



Pektayiinata = We are Resilient

Oscarville Tribal Climate Adaptation Plan

Oscarville Traditional Village, Oscarville, Alaska

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PREFACE

By Jackie Qataliña Schaeffer

As an Iñupiaq from Northwest Alaska I truly believe that we stand at the cusp of change as we witness the climate impacts and extremely-swift changes in our environment in Alaska. From temperatures rising to ocean's warming, from melting permafrost to a change of migration of birds and animals, we sit in the front row of nature's response to human-led actions that contribute to these changes. Our ancestors had generations to adapt to changes that we are responding to in a single generation. This report was led by rural Alaskans, written by rural Alaskans, and is an attempt to bridge the gap between indigenous knowledge and Western science.

In 2014, I sat in a coffee shop with Jack Hébert, CEO/Founder of the Cold Climate Housing Research Center and Mike Black, Director of Rural Utility Management Services, Tribal Utility Support for the Alaska Native Tribal Health Consortium. As friends and longtime advocates for rural projects, we discussed the struggles to build sustainable, cost-effective, community focused projects across our rural Alaska landscape. Most identified failures were due to the lack of community involvement from the initial planning stage to the lack of agency and funder understanding of culture, traditions and rural lifestyles. In rural Alaska we have a saying, "Every season has a reason." This ties us to our seasonal connection to the land, air and sea. Our gathering for medicinal plants, berries and greens, our hunting, fishing and seasonal food resources, and our ancient practice of subsistence lifestyle are embedded in this saying. At this table, on a napkin, birthed the concept of the "Holistic Approach". I personally have been deeply committed to continue these efforts in changing the approach to projects in rural Alaska.

It was our hope, as this document developed, to re-design the framework for adaptation planning and bring to light the importance of ancient wisdom and storytelling that so richly lives in the hearts and minds of our rural people. We know that we must continue to evolve if we are to adapt in a timely manner. In that space-in-between (where indigenous knowledge and Western science blend), we will begin to create new, innovative designs, frameworks and ways to become stronger and more resilient.

My heartfelt gratitude to the people of Oscarville for opening your hearts and sharing your stories. You have forever impacted my life. A big thank you to Princess Lucaj Johnson and the staff at CCHRC, who contributed to this effort.

RE-design the Framework Yupik Drum: "Cauyaq"

Frame never Ending :: Holistic
Skin stretched Tight :: Foundation
Woven in Strength :: Resilient
Bound to Sustain :: Sustainable

Holistic :: Value-based Mindset
Foundation :: Indigenous Wisdom
Resilient :: Space In-between
Sustainable :: 7 Generations Deep



Drum photo courtesy of Phoebe Apperson Hearst Museum of Anthropology, University of California, Berkeley 2 4588

WHERE WE ARE FROM: OUR HISTORY



INTRODUCTION

Oscarville is a small, remote Yup'ik community whose primary food resources come from the land, air and sea. This community is deeply rooted in the traditions and culture of the Yup'ik people. Traditional dancing, singing and games highlight the community gatherings.

Alaska indigenous people have a common cultural connection to place. Many of the 11 distinct cultures in rural Alaska prioritize their connection to place and subsistence way of life over the conventional Western amenities. This connection is deeply rooted in access to birds, fish, greens, berries and animals for food security. Many of the rural communities gather a large portion of their food resources locally. The dynamics of this way of life and thinking creates a diverse challenge when planning for community development. Indigenous populations in Alaska are uniquely vulnerable to climate change because of this relationship with, and dependence on, the land, sea, and natural resources for their well-being.

The history of settlement in rural Alaska did not incorporate this element or the involvement of the residents living there. The connection to place and the cultural practices have existed for over 10,000 years in some documented locations. The subsistence lifestyle of rural tribes is valued and prioritized in a very unique manner. Since most settlements were temporary, seasonal subsistence camps later turned into permanent settlements by Westerners, climate change impacts have made it very difficult to adapt appropriately and timely. In the traditional lifestyle, the community would simply relocate to the next seasonal hunting/fishing location. With the development and implementation of Western technology this tradition no longer exists.

Adaptation in place is simply not an alternative in some cases. Depending on location, some communities stay and protect in place, some slowly relocate, and some have no choice but to completely build a new community elsewhere. Erosion, melting and disintegrating permafrost (permakarsting), severe storm surges and warmer temperatures has caused a very rapid environmental change cycle which is destroying millions of dollars of infrastructure, including sanitation systems, housing, transportation (roads, bridges, waterways) and energy systems. Adaptation to this vicious cycle is forcing a new age of thinking, strategic planning and preparedness that is culturally and environmentally appropriate.

With more frequent and unpredictable weather patterns, the people of Oscarville are having to rethink adaptation and how to respond to a rapidly changing environment. This report utilizes the traditional wisdom of the Yup'ik people and infuses the Western science and research into a new space for value-based decision making for adaptation. Predictions show the Arctic has warmed three times faster than elsewhere in the Northern Hemisphere, reversing a 2000-year cooling trend, and outpacing current climate model predictions. <https://www.tandfonline.com/doi/full/10.3402/gha.v2i0.2075%40zgha20.2009.2.issue-s2?src=recsys>

*“Pitam wall’neqem auga uqlauesqumanritaat.
Kingunra nakriarucugngauq.”*

*“Blood of the caught animal or fish should be kept from being
trampled on because it can cause an extinction of the animal or fish.”*



John Oscar, Artist

RAVEN FINDS LIGHT

All the Native groups in Alaska have folklore, myths and children's stories relating to how the Raven made things, his encounters with other animals, his clever ways, a trickster, getting tricked by other animals, and his encounter with man who had developed from a pea pod. Raven even thought he was the smartest in the world, until he came upon an old woman.

Raven is said to have white feathers before he found light. There was darkness upon the earth with no light except the oil lamps that lit their dwellings. One day, he tells everyone that he is going look for light, so everyone will be able to see. He looked all over the land for light with no luck. He decides to go into the heavens and search. For many days he never came back. Then one day he came back so happy, all sizzled and black and said with glee "I found the light."

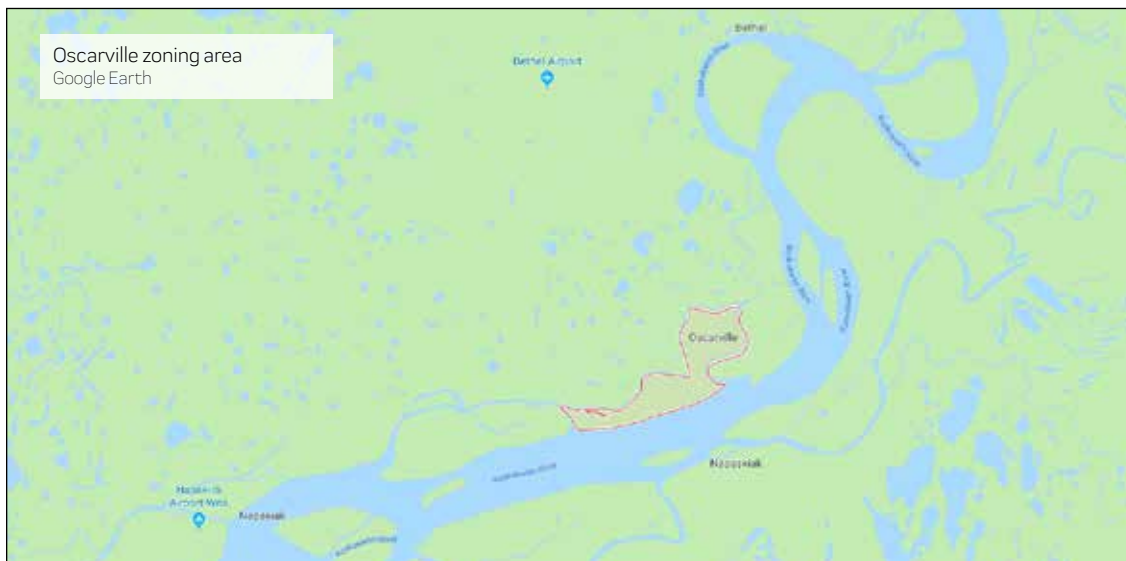
The light he found was the sun, the milky way is the trail he left behind with his snow shoes.

COMMUNITY OVERVIEW

Oscarville is on the north bank of the Kuskokwim River, opposite Napaskiak. It is 6 miles southwest of Bethel and about 400 miles west of Anchorage. Oscarville is within the western transitional climate zone, characterized by tundra interspersed with boreal forests, and weather patterns of long, cold winters and short, warm summers. The weather is influenced by storms in the Bering Sea. The Kuskokwim River is typically ice-free from June through October (DCCED 2018).

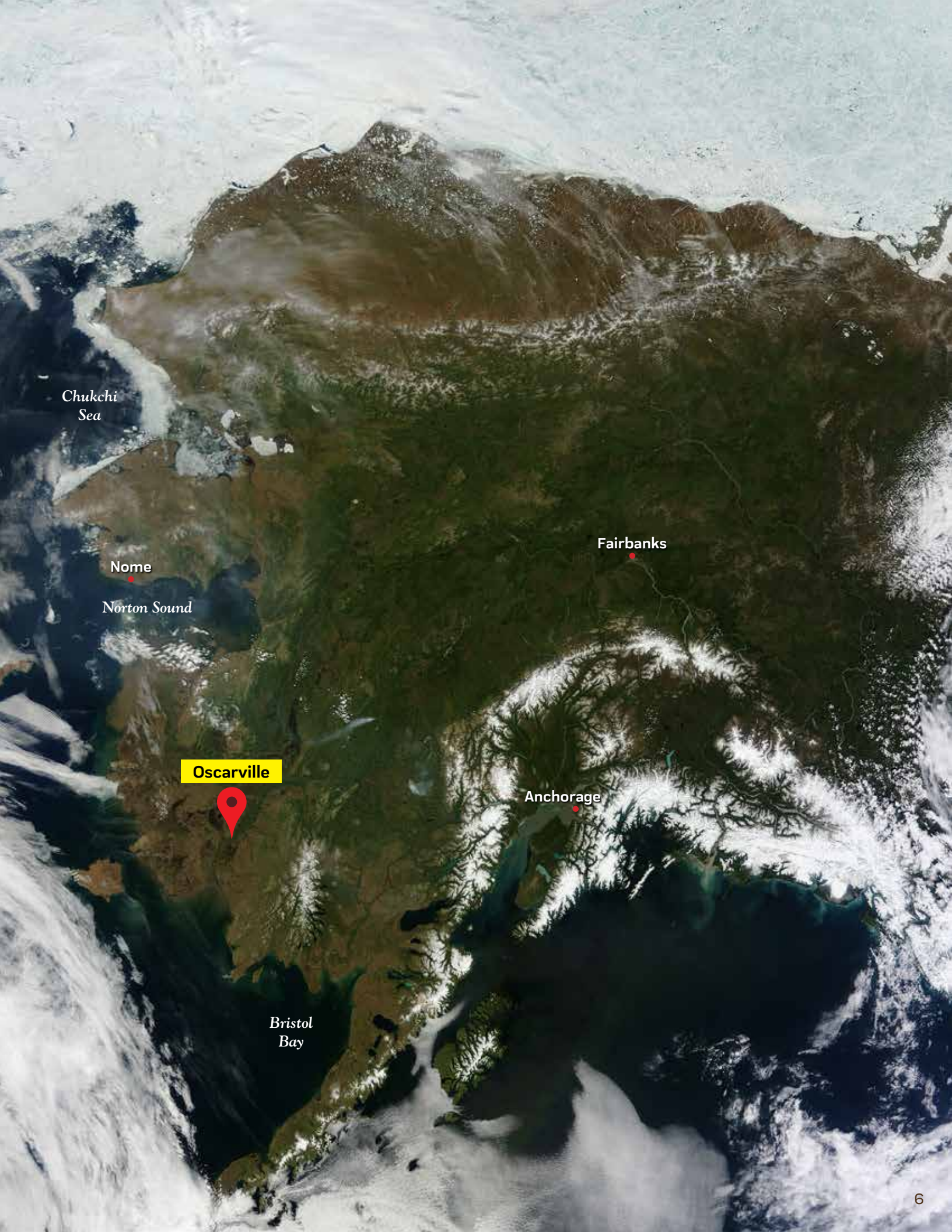
Oscarville is a Yup'ik Eskimo community with extreme climate, economic and infrastructure challenges. According to the State of Alaska Department of Labor, the Yukon-Kuskokwim region is demographically the poorest part of Alaska. In Oscarville, there are no roads, no running water or in-home sanitation systems and no airstrip. There are few job opportunities, and the average annual wage is less than \$20,000. Climate change is adding further stress to the community, as thawing permafrost and river erosion threatens structures and way of life in Oscarville, as well as the current access to the village via a shallow slough. The residents of Oscarville heavily rely on their traditional Yup'ik practices and subsistence lifestyle. This cultural strength is the foundation of this report.

Oscarville is currently the focus of a multi-agency pilot project to develop a framework for Alaska Native villages that addresses climate adaptation, sustainability and project implementation. The project; called “the Holistic Approach to Sustainable Northern Communities,” brings together federal and state agencies, tribes, and development organizations to collectively address energy, housing, health, transportation, and economic development in a way that promotes the long-term



“Ilakliuyuciq aturluku ilaten ikayurnarqaqata ikayualuki.”

“Keep practicing ‘Family helping each other when help is needed.’”



Chukchi
Sea

Nome

Norton Sound

Fairbanks

Oscarville

Anchorage

Bristol
Bay

The outcome of this project is the production of three key sections: Where we Come From: Our History, Where we Are: Today, and Where we Are Going: A Path Forward. This technical section comprises the first milestone of the project. It represents the work of a multidisciplinary team led by the Oscarville Traditional Council (OTC), the Cold Climate Housing Research Center (CCHRC), and the Alaska Native Tribal Health Consortium (ANTHC). This technical section describes the scientific data and potential climate change scenarios, assesses possible local impacts, and identifies specific areas of potential risk and vulnerability to climate change effects, as directly related to the human, environmental and health factors.



— Remote Sensing of Dynamic Permafrost Regions, 2018

COMMUNITY PROFILE: OSCARVILLE

LOCATION: Oscarville is located on the north bank of the Kuskokwim River opposite Napaskiak. It lies six miles southwest of Bethel and 401 miles west of Anchorage.

LANGUAGE: Central Yup'ik

HISTORICAL SETTING: In 1908, Oscar Samuelson and his wife, a Yup'ik from the Nushagak region moved from Napaskiak across the river and opened a trading post. A few Native families settled nearby and the site came to be known as Oscarville. Samuelson managed the store for 45 years until his death in 1953. By 1955, there were 13 homes and two warehouses in the village. The Samuelsons continued to operate the store until 1975 when it was sold; it was closed in the early 1980s. A school was built by the BIA in 1964.

CLIMATE: Oscarville falls within the western transitional climate zone, characterized by tundra interspersed with boreal forests and weather patterns of long, cold winters and shorter, warm summers.

ACCESS: The only access to Oscarville is via boat in the summer months and snowmobile in the winter months. All-terrain vehicles are used when conditions allow. No access during break up or freeze up.

CULTURAL RESOURCES: Yup'ik residents continue to hunt and fish subsistence in the traditional lifestyle.

LOCAL CONTACTS

VILLAGE CORPORATION: Oscarville Native Corporation

PHONE: (907) 737-7090

TRIBAL: Oscarville Traditional Council

PHONE: (907) 737-7099

DEMOGRAPHICS/HOUSING

Poverty Rate	44.6%	Rate of Unemployment	21%
Total Population	61 (2000)	70 (2010)	Median Household Income
Median Age of Total Population	26	23	Denali Commission Distressed Community
Average Household Size	5	5	Percentage of Alaskan Natives
Housing Units	21 total, 18 occupied, 3 vacant, AVCP Regional Housing Authority		

ENERGY

OWNER:	DESCRIPTION:	NOTES:
AVEC	M&O AVEC	Intertie with single line from Bethel, Electrical Assessment 2016

BULK FUEL

OWNER/OPERATOR:	FUEL PROVIDER:	STORAGE CAPACITY:	CONDITION:
Oscarville Native Corp.	Delta Western	10,000 gallons	Poor

WATER & SANITATION

OWNER/OPERATOR:	SYSTEM TYPE:	NUMBER SERVED:	NOTES
LKSD	Piped, Well, Flush Toilets	School Only	LKSD
Self Haul	Honey Buckets, Watering Point, WTP	15 Homes	PASS unit in one home

HEALTH

OWNER/OPERATOR:	DESCRIPTION:	NOTES:
Tribe/YKHC	Health Clinic Closed	No sanitation – Honey Buckets

EDUCATION

OWNER/OPERATOR:	DESCRIPTION:	NOTES:
LKSD	K-12 School	Number of Students: 18

TRANSPORTATION

MODE:	DESCRIPTION:	NOTES:
Air Access	Helicopter	During break up and freeze up months
Boat Access	Slough Landing	Summer Only. Fuel, Goods, Materials access via Bethel
Board Roads/Trails	Board Road, Trail to Bethel	Seasonal. Seven miles to Bethel. 4-wheeler and Snowmobile trails

LANDFILL

OWNER/OPERATOR:	DESCRIPTION:	NOTES:
Tribe	Non-permitted Class III Human Waste Site	Poor condition, Sustainable Solid Waste Plan 2018

A Holistic Approach To Sustainable Northern Communities

To define *Tribal Resilience* in rural Alaska is very unique. The ability of people of the Yup'ik tribe to adapt for thousands of years without outside assistance was never an issue. The issue of adaptation began with Western contact, colonialism, capitalism and imposed regulation and land designation. Prior to contact, the indigenous people were migrant, traveling with the food resources seasonally. Adaptation is now compounded by climate impacts caused by human activities in distant places. Currently the people continue to practice their cultural traditional subsistence lifestyle, yet are slowed in adapting as the climate rapidly changes around them and they are now confined to a boundary that prohibits the nomadic movements of the past.

In the fall of 2014 a group of rural Alaskan leaders, local organizations and state and federal agencies gathered for the first of many roundtable discussions on how to change the approach and direction of rural Alaskan project development to create more sustainable and culturally appropriate projects. The problem identified by all was the need to look at how project development was currently applied in rural Alaska and improve coordination of efforts across disciplines lead by community input. The current status-quo was not resulting in sustainable, cost-effective projects. This gathering, which was held at the Cold Climate Housing Research



A round-table discussion on the Holistic Approach, Bethel, Alaska 2015.

“Ciuliamta ukveqellruat yuk pektayiinaku yuusqelluku.”

“Ancestors believed that our people should live in resilience.”

Center Training Facility, opened the door to future discussions and development of what the group named the Holistic Approach to Sustainable Northern Communities.

During the third roundtable gathering the community of Oscarville stepped up to become the pilot community of this new initiative (the Holistic Approach). A site visit to the community in February of 2015 allowed the Holistic team, which consisted of staff from CCHRC and stakeholders, to work with the community in identifying the community's immediate needs and assisted the leaders in prioritizing projects.

The goal of the Holistic team was to structure a grassroots-based approach to community project development based on the identified and prioritized needs of the community. Leaders from Oscarville worked closely with the team, who provided education and appropriate resources for each priority. With this approach an action plan emerged to help inform the community of resources available and match the resource to the specific project funding, while providing a network of local, regional, state and federal support. Facilitated by the team at CCHRC, Oscarville residents were able to set a clear path forward to create a healthy and sustainable set of community goals. The Holistic Approach team believes that together, in a working collaborative partnership, we can create healthy, thriving, sustainable communities for the future. This roundtable concept has brought together some of the important pieces of a healthy community – residents and their culture, housing, energy, infrastructure, water/sewer, community health, and economic development.



Princess Johnson interviews local residents.
Oscarville, Alaska 2017.



Capturing climate stories from elders was vital
to this document's creation.

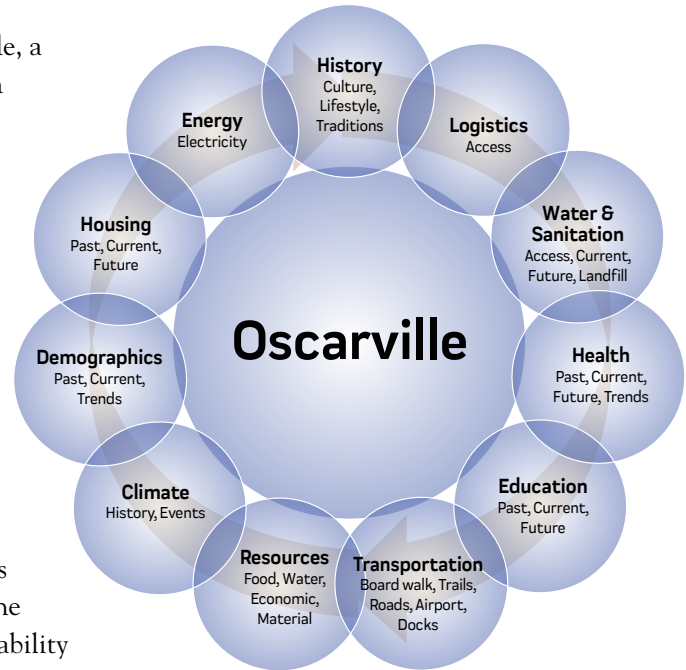
*“Can’get elivumaaqameng anuqliraartelluku ungalamek,
can’get niirumatuat negeqliq.”*

*“When the grasses are bent after the south wind,
they usually point to the direction of the north.”*

— Alexie Nicolai Sr.



The goal with the pilot project in Oscarville, a small community in the Yukon Kuskokwim Delta region, is to address the many elements of sustainability through community engagement and interagency partnerships. It is the hope that this effort will result in a statewide model for community development. The holistic approach shows the interconnectivity of each sector and how it impacts the community as a whole. The diagram to the right illustrates this connective flow.



In establishing a ‘Holistic Approach’ that is community led, it is vitally important for the community to define resilience and sustainability



Many site visits were made to Oscarville to ensure their voice was heard. Energy and Housing site visit. 2015.

“Kina yuk yuluaqercigatuq inerqutnek niiteksaunani.”

“A person will not live a good life without hearing and learning about the cultural values.”

in their own Native language, as often words in the English language such as; Sustainability, Subsistence, Resilience, etc., may not translate directly or do not touch on the rich philosophical theory of knowledge that Alaska Native languages encompass. In this manner, the community is able to keep the over-arching goal of creating a healthy, thriving, sustainable community at heart.

In defining 'resilience' for the community of Oscarville – community members became quiet and thoughtful, and then passionate and animated speaking in Yupik as they came to determine the best word in their language for resilience. Analogies that were made included:

“They never move no matter what – like a mountain.”

“You’re still standing (despite adversity) and doing your own thing.”

After some discussion the Yupik word/term arrived at was “Pekyatiinata = We Are Resilient”. This word seemed to embody both resiliency and a powerful determination held by the community to keep alive their culture and Native ways of life.

Another important term identified was “Kenciq”. This Yupik term is used to identify the respect and relationship held by the Yupik people for all connections to their natural environment, animals and foods. The Yup’ik have coexisted in their ecosystem, with a deep belief that each component of their ecosystem has equal value: food, water, people, and animals. This is true in most Alaskan indigenous cultures.



Tribal Administrator, Michael Stevens, assists with locating vital food resources on the local area map.



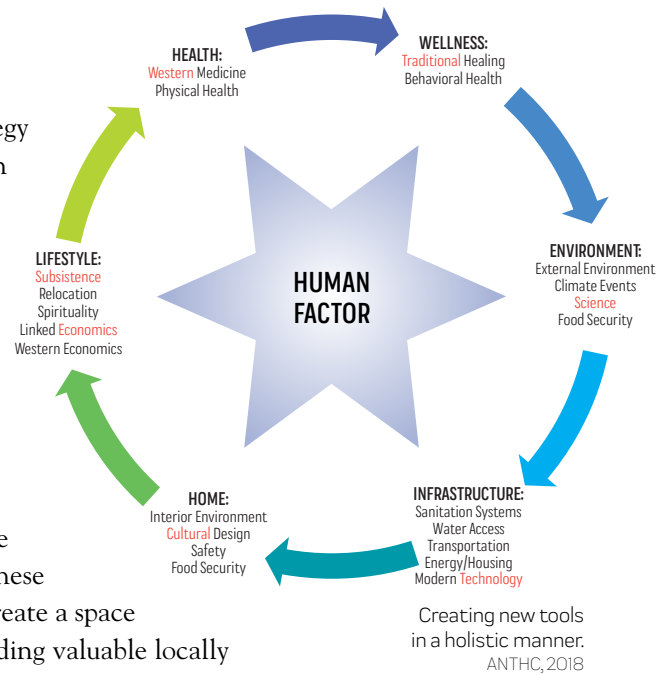
Children worked on a sustainable plan for solid waste in school. 2016.

“Allam yuum caunrilkengraaten, ayuqiinek akiyaqunaku, taugaam niitenrilngurtun wall’ pektayiinak ayuqniartuten.”

“When someone belittles you and hurts your feelings, do not respond on the same level but with empathy or act like you did not hear it.”

Assessment Process:

To a large extent, we utilized the planning strategy as outlined in our proposal for the 'Coordination Center for a Holistic Approach to Climate Adaptation in Alaska Native Villages' BIA Tribal Resilience Grant Proposal. In addition, we utilized resources made available through the US Climate Resilience Tool Kit, referenced guides and manuals such as the 'Climate Change Adaptation Planning Manual: For Coastal Alaskans and Marine-Dependent Communities' and sought out examples of other Tribal threat assessments done in Alaska and the Northwest. During this process, we found that these tools had to have a value-based foundation to create a space for community leaders to feel comfortable providing valuable locally observed changes.



Data, metadata, and tools:

A number of reports, peer-reviewed science articles, and scientific climate change data and models specific to the Arctic, the Yukon-Kuskokwim region, and Oscarville were reviewed and those relevant for the Tribe's threat assessments, were used for this report and are cited in the References section.

This assessment uses climate change projections created by the Scenarios Network for Alaska + Arctic Planning (SNAP).

"SNAP develops the data and analysis tools to quantitatively look at how temperature, precipitation, or other conditions may vary at different points in the future. SNAP uses these tools, along with other data and stakeholder knowledge, to facilitate conversations about possible future conditions and choices. This process can be as casual as a conversation or presentation, but when it is most powerful is when it is part of an integrated scenarios planning process."
(<https://snap.uaf.edu>)

While there is a level of uncertainty with all weather predictions, we have done our best to try to identify where critical thresholds for climate/weather events that affect Oscarville might occur. For example, these are any events that might cause harm to the community, as in flooding to homes or warming temperatures causing native foods to spoil or subsistence species to be unavailable.

"Kencikluki pitat, egmian caliaqluki assirupailgata."

"Respect the subsistence catch, take care of them before they get spoiled."

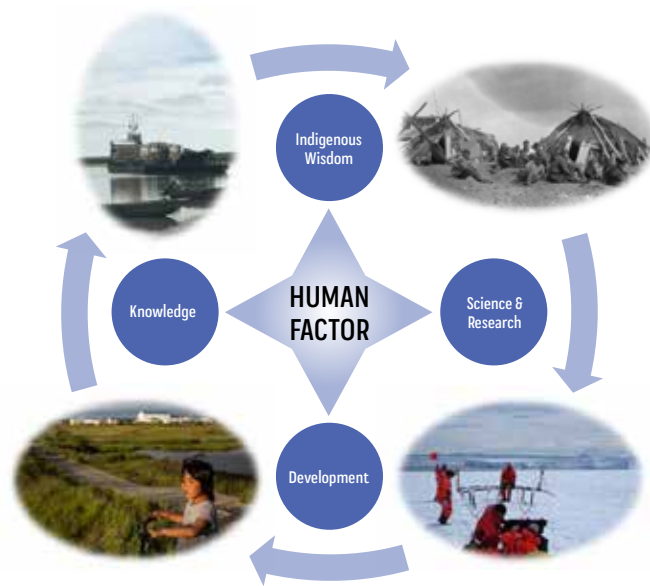
Assessment Methodology:

The observations detailed for this report were documented in a number of community meetings, inter-agency meetings, and interviews that took place in Oscarville. Interviews were often conducted in an inter-generational setting with one or more community members translating the Yupik language and adding to the information. Through deep listening, much of the Traditional Ecological Knowledge (TEK), immersed through the dialogue and often came up while touring the lands in and surrounding the community. The Yupik spiritual relationships to each other as humans, and to the land and animals were a theme that was repeatedly emphasized by the community.

Alaskan Native Tribes and Climate Change:

“Perhaps the most striking impacts in all of Alaska for mitigation and adaptation strategies to be developed and applied are with the village relocation issue in Western Alaska. The convergence of immediate threats, substantial human need, and prohibitive costs presents decision-makers at all levels of government with daunting challenges. The Commission found that climate change presents unavoidable challenges to the citizens of Alaska. There will be new responsibilities for the State of Alaska and public entities, and there will be responsibilities for private interests which individuals must accept. Certainly the economics are a key factor in these challenges. Successful adaptation strategies that recognize the environmental, cultural, and economic factors will be the keys to reducing the adversity of climate change.

The effects have been clearly stated in the stories and anecdotes of the Native people who have spoken before the Commission. These statements have stressed the need for help in adapting to an environment that has changed within a generation, when the culture and subsistence ways were dependent on traditional knowledge and wisdom built over many generations. **Now, the ‘world’ is different as changes are occurring at a more rapid pace.”** (AK Climate Impact Assessment Commission, Final report to the Legislature, 2008).

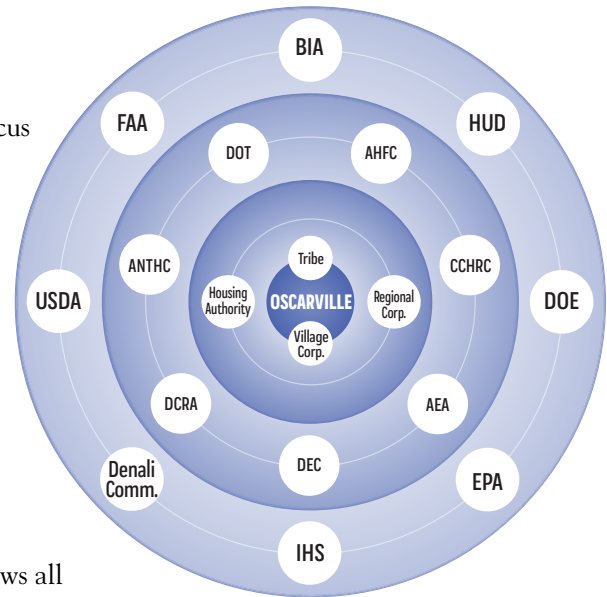


Creating tools to visualize connections.
ANTHC, 2018

“Kencikluki allat yuut, nuna, ungunssit-llu.”

“Respect others, land and animals.”

The Holistic Approach team viewed the current participant structure as lacking strength at the community level. Reversing the perspective to focus locally has allowed the community leaders to engage, drive and control the conversations of how to adapt and prepare for their community members. The resiliency of indigenous cultures has sustained the people of rural Alaska for thousands of years. Community-led resiliency now becomes the deep-rooted catalyst for change, teaching and partnering with regional, state and federal agencies to try a new approach to sustainability. Stakeholders range from local, regional, state, federal and global partners. The primary focus is on local participation, which allows all residents to feel engaged in the process and to hold their tribe accountable. This is vital to the cultural values of the Yup'ik people of Oscarville.



By partnering with agencies, the community is given layers of networking and support vs. a Western linear line of communication. The project has a main coordination center located in Fairbanks, Alaska, at the Cold Climate Housing Research Center (CCHRC).



Kuiggayagaq Slough, Oscarville, Alaska 2017

“Yuilqumi qavartarvillren uniskiu ayuqucillratun.”

*“Leave your camping ground the way it was
when you first arrived.”*

Key Terms:

Adaptive capacity: The ability of a system or individual to adjust to changing conditions or recover from the impacts of change. In ecological systems, adaptive capacity is influenced by the biodiversity and the degree of redundancy in the system. In social systems, it is determined by the structures and processes that enable or constrain choices for action and that shape people's ability to anticipate and plan for future change.



New standards for construction, Ulroan Home.

Alaskan Inuit Food Security¹: Alaskan Inuit food security is the natural right of all Inuit to be part of the ecosystem, to access food and to care-take, protect and respect all of life, land, water and air. It allows for all Inuit to obtain, process, store and consume sufficient amounts of healthy and nutritious preferred food – foods physically and spiritually craved and needed from the land, air and water, which provide for families and future generations through the practice of Inuit customs and spirituality, languages, knowledge, policies, management practices and self-governance. It includes the responsibility and ability to pass on knowledge to younger generations, the taste of traditional foods rooted in place and season, knowledge of how to safely obtain and prepare traditional foods for medicinal use, clothing, housing, nutrients and, overall, how to be within one's environment. It means understanding that food is a lifeline and a connection between the past and today's self and cultural identity. Inuit food security is characterized by environmental health and is made up of six interconnecting dimensions: 1) Availability, 2) Inuit Culture, 3) Decision-Making Power and Management, 4) Health and Wellness, 5) Stability and 6) Accessibility. This definition holds the understanding that without food sovereignty, food security will not exist. This applies to all Alaskan indigenous cultures.

Climate Change: Changes in the Earth's physical systems that occur over long time periods (decades, centuries, or even millions of years) rather than over shorter periods such as for annual or seasonal changes; climate change may include changes in natural cycles of variability such as seasonal, annual, multi-year, and/or multi-decade patterns of variability. As used in the

¹ This definition is borrowed from the ICC Alaskan Inuit Food Security Conceptual Framework: How to Assess the Arctic from an Inuit Perspective, 2016, which includes Yup'ik advisors and cultural practices.

*“Nunamiutaat ungunssit enrit ciqitarkaugut mermun,
mermiutaat ungunssit enrit ciqitarkaugut nunamun.”*

*“Land animals bones need to be discarded in the water.
Water animal bones need to be discarded by burying
them underground.”*



Tribal project, climate change refers to those changes resulting from increase in greenhouse gas concentrations and changes in aerosol emissions that are deemed to be caused by human activities. Examples of global effects of climate change include increase in average atmospheric and sea temperatures, general melting and decrease in snow and ice, increased drought conditions, and rising sea levels.

Cultural ecosystem services: The cultural values and benefits provided by ecosystems, including values such as recreation opportunities, aesthetic inspiration and spiritual values.

Indigenous Knowledge, Native Science, Traditional Knowledge, and Traditional Ecological Knowledge:

The terms are used interchangeably to refer to holistic, evolving practices and beliefs passed down through generations about the relationships of living beings to their environment.

Resilience: The capacity to cope with stress and shocks by responding or reorganizing in ways that maintain essential identity, function and structures, as well as the capacity to navigate and shape change, including transformational change.

Sensitivity: The degree to which a built, natural, or human system is directly or indirectly affected by changes in climate conditions (e.g., temperature and precipitation) or specific climate change impacts (e.g., decreased water availability, increased fire frequency). If a system is likely to be affected as a result of projected climate change, it should be considered sensitive to climate change.

Sustainability: The ability of a system to meet its needs on a continuing basis without harm to the environment and without compromising the ability of systems to do so in the future. In Yupik traditions, the concept of “kenciq” is the idea that decisions and actions should be carried out with respect for the land and animals and considered for their impact on the generations to come.

Vulnerability: The susceptibility of a system to harm from climate change impacts. Vulnerability is a function of a system’s sensitivity to climate and the capacity of that system to adapt to climate changes. In other words, systems that are sensitive to climate and less able to adapt to changes are generally considered to be vulnerable to climate change impacts. In this report, we also consider external, non-climate related factors that may impact the system’s adaptive capacity and vulnerability.



“Anything else you’re interested in is not going to happen if you can’t breathe the air and drink the water. Don’t sit this one out. Do something. You are by accident of fate alive at an absolutely critical moment in the history of our planet.”

— Carl Sagan

Key Findings:

The Third National Climate Change Assessment released in May 2014 by the U.S. Global Change Research Program and the fifth assessment of climate change released by the International Governmental Panel on Climate Change (2014) concur that human-induced climate change continues to strengthen and that the impacts continue to increase across the country and the world.

In November 2018 the Fourth National Climate Assessment was released. In chapter 26, focused on Alaska, the document stated, “As the climate continues to warm, there is likely to be a nearly sea ice-free Arctic during the summer by mid-century. Ocean acidification is an emerging global problem that will intensify with continued carbon dioxide (CO₂) emissions and negatively affects organisms. Climate change will likely affect management actions and economic drivers, including fisheries, in complex ways.” “The impacts of climate change will likely affect all aspects of Alaska Native societies, from nutrition, infrastructure, economics, and health consequences to language, education, and the communities themselves.” In section 4 of this chapter on indigenous peoples it states that “flexible, community-driven adaptation strategies would lessen these impacts by ensuring that climate risks are considered in the full context of the existing sociocultural systems.”

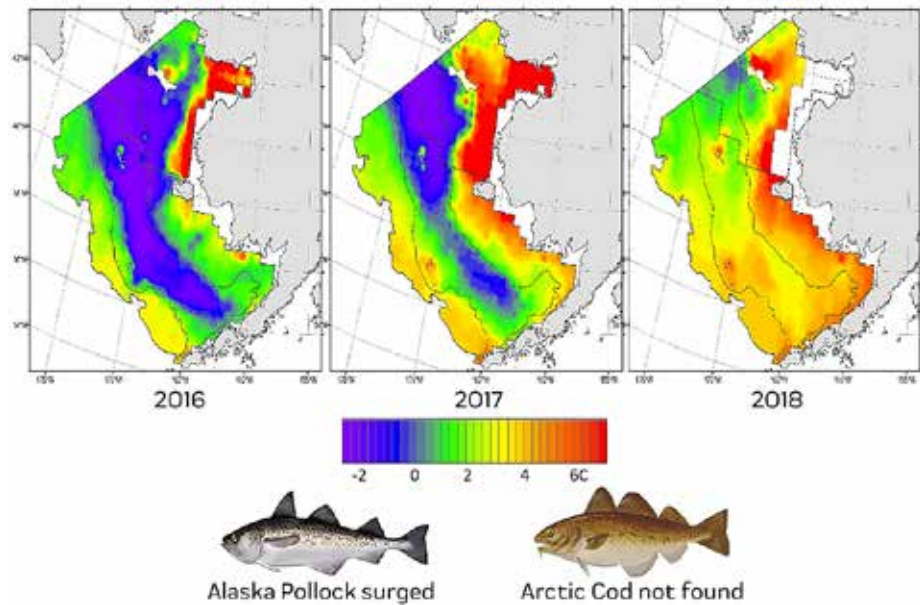
With continued changes, these effects will impact traditional harvest levels, extend the growing seasons, disrupt fisheries, alter hunting seasons and create additional hazards for seasonal river transportation. These create even greater challenges when coupled with state and federal regulatory mandates.



U.S. Senate Committee on Energy and Natural Resources visit Oscarville, 2016

*Every Yup'ik is responsible to all other Yup'iks for survival
of our cultural spirit, and the values and traditions through which
it survives. Through our extended family, we retain, teach,
and live our Yup'ik way.*

Example of rapid change: NOAA/RACE Division recorded the “Bottom Cold Pool”, historically a barrier separating Pacific fish species in the southern Bering Sea from Arctic fish species in the north, had vanished in a year’s time. Summer 2018 monitor shows the “cold pool” completely gone: southern fish species moved north in unprecedented numbers. No longer were the Arctic Cod present, but they were replaced by southern Alaska Pollock. (Rick Thoman, 2018)



Courtesy NOAA/RACE Division

The key findings show the importance of a holistic approach when viewing adaptation, as the interconnectivity of culture, tradition, place, environment, climate and people are active in this Yup'ik communities lifestyle.



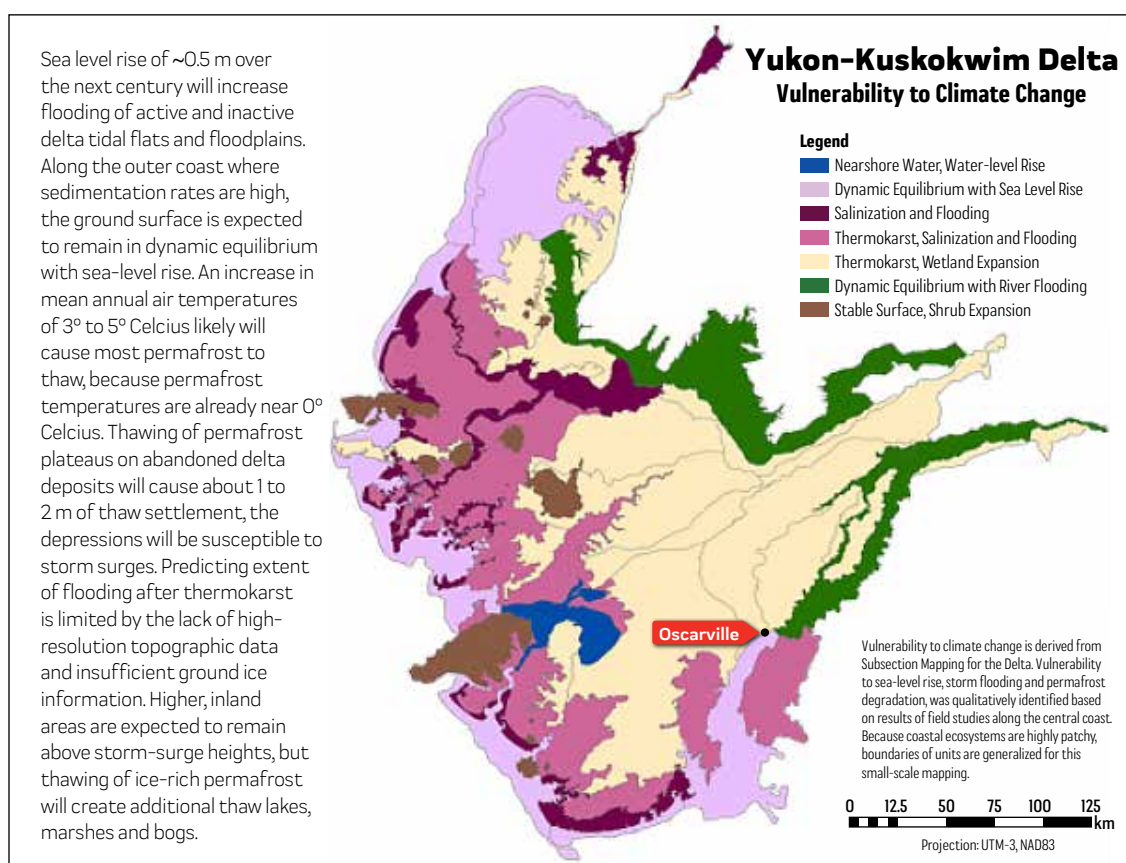
Oscarville Yuraq Dance Group.

WHERE WE ARE: TODAY



THREATS & VULNERABILITIES

In Alaska, the warming climate is causing a rapid decrease in summer sea ice, shrinking glaciers, and thawing permafrost are resulting in damage to infrastructure across the state and major changes to ecosystems are occurring including unpredictable migratory patterns and species distribution. For the community of Oscarville, and other villages whose physical and spiritual sustenance rely heavily on the subsistence way of life, climate change poses a significant threat to the food security and overall wellbeing of the community. This report examines the threats to human and natural systems under future climate change scenarios of varying ranges. It also incorporates traditional ecological knowledge of the environment and community input and observations on how climate change is impacting the overall wellbeing of the community. These are all direct impacts of climate change and these impacts are coupled with other state and federal regulatory efforts that impinge upon the community's ability to hunt and fish.



Torre Jorgenson, Alaska Science Center, Craig Ely and John Terenzi, Alaska Ecoscience

“The effects on wildlife from changing habitats under a warming climate could be profound, as wetland quality strongly influences the abundance and diversity of fish and avifauna.”

— (Danell and Sjoberg 1978, Meents et al. 1983)

Based on assessments of current documented models and scenarios, the areas and resources within Oscarville village and surrounding subsistence harvest areas, vulnerable to climate change impacts include the shorelines along the Kuskokwim and Kuiggayagaq slough, wetlands, low-lying terrain, permafrost degradation, along with assets within these areas. Impacts to some of these vulnerable areas are potentially high within the next 20-50 years and increasing through the end of the century. “Due to the combination of very low ground elevations, predicted increase in sea level, and ongoing permafrost degradation that leads to collapse of the permafrost plateaus, we believe the [Yukon-Kuskokwim Delta] is one of the most vulnerable landscapes in the Arctic to climate warming.” (Jorgenson, et. al. 2010)

The matrix below was created to rank the vulnerability risk. It was designed to be simple and user-friendly. By capturing the residents’ perspective and observation, it allows the community members to input their personal observations over time into the equation. The matrix also allows each sector to show the positive and negative impacts that may occur. The Relative Vulnerability score combines the *Observation*: local indigenous knowledge and science monitoring, *Impact*: severity of action, and *Adaptation*: what response could be done to bounce back. The score allows community leaders to shift accordingly. Example: Ice conditions can change over night creating a very high risk unpredictability. This matrix allows a risk assessment to be created as needed.

Example: Permafrost Melt

Relative Vulnerability	=		Adaptation	+	Impact	+	Observation
9 High		3		4		2	
Extremely High	10-12	4		4	Extreme impact expected, short-term	4	
High	7-9	3	Moderate amount of resources needed to adapt	3		3	
Medium	4-6	2		2		2	Some change observed
Low	0-3	1		1		1	
Notes:		Changes will continue and cause damage into the future. Adapting will require new foundations and technologies, and new standards.		We currently are experiencing impacts that are affecting our infrastructure. To mitigate, we will need to respond in a timely manner		Melting permafrost is causing our foundations and boardwalks to warp and shift, causing damage to critical infrastructure. Sink holes are also seen on the tundra.	

“Effects in YKD could result in hemispheric population changes for multiple species of migratory waterbirds. For example, increased salinity of wetland ponds use by brood-rearing eiders could limit duckling growth, thereby reducing early survival.”

— (DeVink et al. 2005, Flint et al. 2006) (Jorgenson 2010)

TEMPS & PRECIP

Observed change: Warmer summers and more thawing in winter months. Warm winds in winter cause ice melt and open water on the river.

Health concerns: Increased risk to human life when traveling on the river in winter. Unpredictable freeze-thaw cycles create higher risk for subsistence food access.

Projected change: Continued unpredictable temperature variances, causing more freeze/thaw risks for ice travel in winter

Potential adaptation: Prepare for rapid changes, having both safety and defensive measures in place for extreme weather changes.

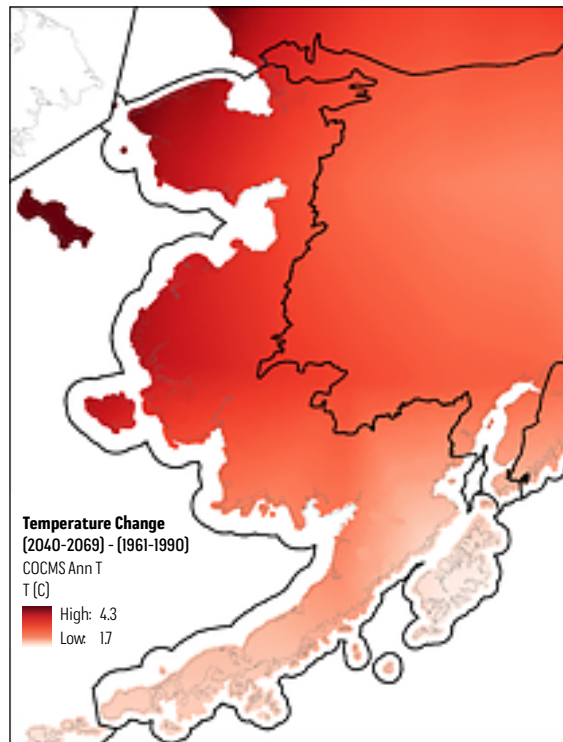
Vulnerability & Risk management score: 9 – Extremely High

Potential Project: Local Data Monitoring

Local residents stated that the temperature is very unpredictable compared to the past. The summers are hotter, the winters have rain and warm winds and this causes a freeze-thaw cycle that endangers traveling on the river to Bethel. Many more people fall through the ice due to warmer temperatures and thawing of river ice, causing open holes. The warmer summer temperatures create drier ground which in turn causes higher risk for fires. These changes also impact access to subsistence food and rain catchment for drinking water.

Continued rise in ambient air temperature is causing a variety of issues. The forecasted temperature rise for the next 100 years, shows this change will continue. These changes will push some food resources further away and bring new resources closer. Research into how previous generations adapted to rapid change needs to be a priority.

This graph from the Scenarios Network for Alaska and Arctic Planning (www.snap.uaf.edu) is based on historical temperature data



Caption

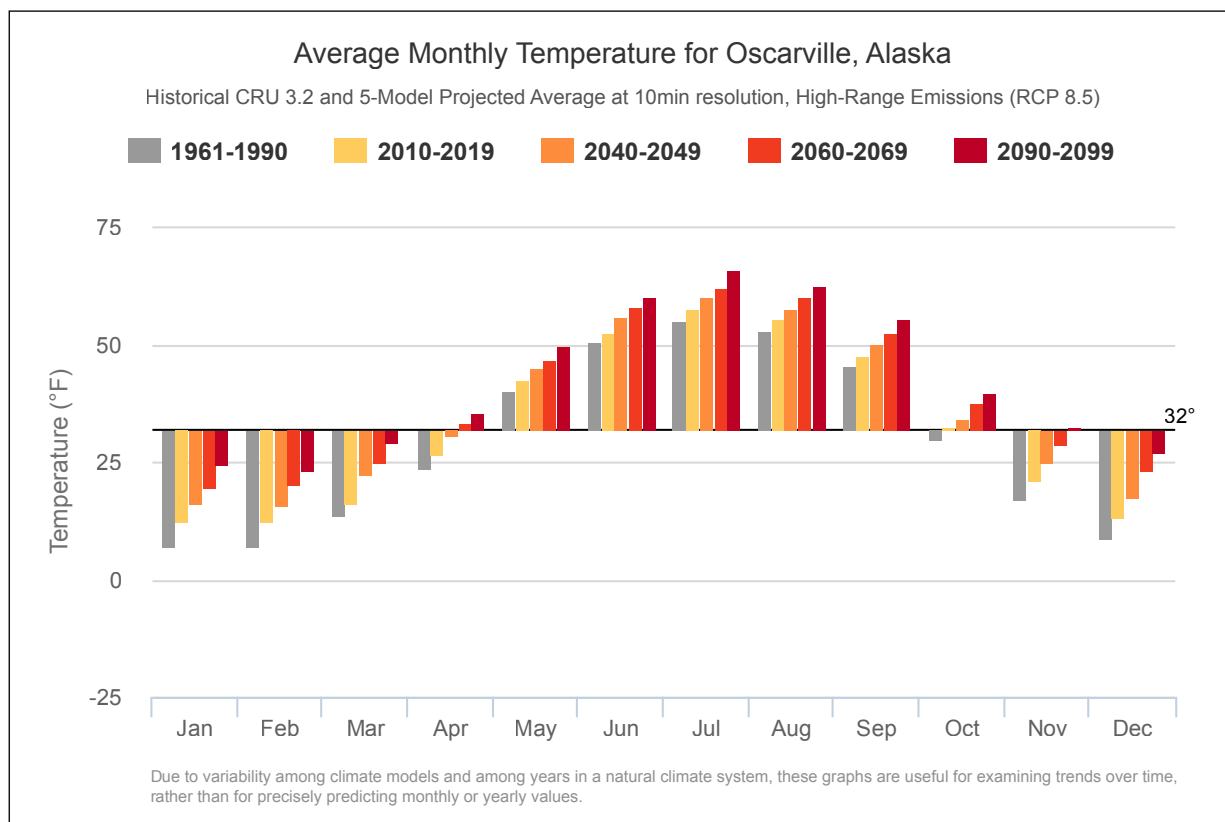
“Imarpik nallutaituq yalrianek. Ilangartellrukuvci wall’ aipan irnicuallrukan imarpigmun pissuryaunak.”

*“The ocean knows who cannot hunt in the ocean.
Please do not hunt in the ocean if you or a family member
have lost a loved one or had a miscarriage.”*

collected in the region where Oscarville is located, and on projections of future temperature. Projected data are derived from models used by the Intergovernmental Panel on Climate Change, and are based on mid-range 6.0) Representative Concentration Pathways (RCP). RCPs are possible scenarios that determine how much we are able to curtail future greenhouse gas emissions in our atmosphere.

Temperature:

- Over past 60 years, warming in winter has already increased by an average of 6°F (USGCRP 2014)
- As shown in the graph, average annual temperatures projected to increase 2-4°F by mid-century, with even greater increases by the end of the century. Winter months show greater warming than summer months. Warming in the spring and fall may greatly impact the timing of seasonal shifts.
- Permafrost thaw causing damage to existing structures (homes, infrastructure)



“We collaborate with our diverse network to develop and communicate plausible scenarios of potential conditions in an evolving climate. SNAP was created in 2007 with Network Director Dr. Scott Rupp and a 3-person staff. We now comprise more than 20 researchers, programmers, science communicators, staff, and students.”

— SNAP, UAF

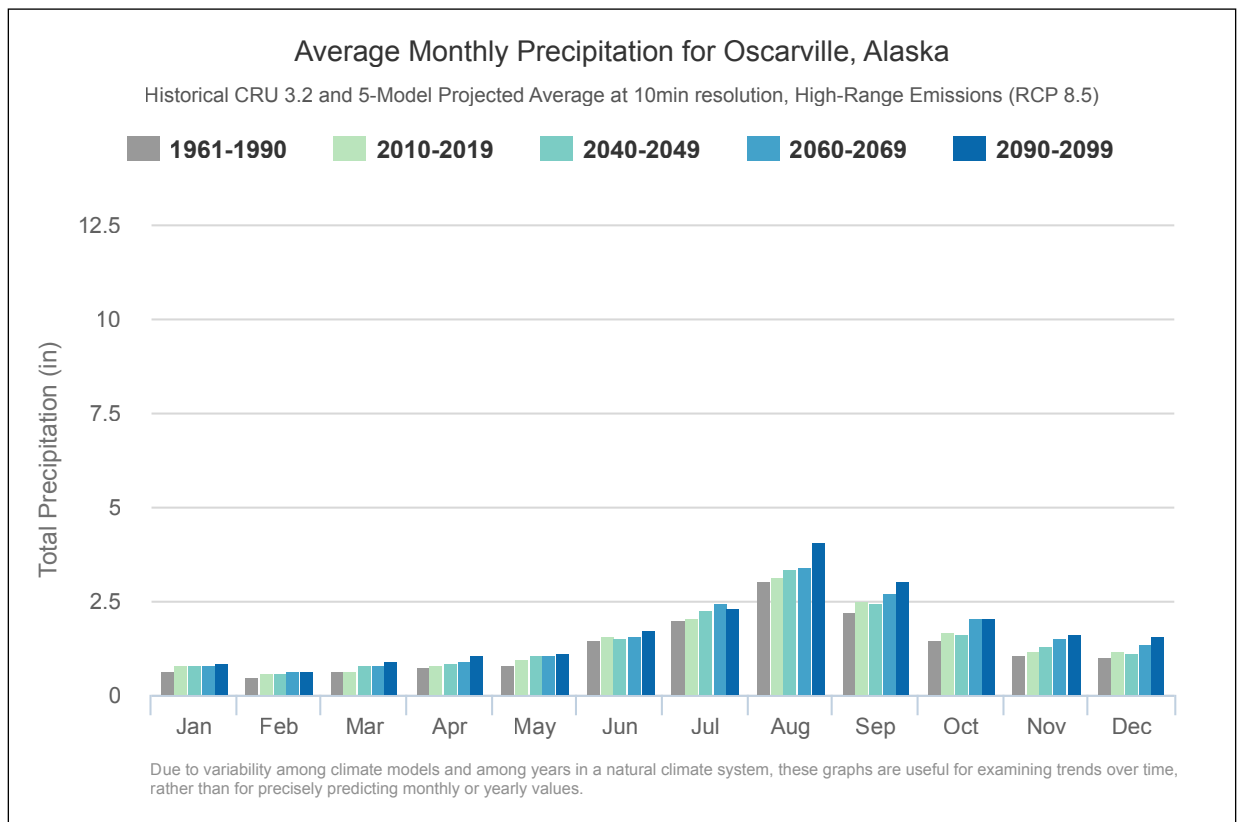
Sea level rise (project change through 2100 in Yukon – Kuskokwim Delta):

- Sea level rise of ~0.5m over next century (Jorgenson & Roth, 2010)
- Increase salinization inshore resulting in salt kill of vegetation
- Increase in storm frequency and storm-surge height
- Thawing of permafrost plateaus on abandoned delta deposits
- After thaw settlements, depressions will be susceptible to storm surges

Note: These predictions are outdated and further water level and temperature monitoring is needed.

Precipitation/Freshwater

- Precipitation is projected to increase 15%-30% during all seasons by end of century if global emissions continue to increase
- Increases in evaporation due to higher air temperatures and longer growing seasons are expected to reduce water availability in most of the state (Hinzmen, et. al. 2015)



“Neqet kaimellret, enrit-llu ciqitarkaугut kia yuum tutmarngaikiitnun.”

“With respect to the fish’s spirit, we clean and dispose all parts of the fish in a place where people will not trample them.”

Like the temperature graph above, this precipitation graph is based on historical and projected climate data from SNAP (www.snap.uaf.edu), using a mid-range scenario to predict human behavior with regard to curtailing climate change. Snowfall is represented in terms of rainwater equivalent. Note that slight increases in precipitation are projected by the end of the century, but that these changes are less marked than increases in temperature shown in the previous graph. Increased precipitation may prove to be less important, in terms of overall impacts, than other changes that affect hydrology. These changes include thawing permafrost, which impacts soil drainage and water availability for plants; timing and proportion of precipitation arriving as rain versus snow; and landscape drying due to higher temperatures and associated increases in evaporation and plant uptake of water. Increased precipitation could allow the community to access more rainwater and snow melt-off for drinking water.



Kuiggayagaq Slough boat launch.

“Qanekcaq amllellruaqan, atsilartuq.”

*“There is an abundance of berries when
there was a lot of snow during the winter.”*

RIVER LEVEL

Observed change: Water level changes in the Oscarville slough. Increased rain and less snow coverage.

Health concerns: Increased injury risk due to late ice freeze-up and break-up. Damage to infrastructure due to water movement. Dangerous freeze/thaw in the middle of winter.

Projected change: Dry out of slough will force relocation of summer boat docking and barge landing.

Potential adaptation: Begin relocation of dock and barge landing. Move potentially comprised infrastructure. Revetment of river bank.

Vulnerability & Risk management score: 5 - Medium

Potential Project: Local monitoring

Oscarville Slough, the local boat access to the village, has gradually lost its water level. This change is driving the community to relocate its boat ramp and docking area. The elevation of Oscarville is 3 feet above sea level. It receives approximately 16 inches of rainfall and 50 inches of snowfall annually. Due to this vulnerable location, Oscarville is susceptible to extreme climate impacts, such as flooding, erosion and shifting of water tables.

Traditional ecological knowledge observations on local weather trends indicate a warming climate with less snowfall and a change in spring breakup and fall freeze up along the Kuskokwim River.



Beautiful summer day in Oscarville, 2018.

“Our river is getting wider and the land is eroding into it due to the permafrost melt.”

— Nicolai Steven, Oscarville Elder

Accompanying a warming climate are changes in the health and abundance of animal and plant species, migratory patterns, and other climate disturbances limiting hunting and gathering access. The National Oceanic and Atmospheric Administration shows three of the five warmest years on record being 2014, 2015, and 2016, with 2016 being the warmest for Oscarville in the last 91 years.

Climate change is affecting the traditional foods of all Alaskans and “resource distribution and abundance are expected to be affected most significantly by shifts in productivity and prey availability, changes in water temperature, ocean acidification, exposure to toxins and pathogens, increased competition with invasive species, [and] changes in sea ice coverage.” (Himes-Cornell & Kasperski 2015, p.2). King Salmon is a primary subsistence food source for Oscarville. ‘The Way of the Fish’ is highly regarded and traditional management practices include not over catching, and making certain that the fish are respected by being handled promptly and correctly. In this manner the Yup’ik believe the fish then will always return.



Subsistence set net fishing on the Kuskokwim River, 2018

In addition to salmon other fish harvested include: whitefish, blackfish, burbot, Arctic grayling, rainbow trout, smelt, and sheefish. Because of warmer summers 1/3 of the salmon went to waste in the summer of 2016 because the flies came out early. Community members reported being fined for the size of their nets and a concern that the U.S. Fish and Wildlife Service regulations are not practical or flexible enough for the needs of the community. Also, one elder noted that the practice of trawling is destructive to the entire ecosystem and destroys the plant foods that the salmon and other species depend on while in the ocean. The community expressed a strong desire to be giving input/voice to scientists, the U.S. Fish & Wildlife Service, and regulatory boards to co-manage the fisheries along the Kuskokwim River.

“Big motor boats are causing waves to hit the river shore and cause big undercuts of land to slough off into the river.”

— Oscarville Elder

EROSION

Observed Change: The Oscarville Slough has experienced low water levels and seems to be drying up forcing our residents to land our boats on the other side of the village. The river channel is changing and causing large undercuts in the river bank, which is diverting the slough water.

Health Concerns: The risk of dust control rises with the slough drying up and the river bank eroding. This allows the dust to whip into the air over the village.

Projected Change: The slough is not getting more water and we predict this will continue until it is dried up.

Potential Adaptation: Relocate the boat landing and mitigate the slough bank before it falls into the slough. Monitor and track changes over time.

Vulnerability & Risk Management Score: 5 - Medium

Potential Project: Local measuring and monitoring

Oscarville is strongly influenced by storms and patterns in the Bering Sea and also by inland continental weather. Average annual precipitation is 16 inches, with 50 inches of snowfall. Summer temperatures range from 42 to 62°F, and winter temperatures average -2 to 19°F. The Kuskokwim River is typically ice-free from June through October³.

According to a local hazard mitigation plan conducted by the City of Bethel in 2008⁴, the Oscarville area is at high risk of floods, severe weather, and erosion. The threat of earthquakes is also noted. The plan addresses the role of climate change in exacerbating threats from flooding and erosion. Warming temperatures have led to thawing permafrost. This has caused severe subsidence, which constrains development of resources, transportation and utility systems, and community expansion. In addition, delayed formation of protective shore ice along the coast leaves shorelines more



Oscarville Village on Kuskokwim River and Kuiggayagaq slough. Image courtesy: Google Earth

³ NOAA Oscarville Community Profile https://www.wafsc.noaa.gov/REFM/Socioeconomics/Projects/communityprofiles/Oscarville_Profile_2000_2010.pdf

⁴ City of Bethel. 2008. Local Hazards Mitigation Plan. Retrieved February 7, 2012 from http://www.dced.state.ak.us/dca/planning/nfip/Hazard_Mitigation_Plans/Bethel_LHMP.pdf.

*“Nunavut kencikluku aulukesqaat wangkutnun.
Uqlanritengnaqluku neqallernek canek-llu uqlarnarqellrianek.”*

*“We are told to take care of our land by treating it with respect.
We should try not to litter it with food refuse or anything
that will make it unclean.”*

vulnerable to fall storms and storm surges, resulting in increased flooding and erosion.

Global warming is likely to delay formation of sea ice to later in the year and raise sea levels, thus increasing the likelihood of storm flooding during early winter and the frequency of overbank flooding. While coastal ecosystems are dependent on frequent sedimentation and salinization from small floods, larger storm floods can cause

salinization of freshwater ponds and non-saline meadows, damage vegetation along the margins of permafrost plateaus and cause thermokarst, and affect village infrastructure. (Terenzi, 2014).



River erosion, Kuskokwim River 2018.

Community members were shown an, ‘Alaska Baseline Erosion Assessment’ conducted by the Army Corps of Engineers in 2008. The report details under ‘Potential Damages’ that several structures are less than 100 feet from active erosion. Community interviews reveal that erosion is now less than 50 feet from active erosion and that one residence is now 20 feet from active erosion along the bank of the ‘Kuiggayagaq’ slough. Residents are concerned about erosion as they have already lost some fish smokehouses and drying racks along the bank of the Kuiggayagaq slough and fear the loss of other built structures. They are also concerned where new housing structures will be built.

Observations of the Kuiggayagaq slough reveal that the current is changing on the North side of the slough. Also that it has become much shallower. Along the Kuskokwim erosion has increased over the last 20 years by 3-4 feet. The community would like to add erosion monitoring to their priority list. With a shifting current in the Kuskokwim River, residents are concerned that predictions could change.

In 2009, the U.S. Army Corps of Engineers published a statewide Alaska Baseline Erosion Assessment. This report identified 178 communities across the state experiencing erosion challenges; each community was classified as a Priority Action Community, Monitor Conditions Community, or Minimal Erosion Community based on the severity of the impact and time horizon of the erosion. Oscarville was identified as a Monitor Conditions Community - “A Monitor Conditions Community generally has reported significant impacts related to erosion, but the impacts are not likely to affect the viability of the community. The erosion issue may warrant Federal, State, or other intervention. A Monitor Conditions Community should be watched. Taking action in a Monitor Conditions Community would be prudent to prevent a problem from becoming worse.”

While this report is nearly a decade old, it remains the guiding report for the current state of erosion across the state.

“Yuut kisvikellrat nunaurcetuut.”

*“The area on the river where many people
have drowned becomes land.”*

PERMAFROST

Observed change: The combined issues of river bank erosion and thawing of the permafrost are intermingled. While the river banks are eroding the ground is settling, causing problems with built infrastructure, homes, and trails out of town.

Health concerns: Any issues involving the endangerment of infrastructure and homes is a threat to the health of the community.

Projected change: Recent observations do not show that this warming trend will cease or slow. This projected continuance of change must be a priority.

Potential adaptation: Securing critical infrastructure, such as fuel and water tanks, boardwalks and housing and creating standards for future foundations could allow projects to align with our vision of a sustainable, healthy community. Monitor changes over time.

Vulnerability & Risk management score: 9 – Extremely High

Potential Project: Local data monitoring

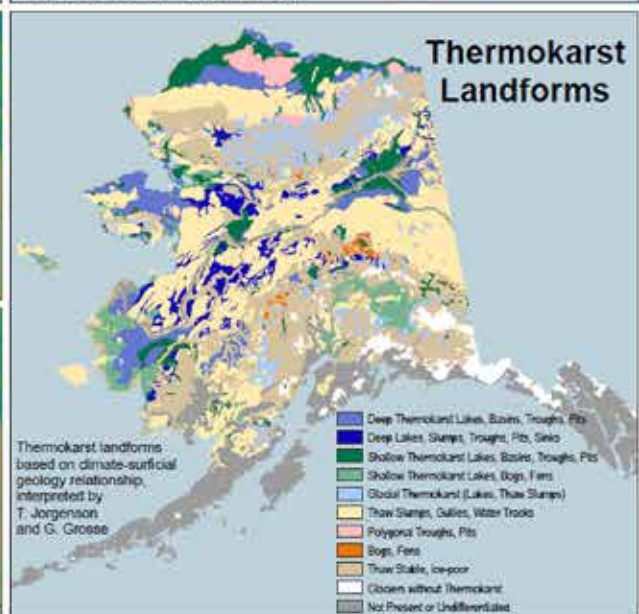
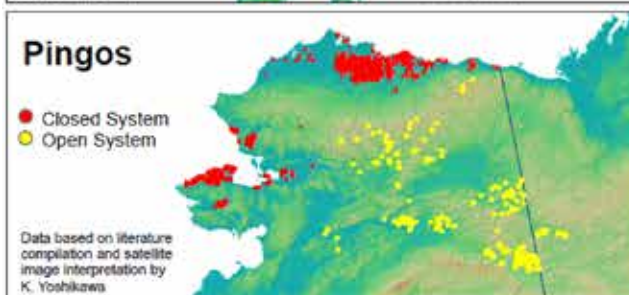
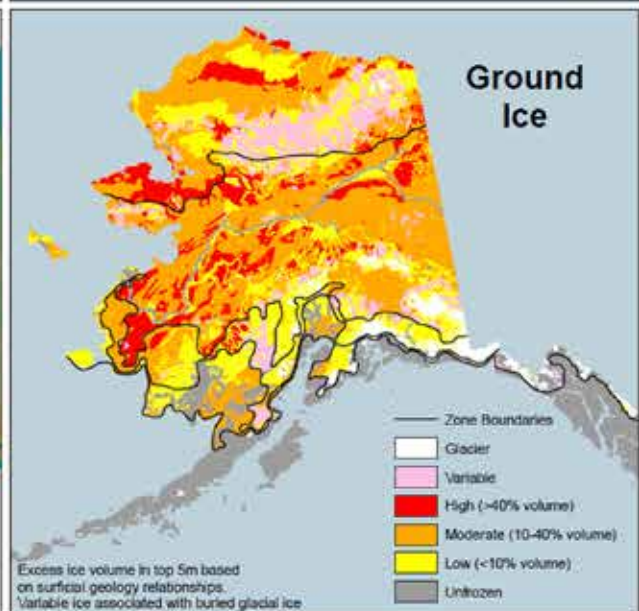
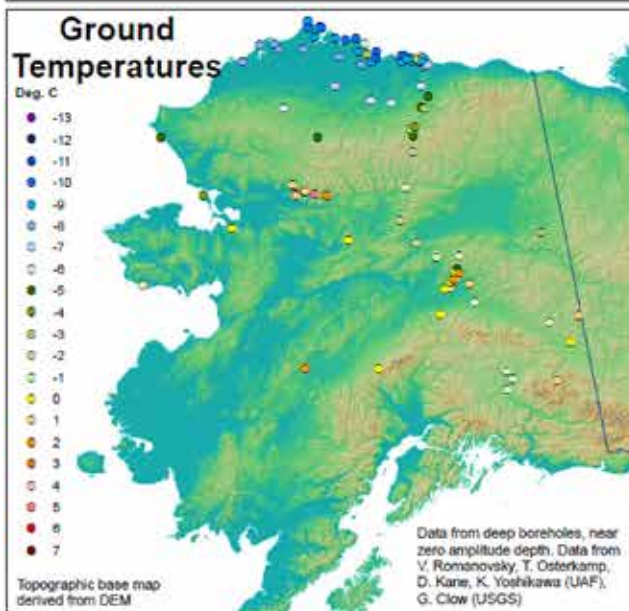
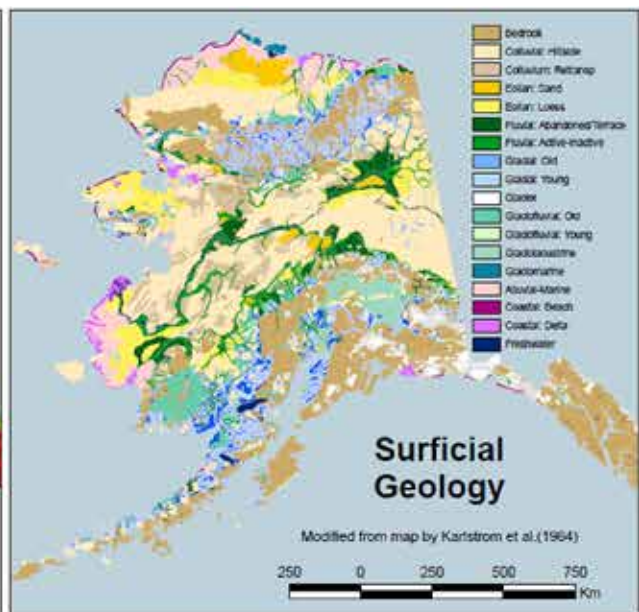
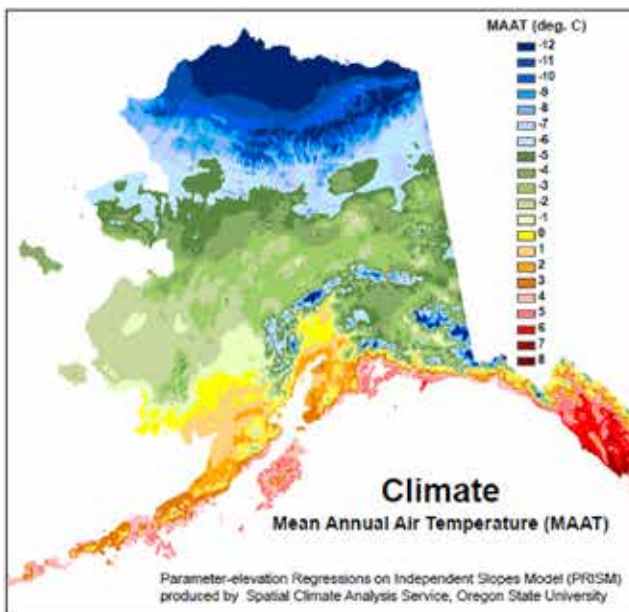
All homes in Oscarville are susceptible to melting permafrost. Each spring/summer permafrost melt will cause shifts to the foundation of built structures resulting in structural damage to the buildings, for instance, egress windows that allow emergency exiting may become inoperable. Not only windows but doors often do not allow safe ingress and egress from homes. In extreme cases, damaged decks, floors, and stairs become hazardous to the residents. (CCHRC Housing Assessment, 2017)

“Permafrost underlies most of Alaska. Air temperature, snow cover, and vegetation affect the temperature of the frozen ground and the depth of seasonal thawing. Recent decades of warmer temperatures have produced extensive thawing, which has resulted in increased coastal erosion, landslides, and sinking of the ground surface, as well as consequent disruption and damage to forests, buildings, infrastructure, and coastal communities. In addition, many industrial activities depend on frozen ground surfaces, and many northern communities rely on ice roads for transport of groceries and other materials. Continued warming will further impair transport by shortening the seasonal use of ice roads. Thawing is projected to accelerate under future warming, with as much as the top 10 to 30 feet of discontinuous permafrost thawing by 2100” (Alaska’s Climate Change Strategy: Addressing Impacts in Alaska. Final Report Submitted by the Adaptation Advisory Group to the Alaska Climate Change Sub-Cabinet, January 2010).

The University of Alaska Fairbanks Geophysical Institute studies the permafrost activity throughout Alaska. No local, on-site monitoring is in place near the community of Oscarville, but the statewide monitoring shows the impact to be severe in the future. The following maps show the various impacts as a whole:

“Caagniqellria yuk pugvik’laraa ercinraat. Kevraartunun tekeskuvit, awayamek navkaulluten, qumigluku-llu, tua-ill’ qanerluten, ‘llaksagutamci.”

“People who have lost a loved one or a family member had experienced a miscarriage may encounter ‘little people’. To possibly avoid encountering one, when you reach a place with pine trees, you should break a small branch off and place it inside your clothing and let it slide down. Then you have to say aloud, ‘I have become part of your family.”



Climate change could cause changes in the incidence of infectious diseases in Arctic regions. Higher ambient temperatures in the Arctic may result in an increase in some temperature sensitive foodborne diseases such as gastroenteritis, paralytic shellfish poisoning and botulism. An increase in mean temperature may also influence the incidence of infectious diseases of animals that are spread to humans (zoonoses) by changing the population and range of animal hosts and insect vectors. (International Journal of Circumpolar Health, 2005)

Viruses that lay dormant in permafrost could also cause great risk to human health, as no current studies truly have identified what lies within the ice-rich soils. (Alan J. Parkinson and Birgitta Evengard, Arctic Investigations Program, Center of Disease Control, Anchorage, Alaska). Residents would like to see this further researched and monitored, as their food resources are directly linked to local soils.



New standards for building. Ulroan Home, new construction 2017.

“Ilavnek tamarillrukuvet, wall’u aglenraraukuvet naqugtarkauguten aluqutkamek arnaukuvet wall’ angutngukuvet qimagmiararkauguten aluqutkamek. Makunek pingqerkuvet ercinraat uitaciiqaatgen.”

“If you have lost a loved one, you have to have a beaver’s gland in your belt, and if you are a man, you have to have one in your pocket. If you possess these at all times, then the ‘little people’ will leave you alone.”

— Alexie Nicholai Sr.



SNOW & ICE

Observed change: Snow texture and ice melt-off vs. break-up are becoming very unpredictable. Winter freeze/thaw cycles are more frequent and dangerous to human life.

Health concerns: Safety risks increase with the unpredictability on both the snow covered tundra and river ice. During fall freeze-up and spring break-up the risks increase and travel to and from the village very dangerous.

Projected change: With the uncertainty of the changing climate and weather patterns, we must find ways to create safe avenues of travel on the snow and ice.

Potential adaptation: Create a new risk management plan. Monitor changes over time.

Vulnerability & risk management score: 8 - High

Potential Project: Local data monitoring

Snow and ice are an integral part of living the subsistence way of life in Oscarville. Without proper snow conditions traveling to hunt, fish, and maintain relationships with surrounding communities is much more difficult. Driving a snow mobile over tundra that isn't properly loaded with snow creates difficulties the machine is not designed to endure. The ice road in the winter months provides access to medical care, grocery stores and airlines. With unpredictable conditions, it is very difficult to adapt. The timing and ways the river is during freeze-up and "melting" vs. break-up, has created an increasingly serious and deadly consequence in the whole Yukon Kuskokwim area for years and is projected to keep changing. Combining modern science with Traditional Ecological Knowledge will help residents in the area monitor and predict what the snow and ice conditions are and will be so they can plan and act accordingly. The National Snow and Ice Data Center,



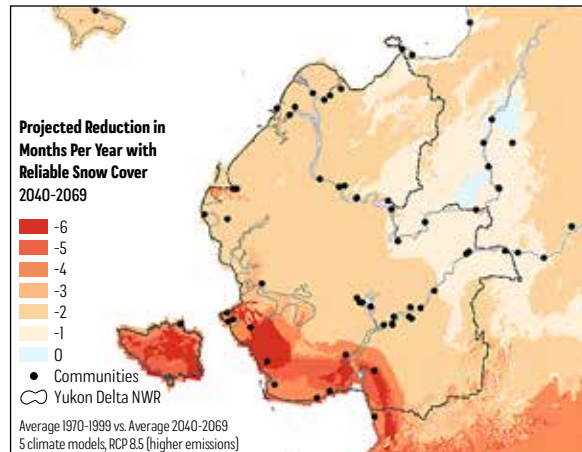
Ice Road, Kuskokwim River, 2017.

“A small temperature increase at the poles leads to still greater warming over time, making the poles the most sensitive regions to climate change on Earth. According to scientific measurements, both the thickness and extent of summer sea ice in the Arctic have shown a dramatic decline over the past thirty years. This is consistent with observations of a warming Arctic. The loss of sea ice also has the potential to accelerate global warming trends and to change climate patterns.”

— National Snow & Ice Data Center (NSIDC)

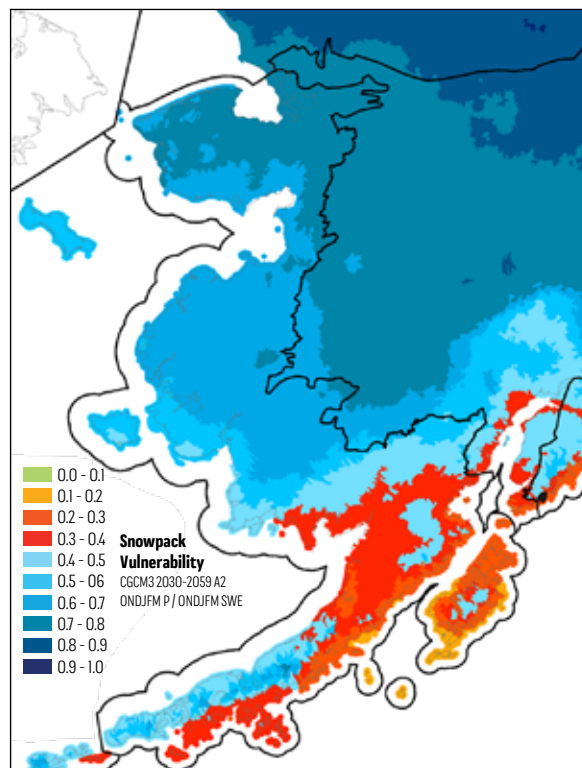
the Alaska Center for Climate Assessment and Policy, and the Scenarios Network for Alaska + Arctic Planning all offer tools for looking at past climate records and provide basic models to make educated projections on future climate conditions.

The modeled projections of snow coverage in the YK Delta region are predicted to affect Oscarville tremendously. The Department of Interior, Alaska Climate Adaptation Science Center map shows these predictions.



SNAP, UAF

The Snowpack Vulnerability map is a collaborative tool created by United States Geological Survey (USGS), Alaska Climate Science Center (ACSC) and Scenarios Network for Alaska + Arctic Planning at the University of Alaska Fairbanks. The collaborative concludes, snowpack vulnerability is an index of the fraction of October to March precipitation that ends up in spring snowpack. This has consequences for the shape of the hydrograph. Rain dominated have hydrographs that look like seasonal precipitation – they peak whenever the rain peaks. Transitional have hydrographs with two similar peaks, one during the spring melt and one during the peak of the wet season, usually in late summer in this part of the world. There are no rain dominant watersheds in the 2040s, but by the 2080s there are, and a big swath of this map becomes transitional. (USGS, ACSC, SNAP)



SNAP, UAF

“Assessing community needs and vulnerabilities is one way we partner with stakeholders to create realistic community plans and climate adaptation strategies across all of Alaska. We study marine resources and assess climate change-related impacts on water availability, sea ice, and wildfire and Alaska Native culture.”

— Alaska Center for Climate Assessment and Policy (ACCAP, UAF)

Observed change: Due to melting Permafrost and other physical changes in soil conditions, increased concentration in total organic carbon (TOC) and other contaminants have been observed in ground water. Permafrost melt shows major damage happening to electrical poles in the inter-tie to Bethel.

Health concerns: Higher risk of skin and gastral disease and infection, higher risk of food security compromised due to lack of electrical energy.

Projected change: Increased melting in permafrost, higher levels of contaminants in the raw water sources

Potential adaptation: Alternative sources of water, sanitation and renewal energy options.

Vulnerability & risk management score: Water & Sanitation, 9 – Extremely High; Energy, 8 - High

Potential Projects: Sanitation plan, Solid Waste plan, Electrical upgrades

Water and Sanitation:

Oscarville is a honeybucket haul community without access to sanitation services. In 1988 the Public Health Service (PHS) designed and built Oscarville's sanitation facilities. Initial facilities included: honeybucket lagoon, landfill, well, Water Treatment Plant (WTP), boardwalk, and the provision of honey bucket haul equipment. Soon after, the community washeteria caught fire and has not been used since. The lagoon has since dried up and the landfill has not been maintained. Residents do not have plumbed water or sewer, and obtain water from the Kuskokwim River, snow melt-off, rain catchment, winter ice from surface ponds near the village or the WTP, which treats water from an old well that is well beyond its life cycle. ANTHC is currently finalizing a Preliminary Engineering Report to look at alternative solutions for water and sanitation. A new water well was drilled in 2017 and funding has been requested to install a water main from the well to the Water Treatment Plant, which is the current watering point for residents. In-home units called the Portable Alternative Sanitation System (PASS) are being considered for on-site, in-home potable water holding tanks and a drying toilet that separates solid and liquid human waste.

The raw water sources in Oscarville are very complex. Treatment of source water in this region, and in Oscarville in particular, proves very challenging from a chemical treatment process perspective. The source water available from the wells in Oscarville is extremely high in iron, manganese, and complex total organic carbon (TOC) which creates unique challenges for water treatment. Often, effective treatment of the water results in the formation of high levels of disinfection byproducts such as haloacetic acids and trihalomethanes. Membrane treatment processes are used for source water in this region with great success, however membrane treatment systems require a level II water treatment certification, which is difficult for local operators to obtain. The unique treatment

“Maurluma alerqullruanga evcusqellua ciquqaarluku qerrun, tua-i-gguq naullutekaqa evcugluku. Cali-llu nutguaresqelluku, tua-i-gguq pitarkaqa pitniarqa.”

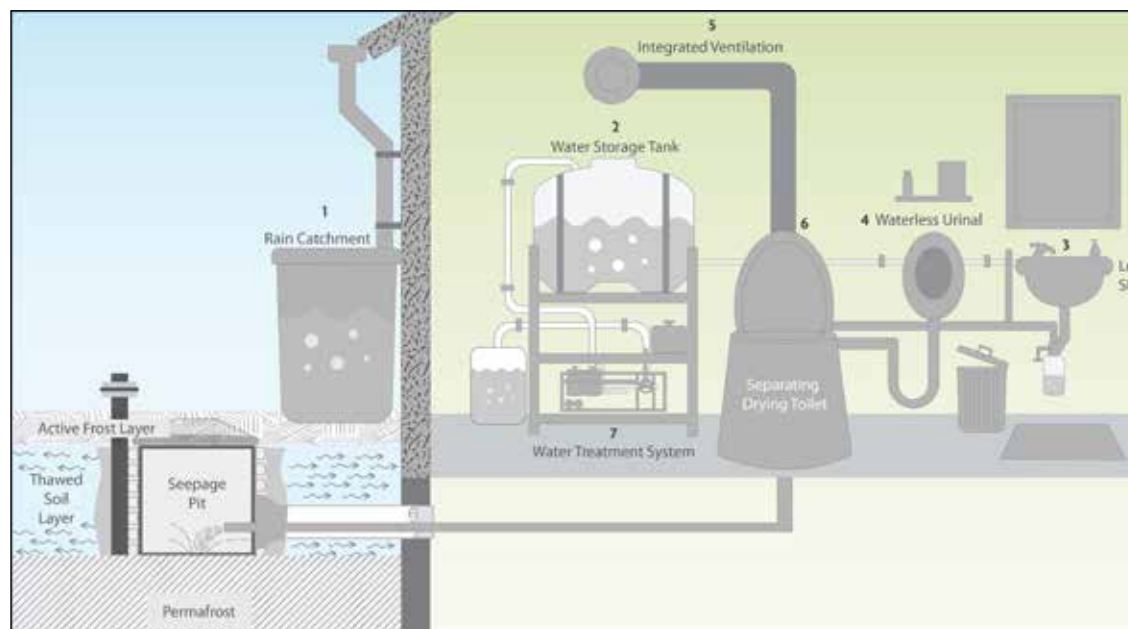
“My grandma told me to brush off my body after dumping the honey bucket in order to brush off sickness and disease from my life. Also to pretend to shoot at it, so I would catch my next subsistence.”

— Michael Stevens

challenges of the source water and limited local availability of highly trained operators creates a difficult environment in which to provide safe water to residents.

In an innovative approach to sanitation and safe drinking water, the Alaska Native Tribal Health Consortium, in collaboration with partners at the Cold Climate Housing Research Center, Lifewater Engineering and Camp Water Industries, designed the Portable Alternative Sanitation System (PASS).

The PASS unit provides four major components: A 50 or 100 gallon holding tank with a filtration and disinfecting system, a separating/drying toilet which separates the solid and liquid waste and discharges the liquid waste into a seepage pit outside the home, a waterless urinal, a rain catchment system with a first-flush component that flushes debris from the roof, and a gravity-fed line from the holding tank to a sink. The PASS unit provides a step away from the honey bucket and wash basin. Honey bucket and wash basins have been shown to increase the health risks from pathogens and bacteria. In 2017, a report by the Center for Disease Control and ANTHC showed the increased risk to human health in communities without water and sanitation.



Portable Alternative Sanitation System, ANTHC.

“Neqkat pitarkat wall’u naunraat, tamarmeng piyarangqertut allrakum iluani. Iqvayuitaput atsalugpiat naucetaarullratni.”

*“Every subsistence food we catch or gather has a season.
For example, we don’t pick salmon berries while they
are flowering but when they are ripe.”*

— Michael Stevens

Energy:

Oscarville receives its electrical power from a single inter-tie transmission line from Bethel, owned and operated by the Alaska Village Electric Cooperative (AVEC). A report by AVEC in 2017 showed major energy loss in the line, but funding to repair the line has not been secured. The local village corporation funded upgrades to the meters on each building in 2017 as a result of this report. Without electrical power, the residents would not be able to power the freezers that store their subsistence foods. If this line was compromised, it would cause major devastation and a break-down in the food security for all residents.

AVEC currently absorbs the line loss cost and seeks to work with the community on upgrades. The distribution system upgrades are estimated at \$50,000.00. The inter-tie line needs modest improvements, which AVEC estimates to cost between \$150-200,000.00. Once completed, AVEC is willing to assume responsibility for routine maintenance on the line. Residents seek to make this a priority towards energy security.



A crossroads of transportation and electrical.

*By the design of our creator we were created Yup'ik
in space and time; proud, for generations to come,
of the values given to us by our creator.*



FOOD SECURITY & SUBSISTENCE

Observed change: Warming temperatures have eliminated the use of underground food storage. Lack of adequate snow coverage has moved the nesting of fowl further away. Warming water temperatures have changed the fish population and spawning areas.

Health concerns: Increased risk to contaminated foods due to inadequate storage. Increased risk to human life with continually changing freeze/thaw cycles and warmer winter temperatures that interrupt access to subsistence foods.

Projected change: Continued unpredictable weather, snow, ice and temperature variables make it difficult to plan for adaptation.

Potential adaptation: Create tools for food resource monitoring, preparation and storage methods. Create food resource management tool to track and monitor movement of species. Create Food Resource map to identify current status of food resources.

Vulnerability & risk management score: 8 - High

A detailed list of Alaska Native subsistence food (animal/plant) species was identified and traditional ecological observations documented through interviews with community members. Of utmost concern to the community is being able to continue the ability to live off the traditional land and waters and have access to these resources. Sustainability of fish and animal species and therefore the health of entire ecosystems, as well as being able to inform fishing and hunting regulations are extremely important to Oscarville residents. Community members qualified their “well-being” as being integral to their ability to go hunting, gather plants, fish and personally harvest and store these traditional foods. All of these elements are immersed into health and wellness and have been for generations.



Traditional Food Potluck.



Summer salmon fish drying 2018.

“Maa-i mer’em cikullra kinguqsigiuq. Cupellra-llu kiingan cikum urullranek piurrluni. Ayagallerkaput arenqiallulingaluta.”

“It is taking longer to freeze and ice break up is actually now called ‘ice melt out’, making travel harder.”

Based on an ADF&G subsistence survey, in 2010, 95% of Oscarville households participated in salmon subsistence, 66% participated in marine mammal subsistence, and 87% participated in non-salmon fish subsistence (not including halibut).

Fish:

King Salmon is a primary subsistence food source for Oscarville. 'The Way of the Fish' is highly regarded and traditional management practices include not over-catching and making certain that the fish are respected by being handled promptly and correctly. In this manner, the Yupik believe the fish then will always return. In addition to salmon, other fish harvested includes: whitefish, blackfish, burbot, Arctic grayling, rainbow trout, smelt, northern pike and sheefish. Because of warmer summers, 1/3 of the salmon went to waste the summer of 2016 because the flies came out too early and laid their eggs on the fish being processed.



Subsistence fishing on the Kuskokwim river.

Fowl:

The community harvests a number of species of migratory birds and their eggs. However, because of recent climate change events that affect navigability of waterways, access to traditional hunting areas has been prohibited. Old squabs, cranes, white wing and black scooters, swans, Canadian geese, emperor geese, black grant geese, white front geese, buffleheads and golden eye duck are the vast variety of birds harvested. Arctic tern and seagull eggs are harvested from the tundra nests in the spring. These traditions are being impacted with unusual nesting times and varying water levels, making it difficult to access gathering areas.



Emperor geese.

“Neqkaucituut ayuqenrilngurnek, yuum maligtaqustai nerengnaqsaram.”

“People who are continually practicing subsistence have different and abundant food supplies.”



Berry picking.



Subsistence hunting for moose.

Plants:

Sour dock, wild celery, wild onions, wild rhubarb, wild raspberries, blueberries, currants, tundra salmon berries, cranberries and black berries are harvested in the spring, summer and fall and stored for use all winter. Medicinal plants include wild sage (stinkweed), tundra tea (ayuuq), lungwort (blue bell leaves), yarrow, blueberry leaves and fireweed. Traditional salves and tinctures are made to help heal ailments such as colds, flus, rashes and intestinal issues.

Hunting:

Moose and caribou hunting is a more recent food source for Oscarville. Availability of moose as a subsistence resource has only come about in the last 10 years or so. Caribou was also not a traditional source of food but has become more prevalent in the past 20-30 years. If moose or caribou are not available or harvest limits go unmet the community supplements with store bought beef and chicken. Local hunters take to the coast, some 100 miles away, to hunt for seal and walrus.

Research observations completed in the interior of Alaska in the document “Living off the Land: Environmental impacts to access in Interior Alaska” (<http://mapventure.org/environmental-impacts-access/index.html#introduction>) shows a rapidly changing cycle that is impacting and changing traditional food resources in the interior. It is the hope of the people of Oscarville that they can secure adaptation responses for future generations by capturing the stories and recording the local observations.

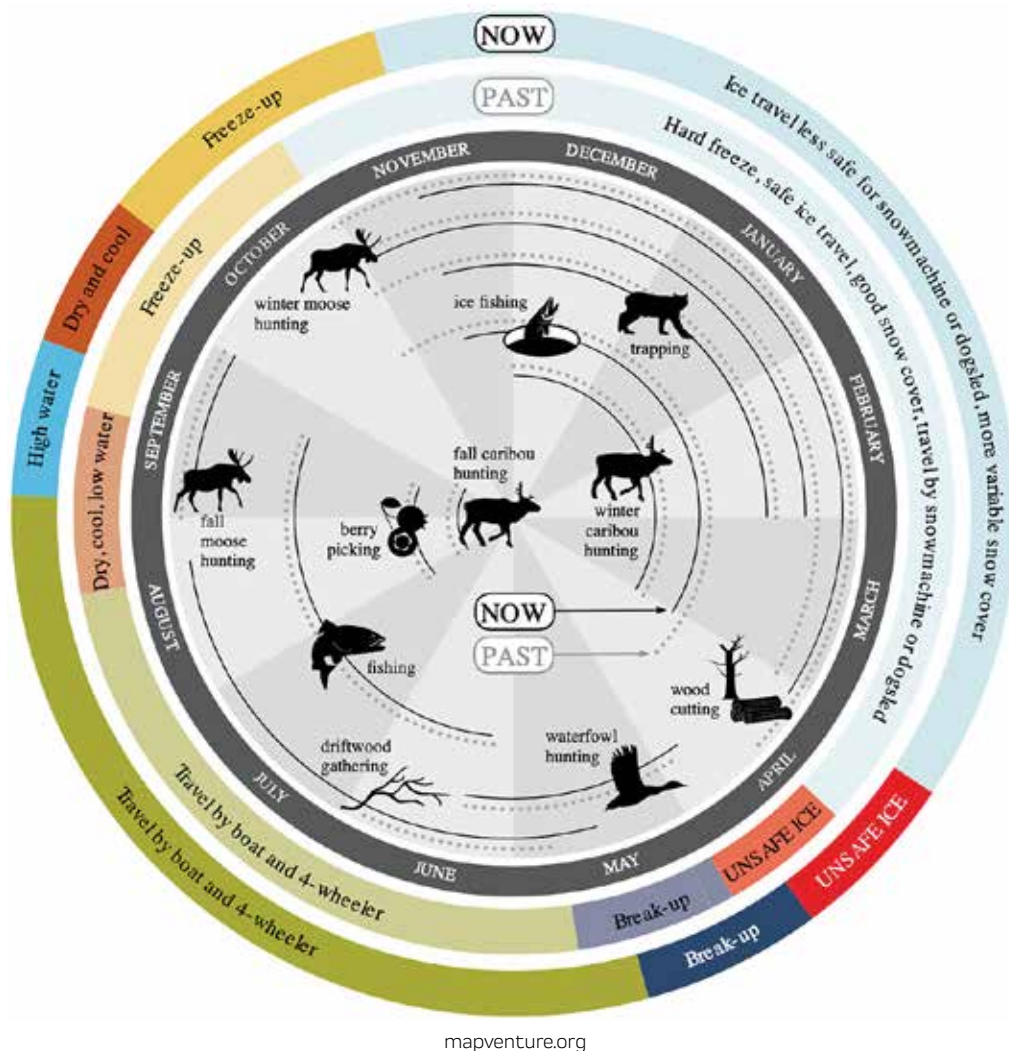
Yup'ik values include:

*“Hard Work, Cooperation, Sharing, Hunter Skills,
Respect for Nature, Respect for Land.”*

Subsistence is our way of life.

Locating current traditional food resources was vital to the leaders of Oscarville. Working with the ANCSA regional corporation, Calista, the residents would like to map out food resources in their Yup'ik language and begin the process of monitoring change. Calista and OTC will be collaborating on this effort. It is their desire to create a food resource tool to track subsistence food resources, trends and changes.

The Changing Seasonal Cycle graph below was created to show the change in food resources for interior Alaska. The community of Oscarville would like to create a similar tool.



*We were once migrant people, traveling with our food resources.
We are no longer able to do so and climate change
is moving our food further away.*

SAFETY & SECURITY

Observed change: Water level changes in the Oscarville slough. Increased rain and less snow coverage.

Observed change: Risk factor increases with unpredictable river conditions.

Health concerns: Increased risk for human danger and/or death as the result of unsafe river conditions.

Projected change: Continued warming may cause more frequent freeze/thaw cycles.

Potential adaptation: Collaborate with Bethel Search and Rescue and employ a Village Police Safety Officer (VPSO).

Vulnerability & Risk management Score: 9 - Extremely High

Potential Projects: Create a Search and Rescue (SAR)

The safety and security environment for the residents of Oscarville currently does not exist. There are no police officers, nor a structure to house them. The community depends on the Bethel outpost of Alaska State Troopers for all human security issues.

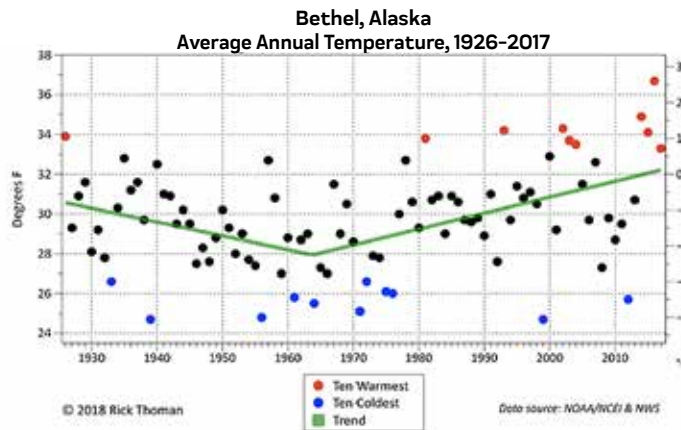
The lived environment poses a variety of risks throughout the year, especially during spring thaw and fall freeze-up on the Kuskokwim River. During these times the only way in and out of Oscarville is via helicopter or a tundra trail on an All-terrain vehicle (ATV). The ATV trail crosses the Kuiggayagaq slough, which poses high risks during these seasonal changes. Climate change events, such as multiple freeze/thaw cycles, creates unpredictable risks in fall, winter and spring.



Spring pick up via helicopter; transports local folks to nearby Bethel.

*“We can only fly out on a helicopter during freeze up and break up.
The river is too dangerous.”*

The temperature variances tracked in the graph to the right confirms the current rate of change for river freeze-up. Bethel is located 7 miles upstream from Oscarville and the Kuskokwim River Ice Road is the only means of transportation during the winter months.



Warmer temperatures make for unpredictable ice conditions.

“As the climate warms, the resulting shorter and milder cold season reduces the season length for ice road use, increases the risk of travel on river ice, and increases the wear and tear on snow machines.”

(National Climate Assessment 2018)

LAND & HOUSING

Observed change: Melting permafrost continues to compromise and destroy housing and infrastructure.

Health concerns: With increased foundation shifting due to permafrost melt, homes are experiencing more moisture issues, including black mold and poor indoor air quality. Due to lack of funding, residents continue to live in homes inadequate for healthy living.

Projected change: Continued damage to structural foundations, board roads and access to landfill.

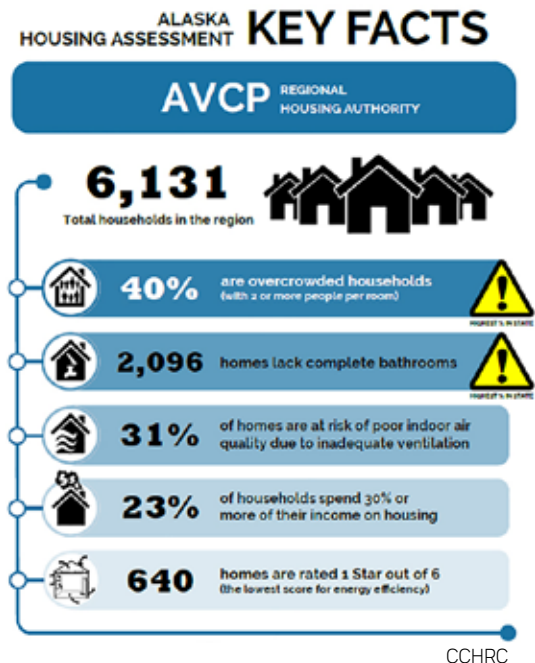
Potential adaptation: Identify location of new community infrastructure and begin to relocate as we grow.

Vulnerability & risk management score: 7 - High

Oscarville residential housing and community buildings are located along the Kuiggayagaq Slough and several feet inland from the Kuskokwim River. Residential housing is very limited and existing housing is often inadequate and unsafe for its residents. Built structures, be they residential housing, community buildings, storage facilities, steam bath houses, or fish racks, are subject to one or more potential impacts including: permafrost melting, potential flooding, erosion, high wind storms, and rain.

Additionally, a number of immediate human health and safety factors were identified. In summary, the older homes are in worse shape than the newer AVCP-RHA homes. Closing houses tightly, without proper ventilation can lead high humidity levels and mold growth. Also, many heat with wood stoves and even use their homes as workshops in the winter. All of this leads to poor indoor air quality. Most homes that use wood for heat have an EPA certified wood stove. Some residents use their homes as workshops to maintain snowmobiles and all-terrain vehicles in the winter, introducing high levels of VOCs to the indoor air. Many homes had mold, but no extensive mold or moisture damage.

Land ownership in Oscarville is complex due to the layers of governmental statutes in place. The YK Delta as a whole is categorized as the most at risk area in the State of Alaska in the State of Alaska in the Alaska Housing Assessment Report, completed by CCHRC in 2017. Overcrowding and lack of sanitation compounds the need for better housing.



“Cauceten aulukekuvki, kituggluki-llu pikumaciqaten.”

*“If you take good care of your belongings,
you will own them for a long time.”*

Oscarville Housing Vulnerability and Air Quality Rating Chart:

Building	Sensitivity	Adaptive Capacity	Vulnerability	Air Quality Rating	Notes
1	Medium	Medium	High	7	
2	Medium	Medium	High	.75	Wooden block foundation is unstable
3					Public Clinic (not in use). Good candidate for outisolation.
4	High	Low	High	2.5	Overcrowded/high moisture mold/resident complains of heat loss in below zero temps
5	Low	High	Medium	6.5	This home is closest to the Kuskokwim
6	High	Low	High	7.75	Not structurally sound
7					Not Occupied
8	High	Low	High	3.75	Not structurally sound
9	Medium	Medium	Medium	3.75	Foundation issues
10	Low	High	Low	1	
11	Low	High	Low	4.75	
12	High	Low	High	12.75	Leaking roof/mold/no ventilation
13	Low	High	Low	5.5	Moisture issues
14	Low	High	Low	0.5	Not
15	Low	High	Low	4.5	
16	Low	High	Low	1.75	
17	Medium	Medium	Medium	4.25	Severe air quality issues, moving foundation - all adjustable

CCHRC Oscarville Housing Assessment, 2017

“Nunapigmi malluqengquvet enermek wall’neqramek elakauskiu nunam acianum. Eling’ratartuq-gguq.”

“If you come across a bone or piece of animal carcass on the tundra or anywhere, bury it and it will give you a spiritual help from gratitude.”



WHERE WE ARE GOING: A PATH FORWARD



RESOURCES

Resource information list			
Organization	Contact Info	Web Link	Description
LEO Network <i>Local Environmental Observers Network, ANTHC</i>	907-729-3430 ceh@anthc.org	www.leonetwork.org	Platform network that connects people through shared information. Local observations on one site.
SNAP UAF <i>Scenarios Network for Alaska and Arctic Planning</i>	907-474-7127	www.snap.uaf.edu	A diverse network to develop and communicate plausible scenarios of potential conditions in an evolving climate. Over 20 collaborators.
ACCAP <i>Alaska Center for Climate Assessment and Policy</i>	907-474-7812	accap.uaf.edu	Online tools for adaptation, arctic climate, extreme events, weather, wildfire
ACEP <i>Alaska Center for Energy & Power</i>	907-474-5402	acep.uaf.edu	Energy research program at UAF that provides innovative energy solutions, including renewables and energy-efficiency.
ISER <i>Institute of Social and Economic Research</i>	907-786-7710	iseralaska.org/	Economic and population research for a changing Alaskan environment.
Arctic Program NOAA <i>National Oceanic Atmospheric Administration</i>	arctic.webnaster@noaa.gov	www.arctic.noaa.gov	Research and management programs in the Arctic. Forecasting sea ice, climate, ecosystem changes, weather and water and coastal resources.
Alaska Native Science Commission	907-258-2672	nativescience.org	Clearinghouse for research and science, in partnership with the native communities of Alaska.
Alaska CASC <i>USGS Climate Adaptation Science Centers</i>	casc@usgs.gov	casc.usgs.gov	Provides information and decision-making tools to respond to effects of climate change.
AOOS <i>Alaska Ocean Observing System</i>	907-644-6751	aos.org	Provides access to coastal and ocean data, assist in increasing observation and forecasting capacity in the Arctic.

“Elluarrluku mikelnguq anglisqekumtegggu tamamta
nunararmiuni ikayuqluta anglicararkaugaput.”

“If we want to properly raise a child,
as a village we need to work together.”

Assessing the relative vulnerability of each sector in this planning document allowed tribal leaders to then prioritize the potential projects for adaptability, connect to potential funders, and create an implementation plan for the future. The community would like to first secure food, water and shelter in place and adapt standards and practices for a more sustainable future. The priority list below was established by the community leaders.

Project priorities set by the community leaders of Oscarville are as follows:

Priority	Project name	Next steps	Partners	Funders	Estimated Costs
1	Improved Sanitation and Water	Sanitation Plan	ANTHC, YKHC	IHS, USDA-RD	\$1.6 million
2	Boardwalk to Bethel New dock and new location of dock	AVCP follow-up for planning	AVCP	BIA	
3	Electrical Upgrades	Meet with AVEC, AEA, DOE	AVEC, AEA, DOE	ONC, AVEC, AEA, DOE	\$150-200,000
4	Wind and Solar integration	Research possibilities	AVEC, AEA, DOE, REAP, ACEP, Calista, CCHRC	TBD	TBD
5	Incinerator for Solid Waste	Finalize Sustainable Solid Waste Plan	ANTHC-CEH	EPA	\$6,000
6	Multi-use building	Research and plan	AVCP, ONC, CCHRC	HUD, EDA,	
7	Local Data Monitoring (temp, precipitation, water, ice, snow)	LEO Network training, research	ANTHC, UAF, UAA	TBD	TBD

“Piciryaraput, qaneryaraput-llu pugumavkarluki.”

“Let’s keep our traditional customs and values alive!”



FINANCIAL MATRIX

Funders Resource List			
Organization	Contact Info	Web Link	Description
ANTHC DEHE <i>Alaska Native Tribal Health Consortium – Division of Environmental Health & Engineering</i>	907-729-3600	anthc.org	Statewide Tribal Health Organization. Provides water, sanitation, engineering, design and construction services to rural communities. Funding can be combined with other funding sources.
YKHC <i>Yukon Kuskokwim Health Corporation</i>	907-543-6000	www.ykhc.org	Regional Health Organization – YK Delta. Provides comprehensive health-related services, including water, sanitation, and healthcare. Funding can be combined with other funding sources.
AVCP <i>Association of Village Council Presidents</i>	907-543-3596	www.avcp.org	Non-profit tribal consortium (56 YK tribes). Provides tribal support services, including grant administration assistance.
AVCP – RHA <i>Association of Village Council Presidents Regional Housing Authority</i>	907-543-3933	www.avcpousing.org	Regional Housing Authority. Provides housing needs to all 56 regional tribes. Funded through NAHASDA, HUD. Provides funding with income restrictions and low-income loans.
AEA RPSU Program <i>Alaska Energy Authority Rural Power Systems Upgrade Program</i>	907-771-3082	www.akenergyauthority.org	Provides financial and technical assistance, including construction management and training. Provides upgrades for energy systems, including efficiency, powerhouse upgrades, line assessments, new lines, heat recovery and repairs.
USDA-RD <i>United States Department of Agriculture Rural Development</i>	907-761-7705	www.rd.usda.gov/ak	Provides federal funding assistance for rural communities, including housing, infrastructure (water, wastewater, electric and telecommunications), grants and loans.
RurAL CAP <i>Rural Alaska Community Action Program, Inc.</i>	907-279-2511	ruralcap.com	Statewide non-profit. Provides assistance to low-income Alaskans, including housing, health and well-being, childcare, education and support services for elders and youth.
RCAC <i>Rural Community Assistance Corporation</i>	916-447-2854	/www.rcac.org	Western states and Pacific Island non-profit. Provides training, technical and financial assistance resources for rural communities.
Alaska Native Fund <i>Alaska Conservation Foundation</i>	907-276-1917	alaskaconservation.org	Provides funding and support services for natural resources, including sustainable economics, terrestrial and marine life, development and culture.
Alaska Conservation Foundation Organizational Capacity Grant			
Rasmuson Foundation	907-297-2700	www.rasmuson.org	Provides grant funding for art, culture, health, social services, housing and promotion of philanthropy.
EPA IGAP Grant – DEC <i>Alaska Department of Environmental Conservation</i>	907-269-7500	www.epa.gov/dec/alaska.gov	Variety of funding opportunities for environmental-related issues.
HUD <i>U.S. Department of Housing and Urban Development</i>	907-677-9800	www.hud.gov/states/alaska	Variety of grant and loan opportunities, including infrastructure, emergencies, housing and environmental.
AHFC <i>Alaska Housing Finance Corporation</i>	907-338-6100	www.ahfc.us	Provides funding and support services for public housing, energy efficiency, senior housing, professional development and weatherization of existing infrastructure.
CVRF <i>Coastal Villages Region Fund</i>	907-278-5151	www.coastalvillages.org	Western Alaska CDQ Program provides economic development funding opportunities for coastal community in the YK Delta.
BIA <i>U.S. Department of the Interior Bureau of Indian Affairs</i>	907-271-4085	www.bia.gov/regional-offices/alaska	Federal agency provides tribal funding for housing, human services, natural resources, subsistence, realty, self-determination and transportation.

Holistic planning integrates the cultural strengths of rural Alaskan communities. The decisions for projects and prioritization are value-based and provide real-life responses to resiliency. The involvement of all community members; youth, adult and elders, is vital to the success of this type of planning. The youth hold the future in their hands, the adults are current implementers, and the elders provide the wisdom of times past. This perspective allows the planner to view through the eyes of the resident, not as an outsider looking in.

Steps to Holistic Community Planning

STEP 1: Community Led Discussion

- Format discussion to extract information needed for plan
- Listen, reiterate and document

STEP 2: Gather history, Data, Maps

- Talk to Elders for oral history
- Research for documented history
- Collect science data and maps

STEP 3: Analyze

- Analyze data collected
- List identified missing information
- Do a comparative cultural analysis

STEP 4: Set Goals

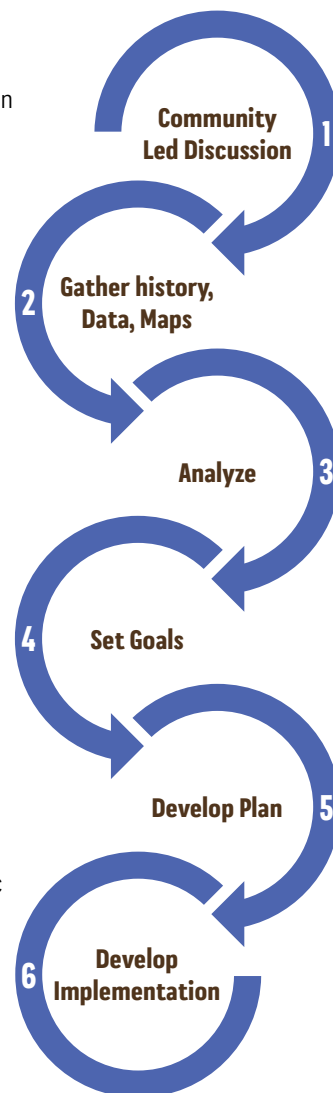
- Remember goal setting may be new to some communities
- Address needs over wants
- List goals and prioritize

STEP 5: Develop Plan

- Develop draft and have community review and edit
- Allow community to form local perspective of each topic

STEP 6: Develop Implementation

- Identify potential partners
- Identify potential funders
- Create a timeframe for plan



CULTURES & TRADITIONS

The southwest Alaska Natives are named after the two main dialects of the Yup'ik language, known as Yup'ik and Cup'ik. The people of Oscarville come from the Yup'ik dialect. Residents still depend upon subsistence fishing, hunting and gathering for food. Elders tell stories of traditional ways of life, as a way to teach the younger generations' survival skills and their heritage. The small groups of people organized their lives according to the animals and plants that they hunted and gathered. In the old days, families came together and dispersed according to the seasons. Most settlements and camps were occupied by extended families or small groups of families. Elaborate winter ceremonies emphasized the relationship among humans, animals, and the spirit world. Oscarville is a modern-day example of a small group of families who settled together and continue to live this traditional lifestyle. Traditional dancing, skin-sewing, maqii (steam bath), community feasts, traditional games and hunting and gathering are the strengths of this community.



Family enjoys summer fish camp.

*"Nature is part of our culture.
When you look out at nature it's all speaking to you.
We're still connected to nature."*

— Alaskan Native Elder

Report disposition:

This adaptation plan builds upon the climate adaptation work of other groups and organizations and strives to incorporate Traditional Knowledge (TK), so that the assessments truly fall within the 'Holistic Approach to Sustainable Northern Communities'. The ultimate intent of this report is to create a framework that is community-led and that will inform state and regional governments as they address other Alaska Native Villages that are imminently threatened by climate change, several of which are listed under the State of Alaska Climate Change Sub-Cabinet Advisory Group and the Denali Commission's Environmentally Threatened Community list. Through this planning effort, the Oscarville Climate Adaptation Advisory Committee was formed to include experts in all sectors, including science, planning, housing, research, academia, environmental health, energy, infrastructure and transportation, in this effort.

Concurrent to the threat assessments, the Cold Climate Housing Research Center in partnership with Alaska Native Tribal Health Consortium (ANTHC), has been identifying gaps in the research and funding challenges, and has incorporated these findings into strategic recommendations for the implementation plan. The project recommendations include potential partnerships and collaboration with local, regional, state and federal agencies. along with potential funders for implementation.

The final report will be shared as a model to assist other tribal governments, agencies and organizations in planning for adaptation. It is expected that the Oscarville Traditional Council will use this report as a living document to be adjusted to fit the needs of the community as they move forward with their short and long term planning goals as they determine how to best cope with and adapt to the significant issues facing their community.



Michael Stevens, Oscarville Tribal Administrator
and two of his children

"Taugaam ayagyuaanta ciunerkaatnun kinguliamta qanruyun taugaam kiingan calissuutekarput. Ellangcarturluki, wangkuta nallunritaarkemtenek augkunek ciuliamtenek elitellruaramtenek kinguvarrvikluki."

"As we work on securing our children's future, what our elders taught us is our only tool. We need to teach and pass down what we know that we heard from our ancestors."

ACRONYMS AND ABBREVIATIONS

ANTHC	Alaska Native Tribal Health Consortium
AEA	Alaska Energy Authority
ACSC	Alaska Climate Science Center
AHFC	Alaska Housing Finance Corporation
ANCSA	Alaska Native Claims Settlement Act
AVCP	Association of Village Council Presidents
AVCP-RHA	Association of Village Council Presidents Regional Housing Authority
AVEC	Alaska Village Electric Cooperative
BIA	Bureau of Indian Affairs
CCHRC	Cold Climate Housing Research Center
CDC	Center for Disease Control
DCCED	Department of Commerce and Community Economic Development
EPA	Environmental Protection Agency
OTC	Oscarville Traditional Council
PASS	Portable Alternative Sanitation System
PHS	Public Health Service
SNAP	Scenarios Network for Alaska + Alaska Planning
TEK	Traditional Ecological Knowledge
TOC	Total organic carbon
UAA	University of Alaska Anchorage
UAF	University of Alaska Fairbanks
USGS	United States Geological Survey
VOC	Volatile organic compounds
WTP	Water Treatment Plant
YK	Yukon-Kuskokwim

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