

Protocol for Identifying, Analyzing, and Incorporating Local Knowledge, Traditional Knowledge, and Subsistence Information in the North Pacific

DRAFT PROTOCOL

January 2022

Abstract	2
1. Introduction	3
2. Background	6
3. Taskforce Ground Rules	11
4. Challenges to Including LK, TK, and Subsistence Information into the Council's Decision-making Process	13
5. Guidelines	16
Guideline 1 - Understand key concepts and definitions related to LK, TK, and Subsistence	16
Guideline 2: Recognize and respect multiple knowledge systems	17
Guideline 3: Recognize how to identify sources of LK, TK, the social science of LK and TK, and subsistence information	18
Guideline 4: Engage in early and frequent communication with Tribes, fishing associations, industry, local governments, co-management bodies, and CDQ groups.	22
Guideline 5: Acknowledge difference in opportunity for capacity among relevant entities	24
Guideline 6: Be aware of and adhere to the protocols that entities have established for sharing information, conducting research, and communicating LK or TK	24
Guideline 7: Ensure appropriate capacity for accessing and using LK, TK, the social science of LK and TK and subsistence	27
6. Conclusions	29
Appendix A: Abbreviated Onramps	30
References	31

Abstract

This protocol provides guidance for analytical staff, researchers, and decision-makers working within the North Pacific Fishery Management Council’s (hereafter Council) process for identifying, analyzing, and incorporating Local Knowledge, Traditional Knowledge, and subsistence information into the Council’s decision-making.¹ This protocol was collaboratively developed throughout a multi-year effort by the Local Knowledge, Traditional Knowledge, and Subsistence Taskforce (LKTKS) formed under the Bering Sea Fishery Ecosystem Plan (BSFEP) Action Module 2 to Develop Protocols for Local Knowledge, Traditional Knowledge, and Subsistence information into the Council’s decision-making process. Designed to be action-informing², this protocol includes several high-level guidelines that identify best practices for working with Local Knowledge, Traditional Knowledge, and subsistence information which are operationalized based on the diverse expertise of Taskforce members. This protocol is followed by a summary of potential ‘onramps’ or places within the Council’s decision-making process where Local Knowledge, Traditional Knowledge, and Subsistence information could be incorporated.

¹ The Council’s January 2020 motion specifying the tasking for this Taskforce can be found here: <https://meetings.npfmc.org/CommentReview/DownloadFile?p=ce213a15-6672-4d0b-9fad-6b0719388804.pdf&fileName=D3%20MOTION%20.pdf>

² By “action informing” we mean that these guidelines are intended to guide and inform Council members and staff throughout their decision-making processes, rather than regulate or mandate Council action.

1. Introduction

The Bering Sea ecosystem is a rich area of marine productivity that supports an array of commercial, sport, and subsistence fisheries (Huntington et al., 2013; National Research Council 1996; Springer et al., 1996). Harvesters and coastal communities hold deep connections to the marine environment as they rely on this ecosystem and its resources (e.g., fish, marine mammals, seabirds and more) to provide economic livelihoods, cultural wellbeing, and food security (Fall et al., 2013; Huntington et al., 2016; Vonoit Baron 2019). Indigenous Peoples³ across the Bering Sea including, but not limited to, the Unangan, Alutiiq, Athabascan, Yup'ik, and Inupiaq have been connected to, and relied on, the Bering Sea since time immemorial.

The Bering Sea is undergoing major ecological and climatological shifts that are increasingly extreme and difficult to accurately predict (i.e., marine heat waves, impacts to seabird populations, marine mammals, forage fish populations, and more) (Cheung & Frölicher 2020; Oliver et al., 2019; Pilcher et al., 2019; Reum et al., 2020; Thoman et al., 2020). Local communities have long observed significant climate variability, such as higher seasonal temperatures, changes in precipitation patterns, wind patterns, storms, and ocean currents (Cochran et al., 2013; Meier et al., 2014; Wrona et al., 2006). These changes have raised concerns about the impacts on subsistence (Ahmasuk et al., 2008; Bering Sea Elders Group 2011; Christie et al., 2018).

The observable effects of climate change on the marine environment have accelerated development and implementation of ecosystem-based fisheries management (EBFM)⁴ and provided national and regional opportunities to broaden the scope of scientific understanding of complex social-ecological systems like the Bering Sea. There is increasing awareness that western science, while providing valuable data for fisheries management, can be limited to specific and often ecologically and temporally narrow approaches (Wheeler et al., 2020). National Standard 2 of the Magnuson Stevens Act (MSA) requires the best available scientific information be used to support the Council's decision-making; and it includes the long-term experiences of people who hold knowledge about the terrestrial and marine environments where they live and work (Huntington 2000; Johannes and Nies 2007; Mulalap et al., 2020; Stephenson et al., 2016; Thompson et al., 2020). As climate variability poses new and ongoing challenges (Dietz et al., 2020; Hauser et al., 2021; Huntington et al., 2020), the need for multiple knowledge systems including Traditional Knowledge and experiential knowledge from local resource harvesters and community members is both relevant and timely (Hosen et al., 2020; Mustonen et al., 2021; Petzold et al., 2020), and will only increase (Arsenault et al., 2019; Chapman & Schott 2020; Flynn et al., 2016; Latulippe & Klenk 2020; Zhongming et al., 2012).

Local Knowledge (LK) and Traditional Knowledge (TK) holders may be some of the earliest observers of environmental changes because of their experience working, living, and harvesting in specific areas (Gadamus & Raymond-Yakoubian 2015). LK and TK can shine light on fluctuations in species abundance, location, spawning areas, migrations, ocean currents, sea ice, migrations, and much more (see Johannes & Nies 2007 for an extended review on this point). LK and TK are not anecdotal information,

³ In this protocol, the terms 'Indigenous Peoples' or 'Alaska Native' are used to designate the diverse populations in the United States and Alaska who could interact with the Council's decision-making process. These terms refer to Federally recognized Tribes, with whom the United States meets its trust responsibility through a government-to-government relationship, consultation and other legal obligations (see Secretarial Order 3206 and EO 13175). In general, we refer to "Indigenous Peoples," "Alaska Native(s)," and "Tribes" interchangeably throughout this document, unless we are talking about a specific group or a specific status.

⁴ Ecosystem-based management aims to maintain ecosystems in a healthy, productive, and resilient condition so they can provide the services humans want and need. Traditional fisheries management has focused on one species in isolation; however increased understanding of ecosystem processes and interactions has driven more effective management strategies including EBFM. NOAA Fisheries is responsible for the stewardship of the nation's living marine resources and their habitats, interactions, and ecosystems. NOAA Fisheries has adopted EBFM to fulfill its mandates and promote consideration of the full range of cumulative effects and trade-offs across various management regimes and human uses, as well as the impacts of these management decisions on human systems (NOAA 2022).

but rather are complex systems of dynamic and living knowledge with adaptive integrity and legitimacy of their own, born from the direct experience of those that hold it (Houde 2007). Often these knowledge systems undergo their own forms of peer review and accountability (Barnhardt & Kawagley 2005).

Decision-makers like the Council are increasingly recognizing the value of multiple knowledge systems for sustainably managing fisheries. In response to increasing awareness of the value and importance of experiential forms of knowledge like LK and TK, and the input gained throughout the development of the BSFEP, the Council established the LKTKS Taskforce in 2019. **The purpose of this protocol is to provide guidance to analytical staff, researchers, and decision-makers working within the Council process for identifying, analyzing, and incorporating LK, TK, the social science of LK and TK, and Subsistence expertise and information into the decision-making process.**⁵

Designed to inform the Council’s decision-making process in a holistic way, this protocol includes several high-level guidelines identifying best practices for working with LK, TK, and subsistence information which are operationalized based on the diverse expertise of Taskforce members. These guidelines are followed by ‘onramps’ or places within the Council’s decision-making process where LK, TK, and subsistence information could be included. It is important to be clear that this protocol was developed with knowledge specific to the Bering Sea region. As such, the insights and reflections herein should be kept in the proper context, and caution should be used when extrapolating the guidance to other decision-making processes.

Following this introduction, Section 2 of the protocol provides critical background information for the reader. Section 3 provides information about the Taskforce’s goals and objectives, as adopted by the Council. Section 4 describes some of the possible challenges to identifying, analyzing, and incorporating the best available experiential knowledge systems alongside western science and decision-making processes. This section also discusses the vital process of partnering with diverse knowledge holders who practice subsistence ways of life. Section 5 contains the main content of the protocol, namely the guidelines. The guidelines are action-informing and intended to:

1. Improve understandings of LK, TK, and subsistence information based on the subsistence way of life.
 - a. Provide foundational information on the role of LK and TK in Federal fishery management.
2. Provide guidance to analytical staff and researchers engaging with diverse forms of knowledge and knowledge holders in analytical or research efforts:
 - a. Establish principles of engagement with LK and TK experts, communities, Tribes, and other relevant entities on issues related to LK and TK.
3. Provide analytical guidance to more richly, accurately, and systematically include LK, TK, the social science of LK and TK, and subsistence information into the Council’s decision-making process.

The guidelines themselves are written at a high-level and are followed by content that provides in depth

⁵ The Taskforce has made a distinction between LK and TK, and the social science of LK and TK because LK and TK exist regardless of whether social science has been conducted to understand, analyze, or synthesize them.

Setting the Stage
<ul style="list-style-type: none">● No one component of this protocol should be separated from the whole.● Cultural sensitivity and awareness are at the core of this work.● The protocol is intentionally broad in its scope, covering the entirety of the Council’s process so it can be useful to all the key entities in the Council’s process (i.e., staff, Council members, Alaska Fisheries Science Center staff, Regional Office staff, and more).● The protocol is specific to the Bering Sea region and fisheries management. While certain elements might be of use in other management contexts, the Taskforce would caution against wholesale application to other decision-making contexts and scientific processes● The protocol is action-informing.

context for their relevance to the Council’s process as well as practical steps for analytical staff, researchers, and decision-makers. The Council’s decision-making process is multi-faceted, dynamic, and involves close partnerships with stakeholders, Federal agencies, Tribes, scientists, and more. By taking a broad approach, the protocol is intended to be useful for all the key entities in the Council’s process (i.e., staff, Council members, Alaska Fisheries Science Center staff, Regional Office staff, and more).

2. Background

People who are intimately familiar with a particular place have knowledge about the past and present conditions of the resource and surrounding ecosystem and could be the first to notice changes in resource abundance, species presence, or habitat destruction (Berkes 1993; Clark 2016; Close & Hall 2006; Neis & Felt 2000). The knowledge that traditional, sport, and commercial fishers, marine hunters, and local community residents can bring to the Council’s decision-making process is invaluable; it is knowledge based on entire careers, generations of knowledge, and in the case of TK, millennia (Ban et al. 2017; Thornton et al. 2010; Raymond-Yakoubian et al., 2017).

LK and TK are interactive and deeply connected to the surrounding environment or place in which the knowledge is produced. Because of its specificity and connectivity to place, there is no one agreed upon definition of LK and TK in international law or common discourse (Mulalap 2020), although there are several legal frameworks that describe and protect TK in particular (for examples see CBD 1992; ILO 169 1989; UNDRIP 2007). LK and TK are best understood as knowledge systems rather than an assemblage of facts. These knowledge systems are linked to skills, observations, and cultural meanings that are often gained or given by experience and story (Aporta 2002; Aporta & Higgs 2005; Folke 1999).

LK broadly includes the observations and experiences of local people in a region as well as people with significant experience or expertise related to a particular location, species, or practice. LK can evolve over time and be acquired over the course of a few generations or less; but it is inherently the product of knowledge formation and dissemination based on personal, shared, and inherited experience (Martin et al. 2007). LK bearers are often relatively small groups of people, living or working in, or connected to, a common geographic location who actively engage with the environment (e.g., fish harvesting or processing, etc.) through local harvest of wild resources. However, LK holders may or may not be Indigenous Peoples (PFRCC 2011). For example, within the Bering Sea region, LK holders might include commercial Bering Sea fishers who spend considerable time in the region and are possibly intergenerational participants in the fishery but reside (at least part of the year) outside the region (i.e., in Lower 48 ports such as Seattle or Astoria).

A practical example of LK with direct relevance to fishery management emerges from inshore cod fishers who communicated a decrease in the North Atlantic cod spawning stock on their fishing grounds prior to the biological collapse of the cod fishery (Johannes et al., 2000). In the Gulf of Alaska, small-scale jig fishermen were among the first to raise concerns about declining abundance of nearshore Pacific cod stocks prior to the drastic 80% cut to the Total Allowable Catch (TAC) in 2018 (Peterson Williams et al., 2021). Both cases illustrate the value of including LK in fisheries assessments early and regularly in the management process to detect and effectively respond to ecological changes.

All forms of place-based and experiential knowledge are legitimate; however it is widely agreed that **TK** is distinct from LK in that TK systems are observed, collected, and vetted across multiple generations for centuries or millennia *by Indigenous Peoples*. To guide its own work, the Taskforce agreed to use the definition for TK put forward in Raymond-Yakoubian et al., (2017) that emerged from extensive dialogue with Bering Sea Tribal Elders and knowledge holders. **TK** is:

“A living body of knowledge which pertains to explaining and understanding the universe and living and acting within it. It is acquired and utilized by Indigenous communities and individuals in and through long-term sociocultural, spiritual and environmental engagement. [Traditional knowledge] is an integral part of the broader knowledge system of Indigenous communities, is transmitted intergenerationally, is practically and widely applicable, and integrates personal experience with oral traditions. It provides perspectives applicable to an array of human and nonhuman

phenomena. It is deeply rooted in history, time, and place, while also being rich, adaptable, and dynamic, all of which keep it relevant and useful in contemporary life. This knowledge is part of, and used in, everyday life, and is inextricably intertwined with peoples' identity, cosmology, values, and way of life. Tradition – and [Traditional Knowledge] – does not preclude change, nor does it equal only 'the past'; in fact, it inherently entails change.” (Raymond-Yakoubian et al., 2017).

As this definition describes, TK is a dynamic body of knowledge—learned through observations and experimentation with the natural world—that is accumulated over centuries or millennia. TK holders share, reassess, and re-evaluate knowledge across generations and in response to new or changing conditions (Noongwook et al., 2007). TK is experience-based and inherently embedded in the cultures who have dwelled in a place since time immemorial (Ingold 2000, 43; Berkes 1999, 8). As such, TK is an evolving system of knowledge that builds over generations of knowledge holders as people learn from the places where they live, work, and harvest. This knowledge is based on life experiences shared across generations and through stories passed down across generations, typically under the guidance of Elders (FAI 2008).

“TK been handed down, undergone its own form of testing generation after generation, and is the culmination of finding the best practical skills to support Alaska Natives' ways of life.” – Alaska Native Elder

At this point, it is important to provide additional context to the idea of ‘knowledge.’ A western understanding of ‘knowledge’ generally sees it as a collection of ‘facts’ – pieces of information that can be learned via formal education or instruction, reading, and experience but it is typically thought of as something to be ‘gained’ or ‘received’ (Nadasdy 2003). Indigenous conceptualizations of ‘knowledge’ may be better understood as personal experiences and related beliefs (Noongwook et al., 2007). Indigenous Peoples across Alaska and Canada tend to believe that people can only know those things which they have personally experienced (Fineup-Reiordan 1990; Goulet 1998; Smith 1998). This is not to say that secondary knowledge, that which is gained through story or formal instruction, is not used or seen as valuable. But that knowledge is seen as being less reliable than personal experience which can validate information as truth (Noongwook et al., 2007).

Alaska Native cultures observe a shared ontology of relationality: everything in creation is connected, dynamic, and constantly changing. Therefore, an important component to respecting TK is to treat it in a holistic way – pieces cannot be separated from the whole (Burnaby 2003). TK is more than information about the ecosystem and its components (i.e., species abundance or movement patterns) as it also includes knowledge informed by Indigenous worldviews and ways of being.

Subsistence and TK are closely linked. The harvest of subsistence foods for nutritional, cultural, spiritual, and food security reasons is extremely important to Alaska Native residents across the Bering Sea region (Callaway 2020; Green et al., 2020). TK informs where individuals practice subsistence activities, how they practice them, and why they practice them. TK is essential to a community’s ability to successfully enact food security (as well as water security, firewood security, etc.), though the timing of subsistence harvests varies by area, community, and the targeted food source (i.e., migratory fish or birds) (Kishigami 2021; Nissin & Evengard 2015; Panikkar & Lemmond 2020; Turner et al., 2013).

The State of Alaska has historically defined subsistence as traditional or customary use of resources, and the value of subsistence is communicated in indices that quantify resource consumption rates and utilizing comparative cost estimates (e.g., Wolfe 2004). Federal policy, as designated under the Alaska National Interest Land Conservation Act of 1980, establishes a “rural preference” for subsistence rights for resource access and use on federal lands (Anderson 2016). At its November 2020 meeting, the Taskforce agreed: while the State and Federal definitions of subsistence do not capture the full scope of what

subsistence means to people depending on wild foods for their way of life, these definitions impact people’s lives in significant ways and, and therefore should be included in the way in which ‘subsistence’ is conceptualized, analyzed, and acted upon in the Council’s decision-making process.

However, from an Alaska Native perspective, subsistence “encompasses hunting and gathering related activities which have a deep connection to history, culture, and tradition, and which are primarily understood to be separate from commercial activities” (Raymond-Yakoubian, Raymond-Yakoubian, & Monicreiff 2017). This perspective is not meant to suggest that Alaska Natives do not engage commercial or cash economies; they do. Rather, Alaska Natives deliberately engage in commercial and market-oriented economies while maintaining subsistence practices, and these cash economies play a critical role in supporting subsistence lifestyles (Aslaksen et al., 2008; Reedy-Maschner 2009).

The importance of subsistence for Alaska Native communities, and the continuation of subsistence-related practices, is that it is a critical linkage to linguistic and cultural survival which are often linked with TK (Active 1999), as well as adaptive capacity and resilience (Huntington et al., 2021; Scaggs et al., 2021) and wellbeing (Donkersloot et al., 2021; Szymkowiak & Kasperski 2021). Therefore, subsistence practices are meaningful beyond the harvest of nutritional and cultural goods.

Respect is the foundation of this Taskforce’s work because it is an effort to bring together different knowledge systems or ways of knowing and therefore different worldviews (see Warren et al., 2020). Respect means acknowledging different knowledge systems, the contributions that they make, and to hold people’s ideas and experiences as valuable (Bartlett et al., 2012; Raymond-Yakoubian et al., 2021). Respect requires an intentional approach and is shown to each other through specific actions (see Guideline 2 for more practical information on this point).

Bringing LK and TK experts into the Council’s decision-making process also requires **trust**. Trust is iterative and reciprocal, and it takes time. Building trust requires that all parties feel as though they are mutually respected for the contributions they can make. An important part of building trust and demonstrating respect requires flexibility in process, for example, in how information is shared. Whether shared in public comment, a Council workshop, or in a research and interview setting, participants will need to be open to different means of sharing information. This is especially true when working with Alaska Native communities and TK holders who may share stories as a means of discussion, problem identification, and solution (FAI 2008). Additionally, Indigenous languages may be used to convey TK for a variety of reasons (i.e., English is a second language, there are no comparable words outside of the Indigenous language, etc.) and that may require additional time. In short, **communication** styles may differ, and it is important that all participants have the necessary and appropriate tools to share information in different formats.

As the discussion of respect, trust, and communication imply, building and supporting **equity** across the

Who is an Alaska Native Elder?

The term ‘Elder’ for Alaska Native cultures and communities holds significance, carrying responsibilities for those who bear the title. Alaska Native Elders are held in high regard. Elders provide critical connections to families, communities, and regions. Elders are bearers of language, cultures, and often Traditional Knowledge.

There is no one way to identify an Alaska Native Elder. Elders are often self-identified and are always in service to their community sharing knowledge, history, language, and culture. In some cases, a community might identify someone as an Alaska Native Elder, but they may not see themselves that way. Some Alaska Native Elders are among the first generation stolen from Indigenous families and communities to attend boarding schools and they may not feel adequate, although they will still be generous in sharing. There are also Elders in training who are individuals that are younger and learning. Finally, there are Alaska Native Elders who bear the title because of their age but they may not necessarily have knowledge to share.

[First Alaskans Institute]

Council’s decision-making process is critical to achieving the expressed goal of this protocol – to better identify, analyze, and include LK, TK, and subsistence information in the Council’s process. In fisheries management, ‘equity’ is often linked to the fair allocation of fishing opportunity or the distribution of costs and benefits among stakeholders (Anderson et al., 2019; Carothers 2011; Szymkowiak et al., 2019). Increasingly, equity is better understood to include representation within governance bodies, secured access rights, recognition and protection of non-economic value of resources, and the extent to which different identities are recognized in a governance context, or awareness of the constraints to inclusive and diverse stakeholder participation (Allison et al., 2012; Capistrano et al., 2012; Carothers et al., 2021; Donkersloot et al., 2021; McDermott et al., 2013; Schreckenber et al., 2016).

There are 229 **sovereign** Tribes across the state of Alaska. Sovereignty is the inherent right of Indigenous Peoples to have self-determination over their political, legal, and social status, in addition to other aspects of an individual or community (UNDRIP 2007). Alaska Tribes are sovereign nations with constitutions, bylaws, and a right to determine their own destiny. Tribes have jurisdiction over their members for their health, safety, and welfare (Lindemuth 2017).

The National Marine Fisheries Service (NMFS) has an obligation under Executive Order 13175 (E.O. 13175) to consult with Alaska Native Tribes and Alaska Native corporations formed under the Alaska Native Claims Settlement Act (ANCSA) on the development of Federal regulations that may have a substantial direct effect on the Tribes. E.O. 13175 establishes the requirement for regular and meaningful consultation and collaboration with Indian Tribal governments in the development of regulatory practices that significantly or uniquely affect their communities; to reduce the imposition of unfunded mandates on Indian Tribal governments; and to streamline the application process for, and increase the availability of, waivers to Indian tribal governments. This includes matters that will affect Tribal sovereignty, impacting Tribal members’ health, safety, and welfare. Government-to-government consultations should occur early in the decision-making process, are relevant to a variety of fishery management and habitat conservation issues including, but not limited to, fisheries management across all large marine ecosystems managed by the Council and NMFS, the incidental catch of species in Federally managed commercial fisheries, and subsistence fisheries.

In addition to consultation obligations, the U.S. court system and the Federal government recognize what is known as the **federal trust responsibility** of the United States towards Indian tribes. The trust responsibility entails the obligation to act honestly and openly in dealings with Tribes, and to act in the best interest of Tribes when dealing with property and resources that are held in trust.

Free, prior, and informed consent is a term used to indicate the need for a fully informed and transparent consent process (usually in written form) before engaging in any activity which may affect past, present, or future research or decision-making. This term relates to an underlying commitment to respect for sovereignty and self-determination (UNDRIP 2007).

Using best available science through the inclusion of multiple ways of knowing in the Council process requires engagement with a diverse range of stakeholders. As sovereign entities Alaska Native Tribes require additional considerations. As a baseline, we have provided some strategies when engaging with Tribes adapted from *American Indian and Alaska Native Culture Card: A Guide to Build Cultural Awareness* (accessible: [here](#)). For additional information, please see the Council’s Community Engagement Committee’s [final report](#) as well as other guiding documents:

- https://www.fws.gov/r7/external/pdf/native_affairs_desk_guide_fws.pdf
- <https://toolkit.climate.gov/tool/guidelines-considering-traditional-knowledges-climate-change-initiatives>
- <https://unsdg.un.org/resources/united-nations-development-groups-guidelines-indigenous-peoples-issues>

Working with Alaska Native Cultures and Tribes

Etiquette—Do's

- Understand and respect the sovereignty, intellectual property rights, and confidentiality of Tribes.
- Learn how a community refers to itself as a group of people (e.g., what is the Tribe's name?).
- Be honest and clear about who you are and the organization(s) you represent.
- Create long term relationships that are not solely for you or your organization(s) benefit or agenda.
- Listen and observe more than you speak.
- Be comfortable with long pauses in conversations and learn to value quiet moments.
- Casual conversation is important for building rapport – be genuine and a person first.
- Avoid jargon and acronyms.
- Be open about your knowledge of Alaska Native cultures and invite people to educate you on the cultural protocols in their community.
- If you are visiting a community and offered food or beverage, it is important to accept it as a sign of respect.
- Allow people to introduce themselves and tell a story before asking questions.
- Do be mindful of cultural norms and expectations.
- Do obtain Free, Prior, and Informed consent before conducting any research or using any information that you hear.

Etiquette—Don'ts

- Don't make promises you can't uphold.
- Avoid intrusive questions early in conversation. As trust is built, more personal questions may be possible.
- Don't interrupt others during conversation or interject during pauses or long silences.
- Don't impose your own personal values, morals, or beliefs.
- Avoid frequently looking at your watch and do not rush conversations or meetings.
- Do not take pictures or record audio or video without permission (see Free, Prior, and Informed consent).
- Avoid any bias based on looks, language, dress, and other outward appearances.
- NEVER use any information gained by working in the community for personal presentations, case studies, research, reports, technical memos, and so on, without the expressed **written consent** of the individual and Tribal government or Alaska Native Corporation.

**Language adapted from "American Indian and Alaska Native Culture Card: A Guide to Build Cultural Awareness." <https://store.samhsa.gov/sites/default/files/d7/priv/sma08-4354.pdf>*

3. Taskforce Ground Rules

The LKTKS Taskforce is a nominated Council advisory body composed of Indigenous and non-Indigenous experts with diverse backgrounds

The Taskforce began its work with a flagship meeting in Anchorage, Alaska in January 2020. It was decided during the first meeting to use a consensus model to identify and prioritize objectives given the diverse worldviews and knowledge systems present in the group. The Taskforce planned for two to three meetings per year over the duration of the Taskforce's projected existence (projected for 2-3 years, i.e., 2020-2023). The anticipated timing of the meetings (e.g., January, April, and November) reflects the prioritization of subsistence hunting and fishing seasons and scheduled Council meetings. With the onset, and continuation, of the global COVID-19 pandemic, the Taskforce moved to a virtual setting in April 2020.

At the February 2020 Council meeting, the Council gave direction to the Taskforce for the duration of its work by taking the following action⁶:

The Council adopted two overarching goals, five related objectives, and several final work products:

Goals

1. To create processes and protocols through which the Council can identify, analyze, and consistently incorporate TK and LK and the social science of TK and LK into Council decision-making processes to support the use of best available scientific information in ecosystem-based fishery management.
2. To create a protocol and develop recommendations through which the Council can define and incorporate subsistence information into analyses and decision-making.

Objectives

Identify and define sources of LK and TK, and the social science of LK and TK, to support the use of best scientific information available in Council decision-making.

1. Provide guidance and analytical protocols to the Council on how to evaluate and analyze LK and TK, and the social science of LK and TK.
2. Provide guidance on how LK and TK, and the social science of LK and TK, could be included in Council decision-making processes.
3. Identify relevant and appropriate sources of subsistence data and information to use in Council decision-making processes.

Members

- Mr. Toby Anungazuk Jr. (Golovin)
- Dr. Rachel Donkersloot (Coastal Cultures Research)
- Dr. Kate Haapala (Council staff)
- Ms. Bridget Mansfield (AKRO)
- Dr. Robert Murphy (APU)
- Ms. Darcy Peter (Woodwell Climate Research Center)
- Dr. Julie Raymond-Yakoubian (Kawerak)
- Mr. Richard Slats (Chevak)
- Mr. Simeon Swetsof (St Paul)
- Ms. Alida Trainor (ADFG Subsistence Division)
- Dr. Sarah Wise (Alaska Fisheries Science Center)

⁶ The Council's motion from February 2020 can be found here: <https://meetings.npfmc.org/CommentReview/DownloadFile?p=ce213a15-6672-4d0b-9fad-6b0719388804.pdf&fileName=D3%20MOTION%20.pdf>

4. Provide guidance on how subsistence data and information can be included in Council decision-making processes.

Work Products

1. Glossary of Terms.
2. Onramps (or ‘points of entry’) document that identifies where within the Council process to include LKTKS information and data (e.g., public testimony, analyses, etc.).
3. Protocol outlining best practices for the Council to identify, analyze, and incorporate TK and LK into Council decision-making documents as appropriate.
4. Guidelines or protocols for Council staff for soliciting/identifying, analyzing, and using subsistence data and information in analyses.
5. Final report for the Council.

4. Challenges to Including LK, TK, and Subsistence Information into the Council's Decision-making Process

By activating this Action Module and creating the LKTKS Taskforce under the BSFEP framework, the Council has acknowledged the importance of LK, TK, and the subsistence information, as well as their relevance for its decision-making process. This section of the protocol outlines some of the challenges to achieving the goal of better identifying and including LK, TK, the social science of LK and TK, and subsistence information.

Complexity

The Council is one of eight regional councils established by the Magnuson-Stevens Fishery Conservation and Management Act in 1976 to manage fisheries in the nation's 200-mile Exclusive Economic Zone. The Council works closely with the National Marine Fisheries Service (NMFS) to ensure the productivity and sustainability of fisheries and fishing communities through science-based decision-making and compliance with regulations.

The Council's jurisdiction is complex; six FMPs cover several large marine ecosystems supporting commercial, recreational, and subsistence fisheries including the largest commercial fishery in the U.S. by volume landed (NOAA 2019). Stakeholders are diverse and span broad geographical scale, as well as dependence on the fisheries. Alaska seafood exports enter global markets, while small-scale fishing continues to sustain small rural communities. Furthermore, Alaska is home to 229 Federally recognized Tribes that speak 20 distinct languages. Many Alaska Natives and residents in remote communities depend on subsistence harvests for food security, social networks, and cultural continuity. The State of Alaska holds some of the most remote communities in the U.S. with 80 percent accessible only by plane or sea.

Participation

Members of rural communities and Tribes from across the Bering Sea region have expressed concern over constraints to meaningfully participating in the Council's decision-making process (Raymond-Yakoubian 2009). One challenge is financial. It is costly to travel to the Council or advisory body's in-person meetings, and internet costs in remote communities for virtual participation can be significant. Language may be another challenge to participation. English is the primary language used in the Council's decision-making process. English can often be a second language for minorities, including Alaska Native Elders which can constrain their willingness and ability to engage in the management process (Berger 1985). The Taskforce appreciates the work of the Council's Community Engagement Committee that was formed to provide the Council recommendations for how improve two-way engagement between rural communities, Tribes, and the Council. These participation challenges are identified because they operate in the background of our work and inform how the Taskforce has come up with ways to better identify, analyze, and incorporate LK, TK, and subsistence information into the Council's decision-making process.

Cultural sensitivity

Among Taskforce members, and with other Council advisory bodies or stakeholders, conversations about management actions can be difficult and fraught with multiple perspectives and meanings. Fisheries management inherently includes decisions that affect economic livelihoods, how people make connections to local places, cultural survival, and food security (Lyons et al., 2017). Alaska's history is tied to material and cultural dispossession of Indigenous Peoples (Carothers 2010; Gritsenko 2018; Lyons

et al., 2019; Stuhl 2016; Torrey 1978); yet strong social, cultural, spiritual, and economic relationships among individuals, communities, Tribes and their local environment persist (Active 1999; Kauani 2016). There is growing research that illustrates the important role of resource management frameworks in dismantling these legacies to support impactful research and effective management (Ban et al., 2018; Hill et al., 2020; Lam et al., 2020; Mastrángelo et al., 2019; Wilson et al., 2003).

Intellectual Property

There are additional sensitivities related to the willingness of individuals, fishing associations, or communities to share information if doing so means they will lose control over how, or where that knowledge is used and interpreted. For example, the Council, as a public body, may hear proprietary information, which could then be shared in a public decision-making document. While unintended, this action may cause concern and erode trust among parties.

Intellectual property rights are a key consideration when engaging LK and TK. There are extensive guidelines for how to appropriately acknowledge intellectual property rights (see for example Stoll 2015). Western scientific research has a long history of extractive methods and approaches (Kovach 2021; Lanzarotta 2020; Nixon 2011; Smith 2021). Acknowledging power differentials and hierarchies within existing management structures is central to effective and inclusive fisheries management. An important first step when engaging with LK TK holders is to become familiar with intellectual property rights and data sovereignty (Carroll et al., 2019; Johnson et al., 2015; Pulsifer et al., 2012; Walter et al., 2021).

Difference in Approaches

TK systems are based on factual observations about the local environment, current and past uses or relationships to particular resources, *ethics, values, culture*, which are the foundation of one's *identity* and validated by

An example of different worldviews in fishery management

Research published by Carothers et al. (2021) discusses the deep, interconnected relationship between salmon and Alaska Native cultures across Alaska. Below is an extended quote from Ahtna Elder and coauthor Wilson Justin describing the differences between Eurocentric and Athabascan worldviews of fish and fishery management.

“We're all familiar with how, in English, things get broken into specific aspects of activities and defined by activities. You go to play a hockey game and you know what it's all about. Hockey game has rules. You don't play hockey in a basketball game. Doesn't work like that in Athabascan. It's all one game. It's all one resource. It's all one creation, and it's all one set of responsibility. So you have to learn not only how to accommodate salmon and river streams, you have to consider yourself a part of the salmon world. Not the other way where the salmon is a part of your entitlement for catch. You're intruding into salmon realm, and when you intrude into salmon realm, you have to give fair and just accounting of yourself. You do that with ceremony of prayers and songs. And then it goes another step further. You go caribou hunting. Well, there is no difference between hunting caribou and catching salmon. You still have to account to the caribou; you're still intruding in their world. Okay you go one step further, let's do sheep. Well there's no difference between sheep, caribou, and salmon. You're still assigned the responsibility of accounting for your intrusion into that world. Now that's extraordinarily easy to speak to in Athabascan, and I've found it extraordinarily, virtually impossible to speak to in English, in the western world.

Just think of this term “sustained yield.” {laughing} In Indian, that would translate to, say into salmon, “You owe me your life, so get up here right now and die.” That's the way it would translate in Athabascan from English, the sustained yield concept. That's why you never hear me say sustained yield—you just can't do that. The salmon, you're intruding in the salmon's world. So, it would be so offensive in our way that if you spoke like that they would run you out of camp until you go back to where you come from. That would be enough for the traditional marriages to be broken up and separated, which is almost impossible to do. So that's the level of offense you're looking at when you use these doggone terms like sustained yield. Wilson Justin, interview, Anchorage, Alaska, USA, September 2019

lived experience (Burgess 1999). Within a community, LK or TK are often not recorded. The social science of LK and TK often uses ethnographic interviews or oral histories. Many of the substantive elements of TK systems, and the way in which it is recorded, do not easily fit into the theoretical and methodological approaches of western natural science, and historically, there has been reluctance among western scientists to include LK or TK because it cannot fit into a particular methodology or approach (e.g., an age-based model of stock dynamics) (Ames 2007; Johannes & Nies 2007).

“In communities, TK is not compiled in print. The traditional ways of doing things have been handed down through generations by word of mouth and hands on learning by doing and living the life. Life experiences and observations have been to live the ways of their forefathers and to carry on their traditions, culture, and heritage for the next several generations.” – Alaska Native Elder

While there is growing recognition of the value of LK and TK, the task is not a simple one. Knowledge systems are not easily transferred across platforms or translate well without extensive context. For example, the scale of knowledge may not always match the scale of research question or management concern. These are not insurmountable issues: in fact, the same issues of scale and scope and translatability exist within interdisciplinary western science. That said, the sensitive, often personal, experience-based, and proprietary knowledge requires special considerations when attempting to include in decision-making. In many cases, it would not be appropriate to reduce quantifications from shared stories and oral histories of TK, forcing these qualitative data into existing models. Doing so would cause harm by distilling and reducing Alaska Native values and experiences to make them relevant thereby misrepresenting the information. If the goal is to include LK or TK into a model, that goal should be expressed from the outset of the project and inform the methodological approach for social scientists as well as knowledge experts.

Similarly, fisheries and ecosystem scientists tend to frame LK or TK as a way to inform questions or hypotheses which are then validated by western scientific methods (Ellis 2005). LK and TK can be meaningful and used to inform decisions relative to a particular report, project, or decision. Sources of information such as metadata, archival materials, oral transcripts, or subsistence maps based on LK and TK expertise contain valuable information. These sources may not have undergone academic peer review but may have undergone other types of rigorous peer review and therefore can be considered representative legitimate bodies of information (e.g., marine mammal hunters reviewing maps of marine mammal harvest areas).

In sum, these challenges suggest that better identifying, analyzing, and incorporating LK, TK, and subsistence information will require new approaches to scientific production and decision-making processes. The steps taken by the Council to address some of these challenges (such as the creation and support of the transdisciplinary BSFEP LKTKS Taskforce) underline their commitment to effective and equitable management using the best available information for decision-making (MSA, National Standard 2).

[Other, potential ideas: funding, capacity building.]

5. Guidelines

Below is a set of guidelines and some practical steps for implementing them. Collectively, the guidelines are intended to provide guidance to identify, analyze, and include LKTKS expertise and information in the Council's decision-making process appropriately and effectively. As stated previously, the guidelines are action-informing and intended to:

1. Improve understandings of LK, TK, and subsistence information based on the subsistence way of life.
 - a. Provide foundational information on the role of LK and TK in Federal fishery management.
2. Provide guidance to analytical staff and researchers engaging with diverse forms of knowledge and knowledge holders in analytical or research efforts:
 - a. Establish principles of engagement with LK and TK experts, communities, Tribes, and other relevant entities on issues related to LK and TK.
3. Provide analytical guidance to more richly, accurately, and systematically include LK, TK, the social science of LK and TK, and subsistence information into the Council's decision-making process.

The Council's decision-making process is multi-faceted, dynamic, and involves close partnerships with stakeholders, Federal agencies, Tribes, scientists, and more. By taking this approach, the protocol is designed to be useful for all the key entities in the Council's process (i.e., staff, Council members, Alaska Fisheries Science Center staff, Regional Office staff, and more).

Guideline 1 - Understand key concepts and definitions related to LK, TK, and Subsistence

The Taskforce agreed on definitions for LK, TK, and subsistence that are regionally specific and appropriate (see Section 2 of this protocol). For example, the Taskforce intentionally chose 'Traditional Knowledge' rather than 'Traditional Ecological Knowledge (TEK)' because it better reflects how Alaska Native Tribes and communities throughout the Bering Sea understand and communicate their own knowledge systems. Phrases like "traditional ecological knowledge" are born from academic and policy circles and may not accurately reflect the ways Indigenous communities think about their knowledge and ways of being (Williams & Hardison 2013; Whyte 2013).

Guideline 1, understand key concepts and definitions related to LK, TK, and Subsistence, focuses on the importance of using mutually understood terminology when talking about, or engaging with, LK, TK or subsistence information. Using clear and defined terminology creates a shared understanding and improves communication among individuals, institutions, and organizations that work together in the Council's process.

Practical steps:

- Become familiar with definitions for LK, TK, and subsistence and related concepts that are regionally appropriate.
 - The consensus definitions developed by the LKTKS Taskforce are a good place to start (see Section 2 of this protocol or the glossary of terms developed by the Taskforce).
- Definitions can vary in meaning across scale and geographic location. Do not assume that by using the same word, everyone has the same understanding. Ask for definitions or terms to be defined, expanded, and clarified.
- Expect Tribes to have their own definitions for TK, which might differ from the regional-specific definition developed by the Taskforce.

- Use Tribal-specific definitions for TK as appropriate, they are likely to be more specific and contextualized (Whyte 2013).
 - For example, ‘Inuit Qaujimagatuqangit’ is “the term used to describe Inuit epistemology or the Indigenous Knowledge of the Inuit. The term translates directly as ‘that which the Inuit have always known to be true.’ Like other Indigenous knowledge systems, Inuit Qaujimagatuqangit is recognized to be a unified system of beliefs and knowledge characteristic of the Inuit culture” (Tagalik 2012).
- When harvesters, fishing associations, or a Tribe have a different understandings or definitions for LK and TK, note that change as appropriate to provide important context for the reader.
- Build a knowledge base to increase understanding of LK, TK, and subsistence.
 - Allow for adequate time to ensure shared understanding and context, especially when you are developing culturally-based knowledge of a particular community or Tribe that you (or your organization) are engaging with.
 - Partner with individuals who can help make connections with those willing to share that knowledge.
 - Several tools can be used to learn about LK, TK, the subsistence way of life, or Alaska Native worldviews more broadly, such as participation in cultural awareness trainings, community visits, and speaking with LK and TK holders and subsistence harvesters.

Guideline 2: Recognize and respect multiple knowledge systems

Guideline 2 builds on and is connected to Guideline 1. Respect is the foundation to better including LK, TK, and subsistence information into the decision-making process because LK and TK are experiential knowledge systems that live within people (Houde 2007). As stated previously, respect requires an intentional approach, and it means to acknowledge different knowledge systems, the contributions that they make, and to hold people’s ideas and experiences as valuable (Raymond-Yakoubian et al., 2021).

Researchers have argued that experiential knowledge like LK and TK are not used systematically to inform management decision-making because they are not taken as seriously as western science (Huntington 2000; Johannes et al., 2000; Ruddle 1994). Fishers’ knowledge has been dismissed as being subjective or ‘anecdotal’ (Ames 2007), assumed to have little relevance to stock assessments and other efforts to inform management decisions (Hay et al., 2000), but LK and TK are based on long-term, in situ observations that can provide a much longer time-horizon than data sets for some species. Indeed, these knowledge systems can help scientists and decision-makers understand what is happening as much as what is not (Ames 1998).

Recognizing the role of, and demonstrating respect for, multiple knowledge systems will require individuals and institutions working within the Council’s decision-making process to see different experiences and knowledge as valid, which includes seeking out that knowledge with the appropriate skills and partnerships to understand and utilize it (see Guideline 7 for more detail on this point).

Practical steps:

- It is critical to *move at the pace of trust* (First Alaskans Institute).
- Keep an open mind when different worldviews or knowledge systems are shared.
- Respect comes by considering, in earnest, what is being shared and understanding the position and concerns.
 - Respect can be demonstrated by listening attentively and never being dismissive.
- Communicate in culturally sensitive ways.

- Seek out individuals who have worked with specific communities to gain understanding of important nuances.
- Learn how a community refers to itself. For example, what is the Tribe's name?
- Build rapport. This happens gradually and requires sustained effort while being sensitive to cultural values. It goes beyond emails or letters; community visits, and other face-to-face interactions can be a good way to create a relationship, demonstrate respect, and build trust.
 - Non-western ways of knowing emphasize the importance of personal experience (Noongwook et al., 2007). Alaska Native communities and Tribes and their members may feel they are and understood by experiencing their community and being present.
 - Set aside time and space simply for relationship building.
- Be humble and seek understanding. You are not the only expert.
 - Understand the established hierarchy (e.g., a crew member may need permission from the captain to share information).
- Respect recognized Elders with TK as you would a disciplinary Ph.D.
- Seek to understand the unique context of LK and TK. Because this knowledge is experiential, it cannot be separated from the social and environmental context where it is gained or from *who* it is that holds it.
- **Tribal engagement in the Council's decision-making process is a key pathway to building rapport, relationships, and the two-way sharing of knowledge (onramp, see Appendix A).**

Guideline 3: Recognize how to identify sources of LK, TK, the social science of LK and TK, and subsistence information

Working with LK and TK experts, and subsistence harvesters, has its own set of hurdles. The process of identifying *who* may be best suited to provide the necessary knowledge on a given issue can be a considerable challenge.

LK holders will have direct experience related to the phenomena of interest (i.e., ecosystem, species, ecological process) and their knowledge is developed from long-term, in-situ observations over the course of many years or decades (Martin et al., 2007). In the case of working with commercial harvesters, asking fishing organizations or associations to help identify cohorts of commercial fishers to talk to or formally interview for a research project can be a good place to start. These entities may be able to prepare a list of individuals who are known within their industry, association, or organization as knowledgeable or skilled (Ames 2007).

TK is based on experience, lessons, and stories that are passed from generation to generation (Berkes 1999; Huntington 2000). TK experts are recognized by their peers as such, and they are often Elders. TK experts are identified by their community or Tribal government as holding the shared collective knowledge from across generations. TK is built on experience and continually refined across generations.

“When citing experience of others, the Yupik will identify the source or sources of information and the people through whom it has been transmitted. When a person's own observations and experience confirm such information, then a person can describe it as a known fact to him or her... [TK] is continually discussed in the community and while engaging in the activities that develop and require traditional knowledge, such as hunting, boating, or traveling over or amid sea ice. Children and youth are taught to remember stories and information accurately, to ‘put it into your body,’ by techniques such as keeping one's head still while listening. Songs may also be

used to memorialize notable events. The Yupik language is a key element of knowledge transmission...” – Noongwook et al., 2007, 48

TK holders are also recognized as responsible for protecting and caring for this knowledge.⁷ Sharing TK is not taken lightly: rather the choice to share TK is made with accountability to the community.

Directly below is a table categorizing different characteristics of LK, TK, and subsistence harvesters from the perspective of one Alaska Native Elder. These reflections capture several important distinctions including how, in their community, TK holders have deep knowledge based on decades of lived experiences and mentorship, as well as generational knowledge passed down across centuries. These reflections also capture the importance of teaching where TK holders are actively teaching what they know while LK holders and subsistence harvesters are still learning or making an effort to teach.

⁷ One caveat to keep in mind throughout this protocol is that it was developed with knowledge specific to the Bering Sea region and all insights and reflections are within this context.

Table 1: An Alaska Native Elder’s Reflections on the variances and linkages among LK, TK, and subsistence.

<i>Local Knowledge</i>	<i>Traditional Knowledge</i>	<i>Subsistence</i>
Residents	Elders - not all are equal	Residents
Youth, Adults & Elders	Elders who go out and gathered	Active gatherers
People who observe gathering	People who had lifelong mentors	Inactive gatherers
People who preserved some food	People who know how to preserve all foods	People who preserved most foods
People who know most gathering places	Knows where and which way to go	Most who just follow
Finally following as Elders	Knows the seasonal migration patterns	Knows of the migration patterns
Trying to teach what they observed	Teach what they learned	Lean to teach
Learned the trails and rivers	Some know most of the trails and rivers	Followers vs. leaders
Commercial fishermen		Weekend warriors (who gather together)
Only know oral histories	Knows and makes oral histories	All seasons hunters
Only learned from books/articles	Knows real life history	
	Knows the climate change impacts	Different levels of climate change
Aware of some of the climate change impacts	Can have valid climate change predictions based on knowledge based on previous incidents	
Learned some weather patterns	Knows weather pattern and changing weather	
Fished some seasons	Fished every season for 60+ years	
Knows some spring and ice break up dates	Kept track of spring and ice breakup over most years	
Wait for first fish	Knows what to watch for, for first fish	
Some comments on research	Few Elders give educated research project comments	
Building trust with local leadership	Local leadership trusts real TK holders	
Capacity building for LK Holders	Reinforces capacity building	
Collaborate with researchers	Assists researchers	
Willing to learn	Willing to learn more	
Easily compromises	Educated compromises	
Know some qualitative research methods	Knows some qualitative research methods	
May think of some research topics	Important information for a research project	
Payment agreements for all participants is necessary for what they know		

Practical steps:

- When appropriate, use the LKTKS Search Engine.⁸ The search engine contains sources of LK, TK, the social science of LK and TK, as well as subsistence information including [peer review articles, databases, narrative sources of information, reports, technical memos, as well as other sources of information.
- Be mindful of the *type* of information you are working with. LK and TK are living bodies of knowledge, which may be recorded or conveyed in multiple ways beyond conventional written formats. Examples include oral history, story, video and audio media, some of which could require different expertise to use.
- Modify analytical templates used by Council staff. For example, add questions, such as:
 - “What are some sources of LK and TK, or the social science of LK and TK, relevant to this topic?”
 - “What are the customary and traditional uses of the resource?”
 - “What Tribal governments and communities may be impacted by this action?”
- Know *who* to talk with prior to contacting Tribal or community governments to avoid redundancy and confusion.
 - What protocols are in place? What governance (formal and informal) systems are in place? What are the cultural values, and how is this information communicated? Who has the authority to sanction work in the area and with whom?
 - For example, familiarize yourself with the liaisons working for or within different entities (in the case of many Fishing Associations, Tribes, local government or NGOs, this is available online or through public directories.)
 - Explore existing publications or news articles. Follow up with people who have done work in the area, field of expertise, or organization.
- Engage and work with “bridging people” - liaisons, representatives, social scientists, and others (i.e., from city or Tribal governments, fishing associations, etc.) to identify LK, TK, or subsistence experts in their communities and organizations.
 - Often, Tribes or communities have their own protocol for identifying and sharing LK and TK or conducting research in a community. If it exists, use it.
 - Be mindful of Tribal or community distinctions between LK and TK.

⁸ The search engine demo can be found here: https://www.npfmc.org/lktns_information/

Where Does Public Comment ‘Fit’?

The Council and its advisory bodies offer an opportunity for every interested member of the public to provide oral or written comments on agenda items of interest. Public comment is the pathway through which the Council and its advisory bodies most often receive Local Knowledge, especially from commercial harvesters. Decision-makers working in a public process rely on the statements made during public comment or conversations with industry contacts to inform management decisions (Feeney 2013).

One benefit of public comment is that it provides the Council with up-to-date and potentially near real-time perspectives from members of the public, unlike LK or TK that is integrated into an analysis which can suffer from a time lag between when it is shared and recorded and its inclusion in a Council decision-making document (e.g., Local Knowledge holders share their observations about environmental change via interviews which are then disseminated in published research).

LK or TK shared through public comment can build a portfolio of observations or impacts, but there are several caveats to using LK or TK that are shared in public comment and the comments alone should not be treated as best available science (National Standard 2). Council staff, researchers, and decision-makers should **caution against generalizing public comments** as they may not represent the entire population of fishers, industry groups, Tribal governments or their members. Similarly, it is important to ask **who** is providing public comments and **when** they decide to do so.

Without more formal, rigorous, and systematic study of public comment, an individual comment runs the risk of introducing biases because the motivation for providing testimony, and the arguments being made, are likely to be based on different and competing interest that are likely to be impacted. One the rigors of social science training is to recognize the inherent bias of familiarity and design research that accounts for the very nature of being human.

Is Public Comment Traditional Knowledge?

Not necessarily. Public comment comes in many forms and is open to anyone. Assumptions about the speaker may not reflect the speaker’s position within the community unless they clearly identify themselves as a TK holder or a representative of a particular community. Public comment may reflect LK from multiple groups. Both LK and TK may inform public comment in multiple ways, but what is spoken should not be repeated, quoted, or used as TK without clarifying if these Knowledges can be used as TK. If a TK holder chooses to share Traditional Knowledge under any circumstances, there are additional steps remaining to ensure you have permission to share or use the knowledge further, including under what conditions and in what contexts, and how to appropriately acknowledge the source

Guideline 4: Engage in early and frequent communication with Tribes, fishing associations, industry, local governments, co-management bodies, and CDQ groups.

What is considered “early” communication may differ depending on the party. Within the Council process, early may mean as soon as a particular topic, concern, or action emerges. One Tribal perspective on what constitutes early communication is that Tribes would be invited for consultations and their input as soon as an issue takes shape, during the early stages of planning and idea formation. Invitations participate mean a lot to Tribes and rural communities. Building partnerships and collaborations among

the Council or NMFS and Tribes will demonstrate that active efforts are being made to meaningfully address Tribal concerns (Alaska Native Elder).

Within the realm of research early would mean during the initial idea or research question stage. It is during this stage that elements of the proposal could be linked to community interests, concerns, or existing bodies of knowledge. Once the proposal is drafted and submitted for funding, the opportunity for meaningful collaboration and communication has passed; as has an opportunity to build goodwill and trust.

Frequent communication also differs depending on the context and to what degree there is mutually shared trust among parties. Early and frequent communication requires established communication pathways, in some cases through formalized materials, but more effectively through shared reciprocal relationships. If a long-standing relationship exists, and one that includes trust and respect, individuals will pull from that history of respect and trust to re-engage with each other. In this way, meaningful communication is circular and iterative. Regardless of the objectives of any engagement with knowledge holders, it is essential to maintain a strong, working, respectful, and reciprocal relationship. While a particular project or management action may end, relationships with knowledge holders and communities should continue to support informed and ethical collaborations.

Practical steps:

- Develop a communication plan that supports meaningful communication throughout the process and beyond.
 - Develop specific approaches for regions, fisheries, and organizations as necessary. What may work in one area or community, may not in another. Identify which communities are within the region of interest or affected, directly or indirectly, by fisheries science and decision-making?
- Maintain and support administrative systems that supports regular communication.
 - Maintain an active contact list and update it regularly.
 - Establish a communication log in which Council staff, researchers, and decision-makers can notate key communications. This will serve as a “map” to better understand the lay of the land and reduce research fatigue. Turn over within agencies and organizations can hamper strong relationships and new individuals must get up to speed and begin to develop relationships. This living document can act as a training tool for people interested in community engagement and collaboration.
- Be aware that communication efforts are bi-directional and take time. Plan and allocate the time and funding necessary to fulfill communication expectations and needs.
- Include people very early in the process. If research will involve people or areas used or inhabited by people, engage with a Tribal liaison and community members from the start of the idea. Get input during idea development and proposal. Create time, space, and funding to do this.
 - If at all possible, include people from the area to collaborate on the project. Offer adequate and relevant compensation for time and expertise.
- Free, prior, and informed consent should be given from authorized parties (at a minimum the individual, and for Alaska Native communities, Tribal officials).
- Consider using many ways to communicate information related to the Council’s process (i.e., mailing letters or materials, posting flyers, telephone calls, and radio announcements).

Guideline 5: Acknowledge difference in opportunity for capacity among relevant entities

Throughout its work process, and within this protocol, the Taskforce has emphasized the importance of building relationships and minimizing harm. An important component to better including LK, TK, and subsistence information into the Council's decision-making process is to acknowledge differences in opportunities and capacities among relevant entities. For example, Tribal governments have full agendas. Engaging Tribes and their representatives require consideration of their time, celebrations or ceremonies in villages, and their own prioritization of urgent issues (e.g., housing, childcare, energy costs, etc.). Other examples include those organizations which may have the capacity for full time staff versus organizations which operate on a smaller scale. Capacity may differ among types of commercial fisheries as well. Fishing fleets represented by a cooperative may maintain government affairs personnel dedicated to tracking management actions and presenting testimony at Council meetings. Alternatively, non-cooperative-based fisheries or those composed of mostly owner-operators may suffer from additional challenges of keeping up with Council processes and providing commentary on issues that affect them.

Practical steps:

- Make use of virtual meetings and remote participation as able and appropriate.
- Be mindful of how a meeting's agenda is structured, to the extent practicable, to try to group like agenda items for members of the public. The goal is to reduce meeting footprint, making it more feasible for interested members of the public to participate.
- Researchers should work to secure the necessary funding and be prepared to compensate LK and TK holders for sharing their knowledge and time in a project.
- When asked, be prepared to print hard copies of all materials and send them at least two weeks before the start of your meeting. People value time to digest materials and it can take time for the material packet to reach rural communities and residents.
- To the extent practicable, plan your meeting or event to avoid key commercial, charter, and subsistence fishing or hunting seasons.
- Reflect and think about what you as an individual or your organization is lacking in terms of resources (i.e., time, finances, etc.) or expertise.
- Do not make assumptions about other entities' (i.e., Tribes or fishing associations) capacity to engage the Council's process.
- Consider voicing support for compensated participation of Alaska Native Tribes and Indigenous peoples in monitoring, observation and research of Bering Sea ecosystem issues (outside the Council process).
- ***Expand Alaska Native and Tribal members' representation on existing Council advisory bodies (Onramp, see Appendix A).***
- ***Consider modifying public comment procedures to allow Alaska Natives to introduce themselves in a way that is culturally appropriate without that extended introduction counting towards their public comment time limit (Potential onramp, see Appendix A).***

Guideline 6: Be aware of and adhere to the protocols that entities have established for sharing information, conducting research, and communicating LK or TK

Many governments, fishing associations, and communities have protocols for sharing information and intellectual property in place (Holm 2016). Harvesters be they commercial, sport, or subsistence may feel threatened if asked to share information that may become public (e.g., at a Council workshop or in a

research project) and decline to engage. A thoughtful strategy is necessary to address what to ask and how to protect the information that is shared. Even if information or knowledge is shared voluntarily via public comment, it is important to recognize the social and economic consequences that harvesters might face when doing so. This is not an insignificant issue. Once shared publicly, knowledge can become available to competitors, regulators, and alternative interests.

“No library is safe. As with the unwritten laws, some things are not ever in print. If TK is stored, it will only collect dust. There needs to be TK holders in place for the benefit of the Council.”—Alaska Native Elder

Guidance related to Tribes and Communities:

Researchers looking to work in Tribal communities should contact Tribal governments or Alaska Native Organizations to see if there are any research or communication protocols in place, in addition to whether permission for conducting research is required. This effort should be made early in the research process; in many cases, ‘early’ means at idea formation to ensure funding timelines and project goals reflect what is possible and wanted by Tribes and communities. After many decades of unrestricted and often extractive research (see Raymond-Yakoubian et al., 2021 for an extended discussion on this point), Alaska Native Tribes have taken an active role in regulating research activities in their communities. If no Tribal processes or protocols for research are in place, at a minimum, Tribes should be notified to the type or work that is expected to be conducted in a community, who will be present, and when.

It is expected that Tribal protocols will be different among various communities and Tribes. For example, the Native Village of Kotzebue developed a research protocol that outlines clear principles for researchers to follow when engaging with the village.

*“All researchers working in **Qikiqtagruṃmiut** (Native Village of Kotzebue Citizens) territory or with **Qikiqtagruṃmiut** have an ethical responsibility towards our Tribal culture, environment and citizens. The following principles have been adopted to provide guidance for researchers in any and all fields. This statement intends to promote mutual respect and communication between scientists and the Tribe.”⁹*

This protocol emphasizes principles of ethical interactions between scientists and the Tribe including expectations surrounding communication, research planning, confidentiality, Intellectual Property Rights, permitting, publications, human subjects’ data, and informed consent. The Village of Kotzebue specifically crafted these principles to reflect the ideas and concerns resonate within that community. While every village may not have a protocol in place that can be accessed, many do. It is worth noting that even in those cases where there is not a published community protocol, these same considerations should be considered and discussed thoroughly with the appropriate parties.

If an existing protocol is not in place, the following is a list of questions to consider and discuss:

- What are the appropriate goals and objectives for the project? How do these reflect community interest?
- To what degree do Tribes and communities want to be involved in the research?
- What are some of the possible benefits and risks in engaging with this research?
- How will TK holders be identified and cited for the project?
- How will TKs holders be involved as equal partners?
- Who will have access to the information, for how long, and for what purpose?

⁹The full Native Village of Kotzebue Research Protocol can be found here:
https://www.arcus.org/files/page/documents/27026/native_village_of_kotzebue_research_protocol_updated_july_2018.pdf

- How will TK be documented, stored for safekeeping, and cited? What confidentiality measures will be employed and enforced? Who will oversee these? Who will be accountable for this and to whom? Who will own the data after project completion?
- What review boards are included to conduct research (IRB, Tribal Council, other)
- How will staff turnover be handled?
- What are tribal obligations, if any?
- Who will enforce these principles? How should potential grievances be handled?

Guidance related to researchers and institutions:

Within academic institutions, the standard for ethical review of research is to go through the Institutional Review Board (IRB) process. This process includes online training and a full review of proposed research.

“While initially created for biomedical research, an IRB’s purpose in the social sciences is to weigh the risks for participants against possible societal gains. However, arguments have been made against IRB review for some fields such as in ethnography and more generally in the qualitative social sciences, where strict requirements may unduly impede researchers (Schrag 2011). In cases where IRB review is not possible, we recommend that managers confirm, at a minimum, that the project’s investigators went through an informal review from area experts, clearly outlined how they minimized participant risk and ethical concerns and discussed how they addressed any problems that may have arisen (Tolich & Fitzgerald 2006).” (as cited in Murphy et al. 2020, in review)

Government agencies and contractors are exempt from the IRB process, instead relying on internal agency data collection requirements. For example, within the National Marine Fisheries Service, researchers must submit all proposals for internal review. Data confidentiality rules require adherence to a “rule of three” (meaning individualized data must be grouped into three or more to ensure the information remains confidential) when reporting findings. The IRB process is widely accepted as a baseline for ethical research design and implementation. In addition to this, other guidelines and protocol specific to the region, community, group, or topic may require additional thresholds of review.

Within the U.S., the Office of Human Research Protections (see [HHS.gov](https://www.hhs.gov)) have standing regulations for the protection of human subjects in research. A human subject is:

[A] living individual about whom an investigator (whether professional or student) conducting research:

- *Obtains information or biospecimens through intervention or interaction with the individual, and uses, studies, or analyzes the information or biospecimens; or*
- *Obtains, uses, studies, analyzes, or generates identifiable private information or identifiable biospecimens.*

45 CFR 46, www.hhs.gov

[Placeholder] Guidance related to fishing associations:

Practical steps:

- Have a plan for attributions and discuss that with collaborators. How will you cite knowledge, narrative sources, collective data, or other forms of information? Who “owns” the data and who will have access? Ensure all parties have a clear understanding and agree on an approach.
- Be aware that unintended consequences are common and can be very impactful. Think carefully about that possibility of unintended consequences before moving forward
- Become familiar with any existing protocol regarding research, knowledge sharing, or Traditional Knowledge systems for the community or region. Follow the appropriate protocols.
- Clearly document the use of established protocols, specific steps, topics or issues covered, and contact information for follow up questions.
- If no existing protocol is in place, collaborate with project partners and communities to develop a working, project-specific protocol that addresses the key points listed above. Describe the nature of the relationship among participants including clear expectation regarding confidentiality, inclusion, accreditation, and appropriate approvals.
- Require cultural training prior to conducting research in region.
 - If conducting research in-person (e.g., ethnographic work), the researcher should have a solid understanding of the history and cultural norms of the region and community.
- The Council may consider composing protocols for long-term and specific data-use agreements with Tribes and communities providing LK and TK information, especially as relates to spatial mapping.

Federal Reporting and Confidentiality

Federally funded research has certain reporting requirements. The Freedom of Information Act (FOIA) provides the public the right to request access to records from any federal agency. Federal agencies are required to disclose any information requested under the FOIA unless it falls under one of nine exemptions which protect interests such as personal privacy, national security, and law enforcement. Full confidentiality cannot be ensured given the possibility of a FOIA request. Federal policies and any contradictions to existing protocol should be discussed in detail prior to information sharing.

Guideline 7: Ensure appropriate capacity for accessing and using LK, TK, the social science of LK and TK and subsistence

Better including LK, TK, the social science of LK and TK, and subsistence information will require capacity building. Capacity building relevant to the Council’s decision-making process has many forms, some of which have already been mentioned elsewhere in this protocol. Examples include the search engine developed by the LKTKS Taskforce to identify published and non-published sources of LK, TK, the social science of LK and TK, and subsistence information, expanding Alaska Native representation across the Council’s advisory bodies, participation in cultural awareness trainings, community visits, Tribal Consultations, etc. Here, we emphasize the importance of capacity building as the requisite training to work with LK and TK, and subsistence information.

Current efforts towards non-economic social science in the North Pacific reflect long-standing trends across all Fishery Management Councils, and the work can be broadly categorized in at least five different ways: (1) baseline descriptions of geographically-defined communities (i.e., Community Profiles), (2) baseline descriptions of the fisheries and fleets that can be used for SAFE, FMP, or SIA documents (i.e., ACEPO), (3) some data collection to assess regulatory impacts for SIAs and NEPA documents including Environmental Justice impacts per E.O. 12898, (4) data on non-market values which is required for NEPA analyses, (5) and research needs for special projects and issues (e.g., Norton Sound Red King Crab fishery).

An intentional effort to work with LK and TK systems, and the people holding this expertise, goes farther than the current non-economic social science efforts. This work entails identifying data gaps, sampling, triangulating, ensuring the representativeness and informed consent, and synthesizing social or qualitative data requires social science expertise (Stephenson et al., 2016). This is a substantial undertaking that requires considerable resources – time, financial, appropriate expertise, etc. However, there are very few non-economic social scientists in federal resource management, and fewer still in fisheries. Just looking within NOAA, there are approximately 12,000 employees in NOAA nationally (NOAA 2021). Of those 4,200 are in the National Marine Fisheries Services, of which 12 are non-economic social scientists (NMFS 2021). On the regional level, the Alaska Fisheries Science Center employs 400 people at the Alaska Fisheries Science Center (Federal Labs 2021), with two non-economic social scientists. Capacity among the Council is equally limited with one staff member trained in non-economic social sciences. This work is complex and highly sensitive and building the adequate capacity to meet these needs is vital.

Practical steps:

- Support increased non-economic social science expertise across the Council’s decision-making process. This includes continued support for the Social Science Planning Team, expanded non-economic social science expertise on the Science and Statistical Committee, support for non-economic social science hiring at the Alaska Fisheries Science Center and on Council staff.
 - A plan may be developed to increase capacity at the Council for working on LK and TK (and non-economic social science more generally). If the Council would like to pursue this idea, the next step would be to determine what type(s) of capacity it would like to increase, before determining whether existing staff might fulfill the desired role(s).
- Support processes to evaluate and incorporate different types of data than is usually included in its process. The onramps developed by the Taskforce are an explicit step to aid in this effort.
- Continued support for cultural awareness training and dialogues for analytical staff, Council members, and advisory bodies like the Advisory Panel and the Science and Statistical Committee.
- Support for conducting LK and TK research for policy priorities.
- ***More rigorous and systematic inclusion of LK, TK, and subsistence information within and across Council analytical and AFSC report documents (Onramp, capacity building, see Appendix A).***

6. Conclusions

Building and maintaining *relationships* is critical. LK and TK are living knowledge systems within people and communities (both geographically situated communities and communities of practice, such as a specific fishing fleet). Second, this work takes time and ethical knowledge sharing requires *trust*. Third, including LK, TK, and subsistence information requires *new approaches* to the decision-making process in addition to scientific production.

Appendix A: Abbreviated Onramps

**This appendix will be flushed out to include more information on each onramp. The LKTKS Taskforce last discussed onramps at its November 2020 meeting.*

1. Tribal Engagement
2. Tribal Liaison responsibilities added to staff
3. Expanded representation of Tribal expertise across Council bodies
4. Rigorous and systematic inclusion of LKTKS in analytical documents
5. Rigorous and systematic inclusion of LKTKS in science center reports
6. **Process changes (Potentially NEW to consider)**
 - a. Modify public comment procedures so individuals that self-identify as Alaska Native can provide respectful and culturally appropriate introductions without the introduction counting to the comment time limit.
 - b. Continued support for remote advisory body meetings and remote participation
 - i. Consider continued practice of one remote council meeting per year or at least remote participation and testimony
7. **Inclusions of Tribal determinations for research priorities (Potentially NEW to consider)**
 - a. Research and policy priorities are rooted in western scientific paradigms and dictated by the Council. A more inclusive approach based on co-production methods would be including Tribally-determined research priorities. The Council could choose to support this kind of work by tasking staff with developing a set of best practices for determining management priorities, alternatives, and tradeoffs through a co-production process, or partnering with Western Alaska Indigenous and community organizations, to answer questions such as:
 - i. What are local/regional community priorities for Federal fisheries policy?
 - ii. What stories do local/regional community members want to share?
 - iii. What kind of spatial data related to subsistence are appropriate to use in public documents/discussions, and how?
 - iv. What do regional community members feel are appropriate and ethical ways for non-Indigenous and non-locals to contribute to Federal fisheries policy and decision-making in the Bering Sea region? What are not appropriate or ethical ways?

References

- Active, J. (1999). Why subsistence is a matter of cultural survival: A Yup'ik point of view. *Alaska Native Writers, Storytellers & Orators: The Expanded Edition*.
- Ahmasuk, A., Trigg, E.W., Magdanz, J.S., & Robbins, B. (2008). Bering Strait region local and traditional knowledge pilot project: A comprehensive subsistence use study of the Bering Strait region. Kawerak, Inc., Nome, North Pacific Research Board Project Final Report, Project #643.
- Anderson, R. T. (2016). Sovereignty and subsistence: native self-government and rights to hunt, fish, and gather after ANCSA." *Alaska Law Review*, 33(2),187-227.
- Allison, E. H., Ratner, B. D., Åsgård, B., Willmann, R., Pomeroy, R., & Kurien, J. (2012). Rights-based fisheries governance: from fishing rights to human rights. *Fish and Fisheries*, 13(1), 14-29.
- Ames, T. (1998). Cod and haddock spawning grounds in the Gulf of Maine from Grand Manan Channel to Ipswich Bay. In H. von Herbing, I.L. Kornfield, M. Tupper and J. Wilson (Ed.). *The implications of localized fisheries stocks (55-64)*. Ithaca, NY: NRAES.
- Ames, T. (2007). Putting fishers' knowledge to work: Reconstructing the Gulf of Maine cod spawning ground on the basis of local ecological knowledge. In F. Hickley, H. Koldewey, and N. Haggan (Ed.). *Fishers' knowledge in fisheries science and management (353-363)*. Paris: UNESCO.
- Anderson, C. M., Krigbaum, M. J., Arostegui, M. C., Feddern, M. L., Koehn, J. Z., P.T. Kuriyama, et al. (2019). How commercial fishing effort is managed. *Fish and Fisheries*, 20(2), 268-285.
- Aporta, C. (2002). Life on the ice: understanding the codes of a changing environment. *Polar Record*, 38(207), 341-54.
- Aporta, C., & Higgs, E. (2005). Satellite culture: Global positioning systems, Inuit wayfinding, and the need for new account of technology. *Current Anthropology*, 46(5).
- Arsenault, R., Bourassa, C., Diver, S., McGregor, D., & Witham, A. (2019). Including indigenous knowledge systems in environmental assessments: restructuring the process. *Global Environmental Politics*, 19(3), 120-132.
- Aslaksen, I., Dallmann, W., Holen, D. L., Høydaahl, E., Kruse, Poppel, J...,et al. (2008). Interdependency of subsistence and market economies in the Arctic. *The economy of the North, 2007*, 75-98.
- Ban, N.C, Eckert, L., McGreer, M., & Frid, A. (2017). Indigenous knowledge as data for modern fishery management: A case study of Dungeness crab in Pacific Canada. *Ecosystem Health and Sustainability*, 3(8).
- Ban, N. C., Frid, A., Reid, M., Edgar, B., Shaw, D., & Siwallace, P. (2018). Incorporate Indigenous perspectives for impactful research and effective management. *Nature ecology & evolution*, 2(11), 1680-1683.
- Barnhardt, R. & Kawagley, O.A. (2005). Indigenous knowledge systems and Alaska Native ways of knowing. *Anthropology & Education Quarterly*, 36(1), 8-23.
- Bartlett, C.M., Marshall, M., & Marshall, A. (2012). Two-eyed seeing and other lessons learned within a co-learning journey of bringing together indigenous and mainstream knowledges and ways of knowing. *Journal of Environmental Studies and Sciences*, 2, 331-340.
- Berger, T.R. 1985. *Village journey: The report of the Alaska Native review commission*. New York: Hill and Wang.
- Bering Sea Elders Advisory Group. 2011. *The Northern Bering Sea. Our way of life*. Alaska Marine Conservation Council.
- http://eloka-arctic.org/communities/media/files/AMCC_BeringSeaElders-northern-bering-sea-report-04-01-12.pdf

- Berkes, F. (1993). Traditional ecological knowledge in perspective. In: J.T. Inglis (Ed.). *Traditional ecological knowledge: Concepts and cases international program on traditional ecological knowledge*. Ottawa, Canada: Canadian Museum of Nature, Ottawa.
- Berkes, F. (1999). *Sacred ecology: traditional ecological knowledge and resource management*. Philadelphia, PA: Taylor & Francis.
- Burgess, P. (1999). *Traditional knowledge: A report prepared for the Arctic Indigenous Peoples Secretariat*. Copenhagen: Indigenous Peoples' Secretariat Arctic Council.
- Callaway, D. (2020). Resource use in rural Alaskan communities. In D.L. Peterson & D.R. Johnson (Ed.). *Human Ecology and Climate Change* (155-168). New York, NY: Taylor & Francis.
- Capistrano, R. C. G., & Charles, A. T. (2012). Indigenous rights and coastal fisheries: a framework of livelihoods, rights and equity. *Ocean & Coastal Management*, 69, 200-209.
- Carothers, C. (2010). Tragedy of commodification: Displacements in Alutiiq fishing communities in the Gulf of Alaska. *Mast*, 9(2), 95-120.
- Carothers, C. (2011). Equity and access to fishing rights: Exploring the community quota program in the Gulf of Alaska." *Human Organization*, 70(3), 213-223.
- Carothers, C., Black, J., Langdon, S., Donkersloot, R., Ringer, D., Coleman, J... et al. (2021). Indigenous peoples and salmon stewardship: a critical relationship. *Ecology and Society*, 26(1).
- Carroll, S. R., Rodriguez-Lonebear, D., & Martinez, A. (2019). Indigenous data governance: Strategies from United States Native nations. *Data Science Journal*, 18(1), 31.
- Chapman, J. M., & Schott, S. (2020). Knowledge coevolution: generating new understanding through bridging and strengthening distinct knowledge systems and empowering local knowledge holders. *Sustainability Science*, 15(3), 931-943.
- Cheung, W. W. L., & Frölicher, T.L. (2020). Marine heatwaves exacerbate climate change impacts for fisheries in the northeast Pacific. *Scientific Reports*, 10, 1–10.
- Christie, K. S., Hollmen, T.E., Huntington, H.P., & Lovvorn, J.R. (2018). Structured decision analysis informed by traditional ecological knowledge as a tool to strengthen subsistence systems in a changing Arctic. *Ecology and Society*, 23(4).
- Clark, C. (2016). Here's how Native knowledge could help save salmon. KCET.
<https://www.kcet.org/shows/tending-the-wild/heres-how-native-knowledge-could-help-save-salmon>
- Close, C. H., & Hall, G.B. (2006). A GIS-based protocol for the collection and use of local knowledge in fisheries management planning. *Journal of environmental management*, 78(4), 341-352.
- Cochran, P., Huntington, O.H., Pungowivi, O.H., Tom, S., Chapin, F.S, Huntington, H.P.,... et al. (2013). Indigenous frameworks for observing and responding to climate change in Alaska. In J.K. Moldonado, B. Colombi, R. Pandya (Ed.). *Climate change and Indigenous Peoples in the United States* (49-59). Cham: Springer.
- Dietz, T., Shwom, R. L., & Whitley, C.T. (2020). Climate change and society. *Annual Review of Sociology*, 46, 135-158.
- Convention on Biological Diversity (CBD). Convention on Biological Diversity, June 5, 1992, 1760 U.N.T.S.79 .
- Donkersloot, R., Black, J., Carothers, C., Ringer, D., Justin, W., Clay, P., ... et al. (2020). Assessing the sustainability and equity of Alaska salmon fisheries through a well-being framework. *Ecology and Society*, 25(2).
- Donkersloot, R., Coleman, J., Carothers, C., Ringer, D., & Cullenberg, P. (2020). Kin, community, and diverse rural economies: Rethinking resource governance for Alaska rural fisheries. *Marine Policy*, 117, 103966.

- Ellis, S. C. (2005). Meaningful consideration? A review of traditional knowledge in environmental decision making. *Arctic*, 66-77.
- Fall et al. (2013). Continuity and change in subsistence harvests in five Bering Sea communities: Akutan, Emmonak, Savoonga, St. Paul and Togiak. *Deep-Sea Research Part II*, 94, 274-291.
- Feeney, R.G. (2013). Evaluating the use of social impact assessment in Northeast US federal fisheries management. *Impact Assessment and Project Appraisal*, 31(4), 271-279.
- Fienup-Riordan, A. (1990). *Eskimo Essays: Yup'ik lives and how WE see them*. New Brunswick, NJ: Rutgers University Press..
- First Alaskans Institute (FAI). (2008). *Do Alaska Native people get free medical care? And other frequently asked questions*. Anchorage, AK: University of Alaska/ Alaska Pacific University.
- Flynn, M., Ford, J. D., Pearce, T., Harper, S. L., & IHACC Research Team. (2018). Participatory scenario planning and climate change impacts, adaptation and vulnerability research in the Arctic. *Environmental Science & Policy*, 79, 45-53.
- Gadamus, L. & Raymond-Yakoubian, J. (2015). A Bering Strait indigenous framework for resource management: respectful seal and walrus hunting. *Arctic Anthropology*, 52(2), 87–101.
- Goulet, J.G. (1998). *Ways of knowing: Experience, knowledge, and power among the Dene Tha*. Lincoln: University of Nebraska Press.
- Green, K. M., Fletcher, S. S., Beaudreau, A. H., & Whiting, S. M. (2020). Iñupiaq Values in Subsistence Harvesting: Applying the Community Voice Method in Northwest Alaska. *Society & Natural Resources*, 33(1), 122-137.
- Gritsenko, D. (2018). Energy development in the Arctic: resource colonialism revisited. In A. Goldthau, M.F. Keating, & C. Kuzemko. *Handbook of the International Political Economy of Energy and Natural Resources*. Edward Elgar Publishing.
- Hay, K. & Inuit Study Participants. 2000. *Final report of the Inuit Bowhead knowledge study*. Nunavut Wildlife Management Board, Iqaluit, Nunavut Territory.
- Hauser, D. D., Whiting, A. V., Mahoney, A. R., Goodwin, J., Harris, C., Schaeffer, R. J., ... et al. (2021). Co-production of knowledge reveals loss of Indigenous hunting opportunities in the face of accelerating Arctic climate change. *Environmental Research Letters*, 16(9), 095003.
- Hill, R., Adem, Ç., Alangui, W. V., Molnár, Z., Aumeeruddy-Thomas, Y., Bridgewater, P., ... et al. (2020). Working with indigenous, local and scientific knowledge in assessments of nature and nature's linkages with people. *Current Opinion in Environmental Sustainability*, 43, 8-20.
- Hosen, N., Nakamura, H., & Hamzah, A. (2020). Adaptation to climate change: Does traditional ecological knowledge hold the key?. *Sustainability*, 12(2), 676.
- Houde, N. (2007). The six faces of traditional ecological knowledge: Challenges and opportunities for Canadian co-management arrangements. *Ecology and Society*, 12(2).
- Huntington, H. P. (2000). Using traditional ecological knowledge in science: Methods and applications." *Ecological Applications* 10(5), 1270-1274.
- Huntington, H.P., Braem, N.M., Brown, C.L., Hunn, E., Krieg, P., Lestenkof, G., Sepez, J., Sigler, M.F., Wiese, F.K., Zavadil, P. (2013). Local and traditional knowledge regarding the Bering Sea ecosystem: Selected results from five indigenous communities. *Deep-Sea Research II*, 94, 323-332.
- Huntington, H. P., Quakenbush, L.T., & Nelson, M. (2016). Effects of changing sea ice on marine Mammals and subsistence hunters in Northern Alaska from traditional knowledge interviews. *Biology Letters*, 12(8).

- Huntington, H. P., Danielson, S. L., Wiese, F. K., Baker, M., Boveng, P., & Citta, J.J., ... et al. (2020). Evidence suggests potential transformation of the Pacific Arctic ecosystem is underway. *Nature Climate Change*, 10(4), 342-348.
- Huntington, H. P., Raymond-Yakoubian, J., Noongwook, G., Naylor, N., Harris, C., Harcharek, Q., & Adams, B. (2021). "We never get stuck:" A collaborative analysis of change and coastal community subsistence practices in the Northern Bering and Chukchi Seas, Alaska. *ARCTIC*, 74(2), 113-126.
- Ingold, T. (2000). *The perception of the environment: essays in livelihood, dwelling, and skill*. London: Routledge.
- Indigenous and Tribal Peoples Convention, 1989 (No. 169). Convention (No. 169) Concerning indigenous and tribal people in independent countries art. 1(1), June 27, 1989, 1650 U.N.T.S. 383.
- Johannes, R.E., Freeman, M.M.R., & Hamilton, R.J. (2000). Ignore fishers' knowledge and miss the boat. *FISH and FISHERIES I*, 257-271.
- Johannes, R.E., & Neis, B. (2007). *The value of anecdote. Fishers' knowledge in fisheries science and management*. Paris: UNESCO Publishing.
- Johnson, N., Alessa, L., Behe, C., Danielsen, F., Gearheard, S., Gofman-Wallingford, V., ... et al. (2015). The contributions of community-based monitoring and traditional knowledge to Arctic observing networks: reflections on the state of the field. *Arctic*, 28-40.
- Kauanui, J. K. (2016). 'A structure, not an event': Settler Colonialism and Enduring Indigeneity. *Lateral*, 5(1), 5-1.
- Kovach, M. (2021). *Indigenous methodologies: Characteristics, conversations, and contexts*. University of Toronto press.
- Kishigami, N. (2021). Food security, food sovereignty, and Bowhead Whale hunts among the Iñupiat in Utqiagvik, Alaska, USA. *Senri Ethnological Studies*, 104, 93-112.
- Lam, D. P., Hinz, E., Lang, D., Tengö, M., Wehrden, H., & Martín-López, B. (2020). Indigenous and local knowledge in sustainability transformations research: a literature review. *Ecology and Society*, 25(1).
- Lanzarotta, T. (2020). Ethics in retrospect: Biomedical research, colonial violence, and Iñupiat sovereignty in the Alaskan Arctic. *Social Studies of Science*, 50(5), 778-801.
- Latulippe, N., & Klenk, N. (2020). Making room and moving over: knowledge co-production, Indigenous knowledge sovereignty and the politics of global environmental change decision-making. *Current Opinion in Environmental Sustainability*, 42, 7-14.
- Lindemuth, J. (2017). *Memorandum regarding the legal status of Tribal Governments in Alaska*. Available at: http://www.law.state.ak.us/pdf/opinions/opinions_2017/17-004_JU20172010.pdf.
- Lyons, C., Carother, C., & Reedy, K. (2017) A tale of two communities: Using relational place-making to examine fisheries policy in the Pribilof Island communities of St. George and St. Paul, Alaska. *Maritime Studies*, 15(7), 1-23.
- Lyons, C., Carothers, C., & Coleman, J. (2019). Alaska's community development quota program: A complex institution affecting rural communities in disparate ways. *Marine Policy*, 108, 103560.
- Martin, K. S., McCay, B. J., Murray, G. D., Johnson, T. R., & O. les, B. (2007). Communities, knowledge and fisheries of the future. *International Journal of Global Environmental Issues*, 7(2-3), 221-239.
- Mastrángelo, M. E., Pérez-Harguindeguy, N., Enrico, L., Bennett, E., Lavorel, S., Cumming, G. S., ... & Zoeller, K. (2019). Key knowledge gaps to achieve global sustainability goals. *Nature Sustainability*, 2(12), 1115-1121.

- McDermott, M., Mahanty, S., & Schreckenberg, K. (2013). Examining equity: A multidimensional framework for assessing equity in payments for ecosystem services. *Environmental Science & Policy*, 33, 416-427.
- McGregor, D. (2005). Traditional ecological knowledge: An Anishnabe woman's perspective. *Atlantis: Critical Studies in Gender, Culture & Social Justice*, 29(2), 103-109.
- Meier, W. N., Hovelsrud, G. K., Van Oort, B. E., Key, J. R., Kovacs, K. M., Michel, C., ... & Reist, J. D. (2014). Arctic sea ice in transformation: A review of recent observed changes and impacts on biology and human activity. *Reviews of Geophysics*, 52(3), 185-217.
- Nadasdy, P. 2003. *Hunters and bureaucrats: Power, knowledge, and Aboriginal-State relations in the Southwest Yukon*. Vancouver: University of British Columbia Press.
- Mulalap, C. Y., Frere, T., Huffer, E., Hviding, E., Paul, K., Smith, A., & Vierros, M. K. (2020). Traditional knowledge and the BBNJ instrument. *Marine Policy*, 122, 104103.
- Mulalap, C. Y., Frere, T., Huffer, E., Hviding, E., Paul, K., Smith, A., & Vierros, M. K. (2020). Traditional knowledge and the BBNJ instrument. *Marine Policy*, 122, 104103.
- Mustonen, T., & Van Dam, B. (2021). Towards a shared understanding of Arctic climate change and urgency in Alaska. *The Geographical Journal*, 187(3), 269-277.
- Murphy, R.D., Downs, M., Wolf, N., & Harris, B. A landscape of social data: guiding principles for integrating stakeholder-based data in marine fisheries management. *In review*.
- National Research Council (NRC). 1996. *The Bering Sea ecosystem*. D.C.: National Academy Press.
- Nilsson, L. M., & Evengård, B. (2015). Food security or food sovereignty: what is the main issue in the Arctic?. In B. Evengård, J. Nymand Larsen, Ø. Paasche (Ed.). *The New Arctic* (213-223). Cham: Springer.
- Nixon, R. (2011). *Slow Violence and the Environmentalism of the Poor*. Cambridge, MA: Harvard University Press.
- Noongwook, G., the Native Village of Savoonga, the Native Village of Gambell, Huntington, H.P., & George, J.C. (2007). Traditional knowledge of the Bowhead Whale (*Balena mysticetus*) around St. Lawrence Island, Alaska. *Arctic*, 60(1), 47-54.
- North Pacific Fishery Management Council (NPFMC). 2019. *Bering Sea fishery ecosystem plan*. 1007 W. 3rd Ave, Anchorage, AK.
- Oliver, E. C. J., Donat, M.G., Burrows, M.T., Moore, P.J., Smale, L. V. Alexander, J. A., Benthuyssen, M., Feng, ... et al. (2018). Longer and more frequent marine heatwaves over the past century. *Nature Communications*, 9,1-12.
- Pacific Fisheries Resource Conservation Council (PFRCC). (2011). *Incorporation of traditional and ecological knowledge and values in fisheries management*. ESSA Technologies Ltd. 1765 West 8th Avenue, Vancouver, BC.
- Panikkar, B., & Lemmond, B. (2020). Being on land and sea in troubled times: Climate change and food sovereignty in Nunavut. *Land*, 9(12), 508.
- Peterson Williams, M.J., Robbins Gisclair, B., Cerny-Chipman, E., Levine, M., & Peterson, T. (2021). The heat is on: Gulf of Alaska pacific cod and climate-ready fisheries. *ICES Journal of Marine Science*.
- Petzold, J., Andrews, N., Ford, J. D., Hedemann, C., & Postigo, J. C. (2020). Indigenous knowledge on climate change adaptation: a global evidence map of academic literature. *Environmental Research Letters*, 15(11), 113007.
- Pilcher, D. J., Naiman, D. M., Cross, J. N., Hermann, A. J., Siedlecki, S. A., Gibson, G. A., & Mathis, J. T. (2019). Modeled effect of coastal biogeochemical processes, climate variability, and ocean acidification on aragonite saturation state in the Bering Sea. *Frontiers in Marine Science*, 5, 508.

- Pulsifer, P., Gearheard, S., Huntington, H.P., Parsons, M.A., McNeave, C., & McCann, H.S. (2012). The role of data management in engaging communities in Arctic research: Overview of the Exchange for Local Observations and Knowledge of the Arctic (ELOKA). *Polar Geography* 35(3- 4):271 – 290.
- Raymond-Yakoubian, J. (2009). Participation and resistance: Tribal involvement in Bering Sea fisheries Management and Policy. In: C. Carothers, K.R. Criddle, C.P. Chambers, P.J. Cullenberg, J.A. Fall, A.H. Himes-Cornell, J.P. Johnsen, N.S. Kimball, C.R. Menzies, and E.S. Springer (eds.), *Fishing people of the north: cultures, economies, and management responding to change (117-130)*. Alaska Sea Grant, University of Alaska Fairbanks.
- Raymond-Yakoubian, J., Raymond-Yakoubian, B., & Moncrieff, C. (2017). The incorporation of traditional knowledge into Alaska federal fisheries management.” *Marine Policy*, 78, 132–42.
- Reedy-Maschner, K. (2009). Entangled livelihoods: economic integration and diversity in the Western Arctic. *Alaska Journal of Anthropology*, 7(2), 135-146.
- Reum, J. C., Blanchard, J. L., Holsman, K. K., Aydin, K., Hollowed, A. B., Hermann, A. J., ... & Punt, A. E. (2020). Ensemble projections of future climate change impacts on the Eastern Bering Sea food web using a multispecies size spectrum model. *Frontiers in Marine Science*, 7, 124.
- Ruddle, K. 1994. Local knowledge in the folk management of fisheries and coastal marine environments. In: C. Dyer & F.R. McGoodwin (Ed.). *Folk management in the world's fisheries: Lessons for modern fisheries management* (161-206). Niwot, CO: University of Colorado Press.
- Scaggs, S. A., Gerkey, D., & McLaughlin, K. R. (2021). Linking subsistence harvest diversity and productivity to adaptive capacity in an Alaskan food sharing network. *American Journal of Human Biology*, e23573.
- Sharp, S.B. & Lach, D. (2003). Integrating social values into fisheries management: A Pacific Northwest study. *Fisheries*, 28(4), 10-15.
- Smith, D. (1998). An Athapaskan way of knowing: Chipewyan ontology. *American Ethnologist*, 25, 412-32.
- Springer, A.M., McRoy, C.P. & Flint, M.V. (1996). The Bering Sea green belt: Shelf-edge processes and ecosystem production. *Fisheries and Oceanography*, 5(3/4), 205-223.
- Stuhl, A. (2016). *Unfreezing the Arctic: Science, colonialism, and the transformation of Inuit lands*. Chicago, IL: University of Chicago Press.
- Szymkowiak, M., Kasperski, S., & Lew, D. K. (2019). Identifying community risk factors for quota share loss. *Ocean & Coastal Management*, 178, 104851.
- Szymkowiak, M., & Kasperski, S. (2021). Sustaining an Alaska coastal community: integrating place based well-being indicators and fisheries participation. *Coastal Management*, 49(1), 107-131.
- Tagalik, S. (2012). Inuit Qaujimagajatuqangit: The role of Indigenous knowledge in supporting wellness in Inuit communities in Nunavut. National Collaborating Centre for Indigenous Health.
- Thoman, R. L., Bhatt, U. S., Bieniek, P. A., Brettschneider, B. R., Brubaker, M., Danielson, S., ... & Walsh, J. E. (2020). The record low Bering sea ice extent in 2018: context, impacts, and an assessment of the role of anthropogenic climate change.
- Thornton, T. F., Moss, M. L., Butler, V. L., Hebert, J., & Funk, F. (2010). Local and traditional knowledge and the historical ecology of Pacific Herring in Alaska. *Journal of Ecological Anthropology*, 14(1), 81-88.
- Thompson, K. L., Lantz, T., & Ban, N. (2020). A review of Indigenous knowledge and participation in environmental monitoring. *Ecology and Society*, 25(2).
- Torrey, B. B. 1978. *Slaves of the harvest: The story of the Pribilof Aleuts*. St. Paul Alaska Tanadgusix Corporation.

- Turner, N. J., Berkes, F., Stephenson, J., & Dick, J. (2013). Blundering intruders: extraneous impacts on two indigenous food systems. *Human Ecology*, 41(4), 563-574.
- Secretarial Order 3206. 1997 American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act (June 5, 1997)
- Schreckenberg, K., Franks, P., Martin, A., & Long, B., (2016). Unpacking equity for protected area conservation. *Parks*, 22, 11-26.
- Smith, L. T. (2021). *Decolonizing methodologies: Research and indigenous peoples*. Zed Books Ltd.
- Stephenson, R.L., Paul, S., Pastoors, M.A., Kraan, Holm, P., Wiber, M., ... et al. (2016). Integrating fishers' knowledge research in science and management. *ICES Journal of Marine Science*, 73(6), 1459-1465.
- Stoll, P. T. (2015). A Right of Indigenous Peoples to Their Cultural Heritage, Their Traditional Knowledge, Their Traditional Cultural Expressions and Their Intellectual Property: Commentary on Art. 30 of the United Nations Declaration on the Rights of Indigenous Peoples. *Forthcoming in A Commentary on the United Nations Declaration on the Rights of Indigenous Peoples, Oxford Commentaries on International Law, Hohmann/Weller (eds)*.
- United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). G.A. Res. 61/295, U.N. Doc. A/RES/61/295 (Oct. 2, 2007).
- Voinot-Baron, W. (2019). Inescapable temporalities: Chinook salmon and the non-sovereignty of co-management in southwest Alaska. *Engagement, Anthropology and Environment Society*.
- Walter, M., Kukutai, T., Carroll, S. R., & Rodriguez-Lonebear, D. (2021). *Indigenous Data Sovereignty and Policy*. London: Routledge.
- Warren, B., Vossoughi, S., Rosebery, A. S., Bang, M., & Taylor, E. V. (2020). Multiple Ways of Knowing*: Re-Imagining Disciplinary Learning. London: Routledge.
- Wheeler, H., Danielsen, F., Fidel, M., Hausner, V. H., Horstkotte, T., Johnson, N., ... & Vronski, N. (2020). The need for transformative changes in the use of Indigenous knowledge along with science for environmental decision-making in the Arctic. *People and Nature*, 2, 544-556
- Williams, T. & Hardison, P. (2013). Culture, law, risk, and governance: Contexts of traditional knowledge in climate change adaptation. *Climatic Change*, 120, 531-544.
- Wilson, D. C., Nielsen, J. R., & Degnbol, P. (Eds.). (2003). *The fisheries co-management experience: accomplishments, challenges and prospects* (Vol. 26). Springer Science & Business Media.
- Whyte, K.P. (2013). On the role of traditional ecological knowledge as a collaborative concept: A philosophical study. *Ecological Processes*, 2(1), 1-12.
- Wolfe, R. J. (2004). *Local traditions and subsistence: A synopsis from twenty-five years of research by the State of Alaska*. Juneau, AK: Alaska Department of Fish and Game, Division of Subsistence.
- Wrona, F.J., Prowse, T.D., Reist, J.D., Hobbie, J.E., Levesque, L.M.J., & Vincent, W.F. (2006). Climate impacts on Arctic freshwater ecosystems and fisheries: Background rationale and approach of the Arctic climate impact assessment (ACIA). *Ambio*, 35, 326-329.
- Zhongming, Z., Linong, L., Wangqiang, Z., & Wei, L. (2012). Weathering uncertainty: traditional knowledge for climate change assessment and adaptation.