

Traditional Ecological Knowledge
[and its Application to Ecological Management]

While there is no universal definition of Traditional Ecological Knowledge (TEK), Fikret Berkes in *Sacred Ecology*, gives this as the working definition for his text:

“...a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment (2012, 7).”

Berkes research included years of living among traditional subsistence fishermen, the Chisasibi Cree of James Bay, in Northern Canada. While conducting field studies and environmental assessment, he accompanied the fishermen while they did the fishing. He collected biological data from their catches, as well as data on the Cree fishery itself...having been asked by them to record their practices for the younger generation to learn from. Berkes also observed traditional caribou hunting methods and recorded years of observations and data on these events. Many of the Cree elders spoke only their native language, much of which had to be translated for his notes. He started out his research project looking at Ethnoscience and Human Ecology. As he studied the functional relationships between the people and their environment, a worldview emerged. Berkes observed the Cree displayed an innate sensitivity to critical signals in the environment. In their belief system, land was held as sacred, and animals determined the success of the hunt. Therefore, animals were immensely respected and a “working” relationship between them and humans was developed over time. The Cree practiced *Sacred Ecology*, adhering to rules of reciprocity and respect at a time when ecology was viewed as “mechanical” and ecological ethics weren’t a part of Western Science practice. Berkes shares the “paradoxical” nature of Indigenous knowledge as being universal, as well as “intensely local” (xxi). For Indigenous people, traditional knowledge was “lived knowledge” (Berkes, 2012, 23-26).

Traditional Ecological Knowledge, as a practice, has been around as long as there have been hunter-gatherer societies, although the term didn’t come into common usage until the 1980’s (Berkes, 2012, 2). TEK is also referred to as Ancient Knowledge, Native Science or Indigenous Environmental Knowledge, as well as other similar terms, such as local knowledge. Berkes gives various reasons for the shift, including a growing accumulation of literature on TEK coinciding with public discontent over resource conservation and management. Having moved from academia to mainstream media in the 1990’s, people became more receptive in accepting new “scholarly” information. This caused a further increase in research and additional understanding, which in turn stimulated even more receptivity. Similar developments in similar fields, such as Environmental Ethics, Commons and Environmental History raised Ecological awareness. Today, an increasing number of Western scientists and Indigenous groups believe TEK and Scientific Ecological Knowledge (SEK) to be complimentary “ways of knowing,” and integration of both are proving to be successful in resource management (U.S. Fish & Wildlife Service, 2011, 1-2).

Just as there is great diversity among Montana’s 12 tribal Nations (Juneau, 2010, 1), the world’s varied human populations carry a multitude of perceptions, each with a distinct cultural heritage. In Cajete’s words, *Native Science* is an evolving philosophy *and* an ecological awareness (2-5), encompassing Native Spirituality, creative expression, immersion in and active participation with nature. Cajete is Tewa from Santa Clara Pueblo of Santa Fe, NM. He is an Education Professor at the University of NM and former Dean of the Center for Research and Cultural Exchange at the Institute of American Indian Arts, also in Santa Fe. He begins with art, myth, ceremony, symbol and storytelling that evolved and continues to evolve out of Indigenous Spiritual and Physical practices. These long-established interdisciplinary approaches of Indigenous Science methodologies stem from living *within* the natural world. Everything is connected. Everything is deserving of respect. Objects and phenomena are not isolated, but perceived in terms of relationships. Multiple levels of meaning about reality, derived from Indigenous Cosmology (worldview),

inform Native Astronomy, Psychology, Agriculture, Ecology, Healing, Spirituality, Rituals, History and Art. In the traditional yarn painting, the first act in the journey toward true understanding is *asking*, and is represented by a human form going to the *mountain* to look for its inner self. The “Flower and the Song” of the human touches the face of the Great Mystery to gain knowledge. A rainbow of thought connects all things to illustrate the “Ecology of relationship” (4). Looking to the mountain is to BE with life and seek knowledge.

According to Cajete, learning begins and ends with Spirit (Look to the Mountain, 69). Native Science requires Native Spirituality. He provides a contemporary model for learning the pathway of vision (69). The *Centering Place* is where the soul and intention of the *vision* is formed, and asking for knowledge and enlightenment is the first circle along the path, symbolized by *prayer*. Everything is asked for through prayer. *Seeking* is the actual process of looking and exploring the boundaries of the world to expand consciousness...sometimes going outside the physical body to find what’s deep within the mental or spiritual. *Making* is creating from the vision, whether through song, dance, physical artifact or other actions. *Having* honors vision, creation and action, allowing deeper meaning as to the nature of responsibility. With *having*, a higher level of understanding is attained, and acceptance of the difference between being created by circumstance, and creating circumstance is realized (73). *Sharing* is teaching others what has been learned, again whether through song, dance, ritual or action. *Celebration* is both individual and communal, and is a natural effect of *sharing*. *Being* is appreciating and coming-to-know...learning that shapes perceptions or a unique worldview that relies on constant motion and transformation of creation (Native Science, xi).

Cajete describes Chaos Theory as it relates to Western and Indigenous Science (2000, 16). In Western Science, the prevailing view has historically been one of human dominance over nature. The western view is that early survival was based on man’s control over natural elements, eliminating uncertainty about how the universe works. Current research on Chaos Theory implies the opposite. Scientists are now illustrating how natural organization cannot be controlled. Nature is not static. Nature is chaotic. This aligns with an indigenous ideology consistent with TEK, and its nonlinear view of nature. Minute changes actually result in significant transformations. In the tradition of ancient societies, according to Cajete, “Chaos and its offspring, creativity, are the generative forces of the universe” (17). He goes on to demonstrate his point using boiling water as an example. The “bifurcation point” describes the exact moment before the composition changes and its structure is altered, immediately prior to the water beginning to boil. The intricate interaction of positive and negative energy creates a stable pattern, which all self-organizing (living) systems in nature depend upon for continued existence. Remaining open to the flow of energy and matter in the universe is a necessary component of survival. Indigenous people have eternally embraced the belief all things are related. Chaos Theory also confirms everything is connected, and nothing is left to chance. Every element of matter, even the most seemingly insignificant, has power to influence. Chaos Theory inspires creativity. Humans transform and respond innately and creatively to their continually changing surroundings.

Robin Kimmerer states, “It (TEK) is born of long intimacy and attentiveness and can arise wherever people are materially and spiritually integrated with their landscape” (Kimmerer, 2000 quoted in Egan et al. 2011, 265). TEK is specific to a location on the landscape. It is rational and reliable knowledge Indigenous people developed through generations of intensely personal contact with land and all it has to offer. It is derived from systematic observations of nature, the same source Western Scientific Knowledge stems from. In the past, TEK has not been given as much credence as Western Science, but has now moved to the forefront of national and international consciousness as a complimentary method for resource management and conservation. Indigenous nations around the world are calling for an increased global awareness of how their homelands are affected by global warming, and are demanding to be consulted and involved. In *Red Alert: Saving the Planet with Indigenous Knowledge* (2009), Daniel Wildcat bluntly makes the case for, at a minimum, asking Indigenous knowledge bases for contributions, and at a maximum, including the active participation of Indigenous populations throughout the country, in the ongoing and extensive communication between global organizations to assess and control the life-threatening effects of climate change, (“global-burning” as he terms it, 60). Wildcat predicts Native Americans will terminate themselves if they continue journeying down the dominant society’s destructive path toward more wealth, power and progress, designed to exclude the natural world. He tells of age-old North American traditions and

Indigenous ideals which recognized practical knowledge, and whose goals were based on acknowledgement and respect of this wisdom. Wildcat calls for a return to prayer and “*an attentiveness to the sacred, in the world around us,*” necessary for our survival as a species, yet viewed as one of the most problematic areas in Western Science (58). It is not an *anthropocentric* idea of “progress,” but rather an active process of communication and collaboration. It is not about changing the immediate situation, but engages past, present and future conditions, in ways sometimes difficult to comprehend. It is insightful and complex, based on mutual respect and about living well *within* the environment.

Kimmerer’s ethics for *Reclaiming the Honorable Harvest* (TEDx Sitka, 2012) echoes Wildcat’s philosophy, asserting personal choice of our actions as key to creating positive change, even slowing the accelerating and widespread decline in biodiversity now being witnessed. She says it’s not the land that’s broken. It’s our relationship with the land. “*Relationship is key to sustainability, authenticity and longevity of restored ecosystems*” (Kimmerer as quoted in Egan et al. 2011, 265). While encompassing a wide range of biological “value-free” data and overlapping content in mainstream ecology and conservation biology, Kimmerer reminds us, TEK is also inseparable from the social and spiritual context of the culture (268). In her view, one of the main principles of Indigenous environmental philosophy is reciprocity and responsibility. Comparing human belief systems with berry picking (resource gathering), warnings are issued, “*never take the first one*” of its kind (whether berry, plant or tree), always ask permission and give thanks. Listen for the answer from nature before taking, and take only what is needed. Everything the Earth provides is a gift. Always express gratitude, and reclaim a giving back role to the Earth. It is human’s responsibility for receiving all the gifts given from the natural world. While minimizing harm when things are taken, stay mindful of taking only that which is freely given. Kimmerer uses the example of birds having been given the gift of song, so it’s their responsibility to greet the day. Humans are given the sun’s energy in limitless supply, but not “without cost.” Humans are not given the right to destroy a mountaintop for extracting coal underneath, nor are they given other resources below ground to freely exploit. Recovering honor is everyone’s moral obligation. Following Kimmerer’s model of Indigenous concepts illustrating right-relationship with respect, especially toward restoration, giving back as responsible behavior, relatedness with all species, and reengaging with land, are solutions for gaining a closer attentiveness to the sacred, in order to collectively become “*Indigenous to place*” (271).

Throughout teachings on Traditional Ecological Knowledge, native languages and linguistic analyses of oral tradition is viewed as a crucial step in understanding rich cultural insight and provides alternative ways to approach restoration ((Kimmerer as quoted in Egan et al. 2011, 271-272). Becoming involved in native languages and learning the dynamics of place, as if our material and spiritual survival depended on it, is one of Kimmerer’s fundamental first steps. Cultural and language dependent metaphors, drawn from past universal experiences, transcend linguistic and cultural boundaries, and embody the conservation ethic of reciprocity (Turner, 2005, 39). Native languages are a “living library” of species composition (Alcose and Hurteau, 2001 as quoted in Kimmerer, 2011, 266). A wide array of misconceptions about native lifestyles and spirituality were drawn largely from distorted “inferences” and misinterpretation of Indigenous languages (Johnston, 2001, 2). In British Columbia alone, over 30 different native languages used to be spoken (Turner, 2005, 14). In *When Languages Die* (2007), K. David Harrison says long observed patterns in behavior of animals and nature’s relationships are embedded in native languages (50). The knowledge contained in these languages, many of which are endangered and at risk of becoming forever lost to the modern world, assist us in comprehending complex organization and also supplements Western Science. In conjunction with losing traditional knowledge structures at an alarming rate, high-quality habitats are on the decline and drastic reductions in biodiversity are being seen worldwide (Harrison, 54). Methods of how to sustainably manage habitats and diverse ecosystems in culturally significant ways are found within a culture’s language. Accumulated ancient knowledge can be specifically adapted to narrow ecological niches (Harrison, 58-59), shared through oral history and native languages.

In the Blackfeet language, the word for horned owl translates to “has meager ears” (Frantz and Russell, 1989, 373), and is akin to the speech of the owl, when heard by human ears. “Kakanottsstookii,” pronounced similar to *coo-coo-nook-stew-key*, can be said to mimic the speech of the horned owl. Another word used by Blackfeet to describe an owl, translates to “night announcer.” In Blackfeet cosmology, the turtle is admired and respected for its wisdom and longevity. Blackfeet language illustrates why turtle has been given an owl’s name, commonly referred to as “sspopii.” Frantz and Russell (1989) define “sspopii”

as Blackfeet for hawk owl, or “sits in a high place.” According to Bull Child (1985, 55), many original Blackfeet names have been lost or changed, including the word given by creation to bison. He defines it as “shall be peeled,” or “ei-i-in-nawhw,” in reference to how it could be utilized, when the tribe initially received it from their maker. Current Blackfeet speakers have since shortened it to “ii ni,” also changing its meaning, now translated as “die or dead.” An earlier term for death encompassed an *ecological/geographical* explanation. “To the *Sandhills* he [she] is gone” is how ancient Blackfeet described death (Johnston, 1987, 62). A specific type of sand, with deep, loose, fine grains, forming an irregular surface and no profile development, occurs in several places on the landscape within traditional Blackfeet territory. These mostly stabilized, but very fragile ecosystems are found in regions of Southern Alberta, Saskatchewan and Northern Montana. Deep-rooted trees and numerous subsistence species, including chokecherry and serviceberry, thrive in this type of soil environment. Canada wild rye, Indian rice grass, sand grass and “needle-and-thread” have adapted well to the limited moisture, rapid rainfall and fast drying ground, where the water table in slight depressions, can easily be found very near the earth’s surface. The *Sandhills* are a soft and pleasant spot to reside in, rich in biodiversity and teeming with life. It is no wonder this is where people departed to, continuing their life journey. Indeed, “*Language is a mirror of mind...a product of human intelligence*” (Chomsky as quoted in Harrison, 2011, 212).

Recognizing that language reflected and shaped experiences, Walter McClintock meticulously recorded life among the Montana Blackfeet, before they were confined to a reservation. Having graduated from Yale and traveling west in 1886 as a US Forest Service expedition member, he was soon adopted into the family of Mad Dog. He learned the language through cultural immersion. In *The Old North Trail: Life, Legends, and Religion of the Blackfeet Indian* (1968, 167), McClintock describes how, for these natives, the “Great Spirit, or Good Power” lived in everything – rocks, mountains, plains, winds, waters, trees, plants, birds, and animals. Living things, animate and inanimate, received differing degrees of power and energy from the sun, and were revered and respected as relatives. Providing a detailed written history based on oral tradition, and giving descriptive accounts of customary rituals, he documents Traditional Ecological Knowledge. He illustrates how the people relied on their acute observations of the environment, and possessed detailed knowledge about animals, animal behavior, inter-species communication, botany, medicinal plants, weather patterns and astronomy. Birds were considered very intelligent “above beings,” who spoke fluent Blackfeet (Farr, 1999 as quoted in McClintock, 1968, vii).

Many North American tribes viewed and explained the workings of the universe in similar terms. In writing about the Omaha, Fletcher and La Flesche (1968, 215) deliver an Indigenous philosophy similar to other authors. In the Omaha worldview, an invisible energy of continuous life infused all things, whether *they* were visible or not. This dynamic, sustaining vitality was manifested in motion and permanency of form. All action of the physical body and functional mind represented life. So too, did the structural form of physical features of the landscape, such as rocks, mountains, plains, streams, rivers, lakes, plants, trees, animals and humans. The force within was similar to will power, of which man is conscious of within himself, and which *relates* everything to another. The seen and unseen are invisibly connected by this intrinsic power or life giving energy, as are the living and the dead and pieces of anything to its entirety.

A Nez Perce worldview supported immortality. Their belief in a living consciousness residing in plants, animals and minerals, resulted in a universal spirituality of respect and relatedness, prohibiting them to indiscriminately or maliciously take life (McWhorter, 2000, 295). Ecological ethics required them to take only what was necessary for sustenance, actively guarding non-edible remains from ruin and abiding by certain rules, i.e. not burning green wood. They strictly adhered to current methodological principles for “*Reclaiming the Honorable Harvest*” (Kimmerer, 2011). They believed the earth to be inhabited with an infinite number of spirits. This invisible power moved between all things, including humans, and came from the earth, animals, the sun, the dead (invisible), thunder, or any number of other natural elements. In British Columbia’s Okanagan tradition, as in many other Indigenous communities, leaders took the responsibility of setting forth ethical examples and constructing conservative and sustainable harvesting rules for the people to follow, lest repercussions from inattentive human actions prove harmful to them or the environment (Turner, 2005, 39). Here, the Black Mountain Huckleberry was considered chief of all the berry people, well worth a long days journey into the mountains to gather.

Both individual and communal ceremonies, rituals and “other-worldly” experiences, also shaped the perceptiveness exhibited by Indigenous people practicing TEK on a daily basis. The Sun Dance is one example. It is a sacrificial act, a coming together of the community of people to acknowledge and *renew* their relationship with the spirits, energizing forces, or laws animating the cosmos (Peat, 1995, 38). Delving deeper into the meaning of the Sun Dance, Theoretical Physicist, F. David Peat, transports us to the core of Indigenous Science. In *Blackfoot Physics*, Peat combines theories from multiple disciplines to assemble connections relating TEK with anthropology, cosmology, metaphysics, quantum theory, philosophy and history. Hailing from London and educated in Europe, he set out to write a book on dialogue between Western and Native realities. After participating in the months-long preparation and experience of a Sun Dance ceremony, Peat comes to question the very essence of power, and the meaning of time and reality. Uncovering universal certainties, he compares two vastly different worldviews and investigates the distinctive ways of knowing exhibited by a tribal people. A unique Native belief system is revealed. The people relied on a realization they could never be truly separated from a much greater entity, the unseen forces directing the world’s working mechanisms. Compelling feats were accomplished when the people collectively and *pensively* exerted themselves, drawing upon energies surpassing those retrievable to one isolated individual. In some cases, time was slowed down, or knowledge of the future was learned (Deloria, 2006, 206-207).

The respected nature of life, matter, mathematics and process is evident in Indigenous ritual and ceremony. Sacred bundles containing natural “holy” objects, assisted many Native American groups in properly conducting rites of passage and entrance into the world of Traditional Ecological Knowledge. Physical objects used in the teachings and transmission of custom, garnered from the surrounding environment and experience, were sanctified through various means. The role of plants was essential. Peacock (1992, 29) defined the habitat of over ninety species of plants utilized by the Blackfoot, noting distribution, traditional uses, identification and classification methods, as well as how the plant world greatly influenced human perceptions and actions. In some cases, sweet grass, or “fragrant smell” in Blackfeet (Johnston, 1987, 63) played an important role in the purification process, cleansing articles or clearing the body of human characteristics, such as odor (Hellsen, 1974, 5). Journeying into the supernatural realm regularly required *scent of the earth*, a desired practice frequently attained through smudging and ritual sweats, which also proved beneficial to the hunt and survival. Incense of sweet grass, pine and cedar were also burned to carry prayer and spirit, and vision quest sites were often constructed of rocks and vegetation, having feathers, fir or pine bough beds and buffalo skull “pillows.” The first pipe, made of earth with contents of the earth, became a symbol of peace (Peat, 1995, 32). With tobacco, the people sought the goodwill of the spirits, making a once neglected plant into the most beneficial and sacred gift (Johnston, 2001, 103).

Plants and animals also dictated migration and movement patterns of the moderately nomadic, nonagricultural tribes on the Northwest Plains. Trading roots and leaves for skins was common, dependent in part on the seasons and time of year, as well as available food sources and successful hunts. Alex Johnston (1987, 17) provides a map of seasonal movement of a Blackfoot band during the pre-settlement period, beginning in the spring and ending with either a return to their original winter camp, or settling on a substitute location adjacent to the previous year’s winter spot. His depiction shows a characteristic cyclical journey of at least 800 kilometers, or nearly 500 miles (of walking). Johnston (1987, 63) relates how these highly purposeful travels were based on expert ecological knowledge of climate and weather conditions over large expansive regions, in addition to specific intellectual information about animal behavior and broad vegetative growth. Early biological classification schemes most likely stemmed from the Traditional Ecological Knowledge base, acquired over generations of similar migrations, informing early developments of modern biology (U.S. Fish & Wildlife Service, 2011,1).

Contributions from birds and animals themselves were not excluded. After all, power and strength were bestowed upon the people by their relatives from the plant and animal world, enhancing their existing knowledge base. According to the *Legend of the Beaver Medicine* (McClintock, 1968, 104), the Blackfeet beaver bundle contained tobacco seeds given to the people by the beaver. These “original” seeds were first secured very early in Blackfeet history, while a man spent one winter living inside a beaver lodge with the beaver people, speaking a common language with the animal instructing the human. Numerous other animals were invited to give their power to the beaver’s medicine, donating their songs, skins, dances and prayers. Moose, elk, woodpecker and lizard are some of the animals represented in the beaver bundle. The

spiritual gifts wrapped protectively within bundles were vital, sustaining and highly respected. They stayed with the people and were ritually used as “an eternal reminder of their contract and relationship with the powers of the universe” (Peat, 1995, 32). Black Elk (Neihardt, 2008, 163) uses a metaphor to describe power from the other world, coming to humans in the form of visions and ceremonies, as if his body was the vessel where it entered. If he didn’t believe in this power, the “hole” would close and his actions would become foolishness. In *Black Elk Speaks*, he tells how power is in the meaning of ceremony. The bison ceremony was necessary for visualizing the relationship between the people and the bison. A sacred circle was fashioned after the bison wallow, and bison tracks were symbolically followed down the bison’s “red road,” walking in a manner that pleased the powers of the universe (164). During the ceremony, a plant is used on the horn of a bison headdress and identified as the “daybreak-star herb...[with] the four-rayed flower of understanding” (165). The elk ceremony Black Elk performed as a duty to *the power where understanding comes from*, recalling the mystery of growing and celebrating the source of life (166).

Alternative views of space and time consistent with Traditional Ecological Knowledge, also share fundamental concepts of ancient creation science. Violette (1995, 7) offers insight into the animistic worldview of early tribal communities. This philosophy of life-like consciences or spirits present in all living things included the earth itself. It contrasts with the mechanistic view of modern physics and Western science’s previous denial of an unseen supernatural realm. Violette makes it clear how this belief in a vast living *beyond*, currently mirrors modern physics theory (1995, 10). Aboriginal groups around the world have perpetuated creation myths conveying the natural world as endowed with sacred qualities. Animate and inanimate physical forms believed to be sustained by a process of invisible energy present in all regions of space, is also regarded as metabolic activity manifesting itself as our energy-powered consciousness (Violette, 1995, 8). Rocks and rivers, human, plant and animal populations alike, all demonstrate these *spiritual* characteristics. Certain myths have been recorded from antiquity showing a sophisticated cosmological science. Much like TEK, ancient creation science was based on the physical world as process, rather than structure. Non-physical, invisible processes occurred within an unobservable *ether* where physical is only a more visible, sacred aspect of the metaphysical (Violette, 1995, 15).

In his book on Native American spirituality (*God Is Red*, 1973, 62), Vine Deloria, Jr., of the Standing Rock Sioux, ascribes Western Eurocentric identity as occupying assumptions that time proceeds in a linear fashion.

“Western Europeans have never learned to consider the nature of the world discerned from a spatial point of view. And a singular difficulty faces people of Western European heritage in making a transition from thinking in terms of time to thinking in terms of space...further it assumes that at a particular point in the unraveling of this sequence, the peoples of Western Europe became the guardians of the world.”

If Indigenous people in this day and age come to replace their philosophies with the dominant western view of man’s control of nature, and complacency in relation to life and living environments, Deloria asks, “*Who will listen to the trees...animals and birds, the voices of the places of the land?*” He predicts, as Traditional Ecological Knowledge rises to the surface of the world’s consciousness, Indigenous nations will reclaim their ancient practices and heritage, rediscovering the meaning of their ancestor’s lands. Restoring relationships in a sacred manner between all species and the land is crucial to our continued mutual existence. Transitioning to this new worldview corresponds with a transformation in values, and balancing the rational with the intuitive (Merchant, 2005, 98-99). Challenging western science’s mechanistic and dominating view of nature requires an “ecocentric ethic” of humans *in nature*, not apart from it, or in charge of it. Holism needs to balance reductionism, and restoration of sustainable ecosystems must be undertaken to satisfy fundamental human and spiritual needs (113).

In *The World We Used to Live In* (2006, 161), Deloria discusses the integral role actual sites on the landscape played in the development of traditional medicine men and their creative powers. Published posthumously by the author’s son, it is a fantastic compilation of miraculous events and mystical accounts from Indigenous spiritual leaders and healers throughout North America. Bull Lodge’s rich narrative of receiving seven visions on seven Montana buttes (Gone, 1980) when he was seventeen reinforces Deloria’s land ethic-awareness. This powerful rendition of fasting, sacrifice, revelation, ritual, holiness and healing, emphasizes the important role sense of place and the physical environment played in connecting spirituality

with daily living and endurance. Without Traditional Ecological Knowledge, young vision seekers would not have survived their solitary experiences in the harsh elements, sometimes without sustenance for weeks and with only plants, animals, and the spirits to aid and guide them. Deloria's unwavering belief in "continuity of spirit" in the universe, and his observations of consecrated landscapes that created a renewed and elevated sense of place, makes one wonder how society today can be so short sighted, when it comes to protection and preservation of the planet and its infinitely diverse inhabitants. The majority of Indigenous tribes were very focused on sacred natural places. Geographic locations represented specific spiritual events naturally taking place at that site. They were revered and remembered places on the landscape, and their descriptions were transmitted from one generation to the next. Other areas signified an actual spot where the people themselves were created and originated from.

In explaining two common, western scientific methods used in wildlife studies, Romesburg (1981) discusses confusion about the definitions of concepts and the dependability of knowledge gained from misused scientific methods. He defines induction as the method used to confirm consistent associations among groups of facts. Retro-duction is when the fact giving processes steering nature inform the research hypotheses. Knowledge is "the set of ideas [in agreement with] or...consistent with the facts of nature discovered through the application of scientific methods" (1981, 293). When the set of scientific approaches is incomplete, or an ill-suited system is used instead of another better suited to the research, knowledge becomes unreliable and mistaken for truth. False laws are built on false foundations of false knowledge. Knowledge must then be retraced back to the past reliable point. Traditional Ecological Knowledge is proven to be reliable and rational knowledge, developed through time and based on experiential conceptions consistent with the facts of nature. It is derived from experience and transmitted from person to person, encoded in language and art (Prober et al. 2011, 2). Rationalism theorizes intellect is the source of knowledge. Empiricism puts forward sensory experiences as the only sources of knowledge (Guthery, 2008, 13). Because scientific knowledge is a product of the human mind, reliable knowledge is naturally confused with statistical tests. Experimental design and testing too often take the place of proficient, yet unpopular human thought. A thorough examination of Indigenous knowledge recognizes it as organized through observation and adjustment over thousands of years, noting its value in building social-ecological resilience (Prober et al. 2011, 2-4). Indigenous seasonal knowledge emphasizes cyclical processes embedded in the ecology of place, nurturing diversity through social-ecological memory, and combining distinctive knowledge types.

Traditional Ecological Knowledge is interdisciplinary and inclusive. It is needed for more resilient and equitable outcomes in natural resource management (Prober et al. 2011, 1). TEK combines population ecology, ecosystem ecology, community ecology, physiological ecology, behavioral ecology, landscape ecology and conservation ecology. It encompasses natural history, biochemistry, biophilia, biomimicry, biology, geology, hydrology, meteorology, phytology, physiology, zoology, and astronomy. With unique, inherent languages and time honored subsistence practices, traditional ecologists were the first ecologists. They developed a science behind interconnected relationships, examining, studying and living by these principles of ecology for thousands of years (Keoke and Porterfield, 2003, 95). Situated throughout time in diverse geographic panoramas of thickly forested mountainous regions, valley ecosystems, rugged coastlines, areas with glacially carved lakes and rivers, lowland meadow biomes, and great grassland plains filled with viable populations of distinct communities, Indigenous people shared a common thread of belief. They recognized they were only one small part in a vast universe. Natural forces were partners influencing the way they lived their daily lives. Food was abundant, Mother Earth demanded respect and gratitude, the Great Spirit permeated all things, and life was good.

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