

A Climate Change Vulnerability Assessment for the Kickapoo Tribe of Oklahoma

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Introduction

This project was the result of my participation in the River Network's Peer Learning Network (PLN) on Climate Change. I began participating in the PLN in November 2011; my participation will end in May 2012. The purpose of the PLN is to provide information and resources for organizations (mostly non-profits) working on climate change projects, and to provide a forum for colleagues to interact on climate change issues. The reason I chose to complete a qualitative climate change vulnerability assessment is two-fold: (1) first, I hope to use this project to shape future proposals for climate change work, particularly for adaptation planning and implementation projects; (2) I hope tribal leaders and program directors can use this document to begin thinking of ways to incorporate climate change planning into existing decision-making processes. This assessment is by no means exhaustive. Instead, it represents a starting point for a climate change dialogue within the Tribe. Planning areas over which the Tribe does not currently exercise authority (transportation, for instance) were not included in the assessment. As the Tribe begins to shape a climate change policy, however, networking with non-tribal agencies within the jurisdiction will hopefully result in a broader assessment of potential impacts than is achieved in this document.

In the process of preparing this assessment, I relied heavily on two resources: *Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments* by the Center for Science in the Earth System (2007) and the *Swinomish Climate Change Initiative Impact Assessment Technical Report* by the Swinomish Indian Tribal Community. Both of these documents were immensely helpful and are available on the web. I also appreciate the guidance of my mentor, Rachel Riley, at the Southern Climate Impacts Planning Program and the help of Randy Dougan, the Tribe's Utility Supervisor. This assessment is intended to be a living document. I expect that predicted vulnerabilities will change as more data are collected and analyzed regarding local and regional climate change. I also expect the predicted potential impacts to expand as experts in various sectors and planning areas enter into climate change dialogue.

Any local vulnerability assessment necessarily incorporates a lot of uncertainty because climate change projections become less reliable at smaller scales. What we do know, however, is that the climate is changing, mostly due to human activity, and will continue to change for the foreseeable future. Natural, built, and social environments will be impacted as a result of climate change. According to the 2009 report *Global Climate Change Impacts in the United States* by the U.S. Global Change Research Program, by 2080-2099, average summer temperatures in the Great Plains region, of which Oklahoma is a part, will increase between 6 and more

than 10°F, depending on the emissions scenario. In the southern portion of the Great Plains region, conditions are expected to become drier, although precipitation projections are more uncertain than temperature projections. Extreme weather events such as heat waves, droughts, and heavy rainfall are expected to become more frequent (Karl, Melillo, and Peterson, 2009). Periods between rain events are expected to lengthen, but individual rain events are expected to become more intense (Oklahoma Climatological Survey, 2007). In addition, evaporation and transpiration are expected to increase year-round (OCS, 2007). These changes will have far-ranging effects on agriculture, wildlife, water resources, air quality, cultural resources, and human health.

The purpose of this assessment is to help tribal leaders, department heads, and resource managers begin to think about and plan for impacts that may affect the tribal community. The vulnerability assessment is presented in a tabular format. Supplementary notes follow the vulnerability assessment and provide extra information that may be helpful, but did not neatly fit into one of the categories in the table. These notes provide information regarding adaptive capacity, or further explain the reasoning behind the vulnerability rating for the associated potential impact.

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Sector	Planning Area	Potential Impacts	Sensitivity to Potential Impacts	Adaptive Capacity	Existing Stressors	Vulnerability
Land Use	Stormwater Control	Increase in sanitary sewer overflows (SSOs) due to intense rain events	High	Medium	SSOs are already a problem on the North Canadian River.	High
	Agriculture	Need to irrigate crops that are not currently irrigated	Medium	Low		Medium
		Increased erosion due to intense rain events	Medium	Medium	See first supplementary note.	Medium
		Loss of crops due to flooding	Unknown	Low	Crop losses due to flooding occurred during 2008; sensitivity is unknown because the amount of damage depends largely on the timing of extreme rain events.	Unknown
		Loss of crops due to drought	High	Low	This problem already occurs within the jurisdiction during drought years and negatively impacts future lease opportunities.	High
		Reduced production of rangeland due to lower soil moisture	High	Low	This problem already occurs within the jurisdiction during drought years.	High
		Higher summer energy costs	Medium	Medium	Some tribal members already have difficulty paying utility bills.	Medium
	Residential	Foundation damage due to drought	Medium	Low	A few tribal buildings sustained structural damage from the 2011 earthquakes. I am not currently aware of documented foundation damage due to drought conditions.	Medium
		Higher risk of fire damage	Medium	Medium	See second supplementary note.	Medium

Sector	Planning Area	Potential Impacts	Sensitivity to Potential Impacts	Adaptive Capacity	Existing Stressors	Vulnerability
Land Use, continued	Residential, continued	Higher risk of flood damage	Medium	Low	Several tribal homes and a few ceremonial areas are located in the flood plain.	Medium
		Possible interruption of utility services during extreme weather events	Medium	Medium	This already occurs during extreme weather events.	Medium
	Tribal Enterprises	Higher summer energy costs	Medium	Medium	Higher energy bills negatively impact the casino's operation and maintenance budget.	Medium
		Possible interruption of utility services during extreme weather events	Medium	Medium	See third supplementary note.	Low
Tribal Utilities	Water	Increase in line breaks due to drought	Med	Low	It is difficult to obtain funding to repair or upgrade infrastructure.	Medium
		Higher water demand for irrigation	Low	Medium	See fourth supplementary note.	Low
		Potential drop in groundwater levels	High	Low	Production of the Tribe's four wells is already declining; the production of one well has declined so much it is almost unusable.	High
	Wastewater	Possible infiltration of stormwater during heavy rain events	Med	High	The wastewater treatment plant does experience some infiltration during significant rain events, but because the plant is operating way below capacity, infiltration is not likely to overwhelm the plant in the foreseeable future.	Low

Sector	Planning Area	Potential Impacts	Sensitivity to Potential Impacts	Adaptive Capacity	Existing Stressors	Vulnerability
Emergency Services	Tribal Police	Increase in requests for emergency response due to extreme weather events or fire	Medium	Medium	The Tribe does not have a coordinated emergency response communication plan. When the Tribal Police need to alert community members they typically have to go door to door.	Medium
Human Health	Heat-Related Illness	Increased need for heat-related (heat exhaustion, heat stroke, etc..) healthcare	Medium	Medium	There are several elders with inadequate air conditioning systems.	Medium
	Disease Related to Solar Radiation	Increase in skin cancers because of depletion of stratospheric ozone and an increase in UV exposure	Unknown	Medium	See fifth supplementary note.	Unknown
	Respiratory Disease	Increased levels of ground-level ozone and longer ozone period during summer months; increased volatility of some toxic compounds	Unknown	Low	Ozone is already a problem during the summer months.	Unknown
Cultural Resources	Burial Sites	Increased susceptibility to flooding	Low	Low	See sixth supplementary note.	Low
	Cultural Use of Plants	Reduction in wetland plants	High	Medium	The Tribe currently has to travel outside of the jurisdiction to obtain cattails for their traditional homes.	Medium

Sector	Planning Area	Potential Impacts	Sensitivity to Potential Impacts	Adaptive Capacity	Existing Stressors	Vulnerability
Cultural Resources, continued	Ceremonial Practices	Timing of ceremonies originally related to the maturation of particular crops, but now scheduled during certain weeks, may become dissociated from the maturation of crops that originally signaled the ceremony.	Medium	Unknown		Unknown
Fish and Wildlife	Traditional Use Species	Populations of traditionally used animals, such as white tailed deer, may change in response to climate change	Unknown	Low	See seventh supplementary note.	Unknown
	Freshwater Species	Freshwater species are likely to be negatively impacted by rising temperatures, decreases in stream flows, and increases in NPS pollution	Medium	Low	See eighth supplementary note.	Medium
Water Resources	Surface Water	Streams and lakes are likely to experience higher temperatures and pollutant loads which may result in a suite of negative effects including lowered DO, toxic algae blooms, and an increase in invasive species.	High	Low	The North Canadian River is already impaired with regard to bacteria, nutrients and turbidity; these problems will likely be exacerbated.	High

Sector	Planning Area	Potential Impacts	Sensitivity to Potential Impacts	Adaptive Capacity	Existing Stressors	Vulnerability
Water Resources, continued	Groundwater	Longer and more frequent droughts may result in less aquifer recharge and increased water usage	High	Low	Tribal members rely almost exclusively upon groundwater for drinking water (public and private) within the jurisdiction. Production of the Tribe's wells is already declining.	High
	Wetlands	Possible loss of ephemeral wetlands	Medium	Medium		Medium
Forest Resources	General	Forests more susceptible to wildfire	High	Low	See ninth supplementary note.	High
		Decline in drought-intolerant species	High	Low		High
		Potential for pest or disease outbreaks	Unknown	Low		Unknown
Air Quality	General	Higher emissions associated with energy consumption in the summer to offset higher temperatures	Medium	Medium		Medium
		Increase in ozone alert days	High	Low	Ozone is already a problem during the summer months.	High

Supplementary Notes

1. The NRCS can provide information and technical assistance with regard to farming practices that reduce erosion.
2. Most tribal residences are not immediately adjacent to forested areas.
3. The casino has back-up generators to cover short interruptions in service.
4. There are currently no agricultural producers on the Tribe's public water supplies. There is some room for increases in water usage; the Utilities Supervisor estimates that current water usage is approximately 75% of the systems' capacity.
5. This problem can be addressed in part with education on reducing exposure.
6. The main burial site is located in an area that is not susceptible to flooding. There may be private burial sites that are more susceptible to flooding.
7. Deer populations may increase or decrease.
8. Although fishing is a common pastime within the jurisdiction, tribal members do not rely heavily upon freshwater species as a food source.
9. Although approximately 31% of the jurisdiction is forested, forests are not a heavily utilized resource within the jurisdiction. The costs associated with fighting wildfires, however, can be catastrophic.

References

- Karl, T.R., Melillo, J.M., and Peterson, T.C. (Eds.). (2009). *Global climate change impacts in the United States*. Cambridge: Cambridge University Press.
- Oklahoma Climatological Survey. 2007. *Statement on climate change and its implications for Oklahoma*. Retrieved from <http://climate.ok.gov/index.php/site/page/reports> on March 22, 2012.
- Snover, A.K., Binder, L.W., Lopez, J., Willmott, E., Kay, J., Howell, D., and Simmonds, J. (2007). *Preparing for climate change: A guidebook for local, regional, and state governments*. Oakland, CA: ICLEI-Local Governments for Sustainability.
- Swinomish Indian Tribal Community. (2009). *Swinomish climate change initiative impact assessment technical report*. La Conner, WA: Office of Planning and Community Development.