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Native Americans: Where in Environmental Justice Research?

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Abstract

While the last two decades have seen important theoretical, empirical, and policy advancements in environmental justice generally, much remains to be done regarding Native Americans. Unique political and cultural dynamics shape the study and pursuit of environmental justice (EJ) in Native American communities. This review summarizes Native American EJ issues based on a cross-disciplinary search of over 60 publications. In so doing, we discuss the unique nature of Native American EJ in terms of conducting research and working toward reducing the continuation of historical trauma associated with environmental ills, the types of strategies used in Native American EJ research, and issues of Native American climate justice. We conclude with discussion of remaining knowledge gaps and future research needs.

Keywords

climate change; environmental health; environmental inequality; environmental justice; indigenous; Native Americans; natural resources

While important theoretical and methodological advances have recently been made in environmental justice (EJ) research, much remains to be done regarding Native American communities. This review summarizes scholarship on Native American environmental justice, including a summary of Native American climate justice research, strategies engaged within this research, discussion of unique political and cultural dynamics, and remaining knowledge gaps. The purpose of this paper is to not only examine and summarize scholarship on Native American EJ literature, but to offer a useful foundation from which subsequent research can expand. Furthermore, this piece also serves to inform decision-makers about the context for improving conditions for communities associated with Native American tribes.

Native American EJ case studies cover wide-ranging topics including indigenous culture or ways of life (e.g., Hoover et al. 2012), resource exploitation (e.g., Smith and Frehner 2010), environmental health (e.g., Shriver and Webb 2009), and, recently, climate justice (e.g.,

Krakoff 2011; Lynn et al. 2013). Although strides have been made among Native American tribes regarding self-determination and control over land use decision-making, important socio-environmental inequalities remain. To situate this review more generally, we first present a brief overview of environmental inequality scholarship overall.

Environmental Inequality Research: Theory and Application

Researchers have made substantial progress in understanding the social inequalities inherent within environmental vulnerability. Within such research, “environmental inequality”, in particular, refers to social variation in the distribution of environmental ills, with inequality often linked to demographics including race, ethnicity, gender, and age. “Environmental racism” focuses specifically on environmental disadvantage primarily associated with racial and ethnic minority status (Sze and London 2008) and, “environmental justice” involves efforts by an affected group to obtain restitution from environmental harm (Cutter 1995).

Race is often a powerful indicator of environmental inequality (Bullard 2001; Bullard and Wright 1993). However, variation in risk exposure extends across other social categories such as gender, age, and socioeconomic status (Bullard 1994; Di Chiro 1996; Tierney 2006). In recent years, researchers have made substantial methodological progress in environmental inequality research, including increasing sophistication in spatial methods (e.g., Gilbert and Chakraborty 2011, Holifield 2012, Maantay 2007, Mohai, Pellow, and Roberts 2009, Wilson et al. 2012). Also, longitudinal approaches allow disentangling race/ethnic residential concentrationism, timing of hazardous facility placement, and neighborhood transitions (e.g., Mitchell and Norman 2012; Pastor, Sadd, and Hipp 2001).

Generally, research suggests that power and influence grant certain populations ability to defer locally unwanted land uses (LULUs) (Bullard 1993; Chess, Burger, and McDermott 2005). More vulnerable communities become “paths of least resistance” (Brook 1998; Mohai, Pellow, and Roberts 2009) — as for Native Americans.

EJ activists have applied research findings to argue for increased subject participation in research and decision-making (Minkler et al. 2008; Shepard et al. 2002; Sze and London 2008). For example, Brown's *Toxic Exposures* (2007) shows how EJ activists have sought to connect environmental health and medicine by promoting a more patient-centered practice with greater awareness of potential environmental causes. As we later demonstrate, Native American EJ research has moved in a similar fashion, with researchers increasingly employing participatory methods to gain a more holistic understanding of tribal EJ issues.

Meta-Analysis Article Selection

We utilized a variety of search engines to create a wide-ranging article collection for this summary. The engines included *JSTOR*, Web of Knowledge, Google Scholar, and the University of Colorado's library system, which compiles literature from many sources including Sociological Abstracts, Academic Search Premier, Social Science Research Network, and Proquest.

We used a variety of keywords and phrases and included only articles and books focused predominantly on Native American EJ, while excluding those on indigenous groups outside the US.¹ A range of academic disciplines was included (e.g., sociology, geography, Native American and environmental law, American Indian studies, and public health). A total of 68 documents included 63 peer-reviewed articles, two books, and material from one non-profit and two government websites.² The material's crossdisciplinarity yields a variety of perspectives and publication years range from 1992 - 2013. After selection, materials were summarized and central overlaps identified.

Unique Dimensions of Native American EJ

Since explorers and white settlers began to appear in North America in the late 15th century, Native Americans have experienced a series of challenges against their reproductive, cultural, spiritual, political and environmental and, altogether, human rights. They have been forced from their homelands, first through land grabs by European settlers and later through the U.S. government's appropriation of Native territory (Isenburg 2000; Nabokov 1999) -- resettlement that resulted in involuntary livelihood changes. Additionally, Native populations experienced drastic population declines due to genocide, warfare, and introduced diseases (Fortune 1989; Nabokov 1999; Nies 1996). Five centuries later, the relationship between Native Americans and today's dominant culture remains exploitative as non-Natives continue attempts to gain access to land, water, minerals and other raw materials from tribal governments (Nies 1996; Smith and Frehner 2010). Native American lands have increasingly become targets for unwanted land uses such as dump sites, nuclear and weapons testing facilities, and resource extraction (e.g. Hooks and Smith 2004, Leonard III 1997).³

Based on the review of current Native American EJ scholarship, we argue that Native American environmental justice issues are unique from broader EJ challenges for 3 major reasons: (1) standard EJ indicators may not apply to indigenous experiences of environmental injustice given cultural distinctiveness; (2) challenges with defining "Native American", and (3) tribal sovereignty requires different research approaches and policy prescriptions.⁴

Measuring Native American Environmental Justice

EJ researchers frequently face problems of how to conceptualize processes of injustice and how to operationalize indicators for analysis (e.g., Harris and Harper 2011). Such challenges are exacerbated within Native American studies for several reasons. In general, indicators

¹Example searches included: "Native American environmental justice / injustice," "tribal environmental justice / injustice," "Native American Climate justice / injustice," "Native American environmental inequality," "Native American environmental racism," "Indian environmental justice / injustice," "Alaska Native environmental justice / injustice," "indigenous environmental justice / injustice."

²An additional 28 articles and books/ chapters provided broader EJ background. The initial search produced over 75 articles although we ultimately included only included empirical studies, critical essays, and historical and legal analyses predominantly focused on Native American EJ and inequality.

³Indigenous EJ issues have played out in other countries as well, and, in a similar fashion, are commonly rooted in historical colonialism (see Chi 2001, Mascarenhas 2007, Perrett 1998, and Westra 2008).

⁴Sovereignty is not the only aspect of Native American EJ that necessitates different research approaches. Different worldviews, histories, and unique outcomes from present-day forms of racism also elicit the need for different research and policy approaches (O'Neill 2003).

typically used to reflect environmental inequality are derived largely from “western” science and do not coincide with Native American understandings of risk, health and comfort (e.g., Burger et al. 2010; Charley et al. 2004; Harris and Harper 2011; Martin 2002; O'Neill 2008). Common EJ measures reflecting, for example, distance to hazardous facilities do not capture the complexity of Native American connections to landscape.

Harris and Harper (2011: 233-35) provide perhaps the most extensive discussion of measurement relating to Native American EJ research. They specify several alternative measures of tribal injustice such as consideration of subsistence lifestyle impacts. These could include effects on tribal access to sacred resources, traditional activities (e.g., cultural landmarks, conduct of sacred ceremonies), and decreased opportunities for cultural education such as livelihood skills (e.g., trapping and hunting). As an additional solution to the challenge of appropriate indicators, Harris and Harper (p232; *italics added*) encourage description of impacts as related to the tribal narrative “*that gives a local tribal perspective and describes the oral history and environmental knowledge of the area and some of the key ecological and cultural keystone resources.*”⁵

Integration of “eco-cultural attributes” of indigenous resources is critically important for appropriate evaluation of potential environmental health impacts and to help ensure that tribal concerns are not dismissed as opinions or “uncertainties” (Harris and Harper 2011, 237).

Indeed, some tribal definitions of health are difficult to quantify and therefore not appropriately addressed in quantitative risk assessments (Ranco et al. 2011, 227). Practices such as gathering and growing food provide not only nourishment, but also serve cultural, spiritual and communal purposes. Such activities also provide intergenerational education opportunities. However, considerations of cultural, spiritual and communal health and well-being are not easily measured and are, therefore, often overlooked in risk and impact assessments, although they are “negatively impacted ... when resources are contaminated” (Ranco et al. 2011, 227).

Culturally significant plants and animals play an important role in tribal health (Adamson 2011; Lynn et al. 2013), again demonstrating cultural definitions at odds with mainstream health indicators. “First foods” in Native America, for example, represent not only sustenance, but also a source of spirituality and mental health. “First foods” is a concept used synonymously with traditional foods, but specifically represents foods considered unpolluted, fresh, culturally meaningful, and accessible on Native lands (Adamson 2011). Thus some researchers argue that efforts to keep “first foods” pure are not political statements, but statements of a desire to ensure healthy populations (Adamson 2011).

Defining Tribal Populations

Environmental justice researchers have long struggled with appropriate definitions of populations deemed environmentally vulnerable. For example, early empirical research in

⁵It should be noted that cultural sensitivity of certain forms of tribal knowledge exacerbates the difficulty in creating appropriate indicators, as manifested in culturally mandated requirements for confidentiality.

the U.S. aimed to disentangle income and race effects in environmental exposure. Results tended to suggest that racial and ethnic minority groups were even more consistently exposed to environmental ills than were low-income groups generally (Bullard 1999; Crowder and Downey 2010; Pulido 1997). Yet like other racial/ethnic groups in today's melting pot, Native Americans are not easily categorized. Specific to Native Americans, however, are questions of federal recognition of specific tribal groups as well as issues of reservation residence vis-à-vis tribal enrollment. Zimmerman (1993) explains that Native Americans may be under- or over-represented in studies depending on the criteria used. For example, without a consistent definition of who is and is not considered a Native American citizen, health statistics and policy prescriptions may be inherently flawed (Zimmerman 1993). In particular, Zimmerman found that misclassification and inconsistencies in classification have “led to substantial variations in the measurement and *interpretation* of health statistics” (644-45; authors' italics). Clearly, misinterpretation of health statistics has the potential to affect public health policy.

Native American populations are defined in a variety of ways including by blood quantum levels, tribal citizenship, reservation residency, and self-identification (Zimmerman 1993). Furthermore, individuals can self-identify on U.S. Census forms as Native American regardless of whether or not they are citizens of federally recognized tribes. Inconsistencies in classification of Native Americans influence understandings of their socioeconomic and health profiles, thus affecting policy and future research. Particularly given the critical policy relevance of EJ scholarship, issues of population definition are critical.

Tribal Sovereignty

Tribal sovereignty, self-determination, and the federal trust responsibility owed by the US to the tribes, represent political and cultural distinctions that differentiate them from other groups seeking EJ restitution (Walker, Bradley, and Humphrey 2012, 381).

Unlike other groups seeking environmental justice in the U.S., federally recognized tribes are inherently self-governing and self-regulating (Bureau of Indian Affairs 2014). Federal recognition is limited to those tribes who have established legal relationships with the U.S. through treaties and executive orders, for example (Bureau of Indian Affairs 2014; Native American Rights Fund). Tribal governments have the right to exercise some degree of political independence and determine their nation's economic, political, and cultural trajectory. Importantly, such sovereignty is not a “partnership” between tribal groups and the federal government. Rather, it “must be recognized, by the dominant culture, that tribal governments can form the basis of a different civic community, a different sense of the public good” (Ranco and Suagee 2007, 692).

Sovereignty enables (or is supposed to enable) Native American tribes to establish environmental regulations on their land (Ranco 2008; Walker, Bradley, and Humphrey 2012). Further, the U.S. Environmental Protection Agency is required to enforce regulations created by tribes — even if they conflict with state regulations. For example, in exercising their sovereignty, the Pueblo of Isleta set their own water quality standards (WQS) that reflected their tribal citizens' needs and desires to keep drinking water clean for both everyday and ceremonial use (Ranco 2008). However, the tribe's WQS were much more

stringent than the state of New Mexico's, which was a source of contention considering that the Pueblo were downstream from water controlled by the state. Despite the fact that New Mexico had proposed its own WQS for downstream discharge, its proposal did not adequately reflect the tribe's concerns and needs, and the EPA did not allow the state's standards to be put into place (Ranco 2008). Despite the Pueblo's apparent victory, Ranco (2008) claims that the use of tribal sovereignty is limited and is not readily available to all tribes:

While the U.S. EPA does provide grants for the development of water monitoring programs on Indian reservations, this money is generally not enough to develop and implement WQS. Thus, while legally an option to all federally recognized tribes, establishing WQS has become a program pursued by mostly wealthier, larger tribes with a government bureaucracy capable of adopting and implementing the full array of the U.S. EPA programs. (360)

Limitations on tribal sovereignty include, but are not limited to, a tribe's lack of economic power to oppose harmful regulations and development as well as whether or not a tribe is federally recognized as a sovereign nation (Arquette et al. 2002; Ranco and Suagee 2007).

Self-determination represents Native Americans' ability to exercise sovereignty, to manage their own development—politically, economically, socially, and culturally (Tsosie 1996; 2007). As explanation, “With respect to voluntary, incentive-based policies, tribal adherence to federal directives is conditioned upon the tribe's assessment of what policy is best suited to advance the tribe's own interests. In addition, Indian nations must examine their own norms and values to determine what is most consistent with the tribe's own view of its desired future” (Tsosie 2009, 213).

Importantly, tribal self-determination does not equate with a romanticized idea of Native American environmentalism—a tribe can choose to accept or reject an environmentally harmful activity (Gover and Walker 1992; Tsosie 2007): “According to ... Native leaders, tribal self-determination entailed the need for tribes to decide their own priorities for economic development and to assume authority as sovereigns over the reservation environment” (Tsosie 2007, 1631). Such decisions are clearly shaped by many factors including economic security, job opportunities, and the value placed on tribally-important natural resources.

For example, the Swinomish of Washington state sought environmental remediation of tribal land that was harmed through use as a petroleum dumpsite (Zaferatos 2006). In an effort to heal the land, the tribe used self-determination to persuade the EPA to remediate: “Environmental justice was accomplished through the concurrent tribal actions of political assertiveness, applying technical knowledge in assessing environmental risk, and framing an effective strategy to achieve remedial action” (Zaferatos 2006, 906).

Conversely, in implementing their right to self-determination, tribes may approve environmentally harmful development (Gover and Walker 1992; Smith and Frehner 2010) often due to the need for economic growth and employment opportunities (Walker, Bradley, and Humphrey 2012). Today, many tribes remain in vulnerable economic positions, largely

due to an ongoing colonial relationship with the U.S. government (Bullard 2001; Ishiyama 2003; Ranco and Suagee 2007). The case of the Mescalero Apache's decision to allow uranium extraction on their lands is described in the upcoming section and demonstrates an excellent example of why tribes may “willingly” opt to allow harmful development (Leonard III 1997; Sachs 1996).

The trust doctrine -- embedded in tribal sovereignty -- is another aspect of Native Americans' political and cultural standing that distinguishes them from other groups seeking EJ restitution. The trust responsibility is defined as “the responsibility of the U.S. to protect tribal resources” (Native American Rights Fund; Ranco 2008, 356). In theory, the trust doctrine is a rule of conduct between tribal governments and the U.S. federal government that serves “as a check on federal administrative power” (Leonard III 1997, 674). In accordance with the trust responsibility, the U.S. government is called to safeguard tribal resources to the fullest capacity to ensure the right to tribal sovereignty in maintaining and protecting tribal communities (Bureau of Indian Affairs 2014; Native American Rights Fund). Standards set by the EPA that affect tribal lands, for example, must aim to limit environmental harm.

However, tribal sovereignty, self-determination and the trust relationship between the U.S. and tribal governments are often ignored or made secondary to federal and corporate endeavors (Arquette et al. 2002; Ranco 2008). Additionally, many tribes lack the resources necessary to exercise sovereignty. In all, the sociopolitical structure of the U.S. remains exploitative and discriminatory, and many tribes remain economically marginalized, thus limiting tribal self-determination.

Strategies in Native American Environmental Justice Research

Historical Analyses

Historical analyses are often engaged to explain the emergence and significance of environmental burdens on Native American populations and lands (Clark 2002; Harris and Harper 2011; Hooks and Smith 2004). Such historical perspectives shed light on present-day environmental justice issues (Hooks and Smith 2004).

Indeed, some argue that without an historical perspective, today's conditions may actually be misinterpreted: “To approach history casually and complacently is to evade history's inevitably multiplicitous facts and to mask the many meanings the facts could support” (Lord and Shutkin 1994, 5). For instance, in a 1992 Vermont Supreme Court case, the Abenaki, a New England Native American tribe, were ruled not to have title to land they had held for centuries. Because of the complexity of the historical record containing proof that the Abenaki had indeed maintained legal residence and the rights to land ownership, the court chose not to heed historical accounts. Such disregard for historical analysis has serious implications regarding how we view not only Native American history, but also justice (Lord and Shutkin 1994).

Many case studies involve historical analyses of energy or military initiatives on Native lands as well as the historical processes of external, nontribal land management. For

instance, Native Hawaiians sought restitution for damage to the island of Kaho'olawe, degraded by over forty years of use as a target range for warplanes by the US military (Blackford 2004). Through an assessment of military actions since the 1930s as well as the political struggles of Native Hawaiians with the federal government, Blackford's historical study illuminated the process leading to present conditions as well as the EJ struggles of Native Hawaiians.

Other historical case studies reveal how economic vulnerability is often linked to natural resource extraction, which ultimately yields additional socioeconomic and environmental harm. The Mescalero Apache tribe of New Mexico has undergone decades of exploitation since uranium deposits were discovered on their land in the 1950s (Leonard III 1997). At first, uranium extraction was imposed on tribes during the development of nuclear power associated with weapons creation during the Cold War, but mineral extraction has since become an economic necessity for many tribes—including the Mescalero Apache (Leonard III 1997). When the tribe received a proposal to build a monitored retrievable nuclear waste storage facility on its land in the early 1990s, the opportunity was welcomed. The tribe's socioeconomic vulnerability was apparent: “Despite the presence of the resort and other industry on the reservation, more than one-third of tribal citizens are unemployed and over half live under the federal poverty line. The tribe also suffers from a housing shortage as well as a lack of any school system” (Leonard III 1997, 659). This case suggests Native American EJ can involve not only direct exploitation, but also indirect exploitation through consent influenced by severe economic marginalization.

Even more troubling, many case studies showcase involuntary development such as military use of native lands through resource extraction or placements of hazardous waste (Blackford 2004; Hooks and Smith 2004; Hoover et al. 2012). Indeed, energy, resource, and military development on tribal lands are perhaps three of the most extensively recorded and studied Native American EJ challenges (e.g. Burger, Powers, and Gochfeld 2010; Gowda and Easterling 2000).

Participatory Research

A participatory approach characterizes much Native American environmental justice research (e.g., Arquette et al. 2002; Minkler et al. 2008; Quigley et al. 2000; Whyte 2011). Participation ranges in terms of involvement throughout the process, including design of data collection instruments, risk assessments, presentation of findings, and development of educational materials to involvement in only one or two aspects of the research endeavor (Arquette et al. 2002; Minkler et al. 2008; Quigley et al. 2000). The goal of much participatory research is to improve poorly conducted risk assessments and to create more appropriate assessments that more accurately reflect Native American environmental and health understandings.

Studying the Mohawk tribe at Akwesasne, Arquette and colleagues (2002) found that unique perspectives emerged through engaging the community. The authors used participatory research to establish a holistic risk assessment approach that captures socioenvironmental interactions and tribal definitions of health and well-being. Arquette and colleagues claim that “[i]n order to promote health, justice, and equity, long-term investments must be made

in community-based research, including efforts that develop specialized strategies for communication and community participation” (263).

Similarly, research on tribal health and hazards management has engaged tribal citizens through research training, shared decision-making, tribal assistance in approval of grant applications, project publications, presentation of progress reports, and developing community exposure profiles (e.g., Minkler et al. 2008). Quigley and colleagues (2000) argue that

participatory research outcomes are far more preferable to the traditional environmental health approaches whereby a technical team determines a health research methodology, with minimal community accountability, and conducts a health study whose findings have little meaning or benefit, and often are more of a detriment, to the communities' health protection. (324)

Participatory research may also increase researchers' understanding of how to more appropriately assess environmental inequalities and best craft response programs and policies. Indeed, participatory research has proven to be beneficial for tribal communities in creating more accurate rubrics concerning risk assessments, effectively distributing research findings to stakeholders, as well as empowering Native American communities to address environmental and social injustices (Minkler et al. 2008; Shepard et al. 2002). For example, in Quigley and colleagues (2000) work on the Nuclear Risk Management for Native Communities (NRMNC)⁶ project, they found positive outcomes of a participatory research effort that included reduction of unequal power relationships between researchers and community members.

Native American Climate Justice

Case studies document a variety of environmental inequalities with regard to Native Americans, including lead poisoning (Bullard 1994; Malcoe et al. 2002), military weaponry testing and waste disposal (Blackford 2004; Gover and Walker 1992), and—more recently—vulnerability to climate change (Cochran et al. 2013; Maldonado et al. 2013; Lynn et al. 2013; Shearer 2012). Climate change became an EJ issue because those experiencing the most harmful effects of a changing climate are typically those who have contributed the least emissions (Trainor et al. 2007). Native groups' vulnerability to climate change manifests through issues of food security, traditional knowledge, climate adaptation, and tribal control of resources.

The impacts of climate change on food security have already been felt (Cochran et al. 2013; Dittmer 2013; Gautam, Chief and Smith Jr. 2012). Many tribal citizens recognize changes (e.g. changing migration patterns, changes in harvesting times for various plants, etc.) in local environments (Cochran et al. 2013; Doyle, Redsteer, and Eggers 2013; McNeeley 2012). Additionally, tribal environmental concern can stem from government restrictions on hunting and harvesting of tribal natural resources (McNeeley 2012) and some tribes are

⁶The NRMNC is a collaborative (academic, community, and tribal) effort designed to support Native American communities in effectively managing nuclear risk (Quigley et al. 2000).

increasingly facing difficulties storing food (Doyle, Redsteer, and Eggers 2013; Lal, Alavatapati, and Mercer 2011). For example, natural ice cellars traditionally used for storing perishables such as fish are less efficient, often causing food-related illnesses and less traditional food use throughout Native Alaskan communities (Cochran et al. 2013). In addition, climate change is altering water flows and, therefore, salmon runs that affect Pacific Northwest tribes that are dependent on the fish for physical, cultural, and spiritual sustenance (Dittmer 2013). And broader ecosystem shifts have complex impacts: “...tribal harvesters have noticed shifts in harvest times for traditional foods; if the timing of flowering plants and the presence of pollinators, such as birds and insects, become less synchronized, impacts can ripple throughout the food webs” (Lynn et al. 2013, 2).⁷

While sustenance issues pertaining to climate change are problematic for Native American communities throughout the U.S., Native Alaskans are perhaps some of the most affected groups due to the fact that they are experiencing the negative effects of a changing climate at an alarming rate, which has hampered their ability to live predominantly off of the land and sea (Cochran et al. 2013; Loring and Gerlach 2009; Lynn et al. 2013; McBeath and Shepro 2007).

Furthermore, declining use of first foods is negatively affecting Native American health (Cochran et al. 2013; Lynn et al. 2013). For example, the quality and quantity of wild berry plants, a Wabanaki first food, are becoming inaccessible due to climate changes such as shifting seasonal patterns and increasing temperatures (Lynn et al. 2013). Wild berries are used to enhance the Wabanaki's spiritual and physical health, often in ways that are not entirely scientifically known (Lynn et al. 2013). Lynn and colleagues (2013) expand on the Wabanaki's use of berries, stating, “[w]ild berry plants serve a number of utilitarian, nutritional medicinal, and spiritual purpose among the Wabanaki people...[b]erries serve as key cultural indicators of ecosystem services in Wabanaki culture” (4). Many tribes now supplement first foods with purchased foods, which have resulted in increases in obesity, diabetes and cancer linked to dietary shifts (Alkon and Norgaard 2009; Lynn et al. 2013).

In addition to physical health impacts, loss of first foods negatively effects spiritual health through lessened ability to pass down traditional ecological knowledge (TEK) (Doyle, Redsteer, and Eggers 2013; Voggeser et al. 2013; Whyte 2013). TEK, or the “indigenous way of knowing” (Lynn et al. 2013, 3), is built upon a tribe's relationship to and dependence on traditional foods (Hoover et al. 2012; Krakoff 2008). This relationship is central to tribal health (Lynn et al. 2013). Because TEK is embedded in a “climatic and ecological context,” climate change increases the vulnerability of TEK and, in this way, environmental injustices become intergenerational issues that threaten culture.

Tribal adaptation to climate change is increasingly being studied (Cochran et al. 2013; Guatam, Chief and Smith Jr. 2012; Krakoff 2008; Lynn et al. 2013; Maldonado et al. 2013; McNeeley 2012; Voggeser et al. 2013; Whyte 2013). Frequently, researchers argue that tribes should be able to make their own culturally appropriate decisions about adaptation

⁷Lynn and colleagues (2013) explore climate impacts on harvest times for several tribes in Canada, Alaska, Maine, and coastal Louisiana.

strategies (Cochran et al. 2013; Krakoff 2011). Considering the oppressive history surrounding Native Americans, such tribal participation is critical in ensuring that decisions made about tribal climate adaptation originate from the affected groups themselves. For instance, if relocation is the only viable option for climate adaptation, tribal participation in the decision-making process is a necessity (Maldonado et al. 2013).

Some researchers argue that TEK may be a valuable resource for climate adaptation (Cochran et al. 2013; Lal, Alavatapati, and Mercer 2011; Lynn et al. 2013; Reo and Parker 2013; Robyn 2002). TEK can better inform policy, resource management and scientific research in order to reduce negative impacts of climate change on natural resources (Lal, Alavatapati, and Mercer 2011; McBeath and Shepro 2007). “TEK and tribal connection to traditional foods offer strategies for adaptation that can help tribal and non-tribal resource managers confront the climate challenge. As TEK informs research, tribes and non-tribal entities can work together to incorporate TEK in a tribally-appropriate manner” (Lynn et al. 2013, 3).⁸

Unfortunately, tribal climate change adaptation and access to traditional resources is often impeded through laws, regulations or policies that limit tribes' climate responses (Krakoff 2008; Lynn et al. 2013; Whyte 2013). Regulations that, for example, limit the times of year tribes can fish or hunt (despite seasonal changes) further exacerbates Native American struggles to fully practice and achieve self-determination and sovereignty (Lynn et al. 2013). In order to overcome these barriers, Whyte (2013) argues that stakeholders are key:

Insofar as these leaders, scientists and professionals work with or for tribes, they are responsible to do what is in their power to address the coupled political obstructions and ecological challenges of adaptation. They are responsible because they do have some capacity to make changes in institutions and political orders, even if these changes must start at scales that are initially local or quite broad. (7)

Conclusion and Future Considerations

Through examination of a cross-disciplinary collection of recent studies, we identified unique dimensions of Native American EJ, including their distinctive cultural and political standings in an EJ context, highlighted strategies used within Native American studies of environmental justice, and provided an analysis of Native American climate justice literature. In so doing, this review offers a useful foundation from which subsequent research can expand.

Research related to climate vulnerability is identified as a critically important gap that warrants further research into climate justice related issues concerning Native Americans and Indigenous groups internationally. Another critical gap -- and as recognized within broader EJ scholarship -- is the critical positioning of contemporary environmental inequalities within historical processes. Recent research focused on urban environmental

⁸The U.S. Forest Service (USFS) provides an excellent case study of the ways in which TEK can be incorporated into environmental science research and land management, specifically with regard to forest fire science and management (<http://www.fs.fed.us/spf/tribalrelations/index.shtml>).

justice links present inequalities to past patterns of racial and ethnic disparities in power and privilege (Taylor 2009). Such a perspective is essential in examination of the issues facing today's native peoples.

The myriad case studies brought together here further suggest that Native American EJ issues continue to challenge “traditional” Western conceptions of science and health—a challenge that must be integrated into research approaches and understandings as well as responsive policies and programs. We argue that such cultural reflection is potentially one of the most significant contributions this collection of literature has provided to the broader field of environmental justice scholarship and one that requires further synthesis and consideration.

Future considerations in Native American EJ research include increased use of qualitative or mixed methods approaches so as to understand (rather than infer) reasons behind decision-making processes within tribal governments that allow or do not allow harmful environmental activities on tribal land, for example. Further, it would be beneficial for researchers to analyze the outcomes of participatory research in Native American EJ studies, and EJ studies generally, in order to determine the effectiveness of specific participatory methods in achieving positive outcomes for the affected group or groups.

Despite the apparent increase in Native American environmental justice studies, the “startling” level of environmental risk borne by these groups mandates additional scholarship (Hooks and Smith 2004, 588).⁹ EJ efforts to remediate environmental ills imposed on Native Americans remain critical. However, Native American EJ research must continue to examine and address justice issues concerning tribal climate adaptation and vulnerability—as Native American tribes are likely to increasingly face environmental, social, and political challenges associated with climate change.

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⁹Forty-three of the 66 articles (65%) reviewed were from the last ten years (2004–2013).

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