

**ADAPTING TO
A CHANGING
CLIMATE**

**Sicangu
Lakota
Oyate**



Lakota laws that guide our everyday life and decisions

Unsikicilapi (Humility),
Wowacintanka (Perseverance),
Wawoohola (Respect),
Wayuonihan (Honor),
Cantognake (Love),
Iciciupi (Sacrifice),
Wowicake (Truth),
Waunsilapi (Compassion),
Woohoitike (Bravery),
Cantewasake (Fortitude),
Canteyuke (Generosity) and
Woksape (Wisdom).

A Climate Adaptation Plan for the Sicangu Lakota Oyate

Presented to Rosebud Sioux Tribal Council
by the
Sicangu Climate Crisis Working Group

Assisted by
Tribal Data Sovereignty Initiative
and
Lark Environmental, Inc.

June 2022



Members of the Sicangu Climate Crisis Working Group (SCCWG)



Photo Credit: Juliana Clifford

About the consulting team: The SCCWG was supported in developing this plan by a partnership involving the Tribal Data Sovereignty Initiative (TDSI), involving two retired federal scientists and a Rosebud Sioux Tribal member. TDSI was joined by Lark Environmental, Inc. a women owned business with planning experience with both the Rosebud Sioux Tribe and other regional tribes. Technical expertise related to climate trends and projection data were provided by the South Dakota State Climatologist located at South Dakota State University and the North Central Climate Adaptation Science Center hosted at the University of Colorado Boulder.

This work was funded under Bureau of Indian Affairs award number A20AP00106.

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Use the following reference to cite:

Adapting to a Changing Climate: Sicangu Lakota Oyate, 2022, Sicangu Climate Crisis Working Group, Rosebud Sioux Tribe.

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Unci Makah Tantanhan - For our Grandmother Earth

Introduction

Phil Two Eagle, Chair, SCCWG; and Executive Director, Sicangu Lakota Treaty Council

Prior to the arrival of the Europeans the Sicangu Lakota Oyate as part of the Oceti Sakowin Oyate (Nation) lived a free and independent life. Our Oyate traveled around Keya Wita (Turtle Island) from the East Coast, Great Lakes, Northern Canada, the Rocky Mountains, and south to where the Comanche roamed, where a battle was fought with the Comanche.

Since 1492 with the arrival of the Europeans we have seen the destruction of our Grandmother Earth beginning with the Industrial Revolution by corporations in collusion with the United States Federal Government with the clear cutting of forests, mountaintop mining, gold mining, uranium mining, oil and gas poisoned the water and air.

We have survived to this day from the encroachment of the Milahanska the Long Knives as our Oyate called the United States government.

The Oceti Sakowin Oyate look to the stars and sky for reflections of our origins and evolution to the humans we are today. As we have seen above reflected below in our history, we see it again. Changes in the sky and air bring changes to our lands, waters and relatives.

The weather is changing, and we all see it. Wetter and drier, hotter than we've seen. Rain, snow, and floods. Early springs, winter rain.

And our relatives see it too. Moles are finding the earth too dry and hard to dig. Magpies aren't around as much anymore.

The Oceti Sakowin Oyate, and more directly, the Sicangu Lakota Oyate, have adapted to great change in the past, and we can do so again.

This Plan peers into the future to help us prepare. We must face this reality with our inherent sovereignty, determination, courage, and community. **It is our choice, our responsibility. Wolakota is Our way.** Peace, harmony, coming together as a community. These are the strengths Oceti Sakowin Oyate will need to call on to meet yet another great challenge. We have moved with the stars and buffalo, met and dealt with the wasicu, **and will meet this challenge as well.**



Photo Credit: Paula Wopilawin Antoine

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Photo: psín, *Achnatherum hymenoides*, Photo Credit: Jared Tarbell

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Key Terms

Adaptation: Adjustment in natural or human systems in response to the effects of a changing environment in a manner that attempts to exploit beneficial opportunities or moderate negative effects.

Climate Change: Changes in the Earth's physical systems that occur over moderate to long time periods, rather than over shorter natural or seasonal cycles; often refers to changes resulting from warming caused by increased greenhouse gas concentrations.

Risk: Function of the magnitude of the potential severity/consequences of an impact and probability (likelihood) that the impact will happen. Combining vulnerability and risk establishes priorities for adaptation actions.

Representative Concentration Pathway (RCP): In this report, RCP 8.5, also called the "business-as-usual" scenario is used as the concentration pathway. More information about RCP 8.5 and the scenario's assumptions can be found in the Intergovernmental Panel on Climate Change IPCC Fifth Assessment Report. Generally, though, the RCPs are prescribed pathways for greenhouse gas and aerosol concentrations, together with land use change, that are consistent with a set of broad climate outcomes used by the climate modelling community. The pathways are characterized by the radiative forcing produced by carbon dioxide (CO₂) emissions by the end of the 21st century.

Resilience: In the context of environmental change, the capability to anticipate, prepare for, respond to, and recover from threats from such changes with minimal damage to well-being.

Itacan: Title from our traditional government, describing a leader for a defined task.

Very high fire danger days: When the fire danger is "very high", fires will start easily from most causes. The fires will spread rapidly and have a quick increase in intensity, right after ignition. Small fires can quickly become large fires and exhibit extreme fire intensity, such as long-distance spotting and fire whirls. These fires can be difficult to control and will often become much larger and longer-lasting fires.

Vulnerability: Susceptibility to harm. Function of the sensitivity to climate and ability of the Sicangu to adapt.

Acronyms

BIA - Bureau of Indian Affairs

Center - Sicangu Climate Center

DOI - Department of the Interior

EPA - Environmental Protection Agency

F - Fahrenheit

Fig - Figure

NOAA - National Oceanic and Atmospheric Administration

PET - potential evapotranspiration

Plan - A Climate Adaptation Plan for the Sicangu Lakota Oyate

SCCWG - Sicangu Climate Change Working Group

US - United States

USGS - United States Geological Survey

Creation Stories - Out of Many, One

Teaching the importance of protecting Unci Maka and all living life forms from greed and domination

Inyan Kaga and the Creation of Unci Maka

The making of Unci Maka (Grandmother Earth) and Mahpiyato Skan (water). In the beginning, there was nothing, except for Inyan (rock), wrapped in the deepest han (darkness). Inyan had great spiritual powers, especially in his blue colored blood, but he longed for companionship. He let his blue blood flow from him to create Maka (earth), and as he watched his blood flow out to the ends of the earth, he called it Mahpiyato Skan, the blue mover. As his powers flowed out, Inyan became an eerie stand of molten rock called Tunkan and when the humans were created from what was left, they called this Tunkansila (grandfather). Tunkansila is the oldest thing known to humans and this term was appropriate. The humans call Unci Maka (grandmother), the next oldest thing, and this was appropriate. The act of creating Unci Maka and Mahpiyato Skan is called Inyan Kaga.

Sicangu Makoce

This land is our home. We began our journey on this earth in the He Sapa (Black Hills) and have traveled across this land to return home again. According to the stories our elders tell, humans and buffalo once lived in the underworld, and only a few people (including Iktomi the Trickster) lived on the earth. Iktomi tricked some villagers into journeying to the world outside the cave, and let them taste meat, wear clothes, and build tipis. They went out through one of the Wasun Niye (wind caves), saw these wonders, and came back to tell their people. Despite words of caution from an elder woman and their chief, some people followed this new path. They became lost, as the elders had predicted, and wandered -- cold, tired, and thirsty. They were led to safety by Waziya the Old Man and Wakanka the Witch, who taught them the ways of earth. We -- for those were our ancestors -- now listen for the Tate Wakan (sacred wind) to remind us of where we came from and remember the lessons of Waziya and Wakanka.



Oceti Sakowin Oyate

As it is above, so it is below. The Sicangu Lakota belong to the Tetonwan, one of the seven Council Fires of the Oceti Sakowin Oyate. We are reflected in the Red Racetrack constellation, cangleska wakan, which again reflects the Red Rim of the Black Hills, where we first came to this earth. The lands and people of the seven bands of the Ocete Sakowin are also reflected in this constellation, and we once sat in our tipis and organized our camps according to these patterns from above. We see Wisun Niye (Wind Cave) out of which came Tokahe (first man) in the center of this red circle, and we hear the voices from our ancestors. We know the teachings from the sacred circle and White Buffalo Calf Woman and the stories from our past have great power, even to this day.

Chanunpa

Chanunpa (the pipe) always marks our ceremonies, and we know it carries our prayers to the Creator. Each part -- stem, bowl, tobacco, breath, and smoke -- reflects the world of plants, animals, people, elements and spirit beings. And the lighting and drawing and the smoke itself make visible our prayers and longings. The pipe came to us from White Buffalo Calf Woman, who brought us the seven sacred ceremonies and many songs and traditional ways. Appearing first to two hunters, White Buffalo Calf Woman appeared as a white buffalo calf, then as a beautiful maiden. While one hunter was consumed by desire, the other was not, and she came to visit his camp. She brought us the White Buffalo Calf Pipe, which we still have, kept by an elder, Arvol Looking Horse, a Hunkpapa Lakota, to this day. We know the power of this pipe to remind us and connect us with our best nature, and the older, better ways of living in this world. It reminds us of our connections.

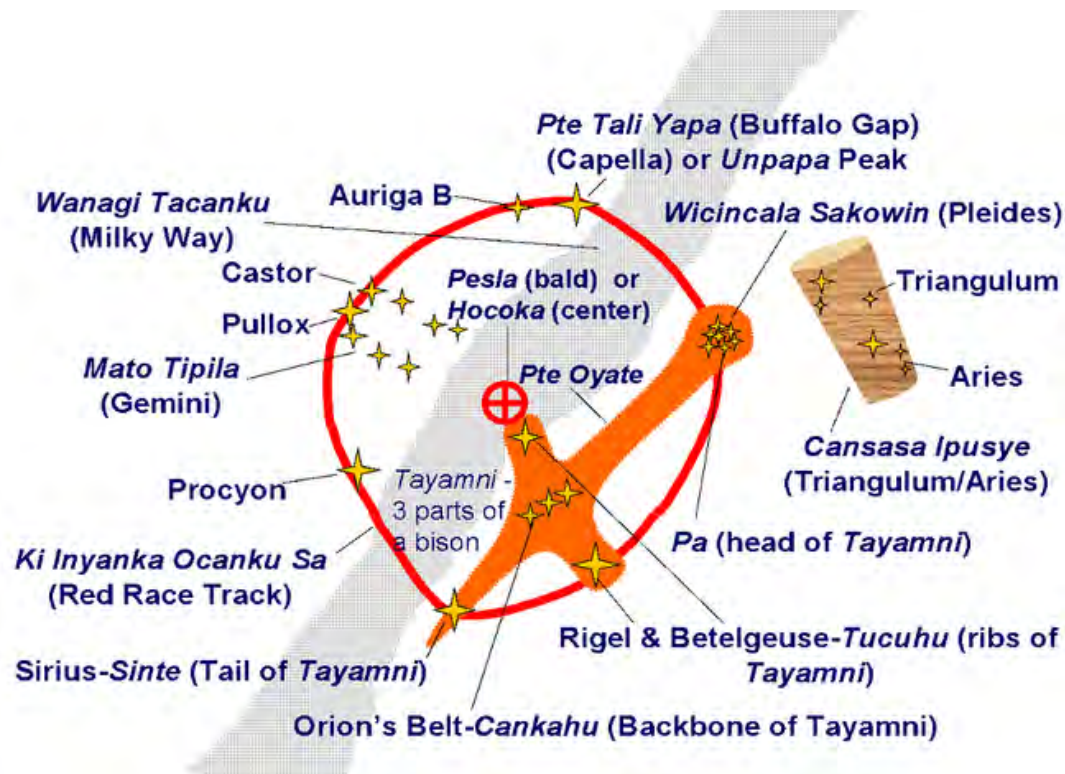


Figure 1. Lakota Wicahpi Owapi (star chart) represents an **earth map** and the **red circle** represents **Wind Cave or Wasun Wiconiye (breathing hole)** in the Black Hills. The embryo coming out from Wasun Wiconiye represents **Tokahe** (first man or leader) who led the people out of the cave. Moreover, the **red circle** also represents a womb from which the Lakotas, transformed from the sky, are born into this world. The embryo or Tayamni Constellation is made up of three parts of the buffalo, the head, the midsection and the tail, representing Pte Oyate (buffalo nation). This representation makes the Lakota akin to the elder buffalo who is addressed as Tunkasila (grandfather to the male buffalo). Both were one until they came out of the cave and transformed to their present form. This origin visualization in the sky, reminds the people of their origins in the sky and on the land.

Tokatakiya Wowayanke - Vision Statement

“Unkiye ca lel unkanihi pi. Wakinyan heunca pi. Wiwila hena unkowaja pi nahan unkitawa pi. Mni hena unkiye etan u.”

“It was us who brought you here. We are Thunder-Beings. The springs are here because of us and belong to us. This water comes from us.”

--Statement from a Thunder-Being in purification ceremony

In 1878, the Sicangu Bands settled at what was to be their final Agency at Rosebud Creek, located at present day Rosebud, South Dakota. It was the Thunder-Beings who guided the Wicasa Wakan or Holy Men to the Maka Izita Opaya Wakpala, or the Smoky Earth River Valley, because of the abundance of spring water. The Little White River Valley is understood to be the “Wizipan” or the buffalo hide container used to store the necessities of life. This environmental Wizipan ecosystem contains water and aquatic life, plants for food and medicine, wildlife and winged, and forests for wood and shelter. It is held in the same high regard as the Black Hills with sacred sites and unmarked burials.

Taku Wakan Tanka Anpetu Wi nahan Maka etan unkcaga pi hena inaunkinjin pi kte, nahan yuha un zaniyan ni unkcunpi kta ca tokatakiya tanyan awa unkciglaka pi kte yelo. Mni Wiconi, nahan Maka Sitomni, nahan Woniya Wakan hena e.

Mni Wiconi ki he tokapa. Mni ki wakan nahan he cola zaniyan ni unkcunpi unkcokhipi sni. Wakinyan ki ta mni ognake ki wiwila etan hinape. Wiwila Oyate eya unki titakuyepi ca tohantanki wiwila hena mahel, nahan ohomni, tipi nahan awanyankapi. Wicoicage upi hena Mni waste yuhapi kte, nahan akilehan, nahan tokeya, iwaste pi kte, nahan yuha oun waste icicagapi kte. Hecel Unci Maka, nahan taku akan waicage, nahan mahel unpi, hena zani pi kte. Lena iyukcanpi nahan Tunkasila wicaunyanpi hena Mila Hanska kici 1868 Wolakota kagapi hena oiyute ki mni ca unpi.

Unci Maka Sitomniyan, nahan mahel, Wakan Tanka taku ki iyuha unkcaga pi; taku maka mahel yanke, nahan slohanpi, nahan waicage, nahan wamakaskan, nahan wahupa koza, nahan Ikce Oyate, nahan taku waunyanapi unkcokhipi sni hena iyuha unkcagapi, nahan taku unkciciyapi. Wicoicage upi hena iyokipiya maka akan zaniyan icagapi kte, nahan waunspe iciciyapi kte, nahan awanyanka pi kte, nahan wacekiyapi kte. Wicoicage upi hena tokeya Makoce unkitawapi ki le etan akilehan, nahan tokeya, iwaste pi kte, nahan yuha oun waste icicagapi kte. 1868 Wolakota tamakoce nahan woiyowaja hena unkcikicupi kte nahan tanyan unkcunpi kte nahan Lakota Wooke, nahan Wolakota Wooke, nahan Mila Hanska Wooke, nahan Mni Wanca Kowakatan Wooke Wakatuya hena yuha un tanyan woiyowaja nahan oyate ki awawica unkciglaka pi kte.

Woniyan ki Wakan Tanka etan u nahan wakan. Taku Maka iyokogna nahan mahpiya icete unpi hena, nahan wicahpi hehan, cewicunkiyapi nahan takuwicaunyanpi. Wakinyan hena mahpiya el mahel unpi nahan wakatanhan awaunyanapi. Wahupa koza hena el okinyanpi. Wicoicage upi hena woniyan waste ki hena tawapi ca tohan unkokhipi ki awanwica unkici yanka pi kte hecel yuha tokatakiya oniya waste yuhapi kte, nahan iye akilehan, nahan tokeya, iwaste pi kte, nahan oun waste icicaga pi kte. Taku tate nahan anpetu wi etan u, nahan oniya unkitawapi ki optaya tankatanhan kahwoke kiyapi, nahan optaya kinye kiyapi, hena tanyan awaun kiglakapi kte.

Tokatakiya takuni mni, nahan makoce, nahan woniya ki wakasape nains yusicinkte hena ecunpi kte sni nahan unkunpi kte sni.

Whatever the Creator created for us from Mother Earth and Father Sun is for our security and protection, and for us to live healthy with, so we shall be diligent to take care of it in the future. This is the water of life, our lands, and our air.

The Water of Life is paramount. This water is sacred and without it we cannot live healthy. The aquifers are where the Thunder-Being's store their water and the springs are where it comes out. The Spring People are our relatives, and are the Guardians who have always lived in and around the springs. The coming generations will have clean water that will benefit them equally, and first, and they will develop environmentally safe and sustainable economies from it. This way Grandmother Earth and everything that grows and lives on the land and beneath it will be healthy. With this in mind, our Grandfathers negotiated the 1868 Ft. Laramie Treaty boundaries to be water.

On and under Grandmother Earth, the Creator made for us all things; sub-surface resources, the crawling, the plants, the animals, the winged, the humans, and that which we cannot see, to be relatives. The coming generations will happily grow and live healthy on our lands, educate themselves, take care of it, and pray in peace. They will benefit equally, and first, from our lands and develop environmentally safe and sustainable economies from our collective resources. We shall strive to reclaim our treaty lands and resources and utilize Lakota Customary Law, Treaty Law, Federal Environmental Law, and the United Nations Declaration on the Rights of Indigenous People's and other Human Rights instruments to protect our People and resources.

The air we breathe is sacred and comes from the Creator. We will continue to pray to and be good relatives to all that is between the earth and the sky, and unto the stars. The Thunder-Beings dwell in the clouds and watch over us from above. The winged dwell there. The right to clean air belongs to the coming generations, and we shall diligently protect it for them so they will benefit from it equally, and first, and develop environmentally safe and sustainable economies from it. We shall protect our solar and wind energy, and regulate any outside transmissions and aircraft crossing our air space with Treaty and International Law.

In the future we shall not do any projects or use chemicals which will contaminate or harm the quality of our water, lands, or air.

Sicangu Makoce

Our Land and People

Before white men came, the Sicangu Lakota Oyate lived, hunted, gathered, fought and traveled over great spaces in the northern plains. The treaties entered in 1851 and 1868 (**Figure [Fig.] 2**) promised the Sicangu Lakota Oyate all of West River, South Dakota (the area west of the Missouri River), as well as part of northern Nebraska and eastern Montana. These treaties were broken, and no longer could the people roam to the Black Hills and other familiar territory. In 1889, they were told that their lands were limited to that which they hold today -- about 1,970 square miles, with parts in five counties, and much of it in small parcels intermixed with non-Indian lands.

Population numbers are about 34,000 (enrolled members) with 29,000 living on the Rosebud Sioux Reservation. Nearly half (44%) of the members are below the age of 19, and about 10% over the age of 60. There are 20 communities that make up the current home of the Sicangu Lakota Oyate (**Fig. 3; Appendix A** provides profiles for each community).

We have a birth-five center (Lakota Tiwahe) providing early intervention services, a day care, and a Head Start program. Children attend six different schools or districts (Crazy Horse School District, St. Francis Indian School, The Sapa Un Catholic Academy, Todd County School District, White River School District, Winner School District). And Sinte Gleska University and tribal student support programs offer higher education to all tribal members (although funding is limited).

About a third of our people have been to some college, with about 15% having a bachelor's degree or higher. Less than half of the homes have broadband access, compared to nearly 60% on "all reservations" and nearly 80% of all United States (US) households.

We are economically poor people. In 2019, about two-thirds of the Oyate were below the poverty line, and income and home values are falling. The median household income is less than half of the US average, with per capita income about a third of the US average.

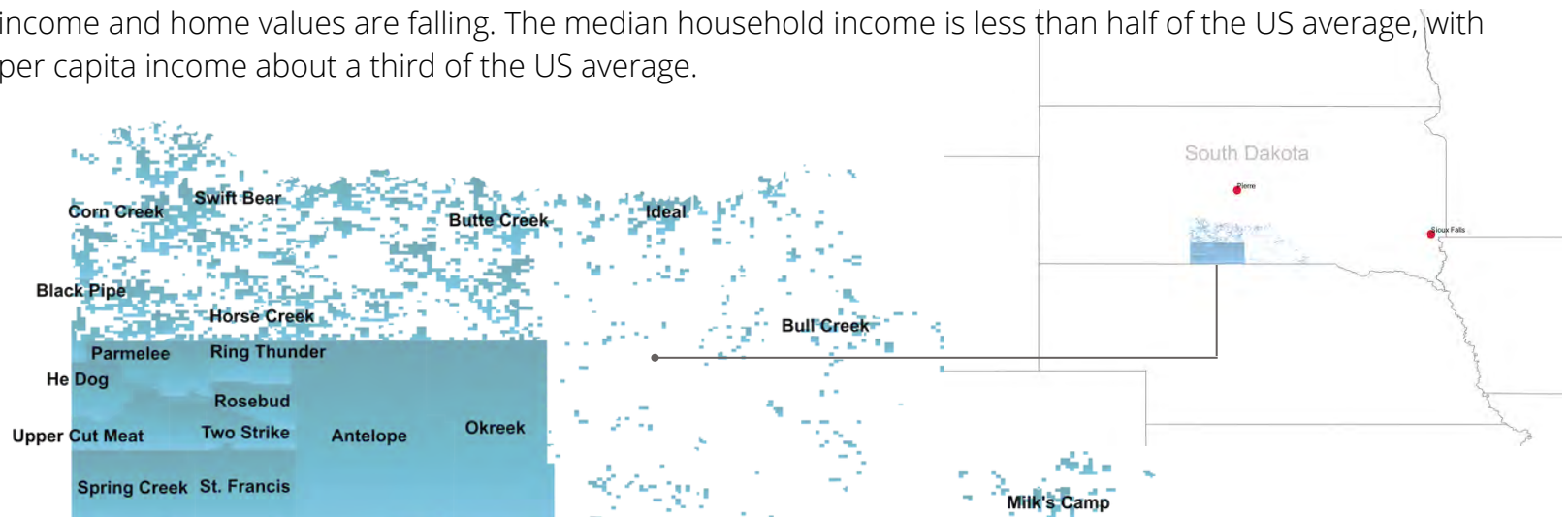


Figure 3. Map of the Rosebud Sioux Reservation and trust lands and the 20 communities that make up the current home of the Sicangu Lakota Oyate.

1851 Fort Laramie Treaty Boundary



1868 Fort Laramie Treaty Boundary

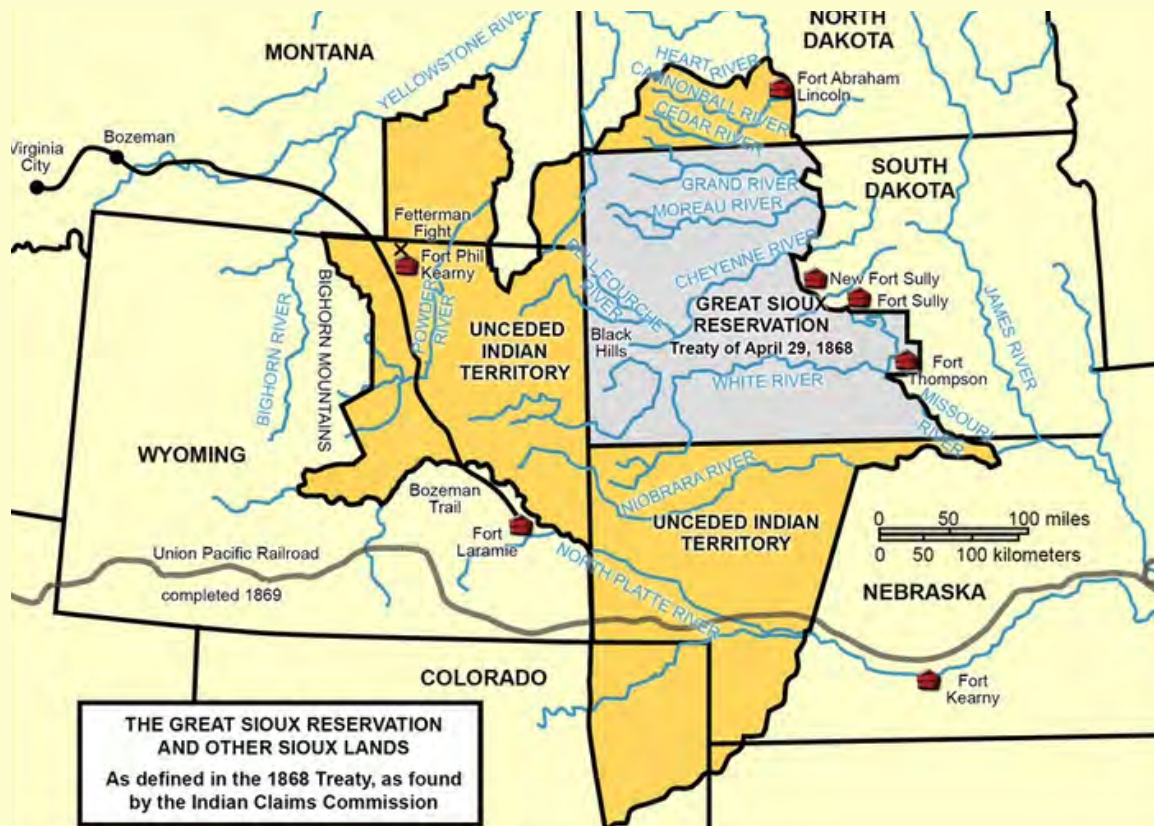
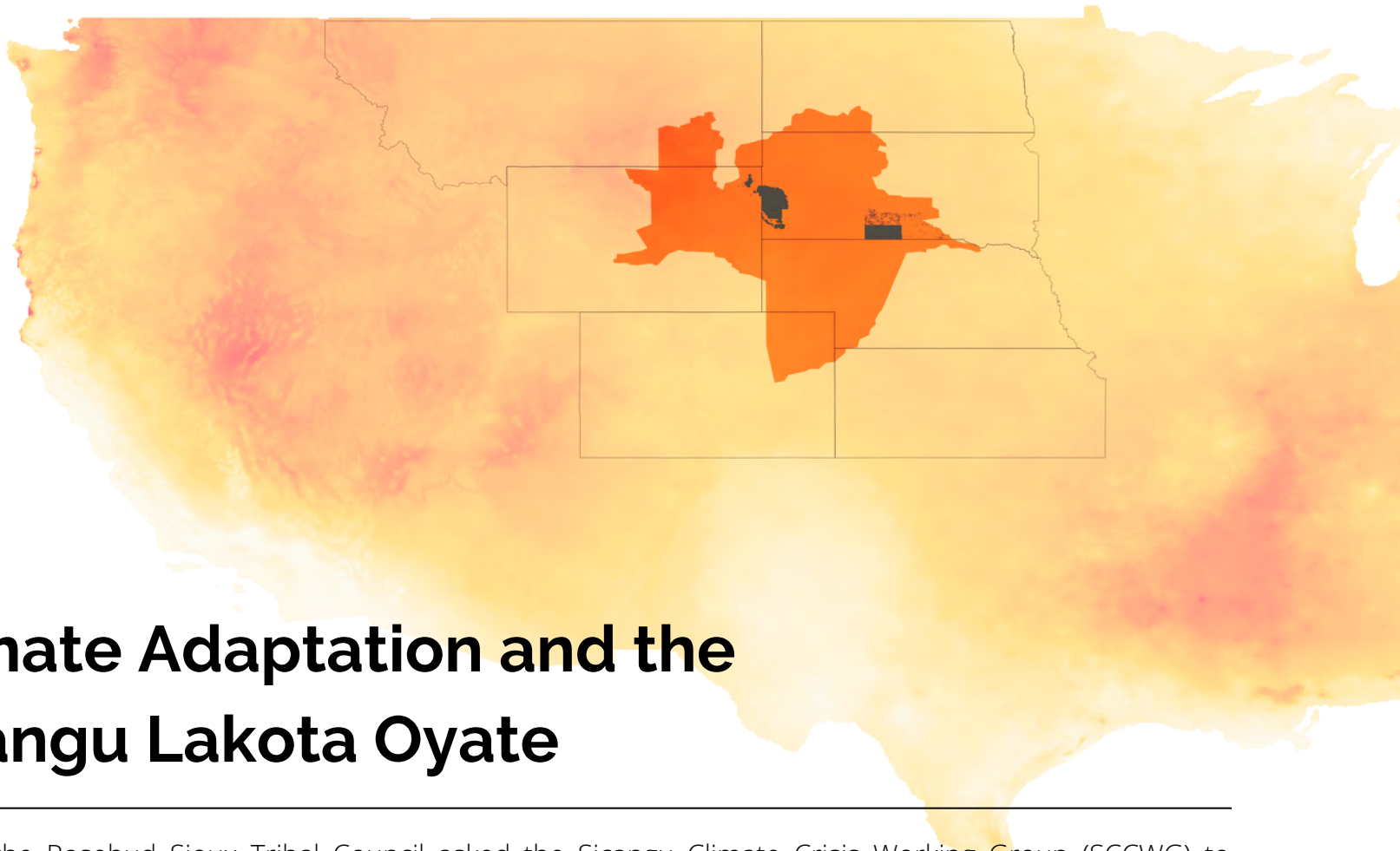


Figure 2. Boundaries from the 1851 Fort Laramie and subsequent treaty in 1868 as found by the Indian Claims Commission.



Climate Adaptation and the Sicangu Lakota Oyate

In 2019, the Rosebud Sioux Tribal Council asked the Sicangu Climate Crisis Working Group (SCCWG) to prepare a plan for responding to climate change for the Sicangu Lakota Oyate. This Plan (i.e., A Climate Adaptation Plan for the Sicangu Lakota Oyate) was prepared under SCCWG guidance by a small team of consultants, all of whom have ties to Rosebud and other native nations.

This Plan was developed during the time of COVID-19, meaning that face-to-face interactions were precluded, and all input and interviewing was done by phone or Zoom. The team conducted numerous community meetings, interviewed Rosebud Sioux tribal program managers/directors, conducted a community-wide survey, and benefitted from interviews with Sicangu Lakota Oyate elders and medicine men.

Our recommendations are organized around three main areas in which climate change will directly affect the Sicangu Lakota Oyate. First, climate change poses direct and significant threats to life and property, from severe weather, floods, and other disasters. Second, water is life and while Sicangu Makoce is currently well situated, drought impacts to the land and wildlife will likely increase, and there are long term threats to sustained access to good water despite the fact that precipitation and recharge to aquifers could increase. Finally, a changing climate will change the land around Sicangu Makoce and the plants and animals that live on it. These changes will affect farmers and ranchers, hunters, gatherers, medicine men, and all community members/residents with a connection and love for nature.

The SCCWG has developed recommended actions to protect our people, to protect our water, and to care for the land and our living relatives. Each of these goals has its own section in the Plan, but there are four recommendations the SCCWG raises above all others.

Key Recommendations

Ensure Focus and Accountability

Establish a permanent tribal office led by a Oyate Climate Itacan. Climate change will affect all aspects of Sicangu Lakota Oyate life, for decades and generations to come. The Oyate need a visible leader to assist in focusing and linking various efforts, coordinating with external partners and the larger Oceti Sakowin Oyate, and helping our people adapt.

Protecting the Oyate

Enhance tribal capacity to protect life and property among the Sicangu Lakota Oyate. Our most important finding is the degree of risk climate change poses to our people. Many of our homes are not adequate for the severe weather we now experience, and the storms will only get worse. Power outages, floods, severe cold and heat -- all of these pose risks to life and property. Insulate existing homes, build better houses, install small scale solar. These and other actions are urgent priorities for the Oyate.

Protecting Our Water: Fully Implement the Rosebud Drought Response Plan

Managing and protecting our water requires the Oyate to control and direct its use. The Rosebud Tribal Water Code outlines reasonable actions and thresholds, and should apply to, all who use our water. The Tribe's Water Resources Department has also identified critical actions, including in response to drought, and has identified key information needed to understand threats to our water. Water is life and we must conserve and protect it.

Protecting Our Sovereignty: Establish the Sicangu Climate Center

Information is power. And true sovereignty for our people requires that we control the information about our people, lands, and water, and we have the expertise needed to apply that information to Oyate decisions.

The image shows a vast, flat landscape of dry, yellowish-brown grass under a bright blue sky with scattered white clouds. The horizon is low and flat, extending across the entire width of the image. The text is overlaid on the upper left portion of the image.

Section One

A Changing Climate and Impacts to the Sicangu Oyate

Climate Trends

Climate trends and the Sicangu Lakota Oyate over the last 100 years

Since the 1880s, global temperature has risen at a rate of 0.14 degrees Fahrenheit (F) per decade. In the last 40 years, the rate of warming has more than doubled. The 10 warmest years on record have all occurred since 2005. Human activities, in the form of greenhouse gases (e.g., carbon dioxide, methane, and nitrous oxide) are the primary causes of this warming, which is contributing to a changing climate. The Sicangu Lakota Oyate and our lands are experiencing changes to temperature and precipitation patterns, which will have long-term impacts to our land and living relatives as well as our cultural practices. This section discusses 1) current climate trends the Oyate have observed; 2) projected trends that may occur within the next generation; and 3) a list of key climate indicators and their expected impacts to the Oyate's health and well-being, housing, infrastructure, culture, and water among others.

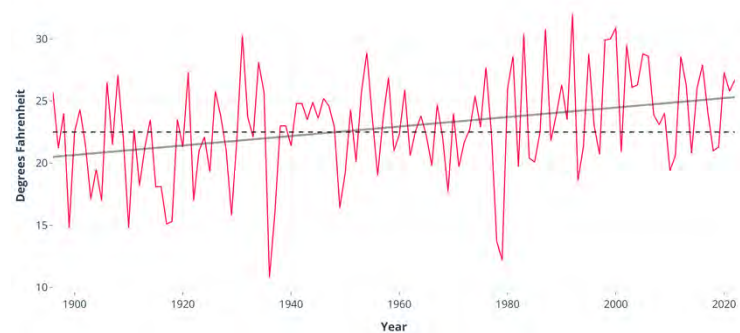
Temperature trends

Over the last 100 plus years, annual temperature trends for the Sicangu Makoce and the surrounding region have been increasing. Temperatures are now approximately 2.5 degrees F warmer than the past century. Warming is not occurring equally across all seasons, however. **Winter (Fig. 4A) and spring are warming faster than the other seasons.** Average summer temperatures show less warming; however, **summer minimum temperatures are increasing.** Increasing minimum temperatures in the summer can increase heat stress in livestock and wildlife by reducing their ability to cool down at night.

Precipitation trends

Annual precipitation for the Sicangu Makoce is also increasing, and the change is occurring faster than almost anywhere else in the US. **There has been an almost 15% increase in annual precipitation since the 1900s.** In the last 30 years, only 6 years had annual precipitation totals less than the 20th century average. Not all seasons have gotten wetter at the same rate, though. **Most of the increase in precipitation has occurred in the spring (Fig. 4B) and fall seasons.**

Todd County, South Dakota, Average Temperature, December-February
1896-2022 Trend: 0.4 degrees F/decade **(4A)**



Todd County, South Dakota, Average Precipitation, March-May
1896-2022 Trend: 0.13 inches/decade **(4B)**

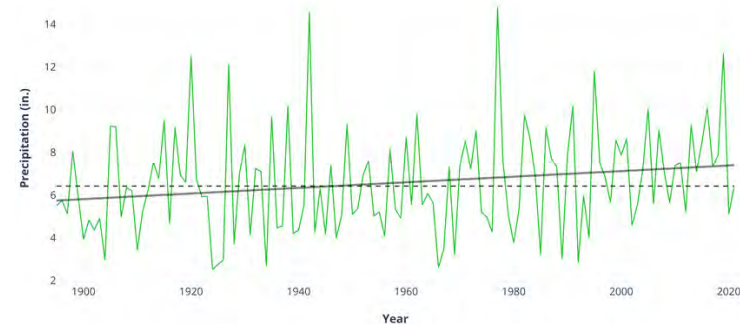


Figure 4. (4A) Average winter temperature trends from 1896-2022 for Todd County, South Dakota (SD). Winter temperatures have been increasing 0.4 degrees F/decade. (4B) Average spring precipitation trends for Todd County, SD, from 1895-2021. Spring precipitation is increasing 0.13 inches/decade. Data from National Oceanic and Atmospheric Administration (NOAA), National Centers for Environmental information, Climate at a Glance: County Time Series.

Temperature and Precipitation Projections

Climate projections for the next generation of the Sicangu Lakota Oyate to 2100

Projected temperature trends to 2100

The Sicangu Makoce could warm between 6 and 10 degrees F by 2100 (Fig. 5). A time period of just one generation. Many of the historically-experienced extreme weather will become more common, and even more severe. Such changes will place great strain on people, on water supplies, and on living relatives.

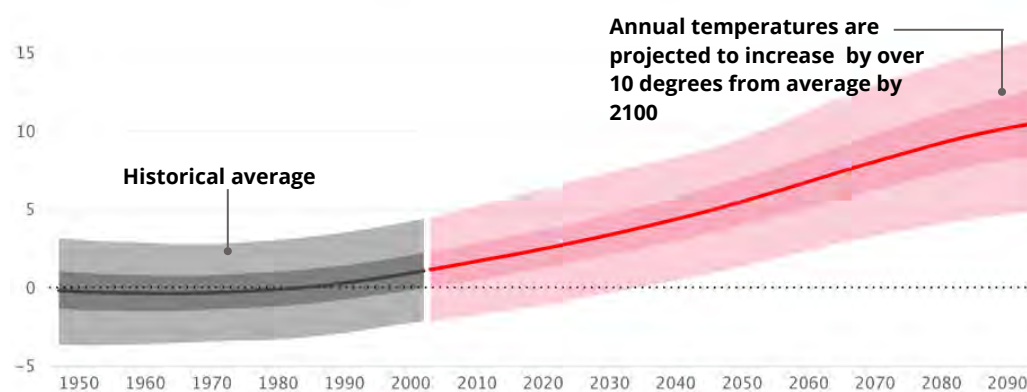


Figure 5. Average annual temperature difference from average projections for the Sicangu Makoce to 2100 under the high emissions pathway (RCP 8.5). Data from Future Time Series' web tool. Climate Toolbox (<https://climatetoolbox.org/>).

Projected heat indices

Days with a heat index equal to or greater than 90 degrees F could increase from an average of approximately 20 days in the early 2000s to over 80 days by 2100 (**Table 1**). Heat index disorders can include things like heat stroke and heat exhaustion. Increasing summer heat indices could severely affect outdoor ceremonies.

Table 1. Projected number of days with heat indices above 90, 100, and 105 degrees F. Data from Future Time Series' web tool. Climate Toolbox (<https://climatetoolbox.org/>).

Heat Indices/Decade	>90 degree F	>100 degree F	>105 degree F
1990s	25 days	2 days	0 days
2025s	43 days	7 days	2 days
2055s	63 days	19 days	6 days
2085s	85 days	43 days	23 days

Projected fire danger

The average number of days classified as very high fire danger is expected to increase in both the summer and fall by 2070 under the higher emissions pathway (**Fig. 6**). Increasing very high fire danger days could result in increased frequency and more intense wildfires for the Sicangu Makoce.

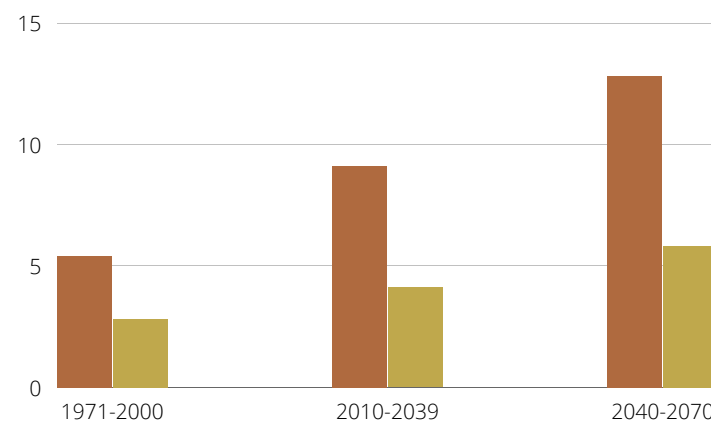
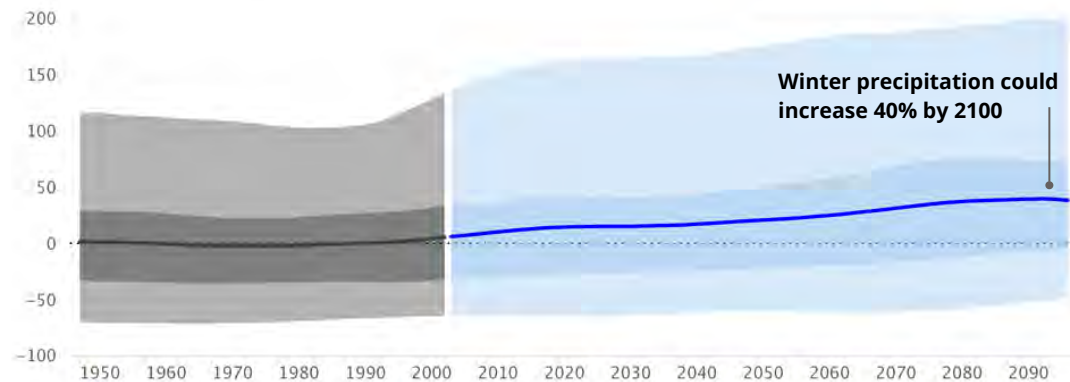


Figure 6. Mean number of days in summer (orange) and fall (yellow) which are classified as very high fire danger days for the Sicangu Makoce to 2070 under the high emissions pathway (RCP 8.5). For description of very high fire danger see the Key Terms section. Data from Future Time Series' web tool. Climate Toolbox (<https://climatetoolbox.org/>).

Projected precipitation trends to 2100

Under a high-emissions pathway, and one that is looking more likely, annual precipitation is expected to increase by approximately 5% by 2100 (**Fig. 7**), however, larger increases could occur in the winter (~40%) and spring (~24%). This could lead to more flooding in the spring as warming temperatures create earlier snowmelt and heavier rain events.

Figure 7. Projected winter percent of average precipitation for the Sicangu Makoce to 2100 under the high emissions pathway (RCP 8.5). The black line/gray shading represents the historical average/historic precipitation range while the blue line/blue shading is the projected average change/range in precipitation. Data from Future Time Series' web tool. Climate Toolbox (<https://climatetoolbox.org/>).



Projected water deficits

Under a high-emissions pathway, annual water deficits could increase due to increased potential evapotranspiration (PET) despite precipitation increasing (**Fig. 8**). PET is the amount of moisture that is lost through evaporation and plant transpiration. Both are influenced by temperature, humidity, sunlight, and wind. PET is the amount of water that could potentially be lost, and would need to be replaced, through irrigation and/or rainfall/snow. If PET increases, droughts could become more frequent and severe even though the climate in general, is expected to become wetter for the Oyate.

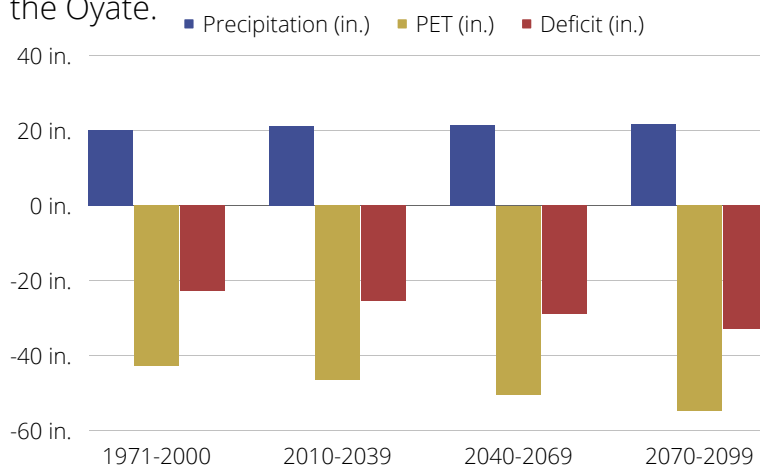


Figure 8. Historical and projected annual precipitation (blue), potential evapotranspiration (yellow), and annual water deficits (red) for the Sicangu Makoce to 2100 under the high emissions pathway (RCP 8.5). By the mid-century, annual water deficits could exceed annual precipitation by more than 7 inches. Data from Future Time Series' web tool. Climate Toolbox (<https://climatetoolbox.org/>).

Projected vegetation types

Under a high-emissions pathway, and without fire suppression, the dominant vegetation type for the Sicangu Makoce land is expected to shift from a grassland dominant system to one that is dominated by shrubland (**Fig. 9**).

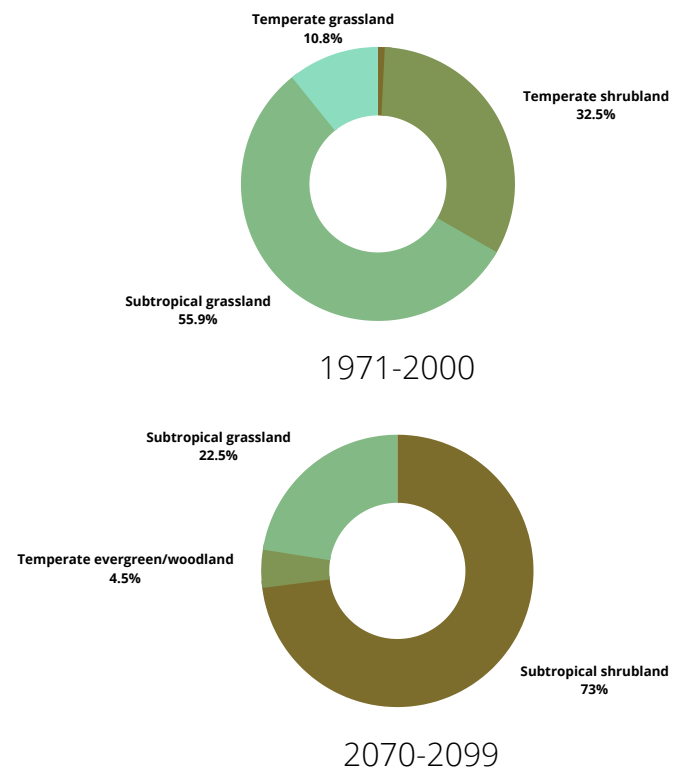


Figure 9. The historical and projected dominant vegetation types for the Sicangu Makoce. The top chart shows the current vegetation types, which are dominated by subtropical grasslands, and the projected change in the dominant vegetation to subtropical shrublands. Data from Future Time Series' web tool. Climate Toolbox (<https://climatetoolbox.org/>).

Section One


Climate Impacts

Climate-related impacts and likelihood of occurrence and potential severity

Climate Indicators	Impacts to the Oyate	Likelihood	Severity
Health and Well-being			
High annual temperatures	Increasing intensity of snow and ice storms, spring floods, heat waves, and other weather changes can isolate and endanger community members.	High	High
Increasing summer heat indices	Extreme heat events can cause heat stroke.	High	High
Change in extreme temperatures	Increased cold or heat can cause increased indoor air pollution.	Medium	Medium
Housing			
Increase in some extreme weather events such as heat waves, extreme winds, and fire weather	Extreme heat events, wildfires, cold/snow/ice storms, and extreme winds challenge the Oyate's existing housing and infrastructure.	High	High
Electricity, Roads, Bridges, and Dams			
Increases in cooling degree days in summer	Increased demand and stress to electricity grids, along with potential failures during extreme weather.	High	High
Increases in temperatures and precipitation	Increased snow and ice result in increased road accidents and injury, road/bridge maintenance costs and time (plowing, etc.).	High	Low
Sicangu Lakota Culture			
Increases in temperatures, precipitation, and drought	Loss of sacred plants: threaten medicinal and food plants, change habitat and migration patterns of special animals, extreme heat can affect dances and ceremonies.	High	High
Wolakota Bison Herd			
Timing of precipitation increase in growing season	Buffalo are adapted to the Great Plains, but forage production may change, and extreme heat can reduce body size.	Medium	Low

Table 2. Expected changes in key climate indicators, potential impacts to the Oyate because of these changes, the probability or likelihood the impacts will occur, and the potential severity of the impact. Likelihood was measured as **low (0-33% chance of occurring)**, **medium (33%-66% chance occurring)**, or **high (66%-100% chance of occurring)**. Severity or consequences if the impact occurs was assessed as **low (little to no impact to health, water, culture etc.)**, **medium (moderate impacts to health, water, culture etc.)** or **high (potentially severe impacts to health, water, culture etc.)**.

Climate Indicator	Impacts to the Oyate	Likelihood	Severity
Water			
High spring and summer temperatures	Droughts are likely to increase, placing greater stress and competition on human and other uses of water.	High	High
High winter and spring temperatures and increases in precipitation	Warmer winter temperatures, more rain-on-snow events, and earlier springs will likely cause greater flooding.	High	Medium
Wildlife			
Change in extreme temperatures and heat indices, change in precipitation patterns	Potential to see changes in abundance and patterns of wildlife due to increases in drought, flooding, ice/snow, extreme heat.	High	Medium
Hunting and Fishing			
Change in extreme temperatures and heat indices, change in precipitation patterns	Impacts from drought, flooding, ice/snow, extreme heat could reduce health of target populations.	High	Medium
Livestock			
Change in extreme temperatures and heat indices, change in precipitation patterns	Increased frequency and intensity of warm season droughts could limit forage production, changes in temperature and precipitation patterns could cause a transition to different grass types, possibly increasing forage productivity but also in poor quality plant types for grazing. Longer growing season could also increase productivity but may increase pests.	High	Medium
Forest and Wildfire			
Increased precipitation, warmer temperatures, and drought	Increased rainfall, warmer temperatures, and drought will impact forest growth in uncertain ways, extreme fire weather conditions could increase, and flooding cause reduced riparian habitat health.	High	High



Section Two
The Voice of the Sicangu Lakota
Oyate



Photo Credit: Heather Paul

Section Two

Footsteps on a Long Path

The people's thoughts

The Sicangu Lakota Oyate face many challenges. Weather and climate are going to be changing for many generations, and things are likely to get worse before they stabilize. This means there is urgency to begin, but the Oyate must also be aware that they are preparing for a very long journey. “Dealing with climate” is not a single point in time, or a single set of actions, done once and over. The stresses people face will mean doing many things differently -- building better for storms, planting earlier, seeing different relatives arrive in spring and depart in fall. For their own lives and those of their children, this challenge and change will be constant.

The Sicangu Lakota Oyate - The People’s Thoughts

Identifying the path forward would not be complete without talking with the Sicangu Lakota Oyate and listening to their experiences, concerns, and ideas for the future. Throughout the late spring of 2021 and into the early spring of 2022, there was a concerted effort to sit with the Sicangu Lakota Oyate and gather their thoughts. Community meetings were held, a community survey was distributed, talks with elders occurred, and interviews with tribal department heads were conducted. The Sicangu Lakota Oyate know the climate is changing, they have witnessed and experienced the changes and pulling from their experiences and traditional knowledge, they have ideas for the future.

- 1) Community Meetings
- 2) Community Survey
- 3) Tribal Government
- 4) Elder Interviews



Oyate Input with SCCWG Guidance



Photo Credit: Paul Wopilawin Antoine



Section Two

Community Meetings

Impacts of a changing climate and listening to personal experiences from the Sicangu Lakota Oyate

Several virtual community meetings were held in 2021, with the intent of the meetings to gather initial community feedback about climate change (including personal experiences with climate change) and to inform the Sicangu Lakota Oyate about climate change and its potential effects. During the meetings, climate scientists gave some expertise on the changing climate and projections and community members shared their observations of weather changes -- the summers seem hotter and more humid; there are more damaging summer storms; the snowfall in the winter has a higher moisture content that makes it harder for people to get around; winters are different now than they were - less snow and not as harsh. With these weather changes, the people also reported on other changes they have seen -- more pests (e.g., mosquitos); plants and animals that are arriving earlier or later than what was once typical; and increased flooding and fires.

The Sicangu Lakota Oyate would like to see more effort made in taking care of the earth, reducing trash/litter, being more forward thinking about landfill placement, investing in alternative energies, and planting more trees. They want to plan for the changing climate to ensure their people's basic needs are met -- increasing electricity costs, more frequent power outages, and inadequate sewer systems must be addressed. And this must be accomplished by utilizing their traditional knowledge, as Indigenous people are in a unique situation to be leaders in climate change. **Appendix B** provides a synopsis of the community meetings.

The flyer on the left is titled "THIS WEEK! VIRTUAL COMMUNITY MEETINGS ON CLIMATE CHANGE". It lists three meetings: IDEAL - Tuesday 5/25 @ 10am, BUTTE CREEK - Wednesday 5/26 @ 10am, OKREEK - Wednesday 5/26 @ 2pm, and ANTELOPE - Thursday 5/27 @ 10am. It provides contact information for the Zoom call via the Sicangu Climate Crisis Working Group Facebook Page or phone number +1 812 626 6799 X 450 125 2185, and notes that the information is for use during the meeting times above.

The top right visualization is a bar chart titled "Mean Temperature, 12-Months Ending in December, South Dakota - Todd County". The x-axis shows years from 1910 to 2020. The y-axis represents temperature. Red bars indicate positive anomalies (warmer than average) and blue bars indicate negative anomalies (cooler than average). A black line shows the mean temperature trend, which shows a clear upward trend over the period.

The bottom right visualization is a global temperature anomaly map. The map uses a color scale from blue (cooler) to red (warmer). The most significant warming is shown in the mid-latitude regions of the Northern Hemisphere, particularly over North America and Europe, where the colors are bright red and orange.

Flyer announcing community meetings for the Butte Creek, Okreek, and Antelope communities along with examples of information presented at the meetings

Section Two

Community Survey

The Sicangu Lakota Oyate's concerns and ideas for building resilience to a changing climate

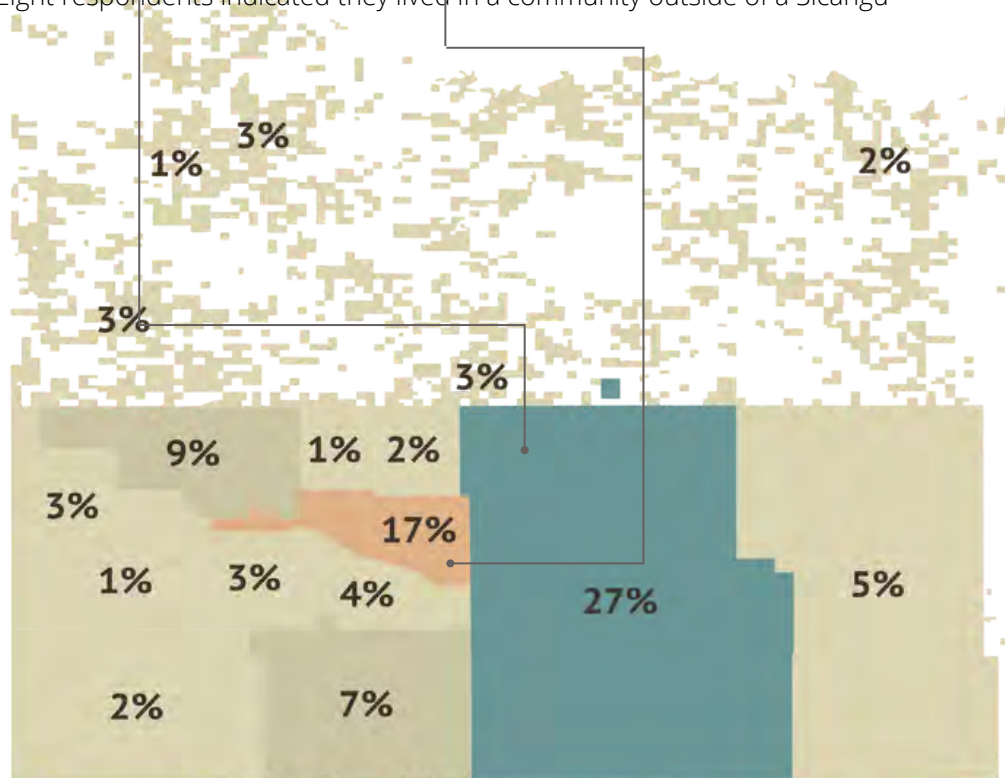
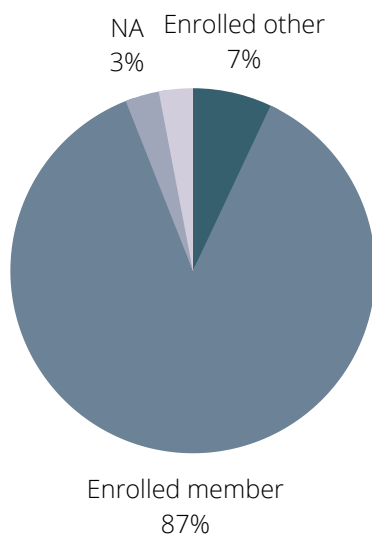
The community survey was conducted to gather additional feedback regarding specific community concerns and personal experiences about a changing climate. The survey also served as a tool for the prioritization of the Sicangu Lakota Oyate's major concerns and how the Oyate should proceed planning for the impacts of a changing climate. **The survey received 271 responses;** synopsis in **Appendix C**.

Communities represented in the survey

Almost **27%** of those who completed the survey were from **Antelope**, followed by **Rosebud (17%)**. All 20 of the Sicangu Lakota Oyate communities were represented in the survey. Eight respondents indicated they lived in a community outside of a Sicangu Lakota Oyate community.

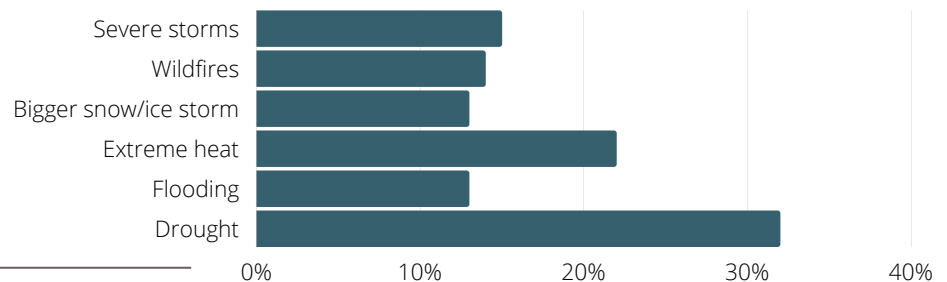
Tribal affiliation

Approximately **86%** of the survey respondents indicated they were enrolled Rosebud Sioux. Not labeled in the chart below were spouses or partners of enrolled members at 3%.



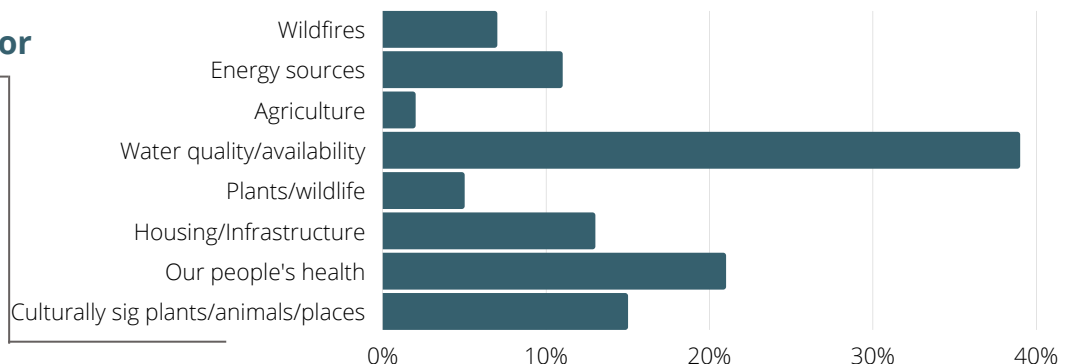
Sicangu Lakota Oyate's concerns about the changing climate

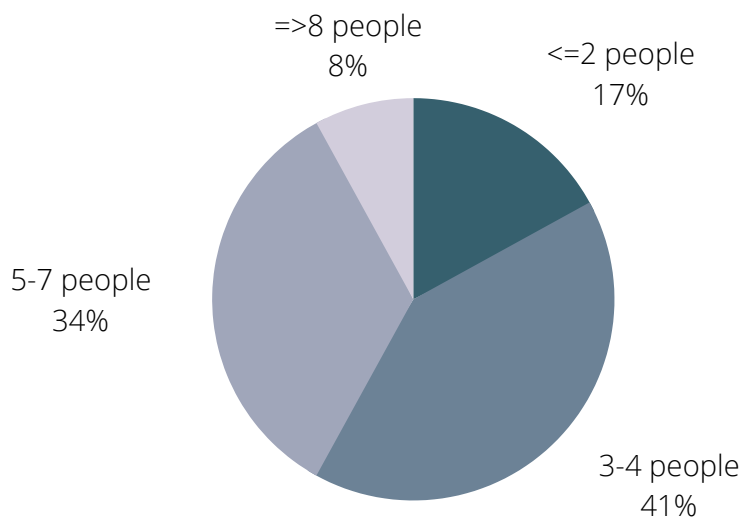
Almost 32% of respondents rated **Drought** as the concern they are most worried about related to climate change followed by **Extreme Heat/Heatwaves**, with approximately 22%.



Sicangu Lakota Oyate's focus for climate change planning

Over 38% of respondents rated **Water Quality and Availability** as the most important issue for the Sicangu Lakota Oyate to focus on for climate change planning. **Our People's Health** was the next highest ranked issue of most importance at approximately 21%.



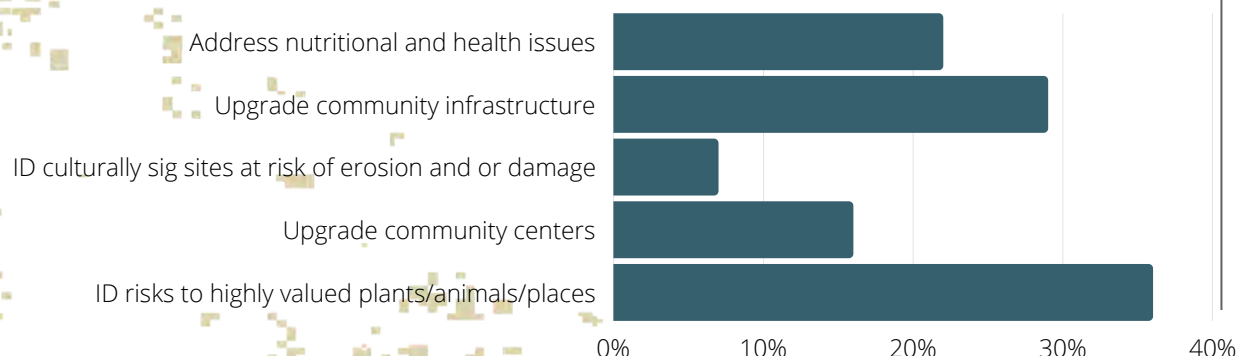


Household size

40% of the responses were from households with **3-4 people**. The next highest percentage were from households of 5-7 people at 34%. Household sizes ranged from 1 to 17. Sixteen survey respondents did not provide an answer to this question.

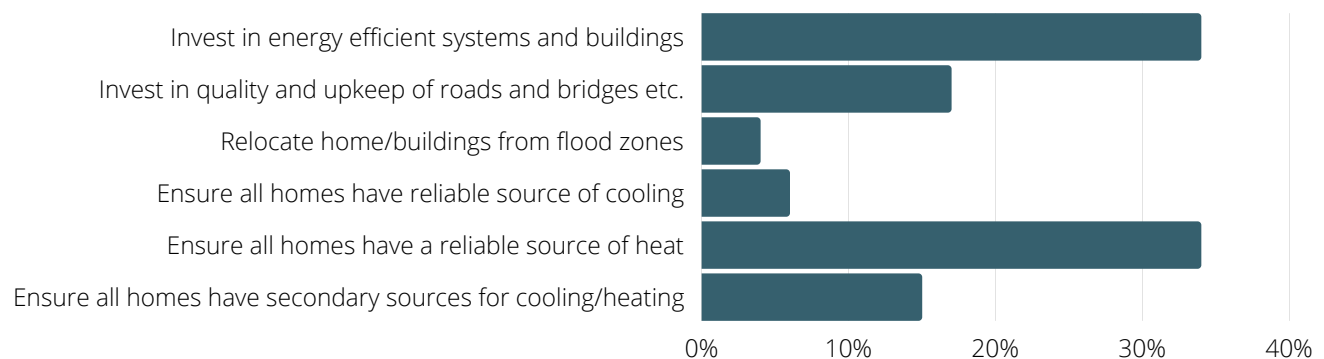
Preparing for the effects of climate change on our people and culture

The highest number of responses indicated there is a **Need to better understand the risks to highly valued plants, animals, and places and the implementation of traditional and cultural land and water management practices using our elders' knowledge and scientists' expertise to help identify those most at risk** with a response.



Improve infrastructure to withstand climate driven weather extremes

Approximately **34%** of the survey respondents want to **ensure all homes have a reliable source of heat**, and to **invest in energy efficient systems and buildings (e.g., better insulation) and/or sustainable sources of energy (e.g., solar and wind) for Tribal buildings and area homes and work to ensure new homes built are suitable for the environment.**



Section Two

Tribal Government

Interviews with Rosebud Sioux tribal program managers

The Rosebud Sioux Tribe has a budget of approximately \$15 million and includes 39 departments and offices to support the Sicangu Lakota Oyate. In the fall of 2021, thirteen "program directors", or the equivalent, met with the SCCWG. The purpose of the meetings was to understand their concerns about climate change and ways the Oyate could respond.

Directors identified the significant risk to life and property from bigger rainfall events and flooding, droughts, and heat waves. They recommended assessing and upgrading infrastructure to withstand greater extremes and ensuring that tribal members are protected from these events -- through heating/cooling centers and emergency fuel deliveries, as well as longer term investments in renewable energy. Several noted substandard housing on the Rosebud Sioux Reservation and identified weatherization, insulation, and rooftop solar to be considered.

Directors also noted that changes in rainfall, drought, temperature, and other factors will place at-risk tribal activities related to forestry, ranching, and agriculture -- as well as living relatives such as buffalo. Some directors identified possible changes in forage for cattle, buffalo, and other wildlife, but response actions were less clear. Better understanding of future changes was a strong desire.

Sicangu Makoce residents and program directors emphasized the importance of water. Sicangu Makoce is relatively well-prepared and well-situated with respect to drinking water supplies and overall drought planning. The Rosebud Sioux Tribe has a Tribal Water Code; recent decisions by the Department of the Interior (DOI) mean that this code may receive the legal backing needed to adopt and enforce it. The Rosebud Sioux Tribe also has a drought plan, but implementation requires scarce resources. **Appendix D** provides a synopsis of the tribal department head interviews.

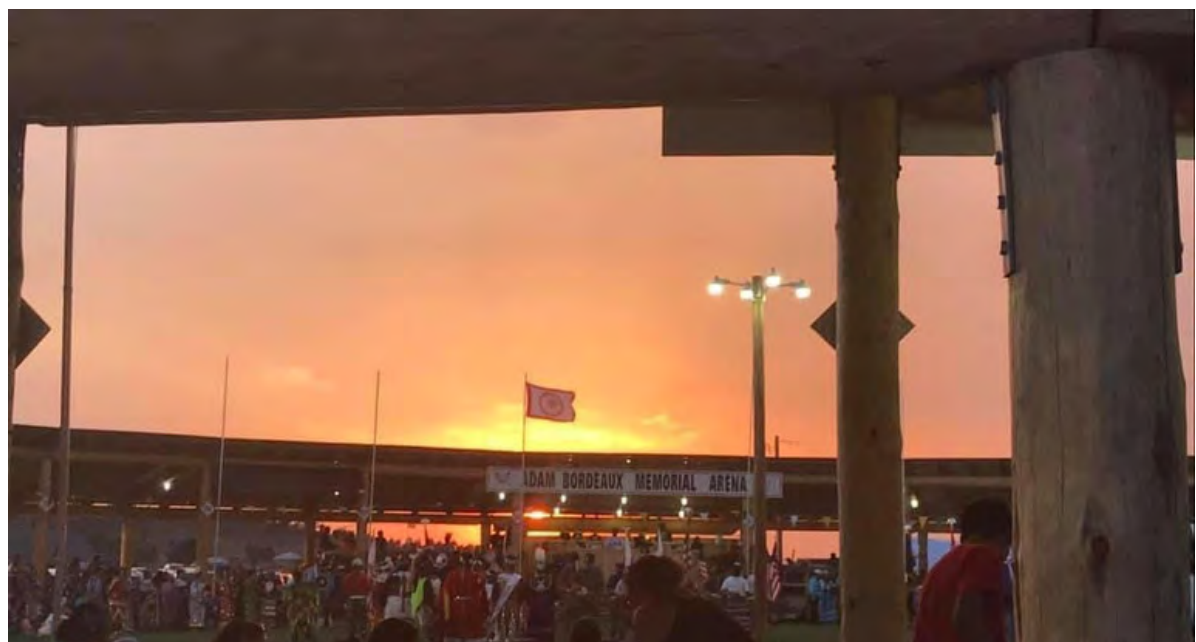


Photo Credit: Paul Wopilawin Antoine

Section Two

Elder Interviews

Traditional Sicangu Lakota Oyate knowledge and climate change

The SCCWG asked several Sicangu Lakota Oyate elders to advise on approaching climate change. These words provided critical context for today's challenges, in light of trauma from oppression and war, and of a history of survival in the face of the odds.

In February 2022, the SCCWG conducted several interviews with tribal elders. The interviews, approximately an hour each, were recorded and broadcasted via the social media platform, YouTube. **Appendix E** provides a summary of the interviews and also a link to the recordings. The elders were asked to speak about climate change and what the Oyate might do about it.

Several of the elders told stories of memorable events, such as the big blizzard in the 1960s, where Claude Two Elk's family ran out of wood and had to burn fence posts and many families went hungry. Or being able to drive cars across the ice on the Little White River. And living from what the world around provided, like game, fish, and medicinal plants. So many birds that they would wake you up in the morning.

And they spoke of living with respect for life, and for Unci Makah, and with gratitude for what she brings. Not wasting life or even digging holes unnecessarily. Recognizing that all beings are relatives, that even rocks and stones have spirit. Seeing the motion of nature, always moving, except where people have stopped it -- like by building dams, and treating valuable things like water as a plaything. The elders noted the loss of connection, and the challenges that this brings. From alcohol and methamphetamines (i.e., meth), to too much trash, to the loss of ceremonial calendars and traditional government, the modern world has robbed people of their respect for life and gratitude for Unci Makah's gifts.

Victor Douville in particular spoke about the origins of the Lakota, and how many elders predicted the kinds of crises we now face, and how these stories remind us of who we are and how we should live. The elders all spoke of Lakota ways, of prayer and life, as being built upon and part of the movement of nature. They spoke of the need to return to these ways and values. They spoke of stepping up and starting somewhere and picking up the trash. They warned of the easy life and its seductions of alcohol, drugs, the plastic bags-and-grocery-life.

The strongest message from the elders was one of responsibility -- for Unci Makah, for the Oyate, for the family, and for oneself. A message that it's time to take on the challenge posed by the pollution and madness of the Western World. A time for assessing what the Oyate have, like its water, and what needs to be done to clean up trash and reduce pollution.

We need to help each other

-Claude Two Elk

Unci Makah must survive if we are to survive

-Sam High Crane

Our view is that everything is connected. Wind, prayers, even rocks

-lone Quigley

Section Three

Recommendations for the Sicangu Oyate



Introduction

Traditional Sicangu Lakota Oyate knowledge, climate change, major concerns, key recommendations, and specific actions

With the guidance from the Sicangu Lakota Oyate in mind, the SCCWG identified three major concerns for the Oyate as climate change intensifies. They are Protecting the Oyate, Protecting and Wisely Using Our Water, and Protecting the Land and Living Relatives.

- **Protecting the Oyate** - Risks to the life and property of the Sicangu people, and to elements of their culture -- special places, medicines, traditional foods, etc.
- **Protecting and Wisely Using Our Water** – Risks to our water. While Sicangu Makoce has adequate water, the future will bring droughts, floods, huge rainstorms, and perhaps attempts to take the water. The Oyate must adapt.
- **Protecting the Land and Living Relatives** - Risks to Sicangu Makoce and our living relatives. Changing temperature and precipitation will change the landscape around us, and with these changes will come different plants and animals, and probably changes to grass production which feeds buffalo, wildlife, cattle and sheep.

From these concerns, SCCWG has identified key recommendations as of overriding importance and urgency for action for the Sicangu Lakota Oyate. Two of these reflect the urgency SCCWG feels for action to ensure the life and property of the Oyate and that our water is secure as climate evolves. Two reflect the need for the Oyate to acknowledge that adapting to climate change is a generations-long effort. Someone must be accountable to the Rosebud Sioux Tribal Council and the Oyate for progress on climate change, and full-time attention is needed to knit together the Rosebud Sioux Tribe's many departments. Finally, true sovereignty for the Sicangu Lakota Oyate requires that we control data and information about us, and our lands and waters, and the Oyate can be leaders in establishing this right.

To tackle a problem, understanding the size and power of the challenge is a first step. Additional specific actions in response to the three concerns were also recommended by the SCCWG and the Sicangu Lakota Oyate. The specific actions are proposed primarily from the elders, the Rosebud Sioux tribal departments, and the people's recommendations.

Protecting the Oyate

Key Recommendation 1: Establish a permanent tribal department led by a Oyate Climate Itacan

Climate change will affect all aspects of Sicangu life, and involve many programs and activities, both tribal and individual. Therefore, the climate crisis deserves a high level of attention as the Rosebud Sioux tribal leadership and Sicangu Lakota Oyate make key decisions, and it needs a focal point for the many activities needed for a sustained climate response.

The actions described in this strategy affect all of the Rosebud Sioux Tribe's departments and offices and all Oyate businesses, farms and ranches, and tribal activities. And, as with all Lakota actions, the strategy envisions responses down the line of generations. The strategy must be periodically reviewed, as the reality of climate changes shows itself (and its surprises), and as state, federal and other partners take action. Our climate actions are likely to be supported by a diverse array of funders, including, hopefully, new ones.

SCCWG and the Sicangu Lakota Treaty Council have played a major role in developing this Plan. The Rosebud Sioux Tribe's Water Resources Department has been a regional leader in drought planning. But climate change is more than, and will last longer than, any other plan the Sicangu Lakota Oyate has made. A permanent tribal office led by a Oyate Climate Itacan would:

- **Coordinate with tribal programs to identify and seize funding opportunities for climate-relevant actions;**
- **Report regularly to the Rosebud Sioux Tribal and Treaty Councils on progress made in implementing the Plan;**
- **Work with educators to expand climate literacy;**
- **Work with regional Oyates, especially the Oceti Sakowin, to showcase Sicangu Lakota Oyate leadership and expand the range of options open to it; and**
- **Provide leadership for the Sicangu Climate Center.**

All involved recognize the fiscal and other constraints on the Rosebud Sioux tribal government. Nonetheless, concerted attention to climate response will save lives and money -- in the long run.

Risks to life and property from climate change are real. Heat waves result in death and suffering -- and will reoccur. Bigger storms mean more flooding, with damage to homes, bridges and perhaps special places. When the Rosebud dam was overtopped -- nearly 100 residents live below. Rosebud has rehabilitated some "high-hazard" dams, but climate change is reducing those margins of safety. Storms of all sorts can cause power outages -- which may mean loss of heating, cooling, and water -- and in the depth of winter or height of summer can mean death as well. Already, some community centers are kept open during events like these, because so many at Rosebud have so little.

-Paula Wopilawin Antoine

Key Recommendation 2: Enhance tribal capacity to protect life and property among the Sicangu Lakota Oyate

Climate change will bring increased risk to life and property for the Sicangu Lakota Oyate. Among community survey respondents, impacts on people -- from drought, extreme heat events, and impacts on water, among others -- are rated most critical for tribal response. Residents recognize that emergencies will occur, that people are vulnerable, and that preparation is urgent.

To respond to this increased danger, the Sicangu Lakota Oyate should undertake a concerted effort to ensure that residents are protected from extreme events and their consequences. This includes a major effort to weatherize existing homes and ensure new ones are built to withstand the future. It includes adding renewable energy sources -- especially small-scale/community level projects. It includes strengthening the public health infrastructure to ensure care for the most vulnerable among the Oyate before, during, and after emergencies.

Survey respondents were vocal on this topic, and recommended actions such as insulating homes and upgrading heating systems, strengthening community centers to shelter those in need, providing renewable energy for grid outages and to reduce greenhouse gas emissions, and upgrading infrastructure to withstand storms.

Housing the people is a priority, and for the Sicangu Lakota Oyate, housing is a major climate concern. Most homes were built to much older design standards for things like insulation, and many are old, leaky and have inefficient heating systems and often no cooling options. Marshaling resources to retrofit or rebuild homes to a climate-ready standard, including consideration of rooftop or community solar, would save residents money and improve their conditions greatly.

Funding is available for energy retrofits, small scale renewable energy installation, and similar activities that increase local resilience. These are crucial. However, the public health aspect of climate change is crucial as well, and involves people caring for others, and having the resources to do so. While funding is not a simple matter, SCCWG believes it is among the most important things the Sicangu Lakota Oyate can do to respond to climate change and protect the people.

Protecting the health of the people is the most important task for any society. Lakota lifeways bring a sense of community and caring absent in much of the outside world. But these ways and indeed lives are at stake. Survey responses recommended the following for high priority action:

- **Better understanding the risks of climate change;**
- **Upgrading infrastructure in their communities; and**
- **Need to address nutritional and health issues associated with climate change.**

Section Three

Protecting the Oyate

Recommended Specific Actions

Plan and build capacity to address human needs in weather emergencies.

Need to determine who is most at risk, how to monitor and respond to emergency needs, determine responsibility and how to support both acute needs and longer term sustainability of infrastructure and housing.

- Ensure all homes have reliable sources of heating and cooling, including emergency backups. Ensure funding to maintain community center heat/cold/snow emergency staffing, etc.;
- Improve substandard housing. Increasing insulation, fixing “leaks”, improving heating/cooling systems, consider rooftop solar;
- Ensure the Rosebud Sioux Tribe Health Administration has resources to conduct or coordinate wellness checks when it is very hot, very cold, people are snowed in, etc. (Fourteen communities have Community Health Representatives who provide rides to appointments, etc. This program could be expanded);
- Plan for flooding and tornados;
 - Invest in the quality and upkeep of our roads, bridges, sewer systems, and ensure that there are “rescue routes” throughout the Rosebud Sioux Reservation.
 - Relocate homes and buildings in flood zones.
 - Ensure all new construction is located outside of flood risk areas. Locate structures and equipment at higher elevations. This may require changes to land use regulations or other zoning controls. Homes within flood inundation zones need significant funding for relocation.
 - Review all dams in light of changes to rainfall and potential flood volume. Rosebud Sioux Tribe has rehabilitated five dams to date.
 - Make sure the people know where they can go during severe weather.
 - Identify areas of concern and have evacuation plans and preparations in place with resolutions to requisition those resources as needed. This should be done for every community.
 - Ensure the Oyate has access to the appropriate forecasts and warning information. Invest in the quality and upkeep of emergency notification systems on a regular frequency to ensure they are in working order.



Photo Credit: Peter Gibbs

- Work with the electric cooperative to “harden” all transmission facilities on and leading to the Rosebud Sioux Reservation. Consider burying new lines and those that are often affected by storms;
- Invest in small-scale solar, community wind power, and other high efficiency or renewable technologies for tribal buildings and area homes to reduce reliance upon the grid, which could very likely become unreliable in emergencies. Communities who plan for these kinds of disruptions and provide alternatives or hardened infrastructure will be in much better shape. Renewable energy can help insulate against shut offs and is valuable for its carbon reduction benefits; and
- Create food sovereignty
 - Assist and provide education and funding for the people to have their own gardens and community gardens;
 - Make traditional foods available such as dry meat for future spiritual or celebration use;
 - Teach the people how to plant food and harvest it, and food preservation techniques; and
 - Need to have local butchers and specialty producers and become less reliant on the current grocery system.



Protecting and Wisely Using Our Water

Key Recommendation 3: Adopt and implement the Rosebud Tribal Water Code and fully implement the Rosebud Drought Adaptation and Mitigation Plan

Mni wiconi -- Water IS life. Water is sacred and all living things rely on it. Without access to enough clean water, the Sicangu Lakota Oyate could not survive. Sicangu Makoce's current water situation is generally positive, with several critical exceptions. The Rosebud Sioux Tribe has legal access to Missouri River water, and the Rosebud Sioux Reservation overlies a major aquifer that supplies many homes and ranches. But, even at present, there are concerns.

Contamination has been found in some wells, but the extent is not well known. This includes high levels of nitrate, hydrocarbons, changes in pH, and pesticides, as well as naturally occurring contaminants including arsenic, fluoride, and selenium. Monitoring of these and other parameters (e.g., suspended solids, coliform counts), however, is not adequate for the Oyate to have a clear picture of water quality. And some alternative sources are contaminated also. The Arikaree aquifer has levels of arsenic and uranium that would preclude its use if Missouri River access was limited in drought times.

The Tribe's Water Resources Department has been analyzing and planning for ensuring adequate water supplies. A Tribal Water Plan was developed and is in the process of being approved for implementation. A drought vulnerability analysis was conducted in 2017, and a drought adaptation plan completed in late 2020.

Water and Sicangu Makoce

Sicangu Makoce water is used by the community for living, by farmers and ranchers, and by the plants and other living relatives.

Most of the water used for community and domestic uses is Missouri River water, provided to the Rosebud Sioux Tribe under a 1988 federal law, assuring about 4.2 million gallons per day to the Rosebud Sioux Tribe and also serving Oglala Sioux, and Lower Brule tribal systems and one community system. River water is taken by a core treatment plant, and then fed to the infrastructure of the four supply systems.

Groundwater under Sicangu Makoce relies on four main aquifers, which also provide baseflow to local streams: Quaternary wind-blown deposits (sandhills) and alluvium, the Ogallala Aquifer, the Arikaree Aquifer, and the White River Group Aquifer. They differ in depth, thickness and capacity, and tribal monitoring, with 28 wells concentrated in the Ogallala Aquifer. There are also several shallow sand lenses that are used as water sources.

There are numerous lakes and small streams, in addition to the larger Keya Paha and Little White Rivers. Over the past several decades, flow has increased in these two larger rivers.

Sicangu Makoce gets about 21 inches of rain, and 37 inches of snow, although climate change is likely to increase overall rainfall, increase winter temperatures resulting in more winter rains or rain-on-snow, and bring earlier spring floods. As noted elsewhere, summer temperatures and low humidity are expected to combine to decrease moisture availability in summer. This may increase irrigation demand in some areas, as producers react to drying conditions.

In addition, the Rosebud Sioux Tribe has partnered with US Geological Survey (USGS) staff and researchers at the Dakotas office, which provided additional data and insights. The primary concern to date has been understanding and adapting to expected droughts, accompanied by longer term concerns over alternate water sources and contamination.

Key conclusions from the 2017 drought vulnerability analysis:

- Groundwater levels on the Rosebud Sioux Reservation are relatively insensitive to droughts;
- Since 1994 the river base flow in both the Keya-Paha River and Little White River has increased by more than a third;
- Isolated water bodies are highly vulnerable to drought;
- Groundwater recharge areas are more susceptible to droughts than discharge areas because recharge areas are more reliant on precipitation, and groundwater may be prone to larger water level fluctuations (see **Fig. 10**);
- Plant species critical to livestock, ranchers, and farmers are susceptible to drought and have a direct impact on the livelihoods of those living on the Rosebud Sioux Reservation; and
- Drought increases the risk of wildfire and the probability of ignition and fire spread.

While Sicangu Makoce is expected to continue getting more precipitation, projections indicate summer heat and drier air will more than offset the additional moisture. The effect could be for drier soils and more warm season droughts. Both living relatives and crops will be affected. Going from flood to drought in one year is a very likely future.

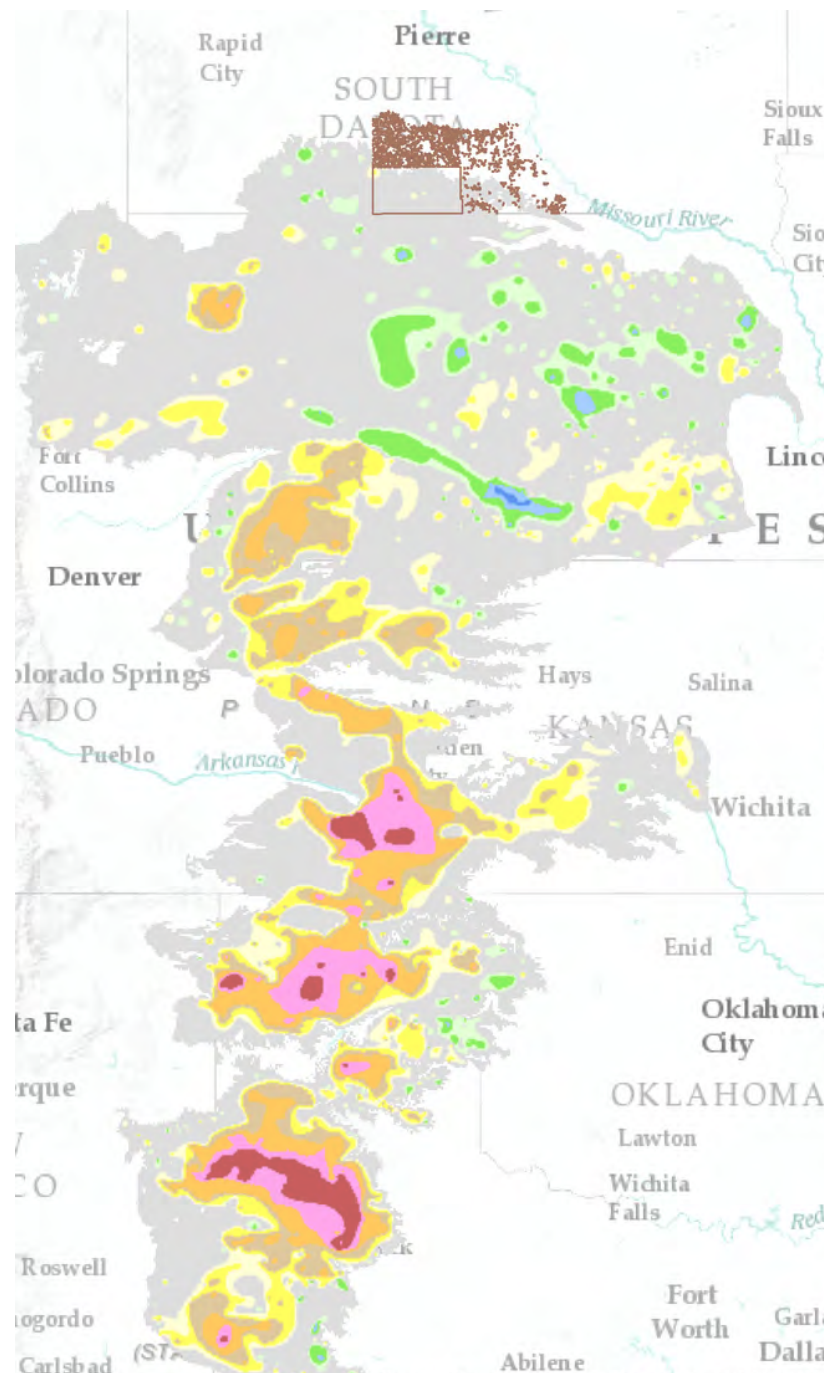


Figure 10. Water level changes for the Ogallala aquifer from 1950 to 2015. Warm colors depict decreases in the aquifer from over 200 to approximately 5 feet. Areas in grey have decreased from 4-5 feet since 1950. Areas in green/blue have increased from 5 to over 50 feet since 1950. (ArcMap Service 2020 digital dataset)

Protecting and Wisely Using Our Water

Recommended Specific Actions

The Tribal Water Code describes allowable uses, constraints on use, and processes for decision making. Previously, DOI policies precluded adoption of many tribal water codes, including Rosebud Sioux Tribe's. DOI recently reversed that policy, and will now consider approval of such codes. The Rosebud Sioux Tribe plans to submit its code for approval, as will other tribes. A key portion of the Tribal Water Code requires all water withdrawals on reservation and trust land and on intermingled fee lands to receive tribal approval. Implementation of this requirement will likely require engagement with irrigators and the State of South Dakota, which claims jurisdiction over all state waters.

There are two key areas where tribal action is essential to ensuring safe, clean and reliable water for the Sicangu Lakota Oyate. These are:

1. **Expand characterization and monitoring of Rosebud water; and**
2. **Expand tribal control over water use by adopting and fully implementing the Tribal Water Code and its Drought Mitigation and Response Plan.**

Both of these areas have multiple parts. Some activities can be conducted by Rosebud Sioux tribal staff, or with external partners, such as USGS or the US Environmental Protection Agency (EPA). Activities under the two key areas could include:

- Develop a strategy for expanded water monitoring in conjunction with USGS, EPA, and the State of South Dakota to provide both baseline and ongoing monitoring to address both water table fluctuations and contaminants;
- Expand and improve the characterization of groundwater. This will also require collaboration with external partners, and some tribal funding. This information is crucial to understanding contaminant risks and expected drought impacts, and to establishing aquifer recharge rates;
- Work with Congressional allies to ensure adequate funding for water resource studies at USGS, EPA, and the Bureau of Reclamation; and
- Implement drought response measures to:
 - Set thresholds for action on drought;
 - Provide education on the need for voluntary conservation and water storage;
 - Support residents in collecting rainwater; and
 - Build a facility to recycle and store water.

A longer term consideration is climate migration and pressure for scarce water resources. The Sicangu Lakota Oyate's access to Missouri River water is currently guaranteed by Congressional action. However, as climate change proceeds, and some areas of the country become less habitable, pressure on those with resources could increase. Several of these actions could bring the Rosebud Sioux Tribe into engagement with the US Congress as well as state and federal courts. For example, the Rosebud Sioux Tribe could implement the Tribal Water Code thereby asserting inherent sovereignty rights over water and challenging state primacy, and vigilantly guarding Missouri River access.

Movement to the Plains: Climate Change and the Migration of the Ojibwa

Climate change in the 16th and 17th centuries brought about migration of the *Ojibwa* (Dakota, Nakota and Lakota tribes of the Ojibwa) from the Great Lakes. In that time, the western Great Lakes region was wetter and colder. The *Ojibwa* entered the western Great Lakes area, after undertaking a grueling trip from North Carolina and the desire to rest in Minnesota, then to continue their journey to the Plains and the Black Hills, the place they left over a thousand years prior.

The trip took ten decades to complete and finally by the late 1500s, they arrived. The migration was led by the Lakota speaking dialect followed by the Nakota/Dakota dialect speakers. The Dakota speaking dialect followed last. The Lakota speakers settled at Sauk Rapids while the Dakota/Nakota speakers settled around Red Lake, while the Dakota speakers settled down around Leach Lake and Mille Lac. By early 1600, the *Ojibwa* were now settled and began to re-explore their domain.

About this time the climate change had already begun and it would take a hundred years to completely alter the landscape. And because it was gradual no one noticed the changes immediately, but keen senses possessed by animals and plants reacted to the changes. Thus, the biomes started to define where the ecotone of each plant life, animal forest would be and by the end of the 17th century it would be almost complete.

The Coniferous forests started the domino effect by expanding southward and the neighboring deciduous forests responded by moving southward causing the tall prairie grass to retreat southward. In its moving to the south, the tall prairie grass pushed the steppe grass southward. After a hundred years or more, the biomes and ecotones were distinct.

The animals feeding on certain plants followed this choice plant wherever it spread and the most significant were the white tail deer and the bison. The white tail deer stayed in the deciduous forest while the bison moved to the southernmost area where the displaced steppe grass grew. Moreover, the deer moved into the territory considered a no man's land that both the Dakota and Ojibwa claimed jurisdiction, this intensified their desire for warfare. Meanwhile the bison, the single animal that both the western *Ojibwa* and the eastern *Ojibwa* depended on the most, moved out of Minnesota and followed where the steppe grass grew in abundance.

Around the 1760s, the western and middle *Ojibwa* called the Ihankton, the Tinton and some Dakota speakers, decided to follow the bison westward due to the displacement of the bison and other factors. They moved out of the prairie-woodlands and targeted the Black Hills and the east of Black Hills for settlement (Fig. 11).

Figure 11. Movement of the Ojibwa from the prairie-woodlands to the Black Hills for settlement. Map and text courtesy of Victor Douville.



Protecting the Land and Living Relatives

Key Recommendation 4: Establish a Sicangu Climate Center for focused information and sovereignty for the land and living relatives

As a nation, as a people, it is essential that the Sicangu Lakota Oyate have adequate information to make informed decisions about their lands, water, plants and animals, relatives and the Sicangu Lakota Oyate themselves. And, in a time of changing climate, understanding tribal assets and monitoring them carefully for change is a necessity. For a nation to survive and prosper, and to be truly sovereign, it must be able to assess how its people, lands, waters, and living relatives fare.

Federal and state government agencies compile and control an enormous amount of information about the Sicangu Lakota, and the Oyate often has to petition the agencies for access. Such data and information are scattered and unconnected, which often requires work to stitch together various information from different jurisdictions. This is especially true of county-level information, as the Rosebud Sioux Reservation lies within five counties.

Observed changes to the land and living relatives

The Sicangu Lakota Oyate are a people of the land, and rely on what comes from it in so many ways. They walk the land, grow cattle and hay, visit with living relatives, eat from its bounty -- berries, fruits, deer, elk, rabbits, birds, and prairie dogs. The land has fed the people before, and continues to feed many at Sicangu Makoce. Elders described reverence and gratitude for nature as being at the heart of Sicangu Lakota Oyate culture.

And people see changes. Several residents noted that fewer magpies are seen, and elders spoke of fishing in now fishless streams, and of the disease in deer. The changes in weather and climate are so large and so intense that they will affect all who live on the land, two legs and four.

Plants and animals move with the weather, as the Ocete Sakowin Oyate did. Unlike the Oceti Sakowin Oyate, however, these relatives will continue to move. Migrations will change. Things will bloom early and be frost-killed. The land will change. The Sicangu Lakota Oyate must face the reality that, without help, many of these friends and relatives will be gone.

Some of these movements could have a major impact on the Oyate. If predictions of our grasslands converting to shrublands because of climate change come about, our ability to support beef cattle and perhaps even buffalo will be affected.

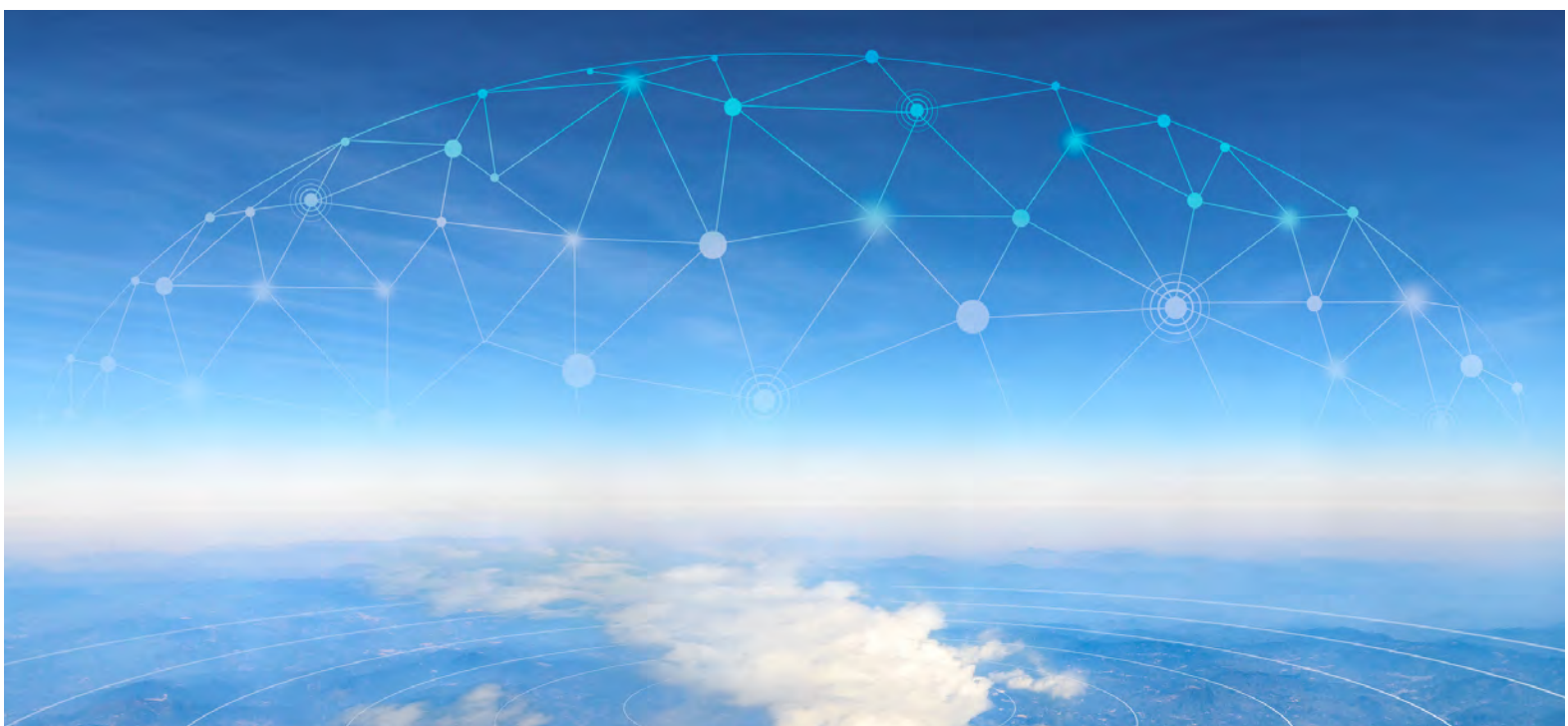
Fire likelihood also increases with climate change. Will the woodlands and wood lots within the Sicangu Makoce burn again? Will trees return? Some elders spoke of the need for greenhouses to prevent the loss of important plants, for medicine and other use. Heat, drought, fire and erosion threaten many sacred places and plants. Sharing and building the knowledge of important relatives within the Oyate can help us ensure they survive the coming changes also.

However, simply acquiring or getting access to information is not enough. As a nation, the Sicangu Lakota may not currently have enough of the expertise needed to assemble, interpret, and manage the kind of data needed for effective management in the face of change.

Therefore, the Oyate should pursue the establishment of a **Sicangu Climate Center**. The Sicangu Climate Center would work closely with Rosebud Sioux Tribal Council and Rosebud Sioux tribal leadership to define what information is needed most and first. At the same time, staff would energize connections with the Bureau of Indian Affairs (BIA), USGS, NOAA, and partners such as the North Central Climate Adaptation Science Center to acquire key datasets and data management, manipulation, and interpretation skills. Additionally, the Sicangu Climate Center would strengthen connections with other nations of the Oceti Sakowin Oyate, which collectively own a vast landscape, all of it facing change.

The key goals of the Sicangu Climate Center would be to:

- **Provide the Sicangu Lakota Oyate with a clear picture of how their lands, waters, and living relatives are changing by developing indicators to track how climate change is affecting the Oyate;**
- **Directly support and facilitate tribal decisions about infrastructure, public health, and managing lands and waters;**
- **Prevent damage to life and property from storms, floods, extreme winds, and other weather disasters by acquiring the best available projections of weather, stream flows and other indicators, establishing weather stations on the Sicangu Makoce, and becoming part of regional early warning systems; and**
- **Eventually cover and help unite all Oceti Sakowin Oyate lands, including the Black Hills.**



Section Three

Protecting the Land and Living Relatives

Recommended Specific Actions

Many of the recommendations provided by tribal members dealt with overall resilience of the Sicangu Lakota Oyate as opposed to focusing only on climate change. This message was repeated by many, and clearly demonstrates the Oyate's awareness, love, and concern for the landscape around them.

Specific recommendations included:

- Clean up the Rosebud Sioux Reservation, including junk car removal, and trash in the communities. Create recycling areas and encourage people to clean their yards and communities. Consider giving fines and/or mandating recycling. Improve trash management at the landfill;
- Expand local food growing to expand tribal food sovereignty. Support local markets to create revenue, jobs and skills for tribal members;
- Help educate the youth on caring for the land and using it with minimal negative impact on Unci Maka;
- Promote habitat and water conservation and reduce overgrazing of the grasslands; adopt and enforce land management practices to achieve this goal;
- Understand trends in forest growth and fire for the Sicangu Makoce. Use the results of the recently completed forest inventory, in collaboration with BIA, the US Forest Service, and other partners;
- Plant more trees;
- Begin tracking forage production and use on all Rosebud Sioux Tribe-controlled lands. This information base will be useful as climate change continues, possibly changing forage phenology (timing), productivity, and timing. South Dakota State University Extension and BIA range specialists are potential partners in designing and implementing such data collection, and the Sicangu Climate Center could serve as host and analyst;
- Understand how climate change will affect forage production. There is at present no agreement on how the various aspects of climate change will combine to change grass composition and productivity. The Sicangu Oyate should develop partnerships with agriculture experts and climate scientists to ensure they have access to the best knowledge about this crucial resource;

Section Three

Summary of Impacts, Priorities, and Actions

Potential impacts based on climate indicators expected to change, priority for planning, and recommended actions

Table 3. Expected impacts to the Oyate, priority for planning based on **High** (high chance of occurring, high-medium impact severity, and if the Oyate are high-moderately susceptible to the expected impacts), **Medium** (high-medium chance of occurring, medium-low impact severity, and if the Oyate are not critically susceptible to the expected impacts), or **Low** categories (medium-low chance of occurring, low impact severity, and if the Oyate are not critically susceptible to the expected impacts), and recommended adaptation actions for improving resilience.

Impacts to the Oyate		Priority	Recommended Actions
Protecting People and Culture			
Health and Well-being	Increasing intensity of snow and ice storms, spring floods, heat waves, and other weather changes can isolate community members	High	<p>Key Recommendation: Enhance tribal capacity to protect life and property among the Rosebud community, especially in extreme weather</p> <ul style="list-style-type: none"> Build capacity for wellness checks; expand Community Health Representative program
Health and Well-being	Increase in extreme heat/heat waves, which can cause heat stroke and respiratory problems. Small children and elders are most at risk.	High	<ul style="list-style-type: none"> Increases and improve reliable heating and cooling Retrofit housing (leaks, insulation, solar)
Health and Well-being	Increased cold or heat can cause increased indoor air pollution.	Medium	<ul style="list-style-type: none"> Capacity for wellness checks; expand Community Health Representative program
Housing	Extreme heat events and cold/snow/ice storms challenge Rosebud Sioux Tribe's housing.	High	<ul style="list-style-type: none"> Ensure all housing is "climate ready" Improve standards for new construction Install rooftop and community solar systems
Electricity, Roads, Bridges, and Dams	Increased flooding, snowstorms, and wildfires create risks to hard infrastructure.	High	<ul style="list-style-type: none"> Invest in vulnerable roads, bridges, and sewer systems Ensure emergency access roads exist Ensure new construction is out of risk areas Relocate structures at risk Emergency alert system for flooding
Electricity, Roads, Bridges, and Dams	Increased snow and ice result in increased maintenance costs and time (plowing, etc.).	Low	<ul style="list-style-type: none"> Increase funds for maintenance of vulnerable roads, bridges, and sewer systems
Electricity, Roads, Bridges, and Dams	As climate stresses regional electricity grids, the Oyate can expect failures during extreme weather.	High	<ul style="list-style-type: none"> Work with utilities to harden area infrastructure; consider burying lines Invest in rooftop and community solar and small-scale wind systems

Impacts to the Oyate		Priority	Recommended Actions
Protecting People and Culture			
Food Sovereignty	The Oyate rely on food from outside sources. Locally grown and processed food saves energy, improves quality/quantity of food and reduces reliance on risky outside sources.	Medium	<ul style="list-style-type: none"> Assistance, education, funding for home and community gardens. Prepare traditional foods (e.g. dry meat) for ceremonial use Teach food preservation Support local butchers and specialty producers
Oyate Culture	<p>Loss of sacred plants: Higher temperatures, more rain plus more drought, following all threaten medicine and food plants</p> <p>Special animals moving away: Changing climate will change habitat and migration patterns.</p>	High	<ul style="list-style-type: none"> Monitor populations of special relatives Build gardens for failing populations Provide water or other resources Provide cooling stations for dancers and celebrants when ceremonies cannot be postponed
Wolakota Buffalo Herd	Buffalo are adapted to the Great Plains, but forage production may change, and extreme heat can reduce body size.	Low	<ul style="list-style-type: none"> Monitor conditions during extreme events Develop climate indicators to track forage and temperature stress
Ensure implementation and updating of this Plan	Climate change will affect the Sicangu Oyate for many generations. The Plan is a first step identifying where risks and opportunities lie. The Oyate must designate a person or office to keep focus on actions needed to protect our people. A changing climate will bring surprises, and the Plan will need to be adapted to survive.	High	Key Recommendation: Establish a permanent tribal office led by a Oyate Climate Itacan.
Protecting Our Water			
Drought	Droughts are likely to increase, placing greater stress on human and other uses of water.	High	<p>Key Recommendation: Fully implement the Tribal Water Code and Rosebud Drought Adaptation Plan</p> <ul style="list-style-type: none"> Expanded water monitoring Improved characterization of groundwater Setting action thresholds based on drought metrics Education regarding water conservation Rainwater collection and re-use
Flooding	Warmer winter temperatures, more rain-on-snow events, and earlier springs will likely cause greater flooding.	Medium	<ul style="list-style-type: none"> Invest in vulnerable roads, bridges, sewer systems, etc. Ensure emergency access roads exist Ensure new construction is out of risk areas Relocate structures at risk Emergency alert system
Access to Missouri River water	Rosebud Sioux Tribe has access to the Missouri River based on federal legislation.	High	<ul style="list-style-type: none"> Remain vigilant to national and regional trends. If competition for water sources increases, as expected, work actively to preempt erosion of Lakota rights.
Rosebud Reservation and trust land wells	<p>Understanding of flow patterns and connections across the various shallow water sources is incomplete.</p> <p>Some wells are contaminated with human and natural contaminants.</p>	High	<ul style="list-style-type: none"> Implement the Water Code and assert sovereignty over reservation/trust land groundwater. Improve characterization of groundwater. This will help identify areas at risk, wells needing remediation, etc. and better plan for use of these smaller water sources.

Section Three

Summary of Impacts, Priorities, and Actions

Table 3 cont... Expected impacts to the Oyate, priority for planning based on **High** (high chance of occurring, high-medium impact severity, and if the Oyate are high-moderately susceptible to the expected impacts), **Medium** (high-medium chance of occurring, medium-low impact severity, and if the Oyate are not critically susceptible to the expected impacts), or **Low** categories (medium-low chance of occurring, low impact severity, and if the Oyate are not critically susceptible to the expected impacts), and recommended adaptation actions for improving resilience.

Impacts to the Oyate		Priority	Recommended Actions
Protecting the Makoce and Living Relatives			
Trash and Litter	The Oyate raised this topic more than any other. While not directly related to climate, this is a visible and important statement to build resilience for the Oyate.	Low	<ul style="list-style-type: none"> Organize community cleanups Instill greater respect for the land
Sacred Plants and Animals and Wildlife	Drought, flooding, ice/snow, extreme heat all affect plants and wildlife. Climate projections indicate plant communities could change over the next 80 years.	Medium	<ul style="list-style-type: none"> Develop climate related indicators and monitoring system for special plants and animals and wildlife as part of Sicangu Climate Office.
Fishing and Hunting	Impacts from drought, flooding, ice/snow, extreme heat could influence abundance and distribution of target species.	Medium	<ul style="list-style-type: none"> Include target species as part of the indicators and monitoring system created by the Sicangu Climate Office.
Forage and Livestock	<p>Climate change could cause a transition to different grass types, possibly increasing forage productivity and decreasing it for other important species.</p> <p>Extreme heat can stress and reduced productivity of large animals.</p> <p>Longer growing season can allow early turnout, but may also allow pests to thrive.</p>	Medium	<ul style="list-style-type: none"> Increase grazing efficiency by improving cross-fencing and develop new water sources. Understand how climate is changing forage productivity and adjust livestock and buffalo stocking rates and schedule. Develop climate related indicators for monitoring forage production, grass community abundance and distribution, pest incidence and related factors.
Forest Condition and Firewood Production	Increased rainfall, warmer temperatures, and drought will impact forest growth in uncertain ways.	Medium	<ul style="list-style-type: none"> Understand recent trends in forest growth and condition, using BIA's recent survey data. Assess capacity for continued firewood production at historic rates and evaluate scale of operations.
Wildfire	Climate projections indicate extreme fire weather conditions will increase over the next 80 years.	High	<ul style="list-style-type: none"> Ensure warning systems are in place for fire weather. Ensure forest conditions minimize extreme fire behavior.
Ensure Sicangu Lakota Oyate Data Sovereignty	This Plan highlights the many aspects of Oyate life that are or will change, and about which information is scattered among many non-tribal entities, often fragmented by colonial border lines (counties, especially), and organized according to agency mandates, not tribal priorities.	High	<ul style="list-style-type: none"> Key Recommendation: Establish a Sicangu Climate Center.

Final Thoughts

The adoption of the Climate Adaptation Plan for the Sicangu Lakota Oyate is the next right step for the Sicangu Lakota Oyate.

This plan creates the pathways and opportunities for our leaders to address the needs of the People and all living things so that we can prepare for a changing climate.

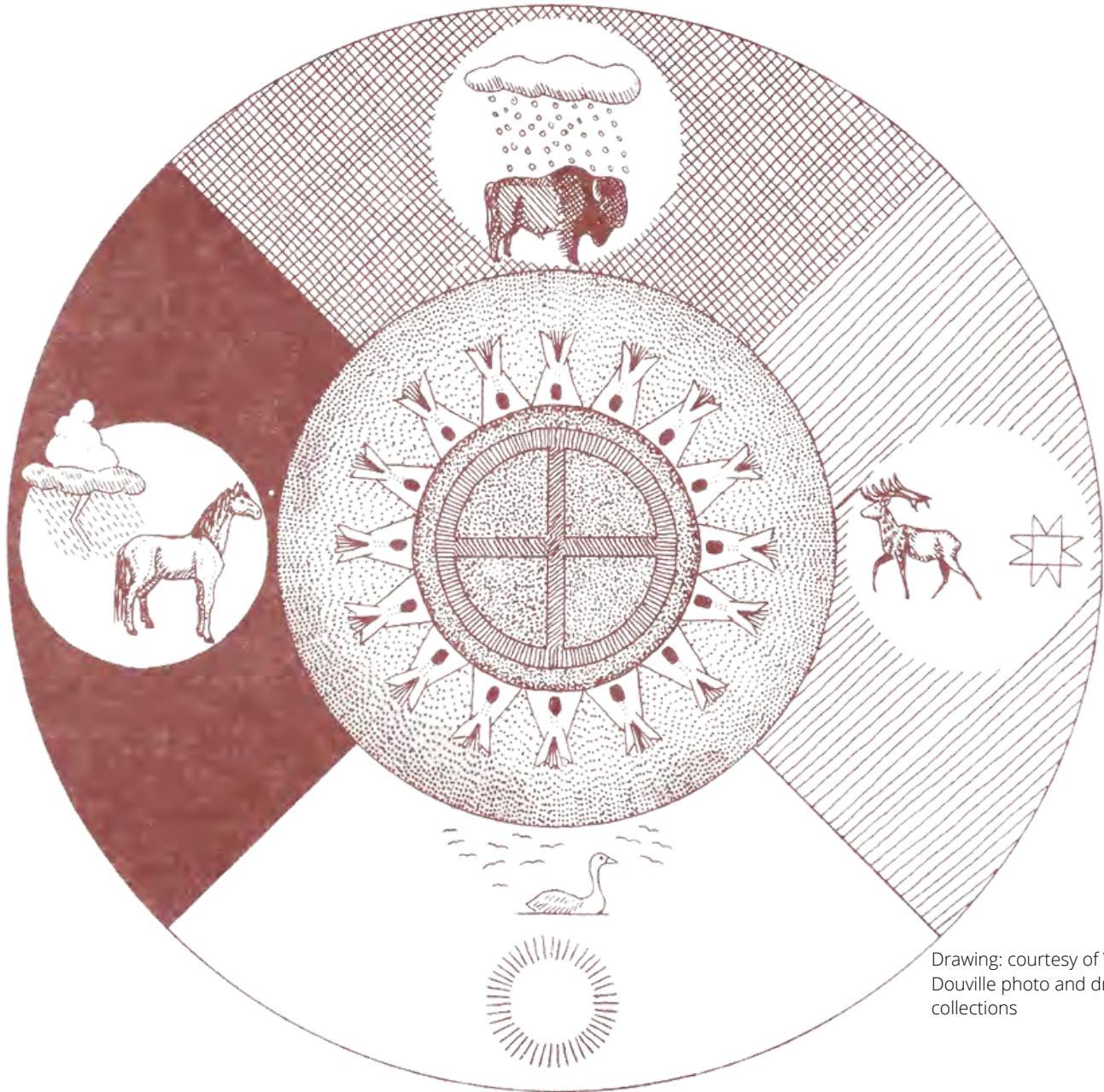
We have a responsibility to make decisions utilizing our Lakota knowledge systems and western based science within a Wolakota framework to protect and sustain our Lakota cultural heritage.

I strongly urge the Sicangu Lakota Oyate to consider the findings of this plan and to prepare yourselves for the work ahead.

To that end, we do all these things to say “Hecel Oyate ki Nipi Kte” so the People may live.

-James Rattling Leaf Sr.





Drawing: courtesy of Victor Douville photo and drawing collections

Hecegla

(that is enough)



About the Climate Adaptation Plan for the Sicangu Lakota Oyate



Photos

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Each are individually cited.

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