U.S. Fish & Wildlife Service

Traditional Ecological Knowledge

for Application by Service Scientists

Fishing at Ninepipe Natiomal Wildlife Refuge, Montana / USFWS

Working Definition of Traditional Ecological Knowledge

Traditional Ecological Knowledge, also called by other names including Indigenous Knowledge or Native Science, (hereafter, TEK) refers to the evolving knowledge acquired by indigenous and local peoples over hundreds or thousands of years through direct contact with the environment. This knowledge is specific to a location and includes the relationships between plants, animals, natural phenomena, landscapes and timing of events that are used for lifeways, including but not limited to hunting, fishing, trapping, agriculture, and forestry. TEK is an accumulating body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (human and non-human) with one another and with the environment. It encompasses the world view of indigenous people which includes ecology, spirituality, human and animal relationships, and more.

The Use of TEK is Nothing New and Continues to Evolve

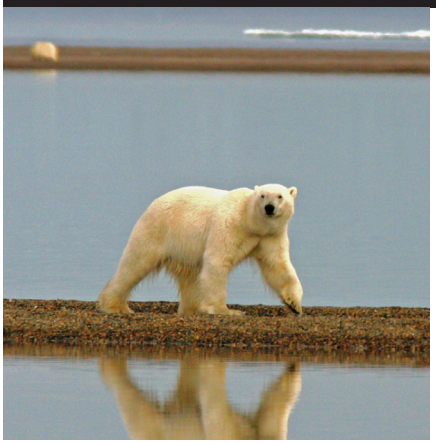
Local biological knowledge, collected and sampled over these early centuries, most likely informed the early development of modern biology. For example, during the 17th century the German born botanist Georg Eberhard Rumphius benefited from local biological knowledge in producing his catalogue, Herbarium Amboinense. Rumphius' index included the plant's name, illustrations, description for nomenclature, place, discussion of the plant's use to the local inhabitants, stories, folklore, and religious practices. During the 18th century, Carl Linnaeus referenced and relied upon Rumphius's work, and also corresponded with other people all around the world when developing the biological classification scheme that now underlies the arrangement of much of the accumulated knowledge of the biological sciences. In addition, during the 19th century, Charles Darwin, the 'father' of evolutionary theory, on his Voyage of the Beagle took interest in the local biological knowledge of peoples he encountered.

Contemporary naturalists and biologists also acknowledged the importance of TEK as it relates to Western science. For example, C. Hart Merriam was one of the great naturalists of his generation. In 1886, Merriam became the first chief of the Division of Economic Ornithology and Mammalogy of the United States Department of Agriculture, predecessor to the National Wildlife Research Center and the United States Fish and Wildlife Service. He was one of the original founders of the National Geographic Society in 1888 and developed the "life zones" concept to classify biomes found in North America. Although not widely recognized, C. Hart Merriam was also an amateur anthropologist who spent decades of five to six months each year traversing the country interviewing Native Americans and writing down voluminous records of what they were still able to tell him. He recorded the distribution of words to ascertain the precise distribution of dialects, languages, tribes, families, and their beliefs and customs, similar to the way he recorded the distribution of song sparrows, grizzly bears, and wolves in order to delimit life zones. The idea that TEK has guided modern biology (or Western science) should encourage conservation biologists to investigate TEK more thoroughly.

U.S. Fish and Wildlife Service's Use of TEK

An increasing number of scientists and Native people believe that Western Science and TEK are complementary. Although an integration of indigenous and western scientific ways of knowing

Grizzly bear in Wyoming / USFWS



Polar bear / USFWS

and managing wildlife can be difficult to achieve, successful integrations have occurred. For example, during the 1989 Exxon Valdez oil spill in Prince William Sound, Alaska, Federal and state agencies recognized the vast traditional knowledge of the Native community who could provide detailed information on conditions in the years prior to the spill. The Native community had knowledge of the historic population sizes and ranges of many of the species injured by the spill as well as observations concerning the diet, behavior, and interrelationships of injured species. Optimal use of scientific data and traditional knowledge while increasing the involvement of communities in oil spill restoration enhanced the success of restoration effort.

Most recently, the U.S. Fish and Wildlife Service used both western scientific data and TEK to justify listing the polar bear *(Ursus maritimus)* as a threatened species under the Endangered Species Act. Ecological knowledge provided by Chukotka, Inuit, and other indigenous coastal residents with regard to polar bear habitat, density estimates and population numbers provided valuable data used in making the decision. The final listing rule stated that both traditional and contemporary indigenous knowledge recognized climate-related changes occurring in the Arctic, and these changes are negatively impacting polar bears.

In Alaska, the Service, as well as the State of Alaska Department of Fish and Game Subsistence Division, collect and use TEK for research and monitoring fish populations under the Federal Subsistence Management Program. The primary objective is to collect and catalogue TEK observations from local residents through interviews with local experts on the ecology, harvest, and use of salmon and non-salmon fish species. Another more recent objective has been to produce a drainage-wide portrait of climate and environmental change, emphasizing those that are related to subsistence fisheries. Use of TEK also contributes to local capacity building by utilizing a framework of community involvement in research.

Collection of TEK

Methods for documenting TEK derive from the social sciences and include ethnography. Social scientists and cultural anthropologists use a wide range of techniques to collect ethnographic data. Below are some of the methods that can be used, but they are not necessarily in the order TEK should be collected. Permission from the indigenous government should be received prior to beginning any research project.

Literature review is an important component in any research project. All most all of the Tribes in the United States have been studied by an anthropologist at one time or another. During a literature search, ethnographies as well as collections of stories/ myths/legends and songs will be instrumental to one's research for information on societies, clans, keepers of knowledge, ceremonies, uses, processes, and interactions.

The semi-directive interview is a standard ethnographic method for gathering information and can use both an open-ended and close-ended (yes or no questions) format. A skilled and experienced ethnographer can help a novice to determine the appropriate reach of the interview questions. For example, questions about a species may include such topics as the species itself, its habitat, interactions with other species, traditions and ceremonies surrounding the species or its parts, identification of who or what positions hold knowledge and rights to the species, taboos, cyclical events, and vocabulary.

Focus groups have also been used to provide direction for additional subject matter and identification of experts. Focus groups can be helpful to determine who within an indigenous Tribe holds the knowledge for the species being studied.

Participant Observation is another research method used, which involves extensive time in a culture watching and recording what people do. Participant Observation can be a source of information to verify that which has been spoken and a source of information for that which the Tribe forgets to tell because it is considered either universally known or assumed.

In addition, Linguistics can provide insight into a culture and its view of the natural world. Some Tribes now have written dictionaries for their languages. A native speaker can provide information about words, their meanings, associations and similarities. For example, the Yupik language on Nelson Island in Alaska is very intrinsically tied to the environment – there are words to describe plants, activities, and elements in the Yupik language that are non-existent in other languages. These words help Yupik people to

Alaskan salmon / USFWS

determine how they interact with their immediate environment.

Ethnography is the process which non-indigenous people interpret indigenous people's lifeways. The ethnographic process for collecting TEK results in a wealth of information that must be carefully considered for its use in a specific project. The researcher will get more than he needs and should accept all that is given during the collection phase. The one providing the information during an interview will be sharing lifeway surrounding the topic. Only afterwards should the researcher begin to decide on what is relevant to the project and what is not needed at the time. To try to edit the one speaking would be considered a lack of respect and would potentially stymie the researcher from obtaining information that on second consideration could be instrumental to the project. Retaining all of this information is important because it may be helpful for another project, although it may be more appropriate for a tribal college or other tribal institution to retain the interview transcripts. The researcher could retain those data needed for the project. Ethnographers are experts in this process.

Better Partnerships with Native American Communities

Although the collection of TEK is not government-to-government consultation, TEK is one way federal employees can honor the federal trust responsibility to tribes with regard to resources of mutual interest. Using TEK allows a mutually beneficial relationship to be created between conservation biologists and local people. Indigenous scholars and the scientific community can benefit by mutual exchange of information and interpreting the information collaboratively. A critical aspect of conservation biology and associated environmental management is acquiring information that is not only accurate, but trusted by those who make and abide by decisions based on that information. In cross-cultural settings, the latter is often difficult. The use of TEK offers one way of bridging gaps in perspective and understanding, especially when used in conjunction with knowledge derived from the scientific method.

TEK and Climate Change

As mentioned above, the Service often uses TEK in Alaska. For example, comments from Yukon River subsistence users in Alaska are beginning to identify a suite of environmental changes attributed to climate change that impact fish, fish habitats, and fishing activities. Observations include the drying-up of wetland areas, lakes, and waterways, as well as changes in weather patterns, which in turn affect river levels and average dates of freeze-up and break-up. What is currently needed is a directed, systematic, drainage-wide effort to collect and understand these changes and their impacts. Traditional Ecological Knowledge is particularly well suited for identifying environmental changes attributable to climate change at the local and regional level. Understanding the potential impacts of climate change on landscapes, wildlife, and subsistence users is important for Federal managers in order for them to carry out the mandates for which the various conservation units were established and to build flexibility into formal management structures to address a changing environment.

TEK in Journals and Professional Organizations

Interest in TEK has been growing in recent years, partly due to a recognition that such knowledge can contribute to the conservation of biodiversity and sustainable resource use in general. In 2000, the journal Ecological Applications produced an invited feature which focused on the subject of TEK in order to encourage the discussion of TEK in environmental management.

The Ecological Society of America has a Traditional Ecological Knowledge Section. The purpose of this Section is to: (1) promote the understanding, dissemination and respectful use of traditional ecological knowledge in ecological research, application and education; (2) to encourage education in traditional ecological knowledge; (3) to stimulate research which incorporates the traditional knowledge and participation of indigenous people and; (4) to increase participation by indigenous people in the Ecological Society of America (see http://www.esa.org/tek/).

In addition, The Wildlife Society has a Native Peoples' Wildlife Management Working Group which promotes improved relationships between state/provincial/federal

Yukon River, Alaska / USFWS

wildlife managers and tribal wildlife managers through improved communications. The Working Group provides a forum for tribal and agency wildlife professionals to discuss wildlife management on reservations and aboriginal lands and to share viewpoints on proposed policies affecting wildlife management on those lands. The Working Group also works to enhance wildlife management on and off reservations through joint activities (see http://joomla.wildlife.org/Native). The Wildlife Society has a Native Peoples' Wildlife Management Working Group recently held a half day symposium titled; "Implementation of Traditional Ecological Knowledge in Natural Resource Management" at their annual conference in 2010. Another whole day symposium on TEK will be hosted again during The Wildlife Society's 2011 annual conference.

How can I learn more?

Collecting TEK is not for a novice without research and guidance. Reading literature about TEK and speaking with professionals or those experienced in the field can help one determine if one would like to directly pursue collection of TEK. It is a good idea to have a professional mentor for several projects before attempting such work independently. In addition, even though one's intent in the collection of TEK may be altruistic, how the information is used can have unintended consequences. It is important to contact the Regional Tribal Liaison if TEK is pursued. The liaison may have experience with TEK and/or will be able to provide insight when working with Tribes. Indigenous ways of understanding and interacting with the natural world are characterized as TEK, which derives from emphasizing relationships and connections among species. There are a number of books and publications that examine TEK and its strengths in relation to Western ecological knowledge and evolutionary philosophy. Some of these books address the scientific basis of TEK, focusing on different concepts of communities and connections among living entities, the importance of understanding the meaning of relatedness in both spiritual and biological creation, and a careful comparison with evolutionary ecology. They may examine the themes and principles informing this knowledge, and offer a look at the complexities of conducting research from an indigenous perspective.

Once TEK is collected, combined with western knowledge, and decisions are being considered for managing the resources, take time to think about what the long-term impacts of these decisions could be beyond addressing the most pressing issue. New methodologies or technologies can have unintended consequences. Case studies are a way of learning to think beyond the hoped for result to the sometimes unintended consequences. The Suggested Reading List below provides information on the topics expressed in this Fact Sheet from several authors.

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Mexican gray wolf / USFWS

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February 2011