

## **Gro-WA Work Component E**

### **Title of Work Component: *CLIMATE CHANGE***

#### **Introductory section**

NMDC engaged a Climate Change Lead Team consisting of federal and state governments, regional government, community and economic development professionals, university professors, and resources such as environmental professionals, planners, university students, and tourism professionals. The first initial meeting of the climate change working group consisted of an introduction of each partner's on-going work relative to climate change as well as an open discussion on the human impacts of climate change. In February, 2013, the climate change working group held a round table discussion focusing on climate change. A group of 28 people in attendance voiced their concerns and identified many issues as a result of climate change. Such issues as coastal and inland flooding, invasive species (both animal and plant), impact on agricultural communities, tourism impacts, and a variety of other impacts to air, land, and water quality were discussed. The concerns and issues voiced at the public forum parallel comments made by climatologist in the U.S. and Canada.

Local and regional predictions of future climate are imprecise, problematic, and often contradictory. Thus it remains difficult to plan for specific predicted changes in the climate. 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.

Responses to climate change can be divided into one of two categories:

- *Causes:* Human activities are major contributors to current global warming. Human-induced climate change includes greenhouse gas (GHS) emissions, deforestation, and carbon dioxide (CO<sub>2</sub>) emissions. These causes can be mitigated through reduction of vehicle miles traveled, reforestation and green building techniques.
- *Symptoms:* This is the result of climate change, such as drought, intense precipitation, sea-level rise and heat waves. Adaptation measures to relieve symptoms might include water resource management, stormwater control measures, coastal hardening, and providing shelters for at-risk and vulnerable populations.

In order to develop and implement effective mitigation and/or adaptation strategies, planners will need to understand the regional effects of climate change in the communities they serve. Aroostook County is located entirely in the northernmost of Maine's three climatic divisions. The average annual temperatures are 64°F in July/August and 18°R in January/February. The average amount of precipitation, based on long-term records dating back to 1895, is 42.6%. This includes conversion of all snowfall to a water equivalent. The average monthly precipitation is between 3"-4" with November being the wettest month and February being the driest month.

## **Gro-WA Work Component E**

### **Title of Work Component: *CLIMATE CHANGE***

#### **Findings**

- There are eight major rivers, more than 5,000 streams and brooks, 6,000 ponds and lakes and 3,500 miles of coastline in Maine, which are vulnerable to the effects of flooding. Flooding has been identified as the number one hazard in each of Maine's 16 counties. Flooding can result in loss of life, property damage or destruction, damage or disruption of communication, transportation, electrical service, and community services, crop and livestock damage and loss; and interruption of business. From January 1, 1950 to April 30, 2010, Aroostook County experienced 685 natural hazard events with thunderstorm and winds accounting for approximately 30% of the events; snow and ice accounted for 26%; hail 15% and flooding 11%. However, flooding has had the greatest impact on crop damage (\$500,000) and property damage (\$69,360,000). In addition, the flooding events have caused 4 deaths and 15 injuries.
- The 4,000 or more miles of coastline in Maine encompasses a wide range of ecosystems types, from salt marshes and sandy beaches to steep cliffs and mountains, to numerous bays, inlets, harbors and estuaries. The coastal zone is also home to the majority of Maine's population and attracts the majority of tourists.
- Predictions for climate change impacts for the northeast according to climatologists includes –
  - Shorter winters with fewer cold days and more precipitation; significant reductions in winter snow season.
  - 20-30 days in which the high temperatures in cities will exceed 100°F; more frequent heat waves; and, on average, 6 weeks or longer summer conditions.
  - More frequent flooding resulting in higher sea-level rise and heavy precipitation.
  - Economic effects will include negative impacts on agricultural production (dairy, fruit, and maple syrup), reduced snow cover will adversely affect winter recreation, northward shift of lobster fisheries, and diminution of cod fisheries.
- The current rate of sea-level rise is accelerating from half a foot in the last century to a predicted two-foot rise or more by 2100.
- A majority of service center communities, such as Presque Isle, Fort Kent, Fort Fairfield, and Van Buren are located along the banks of the St. John and Aroostook Rivers and are frequently subject to flooding.

## **Gro-WA Work Component E**

### **Title of Work Component: *CLIMATE CHANGE***

#### **Analysis and Basic Conclusions**

If global temperatures continue to rise, increases in the number and severity of storms, floods, droughts, and other weather extremes, will have serious impacts on the environment and on society. Societies that are unable to deal with these extreme events will experience more disasters.

Climate simulations to predict seasonal temperature and precipitation show a strong trend in Maine toward warmer and wetter conditions. The Climate Change Institute report projects increases in both temperature and precipitation, which tend to be greatest in the north and least along the coast. The warming trend implies a significant shift in the region, from a snowmelt-dominated regime to one that shows significant runoff during winter. This shift will likely pose challenges in managing water supplies, flood mitigation, and understanding of the ecosystem.

Winter storms are ranked as the second highest hazard in Maine with flooding as the number one hazard. These include heavy snow, ice storms, blizzards, freezing rain and winter storms. Nor'easters, the most severe winter storm, can produce precipitation amounts exceeding several inches of water equivalent to 20-30 inches of snow or more, and produce wind speeds equal to or greater than those of hurricanes.

Seacoast communities are experiencing flooding damage from tidal surge, erosion, and landslides more frequently. The coastal damage will have negative economic effects as well as the obvious hazardous consequences. According to the Federal Emergency Management Agency (FEMA), in southern Maine, a 1" rise in sea-level will make all storms more damaging with serious economic and ecosystem consequences to the region. Fishermen have already noticed significant changes in the lobster fishery. Changes in the lobster fishery have serious implications for Maine's coastal communities where thousands of licensed lobstermen and women support numerous related industries such as boatbuilding, lobster trap production, and bait distribution and transportation.

Flooding occurrences in service center communities affect the surrounding smaller, rural communities who are dependent upon service centers for the distribution of services and products. Flooding has the primary impact of shutting down transportation.

## **Gro-WA Work Component E**

### **Title of Work Component: *CLIMATE CHANGE***

#### **Suggested Actions**

Mitigation and adaptation are two approaches to address the impacts of ongoing climate change. The following are examples to be considered:

##### Mitigation

- Identify infrastructure, populations and habitats (For example are people living on a peninsula with only one road in and out. Need to look at who lives there and identify alternative routes),
- Adjust culvert sizes in land use planning and ways to slow down water flows before they enter a water body (controlling flow of water to help soil erosion and water temperatures),
- Provide warnings to sewage treatment plants that are in the floodplain so that they can prepare for natural disaster,
- Identify possible warming and cooling centers for vulnerable populations,
- Community planning for businesses and residential properties in flood prone areas,
- Awareness of emergency mitigation plans, which are available at all town offices, and
- Explore different zoning and emergency management practices,
- Promote high density development through land use regulations to help reduce energy consumption, which will reduce greenhouse gas emissions.
- Need interagency collaboration to share information.

##### Adaptation

- Rotation of crops and the creation of buffers,
- Moving vital infrastructure and people out of the floodplain and anticipated coastal inundation areas,
- Implement controls for invasive species,
- Adopt better harvesting processes for shellfish and fishing industry;
- Tourism business will need to adapt to creative and innovative ways of staying in business with loss of winter sports,
- Growing food for local consumption lowers transportation costs thereby lowering greenhouse gas emissions.
- Adopt policies that accelerate the transition to renewable energy sources. Support initiatives that generate energy from local renewable sources as a part of economic development efforts.
- Agricultural and forestry practices can mitigate carbon sequestration through properly managed land use. Many sustainable agricultural practices significantly increase the amount of carbon that can be sequestered in soils. These include planting cover crops, adding organic material to soil, and limiting the use of chemical fertilizers which disrupt natural soil processes. Forestry operations also provide significant opportunities for

sequestration, through reforestation, preservation of existing forests and forest management to enhance sequestration, including lengthening the harvest/regeneration cycle and adopting low impact logging methods.

## **Gro-WA Work Component E**

### **Title of Work Component: *CLIMATE CHANGE***

#### **Implementation already occurring**

The University of Maine at Machias (UMM) offers a series of classes, which are not offered at other university sites. Student classes include municipal GIS, scenario building, modeling, and Community Viz. UMM also offers remote classes for LIDAR and GIS 2.

A USGS program, Streamstats, is already in use by municipal officials to give them an idea of stream flow and how to better plan activities. The program measures high and low flow predictions.

Currently, FEMA is concentrated on updating the floodplain maps, which are old and inaccurate, throughout the State of Maine. Based on the increased level of flooding along the coast, the focus for FEMA is to complete mapping along the coast first with the anticipation that the remainder of the state will be completed within the next 5-10 years. Local communities in both Aroostook and Washington Counties are working on Emergency Management Plans.

The Maine Department of Transportation (MDOT) is currently reviewing standards for construction of roads, bridges, and culverts as the changing climate produces more frequent and severe occurrences. Additionally, plan, design, engineer, and construct buildings to anticipate more severe weather events, which will cause more frequent disruptions in the power grid, communication, and transportation infrastructure.

J.D. Irving (JDI) conducts research to understand how forests absorb CO<sub>2</sub> and mitigate climate change. These important research investments will help shape management practices to improve operational and financial performance and ensure long-term forest sustainability. JDI manages GHG emissions at its forest products manufacturing operations through careful monitoring of energy use and investing in efficiency improvements to enhance performance; i.e. increasing heat recovery from processes and acquiring new boilers that will use lower-carbon fuels.

## **Gro-WA Work Component E**

**Title of Work Component:** *CLIMATE CHANGE*

### **Additional resource needs**

Funding for Inland Flood Modeling for areas prone to seasonal or severe weather flooding

Funds to do more refined adaptation and mitigation planning to include the other work components – Electrical/Communications infrastructure:

Climate Change Planning for Agriculture, Forestry, Transportation...