



Oklahoma Inter-Tribal Meeting on Climate Variability and Change

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National Weather Center, Norman, OK

Meeting Summary Report

Courtesy of Bunky Echohawk

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1. Overview

The Haskell Environmental Research Studies Center at Haskell Indian Nations University (HINU), in collaboration with the Oklahoma Climatological Survey (OCS) and Southern Climate Impacts Planning Program (SCIPP), hosted a meeting on climate variability and change with Oklahoma tribal representatives on December 12, 2011. The meeting took place at the National Weather Center in Norman, Oklahoma. Oklahoma is home to 39 tribal nations and this meeting provided them with the opportunity to offer input to be included in the 2013 National Climate Assessment (NCA). Of the seventy-three people that participated in the meeting, 42 represented Oklahoma tribes (21 tribal nations were represented). Two participants from a tribe in Texas also attended. Furthermore, three out of the four tribal colleges in Oklahoma were represented. The majority of the tribal participants were employed by their tribe's environmental department.

The purpose of the meeting was to 1) enhance and foster dialogue between tribal representatives and climate scientists that was previously initiated through two statewide meetings in which tribal representatives were invited and some attended, 2) educate tribal representatives about climate science and climate change, and 3) develop recommendations for material to be included in the 2013 NCA document.

The need for more education about climate science and change to inform decision-making has been identified through prior OCS and SCIPP activities, such during a climate adaptation meeting in December 2009 that brought together stakeholders from various Oklahoma agencies, including tribes (Oklahoma Climatological Survey 2010), and through in-depth interviews as part of an ongoing climate information needs assessment. It is important that knowledge about climate science and change is shared with tribal representatives so that they can make more informed decisions regarding climate change adaptation and mitigation activities. It is also crucial that tribal leaders have the opportunity to share their knowledge about climate impacts and their ideas for adaptation and mitigation strategies and management of key natural resources. The large population of tribal members in the state of Oklahoma provided a tremendous opportunity for many voices to be heard and for the NCA input to be representative of a major proportion of the tribal population in the United States.

The planning team for this meeting consisted of a variety of players. The Principal Investigator was Dr. Daniel Wildcat, Director of the Haskell Environmental Research Studies Center at HINU and convener of the American Indian and Alaska Native Climate Change Working Group. The Project Manager was Rachel Riley, SCIPP Research Associate. The Assistant Project Managers were Paulette Blanchard, HINU undergraduate student in Indigenous and American Indian Studies, and Randy Pepler, Cooperative Institute for Mesoscale Meteorological Studies Associate Director and PhD student in the University of Oklahoma (OU) Department of Geography and Environmental Sustainability. Dr. Bull Bennett, an environmental consultant for Kiksapa Consulting, also assisted in the meeting planning as he was the NCA tribal point of contact.

The meeting was opened with a prayer led by George Blanchard, Governor of the Absentee Shawnee Tribe. Dr. Berrien Moore III, Dean of the College of Atmospheric and Geographic Sciences

at OU, and Dr. Daniel Wildcat provided a welcome and overview of the meeting. To orient everyone in the room on the definition of two key terms that would be used throughout the day, Dr. Kevin Kloesel, Director of the Oklahoma Climatological Survey, presented on the difference between weather and climate. Later Mr. Gary McManus, Associate State Climatologist for Oklahoma, presented on climate variability and change. Dr. Bull Bennett provided the meeting participants with an introduction of how climate variability relates to tribes, and explained the NCA process. Ms. Paulette Blanchard moderated the morning session.



*Figure 1: Meeting attendees during the breakout session.
Credit: Paulette Blanchard.*

The afternoon consisted of a short presentation on where trustworthy climate information can be found, led by Ms. Rachel Riley. The bulk of the afternoon, however, was used to gather input from the tribal representatives during a small group (4-8 people) breakout session. The breakout session included questions about past and current climate-related impacts on

various tribal sectors, including cultural aspects, climate change mitigation and adaptation strategies, their need for resources and information, and long-term recommendations on how to implement adaptation and mitigation strategies. The small group discussion was followed by a large group discussion that was led by Dr. Wildcat. Mr. Randy Pepler moderated the afternoon session. The full agenda is located in Appendix A and findings from the breakout session are presented below.

2. Breakout Session Findings

The meeting participants broke into nine groups for the breakout session. Each group was led by a facilitator. A note-taker was also present to capture the discussions that occurred. Near the conclusion of the small group discussion, each group was tasked to record main points on large tablet paper, which would be later shared with the entire group. The following is a summary of the



*Figure 2: Meeting attendees during the breakout session.
Credit: Paulette Blanchard.*

information that was provided by the participants during the small and large group discussion. The full list of discussion questions is included in Appendix B. None of the groups were able to provide answers to all the questions due to time limitations so the feedback is based on the questions they chose to answer.

2.1 Climate Change and Variability and its Impact on Tribal Sectors

The participants were asked about the climate or environmental issues their tribe had to adapt to or deal with in the past and how that was accomplished. Some participants spoke of events that their family had to adapt to from a historical standpoint while others spoke of issues that occurred in the recent past. In either case, much of the discussion focused on identifying the impacts rather



than the adaptation strategies were used. It is possible that many of the attendees were at Stage 1 of the adaptation planning process: identifying current and future climate changes relevant to the system, as defined by The National Research Council (Figure 3), and had not yet recognized adaptation strategies that have been used in the past or that they plan to use in the future.

Figure 3 (Source: National Research Council 2010)

2.1.1 Historical Climate Stresses and Adaptation

Many participants spoke about how their tribe was forced to experience a climate change while being uprooted in the 1800s or earlier. While some tribes moved to areas of the United States that provided them with a climate and resources they were used to, others moved from places such as Ohio that were very different from Oklahoma. For example, some tribes who originally relied on fish for sustenance had to learn to rely on hunting and agriculture once they relocated. Hence, altering their diet was one way the tribes adapted to their relocation.

Another difficult period of time was during the Dust Bowl. Two participants discussed how their elders survived with very limited agricultural resources. The elders were used to living off of the land, however, so they knew where to find the best natural resources during the drought. Some

tribes also adapted by developing a barter system with neighboring communities. One participant noted that people came together during the difficult time, instead of fighting.

There were also discussions about creeks that elders used to swim in as young children no longer containing enough water to do so. More recently, tribal members have become more reliant on grocery stores instead of growing or finding their own food in part because their means of doing so (e.g. dry conditions, fishing in a stream) is now limited. One participant also commented about how the younger generations are losing touch with how their older relatives once lived because of modern conveniences.

2.1.2 Current Climate Stresses

The current climate-related stresses with which the tribal nations are dealing were complex. Much of the discussion surrounded the 2010-2011 drought and record summer heat, which caused a lot of ponds to dry up and forced farmers to sell their livestock because they were unable to find hay to feed them. Flooding was also an issue that was mentioned. One participant also mentioned that the number of snake and bird species have decreased in Okfuskee County. There was also discussion about stresses due to heavy rain, snow and ice storms, extreme cold, tornadoes, and wildfires.

One of the most common discussions on current climate stresses was the impacts of heat and drought on water resources. Several people cited low water levels in lakes and streams. One participant said their tribe opened up a dam to try to get water to fill up a stream, but much of the water was absorbed into the ground before it traveled very far. Some of the problems that resulted from the low water levels included at least one tribe's water supply becoming contaminated despite purification efforts, and that lakes filled with sediment as the water table dropped.

Drought also has a tremendous impact on ecology, human health, agriculture, and energy supply and use. One participant cited low water levels as the cause for dying wildlife, especially for fish which try to survive stagnant and odorous ponds and lakes. Blue-green algae were also problematic in lakes, and existing stresses from low water levels were compounded if the tribe relied on hydropower for energy because it was difficult to get the amount of power they need. A couple of tribes collaborated to try to address the issue and put a windmill on a lake to try to oxygenate it. Another participant said that some wildlife recently moved inward to tribal lands, which has caused some problems. The health of tribal members was also impacted by the drought. Algae in lakes and streams can be very dangerous to humans. Additionally, the dry climate is conducive to wildfires, which inhibits elders from going outside due to poor air quality.

Agricultural production is also greatly impacted by drought. Several participants described having problems producing enough vegetables to sustain them or producing enough hay to feed cattle. One participant spoke about how the farmers in their tribe typically keep half of their hay and sell the rest, but could not sell any this year because they had to keep all of it to feed their cows. Hay shortages also led some farmers to purchase imported hay, which was very expensive. Invasive pests can also be problematic during drought and abnormally warm years, especially if freezing

temperatures do not occur long enough over the winter to kill off insects. Grasshoppers ate much of the vegetables that one person was growing this past spring and summer.

The participant mentioned that it is possible to use pesticides to deter the grasshoppers, but that she would rather not take that action because of potential negative health impacts.

One tribe tried to adapt to extreme heat by requiring federal funding to help purchase air conditioners for tribal members. This has been very costly for the tribe, however. Tourism is also impacted by heat and drought. Many lakes in Oklahoma are used for recreational purposes, but if water quantity is low and/or water quality is poor, people are unable to take advantage of the resource. This can cause financial strain on agencies that rely on the revenue source. Furthermore, one participant described how his tribe recently had to change the type of grass they have on their golf course to Bermuda, which can withstand the heat better than what they had previously.

Heavy rain and flooding were also identified as climate stresses. Too much precipitation can have negative impacts on ecosystems since runoff damages land. Moreover, ice and snow storms and extreme cold are problematic for energy, health, and transportation. One participant pointed out that essential services cannot be provided to citizens when roads are closed and power outages can endanger human health if people are without heat or water for an extended period of time.

The current climate is also having an impact on tribal cultural practices. One participant noted that some of his tribal members in Oklahoma are responsible for growing and delivering heirloom seeds to their members in Georgia, but the recent fall harvest produced very low yields. The members were unable to get much corn, beans, or squash to germinate due to the drought. One participant also said that two weeks prior to the meeting he was unable to find a specific medicinal plant his tribe uses, and he suspected the climate over the past year was to blame. Another participant said they could not find any sand plums, which they use for their ceremonies. Water is used for some ceremonies, so it can be problematic when there is not much at the tribe's disposal. Heat has been a problem during ceremonies since the older citizens could not go into the non-air conditioned lodge. Instead, they stayed outside in the shade. Heat was also a problem for another tribe. One participant said that they held their ceremonies a week or two earlier than normal to avoid the worse heat. Unfortunately it was still very hot and a couple of dancers succumbed to the heat.

Despite all of these recent hardships, a few people commented on the importance of their tribal communities. They described how they have the obligation to take care of their tribal members no matter the weather, even if they do not have the preferred financial resources available. This could be considered a form of adaptation. Another adaptation practice could be acquiring new plots of land. For example, if a tribe is having problems with flooding due to extreme rainfall, they might be able to purchase land that does not flood.

2.1.3 Most Important Sector

After describing the current climate-related stresses with which the tribal representatives were dealing, the participants were asked about the sector that was most important to the operation of

their tribe. Many of the participants said that water resources were most important. One participant said water is needed to produce hay, which is needed for grazing animals. Another person said that potable water is essential to the operation of their tribe. The importance of water was especially noted in terms of ceremonial practices. One participant said that flowing water was crucial to their ceremonies, and that they had to travel 20 miles one time to find water to finish the ceremony which was very time consuming. Both water quantity and quality are of significant concern to tribal members, but it is difficult to police since as one person pointed out, water policies are generally set by outside groups.

Human health was considered the most important sector by a couple of people, since one person pointed out that healthy people are needed to build and sustain the tribe. Some people solely rely on agriculture as a means to produce income, so that can be very important to their tribe. The culture of the tribe, while not explicitly a sector, was also cited as being very important.

2.1.4 Climate Change Impacts

The projected climate changes for Oklahoma include more intense but less frequent rain events, an increase in the frequency of hot extremes and heat waves, the warm season becoming longer and arriving sooner, and cold extremes decreasing. The participants were asked how these projected changes might impact or already are impacting the operation of their tribe. Based on the limited time to discuss the issues and the complexity that is involved in understanding local and tangible impacts of climate change, much of the discussion remained at a high level. Additional time will be needed to fully understand the impact that climate change is and will have on tribal nations and how best to address the impacts of climate change.

2.1.4.1 Water Resources. As previously mentioned, water resource issues were identified as the most important climate-related issues within tribes. One participant described how his tribe is involved in one of the largest battles with the state of Oklahoma over the ownership of water. He said that tribal rights have not been taken into consideration. Legal actions have also occurred over the desires of non-tribal agencies and companies to develop rock quarries, the operation of which requires a substantial amount of water. In addition to the legal issues, lack of water is already a problem for some tribes and communities. One participant mentioned that several Oklahoma communities had to rely on a water source that was different than what they normally use during the summer of 2011 because of the drought and heat. Another participant cited having to dig deeper wells. Water quality issues were also a concern because stagnant steams do not provide a means to dilute contaminants.

2.1.4.2 Energy Supply and Use. Increased energy costs was one impact that some tribal members were concerned about. Longer warm seasons could mean that air conditioning may have to be used for a longer period of time. Alternatively, however, this could mean that less energy will be needed to heat homes and businesses during the winter. Increasing electricity costs are especially problematic for tribal members who live in poverty. One participant said that many of their tribal elders do not have the technology nor means to keep up with the heat in the summer. One way to

decrease the cost would be, as one participant noted, to increase the energy efficiency of a home. He said that tribes are trying to find ways to reduce energy costs through weatherization programs.

2.1.4.3 Transportation. Some people were concerned about buckling roads and water main breaks related to drought and heat. As one participant pointed out, really dry conditions impact infrastructure and roadway maintenance. She noted her concern about the problems that climate extremes cause and that they will continue to get worse. Another participant commented that they have been having problems with tire failures on their 18-wheelers due to high road surface temperatures. Bridges are also stressed by ice storms and flood-induced erosion.

2.1.4.4 Agriculture. Crop success and failure is closely tied to climate. One participant pointed out that drought, for example, greatly impacts farmers, which in turn impacts surrounding communities and businesses. Another participant said that they distribute meat to the elders but in harsh conditions it is difficult to maintain the health of the animals.

2.1.4.5 Forestry. Climate change impacts on forestry were not discussed very much. However, one participant pointed out that several timber companies operate in southeast Oklahoma and many tribal members work for these companies. If climate change begins to change the landscape, tribal nations will be impacted.

2.1.4.6 Ecosystems and Biodiversity. Much discussion occurred on the impacts that climate change is having or might have on ecosystems and biodiversity. One tribal member noted that warmer nighttime temperatures change the behavior of wildlife. Several participants cited changes in particular species, including a substantial increase in the number of armadillos, the presence of porcupines, and decrease in the number of horny toads. Elk, mountain lion, eagles and other wildlife sightings were also noted, though it was unknown whether the increase was due to climate change, wildfires, or other changes to the environment. In terms of plant species, one participant noted the slow disappearance of willow trees. Another participant said that her tribe is trying to reintroduce the long leaf pine, but ran into problems because of the drought. Some tribal members said that climate change might change the phenology of plants and animals and disrupt, for example, the timing of birds and the insects on which they prey. Warmer temperatures may cause the insect to migrate before the bird is ready to eat it. Much of the evidence on changes in plant and animal species is anecdotal, but as one tribal member noted, data needs to be collected in a systematic manner to determine if changes are actually occurring.

2.1.4.7 Health. The health of tribes could be impacted by heavy rain. One participant who lives near a Superfund site commented on how heavy rain and flooding brings heavy metals into the streams, which contaminates the water. Lead also gets into crops, which is eaten by cattle. During a drought, lead-contaminated creeks dry up and children play in them, which poses health risks. Additionally, more extremes may put additional stress on a population that is already at risk for some diseases, such as diabetes. Extreme heat is also dangerous for tribal members who do not have air conditioning. One participant said that three of their elders passed away this summer due to the extreme heat.

2.2 Climate Change and Variability and its Impact on Tribal Cultures

2.2.1 Impact on Cultural Practices

One of the main concerns that tribal members have is the impact that climate change is or might have on their ability to gather the plants and food they use for ceremonies. Several participants noted having trouble recently finding willow and cottonwood trees, sage, green onions, and cat tails. Either they could not find them, or had to look in a different location. Some participants fear that their cultural identity will be lost if the natural resources upon which they rely no longer exist. Tribal ceremonies are based on different environmental and atmospheric elements, such as stars or plants. One tribal member said that traditionally her tribe had held their ceremony in the first or second week of May, but that it is now held the first or second week of April. This scheduling change created conflict among tribal members. Other tribes have also considered changing the timing of their ceremonies, to better coincide with the timing of plant and animal life. Another participant said that her tribe's most recent war dance was held at night due to the heat.

2.2.2 Greatest Impact and Adaptation

Many of the participants said that extreme heat is and would have the greatest impact on tribal nations. Heat impacts energy production and costs, the health of tribal members, and decreases water availability. One participant said her tribe has adapted to the heat by constructing a building with an air conditioner. This increases the participation among the youngest generation in cultural practices at the ceremonial grounds. Although much of the discussion on climate change impacts and adaptation strategies focused on single sectors, a few participants pointed out that climate change needs to be addressed holistically, because as they noted, everything is connected.

2.3 Long Term Recommendations

Meeting attendees were asked to provide long term recommendations on the resources the information they need to implement adaptation and mitigation strategies.

2.3.1 Resources Needed

The tribal representatives identified several resources they need to implement climate change coping and adaptation strategies. Time, funding, and education were most commonly cited. Lack of education appeared to hinder an understanding of how to address and adapt to climate change issues. One attendee pointed out that in some cases the personnel working in tribal environmental departments do not have the necessary training to fulfill their job duties. Several participants said that education at all levels, from young children to elders, is needed to properly address these

issues. Teaching young students about climate change and environmental stewardship in schools can often provide a doubling effect because the children take the knowledge home to their parents. Tribal elders need to be educated as well. Funding is needed to support these programs, but building stronger partnerships with federal agencies was also cited as being important to inform decision-making. Several participants suggested having more meetings such as this one to continue to build partnerships. One person said that open dialogue is preferred as opposed to strict question and answer sessions. Ideas for research were also suggested, such as understanding the impacts of land tampering decisions and artificial aquifer recharge, and how to purify low quality water. Presence at the state water resources board was also suggested.

2.3.2 Information Needed

Closely tied to resource needs were information needs. In some instances, tribal members were interested in a guidebook that would help them conduct their own vulnerability assessments or to adapt to the changing climate. In other instance, the participants were more interested in receiving technical assistance from scientists, such as what data gaps exist and the direction in which a tribe should go to conduct useful research. One participant cited the Department of Interior's South-Central Climate Science Center as a potential future resource for tribes. He also said that he is trying to get a grant funded that will allow global climate model output to be downscaled and see how climate change is impacting and will impact the local hydrologic systems. There was much interest in collaborating with scientists, but one person also pointed out that most tribal members are more likely to trust an elder or religious leader over someone with a PhD.

2.3.3 Policy Changes

The attendees were asked about policies that need to be implemented or changed to help them limit their vulnerability to climate change or specific weather hazards made worse by climate change. They spoke about policies that need to be changed at federal and state government levels, as well as policies within their own tribes.

2.3.3.1 At the federal level. Much discussion occurred on the relationship between the tribes and the federal government and various changes that could be made. First, a couple of attendees spoke about the need for increased dialogue between them and their federal partners, especially related to the climate-related or environmental issues that will impact the tribe. It was suggested to set aside time for regional consultations so that tribal voices can be heard. Discussion also occurred regarding the right for tribal nations under treaties to be able to exercise their rights on environmental issues. A call for more respect for native peoples was also mentioned.

Specific policy changes that were mentioned was to set mercury and lead limits for fish, and to put out advisories when those limits may be exceeded. One attendee commented that current consumption advisories do not take tribal needs into consideration and can be dangerous for those who rely on fish and ground vegetables that absorb a lot of the chemicals. Another attendee cited

land use policies and suggested that more effort should be taken to preserve and restore natural wetland habitats.

2.3.3.2 At the state level. In terms of state policies, several attendees described problems with the way water resources are regulated. Currently, the state water code only takes consumption into account and leaves out other important components such as recreation and ecological uses. One participant cited being concerned with the long-term sustainability of the water supply. Protecting the environment was also cited as being an important issue, as well as needing better representation within the state government and more dialogue with representatives and senators.

2.3.3.3 At the tribal level. Much discussion also occurred regarding policy changes that could be made within and across tribal governments. In terms of the operation of tribal governments, one person suggested that tribal governments be more nimble than state governments. Also, there was concern that the people in tribal government positions change roles too often which often leads to inconsistencies or diminished impact than might otherwise occur. Moreover, discussion occurred on the need for tribal nations to work with one another across their boundaries and to set their own environmental standards if they are not happy with the federal standards that already exist. For example, if a tribe is not pleased with the current quality of the water that passes through their tribal lands, they should develop their own water quality standards. Understanding current state and federal policies and developing a tribal climate change policy was also suggested as a way of moving forward. One person suggested getting more tribal leaders involved in federal and state policies. Exercising water sovereignty and water rights, as defined in historical treaties, was also a common discussion thread. One attendee said the tribes are going to have to increase their bureaucracy and level of sophistication to engage on the issues, such as water rights, that are the most important to them.

Mitigation, whether in terms of climate change or climate hazards, was also brought up by a few attendees. One person suggested that each tribe should make policies to lower their carbon footprint. Another attendee suggested developing a hazard mitigation plan, while another person said that each tribe needs to evaluate how they will be affected by climate change and be proactive so that they do not allow the federal government to dictate their actions. Finally, policies to conserve water and energy were mentioned, though the entity (federal, state, or tribal) that would coordinate this effort was not specified.

2.3.4 Tribal Role

Following suggestions for changes in policy, the attendees discussed the role they would like tribes to play in continuing to be part of the conversation on climate change. There was a general discussion on the need for ongoing dialogue among tribes on climate issues, as well as the need for intertribal collaboration. One attendee suggested developing a regional task force that would build a long term strategy for climate variability and change. Two attendees suggested developing hazard plans together, such as drought, and to share resources with one another. Another attendee spoke of a tribal networking group that communicates with one another during disasters using online or

phone communication. Collaborative efforts with the National Tribal Science Council could also be useful.

Formally educating the tribal youth was identified as an important step by several attendees. Another person mentioned that young people need to be encouraged to voice their opinion instead of waiting on the tribe to take action. One attendee also said that a tribal college is trying to develop a natural resources associates degree, but that it is difficult to find qualified faculty members because teaching at the evening classes would be in addition to their full-time jobs.

In addition to formal education, informal education was also identified as a way to make progress. There was also quite a bit of discussion on engaging local communities in climate change education and discussing the impacts. One person suggested having a mentoring program within the tribe. Moreover, educating tribal leaders and elders could be important because as one attendee noted, leadership is necessary on issues such as climate change because other will follow suit if the leaders are engaged. Engaging in dialogue with tribal elders could also be valuable since different generations may have unique perspectives. One attendee pointed out that tribal leaders in her tribe do not recognize climate as an issue and the elders sometime rely on the tribal leaders for guidance on the issues on which to focus. She also suggested that the tribes complete their own risk assessment so that a one-size-fits-all approach is not forced upon them.

Completing a risk assessment is only one of the proactive measures that were identified in the breakout session. Another suggestion was to complete home energy audits and encourage and/or provide caulking and fluorescent lights to help the tribal members save money and decrease the amount of energy they are using. Alternative energy tax breaks were also suggested. Also, some tribes may need to broaden the scope of their environmental programs. One attendee pointed out that her tribal environmental department only focuses on septic tanks and wells.

2.3.5 Political Challenges

Meeting attendees were asked about the political challenges they have seen or foresee dealing with in the future in regards to the implementation of climate adaptation and mitigation strategies. Lack of support from the state government and misinformation in the media was identified as a challenge, as well as some lack of coordination within the federal government. One attendee pointed out that it can be difficult to make progress in the climate change arena if you do not know who the agency points of contact are. Water resource competition and representation of tribal rights and sovereignty was also identified as a challenge. Additionally, one attendee said that tribes often appear to be forgotten when environmental issues arise. He cited an example where the hazards of Superfund sites were being acknowledged by the federal government but nearby tribes were not made aware of the issues until the study was completed. This action showed possible ignorance or insensitivity toward tribal sovereignty issues. To deal with some of these issues, one attendee said that tribes are going to have to find ways to solve problems on their own and they cannot rely on external funding. He cited some examples from his own tribe, including food

sovereignty, re-introducing their native language, and teaching cultural practices, as ways of being proactive.

2.3.6 Final Message

The final question on the breakout session protocol asked the attendees about the final message they would like Congress and the broader agencies, tribal and non-tribal, to hear. Multiple representatives said they would like to be included in the conversation over issues that impact them or their tribal lands, from the beginning of the process until the end. They would also like to be appreciated and recognized as sovereign nations. One person commented that Congress should not make laws for tribes without first consulting them; another said that they would like more time to contribute to processes and that many times they are added into the equation at the last minute. He said that two weeks is not enough time to obtain proper input from the tribe. Increased collaboration between tribal and federal governments was also suggested. Increasing funding was also suggested to build capacity, including funding more workshops such as this. Furthermore, one attendee suggested that a few tribal nations be chosen as pilot programs to implement adaptation and mitigation strategies. The results of those programs could then be extrapolated across other tribes. A national plan that would call for serious reduction in greenhouse gasses, especially CO₂, was also identified as well and the desire to invest in mass transit options to reduce gasoline consumption and to reduce the use of coal fired power plants.

3. Key Findings

Following the breakout session, meeting attendees came together as a large group to discuss the most important points they had discussed. The discussion focused on the current and future impacts of climate variability and change on tribal sectors and cultural practices, as well as recommendations for how to adapt to and mitigate climate change. The following is a summary of the major points that were covered.

3.1 Climate Change Impacts

Tribal representatives were greatly concerned about the impact of climate variability and change on water, health, and ecosystems. Impacts on other sectors such as agriculture, energy, and transportation were also discussed, but the main focus was on the aforementioned three, especially water. Many of the attendees were very concerned about water resource depletion and decreasing water quality. Water is needed to sustain all life and stresses on the hydrologic system can have enormous consequences. For example, floods can increase the toxicity of soil, drought is problematic for consumption and farming, and some citizens are faced with very high water costs. It was noted that cooperation among tribal, local, state and federal entities is needed to address ongoing and future water-related issues.

In addition to water, some representatives were concerned about the phenological changes that are occurring or will occur in the ecosystem, which may cause species to get out of sync. Stresses on human health were also of great concern, since poor air quality from coal fired power plants and mercury emissions can lead to health problems. Extreme heat can also be dangerous, especially for those who do not have access to air conditioning.



Figure 4: Some of the meeting attendees during the large group discussion. Credit: Paulette Blanchard.

Climate change could also have significant impact on the cultural identity of tribal nations. Ceremonial and cultural adjustments will need to be made. For example, a tribe may need to move its spring festival to earlier in the year to avoid extreme heat. Medicinal plants and food may also be lost. Some plants are already difficult to find or are disappearing, though the attendees noted that they are unsure whether there is a direct link to climate change. Some fear that heirloom seeds needed to grow and make culturally important foods will become less viable in a changing climate.

3.2 Recommendations for Adaptation and Mitigation

Quite a bit of the discussion on adaptation and mitigation strategies revolved around the need to continue to work with state and federal partners and to recognize that in the case of a water resource management plan, for example, everyone has a stake and work needs to span across state boundaries. Attendees also suggested that meetings like this be maintained so that dialogue can continue. Some of the recommendations also included the need for resources from and dialogue with state and federal partners. In addition, much of the discussion focused on the roles that tribes should play in adapting to and mitigating climate change. Several tribal representatives suggested that indigenous perspectives and native philosophies be taken into consideration when adaptation and mitigation strategies are being considered. This means acknowledging that the atmospheric and environmental elements are connected and that one needs to focus on climate as a complex system rather than thinking about it in boxes. Historical adaptation insights and traditional knowledge may be useful, though tribal representatives need to improve their documentation of ceremonial practices, language, and identification of plants and animals in case they disappear.

In general, more climate change data and information is needed from state and federal partners so that tribal nations can make more informed decisions. Technical assistance would be welcome when creating planning documents, for example. Tribes desire to work with state and federal agencies but they need to be invited to meetings and have a seat at the table. One participant cited an example where tribal environmental oversight was taken away a few years ago and tribes no longer have oversight on projects that may impact their land. Attendees would also like traditional

knowledge to be acknowledged as important in addition to knowledge that is produced by western science. The final point made regarding the relationship that tribal governments have with state and federal agencies was equitable funding, because often times tribal programs are funded on a very short-term basis or with very little funding. It is very difficult to make progress without sustained funding.

There were many recommendations for actions that tribes need to take to adapt to and mitigate the impacts of climate change. Continuing to work across tribal boundaries (in and out of Oklahoma), networking among tribes, and exercising treaty rights were seen as important steps to addressing climate change. In addition, the development of an Oklahoma Inter-Tribal Task Force on Climate Change was suggested. Some of the other tribal nations across the United States have been much more proactive regarding climate change issues, and it may be useful for Oklahoma tribes to look at what other U.S. tribes are doing and piggyback off of them. Continuity in tribal governments was also identified as a something that is necessary to continue momentum that begins while a particular leader is in office. Furthermore, several people suggested that tribes take a proactive role in disaster planning and that they have a designated point of contact for these issues. Tribal leaders also need to be engaged in disaster planning. Finally, much of the discussion focused on the need for informal and formal education on climate change, ranging from young children to higher education. Oftentimes children act as advocates because they take home the knowledge they learned during the school day to their parents. Tribes should also encourage a new generation of leadership so that future generations are prepared to address the challenges brought on by climate change.

4. References

National Research Council, 2010: Adapting to the impacts of climate change (America's climate choices), 292 pp.

Oklahoma Climatological Survey, 2010: Meeting summary, December 10, 2009 Oklahoma climate adaptation planning kick-off meeting, 5 pp.

Appendix A: Meeting Agenda

Oklahoma Inter-Tribal Meeting on Climate Variability and Change

DATE: December 12, 2011
TIME: 10:00am – 4:00pm
PLACE: National Weather Center
120 David L. Boren Boulevard
Norman, OK 73072

AGENDA

MORNING SESSION

Moderator: Paulette Blanchard, Haskell Indian Nations University Indigenous and American Indian Studies

- 9:00-10:00** Arrival and Registration: Refreshments Served
10:00-10:05: Opening Prayer
George Blanchard, Governor of the Absentee Shawnee Tribe
10:05-10:10: Welcome and Overview
Dr. Berrien Moore III, Weather & Climate Programs, College of Atmospheric & Geographic Sciences, National Weather Center
Dr. Daniel Wildcat, Haskell Indian Nations University
10:10-10:30: Climate vs. Weather
Dr. Kevin Kloesel, Oklahoma Climatological Survey
10:30-11:00: Climate Variability and Change, Global and Local
Gary McManus, Oklahoma Climatological Survey
11:00-11:10: **BREAK**
11:10-11:30: What Does This Mean for Tribes?
Dr. Bull Bennett, Kiksapa Consulting
11:30-12:30: Lunch in the Atrium
Provided by the Southern Climate Impacts Planning Program

AFTERNOON SESSION

Moderator: Dr. Randy Peppler, OU Dept. of Geography & Environmental Sustainability and Cooperative Institute for Mesoscale Meteorological Studies

- 12:30-12:40:** Introduction to Small Group Discussions
Dr. Bull Bennett, Kiksapa Consulting
12:40-2:10: Small Group Discussions: Issues & Recommendations
2:10-3:00: Small Groups Report Back to Large Group
Dr. Bull Bennett, Kiksapa Consulting
3:00-3:15: **BREAK** (dessert and drinks available in the Atrium)
3:15-3:30: How and Where to Find Trustworthy Information
Rachel Riley, Southern Climate Impacts Planning Program
3:30-4:00: Where Do We Go From Here? What Actions Need to Take Place?
Dr. Daniel Wildcat, Haskell Indian Nations University



United States Global Change Research Program
National Climate Assessment



Southern Climate Impacts Planning Program



Background Design: Bunky EchoHawk

Appendix B: Breakout Session Discussion Topics and Questions

Prior to beginning the discussion, the participants reviewed the projected changes in climate for Oklahoma, as described in the table below.

Projected Changes in Oklahoma's Climate	Resulting Impact
More intense but less frequent rain events	⇒ • More runoff and flash flooding
	⇒ • Drought frequency & severity will increase
	⇒ • Wildfire risk will increase
Increase in frequency of hot extremes and heat waves	⇒ • Water resources will be stressed
	⇒ • Cattle will be stressed
Warm season becomes longer & arrives sooner; cold extremes will decrease	⇒ • Crops more vulnerable to late freeze events
	⇒ • Pests may increase
	⇒ • Increased year-round evaporation from ground
	⇒ • Increased transpiration from green vegetation due to longer growing season

- 1) Climate change and variability and its impacts on tribes (water resources, energy supply and use, transportation, agriculture, forestry, ecosystems and biodiversity, human health)
 - a) What climate or environmental issue has your tribe had to adapt to/deal with in the past? How was that accomplished?
 - b) What are some current climate-related stresses and concerns among tribes and on tribal lands in Oklahoma and across the country?
 - c) Which sector(s) is most important to the operation of your tribe? (water resources, energy supply and use, transportation, agriculture, forestry, ecosystems and biodiversity, human health)
 - d) What might be the sector impacts of these stresses?

(If time, go through each sector separately)

- e) How might/is climate change impact(ing) water resources?
- f) How might/is climate change impact(ing) energy supply and use?
- g) How might/is climate change impact(ing) transportation?
- h) How might/is climate change impact(ing) agriculture?
- i) How might/is climate change impact(ing) forestry?
- j) How might/is climate change impact(ing) ecosystems and biodiversity?

- k) How might/is climate change impact(ing) the health of your tribe?
- 2) Climate change and variability and its impacts on tribal peoples (cultural practices, food sovereignty, self-determination)
- a) Given the projected changes in climate, what might be the stresses and impacts of climate change and variability on cultural practices and, by inference, self-determination (e.g., with respect to agriculture: traditional knowledge; food sovereignty – traditional growing practices, foods, and heirloom seeds; ceremonies based on growing and food, etc.)?
 - b) Which of the projected changes in climate will have the greatest impact on these? How might you adapt cultural practices to those changes?
 - c) How might traditional knowledge and/or local observational insights be applied to adapt to or mitigate the impacts of climate change?
- 3) Long-term recommendations from tribes on how to implement adaptation or mitigation strategies
- a) What resources do you need to implement these coping and adaptation strategies?
 - b) What new or additional information do you need from the government or scientists to address environmental, social, and economic changes, now and in the future?
 - c) What policy(ies) needs to be implemented or changed to help limit your vulnerability to climate change or specific weather hazards made worse by climate change?
 - d) What role would you like to see the tribes play in continuing to be part of the conversation on climate change?
 - e) What political challenges have you seen, or can you foresee in the future, regarding the implementation of climate adaptation and mitigation strategies? What do you think would help overcome these challenges?
 - f) What is one message you would like to send to Congress?

Appendix C: Meeting Participants

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