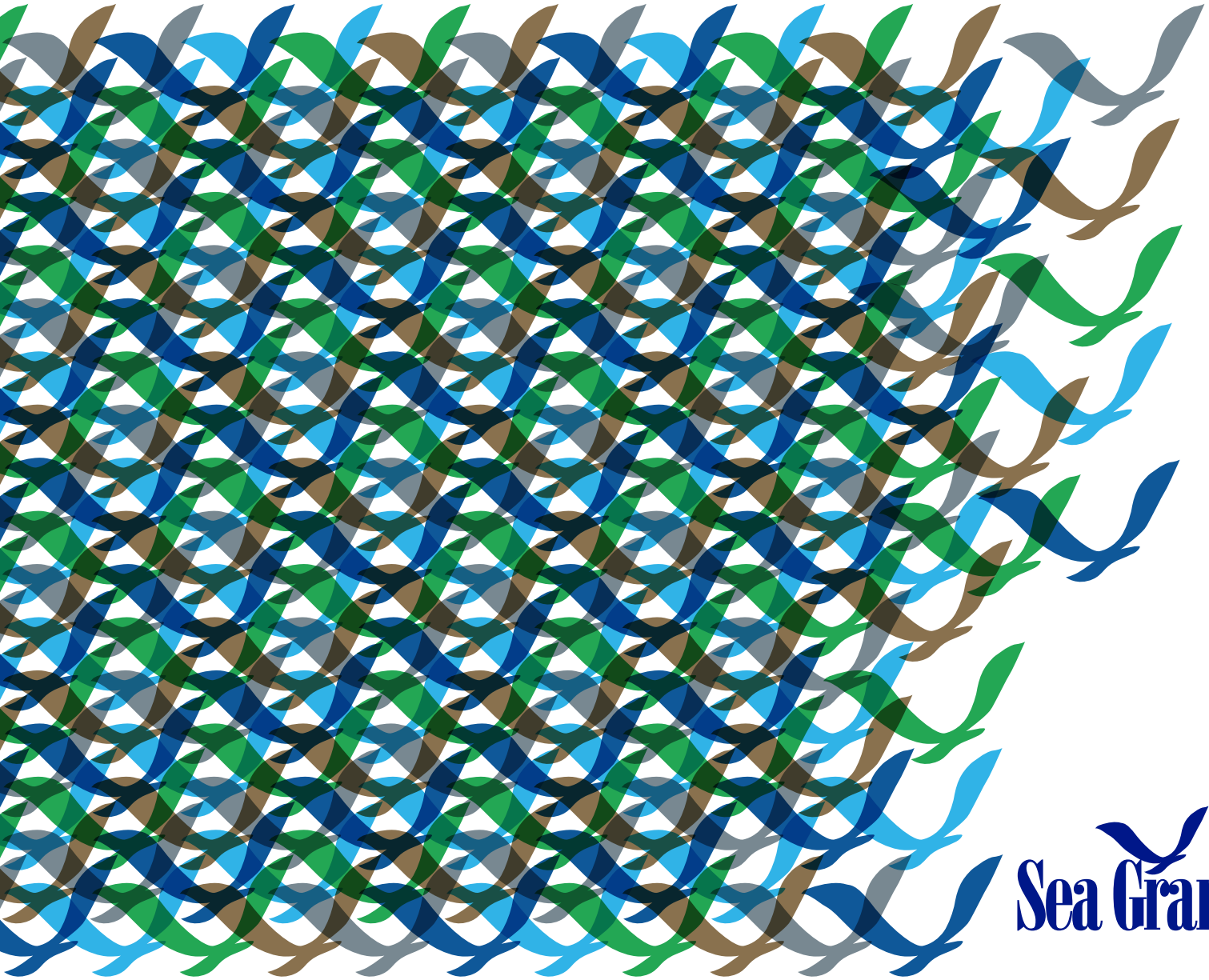
Traditional & Local Knowledge

A vision for the Sea Grant Network | 31 August 2018



Sea Grant

Visioning Partners

The visioning team would like to thank partners who participated in the visioning effort, including representatives of the Central Council of Tlingit and Haida Indian Tribes of Alaska, Wishtoyo Chumash Foundation, Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw Indians, Palau National Congress, Pointe-au-Chien Indian Tribe, Swinomish Indian Tribal Community, and United Houma Nation.

Process for developing the vision

The network visioning exercise to produce this document was led by Louisiana Sea Grant and Alaska Sea Grant with facilitation by the NOAA Office for Coastal Management and support from the National Sea Grant Office. The vision, goals, outcomes, and best practices presented here are based on two workshops; the first in Juneau, Alaska, February 21-22, 2018 in collaboration with the Central Council of Tlingit and Haida Indian Tribes, and the second in Cocodrie, Louisiana, April 5-6, 2018 in collaboration with the Pointe-au-Chien Indian Tribe. It was critical that we involve local partners with place-based knowledge systems in the broadest diversity of communities where Sea Grant programs work to help define a vision and goals. The network visioning group, which included participants from 10 Sea Grant College Programs, went through several exercises with Alaska Natives, Native Americans, Native Hawaiians, and Pacific Islanders in defining terms to ensure that knowledge systems are valued and respected. Maine Sea Grant led the editing and production of this document.

Purpose of the vision document

This vision statement and plan is intended to inform the Sea Grant Network, NOAA, and our partners, providing background on traditional and local ecological knowledge and their use in research, outreach, and education, including best practices and selected references and resources. This vision complements other priority visions guiding the Sea Grant Network, including Diversity, Equity & Inclusion, and Environmental Literacy.

Introduction

Traditional and local knowledge is about people, places, and livelihoods. Sea Grant serves a diversity of rural, Indigenous, and multi-generational communities tied to marine and coastal environments through sustenance, work, and culture. In the far south of the continental United States, the Pointe-au-Chien Tribe is part of a small fishing community along a Louisiana bayou where shrimping is a way of life. The Tribe is still recovering from several severe hurricanes and the Deepwater Horizon oil disaster, while also dealing with the encroaching ocean. What were once family farms and homes are now only small hills along the bayou surrounded by water, and much of the brackish marsh nearby has turned to open water. As they fish and navigate the edges, they see these processes unfolding in human time.

On the Alaska Peninsula, Port Heiden is a stark, treeless landscape of volcanic pumice and ever-present wind. It is also a place where residents harvest caribou, berries, seals, and abundant seafood, as they have for generations. But now, loss of sea ice has intensified waves and wind, eroding away the coastal village of the Unangan community, forcing them to migrate inland. Fishermen now launch their boats from a beach, which can be difficult and dangerous in high waves and wind. An eroding bluff and the imminent drainage of a lake close to the beach has forced them to search elsewhere for safe harbor.

Both communities represent strength and resilience that is articulated in the way people talk about their community, and the deep connection they have to the landscape and marine environment. Both communities have shared their ecological knowledge with Sea Grant, working together to understand environmental change and plan for the future without losing the past.

The Pointe-au-Chien Tribe and Louisiana Sea Grant are mapping the changes along the bayou. The Tribe sees a future bright with opportunity to harvest subsistence foods, especially shrimp, crab, and other shellfish, and make a living from the sea as they have for generations. Young people are present at the Tribe's community center during a crab boil, where Cajun French is still spoken, and local traditions are still very much alive.

In Port Heiden, Alaska Sea Grant is supporting local tribal organizations as they develop strategies for climate change resilience and adaptation that will improve community wellbeing: a new harbor to shelter fishing boats, and plans to bring freshwater from the nearby hills that will also drive a turbine, water and power for a new seafood processing plant and community infrastructure.

Sea Grant's geographic scope includes hundreds of Indigenous communities and thousands of coastal and Great Lakes cities, towns, and villages. It is on these margins of our American landscape, in coastal communities like Pointe aux Chenes and Port Heiden, that deep connections to place, and the resilient nature of communities, are revealed through culture and local knowledge.

This knowledge, born from sea and shore, and knowledge gained via modern scientific methods, are different — and often complementary and parallel — ways of knowing. Traditional and local knowledge includes information about the biological, physical, social, cultural, and spiritual worlds that knowledge bearers inhabit and engage with. Such place-based knowledge

can inform science by providing local ecological information and narrative histories of local ecosystems, as well as best practices and rules about how to live within and care for the natural world that is our shared home.

Sea Grant programs are as different as the people and places they serve. We have a relatively long history of acting as the bridge, liaison, and often, translator, between academic researchers and local communities. Sea Grant extension programs exist explicitly to connect stakeholders and university researchers. Thus, extension professionals have the capacity to integrate locally-generated knowledge into practice and policy. Sea Grant communications programs produce a diverse portfolio of information products that are designed for specific and multiple target audiences. Sea Grant educators bring ocean, coastal, and Great Lakes science literacy to the U.S. population, beginning with preschool students and continuing through lifelong learners.

The inclusion of local and traditional ecological knowledge is vital to the Sea Grant mission to enhance the practical use and conservation of coastal, marine and Great Lakes resources in order to create a sustainable economy and environment. This vision document relates to the National Sea Grant Network's Core Values and 2018-2021 Strategic Plan, in particular the cross-cutting principles outlined in that plan:

Cultivate partnerships–Sea Grant will integrate the expertise and capabilities of our partners from the international, federal, tribal, and state communities and from, academia, and nongovernmental organizations.

Achieve organizational excellence–establish a framework of standards and processes intended to engage and motivate the network to deliver products and services that fulfill the Nation's needs.

Enhance diversity & inclusion–Seek and welcome diverse perspectives and viewpoints in order to strengthen and renew Sea Grant's mission and vision.

Sea Grant programs already recognize the value inherent in including local voices in resource management and education — indeed it is a fundamental and unique part of our mission. Sea Grant is therefore in a position to promote and facilitate this understanding more broadly by supporting coastal and Great Lakes communities in their efforts to manage the resources and ecosystems upon which their livelihoods depend. Using their own knowledge systems to ensure the continuity of their way of life, communities can adapt to social and environmental change. Being more inclusive — respecting and incorporating communities' ways of knowing in planning, research, and decisions — broadens support for science, education, and community projects, while also allowing for community-based leadership of projects and programs now and in the future. We are few, and communities are many, so supporting knowledge holders and including them in Sea Grant projects and programs will increase the likelihood for success in achieving the Sea Grant mission, while at the same time create rich partnerships between Sea Grant staff and researchers, and members of local communities.

Traditional and Local Knowledge: Meanings and Definitions

Traditional Ecological Knowledge (TEK) is a knowledge system or worldview of human-environment relations that incorporates spirituality, cultural values, ethics, and the basic norms of society, and is passed down through generations, often through oral tradition (Berkes 1993). TEK is a living body of knowledge that includes environmental observations and experiences that occur in places and within an indigenous cultural context; as such, TEK is embedded in culture and cannot be separated from the people and places where it is generated (Usher 2000; Nadasdy 1999).

Local knowledge reflects the observations and experiences of people living in a region who may be, but are not necessarily, indigenous. Bearers of local knowledge often live in or are connected to a common geographic location who actively engage with the environment, for example through local harvest of wild resources, or participation in coastal restoration and education. This knowledge is often recently acquired, over one or more generations, compared to TEK which is deeply embedded in cultures who have dwelled in a landscape since time immemorial (Ingold 2000; Thornton et al. 2012). Both are ways of knowing and living that are connected to a specific place, or locale.

Traditional or local knowledge is pragmatic, holistic, and often emphasizes interconnectedness between people and nature. These concepts and terminology are complex and continually evolving and vary across communities and places. For inclusivity and to create a shared vocabulary for Sea Grant and our partners, this vision document will use the term **Traditional and Local Knowledge (TLK).**

Legal and Regulatory Structure of Sovereign Relations

While Sea Grant works in a non-regulatory relationship with numerous Indigenous communities throughout the United States and Territories regardless of recognition status, it is important to understand the broader context of NOAA's responsibilities. As an agency of the United States government, NOAA recognizes the political rights of federally-recognized Indian Tribes to self-government and the exercise of sovereign power over their members and territory. The United States has a unique "government-to-government" relationship to federally-recognized American Indian and Alaska Native Tribes, based on the U.S. Constitution, treaties, federal statutes, federal court decisions, and Executive Branch policies. Central to this relationship is the "trust responsibility," a legal obligation to carry out the mandates of federal law with fiduciary consideration for the rights and interests of American Indian and Alaska Native tribes and villages (NOAA 2013). Not all Tribes are federally recognized, though some are state-recognized, and no tribal governments are federally recognized in the Pacific Islands Region, which includes the State of Hawaii and the unincorporated organized Territory of Guam. For more resources on this topic, see EPA 1984, EPA 2014, Moffa 2016, and Sepez and Lazrus 2005.

Vision

Traditional and local knowledge is woven throughout the Sea Grant network, guiding and informing research, outreach, and education, and respect for the producers and stewards of local knowledge is upheld at every level.

Goals

Achieving our vision requires that we *recognize*, *understand*, *value*, *support*, and *incorporate* traditional and local knowledge, and the holders of knowledge, into all areas of Sea Grant programming.

*Sea Grant staff, researchers, and community partners **recognize** stewards of traditional and local knowledge in all aspects of their work.*

*Sea Grant and the communities we serve **understand** the meaning of traditional and local ecological knowledge, and their importance to different populations.*

*Coastal and Great Lakes communities **value** multiple ways of knowing as important contributions to planning for change, resilience, and sustainability.*

*Sea Grant and NOAA leadership **value** traditional and local knowledge work as important to our success in achieving the Sea Grant mission.*

*With Sea Grant **support**, coastal and Great Lakes communities include multiple ways of knowing about their marine and terrestrial landscapes into solutions and planning for future well-being and resilience.*

*Coastal and Great Lakes communities and governments **incorporate** traditional and local ecological knowledge, and the voices of knowledge stewards, into planning, management, and policy solutions to improve quality of life for all.*

*Sea Grant projects and programs **incorporate** priorities, concerns, and strategies informed by diverse knowledge systems, perspectives, and lived experiences.*

*Sea Grant-funded research projects encourage and **incorporate** multiple ways of knowing, include knowledge stewards as equal partners, and employ best practices.*

*Sea Grant education projects and programs are rooted in the local environment of their students and **incorporate** voices from local stewards of these places.*

*Sea Grant is a recognized leader in raising the scientific credibility and **incorporation** of traditional and local knowledge in ecological research, planning, management, outreach, and education*

These goals are described in the following pages, along with recommended actions, both for Sea Grant's work with local communities and stewards of knowledge, and for Sea Grant and NOAA programmatic elements. The proposed actions (or outcomes) include recommendations for Research, Extension, Communications, and Education. In many cases, however, actions apply across Sea Grant functional areas. Case studies illustrate ongoing work toward these goals across the Network.

RECOGNIZE

Sea Grant staff, researchers, and community partners recognize stewards of traditional and local knowledge in all aspects of their work.

Background

Indigenous communities, and to an extent other groups of people whose livelihoods depend on natural resources such as fishing communities, have unique perspectives about human-ecological relationships that come from years, or millennia, of living in a place and depending on a place for their survival, identity, culture, and sustenance. Recognizing this relationship between people and places, and related different ways of knowing and being in the world, may seem simplistic but is in fact a very real and important act. Recognizing that there are different ways of knowing and living (experimental, observational, experiential) can help people overcome philosophical and ideological differences and thus find ways in which different knowledge systems may complement each other to enhance decision-making and improve quality of life for all.

For some Sea Grant programs, recognizing the existence of other ways of knowing may be the first step in efforts to work with local knowledge holders. Sea Grant programs with a longer history of engagement with knowledge holders continue to acknowledge them throughout their work. Recognition is a continual process that occurs as part of and in parallel with the other goals presented here.

Actions

- Acknowledge the multiple ways of knowing about the world.
- Identify traditional and local stewards of ecological knowledge and their expertise.
- Recognize the history of local peoples and cultures and the deep-rooted issues they face, including the sovereignty of Native American, Alaska Native, Native Hawaiian, Pacific Islanders, and other Indigenous peoples. Sea Grant programs are embedded in academic institutions and governments that in many cases have abused, profited from, and disenfranchised Indigenous peoples, and we share the responsibility to work towards reconciliation.
- Raise the visibility of traditional and local knowledge with intentional programming and communication products.
- Honor Indigenous people and places at events, meetings, and gatherings (e.g., USDAC 2017).
- Include traditional and local ecological knowledge in the National Sea Grant Strategic Plan and reporting measures.

Case Studies

Manoomin: Wild rice education and outreach in the Lake Superior Watershed

The only grain native to North America, Manoomin or wild rice is viewed as essential to the distinct identity of the Anishinaabe people. Hundreds of years ago, they were told to find the place where food grows on water. With this vision, the Anishinaabe began their long migration from the East Coast to the area now known as Michigan, Wisconsin, and Minnesota. Manoomin is a special gift from the creator, and an important source of nutrition and culture for the Anishinaabe people. Despite its cultural significance, Manoomin in the Great Lakes is threatened by climate change, increased tourism and recreation activity, and impairments to water quality. The Wisconsin, Michigan, and Minnesota Sea Grant programs are working with Indigenous communities in the Lake Superior region to raise awareness about wild rice, its cultural and regional significance, its ecological function and importance, and how to protect it from activities associated with recreational water use and lakeshore property ownership. Each state has tribal partners helping to structure the project, who will be consulted on project progress and paid to review draft materials. The Sea Grant team will ensure that the resources created are reflective of broader efforts to restore and protect Manoomin and that they are useful and reflective of the needs of tribal partners.

A canoe filled with just-harvested wild rice in Minnesota. Photo by J. Schomberg.

— Deidre Peroff, Social Science Outreach Specialist, Wisconsin Sea Grant & Jesse Schomberg, Associate Director of Outreach, Minnesota Sea Grant

Recognizing our own traditional and local knowledge within the Sea Grant network

Sea Grant's workforce includes a multitude of individuals who represent a broad range of age groups, backgrounds, expertise, perspectives, and length of time working for Sea Grant. This multigenerational and diverse workforce has tremendous implications for the network. On the one hand, it presents challenges in managing inevitable tensions arising from conflicting values and divergent perspectives. On the other hand, it offers tremendous, untapped, complementary potential within the Sea Grant network. Georgia Sea Grant is home to several individuals who have dedicated their entire professional careers to advancing Sea Grant's mission and are "repositories" of vast traditional and institutional knowledge. Ms. Gennell Gibson was born and raised in Pin Point, a small, predominantly African American community that has a well-established group of Gullah speakers. Pin Point Heritage Museum was once the Varn and Sons Oyster Canning Factory and offers guests the chance to experience the Gullah/Geechee way of life from religion, to foodways, to the fascinating history. Gennell worked as a young girl picking crab in Pinpoint and is a patient teacher to anyone who wants to know the best way to pick a blue crab and learn about the way she was raised. Genell's family goes way back and her stories are rich and funny and fascinating. Genell Gibson has worked with Georgia Sea Grant's education center and aquarium for more than 20 years. She is the face and voice that greets all visitors to the Aquarium. Genell gives her time generously to daily visitors and as an invited speaker and expert for outreach programs to civic groups, onsite public programs, and summer marine science camps.

Gennell Gibson, a native of the Pin Point Gullah community, has worked with Georgia Sea Grant for more than 20 years. Photo courtesy M. Behl.

— Mona Behl, Associate Director, Georgia Sea Grant

Learning from traditional knowledge keepers in California

Chumash maritime culture and history extends back thousands of years in what is now south and central coastal California. The Wishtoyo Chumash Foundation (WCF) preserves the wisdom of the ancient Chumash culture while linking it to present day environmental issues. Several years ago representatives of WCF and USC Sea Grant served together on the Channel Islands National Marine Sanctuary Advisory Team. The partnership has continued through the California Master Naturalist program, in which traditional knowledge and cultural practices are shared along with science curriculum and community-based science. University students and community members learn to see their own connection in the coastal ecosystem, and the diversity of the naturalist corps is expanded. At the recent National Marine Educators Conference, speakers included Chumash Elder, Executive Director and founder of WCF, Mati Wayia; First Nations Program Officer Alicia Cordero; and Luhui Ishia, Director of Cultural Resources and Education. Educators were reminded of the importance of valuing and recognizing the rights of the first residents of the land in both history and current issues. Together, we continue to learn from one another.

— Linda Chilton, Education Programs Manager, Southern California Sea Grant

California Naturalist Certification Program graduating class from 2017. Photo by Luhui Isha/Wishtoyo Chumash Foundation.

UNDERSTAND

Sea Grant and the communities we serve understand the meaning of traditional and local knowledge, and its importance to different populations.

Background

TLK often refers to recent local observations, while also integrating traditional practices and social memory of groups who share communal practices or rely on the same resources. In many cases, members of a community may not even be aware of the knowledge they hold, or its potential to contribute to solutions to local environmental or social problems.

Sea Grant can provide opportunities for this knowledge to be realized, and the knowledge holders to be respected. Understanding the complexity and depth of traditional and local ecological knowledge, and the differences between them and other forms of knowledge, will allow Sea Grant to build and maintain trust when working with knowledge holders. For communities, understanding different types of knowledge and its meaning within a local context is a prerequisite to supporting and incorporating local knowledge for shared planning and solutions.

Actions

- Provide more opportunities for local knowledge holders to share their insights.
- Work with local knowledge partners to share information about local ecology and human interaction with the environment (perspectives on resilience, adaptation, etc.).
- Support researchers and faculty who are interested in working with local knowledge holders, with the understanding that not all scientists are a good "fit for TLK research approaches." For example, requests for proposals can be structured to encourage and attract researchers with a strong interest in and capacity for working with local knowledge holders.
- Support educators in their efforts to make curricula locally relevant and responsive to Indigenous cultures (training, workshops, funding for field trips and community partnerships, etc.).
- Highlight local knowledge and related programs and projects at events.
- Create a resource database on TLK for the Sea Grant Network.
- Communicate TLK projects with the Sea Grant Network and NOAA.

Case Studies

Mapping ocean stories in Maine

Students and community members putting stories on the map. Photo by N. Battista/Island Institute.

The voices of fishermen and fishing community members are often overlooked in decision-making processes that will affect them directly. Collecting these voices is an important step in making sure their perspectives are heard and their stories are protected for future generations. Though fishing oral histories have long been collected in Maine, few are translated into spatial data that can inform decision-making. The Mapping Ocean Stories project combines oral history with geo-referenced mapping in order to build individual accounts and a collective picture of how fishermen and community members live, work, and access the water in Maine. Documenting and aggregating these stories transforms individual anecdotes into a body of knowledge that provides fine-grained insights into impacts of regulatory actions or environmental changes. Collecting and sharing stories instills a strong sense of community that fosters resilience to change. Working with fishing communities, College of the Atlantic, and Island Institute, Maine Sea Grant developed methods to collect and transfer oral history to a geographic information system, and created a database of existing fisheries oral histories. The first Mapping Ocean Stories class at College of the Atlantic had students conducting interviews with more than 30 people in three communities, and presenting their work to the Northeast Regional Planning Body. The partnership has led to additional interview and story mapping projects.

—Natalie Springuel, Marine Extension Associate, Maine Sea Grant

Creating opportunities for researchers to learn from local communities in Louisiana


LaDIA faculty tour the marshes of Terrebonne Parish with members of the Pointe-au-Chien Indian Tribe. Photo by R. Ray.

Time and funding constraints and academic expectations can make it difficult for researchers to learn first-hand about issues coastal residents face in order to make their work relevant to communities. Louisiana Sea Grant developed the Louisiana Discovery, Integration and Application (LaDIA) program to build greater connections between researchers and coastal communities. Participants spend time in the coastal parishes of Louisiana, learning about how TLK may complement their science in collaborative research approaches to address identified local needs. Since the establishment of LaDIA, Louisiana Sea Grant has seen an increase in the number of interdisciplinary research proposals, several coming from participants in the program, and more robust outreach plans that include input from extension staff and local knowledge holders.

— Matthew Bethel, Associate Executive Director of Research, Louisiana Sea Grant

Alaska Seas and Watersheds: Taking local knowledge statewide

In 1969, parents of elementary school students in Juneau, Alaska, led elementary school students on field trips to low-tide beaches and estuarine wetlands. Many of the students had never before explored a beach at "minus tide," or knew the names of marsh birds. Juneau's annual "Sea Week" expanded beyond seven days, to every grade and every school in town, giving every student the opportunity to benefit from place-based science education at a nearby beach, wetland, and glacier. The Sealaska Heritage Institute, the regional Tlingit cultural organization, developed bilingual and cultural education materials and Tlingit teachers led and participated in field trips. In 1980, Alaska Sea Grant expanded the Sea Week model statewide, involving teachers from Juneau and around the state to prepare instructional books. Known as Alaska Seas and Watersheds, the now-online program's emphasis on infusing traditional and local knowledge into instruction is one recognized statewide as an effective means to engage Indigenous K-12 students in science. More recently, Alaska Sea Grant started a grant program to help school districts make their local Sea Week even more effective, supporting teachers in adapting instruction and field trips to local environments and cultures, while ensuring that curriculum frameworks are aligned with the Next Generation Science Standards.

— Marilyn Sigman, Marine Education Specialist, Alaska Sea Grant

Students explore the beach as part of Juneau's Sea Week. Photo by M. Sigman.

VALUE

Coastal and Great Lakes communities value multiple ways of knowing as important contributions to planning for change, resilience, and sustainability.

Sea Grant and NOAA leadership value traditional and local knowledge work as important to our success in achieving the Sea Grant mission.

Background

Over the past few decades, observations provided by people with traditional and local knowledge have aided efforts to understand marine systems and changes in coastal environments, and livelihoods at small local scales. Local knowledge is used effectively by people on their own to thrive in their local environments. The gap between local communities and the study of large issues presents a challenge to ensuring that local knowledge is valued and that the voices of local knowledge holders are upheld at every level — that they are not separated from their knowledge as information is shared and applied in research, regulation, or policy. And even when communities don't wish to share their knowledge, that knowledge must still be believed (it is real, it exists) and valued.

Valuing local knowledge promotes a broader respect for those who possess it, a willingness to consider its relevance for decision-making, to attend to the information it offers, and to incorporate the expertise that is available, all of which are important to the success of Sea Grant's efforts to help communities plan for their own future and identify the most important means of maintaining and enhancing quality of life.

Actions

- Provide opportunities for communities to learn and share (and celebrate!) local knowledge and best practices.
- Develop policies or processes to ensure that Sea Grant communications and education products and strategies are respectful and inclusive of traditional and local knowledge holders.
- Support local experts in leadership roles.
- Communicate about the benefits and outcomes of TLK projects with communities, researchers, educators, and policy-makers.
- Communicate the value of TLK projects to Sea Grant and NOAA administration.
- Include traditional and local knowledge as a priority in the national Sea Grant strategic plan.

Case Studies

Developing community pride in Palau.

Palau is one of 2,100 islands in Micronesia. Twenty-five years ago, in response to the many threats facing the island's tropical forests and coral reefs, Noah Idechong founded the Palau Conservation Society. But public support for conservation action was lacking. Idechong worked on developing community pride in place, using the Biib (fruit dove) as a symbol to unite people across Palau in their shared connection to the environment, generating the will to designate five marine protected areas. Idechong also convinced the chiefs of Palau to reinstate age-old conservation traditions known as *bul*, which limited fishing in the spawning channels within village reefs, considered to be one of the most important conservation measures in the Pacific in recent history. Idechong, now a member of Palau's congress, received the prestigious Goldman Prize for environmental leadership in 1995 and was named Time Magazine's "Hero of the Planet" in 2000. He participated in the Alaska Visioning Workshop.

The Paulau Conservation Society's logo features the Biib, or fruit dove.

— Catherine Schmitt, Maine Sea Grant

Valuing traditional uses in marine protected areas

Communities with ancestral territory on the Oregon coast include the Confederated Tribes of Grand Ronde, Confederated Tribes of Siletz Indians, Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians, Coquille Indian Tribe, and Smith River Rancheria (Tolowa Dee-ni'). In 2012, the State of Oregon designated five ocean sites where development and harvest were prohibited (marine reserves, MR), and paired each reserve with a Marine Protected Area (MPA) with fewer restrictions. Both MRs and MPAs can affect subsistence, ceremonial, and traditional uses of the marine environment, and conflict over these uses has arisen in MPAs in other areas. To inform MR and MPA management in the state, Oregon Sea Grant supported research to describe past and present Tribal uses of marine resources, based on interviews, surveys, and interactive mapping with fishermen, gatherers, and tribal elders. The resulting dataset includes the concerns, knowledge, and use of 152 different species from the last 70 years. Recordings of interviews were returned to the family or tribal staff for their own uses. The results of the project, recently completed, will contribute to Oregon's legislatively-mandated MR/MPA evaluation, and help Oregon coastal managers incorporate tribal uses into MR/MPA management.

— Sabra Marie TallChief Comet, 2018 Knauss Fellow, Oregon Sea Grant

Instilling local knowledge of traditional seafaring in Micronesia

Larry Ray Raigetal is a master navigator from the island of Lamotrek in Yap, Federated States of Micronesia. He travels the seas through the stars, the traditional way to navigate transferred by his ancestors. He also follows winds and currents, and has observed how climate change is affecting weather patterns. He can no longer count on the stars to indicate good sailing conditions. Raigetal formed the group Waa'gey to preserve native technologies and arts both to protect the distinctive outer island identity, and to solve specific problems relating to import dependency, urbanization, climate change, and unemployment. His mission is to pair elders with younger generations for skills and knowledge transfer of traditional navigational techniques. Raigetal was an instructor at a six-week course on traditional seafaring and celestial navigation techniques hosted by the University of Guam Sea Grant. According to Raigetal, cultural traditions like canoe navigation will not be lost as long as we maintain perspective of culture as a living thing that keeps moving and changing. "Climate change is continuing, but I don't think our culture will be lost if we do our best to keep it," he said. Just before losing sight of land, the navigator looks back to determine where he is going to go. He needs to know his point of origin before he can turn to his point of destination. "We will never stop looking back to our past in order for us to know where we are going."

— Fran Castro, Program Leader, Guam Sea Grant

Larry Raigetal teaches a course in navigating by starlight. Photo courtesy Guam Sea Grant.

SUPPORT

With Sea Grant support, coastal and Great Lakes communities include multiple ways of knowing about their marine and terrestrial landscapes into solutions and planning for future well-being and resilience.

Background

The increasing recognition of the value of TLK provides an opportunity for residents whose livelihoods depend on natural resources to be included in research, planning, and management decisions related to their home lands and waters. When community members who are engaged in planning for the future take into account different knowledge systems, perspectives, and lived experiences, they can increase their own efficacy in dealing with hazards and environmental change.

Sustaining equitable partnerships requires that Sea Grant continues to be viewed as a trusted source of information, and communities continue to seek our support and involvement. A challenge is finding the right partners and keeping them engaged. Institutions (management agencies, funders, etc.) often work on short time scales that are difficult to match with the multi-year or multi-generational timescales of local knowledge holders. And yet, cooperation between Sea Grant and local knowledge holders leads to more proactive environmental management (versus reactive) and successful solutions for all involved.

Actions

- Build capacity for TLK holders and local communities to identify, share, and address research and information needs.
- Provide opportunities for traditional and local knowledge holders to share their needs and interests (with researchers, policy-makers, etc.).
- Ensure local participation in planning initiatives and promote local solutions.
- Create communications products about planning and policy initiatives that are accessible to diverse audiences and address locally relevant concerns.
- Develop Sea Grant communications and education products and programs that acknowledge the full and true history of people and places.
- Share successful outcomes and lessons learned beyond the local communities through Sea Grant outreach and education.
- Develop a process for community input to annual reporting to NOAA, and create a performance measure or metric that evaluates enduring partnerships and relationships.
- Address the need for staff recruitment, retention of institutional knowledge, and mentoring within Sea Grant to maintain and increase trusted relationships with local communities.

Case Studies

Adapting to a changing climate in Southeast Alaska

Hoktaheen Cove, a subsistence salmon fishing site in Southeast Alaska. Photo by D. Holen.

In Southeast Alaska, climate change produces unique and enduring impacts: heavy rains and flooding, ocean acidification, warmer waters, snowfall variations, warm springs followed by frost affecting wild berry production, invasive species, and toxins in the marine environment. These factors impact security, access, and abundance of culturally important food and materials. In September 2016, the Central Council of Tlingit and Haida Indian Tribes of Alaska, in collaboration with Southeast Alaska Tribal Ocean Research, held a two-day workshop in Ketchikan to review and plan monitoring, mitigation, and adaptation strategies to address climate change. Alaska Sea Grant facilitated the discussion among 80 participants, including 50 environmental program managers and coordinators from 17 Tribes in Southeast Alaska, and representatives from federal and state agencies, University of Alaska, and Southeast Alaska nonprofits. Tribal participants described their concerns and local observations of change related to these resources, and their concerns about changing ocean conditions. Scientists provided information on the latest research on resources identified by Southeast Alaska tribes as culturally important: salmon, shellfish, berries, and yellow cedar, as well as cultural sites and human health. The workshop resulted in an effort to build greater collaboration, activities to involve community-based monitoring, and sharing of tools and information. The latter is addressed with Adapt Alaska (adaptalaska.org), a source for information, success stories, and tools for planning.

— Davin Holen, Coastal Community Resilience Specialist, Alaska Sea Grant

Sharing the struggle of black gill disease in shrimp

In Georgia, shrimp fishermen were seeing more and more shrimp with black gills during a period of low landings. They had their own ideas about what was causing the black gill condition in shrimp. Shrimpers brought their concerns to Georgia Sea Grant extension staff, with whom they had been working for decades on other fisheries-related issues such as bycatch reduction. Georgia Sea Grant funded a team of researchers to investigate black gill, and ensured that shrimpers were part of the project design and implementation. While research continues, one of the most successful aspects of the project has been the widespread sharing of the fishermen's struggle — both amplifying shrimpers' voices and bringing shrimpers in direct contact with groups to personally tell their stories, for example to the Georgia House of Representatives Natural Resources Committee. Three years of black gill cruises have brought together researchers, shrimpers, resource managers, reporters, extension staff, informal educators and other interested people. As a result of this project, knowledge is co-produced; and there is increased communication and cooperation between fisherman and government.

— Jill Gambill, Coastal Resilience Specialist, Georgia Sea Grant

Creating a subsistence fishing area in Hawai'i

Researchers and community leaders come together to strengthen reciprocal partnerships through a workshop at He'eia Fishpond. Photo courtesy HI Sea Grant.

Communities in Hawai'i have been engaging in comprehensive planning efforts to make informed strategic decisions and advise state resource management agencies, conservation groups, community networks, and funding organizations to support policies that foster collaborative resource management. In particular, partnerships have developed between the Hawai'i Department of Land and Natural Resources (DLNR) and select communities around the state to take an active role in the management of their coastal resources. Hawai'i Sea Grant researcher Mehana Vaughn conducted research and outreach that helped inform/guide the community and DLNR in creating a community-based subsistence fishing area in Haena, Kaua'i, where stakeholders in the community created rules for management of its inshore fishery based on customary Hawaiian gathering practices. In 2014 the Hawai'i Land Board approved the adoption of community-based coastal management rules for Haena, Kaua'i. These rules are the culmination of 20 years of community effort, over 60 public meetings, 15 separate rules drafts, 40 community interviews, and seven scientific studies. These rules are serving as a framework for 10 other Hawai'i communities statewide seeking to propose similar rules packages that protect their nearshore fisheries for subsistence harvesting.

— Katy Hintzen and Mehana Vaughn, Hawai'i Sea Grant

Reviving ancient clam gardens of the Pacific Northwest

Clam gardeners tending the beach. Photo by Courtney Greiner.

Clams are an important traditional food and a cultural keystone species for the Swinomish Indian Tribal Community, a fishing, hunting, and gathering people who continue to be deeply connected to the natural resources of their ancestral lands and waters. Northwest Coastal Indigenous people have a tradition of creating clam gardens: moving and clearing rocks, and building small rock walls to create terraces in the tide flats to enhance clam habitat and support the overall integrity of the surrounding marine environment. In addition to providing a reliable food source, activities like managing and harvesting a clam garden provide opportunities for cultural values, knowledge, and practices to be passed between generations. In partnership with Washington Sea Grant, the Swinomish Indian Tribal Community, a federally recognized American Indian Tribe and a signatory to the 1855 Treaty of Point Elliott, is incorporating Indigenous knowledge and a participatory approach to design and plan a clam garden. This will be the first known reintroduction of a functioning clam garden in the United States. The project is advised by regional and transboundary clam garden experts and Coast Salish Indigenous leaders. It also provides social science training to a Native American graduate fellow, and mentors four Northwest Indian College students in interdisciplinary approaches to ecosystem-based management and integration of socio-cultural values and Indigenous knowledge in ecosystem restoration planning.

— Melissa Poe, Environmental Social Scientist, Washington Sea Grant

INCORPORATE

Coastal and Great Lakes communities incorporate traditional and local knowledge, and the voices of knowledge holders, into planning, management, and policy solutions to improve quality of life for all.

Sea Grant projects and programs incorporate priorities, concerns, and strategies informed by diverse knowledge systems, perspectives, and lived experiences.

Sea Grant-funded research projects encourage and incorporate multiple ways of knowing, include knowledge stewards as equal partners, and employ best practices.

Sea Grant education projects and programs are rooted in the local environment of their students and incorporate voices from local stewards of these places.

Sea Grant is a recognized leader in raising the scientific credibility and incorporation of local knowledge in ecological research, planning, management, education, and outreach.

Background

Tribal, local, state, and federal coastal managers and scientists are continually faced with increasingly complex resource management and hazard mitigation issues that require innovative and collaborative approaches to resolve. Typically, scientific knowledge is simplified and applied to local communities. But research and related outreach that incorporate multiple perspectives, that weave different forms knowledge, can be more impactful and relevant, and create lasting relationships and support for local people (Reid et al. 2016). Sometimes different forms of knowledge are conflicting. In such cases, Sea Grant programs have developed methods for finding common ground through consensus-building and weighting priorities (e.g., Bethel et al. 2011; Bethel et al. 2014).

Our expectation is not that all Sea Grant scientists will "integrate" local knowledge, or policymakers "use" local knowledge. TLK information can be sensitive; some knowledge is owned by families who may not want to share their knowledge, or only share part of it. Rather, our vision is that Sea Grant programs will identify and support Indigenous and local communities in their efforts to make sure their own knowledge is recognized, understood, and valued in relevant research, outreach, and education programs. This is not an easy task and barriers are many. In the case of education, environmental literacy curricula often focuses on broad scientific concepts and global problems without any local context. When it comes to research, there are barriers such as grant processes, funding timelines, paperwork, etc. Another major challenge is that local solutions are often ignored when it comes to final rulemaking or legislation. Upholding respect for the stewards of local knowledge means more than just providing "a seat at the table," but true engagement not only in regulatory decisions, but also the education and science that informs those decisions.

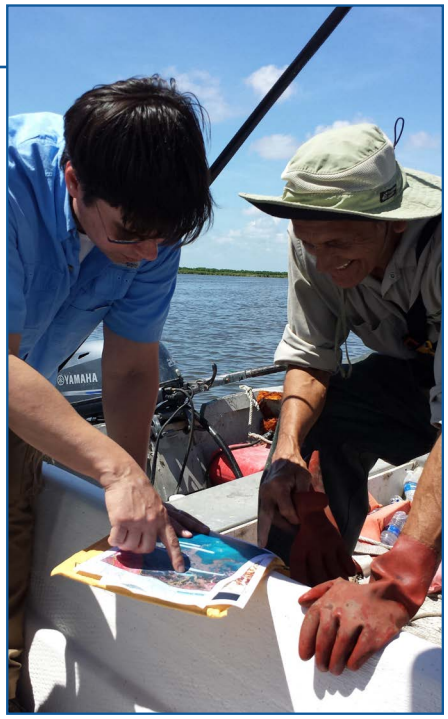
Actions

- Create and support opportunities for communities to share or identify their research needs.
- Create educational fellowship, scholarship, internship, and/or mentorships for representatives of TLK communities.
- Identify and support scientists who are doing or want to incorporate TLK in their work, and communities conducting their own research.
- Include local research needs, local knowledge partners, and relevant environmental justice issues in Sea Grant Requests for Proposals (RFPs).
- Support the participation of social scientists in research teams, and to train colleagues in qualitative data collection.
- Redefine "environmental literacy" as including knowledge of the local environment.
- Design and implement traditional ecological knowledge trainings, events, and mentorship programs for Sea Grant staff, students, and researchers.
- Share this vision document with Sea Grant Directors and Research Directors, and with state and federal agencies.

Case Studies

Collaborative Mapping with the Pointe-au-Chien Indian Tribe

The rate of coastal land loss and projected sea-level rise are putting unprecedented stress on vulnerable communities in coastal Louisiana. The Pointe-au-Chien Indian Tribe's homeland is criss-crossed with canals dredged by oil and gas companies to access drilling rigs and bring equipment into the marshes. By altering the flow of water through wetlands, the canals accelerated land loss — as much as 16 percent of Louisiana's wetland loss since the 1930s. The industry argued the canals were permitted by the state and that their negative effect on the coast is not as significant as other causes of land loss. In other areas, remnant spoil banks from where dredged material was piled up on the sides of canals could offer potential protection from storm surge. Louisiana Sea Grant scientists worked with the Tribe, combining their traditional knowledge of the canal environment with U.S. Geological Survey maps, LiDAR elevation data, and sea-level rise projections to identify areas most vulnerable to sea-level rise and storm surge. During the study, the Tribe realized how the data could help with their application for federal recognition, and at the Tribe's request, the research team helped map historical tribal lands as a part of the project. With federal recognition, the Tribe would have increased legal agency to protect and preserve their traditional lands and sacred sites.



Matthew Bethel and Emery Billiot in Pointe-au-Chien homeland. Photo by C. Miller.

— Matthew Bethel, Associate Executive Director of Research, Louisiana Sea Grant

Multiple generations of North Carolina oystermen with Extension Specialist Chuck Weirich. Photo by Baxter Miller.

Requiring collaborative research approaches in North Carolina

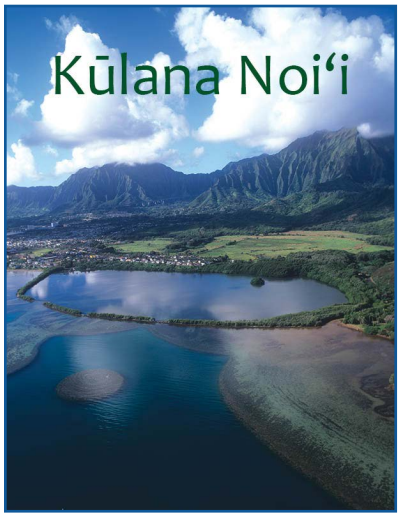
Coastal residents may have local knowledge of their own communities and environments, but often they don't have the scientific expertise or qualifications required to fully characterize a problem or craft science-based solutions that will be accepted by regulatory authorities. Conversely, academic experts may be knowledgeable of scientific principles and potential solutions to problems, but lack the social and historical perspective required to develop solutions appropriate for communities. North Carolina Sea Grant, in partnership with the William R. Kenan Jr. Institute for Engineering, Technology and Science at North Carolina State University, created the Community Collaborative Research Grant Program to address such situations. The program requires research approaches that couple the local knowledge of community stakeholders with academic experts in the field. To date, 12 research projects have supported underserved communities, provided training opportunities, and engaged industry.

— John M. Fear, Deputy Director, North Carolina Sea Grant

Building and sustaining equitable research partnerships in Hawai'i

Every year, across the Hawaiian Islands, hundreds of research projects are conducted on coastal and marine resources that are integral to the livelihoods and cultural practices of Native Hawaiians. However, too often the communities that care for and rely on natural resources are not involved in research decision-making processes. Hawai'i Sea Grant, in collaboration with Kua'āina Ulu 'Auamo and Paepae o He'eia, developed the Kūlana Noi'i, guidance for building and sustaining long-term relationships between researchers and community, and related training workshops for students, faculty, and community leaders. While the Kūlana Noi'i reflect a uniquely Hawaiian perspective, they address common challenges faced by research institutions, resource managers, and community stakeholders globally. Hawai'i Sea Grant has taken significant steps to align the program's research investments with the standards outlined in the Kūlana Noi'i including making participation in training workshops a requirement of funded Principal Investigators and graduate students. Additionally, the Kūlana Noi'i has been incorporated into course curricula and faculty proqfessional development at the University of Hawai'i at Mānoa.

— Katy Hintzen and Rosie Alegado, Hawai'i Sea Grant



Cover of Kulana Noi'i guidance document. Courtesy HI Sea Grant.

General Best Practices

Sea Grant outreach and education professionals, and in many cases researchers, have extensive experience working with local communities through longtime partnerships. Our TLK partners who participated in the workshops and reviewed drafts of this vision, have experiences both positive and negative of working with government and academic institutions. This collective experience informed the following list of best practices, which apply to all of the goals and actions in this vision. Missteps and mistakes are common in this work, and this is partly why this document begins with recognition and understanding before support and incorporation of TLK.

- Spend considerable time in communities to build trusted working partnerships and understanding.
- Listen and learn. Ideas, priorities, leadership should come from the community itself and may differ from existing paradigms, and collaborative efforts will benefit from careful listening.
- Facilitate or create space for reciprocal knowledge transfer, to help TLK experts become more familiar with the capabilities, uncertainties, and limitations of scientific data and products, and how that information may complement their own (Bethel et al. 2011, 2014).
- Ensure meaningful representation and decision-making on advisory councils and stakeholder groups, while avoiding "tokenism," appropriating, and exploiting people's knowledge.
- Start early. Don't wait for a crisis or grant RFP. Include local partners and communities early in project design and planning.
- Commit to sustained engagement and outreach. Don't drop in and drop out.
- Set meeting dates/times/locations that local partners can attend. Understand that other cultures have different concepts of time.
- Compensate local partners for their time and effort, and also ensure non-monetary benefits for local partners (Bethel et al., 2011).
- Acknowledge and understand "ownership" or sovereignty of knowledge and establish agreements with communities to manage local knowledge appropriately (see Harding et al. 2012). Data and Material Sharing and Ownership Agreements are formal, legal agreements between institutions that cover all major and potentially problematic aspects of research, and ensure that the purpose, distribution, future uses, and values of the research and its results are aligned between TLK holders and researchers.
- Understand your place in the social and political context of a community. Be mindful about power dynamics, for example community experience with federal government officials, staff, and programs.

- Include local partners as co-authors and investigators, and employ them as staff and student assistants (e.g., Poe et al. 2016).
- Bring results back to the community. Share interpretations of information with the community (in a format that's useful and accessible to them) and create a process for internal discussion and feedback before sharing more broadly (Bethel et al., 2011, 2014).
- Use clear and simple language (and translate, if necessary).
- Diversify approaches to include storytelling and communication (art, photography, video, maps, dancing, weaving, food, etc.)
- Celebrate. Appreciation for nature is often a strong motivation for stewardship. Our discussions of TLK and the environment, and environmental education, can't only focus on the bad news, the damage, and the declines. There is room for wonder, celebration, and affirmation of our connections to the marine and coastal environment. Music, literature, theater, and other arts embody the importance of people's relationship with ecosystems. These activities provide social space for reflection on the value of ecosystems and people's relationship with their environment, while also sustaining community memory of the past, which can be drawn upon to increase resilience to environmental change (Kofinas and Chapin, 2009).
- Be respectful of privacy and confidentiality (permissions for sharing photos, stories, etc.).
- Align projects with long-term goals of the community (be able to answer the question, "How is your work contributing to the long-term goals of this place?").

Recommendations for implementation in the Sea Grant Network

- Raise the visibility of TLK with intentional programming and communication products.
- Create opportunities for communities to identify and share their research needs, as well as for traditional and local scholars to take an active role in initiating and leading research initiatives within their own communities.
- Create opportunities for exchange between communities and researchers, policy-makers.
- Support education projects and programs that incorporate TLK.
- Fund research that recognizes, values, and incorporates TLK research needs, local knowledge partners, and relevant environmental justice issues in Sea Grant Requests for Proposals (RFPs).
- Develop and fund fellowships to support local knowledge holders in the professional development, and also to better incorporate TLK into Sea Grant and NOAA projects and programs.
- Invest in recruitment and retention of local knowledge holders as Sea Grant staff (see Diversity and Inclusion visioning plan for potential cross-over goals and action items).
- Create a TLK program officer or liaison within the National Sea Grant Office.

Areas for investment to achieve the vision

Goal	Programming	Personnel	Partnership
Recognize	Raise visibility of TLK within Sea Grant through communications product	Identify the stewards of TLK in each Sea Grant region and contacts within Sea Grant	Sustained TLK partnerships are included in reporting metrics
Understand	Communicate and highlight TLK projects and efforts with the Sea Grant network and beyond	Support researchers and educators who are interested in working (or are working) with local knowledge holders	Create opportunities for Sea Grant TLK partners to share/ identify their research needs
Value	Develop protocols and guidelines for respectful engagement with TLK holders in Sea Grant programming	Support TLK experts in leadership roles	Provide opportunities for communities to learn, share, and celebrate TLK and best practices
Support	Create Sea Grant communications and education products that are accessible to TLK holders and communities that address locally-relevant concerns	Address the need for staff recruitment, retention of institutional knowledge, and mentoring within Sea Grant to maintain and increase trusted relationships with TLK holders and communities	Build capacity for TLK holders and communities to identify, share, and address research and information needs
Incorporate	Incentivize best practices for including TLK through Sea Grant RFP process, reporting requirements, performance measures, and research proposal review process	Invest in recruitment and retention of TLK holders as Sea Grant staff and student fellows	Create a national TLK program officer or liaison position within the NSGO

Selected References & Resources

Ball, D., et al. 2015. A guidance document for characterizing tribal cultural landscapes. OCS Study BOEM 2015-47. Bureau of Ocean Energy Management.

Berkes, F. 1993. Traditional Ecological Knowledge: Concepts and Cases. Ottawa: International Development Research Centre.

Berkes F. 1999. Sacred Ecology: Traditional ecological knowledge and resource management. Philadelphia, PA: Taylor & Francis.

Berkes F, Colding J, Folke C. 2000. Rediscovery of Traditional Ecological Knowledge as Adaptive Management. *Ecological Applications* 10(5):1251-1262.

Berkes F, Colding J, Folke C. 2003. Navigating social-ecological systems: Building resilience for complexity and change. Cambridge: Cambridge University Press.

Bethel, M., L. Brien, M. Esposito, C. Miller, H. Buras, S. Laska, R. Philippe, K. Peterson, and C.P. Richards. 2014. Sci-TEK: A GIS-based multidisciplinary method for incorporating traditional ecological knowledge into Louisiana's coastal restoration decision-making processes. *Journal of Coastal Research*, 30(5), 1081-1099.

Bethel, M., L. Brien, E. Danielson, S. Laska, J. Troutman, W. Boshart, M. Giardino, and M. Phillips. 2011. Blending Geospatial Technology and Traditional Ecological Knowledge to Enhance Coastal Restoration Decision-Support Processes in Coastal Louisiana. *Journal of Coastal Research*, 27(3), 555-571.

Climate and Traditional Knowledges Workgroup (CTKW). 2014. Guidelines for Considering Traditional Knowledges in Climate Change Initiatives. *climatetkw.wordpress.com/*

EPA. 2004. Policy for the Administration of Environmental Programs on Indian Reservations. *epa.gov/tribal5*

EPA. 2014. Policy on Environmental Justice for Working with Federally Recognized Tribes and Indigenous Peoples. *epa.gov/environmentaljustice/*

Gruenewald, D.A. 2008. The best of both worlds: a critical pedagogy of place. *Environmental Education Research* 14(3):308-324.

Harding, A., B. Harper, D. Stone, C. O'Neill, P. Berger, S. Harris, and J. Donatuto. 2012. Conducting research with Tribal Communities: Sovereignty, ethics, and data-Sharing Issues. *Environmental Health Perspectives* 120(1):6-10.

Holen, D. 2014. Fishing for community and culture: the value of fisheries in rural Alaska. *Polar Record* 50:403-413.

Huntington, H.P. 2005. "We dance around in a ring and suppose": Academic engagement with traditional knowledge. *Arctic Anthropology* 42(1):29-32.

Ingold, T. 2000. The perception of the environment: Essays in livelihood, dwelling, and skill. London: Routledge. IPSG. 2010. AAG Indigenous Peoples Specialty Group's Declaration of Key Questions About Research Ethics With Indigenous Communities. American Association of Geographers. *indigenousgeography.net/ipsg.shtm*

Kofinas, G.P., and F.S. Chapin. 2009. Sustaining livelihoods and human well-being during social-ecological change. In *Principles of ecosystem stewardship* (pp. 55-75). New York, NY: Springer.

Kimmerer, R.W. 2013. *Braiding Sweetgrass*. Minneapolis, MN: Milkweed Editions.

Kūlana Noiʻi Working Group. 2018. Kūlana Noiʻi v. 1. Honolulu: Hawaiʻi Sea Grant. *seagrant.soest.hawaii.edu/kulana-noii/*

Menzies, C.R. 2006. *Traditional ecological knowledge and natural resource management*. Lincoln: University of Nebraska Press.

Moffa, A. 2016. Traditional ecological rulemaking. Stanford Environmental Law Journal 35(2):101-155.

Nadasdy, P. 1999. The politics of TEK: power and the "integration" of knowledge. *Arctic Anthropology* 36(1-2):1-18.

National Marine Fisheries Service (NMFS). 2004. Local Fisheries Knowledge Project. *st.nmfs.noaa.gov/lfkproject/*

NOAA. 2013. NOAA Procedures for Government-to-Government Consultation With Federally Recognized Indian Tribes and Alaska Native Corporations, NOAA 13175 Policy.

Poe, M.R., J. Donatuto, and T. Satterfield. 2016. "Sense of Place": Human wellbeing considerations for ecological restoration in Puget Sound. *Coastal Management* 44(5):409-426.

Poepoe, K.K., P.K. Bartram, and A.M. Friedlander. 2005. The use of traditional knowledge in the contemporary management of a Hawaiian community's marine resources. *Fishers' knowledge in fisheries science and management*: 437.

Reid, R.S., et al., 2016. Evolution of models to support community and policy action with science: Balancing pastoral livelihoods and wildlife conservation in savannas of East Africa. *Proceedings of the National Academy of Sciences* 113(17):4579-4584.

Sepez, J., and H. Lazrus. 2005. Traditional environmental knowledge in federal natural resource management agencies. Practicing Anthropology 27(1):1-45.

Smith, L.T. 2013. *Decolonizing Methodologies: Research and Indigenous Peoples*. Zed Books Ltd.

Thornton, T.F., and A.M. Scheer. 2012. Collaborative engagement of local and traditional knowledge and science in marine environments: A review. *Ecology and Society* 17(3):8.

U.S. Department of Arts and Culture (USDAC). 2017. Honor Native Land: A Guide and Call to Acknowledgement. *usdac.us/nativeland/*

United States Forest Service. 2015. Tribal Engagement Roadmap Highlights Report Final Draft. U.S. Department of Agriculture.

Usher, P.J. 2000. Traditional ecological knowledge in environmental assessment and management. Arctic 53(2):183-193.


NOAA


Sea Grant