

# Responses of Native American cultural heritage to changes in environmental setting

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## Abstract

Cultural expressions of American Indian and Alaska Natives reflect the relationship between American Indian and Alaska Natives and the plant and animal species present in an area. Different forces that modify that relationship and influence those expressions can potentially shape American Indian and Alaska Natives cultural heritage and even compromise their cultural identity. Herein, we propose seven modalities to illustrate how American Indian and Alaska Natives cultural expressions may respond to changes in environmental settings that alter the relationship between plant and animal assemblages, and Native peoples. Each modality provides insight into the vulnerability, resilience, and adaptive capacity of American Indian and Alaska Natives cultural expressions to changes in environmental settings. Future research may delve deeper into these modalities and help identify appropriate methods for managing culturally important resources. More culturally sensitive management approaches may strengthen conservation practices and safeguard the cultural legacy of indigenous groups.

## Keywords

Native American, traditions, environmental change, cultural expressions, cultural heritage, intangible values

## Introduction

Plants and animals are central to the cultural history and heritage of indigenous communities worldwide. Indigenous cultural expressions (e.g. songs, dances, ceremonies, legends, prayers, stories, and rituals) reflect the natural cycles and celebrate the assemblage of plants and animals of a particular location and environmental setting. From maize in the Mayan society of the Yucatan Peninsula, to dingoes in the Yarralin community of Australia's Northern Territory, to the importance of eland antelopes to the San people in South Africa's Kalahari Desert, the interdependence between flora and fauna and different ethnic groups cannot be overemphasized. This relationship is also evident in the cultural heritage of American Indians and Alaska Natives (AIAN). The importance of fish, wildlife, and native plants to AIAN spans their utilitarian, spiritual, and supernatural value (Berkes, 2018). The celebration of AIAN's spiritual connection with plants and animals is integrated into traditional cultural rituals abundantly documented through time (see references in the section "Modalities for Native cultural practices as environmental settings change"). These cultural expressions and traditional beliefs confer a deep transcendental value to AIAN for they help explain their creation stories and spirituality, provide bonding through shared traditions within their communities, and reaffirm their ancestral connections (Cajete, 2000; Suzuki & Knudtson, 1992). Consequently, any hindrance to accessing plant and animal

species could severely compromise their cultural identity (Garibaldi & Turner, 2004).

The association between AIAN and the assemblages of plant and animal species develops within the context of an environmental setting. On one hand, plants and animals respond to environmental changes, such as natural disturbance (e.g. volcanic eruptions and insect outbreaks), changes in climate (e.g. sea level rise, drought, and fire frequency), land use change (e.g. conversion of wet meadows to agriculture and deforestation), habitat manipulation (e.g. delineation of public and private lands and urbanization of natural areas), industrial development (e.g. harvest practices and energy production), environmental degradation (e.g. pollution, nitrification of soils, rivers, and oceans), or introduction of non-native species (Bobbink, Hornung, & Roelofs, 1998; Dale, Swanson, & Crisafulli, 2005; Leibowitz, 2003; McGuire, Lawler, McRae, Nuñez, & Theobald, 2016; McKinney, 2002; Nicholls & Cazenave,

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2010; Pfeifer et al., 2017; Thom & Seidl, 2016; Vitousek et al., 1997; Wackernagel et al., 2002). Some species will not only shift their distribution according to their habitat preferences (or experience extinction), but may also display changes in the timing of important natural processes such as migration and reproduction (Walther et al., 2002).

On the other hand, the environmental settings and species assemblages may change due to socio-political stressors on AIAN themselves. In these cases, AIAN access to readily available resources is hampered by the traumatic experiences, harassment, and deteriorating conditions they suffer in the context of ongoing adversity arising from legislation, economic policies, political leaders, or racial inequality. The profound implications of forced relocation (e.g. removal, tribal reservation system, and land allotments); social injustice and disruption (e.g. poverty, employment inequalities, and substandard health care); implementation of federal, state, or local policies and agreements (e.g. conquest, assimilation, reorganization, and termination); political and economic marginalization; and other governmental policies (e.g. systematic eradication of buffalo, land rush policies for settlement, colonization, and establishing mixed jurisdictional land ownership) have been well documented. There is extensive literature, concerning the disproportionate hardships faced by AIAN (see, for example, Beckham, 2007; Biolsi, 2004; National Congress of American Indians, 2017; United States Commission on Civil Rights, 2003; Wilkins & Stark, 2018) that documents how these communities have been relegated to locations with diminished access to economically and culturally meaningful resources. These hardships influence their right to exercise treaty-protected activities (Norton-Smith et al., 2016), Native identities, and tribal sovereignty including geographic redistribution, traditional subsistence patterns, stewardship of resources, cosmologies, and cultural expressions.

In recent years, scientists and government officials in the USA have recognized AIAN cultural heritage as an integral component of their vulnerability to environmental change (Adger, Barnett, Brown, Marshall, & O'Brien, 2012; United States Department of the Interior, 2009; Wildcat, 2013; and references therein). This recognition parallels the emerging international regard for cultural diversity and its expressions of symbolic meaning, artistic dimension, and spiritual value (United Nations Educational, Scientific, and Cultural Organization, 2005). We share these concerns and ask: how might changes in environmental settings alter the cultural expressions that reflect the relationships between biological assemblages and Native peoples? While we recognize that AIAN cultural practices may follow a range of expressions in response to changing environmental settings, we propose seven modalities (a particular form in which something exists or is expressed) to illustrate how cultural expressions may be affected by altered access to plants and animals.

### *Cultural heritage: tangible and intangible values of plants and animals*

The concept of cultural heritage acknowledges two primary dimensions: tangible and intangible values (Vecco, 2010).

Tangible values convey a utilitarian focus where plants and animals support essential human needs and even their economies (e.g. traditional foods, clothing, shelter, medicinal plants). In this context, the utilitarian benefits provided by plants and animals are evident, as their abundance and distribution affect the nourishment and well-being of Native groups dependent on them.

The intangible aspects of indigenous cultural heritage concentrate on shared patterns of behavior and indigenous traditions concerning natural living resources that, regardless of their material benefits, are foundational to AIAN's spiritual experience and identity. Intangible aspects of cultural heritage include performing arts, social practices, storytelling, rituals, ceremonies, spiritual relationships, and other expressions based on tradition, ancestral knowledge, and spirituality that define the cultural identity of a group (Vecco, 2010). Other authors promote the concept of cultural ecosystem services (CES; Costanza et al., 1997; Milcu, Hanspach, Abson, & Fischer, 2013) in reference to the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences (Millennium Ecosystem Assessment, 2005). CES are based on an ecosystem's functional role within a culture, its use in traditional activities, its uniqueness in stories and customs, and its significance in ceremonies and rituals (Costanza et al., 1997; Millennium Ecosystem Assessment, 2005). It is important to recognize that songs, dances, or stories are not simple artistic or folkloric expressions; these components of cultural heritage connect members of cultural groups to their land, honor their deities and ancestors, provide intergenerational connections, and rejuvenate their native identity.

Drawing a line between tangible and intangible elements may be an oversimplification inconsistent with tribal realities (Bouchenaki, 2003; Kurin, 2004). The appreciation of cultural heritage requires recognition of both tangible and intangible values (Vecco, 2010). Much like intangible elements provide a spiritual stronghold for indigenous peoples, tangible elements may also help indigenous communities reaffirm their identity and fulfill spiritual connections. For example, some AIAN engage in rituals and ceremonies in connection to hunting. In many AIAN cultures, an honor song is sung to thank the animals before or after the hunt. These songs are often passed down for generations (Cajete, 2000) and reinforce the spiritual connections between the hunter, their ancestor, and their prey. Furthermore, these songs and ceremonies can uphold the religious tenants established by the Creator as part of AIAN creation stories. The Bladder Dance, for instance, is a ceremony held after a successful seal hunt by Iñupiat (Litecky, 2011; Zagoskin, 1967). The tangible or utilitarian products of the hunt (i.e. the dead animal's flesh) feed the members of the community and serve as a communion, but the intangible ritual song honors the spirit of the animal whose life was taken and nurtures human respect for nature (Cajete, 2000). While there are different ways to feed a community, there is no substitute for the spiritual fulfillment achieved by partaking in the traditions and ceremonial practices of past generations. Hunting a *specific* animal, in a *specific* place, according to

*specific* ancestral practices and traditions is a way for AIAN to assert their cultural identity (Sepez, 2002). The symbolism attached to cultural expressions that include plants and animals goes beyond their utilitarian uses (Vecco, 2010). In this example, the intangible and tangible dimensions are closely integrated and essential to AIAN identity.

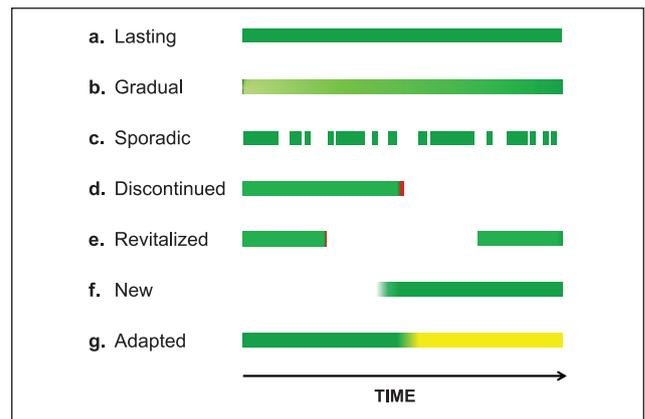
### Cultural significance of plants and animals to AIAN

For many AIAN, particular plant and animal species hold intangible meaning that is central to their cultural identity (Cajete, 2000; Harrod, 2000; Suzuki & Knudtson, 1992). Those species have been defined as cultural keystone species (CKS; Garibaldi & Turner, 2004) that help maintain the cultural stability of human communities over time. For instance, the western red-cedar was identified as a CKS for tribes in the US Pacific Northwest (PNW; Garibaldi & Turner, 2004), whereas black ash was recognized as a CKS for tribes in the Northeastern USA (Costanza et al., 1997). If either species was lost, it could have profound impacts on the cultural identity of the respective AIAN group.

CKS may assume crucial roles according to the mystical symbolism assigned to them by AIAN. Many AIAN traditions are based on animist belief systems (Cajete, 2000; Suzuki & Knudtson, 1992) and as a result, many AIAN cultures feel that humans have a moral obligation to steward, respect, conserve, and protect nature. Native creation stories often recognize that plants and animals are AIAN's human relatives. In some cultures, the figures carved into totem poles represent the animal spirit of family members or loved ones who have passed away and are an example of their connections to culturally significant animals.

Cultural expressions often illustrate AIAN's respect for nature and supernatural spirits (Cajete, 2000; Harrod, 2000; Suzuki & Knudtson, 1992). Many tribes tell stories that teach lessons about the interdependence of nature and people. According to the Hopi tribe, for example, Spider Grandmother created all humans (Suzuki & Knudtson, 1992). For the Cheyenne, however, the spider is a trickster (Erdoes, 1999). In Crow culture, Coyote had two possible identities: Old Man Coyote, Creator of the world, and regular Coyote, a trickster that constantly got everybody into trouble (Crow, 2000). The symbolic values assigned to plant and animal species, and how these values are incorporated into cultural manifestations, varies broadly across AIAN groups.

Given that plants and animals are central to AIAN cultural heritage, it seems worthy to consider how cultural expressions may respond to changes in environmental setting, and the complement of culturally valued plants and animals associated with it. How will AIAN cultural heritage fare when plants and animals shift in abundance or distribution? How have tribal traditions accommodated relocation from a woodland forest landscape to the Great Plains? Are AIAN able to fulfill their spiritual contract with themselves and with nature when environmental or social influence make culturally important species unavailable? If



**Figure 1.** Plants and animals feature prominently in the cultural expressions of American Indians and Alaska Natives (AIAN) as reflected in their ceremonies, songs, dances, stories, and prayers. Seven possible modalities (a–g) illustrate how these elements of cultural heritage may progress as the plant and animal assemblages available to AIAN change over time.

so, how? Is there an accompanying loss of self-identity or culture?

### Modalities for native cultural practices as environmental settings change

Through time, AIAN developed cultural expressions that often incorporate plants and animals from their surroundings. Our premise argues that when the configuration of an ecosystem or an AIAN community is impacted by human influence, climate conditions, administrative policies, or natural processes, it may be challenging to maintain the cultural practices of AIAN societies unabated, because the very foundation of their cultural expressions may no longer be available (Bennett et al., 2014; Norton-Smith et al., 2016). From this perspective, we propose that AIAN cultural expressions that feature plants and animals may assume seven possible modalities over time (Figure 1). We label these seven modalities as lasting, gradual, sporadic, discontinued, revitalized, new, and adapted. In the following sections, we discuss one example for each modality (in the interest of brevity) to illustrate particular ways in which cultural expressions may be impacted by environmental setting. Each example is solely based upon our review of published materials, but socio-cultural investigations would be necessary to assess the significance and magnitude of any cultural impacts.

#### Lasting

The lasting modality (Figure 1(a)) refers to cultural traditions unchanged through time. The faithful adherence to prescribed rituals throughout generations is a testament to Native pride and resolve in observing cherished traditions, regardless of outside cultural influences or environmental changes. An example is reflected in the Alligator Dance of the Caddo Nation, which is a confederacy of tribes that

prior to 1835 inhabited portions of southern Arkansas, Louisiana, east Texas, and eastern Oklahoma (Swanton, 1996). In 1835, the Caddo ceded their territorial lands to the US government, and the tribe eventually relocated to a reservation in northern Texas. However, in 1859, the federal government relocated the Caddo to a new reservation on the great plains of Oklahoma (Swanton, 1996). The Caddo people faced dramatic struggles during relocation, yet they retain many traditions that help them maintain their tribal identity despite the hardships they endured. Songs and dances are at the center of Caddo social gatherings and offer a link to their ancestors (Newkumet & Meredith, 2009). On the Caddo's ceded lands, the power and mysterious nature of the American alligator inspired their Alligator Dance. Their ceded territories had a very different environmental setting than their reservation lands in Oklahoma. While the former was wetter and forested with an abundance of alligators, the latter was an arid grassland, devoid of alligator habitat. Despite the lack of alligators in their post-relocation environmental setting, the Caddo Indians continue to perform the Alligator Dance in modern Caddo social gatherings (Newkumet & Meredith, 2009).

### *Gradual*

Cultural practices can also change subtly over time. The slight modifications in the timing of seasonal cultural rituals based upon the phenology of plants and animals, weather patterns, and climate characteristic of an area provide a good example of the Gradual modality (Figure 1(b)). Phenology refers to the seasonal timing of life cycle events of organisms (Lantz & Turner, 2003). The concept of traditional phenological knowledge (TPK), introduced by Lantz and Turner (2003), refers to the observation of phenological changes in one species to signal the seasonal events of another species (Armatas, Venn, McBride, Watson, & Carver, 2016). There are documented examples of the use of TPK to determine the timing of an AIAN ceremony, which may be important to the ceremony itself. While the general character of the ritual remains similar, its timing or in some cases the environmental cue for the ceremony may change. The Siletz people, for instance, note that when eel ants (flying termites that fly in mid-May after three to four warm days) emerge, the harvest of eels (Pacific lamprey; Sheoships, 2014) and the simultaneous Eel Dance (Banse, 2014) will occur soon, despite variable lamprey population sizes (Sheoships, 2014). Based on previous ethnographic surveys, Miller (2012) states that the lamprey arrival had been signaled by different environmental cues, which varied by location, but included returning carpenter ants, blooming dogwood trees, crickets singing, frogs croaking, full growth of fern fronds, or swallows returning. Miller (2012), however, reports that many of these indicators have become out of sync with the lamprey arrival. While the Eel Dance continues to be performed at the beginning of the eel harvest, the associated phenological cue or the timing of the celebration may change over time for a given location. These types of gradual variations in the timing or the indicator of a traditional event could hold important cultural implications for a given AIAN group.

### *Sporadic*

Cultural expressions under the Sporadic modality (Figure 1(c)) occur at irregular intervals. The Alaskan Iñupiat ceremonial performances associated with the Nalukataq festival (spring whaling festival of the Alaskan Iñupiat) provides a good example (Lantis, 1938). For thousands of years, Arctic bowhead whale hunting has been foundational to Iñupiat cultural identity. The Nalukataq festival, for instance, is held to celebrate a successful hunt. According to Iñupiat tradition, the whale is the source of music to the people (Sakakibara, 2009), but they believe that celebrations and music must be suspended when no whales are caught. External factors interfere with whale hunting, thus threatening the spiritual connection between Iñupiat and whales. For example, in 1977, the International Whaling Commission, fearing a dangerously low whale population, imposed a hunting moratorium on the commercial take of bowhead whales and on the Iñupiat subsistence harvest. Subsequent hunting quotas also restricted the number of landed whales (International Whaling Commission, 2018), and reduced sea ice during the spring has further disrupted the Iñupiat-whale relationship (Berkes & Jolly, 2002). Increasing sea temperatures are anticipated to alter the productivity of the Arctic Ocean. Therefore, abundance and distribution of Arctic whale populations may shift, threatening the traditional whaling cycle and the Iñupiat cultural identity. When the subsistence whale hunt is compromised and cannot adequately meet the communities' needs, celebrations are cancelled and the music of the Iñupiat stops.

### *Discontinued*

Some traditions passed down for generations may be permanently stopped when the necessary environmental conditions are no longer favorable (Figure 1(d)). An example is the Sun Dance ceremony among the Kiowa tribe of Oklahoma (Nye, 1934). The buffalo was the Kiowa's main food source. Each year in midsummer, the scattered bands of the Kiowa would come together for a thanksgiving event to pray to their Sun God to replenish the buffalo herds and to seek protection from Kiowa enemies. The Sun Dance ceremony would last about a month, with dances, prayers, and other performances that provided spiritual and social fulfillment (Nye, 1934). Buffalo were revered and featured throughout the ceremony. However, the US military-backed slaughter (to quell the Native American resistance and force them onto reservations) and commercial overexploitation of buffalo between 1860 and 1885 (Smits, 1994) drove the herds nearly to extinction. By 1885, with a buffalo population of less than 1,000 animals, it became almost impossible to obtain the ceremonial buffalo head for the Sun Dance lodge (Kracht, 1994). In addition, the festivities often included re-enactments of attacks on forts while singing war songs, therefore, the Sun Dance was outlawed by the US Office of Indian Affairs in 1889. Fear about the threat of military force and the buffalo shortage drove the Kiowa to stop performing the ceremony in 1890. While other Plains Indians continued versions of the Sun Dance, the Kiowa tradition appears to have been lost.

### Revitalized

There are instances where culturally significant plants and animals have been extirpated, resulting in discontinued cultural practices. Yet after a period, changes in conditions may restore the species, thus allowing for the revitalization of the suspended cultural tradition (Figure 1(e)). Examples are found among the First Salmon ceremonies of tribes in the PNW. According to tribal belief, the Creator transformed the human bodies of tribal ancestors into salmon to provide sustenance for the people. In return, the tribes were to protect, respect, and honor this relationship and show gratitude for the gift of the salmon—a CKS—that return to spawn. During the ceremony, held at the beginning of the upriver migration, the body of the first fish caught is ritually carried into the longhouse and shared as a communion with all members of the community that are considered to be relatives of the salmon (Gunther, 1928). The culture of many PNW tribes was founded upon the annual return of Chinook salmon, which is featured in many tribal cultural expressions (Gunther, 1928). The importance of the salmon to PNW AIAN spiritual, mental, and physical health could not be overemphasized. The Columbia River and its tributaries have numerous dams that limit the ability of migratory fish (such as salmon) to access upstream river reaches to spawn and results in drastic reductions in the salmon population. For example, a fish ladder was not included in the construction of Chief Joseph Dam in 1961, which led to a large reduction in spawning habitat for salmon (Columbia River Inter-Tribal Fish Commission, 2013). In losing access to salmon, several tribes lost not only a significant subsistence food, but also a cultural icon, access to their tribal ancestors, and their ability to exercise their sovereign right to fish and harvest salmon (Columbia River Inter-Tribal Fish Commission, 2013). Consequently, the First Salmon ceremonies were discontinued by many tribes across the region. In the 2000s, the Confederated Tribes of the Colville Reservation constructed a fish hatchery downstream from Chief Joseph Dam, which provides a source of juvenile salmon and a destination for returning adult salmon to spawn (Ruby, Brown, & Collins, 2010). With the return of the salmon, the Colville revitalized their annual First Salmon ceremony in 2004 (Colville Tribes Fish and Wildlife Department, 2014), the first one held in over four decades, allowing them to exercise their sovereign right to fish, while honoring their relationship with their tribal ancestors.

### New

At any location, the mosaic of plant and animal species is often in flux. Some species disappear or become scarce; others become more abundant or are newly established. In some cases, newly established (non-native) species become foundational and spark new cultural traditions (Figure 1(f)). For example, horses went extinct in North America more than 10,000 years ago, but the Spanish brought them into the USA in the 1500s (Lawrence, 1998). At the time, contemporary AIAN had never seen a horse before and revered the

combination of horse and rider as god-like. Eventually AIAN acquired horses and for American Indians in the Great Plains, this transformed their way of life. The horse became one of their cultural cornerstones and was embraced as the central figure of many cultural expressions. Despite the documented acquisition of the horse in the last 400 years, the Great Plains' Blackfoot Tribe of the Blackfoot Indian Reservation has incorporated the horse as a sacred icon. Ewers (1955) detailed three Blackfoot legends that explain the sacred origin of the horse. In one, a Blackfoot man found Thunder (a supernatural being) and met Thunder's horses. Since he was not frightened by them, Thunder offered him 10 horses and was told that he and his people would have horses until the end of the world. In the second story, a boy was given horses by a powerful water spirit and eventually became chief of his people, and all chiefs since are said to have owned many horses. In the third legend, the Sun made a wooden toy horse for his grandson. After the boy returned to Earth, his father provided him with horses that emerged from a lake. These stories illustrate how the horse was regarded as a godsend figure that has become incorporated into Blackfoot mythological accounts despite the horse's relatively recent establishment in the Great Plains.

### Adapted

Traditional ceremonies may also be adapted to reflect changing conditions. Examples of the Adapted modality (Figure 1(g)) include alterations of cultural practices that result in a distinct before-and-after appearance. The fishing ceremonies and rituals of the Klamath tribes are good examples (Thomson, 2011). The harvest of suckerfish (Lost River suckers and Shortnose suckers) in the spring is central to the tribes' social, cultural, and economic activities. Fishing for suckers is more than a tangible means of sustenance: it includes intangible behaviors and beliefs intended to honor the fish. The C'waam (suckerfish) ceremony is observed to celebrate the annual arrival of the sucker. Historically, great numbers of suckers were reported in Klamath Lake, but the construction of dams, water diversions, and changes in habitat quality led to a reduced population (Thomson, 2011). In 1985, the Klamath restricted their sucker fishing, and in 1986, they agreed to terminate the sucker fishery (Most, 2003). Then in 1988, both sucker species were listed under the US Endangered Species Act. Rather than holding the traditional C'waam harvest celebration, the ceremony was adapted in 1990 and renamed to the Return of the C'waam ceremony (Most, 2003). Historically, the suckerfish was captured, killed, and roasted (Gunther, 1928). However, given the fish's new legal status as endangered and the interest to maintain cultural traditions, the tribe modified the ceremony to avoid having to discontinue it. In the adapted version of the ceremony in modern times, two suckerfish artificially raised in the Klamath tribes' Aquatic Research Center are blessed and released into the river (Klamath Tribes, 2016). This is a good example of how the cultural practices of tribes may be adapted to accommodate shifting environmental settings, which includes related political and legal considerations.

## Discussion

In this article, we explore the response of AIAN cultural expressions (e.g. songs, dances, ceremonies, etc.) to changes in environmental settings that alter AIAN access to plants and animals. This concept is important in the recognition of significant impacts to the identities of AIAN groups and to articulate strategies to preserve not only their cultural heritage, but also the necessary environmental conditions associated with it.

When confronted with changes in environmental settings, AIAN cultural expressions display different vulnerabilities, resilience, and adaptive capacities: some appear more susceptible, while others seem more resilient to change. The breadth and complexity of this diversity in cultural expressions may be abstract and challenging to grasp. As a first approximation toward characterizing this broad spectrum, we introduce seven modalities that AIAN cultural practices may assume in response to altered environmental circumstances. While our proposed modalities artificially segment that spectrum, they offer a conceptual simplification to help comprehend the individual nuances and intangible significance along discrete portions of that range. As a caveat, this categorization does not convey a judgment tool to assign relative value or recognize advantages of any one particular cultural modality over another. In addition, none of these modalities provide a method to quantify the rate or magnitude in which the environmental conditions or the cultural expression of interest have changed.

We anticipate that our conceptual model will stimulate future research. AIAN culture is rich and fluid, and future studies of its connection to the environment and progression over time may suggest new modalities or novel combinations of them. Several opportunities, implications, and challenges lie ahead for researchers interested in pursuing this theme. Further, study might ask whether or why certain cultural expressions are more or less resilient to change than others. Future efforts may explore the intersection of the environmental, ethnographic, social, economic, historic, legal, and political dimensions (Sarna-Wojcicki, Sowerwine, Hillman, Hillman, & Tripp, 2019). Multidisciplinary collaborations will be essential to understand how changes in environmental setting influences AIAN communities and their cultures. The discovery process may be challenging as practitioners of cultural expressions make choices about what elements to keep, what to discard, what to share publicly, and what to keep private. These studies may also lead to sensitive legal and political areas, such as whether treaty rights or other legal instruments afford AIAN communities the necessary safeguard measures to preserve their cultural heritage.

Comprehensive research into AIAN traditional heritage requires balanced recognition of both tangible and intangible elements. Tangible values are easier to quantify; thus, the importance of plants and animals as consumptive resources is relatively easier to prioritize and incorporate into resource management decisions. In contrast, intangible values and CES are more difficult to quantify and subsequently are given less weight in management decisions (Chan et al., 2012; Daniel et al., 2012). Furthermore,

assessing the intangible benefits of a species may require analysis, storage, and reporting of culturally sensitive knowledge that may warrant Institutional Review Board approval, confidentiality agreements, and navigating numerous other laws, regulations, Executive Orders, and considerations (Huntington, 2011; United States, 2012).

The conceptual simplicity of the seven modalities proposed here may help reach more culturally sensitive policies. In theory, understanding the diversity of cultural manifestations constitutes an important early step when trying to invite resource managers to consider AIAN cultural heritage in making their decisions. In practice, however, it will be challenging to demonstrate the intangible impacts of policy and management decisions on AIAN cultural heritage. Convincing decision makers of the cultural importance of individual species may be difficult (Verschuuren, 2006), and persuading them to formulate policies and decisions in favor of culturally important species may prove challenging. In some cases, decision makers may be open to integrating cultural considerations, but may not know how to initiate the process or what precedents exist for them to model. However, there are examples where managers and decision makers intentionally incorporated the values of indigenous people into their resource monitoring and management decisions (Donatuto, Grossman, Konovsky, Grossman, & Campbell, 2014; Satterfield, Gregory, Klain, Roberts, & Chan, 2013; Tipa & Teirney, 2006). Yet, further development of tools that assess intangible values or measure the CES associated with plants and animals could help resource managers to take a more inclusive approach (Sarna-Wojcicki et al., 2019).

In this article, we briefly referenced environmental factors and historic governmental policy on AIAN matters as having significantly altered the environmental settings available to AIAN. We recognize that other confounding factors have and continue to shape AIAN traditions and these must not be ignored. They include, for example, migration to urban areas, economic challenges, health and addiction issues, and technological distractions. These additional forces conspire against learning and participating in traditional lifestyles and contribute to an erosion of AIAN cultures (Bennett et al., 2014; Lynn, Mackendrick, & Donoghue, 2011; Pickering, 2004). Intertribal collaborative events (e.g. annual Tribal canoe journeys and regional Powwows), intertribal information sharing, or integrating indigenous knowledge with western science could prove useful as approaches for preserving AIAN cultural heritage. In the end, social incentives, renewed interest in upholding longstanding traditions by AIAN youth, or the integration of modern technology with indigenous knowledge (e.g. applications for mobile devices, Geographic Information System tools, or Cloud computing and storage) could play a role in how AIAN cultural expressions respond to changes.

## Conclusion

Plants and animals are central to AIAN cultural heritage and indispensable to the identity of place-based, cultural groups. These groups often have a unique repertoire of ceremonial expressions associated with their relationship to

nature, their connection with past and future generations, and their spiritual beliefs about creation and the afterlife. In our analysis, we illustrated how these cultural traditions may be influenced by changed environmental settings and the available plant and animal assemblages. The proposed modalities of ceremonial expressions can be used to encourage discussion between AIAN, policymakers, and resource stewards to frame the issue about the impacts of policies on environmental setting and to AIAN cultural heritage. The largest obstacles to these conversations may be the perceptions and trade-offs recognized by resource managers, decision makers, and the public, when prioritizing the management of numerous plant and animal species (Daniel et al., 2012). For instance, species of tangible economic value (e.g. cattle or corn) are given priority consideration when defining land use or water policies (Millennium Ecosystem Assessment, 2005). Existing conservation policies and decisions may prioritize species based on some intangible values, such as historic (e.g. reintroducing wolves into national parks), aesthetic (e.g. preferring manicured urbanized parks over wetlands), or charismatic (e.g. species that capture the public's interest such as whales and dolphins). Often missing from this list, however, is AIAN cultural and spiritual significance of plants and animals. Perhaps reflecting on the concepts of CKS (Garibaldi & Turner, 2004) or CES (Costanza et al., 1997; Milcu et al., 2013) may further our understanding of how species contribute to the fulfillment of the human experience and maintaining AIAN cultural heritage.

Revising conservation strategies in the context of dynamic environmental settings invites consideration of cultural expressions in the management of plant and animal resources (Sarna-Wojcicki et al., 2019). In some cases, co-managing culturally important natural resources with AIAN could improve conservation practices and sustainable resource management (Alexander et al., 2011; Lake & Long, 2014; Norgaard, 2005; Norton-Smith et al., 2016; Verschuuren, 2006; Voggesser, Lynn, Daigle, Lake, & Ranco, 2013) or introduce innovative management approaches for culturally significant species (Berkes, 2009; Donatuto et al., 2014; Dudley, Higgins-Zogib, & Mansourian, 2009). Furthermore, understanding how resource management decisions may impact cultural expressions could uncover more holistic adaptation options that benefit not only AIAN, but also all of society. In the end, if we listen to the messages contained in the ceremonies, songs, dances, and stories cherished by AIAN, we may improve our strategies for managing plants and animals as our environmental settings continue to change.

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### Glossary

C'waam suckerfish  
Nalukataq festival spring whaling festival of the Alaskan Iñupiat

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