**Climate Change Implications for Aroostook County, Maine**

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**Introduction**

Local and regional predictions of future climate are imprecise, problematic, and often contradictory (see Maine’s Climate Future). Thus it remains difficult to plan for specific predicted changes in the climate of Aroostook County. However, general trends all indicate that we are entering a period of greater variability in our climate: more intense summer storms and extreme winter weather, flashier discharge of surface water with higher frequency of floods and droughts, and generally higher temperatures in all four seasons. These predicted changes do permit us to evaluate the nature of impacts to our regional society, both detrimental and beneficial, and to effectively plan to mitigate negative impacts.

I have attempted to divide the implications of predicted climate change in Aroostook County into the following categories (new development, human health, economy, infrastructure, and ecosystems. These categories are all hopelessly intertwined and interactive, so it is nearly impossible to draw clear lines between them.

The general theme is to invest more in security up front (zoning, engineering, and infrastructure), at the expense of efficiency. These investments will almost certainly pay off eventually, mitigating unpredictable catastrophic costs of extreme events.

1. **New Development –** plan, design, engineer, and construct buildings to anticipate greater variability in weather and weather related events (severe summer storms, tornados, floods, drought, extreme heat, and cold). Anticipate that these weather events will cause more frequent disruptions in the power grid, communication and transportation infrastructure.
2. **Zoning** – review and update regional and municipal zoning guidelines.

* Increase floodplain maps. Our former 500 year flood may occur every 50 years in the future.
* Restrict sprawl. Plan to minimize transportation cost, fossil fuel use, and CO2 emissions.
* Preserve arable agricultural lands. One benefit of a warming climate is the opportunity to expand the variety of crops we can produce, particularly corn and wheat. Aroostook County may be poised to produce valuable food crops at the very time when predictions indicate that the regions that currently produce these crops will suffer catastrophic agricultural decline (heat waves, drought, floods, extreme weather), another dust bowl.

1. **Building Design and placement** –choose optimum locations and over-engineer.

* Design to withstand F-4 tornado and maximize energy efficiency (rooftop solar, wind, biomass, hydropower, and geothermal) both at the individual building and community level.
* Earth shelter construction
* Incorporate backup electrical generation capacity in new construction.

1. **Transportation** -peer into a crystal ball and plan to intercept the transportation needs of Aroostook County 30-50 years in the future. Electric cars? Railroads? Horse and buggy?
2. **Human Health**
3. **Pandemic Disease** – of all the threats that face global society, pandemic disease is the most imminent and dire. Terrorism, although it might involve a biological agent, is a miniscule threat in comparison. This is not a matter of if, but when.

Climate change will increase global competition for essential resources, increase violent conflicts, and result in vast numbers of displaced people in refugee camps. Refugee camps are incubators for the viruses that will kill us all. The human population of the planet now exceeds 7 billion, and the vectors that can spread viruses have never been more extensive and rapid (global air travel). A newly mutated virus in a refugee camp in Myanmar can be in Caribou within 24 hours – in its deadliest and most virulent form.

1. **Insect borne disease** – increased summer heat and warmer winters favor the northward spread of insects that carry dangerous pathogenic agents, such as Lyme disease, West Nile disease, and Eastern Equine Enchephalitus.
2. **Respiratory Ailments** – as northern Maine experiences more frequent incursions of air masses from the south, conditions that include oppressive heat, humidity, ozone, and pollutants, we can expect the incidence of respiratory ailments, particularly in the aged, very young, and vulnerable segments of our population.
3. **Economy –** the economy of Aroostook County is based on a foundation of agriculture and forest products. A growing third leg of the economic stool is energy production. All other economic activity is tertiary, built upon the foundation of natural resource production and energy generation. There are pitfalls and opportunities afforded by predicted climate change, but to capitalize on the opportunities we must plan accordingly.
4. **Agriculture** – longer growing seasons and warmer summer temperatures will both increase the variety of valuable food crops that we can effectively grow and increase the number of insect and disease threats to future and existing crops. Irrigation will become more important just as surface water resources decline during the critical period in summer. Irrigation and our native cold water fishes are already in direct competition, with irrigators drawing water from upland drainages that form the critical habitat for brook trout at the very worst time of year. They sometimes take all of the water, drying streams up completely. We must address this conflict.

* Plan to grow wheat, corn, and soybeans.
* Preserve arable land for farming (food crops should take precedence over energy crops)
* Develop better water extraction policy, regulations, and enforcement.
* Diversify and rotate croplands to mitigate insect, blight, and storm losses.
* Again, invest in crop security at the expense of efficiency.

1. **Forest Products** – Changing climate will result in a responsive change in the tree species that make up our northern forest. Spruce and fir have only been important constituents of the forest since about 1,000 years ago in concert with the Little Ice Age. Dr. George Jacobsen, Maine state climatologist and Emeritus faculty of U Maine’s Climate Change Institute, recommends planting red oak and white pine here in the north with the expectations that conditions favorable for those species will occur here in Aroostook County during their life span.
2. **Energy Generation –** much argument is conducted over which locally available sources of energy are better than the others. There is no free lunch – they all have costs. We need to include all such sources in our energy portfolio (i.e., wind, solar, biomass, and hydro).

* **Promote community scale energy generation** – diversify our energy generation both geographically (community scale) and by source (wind, solar, small-scale hydro, and biomass).
* **Explore In**-**channel, run of the river turbines**- adapt new tidal power technology to river channel application.
* **Explore ways to integrate power generation** – the wood waste generator in Ashland sits idle as the Mars Hill turbines operate. Biomass energy generation can mitigate surges and lulls in wind energy to provide a reliable response to consumer demand. Yet the two facilities are in a competitive rather than a cooperative relationship, to the detriment of both and society in general.

1. **Infrastructure** – plan and design infrastructure upgrades with the objective of intercepting the needs of Aroostook County 30 – 50 years from now. Electric vehicles likely will be very quiet and very lightweight. We can expect an increase in human pedestrian and large animal collisions unless we redesign our highways to account for this change.
2. **Roads and Railroads**
3. **Electrical Grid –** bundle utilities underground! Water, sewer, electric, communication, and natural gas lines should all be bundled into one, accessible system with ready access for efficient maintenance.
4. **Natural Gas/LNG**
5. **Ecosystems –**Although the impacts of climate changeon natural ecosystemsare largely invisible over short time spans, and tend to be disregarded by economists and developers, they have implications for every facet of our lives. We have already converted our cold water habitat in our rivers and lakes to warm water systems through land use activities (forest clearing, urban development, and dams), but Tinker Dam, Fish River Falls, and Allagash Falls provide barriers against an invasion of warm water species. These three rivers (Aroostook, Fish, and Allagash) are the last, uncontaminated native brook trout habitat in the US, and we are about to lose it. We can expect moose numbers to decline and white tailed deer to increase. Snowshoe hare and lynx will give way to cottontail and bobcat Our forest may look something like Massachusetts or Rhode Island. The caveat is that ecosystems don’t necessarily march northwards in lock step with a warming climate. “Global weirding” describes the ecological chaos that ensues when change happens rapidly and the species within the ecosystem remain in constant flux. Twelve hundred years ago, during the Medieval Warm period, northern Maine supported herds of caribou and a large population of snapping turtles (enough so that local Native Americans ate a lot of them). The subsequent Little Ice Age pushed the snappers south – they are only now moving back into the Aroostook drainage, and later Euroamerican settlement pushed the southern range limit of caribou northwards to the Gaspe. Nowhere do caribou and snapping turtles co-exist today. We can expect other, seemingly incongruous, species assemblages as a result of the predicted rapid rate of climate change. Some may be beneficial, others not, but all are likely to continue to change rapidly rather than establish long term equilibrium, which only occurs during period of low rates of change and general environmental stability.