Climate Change Adaptation Plan for Akwesasne

August 30, 2013

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Key Terms

Adaptation (climate change): actions in response to actual or expected climate change and its effects, that lessen harm or exploit beneficial opportunities. It includes reducing the vulnerability of people, places, and ecosystems to the impacts of climate change.

Adaptive Capacity: the ability of a system to accommodate or respond to the changes in climate with minimum disruption or cost. Generally, systems that have high adaptive capacities are better able to deal with climate change.

Climate: the "average weather" generally over a period of three decades. Measures of climate include temperature, precipitation, and wind.

Climate Change: any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period of time (decades or longer). Climate change may result from natural factors and processes and from human activities that change the atmosphere's composition and land surface.

Global Warming: average increase in the temperature of the atmosphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced.

Greenhouse Gas (GHG): any gas that absorbs infrared radiation in the atmosphere; examples include carbon dioxide, methane, nitrous oxide, ozone, and water vapor.

Hazards are the direct effects of climate change, including changes in temperature, precipitation, extreme events, and water resource quality and availability.

Impacts are the effects on human and natural systems of these climate change hazards; more vulnerable communities will experience more pronounced impacts of climate change.

Mitigation (climate change): actions that reduce the levels of greenhouse gases in the atmosphere; includes reducing emissions of greenhouse gases and enhancing sinks (things that absorb more greenhouse gases than they emit). Examples include switching to renewable energy sources and implementing energy efficiency measures.

Planning Area: this is an area in which the tribal government manages, plans, or makes policy affecting the services and activities associated with built, human, and natural systems. For example, within the sector Utilities, you might have planning areas of Water and Electricity.

Preparedness Actions: actions or activities that the tribe could take to achieve its climate change preparedness goals.

Preparedness Goals: what the tribe wants to accomplish in the priority planning areas through preparedness actions.

Priority planning areas: planning areas of particular importance to the tribal government or community which are vulnerable to climate change impacts.

Resilience: ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to absorb stress and change.

Risk: Risk= Consequence of an impact X Probability or likelihood that the impact will happen.

Sector: general grouping used to describe any resource, ecological system, species, management area, etc. that may be affected by climate change. For example, Transportation, Utilities, Water Resources, Forest Resources, Human Health, or Cultural Resources and Traditions.

Sensitivity: how much a system is directly or indirectly affected by changes in climate conditions (e.g., temperature and precipitation) or specific climate change impacts (e.g., sea level rise, increased water temperature). If a system is likely to be affected as a result of projected climate change, it should be considered sensitive to climate change.

Vulnerability: the susceptibility of a system to harm from climate change impacts. It's a function of how sensitive the system is to climate and the adaptive capacity of the system to respond to such changes. Generally, systems that are sensitive to climate and less able to adapt to changes are considered to be vulnerable to climate change impacts.

INTRODUCTION TO THE PLAN

The Saint Regis Mohawk Reservation is located in the St. Lawrence River Valley in upstate New York along the U.S. Canada border. The Mohawk Nation Territory (Akwesasne) straddles three borders – New York State; Ontario, Canada; and Quebec, Canada (see Exhibit 1). Most tribal members fish in the St. Lawrence River, and several other tributary rivers run through the community (including the St. Regis and Raquette Rivers). The St. Lawrence River has a strong current at Akwesasne, and two dams upstream from the reservation produce a significant amount of power. The territory has 3,000 acres of wetlands.

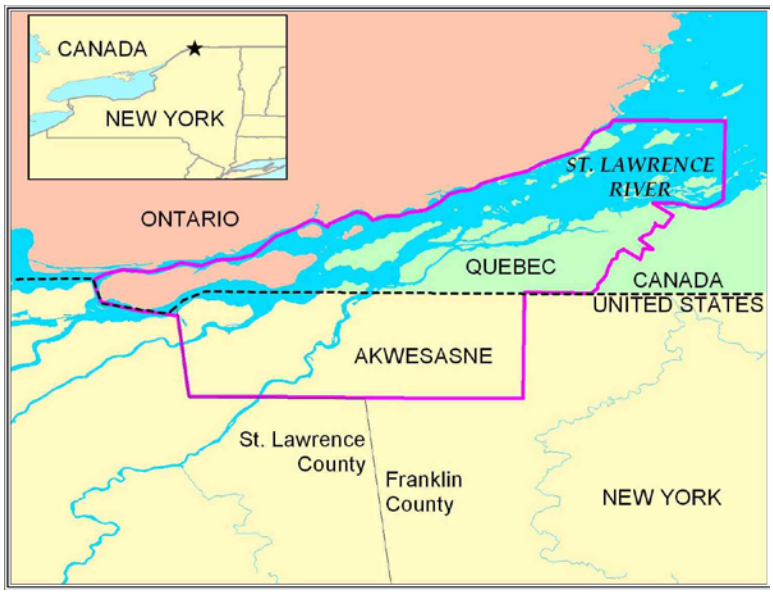
Before technology, families at Akwesasne used to fish, hunt, farm, harvest hay, plant large gardens, harvest food, and can food, among other activities, which meant that there was more physical activity in doing these seasonal activities and better overall public health. Every home had a wood stove for heat and cooking, and everyone had kerosene lamps. Doors were never locked because no one broke into homes. People were always welcome to rest and have a meal with the family anytime.

The people of Akwesasne in past decades have been influenced by non-traditional ways of life, resulting in traditional practices being lost. Our territory has contaminated rivers, fish and wildlife caused from industrial plants which have been located upstream from Akwesasne for many decades. Today, we buy food from the grocery stores and it is not organic. Many fruits and vegetables have been grown using pesticides. Animals are raised for income and are therefore confined in small spaces with limited movement, injected with growth hormones, and injected with antibiotics. Consuming these chemicals has altered our overall health. Akwesasne Mohawk youth have been shown to contain higher-than-normal levels of toxic PCBs (Schell et al. 2003), and many young pre-teen girls' bodies are developing early, some of them starting their cycles as early as 10 years old (Schell and Gallo 2010).

Climate change, long-term changes in weather patterns caused by anthropogenic emissions, poses an additional threat to the Saint Regis Mohawk Tribe. The phenomenon is projected to bring a number of changes to Akwesasne, including an increase in the frequency of extreme weather events such as the Ice Storm of 1998, a severe storm that caused many trees and utility poles to fall and produced widespread blackouts. Akwesasne is planning for climate change not because the climate is changing but because the climate is changing at a faster rate than ever before. Climate change has begun, and adaptation needs to be vigorous. It is no longer possible to not do something about climate change.

The Saint Regis Mohawk Tribe's (SRMT) Environment Division is investigating the impacts of climate change on the resources, assets, and community of Akwesasne and is developing recommendations for actions to adapt to projected climate change impacts. This plan is a first step in an effort to develop practical actions that the Tribe can take in order to adapt to ongoing and expected climate changes.

Exhibit 1: Map of Current Akwesasne Boundary



INTRODUCTION TO CLIMATE CHANGE

Climate change is leading to global temperature increases, changes in precipitation, and an increased frequency and severity of extreme weather events. These changes are already being observed in northern and western New York, as temperatures have increased and snowfall has declined. Many activities that are traditionally practiced by Tribal communities and which continue to be important culturally and economically to these communities, such as fishing, medicinal plant harvest, and care of natural ecosystem health, are tied directly to climate. Because of their close ties to the land, these communities are more sensitive to shifts in climate than other non-Tribal communities in the same general geographic area. As a result, in the Tribal lands of Northern and Western New York, climate change is a particularly important problem, one that threatens not only local plant and animal species but also tribal sovereignty, economy, and culture. For this reason, we have chosen to use the Mohawk Thanksgiving Address as the structure for this plan.

Planned and ongoing U.S. and international efforts to limit greenhouse gases and to mitigate climate change now and in the future are unlikely to be sufficient to prevent the harmful effects of climate change. Harmful effects that are relevant to Tribal communities may include decreased fish populations associated with higher air and water temperatures, reduced abundance of certain medicinal plant species, shifts in tree species to higher elevations and more northern latitudes, and shifts in the ranges of other plant and animal species. At the same time, climate change does have the potential to create beneficial opportunities. For example, increased air temperatures have the potential to lengthen the growing seasons of medicinal plants, higher carbon dioxide concentrations in the air can enhance plant growth, and in some areas, the availability of water resources may increase as rainfall patterns shift as a result of climate change. Taking advantage of these opportunities, however, will require advance planning.

The risks of climate change to the SRMT cannot be effectively dealt with and the opportunities cannot be effectively exploited without a clear plan for adaptation. This includes steps for aligning Tribal government policies with climate change, for developing key institutional capabilities, and for making needed infrastructure investments. Developing such a plan should involve a combination of high-quality quantitative analysis and consultation of Tribal experts and community members.

BACKGROUND ON CLIMATE CHANGE TERMINOLOGY

The *climate* of a region refers to the long term average weather conditions in that area. *Climate change* is thus any significant change in climate conditions—such as temperature, precipitation, wind speed, or drought frequency—that occurs over an extended period of decades or longer (USEPA 2012). In this report, we focus on three broad topics related to climate change on Tribal community lands: the hazards posed by climate change, the impacts to human activities and ecosystems that could result, and the adaptation options that may be available to reduce those impacts on tribal communities, or to take advantage of opportunities provided by climate change. Exhibit 2 describes each of these concepts. **Hazards** are the direct effects of climate change, including changes in temperature, precipitation, extreme events, and water resource quality and availability. **Impacts** are the effects on human and natural systems of these climate change hazards; more vulnerable communities will experience more pronounced impacts of climate change. **Adaptation** refers to actions in response to actual or expected climate change and its effects that lessen harm or exploit beneficial opportunities. It includes reducing the vulnerability of people, places, and ecosystems to the impacts of climate change. Using fishing as an example, increasing drought frequency and temperatures coupled with decreasing precipitation (the *hazards*), may cause fish populations to decline (*impacts to ecosystems*). This would in turn affect the number of fish caught by tribal members (*impacts to Tribal activities*). Possible *adaptation* options to reduce these impacts may include restoration of the natural ecosystem, such as tree planting along river banks to increase shading and reduce river temperatures, or adjustments in human behavior, such as shifting fishing to warmer water fish species that may be more abundant due to changes in climate. This latter example represents one of the *opportunities* that may be provided by climate change.

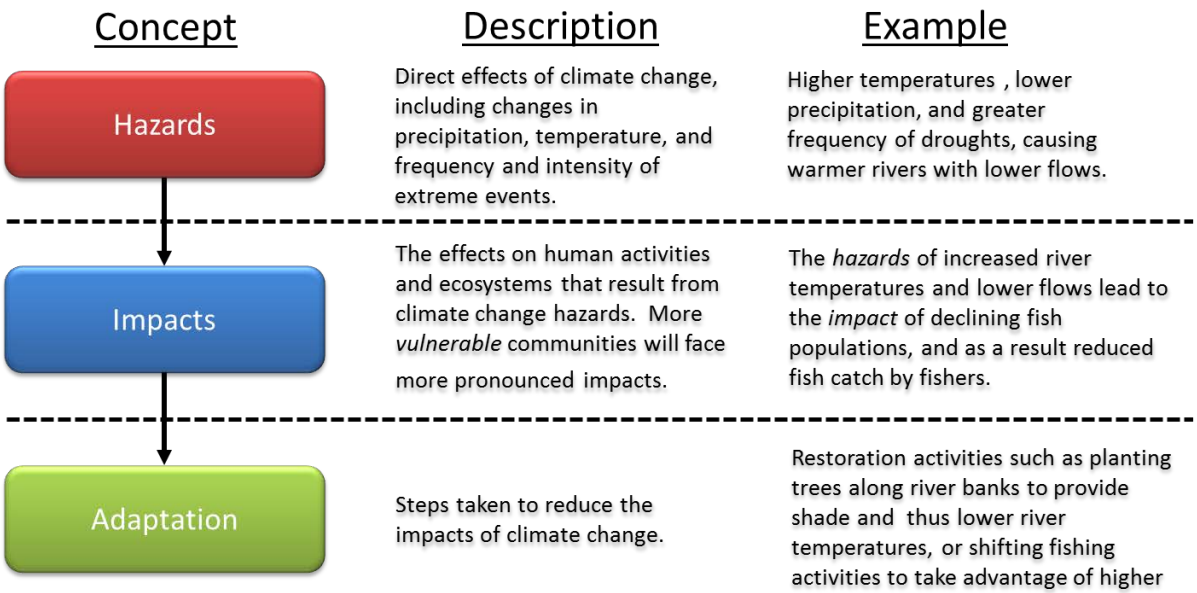


Exhibit 2: Key Climate Change Concepts

THE PEOPLE

"Today we have gathered and we see that the cycles of life continue. We have been given the duty to live in balance and harmony with each other and all living things. So now, we bring our minds together as one as we give greetings and thanks to each other as People. Now our minds are one."

Our original instructions from the Creator are that it is our duty on Mother Earth to give thanks to all creation and to never take it for granted. We are to give thanks by offering sacred tobacco to all of creation and give thanks to the Creator. We are responsible to the Creator for maintaining balance with all of creation.

HISTORY

CULTURAL PRESERVATION

The Kanienkehaka, or Mohawks as they are known in English, have managed to preserve, maintain and foster a unique culture for thousands of years. This dynamic culture has survived, despite the oppressive odds brought about with the arrival of Europeans in what is now known as North America. In America, noted author John Steinbeck wrote, "The Indians survived our open intention of wiping them out, and since the tide turned they have even weathered our good intentions toward them, which can be much more deadly."

Generic terms like Indian, American Indian, Native American or Aboriginal people are used today. The Iroquois people prefer to be known by their specific nation names, thus Mohawks should be referred to as Mohawks or Kanienkehake People of the Flint.

The Kanienkehaka/Mohawks constitute one of six nations within the Iroquois Confederacy. The others are the Oneidas, Senecas, Cayugas, Onondagas and the Tuscaroras. Scholars and historians credit the Iroquois Confederacy as being the model upon which of the Constitution of the United States is based.

Archaeological findings at Garoga in Fulton County have confirmed that Mohawks have occupied lands, now known as New York State, since at least 1600 A.D.

The contributions of these Iroquoian people to European survival on this continent is significant. Research shows the Mohawks were experts in the fields of hunting, trapping, fishing and agriculture, contributing many, many different species of fruits, vegetables, spices and herbs to today's menu. Without these contributions, it is safe to say the lifestyle of the Europeans in North America would not have developed as rapidly as it did.

Mohawk people of today have combined centuries-old ways of living into 20th century everyday life. The values of their historical culture still remain present in their daily life. Their distinctive heritage, language, ceremonies and traditional beliefs are still revered and maintained. The code of everyday

living, "The Great Law," has been kept alive by verbal teachings and continued practices for hundreds of years. People still honor the traditional system of Chieftainship, Clan Mothers and Faith keepers.

The system of clans, or family lineage, is still kept intact. Among the Iroquois, descent and consequently clan membership are traced through the mother's family line only.

The Mohawk people strongly believe in perpetuating their language, songs, dances and special ceremonies in the old way within traditional Longhouses. Failure to keep sacred this tradition would be in violation of the teachings passed on to them by the Creator.

Mohawk people recognize that they belong to a very distinct society, and as unconquered people living in a nation within a nation will continue to exist and hold steadfast to their culture and traditions within today's modern society.

CULTURE AND HISTORY

The Mohawk are traditionally the keepers of the Eastern Door of the Iroquois Confederacy, also known as the Six Nations Confederacy or the *Haudenosaunee* Confederacy. Our original homeland is the north eastern region of New York State extending into southern Canada and Vermont. Prior to contact with Europeans, the Mohawk settlements populated the Mohawk Valley of New York State. Through the centuries Mohawk influence extended far beyond their territory and was felt by the Dutch who settled on the Hudson River and in Manhattan. The Mohawks' location as the Iroquois nation closest to Albany and Montreal, and the fur traders there, gave them considerable influence among the other Tribes. This location has also contributed directly to a long and beautifully complicated history.

In the 1750s, to relieve crowding at *Kahnawake* and to move closer to the Iroquois homeland, the French Jesuits established a mission at the present site on the St. Regis River. The Mohawk people had continually used this site at the confluence of the St. Lawrence River Valley as part of our fishing and hunting grounds prior to the building of the first church. "Akwesasne" as it is known today, translating roughly to "Land where the partridge drums," has always been a prime location due to the confluence of several small rivers and the St. Lawrence River. The Catholic Church records date back to the late 1600's. Oral history states the church was built on traditional ceremonial grounds.

The community became more populated as Mohawks left the Mohawk Valley under distressed conditions in the mid 1700's. In 1759 a band of Abenakis sought refuge with the Mohawk people during the French and Indian War, with some remaining behind after their party returned to their own village. In addition, also as a result of the dislocation caused by the war, a number of refugees from the Oswegatchie Mission (near present day Ogdensburg, NY) settled at Saint Regis. After this immigration, the culture at Saint Regis stayed predominately Mohawk. In 1796 the Seven Nations of Canada, which included Christian Mohawks living in St. Regis, asserted rights to their lands and were eventually confined to a small parcel of land through a treaty signed by representatives of the Seven Nations of Canada and the State of New York. Today the Mohawk people of Akwesasne still rightfully claim territory outside the confines of the current boundaries of the reservation and exercise guardianship over these lands through Section 106 of the National Historic Preservation Act and Environmental Protection Act processes.

In 1888, at a Grand Council of the Six Nations Iroquois Confederacy (*Haudenosaunee* Confederacy), the Mohawk Nation formally rekindled their fire and responsibilities to the Confederacy as the successor of the descendants of Mohawks who had left the Mohawk Valley a hundred years earlier. The Mohawk people who had maintained their traditional customs and ceremonies restored their place as an "Elder Brother" of the *Haudenosaunee*. The Confederacy felt it was beneficial to all to remain united, therefore strengthening its position when fighting for Indian rights under treaties previously negotiated with the United States.

After the American War of Independence, the Mohawk people found it necessary to deal with the government of the State of New York. In order to protect themselves and their best interests, the Mohawks decided to select representatives to interact with New York. In the 1930s, the Federal Government proposed the Indian Reorganization Act (IRA). Each Tribe was given the opportunity to reject the IRA and the Saint Regis Mohawks did reject the Act of 1935. In 1953, a Federal task force arrived at Saint Regis to prepare termination legislation, but the chiefs and Saint Regis people rejected the termination. Despite this, the Bureau of Indian Affairs' proposed bill was presented to Congress where it died in committee without serious consideration.

Administrative termination of Tribes continued throughout the 1950s. In the mid-1960s, however, the Federal Government was reminded that there had been no official termination of the Federal relationship with the New York State Iroquois. The acknowledgment of the Federal relationship was slow to manifest itself. Following preliminary findings, the leaders of the Iroquois Tribes, including those of the Saint Regis, were invited to Washington to explore the establishment of a viable relationship.

THE HISTORY OF TRIBAL GOVERNMENT

In 1802, the Saint Regis Mohawk selected trustees and a clerk at a community meeting held on the reservation. The New York State legislature passed a law recognizing three trustees and a clerk as the Mohawk people's chosen representatives. The trustees' primary purpose was to give a voice to the Saint Regis Mohawks who lived on the American side of the Mohawk territory in New York and to oversee certain aspects of the relationship with non-Native governments. It is not believed the trustees initially usurped the role of life chiefs (who were chosen in a more traditional manner and held their positions for life) who continued to control the internal affairs of the Tribe. However, two of the original trustees were also life chiefs.

By 1818, two of the original trustees had passed away and two new trustees were chosen, both of whom were also life chiefs. This unique mixture of tradition and adaptability coupled with strong non-Native influences, brought about a new form of government. The present Saint Regis Mohawk Tribal Council has emerged from those changes.

Throughout the 19th century, the Saint Regis Mohawk Tribal Council Government evolved to a point where the trustees were called Tribal Chiefs, formalized elections are now scheduled each year and definite terms of office were established. The Tribal Council is comprised of three Chiefs, three Sub-Chiefs and a Tribal Clerk.

The Saint Regis Mohawk Tribal Council Chiefs are responsible for setting policy and making major decisions on behalf of the tribe. They oversee the operation of the Saint Regis Mohawk Tribal government and assure that quality programs and services are made available to the Mohawk people. The Tribal Clerk maintains the official records of Council. New York State and the United States Federal Government deal with the Saint Regis Mohawk Tribal Council on a government-to-government level. The Tribal Council has received Federal and State funds for a variety of tribally administered programs since 1973, all of which primarily employ Mohawk people.

Today, the Saint Regis Mohawk Tribe administers its own environmental, social, policing, economic, health and educational programs, policies, laws and regulations. The Tribal Council consists of three Chiefs and three Sub-Chiefs who are elected officials. They each serve three-year staggered terms.

CURRENT PUBLIC HEALTH CONDITIONS

Prior to the 1950's, we had rare occurrences of diabetes in our community. Today in Akwesasne, there is a high level of cancer, diabetes, thyroid disease, obesity, and other health related diseases. There is a high rate of respiratory and coronary problems. There is easy access to fast foods throughout the reservation. Our youth are less active. Changes in our diet and lifestyles are also a source of our health problems.

FUTURE WITH CLIMATE CHANGE

Climate change has the potential to have adverse effects on human health. Rising temperatures will increase occurrences of heat-related illness and death. Intense precipitation and flooding may result in stress and mental health impacts, reduced ability to provide public health and medical services, increased respiratory disease such as asthma, and more gastrointestinal diseases. Worsening air quality will lead to cardiovascular and respiratory-related issues, and the range of vector-borne diseases will expand or change. Water supply, recreational water quality, and food production may be impacted due to changes in temperature and precipitation patterns, which will have direct effects on human health. Water- and food-borne diseases are expected to increase if adaptation does not occur (Rosenzweig 2010).

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

The Seniors Center provides congregate lunches Monday to Friday which is portion controlled and healthy. They provide this service to *Akwesashró:non* for an affordable fee. They provide seniors with accessible transportation to and from their facility. They provide many services as in physical activities, grief counseling, legal aid, weekly shopping, transportation to medical appointments, and assist in many other capacities. They also use the center as a heating/cooling center in times of extreme cold and heat. The center can be run by generator in time of power outages.

Strong rains for example, birth numerous stagnant pools, which are prime breeding spots for mosquitoes. Identifying practical solutions to these problems – like ridding homes of anything which can gather standing water and keeping our surroundings clean – is a high priority.

MOTHER EARTH

"We are all thankful to our Mother, the Earth, for she gives us all that we need for life. She supports our feet as we walk about upon her. It gives us joy that she continues to care for us as we walk about upon her. It gives us joy that she continues to care for us as she has from the beginning of time. To our Mother, we send greetings and thanks.
Now our minds are one."

Mother Earth continues to provide us with sustenance as she has always done since the beginning of time as she was originally instructed by the Creator.

The Land, and a defined land base are essential for the survival of our culture, our life-ways and our People. We are not the owners of the soil or the Earth, but we are dependent upon the Earth for our survival. It is our responsibility for its protection so that successive generations of our people and the other Nations of Creation will continue to receive sustenance from the Earth in the same way that we have.

CURRENT CONDITIONS

Akwesasne is part of the St. Lawrence-Champlain Lowlands Physiographic Province. The underlying bedrock is Ogdensburg dolostone, which is for the most part deeply buried under glacial drift, though it is exposed in a few places, such as in the channels of large streams. The area was completely covered by ice during the Pleistocene Epoch, and its topography demonstrates this glacial past. When the glaciers

melted, ocean water created the ancient Champlain Sea, and the soils of Akwesasne reflect this saltwater intrusion. Most soils are laminated to massive marine and lacustrine silts and clays, and were deposited in a brackish to salt water environment. The other major deposit in addition to the marine soils is glacial till deposited beneath glacial ice. Ridges of this till material can be found running east to west across Akwesasne. The remaining soils are made up of recent deposits of fine sand and gravel (alluvium and outwash) associated with the St. Regis and Raquette Rivers (USDA 2005). Exhibit 3 provides an illustration of some of the typical soil formations found in Akwesasne, including glacial till knolls and ridges of Hogansburg and Malone soils as well as more clay-like and nearly level Adjidaumo and Muskellunge soils. The latter are fairly fertile and more beneficial for agricultural use, while the till soils tend to be stonier and more desirable for use as building sites.

Some of Akwesasne's soils have been affected by industrial contamination. The natural resource damage assessment associated with the General Motors and Alcoa Inc. case found that average PCB concentrations in soil adjacent to General Motors property exceeded the Soil Quality Guideline for agricultural soil in 1985 and 2001, though concentrations did not exceed the lowest ecological threshold for effects on terrestrial plants or oldfield mice (RDCP 2013). An analysis of soil samples collected from the private gardens of members of the Saint Regis Mohawk tribe determined that PCB levels were below the Tribe's action level of one part per million (Lewis and DelVecchio 2007).

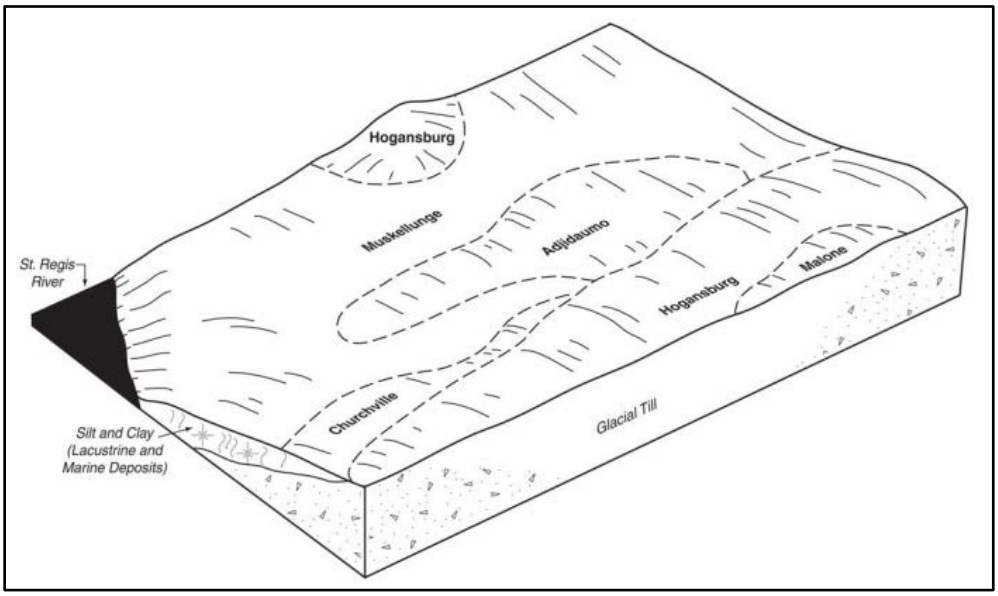


Exhibit 3: Soils of Akwesasne

Source: USDA 2005.

At Akwesasne, the drought of summer 2012 affected many of nature's cycles on all of creation. The changes came about in the way of hot and humid temperatures, high winds, heavy rainfall, hail, and low water levels. As a result of the dry conditions, residents who planted gardens needed to work extra hard to keep gardens from drying up. The heat waves during the summer of 2012 caused the ground to be very dry.

FUTURE WITH CLIMATE CHANGE

As was observed during the summer of 2012, New York State is predicted to experience increased temperatures and a greater frequency of droughts and heavy rainfall events in the future due to climate change (Rosenzweig 2011). Akwesasne's soils may as a result become drier during summer months and drought times, impacting natural ecosystems, landscaping, and farms and gardens. Soils may also become waterlogged as well during times of heavy rainfall, leading to lower oxygen levels in the soil and increasing soil compaction (USGCP 2009). This is a particular concern for Akwesasne, since poor drainage is already a major limitation of soils used for agricultural production and excessive soil wetness is a major management concern for about 90 percent of Akwesasne's cropland and pasture acres (USDA 2005). Soil erosion rates may also increase due to climate change (Nearing et al. 2004).

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Below are several adaptation measures that are ongoing or that could be adopted to help maintain and restore the Tribe's soils under future climatic conditions.

WASTE MANAGEMENT. The Saint Regis Mohawk Tribe has a number of ongoing efforts designed to keep its soil clean. The Tribe issues burn permits, and recently removed a tire dump near the local raceway. The Tribe hosts annual events including Roadside Cleanups throughout Akwesasne, and a National Recycle Day event which includes disposal of electronics (e-waste) for recycling. Akwesasne has a Solid Waste Transfer Station with weekly collection of trash on a rotating schedule, and a recycle depot for residents in the southern portion of Akwesasne. The Saint Regis Mohawk Tribe also has a Brownfields Program, issues Burn Bans, samples river water, and has an Environmental Response Team (ERT) to stop contamination of any toxic spills on land and water.

INSTALLATION OF DRAINAGE AND IRRIGATION SYSTEMS. Poor drainage of soils is already a major limitation for agriculture in Akwesasne. Climate change may worsen this limitation by increasing the frequency of heavy rain events. Well-designed and maintained drainage systems can offer many benefits, by allowing for timelier field management and reducing soil compaction, excess water stress, and denitrification losses. Improved soil drainage can also improve crop quality and quantity (USDA 2005). Irrigation systems also have the potential to help Akwesasne better manage its soils under drought conditions.

SOIL MONITORING. A soil survey of Akwesasne was conducted in 1994 by the Natural Resources Conservation Service of the United States Department of Agriculture. This document and the associated maps provide a resource for better managing Akwesasne's soils by identifying their capacity for agriculture and other uses, and by determining which areas most need drainage improvements or additional irrigation to be effectively used for agriculture.

SOIL IMPROVEMENT. Akwesasne's soils could be improved through composting and other methods. Improved irrigation and drainage systems could be used to help moisten soils that are too dry and drain soils that are waterlogged. Planting trees and shrubs may also help to combat soil erosion.

THE WATERS

"We give thanks to all the Waters of the world for quenching our thirst and providing us with strength. Water is life. We know its power in many forms—waterfalls and rain, mists and streams, rivers and oceans. With one mind, we send greetings and thanks to the spirit of Water.
Now our minds are one."

The Waters are the veins and blood to our Mother Earth. The waters were given instructions by the Creator to supply Mother Earth with water to be used by the people for healing, making medicines, cleansing our bodies, and supporting aquatic life forms, and to quench our thirst and to provide sustenance to all of creation.

We remember in the 1960's how our snow banks were about seven feet high and our roadways were very narrow in the winter. There were many days off from school because our buses would get stuck in the snow somewhere or couldn't leave the driver's home, and it would take a few days for our roads to be drivable again. The snow was so high that some kids would go on the roof tops with their sleds and slide off the roof. We used to build tunnels through snow banks. Snow banks were higher than the school buses. The temperatures were colder and vehicles wouldn't start. Tractors and heavy machinery were the only vehicles that would start and tractors were the only vehicles that had snow plows. It was rare that a tractor had a snow plow. They were in high demand back in the day. Now almost every truck has a snowplow for the winter.

Before the power dams were built in Akwesasne, our grandparents who lived on Cornwall Island, Ontario (northern portion), used row boats to get off the Island. There weren't any swift currents and there weren't any bridges or electricity. The bridges were built in the late 1950's and electricity wasn't available until the 1950's.

CURRENT CONDITIONS

Many ships pass through our territory and cause erosion along our shores.

In the waterways in the territory of Akwesasne we have two power dams. Two industrial aluminum plants (there were three in previous years) upstream of our land have for many years contaminated our land, water, fish, and wildlife. Today, our community drinks from bottled water and water from the waterline. Many wells have been contaminated with excessive salt and other minerals, making the water unfit for drinking, and others contain hydrogen sulfide, a naturally occurring gas that gives water

an unpleasant smell and taste. Homes installed water softening systems before waterlines were available. Some areas on the northern portion of Akwesasne still don't have waterlines.

Historically, there have been no clear trends in annual precipitation patterns over the last century; however, intense precipitation events have increased (Rosenzweig 2011). If we look at broader geographic areas, however, some trends do emerge. Exhibit 4 shows the percentage increase in the number of days with very heavy precipitation between 1958 and 2007. Note the clear trend in increased precipitation in the Northeast. Over the past 50 years, the fraction of precipitation that fell as rain versus snow has increased. In the past century, average precipitation in the United States increased by seven percent, and the heaviest one percent of rain events increased by 20 percent (Gutowski et al. 2008).

In Akwesasne, we experienced a hail storm in July 2012, as well as heavy rainfall that downed corn stalks and tall plants. The southern portion of Akwesasne had salt contamination in wells before the waterline system was available, and *E. coli* contamination was found in well water in the northern portion of Akwesasne. This prompted the Mohawk Council of Akwesasne to get funding for waterlines and a water treatment plant for all three districts, though some homes are still on well water as the last phase of the waterline hasn't been started yet.

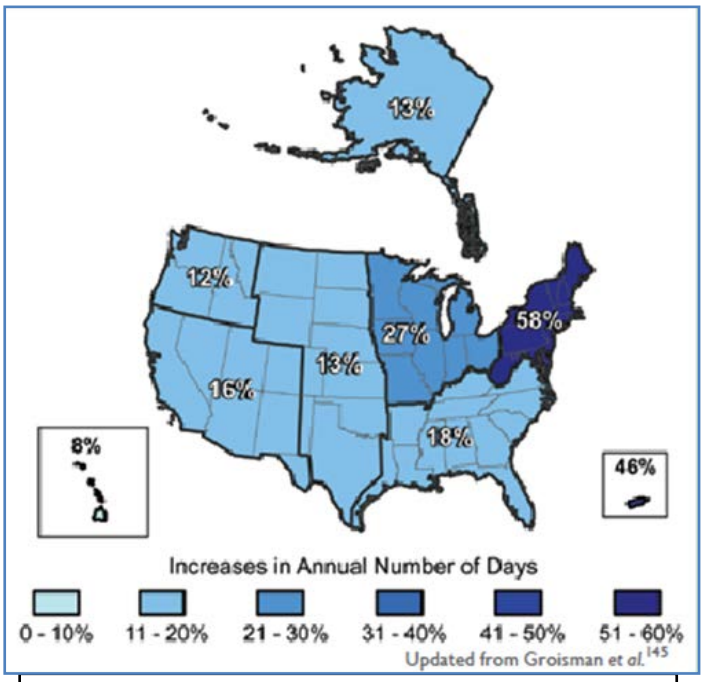


Exhibit 4: Changes in Precipitation across the U.S.
Source: U.S. Global Change Research, 2009

In the past, river ice used to be thick enough to form an ice bridge between the islands. Elders knew how to determine the trails. Now, temperatures haven't been cold enough for ice thick enough to cross the river in the past two years, and many travel frozen portions along the islands without heeding the warnings given by authorities because of unsafe conditions due to warm temperatures. Before the arena was built the river used to be thick enough for skating and to have ski doo races on it. These activities no longer take place, and ice fishing isn't common anymore in Akwesasne either. Ski doos, four wheelers, and vehicles have taken over the river when there is ice.

Numerous marinas have been built along the St. Lawrence River as well, disturbing fish habitats and vegetation when concrete is poured during construction. Shipping seasons are now longer because there isn't thick ice on the surface and it thaws out quickly because of the high temperatures.

There was drought in Akwesasne during the summer of 2012, with lower water levels in the St. Lawrence River and other rivers, creeks, and ponds. Some streams ran dry. Holding tanks and rain barrels were required for watering gardens in order to collect water during extreme rain events since there was not a nice even stream of rain over the summer months.

FUTURE WITH CLIMATE CHANGE

Globally, the IPCC expects negative future impacts on water resources and freshwater ecosystems due to climate change. Specifically in the Northeast, the IPCC expects to see reduced snow cover in quantity and duration, decreased streamflow, changes in size and timing of ice freeze and thaw which may affect spring flooding, disappearance of bog ecosystems, and shifts in fish species distributions and migration patterns (IPCC 2007).

Water quality also has the potential to deteriorate. Higher temperatures, longer periods of summer stratification, and less dissolved oxygen, which is needed by aquatic animals and for self-purification, can cause water quality to decline (Bates et al. 2008). The negative effects of water pollution are intensified with increased precipitation intensity and longer episodes of low streamflow (USEPA 2008). Heavy rainfall can also lead to greater sediment in runoff and outbreaks of waterborne disease (Ebi et al. 2008; Field et al. 2007).

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

The Saint Regis Mohawk Tribe has undertaken several programs to help protect its waters and ensure clean water availability to its members in the face of climate change, and the Water Resource Program of the Tribe's Environment Division is actively working to protect, preserve and enhance the water resources of Akwesasne. These projects are summarized below, along with additional adaptation measures that could be adopted.

INSTALLATION OF WATERLINE AND WATER TREATMENT SYSTEMS. The Saint Regis Mohawk Tribe has completed waterline, water treatment plant, and sewer line systems throughout the southern portion of Akwesasne. The Northern portion has one more phase to complete the waterline system. Only one district in the Northern portion has a sewer line system.

WATER QUALITY MONITORING. The Saint Regis Mohawk Tribe has implemented EPA-approved water quality standards under the Clean Water Act since 2007, and currently manages ambient water quality, non-point source pollutants, and direct discharges to the waters of Akwesasne. The Tribe's Water Resources Program also monitors swimming safety in the Raquette, St. Regis and St. Lawrence Rivers by measuring E. coli levels. Water quality could be improved through the protection and enhancement of wetlands and forests, which help to purify groundwater and reduce erosion. Funds from two settlements (with Alcoa Inc. and Reynolds Metals Company) associated with St. Lawrence River natural resource damages could also be used to improve water quality in the rivers and streams of Akwesasne.

WATER STORAGE. Holding tanks, rain barrels and other technologies could be used to store water for irrigation during droughts, as in the summer of 2012, when Akwesasne experienced drought punctuated by periods of sporadic downpours of rain.

ADVISORIES. Swimming advisories were issued in recent years for public and family swimming areas. These were never issued until recent years. Public notices communicating when it is unsafe to swim, use iced-over areas in the winter and eat fish from various locations can help reduce the risk associated with water-related activities.

THE FISH

"We turn our minds to all the Fish life in the water. They were instructed to cleanse and purify the water. They also give themselves to us as food. We are grateful that we can still find pure water. So, we turn now to the Fish and send our greetings and thanks.
Now our minds are one."

The fish continue to carry on their original instructions from the Creator and cleanse and purify the water and give themselves as sustenance to the people, bird life, and wildlife.

It was a traditional lifestyle for Akwesasronon to fish from the St. Lawrence. Our river once had many species of fish and many have disappeared. When the dam was built, many fishing holes were filled in with dredged material disposed of from the project. Industrial structures were built and contaminated our fish that remain. In 1986, the Tribe issued an advisory not to eat fish that were contaminated from the St. Lawrence River because of the PCBs, mercury, heavy metals and other toxins that the industrial plants have been polluting into the air and water. Fish as a food source to our people has impacted our diet and health through these pollutants.

Today our children no longer have the knowledge of our ancient ways in spearing, netting, and harvesting fish for food. Many fish for sport and for fishing derbies.

Fish spawned in March 2012 due to warm temperatures which went to 80 degrees for a short time and then went back to freezing. The drought hindered the fish from spawning because of the river's water temperatures being too hot. Habitat for fish in Akwesasne is also decreasing from the construction along shores by marinas using cement and dredging shores to make marinas accessible for larger recreational boats, and expanding property along shorelines.

CURRENT CONDITIONS

Fishing has become a sport and not a way of life. Memorial Derbies are held annually for money prizes. Many fishermen/women used to fish to provide for their families throughout the year. Today the community sometimes sells fish for fundraisers.

Many non-natives have fished and continue to do so in our waters and have overfished to sell to restaurants for profit. The St. Regis Mohawk Tribe's Compliance Office has made it mandatory for non-natives to apply for fishing permits. Our people fish in/or purchase fish from Tyendinaga Mohawk Territory. Some fishermen sell to local restaurants and sell to those who have fish dinners as fundraisers which are big sellers.

Fish species found in the area's rivers (such as the Saint Regis River and the Raquette River) include the native American eel, lake sturgeon, pug-nosed shiner, eastern sand darter, walleye, muskellunge, white sucker, and shorthead redhorse, as well as other non-native species. Both lake sturgeon and the eastern sand darter are listed as threatened species in the State of New York.

FUTURE WITH CLIMATE CHANGE

The likely impacts of climate change on fish populations are complex. Many fish species will migrate northward as river temperatures increase, and suitable habitat for certain cold water fish species such as brook trout could be reduced by 50 percent. On the other hand, the ranges of warmer water species are likely to expand (Eaton and Scheller 1996; Shuter and Post 1990). One example of declines in cold water fish is the salmon; precipitation as rain rather than snow can feed floods that wash away salmon eggs in streambeds, and warmer water leads eggs to hatch earlier. The young fish are small and more vulnerable to predators, and warmth increases fish's metabolism, taking energy from growth and necessitating more food. Earlier hatching can also put fish out of sync with the lifecycles of their sources of food, such as insects. Additionally, warmer, shallower rivers and streams during the summer and fall will allow diseases and parasites to thrive (Battin et al. 2007).

Potential declines in fish populations due to climate change can have negative effects on tribes who have traditionally depended upon fish species for their livelihood, subsistence and ceremonial purposes. For example, Dittmer (2013) models potential climate change impacts on salmon and other fish species in the Columbia River Basin, and describes how such impacts can disrupt tribal religious services, cultural identity, sense of traditional place, traditional nutritional health, transferal of traditional values to the next generation, and livelihood. By threatening the fisheries of Akwesasne, climate change also threatens the Tribe's traditional fishing practices and way of life. For example, warmer temperatures have begun to interfere with the practice of ice fishing on the St. Lawrence River. In January 2013, for instance, ice fishermen were forbidden from using part of the river due to the possibility of unstable ice cover.

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

The Saint Regis Mohawk Tribe's Environment Division has undertaken several programs to help protect its fisheries and traditional fishing practices in the face of climate change. These projects are summarized below, along with additional adaptation measures that could be adopted to help maintain and restore the Tribe's fish populations.

LAKE STURGEON AND ATLANTIC SALMON RESTORATION. The Saint Regis Mohawk Tribe has been working with the New York State Department of Environmental Conservation (NYSDEC) and USGS on lake sturgeon restoration in the St. Lawrence and tributaries including the St. Regis River. Eggs and sperm of these fish have been collected and hatchery reared sturgeon are stocked to reestablish populations in historic sturgeon waters. The survival and habitat use by the stocked fish is being assessed.

On November 6th, 2012, the SRMT's Environmental Division released sturgeon fingerlings near River Bend Farms on State Rte. 37, and half were released at Pine Ridge Park campsite as part of the SRMT

Environmental Division's Lake Sturgeon restoration project. The shrinking population of sturgeon is due to over-fishing and habitat changes brought about by the construction of dams.

Since 1997, the Water Resources Program of the Tribe's Environment Division has also been working with USGS to reintroduce the locally extirpated Atlantic Salmon to tributaries and sections of the St. Regis River. Each year, about 12,000 – 14,000 salmon fry are released with the goal of reestablishing a permanent, self-sustaining population of these fish. The results of the project show that some of the tributaries of the St. Regis can sustain Atlantic salmon, one of the many fish that the Mohawk traditionally caught to sustain their families.

RESEARCH. The Water Resources Program of the Saint Regis Mohawk Tribe's Environment Division was awarded a $278,315 contract by the U.S. Fish and Wildlife Service to conduct research on threatened and endangered species of fish in two tributaries of the St. Lawrence River, the Salmon and St. Regis Rivers. The work began in June 2012 and will run through June 2014. Other funding for a similar project running from 2009 to 2012 came from the Fisheries Enhancement Mitigation Research Fund (FEMRF). Information on the distribution of uncommon species generated by such activities can help to inform and prioritize protection and restoration efforts that will help to maintain Akwesasne's fisheries under climate change.

STREAM, RIVER, AND WETLAND RESTORATION. A number of restoration projects have been proposed through the Alcoa and General Motors natural resource damage assessments, including the construction of fish passage, restoration of fish habitat and spawning beds, culvert improvements, and streambank restoration. Planting trees and other vegetation along streams and riverbanks can help to increase water quality and decrease water temperatures that may increase as a result of climate change. The removal of dams such as the Hogansburg Dam on the St. Regis River also has the potential to reconnect fragmented river habitat, increase the availability and quality of fish habitat and spawning grounds, increase water quality and decrease water temperatures.

FISH MONITORING. Fish showing signs of external anomalies such as tumors, lesions, and ulcers are being collected by the Tribe's Environment Division. The Division also works to publicize fish advisories and provide information on how to clean and cook fish to reduce the amount of contaminants consumed.

EDUCATION. Local Pro Fishermen Champions have an annual Kids 4 Fishing event to teach young kids fishing techniques and boat safety that always has a good turnout.

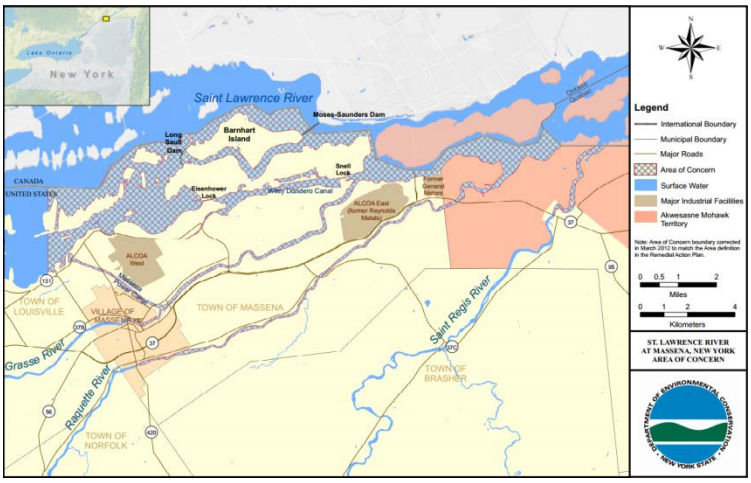


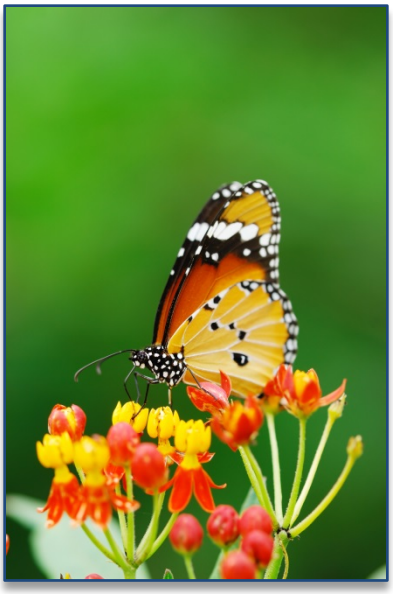
Exhibit 5: Areas with Contaminated River Water

http://www.srmtenv.org/web_docs/stlawrenceriver_aoc/St_LawrenceRiver_atMassenaAOC_2012.pdf

COLLABORATION. The Saint Regis Mohawk Tribe has built partnerships with a number of groups in its efforts to restore its fisheries, such as the U.S. Geological Survey and the U.S. Fish and Wildlife Service. Such collaborative efforts have great potential to effectively restore the Tribe's fish populations and render them more resilient to the impacts of climate change. The Tribe could attempt to identify other governmental, tribal and non-profit organizations with which to work. Another framework that could prove useful to the Tribe in its efforts to protect its fisheries in the face of climate change is provided by the Columbia River Inter-Tribal Fish Commission (CRITFC), which has worked to halt and reverse the decline of Pacific Northwest salmon, steelhead, Pacific lamprey and sturgeon populations for 36 years in the Northwest region of the United States (Dittmer 2013).

SMALL PLANTS AND GRASSES

"With one mind, we turn to honor and thank all the Small Plants and Grasses we harvest from the garden and fields. Since the beginning of time, the grains and grasses have helped the people to survive. Many other living things draw strength from them too. We gather all the Small Plants and Grasses together as one and send them greetings and thanks. Now our minds are one."



The small plants and grasses were given original instructions to provide us with food to eat to sustain life. This is where we get our sacred tobacco, food, medicines to sustain and heal people, and the rest of creation. Without water we would not have our small plants and grasses, and the grasses provide oxygen, food, and shelter for the water beings. Plants grow in water and purify water and feed aquatic mammals and fish. Flowers provide nectar for bees to produce honey.

CURRENT CONDITIONS

The culture of the Saint Regis Mohawk Tribe includes basket-making, and sweetgrass is picked in July for making baskets, braiding and use as incense. Other important small plants and grasses for the Tribe include wild rice and dandelions.

Many families stopped gardening in Akwesasne because of the high emissions of metal and other contaminants in the air and land from the nearby industrial plants. Many families rely on grocery stores that have food with pesticide residue, and canned foods. More health problems have arisen with the pollution and eating of canned food. There is a high rate of chronic diseases including respiratory problems, coronary problems, dementia, stroke, and thyroid diseases. Very few families plant or can food anymore.

In the summer of 2012, farmers didn't get their second cut of hay for the winter season. Residents who planted gardens worked extra hard to keep gardens from drying up. Sweetgrass used for smudging and to make baskets wasn't tall and had a short season.

FUTURE WITH CLIMATE CHANGE

Small plants and grasses in Akwesasne may be negatively affected by the predicted changes in climate for New York State, including temperature increases, a greater frequency of heavy precipitation and drought events, a greater prevalence of pests and pathogens, and a heightened risk of wildfires (Rosenzweig 2011). More specific risks exist as well. For example, plants may be at increased risk of frost damage with premature development and blooming, which allows vulnerable young plants and plant tissue to be exposed to the cold. A greater frequency of heavy rainfall events may also lead to increased soil compaction and exacerbate susceptibility to root diseases (USGCP 2009). Increases in temperature and changes in precipitation patterns are also likely to lead to changes in the spatial distribution and

phenology (the timing of seed emergence, flowering and other key biological events) of small plant and grass species.

However, many small plants and grasses are weedy and may benefit more from higher temperatures and carbon dioxide levels than other plants (Hyman et al. 2008). Climate change may thus benefit some of the native plants and grasses of Akwesasne, while also allowing invasive plant species and weeds to move into the area as well. Other native plant species may be at risk from the predicted climatic changes listed above.

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Below are several adaptation measures that are ongoing or that could be adopted to help maintain and restore the Tribe's populations of small plant and grass species under future climatic conditions.

CONSERVATION AND RESTORATION. The conservation and restoration of small plant and grass species that are native to Akwesasne could be included in ongoing Tribal efforts to manage its forests and wetlands, with a focus on species that are uncommon, at particular risk due to climate change, and that have traditional tribal uses (such as sweetgrass).

EDUCATION. Funds provided to the Mohawk Council of Akwesasne (MCA) by the National Child Benefit Reinvestment Fund (NCBR) are used to teach teenagers in the community how to make traditional cornbread, moccasins, feather fans, gustowehs, rattles, washing Indian corn, water drums, and other handmade/homemade food and things that were commonly made decades ago. Other classes held at the Akwesasne Cultural Museum educate participants on beadwork, ribbon shirt and ribbon dress making, basket making classes, how to make corn husk dolls, and other relevant subjects. These educational programs help to pass down knowledge of the Tribe's traditional uses of Akwesasne's small plants and grasses.

WEED AND INVASIVE PLANT MANAGEMENT. Climate change may lead to an increased prevalence of weeds and invasive plants in Akwesasne, creating a greater need for effective weed and invasive plant management. Invasive species such as purple loosestrife (*Lythrum salicaria*) and the Common reed (*Phragmites australis*) are already present in the area. Both species have the ability to outcompete native plants. Some beetle species are an effective form of biological control for reducing populations of purple loosestrife, while *Phragmites* is more difficult to remove. The Saint Regis Mohawk Tribe has undertaken weed eradication efforts under its Wetlands Protection Program by partnering with the Bureau of Indian Affairs' Noxious Weed Eradication Program, and released *Galerucella* beetles in 2005 in collaboration with Cornell University, leading to a 90% reduction of purple loosestrife in the area. Adding to these already existing efforts could help manage a potential increase in the populations of weeds and invasive plants resulting from climatic changes.

THE BERRIES

"With one mind, we turn to honor and thank all the berries. Since the beginning of time the berries have helped the people survive. Many other living things draw strength from them too. We gather all the berries together as one and send them greetings and thanks. Now our minds are one."

The berries continue to carry out their instructions. They provide food for wildlife and people. The roots and leaves are used as medicine for children and women. The strawberry is the leader of the berries and is used in ceremonies with food and drink.

Recently, farmers that are located away from water resources and have large farmland were worried about getting fruit from their plants. The leaves were dry and birds were eating the leaves. This was a farm an hour away from Akwesasne where they had less rainfall. Squirrels were damaging water tubes for the strawberries to get water.

CURRENT CONDITIONS

Berries, including strawberry, red raspberry, currant, elderberry, juniper berry, cranberry, blackberry, blueberry, and others, are both grown and gathered in the wild in Akwesasne for their nutritional and medicinal value. Wild berries are rich in vitamin C, and recent investigations have identified diverse phytochemicals in berries that act to prevent a wide range of metabolic syndromes and chronic disease outcomes and help to improve cardiovascular protection (Seeram 2008; Basu et al. 2010). Given their cultural and nutritional importance, it is useful to evaluate the potential impacts of climate change on the species varieties and survival of berry plants at Akwesasne.

FUTURE WITH CLIMATE CHANGE

Climate change is expected to influence future precipitation patterns. In particular, climate change may lead to an increased frequency of late-summer drought as well as increased summer high temperatures in New York State. This may in turn lead to reduced harvests of both wild and farmed berry plants in this area (Rosenzweig 2010). Already, climate change and other environmental impacts have begun to affect the range, quality and quantity of berry resources in the Northeast (Michelle 2012).

As stated in Lynn et al. (2013), "the indigenous relationship between food and people is intimately tied to the cultural, physical, emotional, psychological and spiritual health of tribal communities." The impact of climate change on food species and ecological processes thus has a multifaceted impact on tribal culture and life, and the threat climate change poses to traditional food use can worsen already existing declines in health due to issues like obesity, diabetes and cancer. Reductions in the availability of traditional food due to climate change thus results in what Lynn et al. (2013) call "a denial of [tribal]

rights to have access to a steady supply of nutritionally balanced, culturally relevant foods," and can also erode traditional practices and knowledge associated with these activities.

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Broadly, Lynn et al. (2013) suggest that "traditional ecological knowledge may guide the myriad of social, political, ecological and cultural adaptation strategies that Tribes may pursue" to address impacts of climate change on Native food sources. Such strategies may include clarifying legal obligations of federal agencies, exchanging information and identifying different technologies to access and store foods, making agreements with other tribes to grant or request access to traditional foods, or the diversification of food-based resources to other species. Adaptation efforts should also include collaboration between Western scientists and managers and Tribal scientists, managers, harvesters and communities to explore innovative approaches to addressing climate change impacts, they argue (Lynn et al., 2013).

Climate change adaptation measures that could be adopted for berry resources include:

- Rain barrels and cisterns can help to store water for use in irrigation of berries when water resources are scarce.
- Wild berry species could be included in the Tribe's Forest Management Plan and the wild berry resources could be augmented through seeding and planting efforts.
- The seeds of wild berry plants in Akwesasne could be collected as has been done with Black Ash seeds to ensure that the historic wild berries of the Tribe survive even if wild populations of these species disappear from the area due to climate change.
- Tribal members could be provided with berry seed and encouraged to grow berries on their land.

A framework that could prove useful to the Saint Regis Mohawk Tribe in its efforts to protect its berry resources (and other wild foods) in the face of climate change is provided by the Confederated Tribes of the Umatilla Indian Reservation's (CTUIR) "First Foods" program. The CTUIR Department of Natural Resources has partnered with local, state and federal entities to restore ecosystems that support culturally important foods (Lynn et al. 2013).

THREE SISTERS

"With one mind, we turn to honor and thank the Food Plants we harvest from the garden. Since the beginning of time, the Plant Foods, especially the Three Sisters, the corn, beans and squash have helped the people survive. They sustain life. With our minds gathered together; we give thanks and look forward to seeing the Three Sisters for many generations to come. Now our minds are one."

The Three Sisters, Corn, Beans, and Squash continue to follow their original instructions and continue to provide food to the people for survival. The Three Sisters are the foundation of the Haudenosaunee culture. Ceremonies are to be concluded with the Three Sisters as an offering to the spirit beings.

CURRENT CONDITIONS

Agricultural production was once one of the main economic activities of the Iroquois in New York State. However, farming began to decline in the latter half of the 20th century in Akwesasne as well as in other communities across upstate New York as agricultural practices began to modernize. For example, a team from Cornell University found a total of only nine full or part-time farming families in Akwesasne in 1989. At the same time, they found that between 30 and 35 percent of the area's households had family gardens. There is a strong tradition of maintaining small gardens for personal consumption in Akwesasne, and traditional varieties of the Three Sisters are used in Longhouse ceremonies and for other special occasions (Hoover 2010).

Pollution from the General Motors and Alcoa facilities near Akwesasne has also impacted agriculture in the area. Today, some plants grown in gardens in Akwesasne are still contaminated from pollution by industrial plants upwind and upriver from the territory.

Climate change also poses a threat to farming in Akwesasne. The Three Sisters didn't grow well after recent hail storms. Some squash plants were damaged and those that grew were small due to high temperatures and lack of rainfall. Corn growers have experienced reduced yields, and have had less to provide for their cows over the winter.

FUTURE WITH CLIMATE CHANGE

The State of New York is expected to experience increased temperature and precipitation due to climate change, though precipitation is predicted to decline in the late summer and early fall. Droughts are expected to become more frequent, as are extreme rainfall events, and pests, weeds, and diseases are expected to spread due to increased temperatures (Rosenzweig 2011). All of these factors have the potential to negatively affect the cultivation of the Three Sisters and other food plants in Akwesasne.

Increased heavy rainfall events can delay spring planting and flood fields during the growing season, sometimes leading to crop loss through decreased oxygen levels and root disease (USGCP 2009), and corn has been shown to be particularly vulnerable to increased soil moisture due to heavy precipitation events (Rosenzweig et al. 2002). Increased drought frequency and severity can be harmful to all crops (Wolfe et al. 2007). Overall, agricultural production of many crops in the Northeast is expected to decrease (USGCP 2009). Climate change may also provide benefits to agricultural production, however, through warmer temperatures, a longer growing season, and increased atmospheric carbon dioxide (Rosenzweig 2011).

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Below are adaptation measures that could be adopted in addition to current efforts of the Tribe to help maintain and expand the Saint Regis Mohawk Tribe's agricultural practices under future climatic conditions.

SEED STORAGE AND EXCHANGE. The Saint Regis Mohawk Tribe could begin to store the seeds of crop varieties grown on the reservation in a community seed bank, and procure seeds from other tribes and seed collections through purchase or exchange. For example, members of the Tribe participated in a recent Haudenosaunee seed exchange workshop, and the Akwesasne Task Force on the Environment holds an annual seed giveaway. Further resources and historic Iroquois crop varieties may be found through collaboration with the U.S. Department of Agriculture. Traditional Iroquois White Flour corn seed may also be available through Cornell University's American Indian Agriculture Project, designed to support and expand indigenous agriculture in New York. Some of these varieties may be hardier and more adaptive under the climatic conditions of the future. As Hoover (2010) notes, crop varieties used by Haudenosaunee farmers in the past may be more suited to local climate and soil conditions, have stronger resistance to local pests and diseases, and provide more nutrition than modern varieties.

EXPANDED IRRIGATION AND DRAINAGE SYSTEMS. Water could be collected and stored in rain barrels, cisterns and other storage facilities so that crops can be irrigated during times of drought, while more efficient irrigation technology could be used to conserve water. At the same time, improved drainage systems could help prevent waterlogging from extreme precipitation events.

SHIFTING PLANTING DATES. Changing the dates crops are planted and harvested is an effective and inexpensive way to take advantage of longer growing seasons.

EDUCATION. The Akwesasne Task Force on the Environment (ATFE) has supported a number of agricultural projects, including a community garden created in conjunction with the Longhouse, and a greenhouse project on Cornwall Island. The project was later discontinued due to lack of funding, but the greenhouse was donated to the Akwesasne Freedom School, where it is now used by teachers and students. A community garden has also been established at the Akwesasne Freedom School (AFS) with student involvement. A newer organization at Akwesasne is Kanenhi:io Ionkwaienthon:hakie, a group dedicated to helping families with agricultural projects that is funded by Heifer International (Hoover 2010). These programs could be expanded and publicized to increase awareness of opportunities to get involved with agriculture in Akwesasne. Another resource could be provided by Cornell University's American Indian Agriculture Project, which conducts research on indigenous cropping systems and

supports creative marketing outlets for Tribe-grown products, and further funding for agricultural education activities may also be available through recent settlements. Educational efforts could focus on "climate-smart" agricultural practices that make Akwesasne's farms and gardens more resilient in the face of climate change.

SUBSIDIES. Agricultural activities and climate change adaptation measures on farms in Akwesasne could also be subsidized through the formation of a Tribal Conservation District or through settlement funds.

CANNING. Learn the art of canning to preserve food for the future. This helps with food security and well-being because when you can your product you know what's going in there – your food is not processed commercially.

COMMUNITY PROGRAMS. Akwesasne has several community programs designed to enhance food security. For example, the Mohawk Council of Akwesasne's Community Health Program within the Department of Health has developed a very successful Green Food Box program, which provides a non-profit system for distributing and selling fresh seasonal fruit and vegetables that are grown in local gardens and farms. The program sells $10 bags containing fruits and vegetables including bananas, potatoes, zucchinis, apples, pears, carrots, and pomegranates, and any Tribal member can purchase them regardless of residency. The Community Health Program has also worked to develop a Community Kitchen project, which aims to help working families, single home elders and other demographic groups collectively cook large meals that can be portioned off appropriately. These programs both help to support local agriculture and strengthen food security and health in the community.

MEDICINE HERBS

"Now we turn to all the Medicine Herbs of the world. From the beginning, they were instructed to take away sickness. They are always waiting and ready to heal us. We are happy they are still among us, those special few who remember how to use these plants for healing. With one mind, we send greetings and thanks to the Medicines and to the keepers of the Medicines.
Now our minds are one."

The Medicine Plants were instructed to take away sickness and to heal us. They have carried on their original instructions to this day. The medicines help animals, birds and people to heal and stay healthy.

Medicines grow all over. They can be found in the forest. They are in the meadows, in water, on the shore. Learning the right ways of gathering and caring for medicine plants is a lesson in an entire way of living.

Tobacco, sage, sweetgrass and cedar are four very sacred and important medicine plants for the people of this continent. Each has medicinal properties. Each of these plants represents a particular direction, and the peoples of that direction.

The blood that flows through our medicines is the same water that runs through our mother and the flesh that builds the medicines is also that of our mother. The medicine plants are constantly grateful to our Mother Earth, so they can continue their original instructions.

CURRENT CONDITIONS

Elders in Akwesasne have knowledge about medicine plants, and still harvest these medicines. Medicine plants historically gathered in Akwesasne include sweetflag, golden thread, willow tree bark, cherry branches, turtle socks and ginseng, and over 120 species of wetland plants have been identified that are still in use for medicinal purposes (RCDP 2013). Today, many people who do not know the medicines go to the health food store in Massena and buy from an herbalist who also sells bottled remedies. The herbs are shipped in from elsewhere and are not locally grown.

There is a natural smoothies business in Akwesasne that makes smoothies from natural foods that are either shipped in or purchased at the grocery store. They are washed in a special natural solution before being made into a smoothie. The smoothies have to be pre-ordered and must be drunk within a couple of hours. The business has delivery service to local businesses with multiple orders. There are varieties of drinks for various ailments and for cleanses. It works well if the customer has a proper diet.

Medicine plants in Akwesasne have also been negatively affected by contaminants released by industrial facilities in Massena, New York (including Alcoa Inc. and the Reynolds Metals Corporation). In some cases, the pollution led to the disappearance of medicine plants, and in others changed the appearance or taste of the plants, alarming healers and disrupting traditional healing practices (RCDP 2013).

FUTURE WITH CLIMATE CHANGE

Not much research has been conducted on the effects of climate change on medicinal plants, but the existing literature suggests that these species may be increasingly threatened by the phenomenon, particularly those in high-altitude environments (Cavaliere 2009). Climate change may negatively affect medicinal plants through heat stress, a higher frequency of drought and heavy rainfall events, shifts in species composition and forest type, and an increased number of invasive species and pests (Rosenzweig 2011). The abundance of certain medicinal plant species may decrease due to these changes, and temperature stress may also affect the secondary metabolites and other compounds that these plants produce (Cavaliere 2009). Climate change may also have the potential to lengthen the growing seasons of medicinal plants and enhance plant growth through higher carbon dioxide concentrations in the air as well.

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Summarized below are adaptation measures that could be adopted to help maintain and restore the Tribe's medicinal plant populations and traditional medicinal practices in the face of climate change.

CONSERVATION, MANAGEMENT AND RESTORATION. Medicinal plant species could be grown in greenhouses and planted in suitable areas to bolster populations, particularly for medicinal plants like ginseng that have become uncommon. Funds from recent settlements with Alcoa Inc. and other companies may also be used to launch a "medicine plant restoration program," including the development of a medicine garden (RCDP 2013). Conservation, management and restoration of medicinal plants could take place as part of already existing efforts to restore and manage Akwesasne's forests and wetlands. Further resources may be available through United Plant Savers, an organization dedicated to protecting the native medicinal plants of the United States and Canada and their native habitat.

MONITORING. The spatial distributions and extent of medicinal plants may shift under climate change. The locations of medicinal plant populations could be monitored to enable the Saint Regis Mohawk Tribe to adjust their harvesting locations and practices to these changes.

EDUCATION. In addition to conserving and restoring medicinal plant populations, educating community members about the traditional medicinal ways of the Saint Regis Mohawk Tribe is also essential to ensure that these practices survive climate change. Such activities could take place through already existing groups such as the Akwesasne Task Force on the Environment, and could potentially be funded through recent settlements, for example through the proposed Community Environmental Education Project Fund.

ANIMALS

"We gather our minds together to send greetings and thanks to all the Animal life in the world. They have many things to teach us as people. We see them near our homes and in the deep forests. We are glad they are still here and we hope that it will always be so. Now our minds are one."

The animals from the largest moose to the smallest insect play a role in creation and still follow their original instructions as given by the Creator. They provide food, clothing, shelter and medicines to people, and insects spread pollen from plant to plant to help with food production. Bees create honey from the nectar from flowers.

We have learned how to hunt, store food, and survive from the animals. We also rely on them for our emotional and spiritual strength. In many ways, animals remind us of our humanity, and teach us to share, to take care of our children, to protect our land, to look out for others, and to love our families.

Our traditions require that we work to maintain good relationships with animals.

CURRENT CONDITIONS

Akwesasne is home to many animals including freshwater mussels, turtles, frogs, salamanders, deer, mice, and bats.

Deer have been overharvested in Akwesasne. There used to be eight deer per square mile and now there is only one deer per square mile. Outside of the Akwesasne Territory, the Amish were given hunting licenses by the state to hunt deer and they killed many. They claimed that the deer were a nuisance. Tribal hunters were given hunting licenses where they had to hunt in other parts of the state. Our tribal members now hunt for deer away from our territory because of Department of Environmental Conservation Regulations which reports low numbers in this area. Hunting licenses are issued for other zones.

Some wildlife habitats have become uninhabitable. For example, beaver habitats have been exposed. They need to be under water because beavers are aquatic mammals. Wildlife reproductive cycles have also begun to be irregular due to droughts. Dairy cows haven't been producing the normal amount of milk. Rabbits have been eating from unprotected gardens.

FUTURE WITH CLIMATE CHANGE

Climate change is likely to have a number of effects on ecosystems and animals, benefiting some species and leading to declines for others. Temperature changes are likely to lead to range shifts of wildlife

species, the success of which will depend on migration ability, the existence of migration corridors, suitable new habitats, and food resources (Rosenzweig 2011). Snow-dependent animal species and their winter predators, moose, and wetland species may be under particular threat from climate change, while generalists such as the white-tailed deer that do well in many habitats and are able to eat many foods are likely to do better (Rosenzweig 2011).

Amphibians are also likely to be negatively affected by the increased frequency of summer drought predicted for New York State, since they are dependent on wetland and seasonal pool habitats for part or all of their life cycles. Climate change may thus increase competition for resources among amphibian young, decrease their size, and strand young amphibians that have not yet metamorphosed (Rodenhouse et al., 2009). Increased winter and early spring temperatures may, on the other hand, lead to increased foraging opportunities for salamanders and other amphibians earlier in the year, providing a benefit to these species (Rosenzweig 2011).

Reptiles are likely to be greatly influenced by climate change due to their sensitivity to temperature. For example, painted turtles grow and reach sexual maturity more quickly during warmer years (Frazer et al., 1993), and temperature can also determine hatchling sex ratio of some reptile species. Increased temperatures could thus result in a higher rate of reproduction, but also skew the ratio of female to male reptiles in certain instances and also lower overwinter survival of turtle hatchlings due to decreased snow cover (Rosenzweig 2011). Turtle species in particular may be particularly vulnerable to climate change due to their limited dispersal abilities and small, isolated populations.

Lastly, climate change is likely to lead to increased levels of pests (such as insects), pathogens, and invasive species, as longer growing seasons and warmer winters increase insect populations and increasing temperatures shift the habitat ranges of many species northward, potentially leading to detrimental effects on Akwesasne's native animal species (Rosenzweig 2011).

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Below are several ongoing and proposed adaptation measures that could be adopted to help maintain and restore the Tribe's wildlife under future climatic conditions.

RESTORATION AND CONSERVATION. Many of the Tribe's ongoing projects to restore and conserve the streams, forests, wetlands and other wild lands of Akwesasne have the potential to increase and improve habitat for the area's wildlife. For example, the U.S. Fish and Wildlife Service awarded the Tribe more than $190,000 for hardwood wetlands habitat restoration and management to help enhance and restore black ash resources for the benefit of wildlife. A number of the proposed ecological restoration projects from the Alcoa Inc. and General Motors settlement-associated natural resource damage assessment – including stream and wetland restoration, acquisition of land, amphibian and reptile enhancement and restoration projects, and freshwater mussel restoration projects – may also have the potential to help conserve the wildlife species that live in or pass through Akwesasne in the face of climate change. The protection of riparian zones and migration corridors may also help to facilitate natural adaptive behaviors among Akwesasne's wildlife species.

COLLABORATION WITH STATE, FEDERAL AND NON-PROFIT ORGANIZATIONS. Collaboration with a number of organizations such as the U.S. Fish and Wildlife Service, the New York State Department of Environmental Conservation, the New York State Division of Fish, Wildlife and Marine Resources, and non-governmental organizations such as the World Wildlife Fund and The Nature Conservancy may provide valuable benefits to the Tribe's efforts to conserve its wildlife. These groups can provide information and resources and may be able to help the Tribe identify key wildlife areas in Akwesasne as well as determine useful and effective restoration actions for wildlife in the area.

MONITORING. Monitoring of at-risk species can help to track the status of vulnerable animals and target conservation effort. The Saint Regis Mohawk Tribe Environment Division and community members currently monitor female snapping turtle nesting.

INVASIVE SPECIES MANAGEMENT. The Saint Regis Mohawk Tribe could work with other organizations such as the New York Invasive Species Research Institute (nyisri.org) to manage and mitigate the spread of pests, diseases and invasive species into Akwesasne.

TREES

"We now turn our thoughts to the Trees. The Earth has many families of Trees who have their own instructions and uses. Some provide us with shelter and shade, others with fruit, beauty, and other useful things. Many peoples of the world use a Tree as a symbol of peace and strength. With one mind, we greet and thank the Tree life.
Now our minds are one."

The trees carry on their original instructions by continuing to provide maple syrup, wood for heat and shelter, the bark is used for medicines, leaves shelter people and wildlife from heat and certain medicines grow in the shade of trees.

The leader of all the trees is the Maple, it provides us with the first medicine food of the Spring which helps renew our strength and reminds us of our continual responsibility. The Maple syrup is used in every longhouse ceremony. It is used as a medicine, drink and added in our food.

At Akwesasne in the Spring of 2012, those who tap the Maple trees for syrup did not get any syrup at all due to the warm temperatures through the winter months that set in quickly in early spring. The nights were not getting cold enough to get the syrup to flow. People also observed that trees dried out early, and the color of leaves started changing early, in August 2012.

CURRENT CONDITIONS

Of the Saint Regis Mohawk Tribe's approximately 12,100 acres of land, the majority (6,860 acres, or 56 percent) are forested. Akwesasne's forests are well stocked with good quality hardwood trees, including quaking aspen (17% of basal area), basswood (13%), red and silver maples (8%) and many other northern hardwood and bottomland hardwood species such as black ash. A small number of softwood species are also present, including white pine, northern white-cedar, and balsam fir, though these species are not numerous. Exhibit 6 presents the distribution of eight forest cover types across Akwesasne (Bridgen et al. 2004).

As described above, the tree species that currently inhabit these Tribal lands have important cultural values and uses. As such, it is useful to examine potential changes that climate change could have on tree species composition and survival on Saint Regis Mohawk Tribe lands, as well as potential actions that can be taken to adapt to these impacts.

FUTURE WITH CLIMATE CHANGE

Scientists expect that forests and other natural areas are likely to transform as a result of climate change. These climate change impacts threaten access to valued resources that tribes depend upon to perpetuate their cultures and livelihood, and that have contributed to cultural, economic, medicinal and community health for centuries (Voggesser et al., 2013).

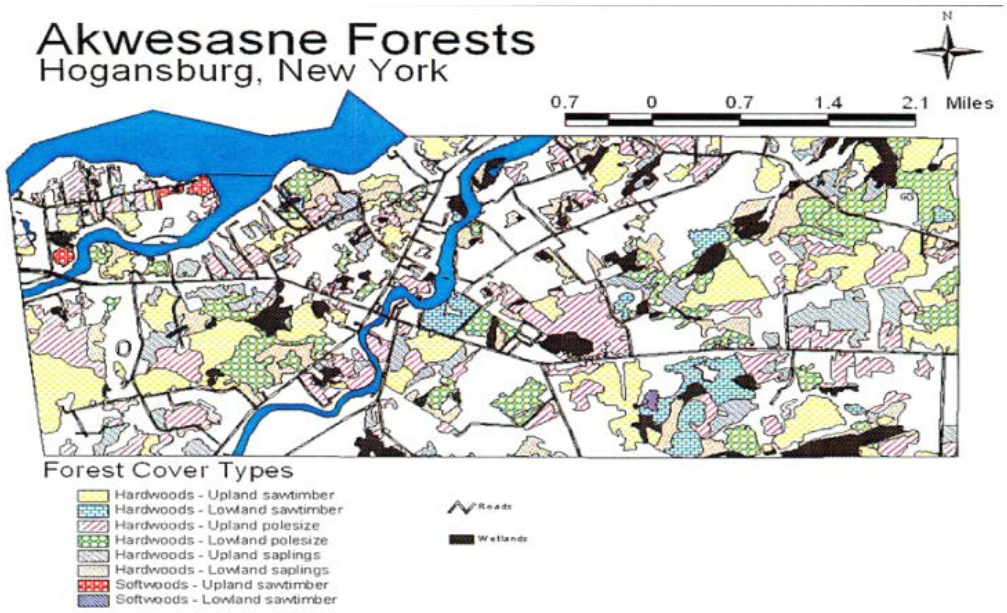


Exhibit 6: Distribution of eight forest cover types across the St. Regis Mohawk Reservation forest
Source: Bridgen 2009

Scientists expect that climate change impacts to forests will include species loss, shifts in species range (such as northward or elevational migration of some temperate forest species), contraction or expansion of plant species, increases in the range of invasive species and pathogens, and changes in the distribution and population density of wildlife species (Voggesser et al., 2013). Wildfires and droughts are also expected to increase. Forests can also, however, play a role in mitigating local climate responses to climate change (Voggesser et al., 2013).

Climate change is expected to cause shifts in species composition, including loss of spruce-fir forests, alpine tundra and boreal plant communities at high altitudes and latitudes. The forest type and composition shifts expected for the northeastern U.S. are shown in Exhibit 7. As shown, the currently dominant maple-beech-birch forest type is projected to be displaced by the oak-hickory forest type in most of the Northeast by 2100. A prolonged growing season and a “fertilization effect” of increased carbon dioxide levels could increase productivity in some hardwood trees, if they are not limited by other factors. However, the fertilization effect can also preferentially increase the growth rate of fast growing species, which are frequently weeds and other invasive species (USGCP 2009).

The U.S. Global Climate Research Program predicts that maple syrup production will decrease in the Northeast, as part of an overall decline in agricultural production (USGCP 2009). The 2012 experience at Akwesasne where maple production was reduced may be an indication of potential future reductions in the production of this important tribal resource.

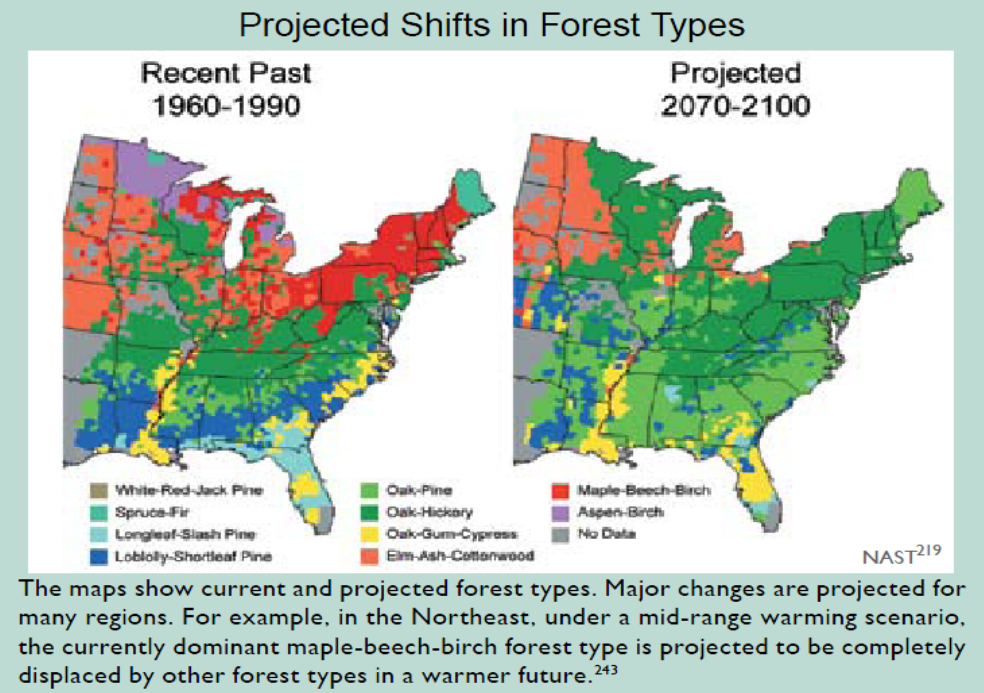
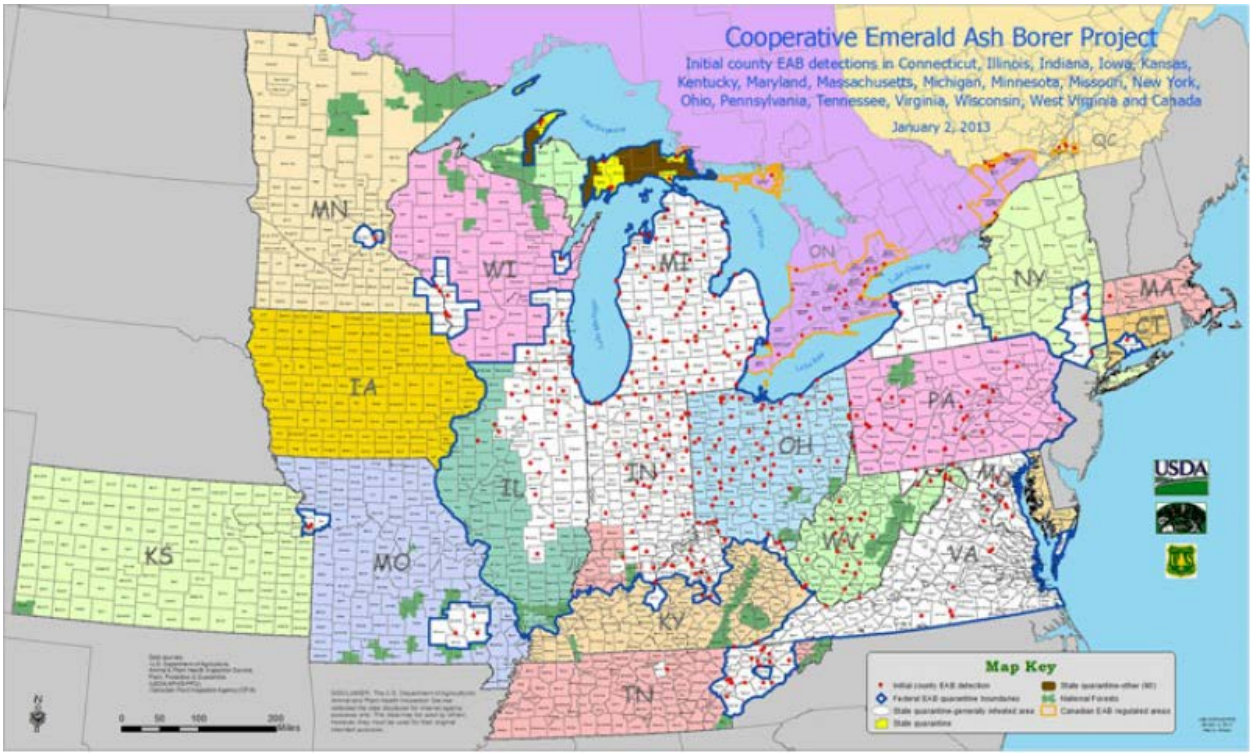


Exhibit 7: Projected Shifts in Forest Types
Source: U.S. Global Change Research, 2009

Invasive species, including animal and plant pests, pathogens, and diseases, can increase forest mortality and reduce the quality and quantity of woodland products used by the Saint Regis Mohawk Tribe (Voggesser et al., 2013). An important example of an invasive species that may directly affect the Saint Regis Mohawk Tribe is the emerald ash borer (EAB), which is creating landscape-level change in the eastern U.S. in areas where black ash (*Fraxinus nigra*) occurs (see Exhibit 7). The EAB has not yet reached the Saint Regis Mohawk Tribe Reservation, but it has reached nearby Toronto, Ontario and certain locations in New York State. Black ash is widely used in basket-making, and plays an important role in the functioning and resilience of Kanienkehaka/Mohawk culture. The economic impact of EAB-related street tree removal and replacement in 25 states has been estimated at $10.7 billion (Kovacs et al. 2010).

Exhibit 8: Map of Emerald Ash Borer (EAB) Beetle Detections

Source: http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/index.shtml



ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

The Forestry Resources program of the Saint Regis Mohawk Tribe's Environment Division has already undertaken several programs that will help the Tribe's forest lands to adapt to climate change. These current adaptation actions for the Tribe's forest resources are summarized below, along with additional adaptation measures that could be adopted.

FOREST INVENTORY. The Saint Regis Mohawk Tribe conducted a forest inventory in 2003 using aerial photography, Geographic Information System (GIS) technology and direct field surveys to measure the Reservation's 6,860 acres of forest land, resulting in the publication of a forest inventory analysis report (Bridgen et al. 2004). A supplemental report in 2006 modeled forest stand growth and provided information such as indicated annual cut (which approximates what level of timber harvest will be balanced out by new growth) useful for establishing sustainable long-term harvesting and management plans. The Forestry Resources program has begun **inventorying forest resources** on the Tribe's lands again as an update to the earlier effort. The Forestry Resources program's Forest Inventory and Planning group is also working on the development of a **Forest Management Plan** to help the community achieve its forestland use goals (to produce firewood, timber, provide habitat, etc.). Further monitoring of tribal forests has the potential to help manage weeds, invasive pest species, better meet the needs of wildlife,

increase the populations of rare, edible and medicinal plants, and help manage the Tribe's forests to maximize resilience to the impacts of climate change.

HARVEST OF ASH SEEDS. The Saint Regis Mohawk Tribe Environment Division has harvested Black, Green, and White Ash Tree seeds annually in recent years in collaboration with the US Forest Service and other partners for use in restoration in case the Emerald Ash Borer invades the Akwesasne territory. The Tribe's Forestry Resources Program is also working on a collaborative, 3-year effort with the SUNY Ranger School and others to manage Black Ash to increase forest health and production. The findings of this program should aid in future management of this tree species. Proactive forestry management of this and other tree species has the potential to increase the resilience of the Saint Regis Mohawk Tribe Reservation's forests in the face of climate change.

INVASIVE SPECIES PREVENTION. **EAB** poses a significant threat to the Tribe's ash trees. Thus far, the Tribe has worked with the USDA to conduct **monitoring surveys** in Akwesasne to determine whether the EAB is present by setting monitoring traps in ash trees that attract the pest. Perhaps the best measure for controlling the spread of this and other pests into Tribal lands is to strictly **enforce New York's firewood ban**, which prohibits transportation of firewood of any kind. Keeping non-reservation firewood out has the potential to prevent the spread of this species. The Forestry Resources Program could launch a **Tribal public education effort** to explain why keeping firewood (and seeds) local is important. The Saint Regis Mohawk Tribe could also **work together with the local St. Lawrence – Eastern Lake Ontario Partnership for Regional Invasive Species Management** (convened by New York State's Invasive Species Task Force) to reduce the negative impacts associated with the spread of invasive species due to climate change (Rosenzweig et al. 2011; Voggesser et al. 2013).

Further resources for invasive species management include the New York Invasive Species Research Institute (nyisri.org), which promotes information-sharing regarding the management of invasive species; the iMapInvasives mapping tool (imapinvasives.org); and the Cooperative Emerald Ash Borer Project.

FIRE MANAGEMENT PLANNING. The Forestry Resources program of the Saint Regis Mohawk Tribe's Environment Division has launched a Fire Management Planning project in conjunction with Emergency Planning and the Hogansburg Akwesasne Volunteer Fire Department to determine goals, objectives, and strategies for reducing and preventing fires. This effort has resulted in a strategic **Fire Management Plan** giving programmatic direction for the safe, effective management of wildland fires in Akwesasne. The program also provides mechanisms for fire department cost reimbursement from fighting brush fires, and provides access to firefighting training. The Tribe's Forest Management Plan currently allows for suppression of wildfires, emergency fire stabilization and rehabilitation activities, but prescribed fire is not permitted. The **Wildland Urban Interface project**, another activity of the Forestry Resources program of the Tribe, has a mechanism to achieve reduced fire hazard through the removal of brush and woody debris near and around homes, critical infrastructure, and government facilities. Services are provided by the project's five-man crew that undertakes these activities throughout the summer months. These efforts should be strengthened in coming years to reduce the increased threat of wildfire under climate change.

MAPLE SYRUP PRODUCTION. Climate change is likely to impact maple syrup production by leading to earlier and shorter sap flow seasons due to warmer temperatures, as has already been observed at Akwesasne in the Spring of 2012 (Rosenzweig et al. 2011). These effects may have negative impacts on the Tribe's production and use of maple syrup as food, drink, and medicine in the longhouse ceremony. Adaptation measures that could help mitigate these negative impacts include:

- Forest management to reduce competition from other tree species and pests;
- Tapping trees earlier in the year;
- Increasing the sap yield from trees by using new spout technology;
- Bringing more sugar maple trees into production; and
- Experimenting with tapping red and silver maples in addition to sugar maples. Though red and silver maples have lower sugar concentrations in their sap, using reverse osmosis before boiling can make it easier to process maple syrup from these two species (Rosenzweig et al. 2011).

THE BIRDS

"We put our minds together as one and thank all the Birds who move and fly about over our heads. The Creator gave them beautiful songs. Each day they remind us to enjoy and appreciate life. The Eagle was chosen to be their leader. To all the Birds—from the smallest to the largest—we send our joyful greetings and thanks. Now our minds are one."

The birds spread seeds as they travel, they give us their beautiful songs to keep us wanting to stay here on earth. The eagle is the leader of the bird life as the eagle can fly the closest to the Creator.

CURRENT CONDITIONS

The lower St. Lawrence River has been identified as an Important Bird Area by the National Audubon Society, and Akwesasne is located within a region that provides habitat to a number of endangered, threatened and "bird species of special concern" including the black tern, common tern, wood thrush, vesper sparrow, short-eared owl, northern harrier, pied-billed grebe, bald eagle and least bittern (RCDP 2013). Akwesasne is utilized by both resident and migratory bird species for breeding, feeding and roosting. These birds include waterfowl, waterbird, raptor and songbird species.

Climatic changes have begun to affect the birds of Akwesasne. Geese aren't travelling too far to the south anymore. Wild turkeys are abundant because of milder weather, and robins are returning earlier in the year. In the past few years there have been more black crows in the territory of Akwesasne. They destroy robin nests and eat the eggs. More eagles are back in the territory to nest. Many have been sighted along the river on remote islands. Invasive cormorants have been sighted on rivers. They eat game fish and have moved into the territory of Akwesasne.

The bird life of Akwesasne has also been impacted by industrial contamination. Facility-related contaminants are estimated to have destroyed or impaired local bird habitat, and PCBs have been found in the eggs and blood of great blue herons in the area (RCDP 2013).

FUTURE WITH CLIMATE CHANGE

Climate change is predicted to have a number of impacts on ecological processes and habitat quality, many of which may affect the behavior and population levels of bird species. Such effects may include changes in the timing of migration and nesting (Crick 2004), as observed above for geese and robins, as well as geographic shifts in migration patterns (Rosenzweig 2011). Some bird species may benefit from climate change, while others may suffer, and changing climates may shift the range of certain species, leading to the spread of invasive and alien species (Crick 2004). For example, the ranges of 12 bird

species in Britain have been observed to have shifted on average 18.9 km northwards over a 20-year period due to increased winter temperatures (Thomas and Lennon 1999). In New York, 27 out of 34 Northeast bird species for which range shifts have been documented in recent decades show a northward shift in range (Rosenzweig 2011). Bird species that are habitat generalists able to thrive in a number of habitat conditions are likely to do well under climate change, while habitat specialists are likely to suffer (Rosenzweig 2011). Extreme weather events such as droughts and heavy rainfall events, both predicted to increase in frequency for the State of New York in the 21st century (Rosenzweig 2011), can have significant negative impacts on bird populations (Stenseth et al. 2002).

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Below are several ongoing and proposed adaptation measures that could be adopted to help maintain and restore the Tribe's bird life under future climatic conditions.

WETLAND PROTECTION. The Saint Regis Mohawk Tribe currently regulates and protects the area's wetland resources through its Wetlands Protection Plan and the Akwesasne Wetlands Conservation Act, and the Tribe's Environment Division has a Wetlands Protection Program. These programs include policy, wetland mapping, public notice, permitting and enforcement elements, and help to protect the wetlands and water quality of Akwesasne from encroachment and development. Such activities help to create and enhance foraging and nesting habitat for a number of wetland birds. A number of wetland bird species, such as the American bittern, common loon and sora, are projected to decline as a result of climate-driven changes (Rosenzweig 2011).

RESTORATION AND CONSERVATION. Many of the Tribe's other ongoing projects to restore and conserve the streams, forests, wildlife and other wild lands of Akwesasne have the potential to increase and improve habitat for the area's bird life. A number of the proposed ecological restoration projects from the Alcoa Inc. and General Motors settlement-associated natural resource damage assessment – including stream and wetland restoration, acquisition of land, upland restoration, and the construction of osprey and bald eagle nesting platforms – all have the potential to help conserve the birds that live or pass through Akwesasne in the face of climate change. The proposed Murphy Island restoration project would likely provide benefits to the state threatened common tern. On a smaller scale, households could put up nesting boxes and birdfeeders to help provide habitat and food to birds.

COLLABORATION WITH STATE, FEDERAL AND NON-PROFIT ORGANIZATIONS. Collaboration with a number of organizations such as the U.S. Fish and Wildlife Service, the New York State Department of Environmental Conservation, the New York State Division of Fish, Wildlife and Marine Resources, and non-governmental organizations such as the National Audubon Society, the Nature Conservancy, and the Native American Fish and Wildlife Society may provide valuable benefits to the Tribe's efforts to conserve its bird life. These groups can provide information and resources and may be able to help the Tribe identify key bird areas for conservation in Akwesasne as well as determine useful and effective restoration actions for native bird species in the area.

THE FOUR WINDS

"We are all thankful to the powers we know as the Four Winds. We hear their voices in the moving air as they refresh us and purify the air we breathe. They help to bring the change of seasons. From the four directions they come, bringing up messages and giving us strength. With one mind, we send our greetings and thanks to the Four Winds. Now our minds are one."

The four winds bring the change of the four seasons. The winds carry pollen and seeds and are dispersed to be reproduced. The winds carry vapor in the form of water, snow, rain, hail, and ice. The four winds carry the smoke from tobacco burnings with the messages that are directed upward to the medicine spirits and the Creator.

CURRENT CONDITIONS

Air quality in Akwesasne is being monitored by the Tribe. There are two industrial plants located upwind from the territory which pollute the air. Decades ago in Akwesasne, before stricter regulations were imposed on industry for air emissions, the cattle were losing their teeth and were found to be contaminated with fluoride. Studies were conducted by the Mohawk Council's Environment Division. This caused many farmers to stop farming and many families stopped gardening. This led to families purchasing canned food from grocery stores.

Before garbage disposal was available in Akwesasne, many families had burn barrels and family dumps. Many homes are still heated with wood stoves in Akwesasne. Many houses in the area also have mold problems due to poor air circulation and damp basements due to the high water table, in many areas only about three feet below the surface. The Saint Regis Mohawk Tribe's Environment Division conducts Indoor Air Quality Tests for those who request it.

FUTURE WITH CLIMATE CHANGE

Climate variables such as temperature, humidity, and wind speed and direction all contribute to air quality patterns across space and time. Changes in these climate variables, such as temperature increases due to climate change, can thus be expected to influence air quality (Rosenzweig 2011). Climate change may worsen air quality; for example, the formation of ozone (which can cause inflammation in the deep lung and short-term decreases in lung function) increases with greater sunlight and higher temperatures (Rosenzweig 2011). Heightened ozone levels due to increased temperatures may also increase the risk of asthma (Rosenzweig 2011). Levels of $PM_{2.5}$ (a complex mixture of solid and liquid particles of less than 2.5 millionths of a meter in diameter) are also likely to increase with climate

change as well (Hogrefe et al., 2006). High concentrations of ambient $PM_{2.5}$ can lead to a number of adverse health outcomes, including heart and lung disease (Rosenzweig 2011). An increased frequency of wildfires may also contribute to diminished air quality through increases in fine particulate air pollution, and increased summer temperatures have been shown to increase emissions from power plants due to increased air conditioning use (Drechsler et al., 2006). Lastly, climate change may increase pollen levels through an earlier onset of the pollen season, enhanced seasonal pollen loads in response to higher temperatures and longer growing seasons, and increased CO_2 concentrations, which have been shown to stimulate pollen production and allergen potency in ragweed. This predicted increase in pollen levels under climate change may lead to an increase in allergic diseases including allergic asthma, hay fever, and atopic dermatitis (Rosenzweig 2011).

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Below are several ongoing and proposed adaptation measures that could be adopted to help improve Akwesasne's air quality under future climatic conditions.

AIR QUALITY MONITORING. The Saint Regis Mohawk Tribe's Air Quality Program currently monitors ambient levels of ozone, SO_2, NO_2, $PM_{2.5}$, PM_{10}, polycyclic aromatic hydrocarbons (PAH), benzene, and metals such as nickel, cadmium, and lead in Akwesasne. The Tribe also collaborates with the National Atmospheric Deposition Program to monitor acid rain in the area, and samples fluoride levels in vegetation in conjunction with the Alcoa. The Air Quality Program monitors indoor air quality as a free service to Akwesasne residents who call in with indoor air concerns as well, and levels of carbon monoxide, carbon dioxide, hydrogen sulfide, petroleum products, humidity, and temperature are measured and recorded during home visits. The air quality monitoring efforts described above will help to determine how air quality is changing in Akwesasne as the climate changes.

EMISSIONS REDUCTION. Air quality in Akwesasne could be improved through increased use of renewable energy, and a reduction in the amount of fossil fuels burned in the area. The Saint Regis Mohawk Tribe's Environment Division has launched a green building project to design a green building that will use less energy, and the Tribe and community members are looking at bringing electric utilities to Akwesasne in the way of solar energy, potentially entailing a solar farm or solar barn concept to provide low-cost, low-carbon energy with a potential to become self-sufficient and off the main grid. The Tribe could also recommend the use of clean-burning stoves to help improve indoor air quality.

COLLABORATION. The Saint Regis Mohawk Tribe currently collaborates with the National Atmospheric Deposition Program to monitor acid rain, and assesses the impact of benzene and other air toxics in Akwesasne in conjunction with the Center for Air Resources Engineering and Science at Clarkson University through a grant from the U.S. Environmental Protection Agency. Further collaboration with other governmental and non-governmental organizations may be useful for ongoing Tribal efforts to monitor and improve Akwesasne's air quality. For example, the Institute for Tribal Environmental Professionals (ITEP) provides training for tribal air monitoring programs at its Tribal Air Monitoring Support Center, created through a partnership between tribes, ITEP, and the United States Environmental Protection Agency (USEPA).

THE THUNDERERS

"Now we turn to the west where our Grandfathers, the Thunder Beings, live. With lightning and thundering voices, they bring with them the water that renews life. We bring our minds together as one to send greetings and thanks to our Grandfathers, the Thunderers. Now our minds are one."

The Thunder Beings, known as the Grandfathers, carry out their original instructions and continue to bring lightning and water to replenish and renew our water supply. They water our plants and Mother Earth. They strike the ground to keep the creatures beneath the ground from coming to the surface. They were placed there by the Creator. Today, we must respect the Thunderers as they continue to perform their duties that have been bestowed upon them.

CURRENT CONDITIONS

Akwesasne, in the Northern New York region, has a relatively wet climate; the average annual precipitation for the region between 1971 and 2000 was 39 inches, while Indian Lake (in the nearby northern Adirondacks region) has historically received 15 inches of total precipitation over the summer months of June through September. Northern New York is also prone to more frequent and severe ice and snowstorms than the coastal areas of the state, with Akwesasne receiving an average of 65 inches of annual snowfall between 1971 and 2000. The major extreme climate events in New York include extreme hot days and heat waves, extreme cold days, large precipitation events and flooding, lake-enhanced snow events, severe thunderstorms, tropical cyclones, and nor'easters (Rosenzweig 2011).

Observed climate trends over the past few decades indicate a changing climate. Since 1970, trends that have been observed include rising temperatures, more frequent hot days, longer growing seasons, less snowfall and more winter rain, reduced snowpack, and earlier ice and snowmelt resulting in earlier peak river flows.

At Akwesasne, the drought of summer 2012 affected many of nature's cycles on all of creation. The changes came about in the way of hot and humid temperatures, high winds, heavy rainfall, hail, low water levels, and fish and wildlife reproductive cycles were out of sync. The downpour of rainfall, hail, and strong high winds destroyed gardens at a time when it was late to restart gardens to get a good crop. Some areas had 6 inches of hail in July. Thunderstorm warnings were also issued. As a result of the dry conditions, residents who planted gardens needed to work extra hard to keep gardens from drying up. Heavy rainfall has been more frequent, downing corn stalks and other tall plants, and heavy cloud cover and cloud formations with high winds have been observed to have become more frequent as well. A tornado hit in Summerstown in summer 2012, just miles from Akwesasne. Akwesasne had high winds on that day.

On December 27th, 2012, there was a winter storm warning in Akwesasne and many businesses and offices were closed. Schools were out on Christmas vacation. Thirteen to 17 inches of snow fell within 24 hours.

FUTURE WITH CLIMATE CHANGE

Winters in northeastern North America are expected to have greater increases in precipitation volume than the U.S. average. In New York, average precipitation volume is predicted to rise by as much as 5 percent by the 2020s, 10 percent by the 2050s, and 15 percent by the 2080s. Most of this increase is expected during winter months, with decreased precipitation in the late summer and early fall (Rosenzweig 2011). The length of the winter snow season is expected to decrease by 50 percent in New York State.

In general, precipitation events are expected to increase in intensity, with an increased frequency of heavy downpours (IPCC 2007; USGCP 2009). At the same time, one to three month droughts are expected to occur as frequently as once each summer in the Catskill and Adirondack Mountains, and across New England (USGCP 2009).

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Below are several ongoing and proposed adaptation measures that could be adopted to help Akwesasne become readier for changes in storm and precipitation events under future climatic conditions.

STORM READINESS. The Mohawk Council of Akwesasne has a team of workers who trim branches and cut trees that are too close to power lines and homes to prevent damage in case of high winds, as well as a free Hazard Tree Program available to assist the elderly and disabled with the removal of hazardous trees. The Saint Regis Mohawk Tribe also has an Emergency Planning Coordinator.

STORM RESPONSE. During Hurricane Sandy, the Tribe activated Emergency Operations Command Centers to monitor the storm, and the combined efforts of these centers helped ensure a coordinated response of the community. Community members were advised on the storm's progress. This system could be continued and improved to better manage an increased number of storm events in the future due to climate change. There also are many gas stations throughout the Akwesasne territory, and it would be hazardous if there were to be a tornado, earthquake, or other catastrophe since oil could contaminate ground water and wetlands. The Saint Regis Mohawk Tribe's Environment Division Environmental Response Team (ERT) has been responding to accidental spills of hazardous materials in Akwesasne since 1993, and could help respond to any storm-related spills. Evacuation plans could also be put in place for major storm events.

EVACUATION PLANNING. The Saint Regis Mohawk Tribe has an Emergency Response Plan that includes guidance for evacuations if this is determined to be the most effective course of action for protecting people from the effects of a disaster such as a major storm. The evacuation plan divides the territory of Akwesasne into eight zones with associated assembly areas, and provides an Emergency Operations Control Group plan that outlines the responsibilities of each section, department and agency of the Tribe.

GRAND MOTHER MOON

"We put our minds together and give thanks to our oldest Grandmother, the Moon, who lights the nighttime sky. She is the leader of women all over the world, and she governs the movement of the ocean tides. By her changing face we measure time, and it is the Moon who watches over the arrival of children here on Earth. With one mind, we send greetings and thanks to our Grandmother, the Moon.
Now our minds are one."

The moon provides special powers at night to ensure the plants grow and reproduce until the next sunrise. She guides us when to have ceremonies, when to pick medicines, when to plant and harvest.

Grandmother Moon is the leader of the females. She controls the ocean tides, women and animal life cycles, gravity, and the conception and birth of babies.

CURRENT CONDITIONS

The Haudenosaunee Longhouse ceremonies are set by the traditional/ceremonial moon calendar which follows the 13 full moons in every year. Ceremonies are carried out throughout the year by following the moon cycles.

In the past few decades, many women have been forced to have their babies on the doctor's schedule so that the doctor may collect the money for delivering babies, forcing women to have cesareans rather than delivering naturally. Women use contraceptives that stop them from having cycles to avoid pregnancy, and many women cannot conceive.

In the winter of 2012, in February, temperatures went up into the 80s and caused fish to spawn early, but several days later the cold temperatures set back in. In May 2012, there was a Super Moon during which the moon came very close to the earth. In the summer of 2012, some wells went dry and water levels were low for the entire summer. There were low water levels in rivers in the Akwesasne Territory, and beavers and muskrats did not reproduce their second litters.

FUTURE WITH CLIMATE CHANGE

Many of the patterns and reproductive cycles of nature have been disrupted or altered in the modern world by contaminants such as PCBs, dioxins and DDT and other impacts of industrialization and urbanization. Climate change has begun to further effect a number of nature's cycles. Some fish species have started to spawn earlier in relation to changing temperatures, birds have begun breeding and migrating earlier in the year, and plants have begun to flower at different times of year, among other effects (Rosenzweig 2011). In general, the timing of seasonal spring activities of animals and plants have occurred progressively earlier since the 1960s, and datasets exist to document this shift for birds, butterflies and wild plants (Walther et al. 2002).

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Climate change has already and will continue to affect the cycles of life, and there is little that can be done to change this. However, monitoring these trends can provide information on how the lifecycles of various organisms are changing, and potentially inform adaptive actions. For example, sugar maples could be tapped earlier, and it may be beneficial to plant some crops earlier in the year.

THE SUN

"We now send greetings and thanks to our eldest Brother, the Sun. Each day without fail he travels the sky from east to west, bringing the light of a new day. He is the source of all the fires of life. With one mind, we send greetings and thanks to our Brother, the Sun. Now our minds are one."

The Sun produces rays that give strength and warmth to people and that help to grow and reproduce plants with the help of water. The Sun is the elder brother of the Earth and is recognized as one of the many forces of Creation that sustain life.

In bringing greetings to the forces of Creation, the Sun is recognized for continually carrying out its responsibilities each and every day without fail. The example set by the sun is a reminder to the people to be vigilant in following the instructions given by the Creator at the beginning of time.

CURRENT CONDITIONS

In general, New York has a humid continental climate, similar to the rest of the northeastern United States, with hot summers and cold winters. The Northern New York area is on average colder than the more southerly parts of the state, with an average air temperature of 42˚F between 1971 and 2000 (as opposed to 53˚F over the same period in the New York City area). The annual average temperature in New York increased by 0.6°F per decade since 1970, and winter temperatures rose 1.1°F per decade (Rosenzweig 2011).

The extreme variations in temperature experienced in recent years are an observable consequence of the effects of existing industrial behavior. Atmospheric dumping of chemicals has created holes in the atmosphere which let through many wavelengths of the Sun's energy. Temperature fluctuations cause vegetation, crops and animals to suffer. Very high temperatures led to a drought in the summer of 2012, and the ground was very dry with the windy conditions.

UV rays are at higher levels, leading to a higher risk of skin cancer and creating hazardous issues for people with sun sensitivities, making them spend more time indoors. Increased temperatures have also led to a greater risk of heat deaths.

FUTURE WITH CLIMATE CHANGE

Observed climate trends over the past few decades indicate a changing climate, and temperatures in Akwesasne are predicted to continue to increase in the 21st century (Rosenzweig 2011). The Intergovernmental Panel on Climate Change (IPCC) projects that in New York, temperatures will rise by 1.5 to 3.0°F by the 2020s, 3.0 to 5.5°F by the 2050s, and 4.0 to 9.0°F by the 2080s (Rosenzweig 2011).

Exhibit 8 illustrates these temperature changes, and Exhibit 9 shows how the number of extreme heat days in New York in future years will compare to the number of extreme heat days under the current climate at various locations along the East Coast. By the 2070 to 2090 period, New York is predicted to have as many extreme heat days each year as Georgia does currently, likely leading to increased heat illness and mortality.

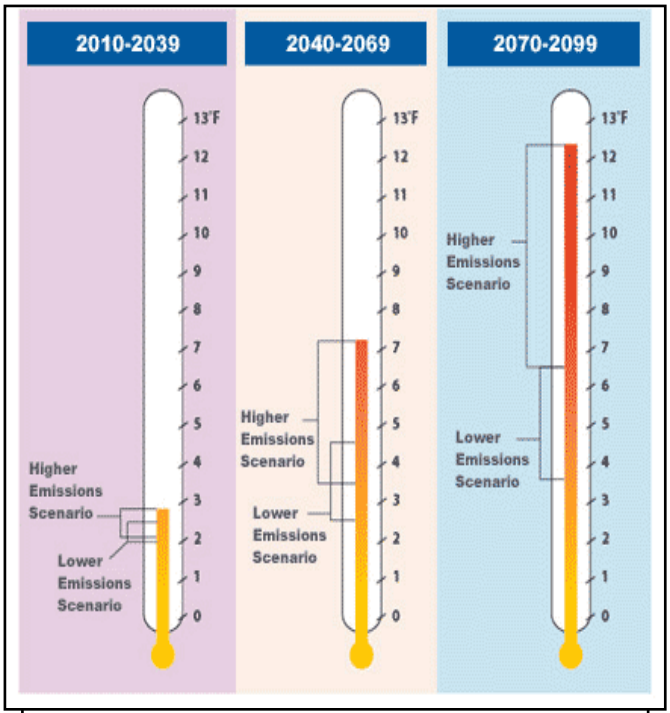


Exhibit 9: Changes in Average Annual Temperature in the Northeast.
Source: Climate Choices, 2010

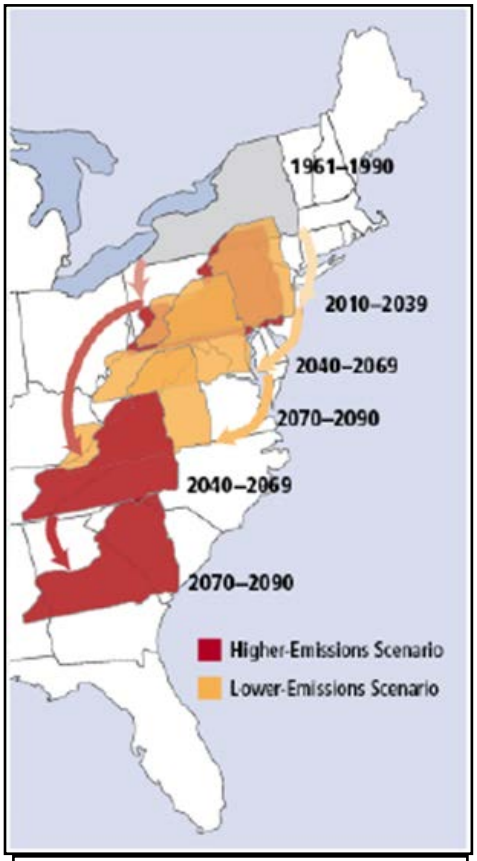


Exhibit 10: Summer in Upstate New York
Source: Climate Choices, 2010
http://www.climatechoices.org/ne/impacts_ne/clim

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Below are several ongoing and proposed adaptation measures that could be adopted to help members of the Saint Regis Mohawk Tribe adapt to increased temperatures and levels of UV rays under future climatic conditions.

PREVENTION OF TEMPERATURE-RELATED MORTALITY AND ILLNESS. Climate change is likely to lead to increased temperatures and an increased frequency of extreme heat events in Akwesasne. Proactive efforts such as ensuring access to working air conditioning may help prevent heat-related illness and deaths, particularly among vulnerable populations such as the elderly, young children, and those suffering from cardiovascular or respiratory conditions.

EDUCATION AND OUTREACH. The Saint Regis Mohawk Tribe sometimes includes heat safety information in the Tribe's newsletter. For example, June 2011 was named "National Safety Month" in Akwesasne to raise public awareness of safety in the community, and the Tribe's newsletter for that month included information on how to avert and treat heat stroke, heat exhaustion, heat cramps and heat rash during the heat of summer. The Mohawk Council of Akwesasne's Community Health Program also issues notices when the area becomes overly hot and humid advising community members to stay indoors and out of the sun. Providing information on how to mitigate the effects of increased temperatures and UV rays can help prevent and lessen heat-related illness.

THE STARS

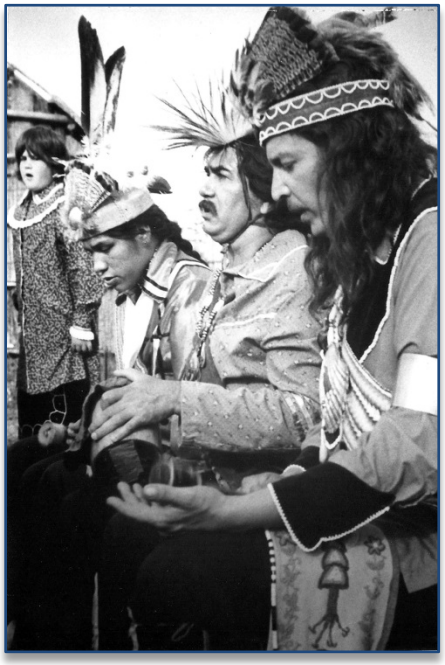
"We give thanks to the Stars who are spread across the sky like jewelry. We see them in the night, helping the Moon to light the darkness and bringing dew to the gardens and growing things. When we travel at night, they guide us home. With our minds gathered together as one, we send greetings and thanks to all the Stars.
Now our minds are one."

The stars spread the dew at night, which cools the plants and quenches their thirst when the Thunderers are not around. Knowledge of the stars was eroded and hasn't been passed on. Today some navigate through the night by the stars. Our belief is that the vast canopy of the Milky Way is a path to the Creator, and each separate star represents the spirit of a single person, making their way homeward. Today it is known that when a star is near the moon, there will be a death in the community.

Far away from the effects of climate change on Earth, the stars provide perspective on the environmental change caused by humans.

THE FOUR BEINGS

"We gather our minds to greet and thank the enlightened Teachers who have come to help throughout the ages. When we forget how to live in harmony, they remind us of the way we were instructed to live as people. With one mind, we send greetings and thanks to these caring Teachers.
Now our minds are one."



The Four Beings continue to carry out their original instructions by watching and caring for humankind as long as the people lie in harmony, and continue our original instructions. There will be signs of creation when we lose that protection by not carrying on our teachings. There will be diseases appearing that were not known before, and many will die.

The Creator will remove our life sustainers because we will fail to give thanks. The corn will not be plentiful. Insects will destroy many crops. The Strawberries will fail to bear fruit. Partridges will not land on the ground, which will become too hot with sin. Trees will die. They will rot from the tops down. Rivers and streams will become polluted. Weeds and shrubs will not grow. They will not be able to use the water. Nature will stop.

CURRENT CONDITIONS

There was a shortage of corn in the United States because of the drought in 2012, and grass used for haying was short in the summer of 2012 and didn't get a second cut. Insects are moving north with the warmer temperatures, causing invasive species to destroy trees and plants. Deer ticks arrived in Akwesasne at an alarming rate in 2012 because of higher temperatures. This may be the cause of the low numbers of deer. More people have contracted Lyme disease. Mosquitoes transmitted West Nile Virus in Ontario in 2012.

FUTURE WITH CLIMATE CHANGE

In addition to an increased frequency of extreme heat and drought events, particularly in the summer, climate change is predicted to lead to new challenges with insect and disease management as longer growing seasons and warmer winters benefit insect populations and invasive species (Rosenzweig 2011). Plants (including crops) and wildlife may become more vulnerable to insect pests and disease. Vector species such as mosquitoes, ticks, midges, and other biting insects respond considerably to small changes in temperature, and tick-borne diseases such as Lyme disease and erlichiosis are spreading and moving northward as temperatures increase (Rosenzweig 2011). Epizootic hemorrhagic disease, a viral disease of white-tailed deer transmitted by the bites of infected midges, spread to New York State in

2007 (Rosenzweig 2011). West Nile virus, transmitted by mosquitoes, is another disease of concern that may affect Akwesasne in the future.

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

Below are several ongoing and proposed adaptation measures that could be adopted to help reduce the risks insect-borne diseases pose to Akwesasne under climate change.

EDUCATION AND OUTREACH. Community Health Services distributed information about preventing deer ticks from latching on to skin, as well as instructions on how to remove deer ticks if they latched on to the skin of community members. The community was informed about how to dress when in tall grass and in the forest, and about using insect repellent. In the summer of 2012, when there was an increase in the number of deer ticks in Akwesasne, many warnings and preventative measures were broadcast to the Tribe through local media by Community Health Services.

EPIDEMIC PLANNING. The St. Regis Mohawk Tribe has a proactive pandemic flu response plan. Emergency plans developed to plan for potential epidemics caused by virulent flu outbreaks such as swine flu or avian flu can help reduce the risks of such disruptions.

PREVENTION. The Saint Regis Mohawk Tribe has removed tire piles near the raceway to keep the soil clean and stop mosquito reproduction. Similarly, any other stagnant pools identified after rain should be drained, and homes should be ridded of anything that could gather standing water. Practical solutions to the problem of insects and the diseases they carry should be identified and put into practice.

THE CREATOR

"Now we turn our thoughts to the Creator, or Great Spirit, and send greetings and thanks for all the gifts of Creation. Everything we need to live a good life is here on this Mother Earth. For all the love that is still around us, we gather our minds together as one and send our choicest words of greetings and thanks to the Creator. Now our minds are one."

The Creator has given us everything we need to survive here on Mother Earth. He created everything with love. He asked that we fulfill our responsibilities to the Earth, Creation, and give thanks. The Haudenosaunee are to live in peace, harmony, and in balance with Creation.

The concept of responsibility is central to the beliefs of the Haudenosaunee. The Creator assigned to all of the creatures of Creation the responsibilities to protect and keep the universe. We keep faith with the instructions of the Creator by fulfilling our responsibilities to the Earth, Creation, and all things named.

CURRENT CONDITIONS

The Saint Regis Mohawk Tribe has a number of active, ongoing educational programs related to the environment and traditional Mohawk ways. The Environment Division submits articles to the Saint Regis Mohawk Tribe's *Kawennì:ios* newsletter, and has an educational outreach instructor. The Akwesasne Freedom School (AFS), founded in 1979, is an independent elementary school in the area that teaches its students in the Mohawk language and focuses on Mohawk language and culture. The *Iohahi:io* Akwesasne Adult Education Center offers a number of educational programs, and the Tribe also has a cultural center and museum containing over 3,000 artifacts. The Akwesasne Task Force on the Environment organizes environmental education and agricultural programs as well.

FUTURE WITH CLIMATE CHANGE

Through its effects on Akwesasne's forests, plants, rivers, streams, wetlands and wildlife, climate change has the potential to impact a number of the Saint Regis Mohawk Tribe's traditional ways, including hunting, fishing, and plant-gathering. These changes will require adaptive approaches to resource management to ensure that the Tribe's traditional cultural practices can continue into the future. The Saint Regis Mohawk Tribe already possesses significant adaptive capacity in the form of its environmental and educational programs, institutions, partnerships, community members, and commitment to its culture and environment.

ONGOING AND PLANNED CLIMATE CHANGE ADAPTATION ACTIONS

In addition to the educational activities that are currently taking place, the Saint Regis Mohawk Tribe could hold a number of Adaptation Planning classes to teach community members how to prepare for climate change now, and uphold the traditional culture of the Tribe under the changed climatic conditions of the future. These classes could also be incorporated into already-existing programs and projects as well.

EDUCATION. In the future, the Saint Regis Mohawk Tribe could have Adaptation Planning classes on how to prepare for climate change by teaching a number of traditional skills such as hunting, fishing and harvesting techniques; how to cure and smoke fish; how to garden, weed, harvest, and can; make clothes/pouches out of hide; make baskets; prepare and dry corn, beans and squash and other root vegetables; identify, prepare, and harvest medicine plants; prepare Indian Corn for drying, braiding, grinding, and making into mush; prepare cornbread; make drums and rattles; carve wood; and use cow horns. These classes would help to pass down the traditional practices of the Tribe in the face of the changes that climate change will bring.

CLOSING WORDS

"We have now arrived at the place where we end our words. Of all the things we have named, it was not our intention to leave anything out. If something was forgotten, we leave it to each individual to send such greetings and thanks in their own way.
And now our minds are one."

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