases could also have an impact on Canadians' health. As well as affecting the health of individual Canadians, these projected changes would place additional stresses on the health-infrastructure and social-support systems.

The World Health Organization has warned that heat stress and climate-induced respiratory problems as a result of reduced air quality could occur in urban areas, and could lead to increased death rates. Locally, the Ontario Medical Association (OMA) has reported that Muskoka experienced 31 premature deaths in 2005 with an additional 56 deaths projected for 2006 as a result of poor air. Most premature deaths are due to poor air quality that results in cardio-vascular and respiratory complications. The OMA also identified a total cost to the health care system and lost productivity in Muskoka due to poor air quality as \$3.42 million in 2005. This cost is expected to rise as warmer temperatures produce more poor air quality days.⁶⁶

Infrastructure

In 2007, there is insufficient local trend data to determine any real change in long-term trends with respect to such factors as the levels of precipitation, temperatures or wind storms and how that might impact on local infrastructure.

Nationally, it is projected that changes in rainfall intensity and snowmelt runoff could increase the potential for flooding in water basins, with over-tipping of dams, culverts, and flood control structures. Projected increases in rainfall intensity could change the patterns of flooding in Canada, requiring adaptation of flood-prevention infrastructure.

Human settlements and infrastructure are especially vulnerable to extreme weather events. In 1996, floods and hailstorms cost an estimated \$1.5 billion in damages to homes, business, and infrastructure.

Although Muskoka has not experienced some of the extreme flooding, ice storms and wind damage seen in other areas, there has been an increase in severe weather damage over the last ten years and municipalities are beginning to take steps to adapt to what is seen as a new reality. Based on previous year's experiences where 'clean-up' dollars had to be redirected from capital projects to address storm

⁶⁶ Ontario Medical Association, *Illness Costs of Air Pollution (ICAP) – regional Data for 2005 (with projections to 2006)*.

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damage, such as the rebuilding of Fraserburg Road (DR #14) in the 2000, Muskoka has established a storm reserve in the 2007 budget with an initial contribution of \$103,000.

Economic Impact

Changing weather patterns could mean differences in how Canadians enjoy the outdoors and may impact the local economy. Adapting now may place us in a favourable position to take advantage of future opportunities.

Hunting of game and waterfowl is likely to feel the impact of climate change as wildlife may be displaced due to habitat loss, altering community structures, or increased competition. Protection of wetland habitat and forested areas will be important to support this activity.

Recreational fishing may be locally disrupted by lower water levels in lakes, declining flow rates in streams, warmer temperatures, and reductions in nutrient loading. On larger lakes, however, opportunities for events such as bass tournaments may present themselves as warm water fish species move into the area.

The season for summer outdoor activities may be lengthened with warmer temperatures earlier in the spring and later in the fall. In the past twelve years the average opening date for several golf courses has gone from the May 24th weekend to late April or early May, a lengthening of 2 to 4 weeks. Although an anomaly, in the fall of 2006, golf was still being played in some areas across the watershed well into December.⁶⁷

The season for outdoor activities in winter will likely be shorter, especially in more southerly latitudes. Shorter winters with less snow but more ice storm problems, fewer days with frozen lakes that are safe for travel and ice fishing, fewer days for Nordic and Alpine skiing and snow mobiling, and less energy demand for heating per household can be expected.

Economic opportunities also exist, especially if consumers reduce dependence on fossil fuels. Industries that support sustainable technologies such as, geothermal, solar and wind as well as efficient transportation vehicles and buildings, and mass transit are thriving in Europe and could do so here. In addition, towns are likely to become more densely populated as fuel prices and shortages drive prices up and commuters move closer to their work places.

A Call To Action

Global warming as a result of human activity is occurring, and its effects will continue to affect all life on Earth. Rapid unsettling change may be reduced if individuals and communities “act locally and think globally”.

Recent books such as Tim Flannery’s [The Weather Makers](#) and videos such as Al Gore’s [An Inconvenient Truth](#) restate practical advice that has been around for generations; they also encourage local action that may lead to worldwide action. A question that each individual should ask is: “Am I going to be part of the problem or part of the solution?”

An overwhelming majority of World leaders, with earth scientists’ encouragement, signed the Kyoto Protocol on Feb. 16, 2006. It is intended to reduce the causes of Global Warming: the excessive and increasing use of fossil fuels.

“The treaty marks a great divide, on one side of which stand those who are certain it is essential to Earth’s survival, and on the other those who are fiercely opposed on economic and ideological grounds. Many in this group think Kyoto is economically flawed and politically unrealistic. Others believe that the entire climate change issue is hogwash.”⁶⁸

⁶⁷ Don MacKay, owner, Muskoka highlands Golf Club, pers com.

⁶⁸ Flannery, [The Weather makers](#), 2006, p 223

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Since Canada's federal Liberal government signed the agreement, little has been done to get on with the difficult decisions that will curb our appetites for fossil fuels and excessive lifestyles that drive our economy. The current Conservative government, in agreement with U.S.A.'s president has declared Kyoto too potentially damaging to Canada's economy and has put another plan that supports the status quo.

Positive initiatives are occurring. Both federal and Ontario's governments have recently encouraged intelligent purchases of new fuel-efficient cars by giving rebates and reducing sales tax. According to a local car dealer, there are no more of the preferred cars available for this year, and hopefully the manufacturers will build more to meet the demand.

The Ontario provincial government is promoting conservation and non-polluting renewable sources such as solar and wind energy with the long-term goal of reducing fossil fuel use in electrical generation. As with many issues, a solution to the reduction of greenhouse gases is not simple or straightforward. The decision to replace coal with nuclear-fueled plants is debatable and although it will reduce greenhouse gas emissions, it will increase nuclear waste and perhaps increase threats to the environment from nuclear accidents or acts of war.

The Ontario provincial government is also amending the elementary and secondary school curriculums to include more about [ecology](#) and the importance of fostering the natural environment. The grade 10-science curriculum will have a whole unit on Global Warming.

Canadians, however, remain the biggest fossil fuel consumers per capita in the world and grass roots initiatives are required to demonstrate to senior levels of government that actions can be taken to curb carbon emissions while still maintaining a healthy economy.

At the local level, both the Towns of Huntsville and Bracebridge have enacted anti idling bylaws, and several local municipalities have passed by-laws or resolutions discouraging the non-essential use of pesticides. Local governments could take a leadership role by leasing energy-efficient vehicles, undertaking and implementing energy audits on all buildings, and promoting energy efficiency through local program initiatives.

Community groups across the watersheds have formed to promote activities that will reduce carbon emissions and develop sustainable communities. These include: the Active Transportation Committee, the Huntsville Local Environmental Committee, the Muskoka Sustainability Coalition, the Huntsville Lakes Council, and many lake associations. These groups undertake local action, like trail development and support for bicycle commuting; education activities, like environment fairs; and support local government initiatives.

On a broader scale, the Muskoka Heritage Foundation and the Muskoka Watershed Council have joined with the District of Muskoka and the Ministry of Natural Resources to develop a watershed inventory that identifies significant areas for protection. The District of Muskoka will use the information as background to develop a natural areas strategy that will be incorporated into the revised Official Plan. The Muskoka Heritage Foundation will develop an acquisition strategy to guide in future purchases of key parcels of land. Maintaining Muskoka's forests in this way will ensure they continue to sequester carbon and produce oxygen into the future.

It is likely that if administrators and directors of business and institutions implemented a bottom up approach for finding ways to reduce energy use, Canada would be well along in its commitment to The Kyoto agreement. Global Warming caused by humans could be slowed with efforts by all levels of societies.

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TOP 4 LOCAL ACTIONS TO ADDRESS CLIMATE CHANGE

1. Reduce Energy Used For Transportation
 - a. Reduce the use of your vehicle – walk, bike, car pool, use public transportation
 - b. Make sure your next car meets low greenhouse gas emissions standards
 - c. Don't idle more than 10 seconds
2. Reduce your use of electricity
 - a. Reduce your use of air conditioning
 - b. Turn off lights, install compact fluorescent light bulbs, buy energy efficient appliances
3. Make sure that your home is energy efficient
 - a. Insulate
 - b. Upgrade to an high efficiency furnace
4. Become an advocate for Change
 - a. Write your local MP, MPP, and local councils and demand action at all levels to address climate change issues
 - b. Encourage dialogue with the United States to reduce American emissions

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