

# INTERMOUNTAIN WEST CLIMATE SUMMARY



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## Understanding the Climate Vulnerabilities, Needs, and Resources of Tribal Communities: A Summary of Two Recent Workshops

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Over 550 federally recognized Native Nations occupy and manage 56 million acres across the U.S, with the majority of tribal lands being located west of the Mississippi River. In Colorado, Utah, and Wyoming, there are nine federally recognized tribes (Figure 1). These tribal communities in the Intermountain West, like all communities and lands in the region, are subject to climate vulnerabilities and the prospect of worsening impacts from climate change. But managers of tribal lands here and elsewhere face additional and significant challenges, and native communities across the country will be disproportionately impacted by climate change due to the prevalence of subsistence economies and the deep cultural and spiritual association with place (Hanna et al 2007). Compounding these issues, many reservations and tribal lands within the U.S. are located in remote areas where substandard housing, unemployment, and poverty prevail (NPNH press release, 2009). At the same time, Native peoples also have unique capabilities, including practices, traditions, and associated cultural resources developed over hundreds or thousands of years that are inseparable from their land and resources.

Despite the importance of tribal communities in the West and the US, and their increased vulnerability to drought and climate change, there has been limited attention given to the challenges and needs specific to the tribes.

In the past year, two workshops were convened to discuss the challenges faced by tribes in responding to and mitigating the impacts of climate variability and climate change. On June 9-11, 2009, the National Integrated Drought Information System (NIDIS) convened the **Climate, Drought and Early Warning on Western Native Lands Workshop** in Jackson Hole, Wyoming, to initiate a long-term commitment to providing western tribes

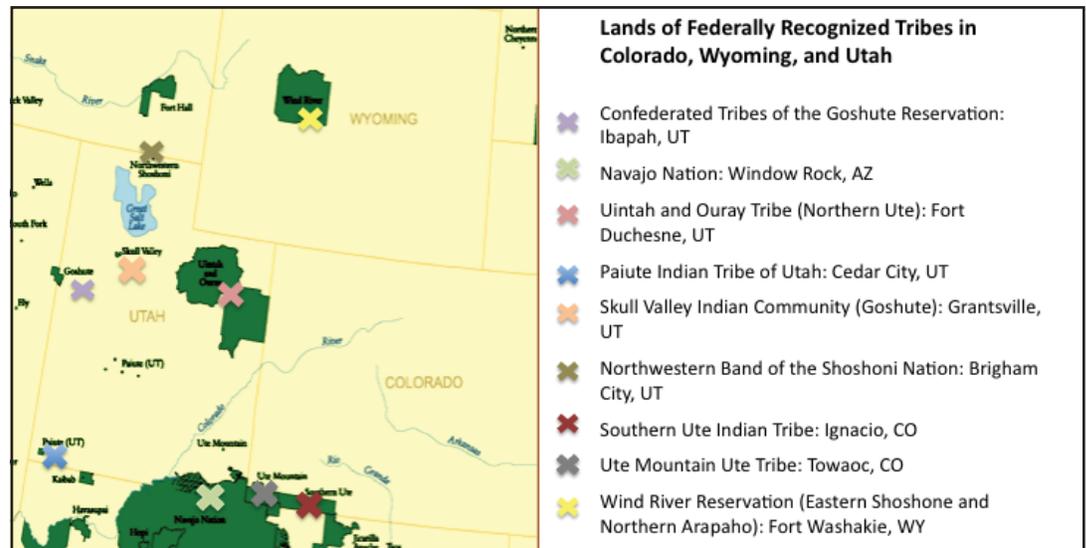


Figure 1: Map of federally recognized tribes in Wyoming, Utah, and Colorado (U.S. Census Bureau)

with the drought information and resources needed to better monitor and respond to drought conditions and long-term climate changes. From November 18-21, 2009 in Mystic Lake, Minnesota, in conjunction with partner tribal colleges and universities, NASA convened the second **Native Peoples Native Homelands (NPNH) Workshop** to discuss strategies for addressing the impacts of climate change.

The Jackson Hole workshop framed impacts and recommendations in the context of building drought preparedness, while the NPNH workshop focused specifically on climate change as the framing for discussion. However, many recommendations from the Jackson Hole workshop fall in line with the NPNH objective of identifying response strategies to adapt to and mitigate climate change impacts on tribal lands. The recommendations from both workshops discussed here may help federal agencies and other decision-makers with potential cross-agency and tribal collaborations, and help prioritize research and funding within the local, state, federal, and tribal agencies and utilities.



## Climate, Drought and Early Warning on Western Native Lands Workshop Summary

This NIDIS-sponsored workshop brought together 40 representatives from several western tribes, including Northern Arapaho, Swinomish, Taos and Hualapai, tribal colleges such as Diné College, as well as NGOs, federal research agencies, and federal natural resource management agencies, to address drought monitoring needs, gaps, and projects on western tribal lands. The majority of discussion focused on drought-monitoring technologies, products, and needs, cultural resources, energy development, and defining the federal trust responsibility as it relates to drought monitoring efforts. The main workshop objectives included:

- Understand and identify barriers to mitigating drought conditions;
- Identify specific projects and/or areas of research that address or help remove barriers; and
- Identify the partnerships and institutional structures needed to carry out project goals.

Experts delivered short topical presentations followed by small group discussion sessions. Based on recommendations from workshop participants, the federal trust responsibility—the legally binding relationship between federal and tribal governments to nurture tribal well being—was presented to help frame research needs and guide central objectives identified throughout this workshop (Revar 2004). Below are the recommendations to address early warning drought monitoring, and on a larger scale, to mitigate climate change on western tribal lands.

### Understanding the Role of Federal Trust Responsibilities

The federal trust responsibility characterizes the legal relationship that exists between the federal government and American Indian tribes, intended to promote and guarantee the overall welfare of tribes and individual Native Americans, including an obligation to provide those services required to protect and enhance Indian lands, resources, and self-government (Pevar 2004). With respect to NOAA and NIDIS, identifying active trust responsibilities vis-a-vis western tribes is important in prioritizing drought monitoring and other activities on tribal lands. First, workshop participants recommended drafting a document explaining the federal trust responsibility, including background, central tenets, and applications to help tribes and federal agencies come to the table with an understanding of expectations. Second, an assess-

ment of active federal trust responsibility activities that relate to natural resource management could set the stage for cross-agency collaborations and clarify how the trust responsibility functions in an operational role. Once this information is compiled and understood, federal agencies could more effectively carry out work on drought monitoring and mitigation within the context of trust responsibilities.

### Data Collection and Monitoring Gaps

Workshop participants noted that insufficient monitoring of drought, climate, and hydrologic conditions is a primary hurdle in assessing emerging trends in precipitation, streamflow, soil moisture, and other drought and climate indicators. Expanding remote sensing technologies, improving streamflow monitoring, and greater tribal engagement and inclusion in data collection and observation efforts were highlighted as primary ways to help address observation and monitoring gaps.

Workshop participants recommended improving remote sensing datasets and drought monitoring gaps on tribal lands, emphasizing that remote sensing measurements have broad application for measuring a number of drought indicators depending on the surface characteristic or process being measured. In turn, tribes could emerge as major users of remote sensing technologies and datasets, justifying increased overall support for early warning drought capabilities and drought relief strategies. Second, workshop participants acknowledged the need to expand streamflow monitoring efforts on tribal lands, noting that USGS streamflow gauges currently in place underrepresent the span of geographic, climatic, and hydrologic conditions that exist. Streamflow monitoring is also key to risk assessment, and in the development and accurate representation of drought indices, products, and triggers that promote decisive action. A recurring theme in the workshop discussion was the necessity of tribal involvement in data collection efforts, including an understanding of datasets, methodologies for collection and interpretation, applications to drought monitoring, and climate models. Tribal involvement in data collection efforts helps entities and researchers advance regional monitoring that will in turn assist tribes in building the capacity to monitor and manage their own resources. Technical data integration, application and interpretation is currently of little use to tribes because it is poorly translated, and is largely beyond the scope and relevancy of Native communities. Also, current observations by tribal communities are not clearly categorized or acknowledged as a formal data sets, and instead are usually treated as supplemental “anecdotal” evidence. Although some tribes have indicated that indigenous methods of drought observations are currently used, formal integration and collaboration with federal and state agencies is needed.

### Interdisciplinary Research Needs

There are four categories identified by workshop participants as interdisciplinary research needs:

#### Workshop Weblinks:

##### Climate, Drought and Early Warning on Western Native Lands website:

[http://www.drought.gov/portal/server.pt/community/drought.gov/tribal\\_workshop](http://www.drought.gov/portal/server.pt/community/drought.gov/tribal_workshop)

##### Native Peoples Native Homelands Workshop website:

<http://nativepeoplesnativehomelands.org/>



risk and impact assessment, water supply assessment and improved management of water natural resources, development of knowledge systems, and renewable energy scoping and development.

### ***Risk and Impact Assessment***

Updated impact assessments provide valuable information on the progression of impacts from anomalous climate and hydrologic conditions. However, engaging tribal communities in drought monitoring and impact assessment efforts requires using different strategies than those currently employed in federal and state drought planning. Workshop participants recommended an assessment of current and projected drought risk, drought impacts and vulnerabilities, impacts from various energy development sources and projects, and development of a tribal drought index and suite of drought monitoring products.

### ***Water Supply Assessment & Improved Management of Water and Natural Resources***

Underlying many of the challenges facing western tribes is insufficient management or control of natural resources such as water. Workshop participants recommended a water supply assessment on western tribal lands, citing increasing regional development bordering tribal lands, increased natural resource extraction and renewable energy development, and adjudicated water rights as justification for better understanding the state of tribal water supplies. Water supply assessment would also provide necessary information for water adjudication suits, thus fulfilling multiple goals for the benefit of tribal water supplies and rights. Second, solidification of water rights was identified as a necessary step in mitigating impacts felt from drought and changing climate conditions. Finally, the creation of a document describing the adjudication process, supplemented with resources and contacts, could also provide tribes with useful support for the adjudication process.

### ***Development of Knowledge Systems***

Development of knowledge systems refers to the expansion of financial, educational, and other skill sets or resources needed to build tribal expertise, engage in drought monitoring efforts, gain better control of natural resources, and promote expansion of renewable energy or other markets. Workshop participants recognized that engaging tribal colleges and schools is an appropriate place to build curricula, advance skill sets, and fulfill the goal of engaging Native people in research efforts. In addition, participants noted that better communication and instruction on drought monitoring technologies, datasets and products by federal and state agencies is needed if promotion of building tribal knowledge is a primary objective. Educational workshops could cover important topics such as climate processes, observations of climate variability and climate change projections, impacts to regional hydrologic processes, water management, prior appropriation, and water right acquisition and adjudication. Finally,

development of an tribal elder advisory program was identified as a means to sustain and promote the traditional knowledge base of tribes. Tribal representatives recommended that allowing students to spend time with tribal elders, and learning traditional knowledge methodologies, worldviews, language, and traditions, be an integral part of classroom curriculum.

### ***Renewable Energy Scoping and Development***

Workshop attendees focused much discussion on renewable energy development as a primary means to secure financial capital, mitigate climate, and to potentially gain more control over natural resources. Expanding specific renewable energy efforts is also in alignment with land use ethics practiced by many tribes. Four specific areas were identified to help achieve the primary objective of expanding tribal involvement in renewable energy markets. Regardless of motivation to pursue alternative financial markets, bridging the gap between wanting to pursue alternative financial markets and the know-how needed to begin was an issue brought up by workshop participants. Workshop participants suggested the creation of an energy handbook or template, a resource to help equip tribes with the fundamental information and resources necessary to begin renewable energy pursuits. Workshop representatives also indicated a need for a renewable energy feasibility study that would provide Native communities with guidance on the financial requirements, technological capacity, infrastructure needed, and projected return values of renewable energy sectors, specifically focusing on wind and solar markets. Suggested feasibility studies include the Colorado Plateau, Pacific Northwest, and the Intermountain West regions, capturing the geographic, climatic, and hydrologic variability across tribal lands in the West.

In response to Executive Order 12902 (Energy efficiency and Water Conservation at Federal Facilities) that requires a “comprehensive facility audits” of federal facilities, workshop participants recommended the inclusion of tribal facilities and properties in the auditing processes. Finally, participants recommended the creation of an “energy portal” on the NIDIS ‘U.S. Drought Portal’ website (<http://www.drought.gov>) as a central location to coordinate research, facilitate communication between tribes, and in general, establish long-term partnerships and build and sustain momentum for renewable energy projects on tribal lands. The energy portal could potentially serve as a prototype for coordinating research and facilitating discussion for all drought monitoring and climate- and water-related efforts on tribal land.

### ***Developing and Strengthening Federal/State and Tribal Institutional Capacities***

Tribal, federal, and state representatives alike agreed that strengthening institutional capacities is key to fulfilling the federal trust responsibility, to building long-term research partnerships, and to engaging tribes from within. Workshop participants recommended creating or involving organizations or positions that serve in an intermediary or advisory capacity to coordinate



## Southwest/California/Great Basin Geographic Regional Breakout Session

*What are the observed stresses and impacts, tied to climate change, on tribal lands?*

### Northern California (Tribes unspecified):

- Changes in salmon spawning behavior due to increasing stream temperatures
- Juvenile fish migration patterns adversely affected
- Increased fire affects water quality, increased sediment loading



### Pyramid Lake Paiute Tribe: Truckee River Basin

- Lahontan Cutthroat Trout in Pyramid Lake threatened due to:
  - Increased salinity, increased solids in Pyramid Lake, Truckee River
  - Multi-year low streamflows result in increased water resource development projects, increased competition, increased water diversions from dams



Lahontan Cutthroat Trout Cui-ui Chub

### Tohono O'odham Tribe: Southern Arizona/Mexico Border:

- Changes in animal migration patterns
- Impact to traditional economies: basket-making—must go to Mexico to find adequate materials
- Harvest patterns of traditional foods, saguaro and prickly pear cactus
- Earlier occurrence and persistence of warm temperatures
- Change in monsoon rains: unreliable, earlier occurrence observed; once monsoon rains arrive, can't harvest
- Invasives: buffelgrass from Africa: water intensive, invades native species



### Hopi Tribe: Black Mesa, Four Corners Region

- Increased drought
- Increased invasives: tamarisk, tumbleweed
- Impact to native species
- Impact to traditional subsistence economies: increased pressure to rely on energy development to supplement struggling economies, contributing to fossil fuel emissions
- Severe impacts resulting from the Coal slurry operation (Peabody Mining) on Black Mesa extracted coal using groundwater: Mojave Generating Station (closed in 2005)



- Impact to groundwater: extracted 4,000 acre-feet of water annually for 30 years—major groundwater depletions
- Springs, wells depleted: delay in hauling water
- Mining disturbs gas pockets
- Emitting nitrous gas, acids
- Threatened sacred water resources

### Navajo Tribe: Four Corners Region

- Increased drought
- Changes in plant diversity, wildlife migration pattern
- Impacts to plants/edibles: traditional, piñon juniper ecosystems
- Piñon pine requires 70-80 years to harvest pinyon nuts, rate of regeneration has dramatically declined
- Weak, unreliable monsoon systems: Impact to cultural traditions: ceremonial obligations tied to monsoon systems
- Resulting impacts to pastoral lifestyles
- Increased energy development on sacred land
  - Uranium open-pit mining operations on San Francisco Peaks



### Havasupai Tribes & Colorado River Tribes: Grand Canyon Region

- Impact to traditional economies due to increased energy development projects
- Uranium, mining extraction impacts:
  - Threat to health: prevalence of cancer, asthma
  - Contamination of ground and surface water supplies, Colorado River
  - Contamination of Grand Canyon watershed



Figure 2: Summary of impacts addressed by tribal representatives in attendance at the Southwest/California/Great Basin regional breakout session at the NPNH workshop. This is not a comprehensive list of impacts experienced on tribal lands in these regions, but rather a summary of major impacts and stresses raised by session participants.



between multiple stakeholder groups; for example, regional NOAA tribal liaisons, and a North American tribal representative to the Intergovernmental Panel on Climate Change (IPCC). Tribal appointees could help coordinate tribal projects with affiliated entities on the regional and international scale.

Also recommended was greater tribal collaboration with the Regional Integrated Sciences and Assessments (RISA) programs such as Western Water Assessment (RISA 2020 and [http://www.climate.noaa.gov/cpo\\_pa/risa/](http://www.climate.noaa.gov/cpo_pa/risa/)). There are currently eight active RISA programs across the U.S. The RISAs could provide tribes with assessments, projects, and materials geared towards assisting tribal members with adapting to and mitigating climate variability and change, as well as data collection and monitoring needs. Climate Assessment for the Southwest (CLIMAS), the RISA program covering Arizona and New Mexico, has for years been directly involved in assisting tribes and has carried out projects and research with western tribal applications. Participants also pointed out that tribal colleges are a crucial institutional framework from which to facilitate research, resources, and transfer of knowledge and dissemination of information. Developing a set of projects with direct input from tribal colleges and faculty could assist federal and affiliated agencies with an idea of where interests, research needs and gaps lie concerning drought monitoring and adapting to and mitigating climate change. Finally, state and private undergraduate and graduate program involvement could help facilitate projects or research themes that focus on an area identified by partnering tribal leaders and tribal colleges.

### Native Peoples Native Homelands Workshop

Ten years after the first NPNH Workshop was held in Albuquerque, New Mexico in 1998, the second NPNH workshop addressed strategies for addressing the impacts of climate change, propose immediate response and adaptation recommendations,



Figure 3: Tribal members presenting concerns to EPA representatives during the EPA Council of Environmental Quality Listening Session at the NPNH workshop. Photo courtesy Dick Bancroft, Honor the Earth, <http://www.honorearth.org/>.



Figure 4: Winona LaDuke, Executive Director, Honor the Earth, speaking at the NPNH workshop. Photo courtesy Dick Bancroft, Honor the Earth, <http://www.honorearth.org/>.

and draft a declaration of actions, called the Mystic Lake Declaration, from represented tribes to address the Copenhagen Climate Summit in December 2009. The workshop was also in part a collective response to the recent release of the 2009 U.S. National Assessment of Global Climate Change Impacts in the United States, which, according to many tribal communities, did not include adequate consideration of tribal issues.

The workshop participants included American Indian, Alaska Native, and Native Hawaiian community members, leaders and elders, tribal College and Universities, climate scientists, NGOs, and federal and state agencies. The four-day workshop featured issue-based presentations, panel discussions, and small break-out groups. On the second day, representatives from the EPA Council on Environmental Quality hosted a listening session, asking participants to address observed impacts stemming from or contributing to climate change, adaptation or mitigation strategies being employed, and recommendations concerning where to direct federal funding support to aid in alleviating impacts (Figure 3). Throughout the workshop, concurrent topic or region-based sessions helped narrow discussion by convening experts and individuals interested in specific issues and regions. Figure 2 shows a summary of climate change impacts identified in the Southwest/California/Great Basin session. Below is a summary of the principal workshop recommendations for effective adaptation and mitigation strategies to address observed and projected climate change impacts.

### Building Renewable Energy Economies

Speakers cited the necessity of moving away from fossil fuel energy development agenda as an immediate mitigation strategy, with a target of achieving global carbon emission reductions of 40% below 1990 levels by 2020. Workshop organizers and speakers recommended widespread development of renewable energy economies on tribal lands, particularly solar and wind projects, as a response to achieving emission reductions, building



sustainable economies, and mitigating health impacts associated with energy development. As Winona LaDuke, Executive Director of Honor the Earth, stated, “This means shifting the energy paradigm so that [native peoples] develop efficiency and produce our own clean energy” (NPNH press release 2009) (Figure 4). Throughout the workshop, speakers raised concerns over coal, natural gas, and coal-bed methane extraction on tribal lands that increases fossil fuel emissions. In addition, proximity to energy development projects is a contributing factor in asthma prevalence and exposure to airborne carcinogens on tribal lands (Wernham 2007). Representatives from Diné CARE (Citizens Against Ruining our Environment), a Navajo Nation-based NGO, indicated that prevalence of asthma, respiratory problems, and certain types of cancers on reservations is much higher than the national averages, in some cases 16 times the national average. Many tribal communities are currently pursuing active participation in renewable energy markets. Renewable energy initiatives are prevalent in tribal NGO action agendas, and many courses are being developed by tribal colleges to provide tribal members with the skills to build and sustain renewable energy developments on their lands.

### **Protection of Cultural Resources**

Protecting cultural resources was repeatedly highlighted as strategy for reducing climate vulnerability and related impacts to Traditional lifestyles. Tribal livelihoods are based on an intrinsic relationship to the land and resources, with continuing reliance on subsistence economies and the “deep cultural and spiritual significance of place” (NPNH press release, 2009). As a result, climate change and hydrologic changes that impact regional landscapes, habitat, and species, also threaten long-standing traditions and practices. Participants echoed concerns surrounding land use changes tied to energy development, drought, or erosion of coastal shorelines, stating that if impacts connected to climate change forces communities to move off of reservations, then the destruction of entire cultures and traditions is imminent. Tribal elders encouraged participants to continue upholding traditional languages and customs as a defense mechanism to reduce the effects from climate change, reminding tribal participants that when times are tough, generations of knowledge will help guide decision-making. Enhanced cultural education within families, communities, and schools was recommended throughout the workshop discussions.

### **Protection of Water Resources**

The availability and quality of water resources were widespread concerns among native community members in attendance. Tribal members have observed warmer stream temperatures, earlier runoff in snowpack-dominated watersheds, and lower streamflows, impacting fisheries and agriculture. In general, tribal representatives expressed frustrations over their lack of control over water resources on their lands, citing increased sediment loading, rising levels of pollutants, and impacts

to fisheries and riparian ecosystems as evidence of poor management. Further, representatives from the Inter-tribal Wind Project expressed concerns about large reservoir storage projects as a potential solution for securing future water resources. Finally, tribes expressed the need to adjudicate or solidify federally reserved water rights, in the face of increasing efforts by municipalities to secure additional water resources. Solidifying tribal water rights, developing tribal water management codes, and rehabilitating fisheries and aquatic habitats were identified as mechanisms to protect water resources both on and off tribal lands.

### **Behavior Modification and Lifestyle Changes**

The workshop discussion was centered on lifestyle changes and behavioral modifications that are in alignment with known ecological and natural resource thresholds. Tribal speakers urged participants to identify their individual fossil fuel and natural resource consumption rates and frame solutions within a spiritual, ethic-based perspective. Many speakers pointed out that taking responsibility for individual and community consumption is crucial in seeking long-term solutions to climate change impacts. Speakers recommended the development of household energy budgets, an assessment of water consumption, the development of renewable energy economies, and an increase in domestic food production, particularly growing traditional seeds and native plants as mitigation strategies. LaDuke noted that the first step in addressing climate change on tribal lands is to make changes individually and within communities, emphasizing that family or community-scale food production is a powerful step to living sustainably. Speakers continuously urged participants to be cautious of technology or policies that support consumption-driven lifestyles, business-as-usual fossil fuel emissions, current natural resource consumption rates, and unequal sharing of climate change consequences.

### **Building Tribal Expertise**

Workshop speakers and participants expressed continued frustration with the inadequacy of current scientific assessments and climate change policy, noting that the vast majority of climate-related research, stakeholder interaction, and solution mechanisms exclude tribal input and methodologies. According to Daniel Wildcat, workshop organizer and Haskell Indian Nations University professor, “Our knowledge and work must be included in a meaningful and central way in any assessment of climate change. We need a legitimate seat at the table in policy discussions” (NPNH press release, 2009). In addition, indigenous methodologies of observing change in resources, land, habitat and wildlife are consistently regarded as inferior to mainstream scientific methodologies, and subsequently such findings are consistently left out of climate change research and policy.

To address these inadequacies, participants recommended building tribal expertise as a mechanism for both tribal participation in federal and state policy landscapes and incorporation of indigenous methodologies in academic spheres. Participants



and speakers alike urged tribal colleges and advocacy groups to support programs and initiatives that develop tribal expertise in natural resource management, renewable energy development, community and social health, agriculture, and community planning, as an effective approach to addressing the nexus between climate change, long-term cultural vitality, and policy reform. Such programs would help achieve what Haskell representatives saw as a growing trend in support of “tribal autonomy of research.” Further, participants recommended more collaborations with federal and state agencies and universities, to help build saliency and awareness within mainstream scientific and academic spheres.

### The Mystic Lake Declaration

Building on the 1998 Albuquerque Declaration from the first NPNH Workshop, the Mystic Lake Declaration provides statements of indigenous perspectives and solutions to help manage and mitigate the cause and impacts of human-induced climate change (<http://portal3.aihec.org/sites/NPNH/Document%20Center/The%20Mystic%20Lake%20Declaration2.htm>). Central statements of the draft Mystic Lake Declaration summarize the key issues, concerns, and solutions from the workshop discussions and presentations. Overarching tenets of the Declaration include: Global carbon emission reductions of 40% below 1990 levels by 2020, development of new economies based on the limits of ecological sustainability, a more equitable sharing of global and local resources, the inclusion of United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) in all negotiations as standard for protecting Indigenous Rights; and indigenous inclusion of decision-making and negotiations at Copenhagen and elsewhere. The Declaration was brought to the Copenhagen climate summit as a unified indigenous statement of responsibility and action. The complete text is available on the workshop website homepage: <http://nativepeoplesnativehomelands.org/>.

### Conclusion & Next Steps

In summary, both workshops highlighted security of water resources, protection of cultural resources, expansion of renewable energy markets, and development of tribal expertise as action items to direct tribal, federal, and state research and collaborations. Above all, tribal representatives emphasized a necessity to be included in natural resource management and policy discussions, and recognition that seemingly unrelated policies and decisions have lasting impacts on tribal resources and lifestyles.

Currently, the NPNH Workshop report is being drafted by workshop organizers, and the NIDIS Jackson Hole Workshop report is near final form and will be posted shortly on the workshop website. Further regional tribal collaborations are being identified by NOAA, NIDIS, NASA, and partnering universities. Contact Christina Alvord at [Christina.alvord@noaa.gov](mailto:Christina.alvord@noaa.gov) for additional information about developing collaborative projects.

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