

NATIVE PEOPLES-NATIVE HOMELANDS CLIMATE CHANGE WORKSHOP

– Final Report –
Nancy G. Maynard, Editor

CIRCLES OF WISDOM



U.S. Global Change Research Program

OCTOBER 28 – NOVEMBER 1, 1998
Albuquerque Convention Center
Albuquerque, New Mexico

Sponsors:
The National Aeronautics and Space Administration
American Indian Chamber of Commerce of New Mexico
City of Albuquerque

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Editor's Notes

Following this workshop, the discussion results from the Wisdom Circles (Breakout Groups) were synthesized and augmented based upon comments from a number of workshop participants and other reviewers into what is now Chapter 12 of the U.S. National Assessment (Chapter 12: Potential Consequences of Climate Variability and Change for Native Peoples and Homelands, by Schuyler Houser, Verna Teller, Michael MacCracken, Robert Gough, and Patrick Spears, pp. 351–377 in *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change. Foundation Report*, prepared by the National Assessment Synthesis Team, U.S. Global Change Research Program, published by Cambridge University Press, Cambridge UK, 2001, 612 pp.

Because the U.S. National Assessment chapter was put together based upon the material from our workshop discussions, we have chosen to use the "Key Issues" section from Chapter 12 as part of this workshop report. In addition, for the convenience of the reader, we have included Chapter 12 in its entirety in the appendix.

To highlight regional concerns identified in other workshops held as part of the U.S. National Assessment, selected information is reprinted here to provide context for consideration of Native Peoples and Homelands issues and concerns.

Foreword



The Native Peoples-Native Homelands Climate Change Workshop was held on October 28 through November 01, 1998, as part of a series of workshops being held around the U.S. to improve the understanding of the potential consequences of climate variability and change for the Nation. This workshop was specifically designed by Native Peoples to examine the impacts of climate change and extreme weather variability on Native Peoples and Native Homelands from an indigenous cultural and spiritual perspective and to develop recommendations as well as identify potential response actions. Native Peoples, with our spiritual traditions and long community histories of change, adaptation, and survival in specific regions, are providing a unique contribution to the assessment and understanding of climate change as well as to the development of sustainable economies in this country.

Native Peoples represent the premier human communities of this continent with our traditional cultures seasoned over millennia. Native Peoples carry not only sharpened skills of observation, specialized environmental knowledge and time-tested ecological wisdom embedded within various aspects of our traditional cultures, but also the awesome responsibility to speak from the broader base of human experience sadly lacking in those merely concerned with the commodification of this planet, its nature and climate.

Native Peoples and their homelands are repositories of valuable human and natural resources with significant implications for addressing climate change issues. Not unlike island nations, the land bases contained within Indian reservations represent significant land holdings often in relatively undisturbed tracts embracing a variety of microenvironments that contain a wide range of indigenous plant and animal species. These species include many which can serve as key indicator species to monitor and document climate change.

Reservation communities are composed of multi-generations of Indian families who have resided in relatively fixed locations of federal reservations for over a

century. Some tribes were not given the opportunity to select their own reservation lands, and were sent to distant, and often inhospitable areas remote from their original homelands. Of those tribes that could select the locations of their reserved lands, most chose selectively within their aboriginal homelands in order to assure access to critical cultural and natural resources, including particular plant and animal species. These communities have first-hand, detailed familiarity with the environment and its history over long periods of time and through various types of economic development. Surviving indigenous cultures continue to rely upon strong traditions and pass ecological knowledge across generations through intact oral histories, ceremonies, and cultural practices about specific locations and past climatic variability.

Tribal concerns naturally span many generations, and strategic thinking is naturally inclined for the long-term, not just short-term survival. Tribal cultural worldviews envision and accept the relationship between the human and the natural world. Basic cultural assumptions hold that all things in creation are related and each has effects upon the other.

The Native Peoples-Native Homelands Climate Change Workshop was an opportunity for Native Peoples to provide the basis for the section of the U.S. National Assessment addressing the impacts of global climate change on Native Homelands and Peoples and to participate in the development of the national policy and research agenda. Areas of impact that were considered in the workshop included agriculture, energy, natural resources, vegetation, fish and wildlife, economy, disaster planning, water resources, tourism, culture, and human populations.

Under numerous treaties, statutes, executive orders and policies, the United States has direct and express legal obligations through its trust responsibility to Native Peoples for the protection of our Native Homelands, sacred sites, and natural and cultural resources. To meet fully its obligations for the protection of cultural resources and the maintenance of habitat integrity and biodiversity,

the United States must engage in meaningful consultation and participation in public processes, must be responsive to tribal concerns, and must establish appropriate protocols with American Indian Tribal nations on a government to government basis.

Traditional native cultures intimately rely upon plant and animal resources found in specific microhabitats, many of which are critically vulnerable and already under extreme pressure from pollution and other activities of industrial society. Superimposed upon these vulnerabilities, global climate change is already having direct and adverse impact on cultures of Native Peoples and the biological resources of our traditional Homelands. Nowhere can these changes be seen more dramatically than in the Arctic and Sub-Arctic regions highlighted in this report.

This workshop raised critical concerns about the potential impacts that changing and extremely variable weather patterns may hold for Native Homelands with geographic and political ties to the United States of America. It presents the concerns of a variety of indigenous Native Americans, and particularly American Indians, who are the largest and perhaps most widely recognized group of indigenous people living in North America. However, it references the concerns and opportunities originating throughout indigenous America, including Native Alaskans, Hawaiians, and Caribbean and Pacific Islanders whose histories, cultures, and imminent climatic risk warrant thoughtful consideration in the national assessment.

The Native Peoples-Native Homelands Workshop took its impetus from several sources:

First, as mentioned above, the United States has legal responsibilities under numerous treaties and agreements to consult with American Indian Tribes on questions of policy directly affecting Tribal resources.

Second, as America's oldest surviving societies, Native Peoples carry a wealth of traditions and knowledge about the role of human beings in balance of plant, animal, human, and spirit relations on this continent.

Third, today from the Arctic to Mexico, Native Peoples who continue age-old subsistence and cultural traditions intimately woven into the seasonal cycles of plant and animal life, report that the seasons are slipping.

These contemporary observations of the shifts in the normal historic range of physical phenomena and bio-behaviors support the conclusions of western scientific observations associated with climatic warming and variability, and should be included on their own merits as well as a basis for additional investigation.

Fourth and finally, Native Peoples recognize that the present circumstances require pro-active protection of our natural environments, including the support of various "no and low regrets" strategies. With a few exceptions, economic conditions for Native Peoples in their traditional Homelands range from the least economically developed to those scarred by the assaults of rampant energy-related resource extraction. With assistance, Native Homelands may serve as models for sustainable development practices through a variety of "no regrets" strategies that may have applicability throughout this continent and the developing world. Such development, guided by the traditional wisdom of decision making, that regards the impact of such decisions upon the next seven generations, may help strike the necessary environmental balances required to sustain the health and diversity of our ecosystems in the difficult times ahead, as now prophesied by both the Native and scientific traditions.

The fact that North American indigenous societies have survived into the 21st century, with cultures, traditions, languages, and portions of their Native Homelands relatively intact, speaks of a respectful and enduring reliance upon traditional ecological knowledge, spiritual strength, and cultural adaptations unsurpassed in North America.

American Indians are not the only indigenous examples of sustainable living within the political sphere of the United States with traditional ecological knowledge and cultural traditions. Similarly situated Native Alaskan villages and communities, as well as Native Hawaiians, also hold a special status within the United States and their respective states. In addition, there are numerous indigenous communities to be found on the many Pacific and Caribbean Islands, that maintain formal political, geographic and economic relationships between their homeland territories and the United States. The concerns of all of these Native Peoples are of vital importance to the national assessment.

In principle, the concerns raised in this workshop encompass the entirety of the United States, including all

flag island territories. Native communities may be found within 200 miles of any place on the map of this country. Participation was necessarily limited due to financial and facility requirements. However, participants in this assessment workshop were invited from every part of the country. Attendees were primarily representing interested Native Peoples, Tribal Governments, and Tribal Colleges and included Tribal leaders, natural resource managers, and Tribal College staff, students, and climate scientists from government agencies and universities.

It should be underscored that while the workshop provided a unique opportunity for Tribal participants to interact with climate scientists and federal officials, this workshop did not constitute legal, government-to-government consultation between federal officials and the tribes. Instead, it should serve as a guidance document for policy consultations yet to come.

As co-chairs and on behalf of the steering committee, we wish to express our personal gratitude to the many individuals and organizations that brought the energy, insight, experience and resources together throughout the year leading up to the convening of the Native Peoples-Native Homelands USGCRP Climate Change Workshop. We offer our deepest thanks to the elders and spiritual leaders from the Four Corners of this Turtle Island, who carry this continent's traditional wisdom, for their prayers, guidance, and encouragement, and the participation that they provided to this undertaking. We acknowledge the many Native environmental warriors who took time from their regional and local struggles to provide concrete historical detail of the work Native Peoples are engaged in today for the protection of the land, water, air, and other living aspects of this Creation. We thank the numerous Tribal, intertribal and native organizations, Tribal colleges and universities, reflected in their representation as participants who assisted in the planning and convening of this workshop.

We acknowledge our debt of thanks to each of the regional climate assessment workshops and their chairs for the background information they have provided and for bringing regional native issues into the process, and especially those regional chairs who participated directly in the NP-NH regional breakout sessions.

In particular, there are a few individuals without whose interest and assistance there would not have been a separate national Native Peoples workshop. We offer our profound gratitude to Dr. George Seielstad of the Aerospace Program at the University of North Dakota, who initially included Tribal lands in the Northern Plains workshop; to the National Aeronautics and Space Administration (NASA), which supported the NP-NH workshop, and especially, Dr. Nancy Maynard, then Deputy Director of the Science Division in NASA's Office of Mission to Planet Earth, who recognized the unique contributions Native Peoples could make to the national assessment, and then worked tirelessly to make this workshop possible; to the Department of Energy for making travel funds available for a number of participants; to University Corporation for Atmospheric Research, Gene Martin, Cathy Clark, and staff, who managed the finance and accounting for convening a national workshop; and to the United States Global Change Research Program, in particular, Dr. Lynn Mortensen, Dr. Michael MacCracken, and Dr. Anthony Socci, who have each offered significant contributions to the workshop's planning and success. We extend our grateful appreciation to Vine Deloria, acclaimed Indian scholar, whose experience and insightful comments provided early guidance to the steering committee. Our thanks also to Professors Dean Suagee of the Vermont Law School and John LaVelle of the University of South Dakota School of Law, whose thoughtful insights on Tribal sovereignty presented at the workshop have served as a foundation for many of the observations reflected in this report. A special thanks to Jose Barrero, editor of "Native Americas," who devoted an entire issue of the magazine to climate change and the impacts related by Native representatives from a number of culture areas in the Americas. The most heartfelt gratitude is extended to the grassroots Native Peoples who have remembered and lived the spiritual ways and who have endured through tumultuous times.

As co-chairs, we recognize the sacrifice of time and endless energy of the steering committee members who met throughout 1998 to bring a vision to reality, including Chief Oren Lyons and Janice Whitney for envisioning and catalyzing the Native Workshop and this subsequent report and Verna Teller and her staff on the ground in Albuquerque who not only successfully managed the

myriad details of workshop organization and logistics (including travel, lodging, and facility arrangements) but brought the traditional grace and hospitality of the Pueblo cultures to the task of gathering, welcoming, and providing for the Native Peoples from throughout the continent for the four day workshop; Valerie Taliman and who handled media arrangements; Joe Leon and Fidel Moreno and their crews, who oversaw the audio and video tape documentation of the workshop and associated interviews; and Schuyler Houser and Nancy Maynard who helped us in the enormous task of taking into account the truth of thousands of years of cultural and historical experience of hundreds of distinct aboriginal societies coming from every corner of North America, delivered in the oral tradition over the course of the four day workshop, and committing it to the pages of this report, and subsequently extending it into Chapter 12 of the U.S. National Assessment.

Finally, we recognize the international importance of the Albuquerque workshop, where the Native Peoples so gathered prepared “The Albuquerque Declaration” (accompanying this report), which was presented as an intervention at the Conference of the Parties (COP-4) of the UN Framework Convention on Climate Change in Buenos Aries in November 1998. The Albuquerque Declaration stands as the first articulation of indigenous concerns with regard to the disproportionate impact of climate change, variation, and extremes on Native Peoples in the international arena. This initial indigenous plea for climate justice raised by the Native Peoples of this continent gives voice to similar concerns held by indigenous peoples throughout the world, where the impacts of rapid climatic shifts and extreme events, resulting from the increased human industrial activities, now threaten the subsistence habitats and traditional indigenous cultures that have otherwise survived for many thousands of years.



It is our most humble prayer that this report honors and reflects the spirits, wisdom, energies and efforts of Native Peoples who came together in Albuquerque from throughout the northwestern hemisphere for four days in the Autumn of 1998 to make a difference in how we live upon this planet. We offer our humble thanks for the honor and privilege to serve the elders and the coming generations of this hemisphere’s indigenous nations as co-chairs of the Native Peoples-Native Homelands Climate Change Workshop. Wopila!

Robert Gough
Co-Chair

Patrick Spears
Co-Chair

Chinook Blessing Litany



WE CALL upon the Earth, our planet home, with its beautiful depths and soaring heights, its vitality and abundance of life, and together we ask that it

Teach us, and show us the way

WE CALL upon the mountains, the Cascades and the Olympics, the high green valleys and meadows filled with wild flowers, the snows that never melt, the summits of intense silence, and we ask that they

Teach us, and show us the way

WE CALL upon the waters that rim the Earth, horizon to horizon, that flow in our rivers and streams, that fall upon our gardens and fields and ask that they

Teach us, and show us the way

WE CALL upon the land which grows our food, the nurturing soil, the fertile fields, the abundant gardens and orchards, and ask that they

Teach us, and show us the way

WE CALL upon the forests, the great trees reaching strongly to the sky with Earth in their roots and the heavens in their branches, the fir and the pine and the cedar, and we ask them to

Teach us, and show us the way

WE CALL upon the creatures of the fields and the forests and the seas, our brothers and sisters the wolves and the deer, the eagle and dove, the great whales and the dolphin, the beautiful Orcas and salmon who share our Northwest home, we ask them to

Teach us, and show us the way

WE CALL upon those who have lived on this Earth, our ancestors and our friends, who dreamed the best for future generations, and upon whose lives our lives are built, and with thanksgiving, we call upon them to

Teach us, and show us the way

And lastly, WE CALL upon all that we hold most sacred, the presence and power of the Great Spirit of Love and Truth which flows through all the Universe ... to be with us to

Teach us, and show us the way

(Published in: "The Way: An Ecological World-View", Edward Goldsmith, University of Georgia, 1998, Author unknown)

Native Peoples and NASA



On October 29, 1998, almost all eyes focused upon the near flawless launch of the Space Shuttle Discovery and its seven-person crew from Cape Canaveral, Florida, for nine days in space. That flight returned Senator John Glenn to the Earth's outer atmosphere some 36 years after his historic Friendship 7 flight, as a dramatic symbol of this nation's scientific preeminence at the end of the twentieth century. On November 1, from his shuttle window 350 statute miles above the Earth, Glenn could view a 4,000-mile swath of the Earth, clearly beholding the eastern third of North America from Canaveral to the Great Lakes and into Canada. But even from his unworldly vantage point, Glenn could not have seen the Caribbean coast of Central America, for on that very day Hurricane Mitch began its devastating sweeps across Honduras and Nicaragua, claiming tens of thousands of lives and destroying roads, bridges, utilities, crops, and villages as the most destructive natural disaster to strike the Western Hemisphere since the landfall of Columbus.

In those four days, the world's attention was torn back from those heavenly heights to the tragic hardship of the Native Peoples of Honduras and Nicaragua bearing the brunt of Mitch's destructive pounding, as a reminder of the awesome power nature exerts over the planet upon which we live. During those same four days, Native North Americans met in a climate change workshop in Albuquerque, New Mexico to consider the prospects facing us of a significantly warmer and more variable climate through the next century. This workshop was one of twenty convened by the multi-agency United States Global Change Research Program (USGCRP). The Native Peoples-Native Homelands Climate Change Workshop took place under the sponsorship of the National Aeronautics and Space Administration (NASA) in partnership with a number of native organizations from throughout the United States.

The National Aeronautics and Space Administration in initially proposing and then sponsoring this USGCRP workshop, deserves special credit for providing this opportunity to gain the input of America's Native Peoples to the U.S. National Assessment. In particular, we wish to commend Dr. Nancy G. Maynard, NASA Goddard Space Flight Center, for recognizing the importance of incorporating indigenous perspectives into the U.S. National Assessment and for working tirelessly to make this unique workshop possible.

In a very important sense, NASA shares a perspective on the Earth quite similar to that held by many Native Peoples. NASA is perhaps the only civil government agency to see the Earth as a unique, complex and unified living system, suspended in the vastness of space and dependent upon a fragile and finite life support system with natural land, water, and airspaces overshadowing imagined political boundaries. The technical achievements of NASA have provided humans with a vision of our place in the universe through the application of science and technology. It is a vision not unlike that shared by many Native Peoples – though achieved through a cultural experience and spiritual understanding, rather than technological prowess – of a place we human beings share as part of the life on this planet.

Bob Gough, Co-Chair
Pat Spears, Co-Chair

Native Peoples- Native Homelands – The Name



The term “Native” was deliberately chosen to use in the title “Native Peoples-Native Homelands Climate Change Workshop.” While American Indians are the largest and perhaps most widely recognized indigenous people living in North America, they are not the only indigenous people with geographic and political ties to traditional homelands within the political sphere of the United States of America, and thus, within the scope of the National Assessment on Climate Change. Although this Workshop pays particular attention to the issues raised by American Indians in Indian Country, it does so to highlight the nature of concerns and opportunities originating throughout indigenous America, so as not to exclude other participating indigenous groups, such as Native Alaskans and Hawaiian, or various Caribbean or Pacific Islanders whose histories, cultures and climatic risk warrant thoughtful consideration in the National Assessment.

Native Peoples

Native Peoples, encompassing American Indians and the indigenous peoples of Alaska, Hawaii, and the Pacific and Caribbean Islands, currently comprise almost 1% of the US population. Formal Tribal enrollments total approximately two million individuals, of which more than half live on or adjacent to hundreds of reservations throughout the country, while the rest live in cities, suburbs, and small rural communities outside the boundaries of reservations. The federal government recognizes the unique status of more than 565 Tribal and Alaska Native governments as “domestic dependent nations.” The relationships between tribes and the federal government are determined by treaties, executive orders, Tribal legislation, acts of Congress, and decisions of the federal courts. These actions cover a range of issues that will be important in adapting to climate change, from responsibilities and governance to use and maintenance of land and water resources.

The number of Native Americans depends on the definition that is used. As a result, the number of those counted as Native Americans can vary based on differences, and even changes in federal, Tribal, and state legislation, and the policies of governments at several levels. For example, the U.S. Bureau of the Census counts as American Indian anyone who identifies him or herself as such. As in asking about other ancestral connections, census enumerators require no proof of Indian identity. Thus, census data include individuals who may identify themselves culturally and socially as American Indian, but who are not formally enrolled as a member of a particular tribe. As a result, the census produces a comparatively high count of the number of American Indian people in the United States (U.S. Bureau of the Census, 1990). The Bureau of Indian Affairs (BIA), on the other hand, counts only individuals with a sufficient blood quantum of 25% or more and who are officially enrolled as members of federally recognized tribes.

Each tribe has the right to establish its own criteria for enrollment. Most tribes require that a certain percentage of the individual’s ancestors must have been members of that tribe. Some tribes recognize only affiliation through one parent’s family. Still other tribes have residency requirements indicating that the individual must live on the tribe’s reservation for a specified number of years. The BIA’s total (see http://www.doi.gov/bia/aitoday/q_and_a.html) thus yields a lower number of American Indians. As a further complication, some tribes are recognized by state governments, but not by the Bureau of Indian Affairs (e.g., the Lumbee of North Carolina). Members of these tribes are, therefore, recognized as Indian by some levels and agencies of government, but not by others. Periodically, a tribe may succeed in completing the BIA’s rigorous process for obtaining federal recognition, thus increasing the number of Indian people recognized as such by the Department of

the Interior. Further, descendants of the original inhabitants of the Hawaiian Islands have, using the Department of the Interior's own criteria, made credible claim for federal recognition as Native Americans (Bordewich, 1996).

The presence of non-Native Americans on reservation lands was largely prevented until passage by the Congress in 1887 of the Dawes Severalty Act, commonly called the Allotment Act. Prior to this law, reservation lands were held corporately by an entire tribe and no particular individual held title to any particular tract of land. Furthermore, no outsiders, except government officials and soldiers, were permitted to live within reservation borders. The Allotment Act, however, mandated that each member of a tribe receive an individual allotment of land. The allotments varied in size from 80 to 1,040 acres, depending on the particular reservation. After each head of household and family member had received an allotment, the remaining unassigned lands within the boundaries of each reservation could be opened to non-Indian homesteaders.¹ These settlers were granted clear title to the lands on which they settled if they fulfilled the normal conditions of homesteading. Land that was conveyed in this way to homesteaders was simply subtracted from the total lands that had been originally reserved for the tribe. As a result, until the passage of the Indian Reorganization Act in 1934, significant amounts of reservation lands passed out of Indian ownership even though they were within the original boundaries of reservation.

Native Homelands

Tribal land holdings in the 48 contiguous states currently total about 56 million acres, or about 3% of the land. Additionally, Alaska Native corporations hold approximately 44 million acres of land. Despite the relatively extensive total land holdings, most individual reservations are small, supporting communities with populations of less than 2,000. Larger reservation populations are exceptional, but range as high as 200,000 people living on the Navajo Reservation.

The federal government has recognized that tribes and Tribal governments also have legal rights in territories that lie beyond the boundaries of their respective reservations. For example, treaties in the Pacific Northwest and the north-central states of Minnesota, Wisconsin, and Michigan recognize rights of tribes to fish, hunt, and gather off-reservation. Further, federal legislation has recognized Tribal interests in historical and cultural interest areas beyond reservation boundaries. These interest areas cover a significant fraction of the 48 contiguous states, generally matching the "Native Homelands" that Native Peoples inhabited prior to or since European settlement.

With the beginning of clearly observable climate change, and because of the relationships of plants, water, and migrating wildlife with ecosystems outside reservation boundaries, the potential consequences of climate change create significant interest among Native Peoples. These interests arise because the consequences will affect both their reservation lands and the much larger land areas encompassed in the concept of Native Homelands. While each tribe will face its own challenges, this workshop focused on a few general issues facing large numbers of Native Peoples, particularly American Indians. More region-specific issues are covered in the various regional sections of the assessment report, notably in those dealing with the Northwest, Alaska, and the Pacific and Caribbean Islands.

¹ Many tribes were able to avoid the allotment of Tribal lands. The reservations of the Red Lake Chippewa in Minnesota, the Menominee Nation of Wisconsin, several Pueblo tribes and a large portion of the Navajo Nation remain undivided and intact within their original borders.

I. Introduction



U.S. National Assessment Background Information

Reprinted from the USGCRP “Background Information” for the Climate Change Impact on the United States called for by a 1990 law, U.S. National Assessment Coordination Office, available at <http://www.usgcrp.gov/usgcrp/nacc/background/default.htm>

Why a National Assessment? ²

To Prepare the Nation for Future Change: To assure that the United States is prepared for future change, the United States Global Change Research Program (USGCRP) initiated a national assessment on the potential consequences of climate variability and change for the nation. The national assessment process analyzed and evaluated what is known about the potential consequences of climate variability and change for the nation, in the context of other pressures on the public, the environment, and the nation’s resources.

Responsive to Congressional Needs: The USGCRP is mandated by statute with the responsibility to undertake scientific assessments of the potential consequences of global change for the United States in the “Global Change Research Act of 1990” (P.L. 101-606), which states the federal interagency committee for global change research of the National Science and Technology Council “shall prepare and submit to the President and the Congress an assessment which —

- integrates, evaluates, and interprets the findings of the Program and discusses the scientific uncertainties associated with such findings;
- analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity; and

- analyzes current trends in global change, both human-induced and natural, and projects major trends for the subsequent 25 to 100 years.”

Providing Input Into the Intergovernmental Panel on Climate Change: The national assessment was timed to provide input to the Third Assessment Report of the UNEP/WMO Intergovernmental Panel on Climate Change (IPCC), which has been working to integrate more regional detail into its analyses.

Involving Stakeholders from a Broad Spectrum of Society: The national assessment process has involved a broad spectrum of stakeholders from state, local, Tribal, and Federal governments; business; labor; academia; non-profit organizations; and the general public.

Linking Scientists and Stakeholders: The assessment is linking research by scientists to specific needs of the stakeholders; and is providing planners, managers, organizations, and the public with the information needed to increase resilience to climate variability and cope with climate change.

Scientific Excellence Combined with an Open and Participatory Approach: The national assessment has been founded on the principles of scientific excellence and openness, and will be integrative and iterative.

Overview

To help prepare the nation for climate variability and change, the USGCRP, in cooperation with the Office of Science and Technology Policy (OSTP), has engaged in a comprehensive planning effort to implement a national assessment process. These efforts began in early 1997 with a series of regional workshops, and have included a National Forum, intensive sessions of team leaders and

²For further information, see <http://www.usgcrp.gov/usgcrp/nacc/background/default.htm>

advisory bodies, and extensive discussions among federal agencies, the science community, stakeholder communities, and the interagency committee for global change research. These efforts have contributed to the development of a comprehensive plan for the National Assessment to involve 20 regions, 5 sectors, and a synthesis, all led by teams of scientists, managers, and other stakeholders who are committed to understanding the nation's vulnerabilities and to identifying the most rewarding ways of responding to future change.

Driving Questions

Each workshop focused on four central questions:

1. What are the current stresses and issues for the region?
2. What are the expected consequences of climate change and variability and how will these interact with existing stressors?
3. What are the priority research and information needs?
4. What coping options exist that can build resilience and possibly assist the climate change problem?

High priority was also placed on the process of engaging a network of stakeholders in a dialogue about vulnerabilities and coping mechanisms. The goal was to begin a two way process of interaction: scientists gain input from the stakeholders about their information needs, and the stakeholders learn from the scientists about climate change projections, and possible consequences in the region.

The assessment process was founded on the principles of scientific excellence and openness; designed to be comprehensive, integrative, and iterative; and intended to link research by scientists to specific needs of the stakeholders. It was also designed to provide planners, managers, organizations, and the public with the information needed to increase resilience to climate variability and to begin to cope with climate change. The national level reports were published in late 2000, and the regional

and sectoral reports have been published as they were completed, beginning in late 1999 and continuing.³ However, the National Assessment has been conceived as an ongoing process to continue beyond the publication of the first reports, eventually also dealing with other global change-related issues.

Elements of the National Assessment ³

The National Assessment was designed with a multi-pronged approach involving regions, sectors, and an overall synthesis. These different elements are designed to provide perspectives from multiple scales and for different audiences.

Regional Assessments: 20 regional assessments are focusing on the issues of most importance at the regional level across the United States. Each began with a scoping workshop involving an average of 100 regional participants in a dialogue about perspectives and priorities related to global change for that part of the country. Most workshops are being followed by an assessment activity involving a minimum of three activities: (1) quantitative analysis of 2-3 key issues; (2) continuous engagement of regional stakeholders; and (3) publication of a report in a common format. Many regional assessments will go beyond this scope in holding additional meetings, or publishing multiple products for different audiences.

Sectoral Assessments: Sectoral assessments are focusing on issues that are national in scope and related to the goods and services on which people, society, and the economy depend. The first phase of the assessment focused on five sectors: agriculture, water, human health, forest, and coastal areas and marine resources. The regional assessments provided coverage (although not necessarily national in scope) of many additional sectors and issues and a few additional sector assessments are being initiated.

National Synthesis: The Synthesis Report integrates key findings from the regional and sectoral assessments and addresses overarching questions related to implications over the next 25 and 100 years.

³For further information, see <http://www.usgcrp.gov/usgcrp/nacc/default.htm>

Workshop Format

While the workshops varied by regional considerations, the format for each was based upon the task of addressing four basic questions posed by the White House Office of Science and Technology and the U.S. Global Change Research Program. These questions were adapted to create a framework for discussion at the NP-NH workshop.

1. **CURRENT STRESSES:** What are the current stresses affecting the social systems, natural resources and economic sectors in your Cultural Area?
2. **CLIMATE CHANGE IMPACT:** Consider how weather extremes, climate change and variability might either amplify or dampen these stresses, or create new ones.
3. **ACTION STRATEGIES:** What coping or action strategies might address the additional stresses created by extreme weather events, climate variability, and climate change, as well as helping to address existing non-climate stresses?

4. **INFORMATIONAL NEEDS:** What new or additional information would allow people to better understand the linkages between the current stresses and weather extremes, climate variability and change and take appropriate action?

Questions #3 and #4 appear here in reversed order from that considered in the other USGCRP Climate Change Workshops. In reversing this order, the NP-NH Climate Change Workshop Steering Committee responded to the desire for “action” as part of “no-regrets” strategies, instead of “coping” strategies. Thus, the discussion of informational needs in question #4 made more sense to participants with regard to how Native stakeholders might accomplish the action strategies discussed in question #3. The initial order of the questions seemed to assume the need for additional environmental information toward increasing the stakeholders’ understanding of concepts, issues and realities of climate change and variability before specific “coping” strategies could be discussed. Participants felt that some coping strategies could be formulated immediately based on existing data and information, and improved as new information becomes available.



Native Peoples as Stakeholders

Our View of Environment and Climate Issues

As scientists and policy-makers from both the Native and non-Native communities begin to build closer partnerships and discuss common concerns such as climate change and extreme weather events, it is important that the non-Native participants realize that the perspectives from which Native peoples view issues related to environment and climate are markedly different from those of the broader non-Native society. Our Native peoples, in turn, are trying to better understand non-Native approaches to these issues. We feel this will improve our mutual understanding of each other's points of view, create smoother communications, and enable much stronger solutions to these important problems.

In an effort to help our non-Native partners better understand our point of view as Native American stakeholders, we have listed some of the commonly shared perspectives, that guide the thinking of many Native peoples. It is based upon these fundamentals that we make decisions and carry out future planning:

- **Common Ecological Perspective:** Broadly speaking, it may be said that Native peoples and global climate scientists share several common perspectives that view the Earth and its global climate as a single, complex, dynamically-balanced, interconnected natural system.
- **Government Treaty and Trust Relationship:** The government-to-government relationships between many Native nations (particularly American Indian Tribes) and the United States must be honored as an expression of federal treaty obligations and trust responsibility. Federal agencies may be required in certain cases to consult directly with particular Native governments with regard to climate policies and actions that may directly affect specific Native rights and resources.
- **Humans Are a Part of Nature:** While Native cultures, traditions, and perspectives vary across the continent, there is a shared understanding that we humans must remember to see ourselves as a part of, and not apart from Nature. We are not separate from the sacredness of the natural world in which we live. Our planet – with her air, land, and water – is the source and sustenance of all Earthly life. Our Earth is physically and spiritually our Mother and we must respect our relationship with her, for our own well-being and for the benefit and survival of all living creatures with whom we share this planet.
- **Ecologically Sustainable Homeland Economies:** Entering the 21st century, a prime Native strategy encourages the development of sustainable homeland economies to ensure survival as Nations and for the restoration of a more balanced climate for Mother Earth. This strategy includes the protection of naturally diverse ecosystems and the use of renewable energy technologies.

Additional Factors Regarding Native Involvement in Assessment Follow-on Activities and Other Scientific Meetings

There are also several other considerations which are important to keep in mind when partnering with Native American stakeholders because they may influence the degree of Native involvement in activities such as scientific and assessment workshops.

- Significant functional linkages between the scientific and policy communities concerned with issues of climate change and variability, and the Native community stakeholders are only beginning to be forged.
- Effective communications between the various state university departments and research centers on the one hand, and the appropriate Tribal and intertribal planning offices on the other, are inadequate at present and need to be strengthened.
- In the lower forty-eight states, the participation of Tribal governments in regional meetings organized by or through state agencies is often restrained by tribal preferences for dealing either intertribally or directly with the Federal Government. Because of its relatively large Native population occupying such a vast amount of territory, only Alaska has treated subsistence hunting and fishing as a major component of its workshop. Foremost from a Tribal government perspective, however, is that participation may be a matter of political sovereignty, where it is deemed more appropriate for Indian Nations and Tribes to deal directly with federal agencies on a government-to-government basis, rather than to work through state or regionally organized forums.
- Native peoples are extremely family, as opposed to individually, oriented. An individual person must accommodate many extended family responsibilities before, or while he/she accomplishes his/her own individual interest. Participation in any activity away from home will often depend upon how critical the issue or activity is to that community, and what accommodations might be made for a person's familial responsibilities during the time away from home.
- The spouses or other family members of traditional elders and medicine people often play a critical cultural role assisting in their relatives' cultural duties, tending to personal needs, advising, handling unfamiliar arrangements, singing, translating, and interpreting, etc. Usually, such elders and medicine people may travel with their family members.
- Some federal agencies with an established network, historical track record, and bureaucratic presence in "Indian Country," such as the Environmental Protection Agency, may have greater success on a regional or national level than those without such pre-existing connections.
- Lack of official political recognition of some Native groups may also hinder outreach and, thus, participation.
- Desires on the part of some Native peoples not to air their concerns publicly, not to have their sacred knowledge revealed to the uninitiated, not to have their wisdom and stories dismissed as mere folklore, or not to have their participation become overly romanticized by those who may wish to focus on quaint pageantry while ignoring the vital message carried by the seasoned wisdom of these traditions, sometimes influences the willingness to participate.
- Some indigenous communities living on American flag island homelands within the political reach of the United States may lack the political organization, human resources, or financial ability to make their voices heard at workshops scheduled some distance away.

Issues and Recommendations Regarding Data Collection

There are special issues regarding American Indians and data collection and analysis relevant to the assessment of climate change. Although they are the only ethnic group with its own federal bureaucracy charged with keeping track of the population's births, deaths, whereabouts, and inheritance, American Indians have been consistently undercounted in the U.S. Census. With a long history of being subjected to anthropological study, international curiosity, and outright appropriation of resources, rights and culture, reservation communities are understandably wary with regard to data collection.

Several recommendations were made to help ensure appropriate and respectful collection of data and more complete cross-cultural analyses:

- Indigenous intellectual property must be respected. Physical and intellectual control of culturally sensitive information and the protection of Tribal cultural and intellectual property rights are essential issues in any data collection effort.
- Tribal Colleges are recommended as a culturally appropriate vehicle for access to Indian knowledge. Indigenous communities have a great number of local and regional institutions with the capacity to compile and interpret significant bodies of historical and ecological data on flora and fauna, climate variation and extremes, and traditional cultural practices. These institutions include Tribal colleges and universities, and Tribal government natural and cultural resource management programs, departments and commissions. In addition, there are numerous regional and national intertribal organizations, councils, commissions and associations, many of which are based upon the legal protection and indigenous utilization of specific natural resources found on Native lands and in regional aquatic systems. Such indigenous cultural and ecological knowledge demonstrates intimate Tribal familiarity with the natural environment and the ability to recognize changes in the behaviors of local natural systems. It is recommended that the Tribal institutions be incorporated directly into the national assessment process.

- Training of Tribal expertise in western scientific techniques. Along with rich, living cultural heritages based upon utilization of local resources and embodied in Tribal elders, many indigenous communities have expanding young populations who face the prospect of diminishing or changing resource bases which may be further impacted by climate change. The upcoming generations need to have their feet firmly established in both worlds in order to have the ability to protect their cultural heritage and adapt to rapidly changing resource availability. It is recommended that Tribal institutional capacity for training Tribal expertise in utilizing western scientific techniques to monitor, analyze and interpret climatological data be developed.



Historical Context

Reprinted from Chapter 12 of Climate Change Impacts on the United States, see Appendix D.

Over the last 500 years, essential environmental balances that had sustained Native peoples in North America for many millennia began to rapidly shift. Forests were cut for homesteads and farming. Alien plants displaced grasslands. Dry lands flooded, rivers changed their courses, and ponds and swamps drained away as watercourses were dammed and channeled. Important providers of nourishment and protection – buffalo, salmon, eagle, wolf, and shad – were pushed to near extinction. New and strange creatures – horse, cow, pig, sheep, and pheasant – shoved aside indigenous species and came to dominate local economies. Exotic new diseases eradicated whole villages. Tribal social, political, cultural, and spiritual relationships throughout entire regions collapsed. Spiritual leaders lost their followers. Communities – even entire Tribal nations – were extinguished or forced to relocate.

Five hundred years ago, the population of Native peoples in North America is thought to have ranged between about 10 and 18 million. By 1890, the population of Native peoples on the continent had dropped to only 228,000 and was declining at an average rate of between 500,000 and 850,000 individuals each 20-year generation between 1500 and 1890 (Snipp, 1991). Some thoughtful leaders predicted that Native people would soon disappear. However, those who predicted the ‘vanishing of the Red Man’ substantially underestimated the endurance and adaptability of Native peoples, and the strength of Native perspectives and values. Over the last 100 years, the population of Native peoples has grown almost ten-fold as Native communities have been rebuilt, artists and craft workers and writers have created a renaissance of beauty and meaning, and economic development has accelerated (Cornell, 1998).⁴

The environmental changes that drastically altered the lives and circumstances of Native peoples as a whole between 1492 and the present did not arise from changes



in the global climate, although there were some influences at the regional level. However, as Native peoples were displaced and national development occurred (Brown, 1991), Native peoples experienced continental-scale changes in their surroundings that are not unlike the types of changes that all Americans, indeed, all peoples may face in coming decades. The changes were substantial in magnitude, surprising in their occurrence, unmanageable by available technologies and existing forms of government, and irreversible. In those respects, the changes may provide insights of the kinds of transformations – cultural, economic, and social – that global changes in climate may bring, both for Native peoples and for America as a whole.⁴

⁴References are listed at the end of the chapter reprint included as Appendix D.

Geographical and Socioeconomic Context

Reprinted from Chapter 12 of Climate Change Impacts on the United States, see Appendix D.

The lands held by Native peoples are extensive. In addition to the 40 million acres of land held by Alaska Natives, Tribal lands in the rest of the US currently total about 56 million acres (Department of the Interior, 1996). The lands outside Alaska amount to about 3% of the land area of the 48 contiguous states, or approximately the size of the state of Minnesota. The largest portion of Indian lands are held on reservations, so named because they consist of lands that were reserved for the sole use and occupancy of Indian peoples from the vast expanses of land which were ceded to the United States government (Brown, 1991). Property ownership by Native peoples of the Pacific and Caribbean islands varies greatly because of the variety of situations, including traditional rights and historical legal rights. As indicated in the Islands chapter,⁵ however, on some islands lands are overseen by clans with responsibility for stewardship on behalf of their members whereas on other islands there are no longer reserved land rights.

By far the majority of reservations are small, both geographically and demographically, with populations less than 2,000 (Tiller, 1996). These lands, although they are owned by tribes or individual Indian people, are held in trust for the owners by the Federal Government, in the same way that a trustee might hold property for an heir until that individual comes of age and can take personal management of the property. One result of this system of trusteeship is that tribes and individual Indian people have had very limited control over the use, environmental management, or profits of their own lands. For much of the 20th century, in fact, many of the decisions over these matters rested with the Federal Government, not with the tribes themselves. Only in the last several decades have Tribal governments taken over more control of and responsibility for their lands.

From the most basic perspectives of the American legal system, reservations may be viewed as jurisdictional islands, largely exempt from the laws of the states that surround them due to the fact that the federal trust relationship preempts state law, unless states have been specifically delegated governmental authority by Congress. Tribal governments hold the authority within the reservations to levy taxes, regulate commerce, pass and enforce civil and criminal codes and, in principle, regulate the use of Tribal lands and water. While federal laws prevail, state authorities generally have no rights of enforcement within these jurisdictional islands.

However, from the perspective of Tribal environmental and land management policies and practices, the paradigm of reservations as islands is inadequate. First, the paradigm is inadequate environmentally because these 'islands' are surrounded not by oceans, but by land, and so these lands are intimately tied to the forests, grasslands, watersheds, and other ecosystems surrounding them; thus, the changes on Native and surrounding lands will be closely coupled. Second, because many reservations have considerable populations of non-Indians residing within the exterior borders of reservations the paradigm is inadequate administratively. Third, throughout the country, non-Indians also work on Indian lands because of the leasing of Tribal lands to non-Indian farmers and ranchers – or, in the case of Agua Caliente, near Palm Springs, California, for example, for commercial development. The leasing of reservation lands is a long-standing practice and a vital source of income to the Indian landowners (Lawson, 1982). Complicating matters further, a major portion of the lands that were allotted to Indian heads of household are now managed either by the BIA or by the appropriate Tribal government. This land is also frequently leased to non-Indian farmers or ranchers with the proceeds from the leases then being divided among the descendants of the original allottee. Maps of land ownership and Tribal jurisdiction on many individual reservations thus resemble checkerboards, greatly complicating planning efforts.

⁵Chapter 11: *Potential Consequences of Climate Variability and Change for the US-affiliated Islands of the Pacific and Caribbean*, by Carter et al., pp. 315–349 in *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change: Foundation Report, prepared by the National Assessment Synthesis Team, U.S. Global Change Research Program, published by Cambridge University Press, Cambridge UK, 2001, 612 pp.*

At the same time, judicial decisions have sharply limited the jurisdiction of Tribal governments and Tribal courts over the activities of non-Indians.

As a result, many tribes face severe legal difficulties in creating or enforcing comprehensive plans for land use or natural resource management, a situation that will complicate planning for climate change. For example, if a Tribal government creates an environmental code, enforcement over an entire watershed or forest may be impossible without the voluntary consent of non-Indian owners of property within and outside of reservation boundaries. If a tribe leases cropland, grazing rights, or timber to non-Indians, environmental regulations can conceivably be written into the terms of the leases, although long-term traditions are likely to be difficult to change and the practical job of enforcing new regulations is likely to stretch the resources of small and understaffed Tribal governments (Getches, 1998; Pevar, 1992).

Tribal governments also have some legal rights in lands beyond the boundaries of reservations – rights that may establish precedents for collaboration on issues involving climate and environmental changes. For example, the Federal Government has recognized historical and cultural interests of tribes and Tribal governments in broader regions, often called “Native Homelands,” which include lands occupied by Native peoples at present or in the past. Within the pre-determined boundaries of historical and cultural interest areas (generally homeland areas inhabited by a particular Native people prior to contact with Europeans), tribes are entitled, for example, to establish claims to human remains if evidence of kinship or ancestry can be established.⁶ These historical and cultural interest areas cover a significant fraction of the 48 contiguous states widening greatly the areas of interests of Native peoples.

Climate and Ecological Context

Reprinted from Chapter 12 of Climate Change Impacts on the United States, see Appendix D.

Native homelands are present in all of the major ecosystems across the US, including the unique environments represented by Alaska and the islands of the Pacific and Caribbean regions, and Native peoples have been experiencing the vagaries of climate on this continent for many thousands of years. The resource-rich environments created by the woodlands of the northeastern, southeastern, and Great Lakes regions, especially the presence of deer, rabbit, beaver, fish, berries, and many other resources, allowed tribes to occupy particular regions for long periods through the establishment of villages. The Great Plains provided a source of buffalo, deer, berries, and grains, along with fish and other resources, but the wide range of climate extremes, the migration of the herds and differential availability of plant resources, caused these tribes to need to be relatively mobile in order to survive. The western US provided a wide array of environments, from coastlines to mountains and river valleys to deserts, and are now home to the greatest number of Indian reservations. The Native peoples of Alaska have developed a lifestyle that depends, in large part, on there being very cold winters. Those living on islands depend on the reliability of the rains, being adversely affected by both too much and too little precipitation.

These adaptations, and the histories of the experiences and the lessons that have been learned about coping with climate fluctuations, have sustained Native cultures through many generations. Native oral histories are now being linked with past climate data derived from tree rings and other sources in ways that enrich our understanding of past climatic conditions. Oral histories often correlate with events identified in the geological record, such as periods with high or low rainfall, periods of warm or cold winters, and periods of flooding or drought (e. g., Deloria, 1997). What makes these histories especially valuable is that they often record not only the consequences of these climate fluctuations for people and for the environment around

⁶For further information, see <http://www.doi.gov/oait/docs/eo13007.htm>.

them, but also the responses that helped the communities to adjust and survive. Thus, where elements of traditional culture are still strong, the retelling of these events by Tribal elders over generations has created a populace that is relatively well informed about how to adapt and is generally well prepared to accept that extreme climate fluctuations are likely to recur.

There is, however, one key change that will limit the application of some of the lessons to the issue of climate change and is likely to create greater vulnerability than in the past. Earlier coping strategies of Native peoples, on which many of their histories and traditions are based, relied on shifting and moving, sometimes from one food source to another, sometimes from one place to another, or sometimes to find alternative sources of food and water or to intersect with the annual migrations of wildlife. In the Southwest, archeological evidence and Native oral histories indicate that the great regional drought of the 13th century caused the ancestral Pueblo People to abandon their permanent homes in the mesas and valleys of marginal areas. When the ability to cope in one place was exceeded, Native peoples moved, later returning if and when climate permitted.

Over recent decades, Native peoples have been observing that changes in the environment have been occurring, some due to regional to global-scale changes in the climate and some due to changing practices of land management and use. These changes are indicated as much by how Native peoples are changing their practices as by observations of the changes themselves. In north-western Alaska, for example, elders lament that winter temperatures have become so warm (now typically only -20°F instead of -70°F) that the traditional ecosystem on which they have depended for generations is deteriorating and is no longer able to provide the needed resources. In the Southwest, recollections by elders (corroborated by Army records from the early 1800s) are of valleys full of tall sacaton grasslands, whereas the region now is scarred

by deep arroyos and supports only sparse vegetation, likely as a result of overgrazing and subsequent drought. All across North America, Tribal histories indicate that change is occurring.

Native peoples today feel increasingly vulnerable to significant environmental changes because they are no longer able to cope easily with changes by relocating. Few contemporary tribes can afford the purchase of large tracts of new land, and federal laws hinder the transfer or expansion of Tribal jurisdiction. Tribes therefore see their traditional cultures directly endangered by the magnitude of the projected climate change. Had the ancient Anasazi been compelled to remain in place, the culture and way of life of an indigenous people that can be traced back thousands of years would likely have been lost forever. This history provides a context for thinking about the potential consequences of future changes in the climate.

Special Report on Climate Impacts in the Arctic

Caleb Pongoylwi, Siberian Yupik

“Traditional activities, such as hunting, fishing and gathering of plants, are crucial to Alaskan Native Peoples’ way of life. Even subtle changes in temperature over the long term can affect our ability to live as our parents and grandparents have. We need a healthy environment to fully preserve our traditional values, culture and spirituality.”

— Art Ivanoff, Chairman of the Arctic Network and a resident of Unalakleet, Alaska. Reported in “Answers from the Ice Edge” released by Greenpeace and the Arctic Network, August 1998.

Climate change is not a theoretical future concern for Native peoples in Alaska. The impact of global warming is seen in the immediate changes occurring in the permanently frozen land (permafrost), seacoasts, and subsistence resources. The State of Alaska is so large and diverse in its extremes that it is the subject of a single “regional” workshop in its own right. Alaska embraces some twenty (20) distinct Level III Eco-Regions. These eco-regions range from perma-frosted Arctic Coastal Plains, to the glaciated Alaskan Range, to the rain-forested Pacific Coastal Mountains. Of particular interest to Native peoples, Alaska has the only assessment that expressly includes climatic stresses on subsistence livelihoods as a key issue. Due to its size, seasonal extremes, and proximity to the North Pole, Alaska’s present environment is particularly susceptible to climate related stresses.

In an opening workshop presentation, Mr. Caleb Pungowiyi, Director of Natural Resources with Kawerak, Inc., reported on climate related observations in the Bering Sea region of Alaska, from the perspective of a marine hunter. Mr. Pungowiyi, a Yupik Native from Nome, Alaska, specifically noted observed changes in the current environment, including damage to the permafrost, coastal erosion and sea-level rise, and wildlife; expected changes from a doubling of atmospheric CO₂; and the likely impacts on Native subsistence and the local economies, and reported as follows:

Presently observed changes included:

- An increase in air temperatures over most of Alaska of 3-4 degrees Centigrade in winter/spring from 1961-1990 and 1 degree Centigrade in summer.



(Courtesy of U.S. Fish and Wildlife Service)

- Annual snowfall increase of 20% from 1950 to 1990.
- Cyclone and anticyclone frequency increase over the Arctic between 1952-1989.
- Extent of Bering Sea ice decreased about 5% over the last 40 years, with the steepest decrease in the late 1970s.
- Glaciers have generally receded, with typical ice thickness decreasing 10 meters over the last 40 years. Wetter summer and fall seasons with drier winters.
- Permafrost has warmed by 2-3 degrees Centigrade over last 100 years; with both top and bottom thawing in discontinuous permafrost areas.

Observed changes in the Bering Straits region:

- Wetter summer and fall seasons with drier winters.
- Sea ice forms later in fall.
- Sea ice melts and disintegrates earlier in spring.
- Sea birds dying from starvation.
- Lots of beaver moving into area streams.
- Western Arctic caribou increasing and migrating into Seward Peninsula (These conditions may be good for hunters, but bad for reindeer herders who have lost at least 35% of their herds, which have joined with caribou migrations).

Expected changes given a doubling of atmospheric CO₂:

- Pole-ward migration of tree-line and establishment of new ecosystems as entire forest types disappear. (High confidence)
- Change in the polar bear and caribou migration patterns. (High confidence)
- Fisheries and marine mammal displacements due to ocean temperature and sea ice changes. Many species shift pole-ward about 150 km for every 1 degree Centigrade temperature increase. (High Confidence)

Likely impacts on subsistence and local economy:

- Increased coastal village economy problems.
- Change in energy pattern use due to climate change.
- Effects on subsistence economy (in Alaskan villages: 700 to 1,100 lbs harvest per capita).
- Relocation of populations closer to new subsistence harvest sources.
- Problems of coastal land inundation and erosion.

Areas of concern:

- Unprecedented rates of change.
- Impact on availability of subsistence resources.
- Weather variability – rain, wind, snow.
- Impact on transportation and economy.
- What are the future implications?
- At what point will the world respond to impacts of climate change?

Climate related socio-economic impacts occurring over the last decade:

- Major increases in catches of Alaskan salmon, due to El Niño conditions since mid-1970s and marine mammal displacements due to ocean temperature and sea ice changes.
- Same conditions have unfavorably affected Pacific Northwest and Canadian salmon stocks due to increased smolt predation and adverse stream flow.
- Costly increases in road damage and maintenance costs due to accelerated permafrost thawing.
- Major landscape changes from permafrost thawing from forest to bogs, grasslands and wetland ecosystems, affecting land use.
- Increase slope instability, landslides and erosion threatening roads, bridges and pipelines, and causing local floods.
- Disappearance of permafrost also reduces construction problems; in some areas permafrost boundaries have moved north by over 100 km (62 miles) in the last century.
- Increased fire frequency and insect outbreaks that have reduced economic forest yields.
- Warmer climate has lengthened the growing season for agriculture and forestry producing higher yields.
- Boreal forests are expanding north at the rate of over 100 km (62 miles) for each 1 degree C temperature increase.
- Increased coastal erosion and inundation from storm surges with reduction of Bering Sea ice.
- Changes in sea ice conditions make hunting on the ice more dangerous and reduces the availability of marine mammals, negatively affect subsistence lifestyles.
- Thawing of traditional ice cellars in several northern villages have made them useless for storing food.
- New diseases moving north, affecting human health.

II. Reports from Wisdom Circles (Breakout Groups)



Native Peoples-Native Homelands Regional Breakout Groups Introduction and Background

The Native People-Native Homelands Climate Change Workshop was designed to begin Native stakeholder involvement in the National Assessment from throughout the entirety of the United States and the various Pacific and Caribbean Islands politically associated with the United States. Native stakeholders have cultural affiliations with all the distinctly identifiable eco-regions of North America and the various island territories in which they have resided and currently reside. During the Workshop, participants met in several plenary sessions for discussions of matters of general applicability and also broke out into Breakout sessions organized generally by Cultural Areas to specifically address the four workshop questions.

This report summarizes the various conditions, issues, and concerns identified for the regions represented at the Native People-Native Homelands Workshop along with the results of the Workshop Breakout sessions. Summaries here are not intended to provide a detailed treatment for each of the specific regions or to address all of the issues and concerns raised in the other regional climate change workshops. Readers of this workshop report are encouraged to review the specific reports from the various distinct regions for the rationales and details of those workshops. The NP-NH Breakout group responses have been re-arranged by category to facilitate comparisons between regions and sectors, except in those cases where information was specifically reported in numerical order.

Finally, the NP-NH Workshop recognized that the United States of America is home to perhaps the broadest array of eco-systems in the world. This multiplicity of diverse biological habitats sustains a tremendous variety of plant and animal life. References to Level III Eco-Regions refer to usage by the National Health and Environmental Effects Research Laboratory of the United States Environmental Protection Agency, derived from the work of J.M. Omernik (Ecoregions of the conterminous United States, 1987) and others, as revised in 1996, and mapped as: "Level III Eco-Regions of the Continental United States". In this approach, ecological regions are identified through the analysis of the patterns and composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity, including geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. References are made herein to demonstrate the diversity of regional ecologies found in each of the Cultural Areas.

Selected information from the various other workshop reports is reprinted here from earlier U.S. National Assessment workshop reports to highlight some of the previously identified regional concerns to provide the context in which Native issues and concerns arise.

The Eastern Woodlands

“We trace our ancestry in this land to many, many thousands of years ago. And we were created as distinct national entities when the Confederacy was formed by our Peacemaker. We are free people. We are sovereign people. We have our own nation governments. We have a distinct culture. We have a specific land base. We have a specific language. We fit the international definition of sovereign peoples.”

— Doug George, Mohawk, in *The Great Law of the Iroquois* (video) San Francisco: Hearts and Hands Media Arts; Pittsburgh: Carnegie Museum of Natural History, 1998.

Eastern Woodlands Region Key Characteristics

The Woodland Tribes and Nations have historically occupied the eastern third of the United States. The area east of the Mississippi River consists of some twenty-nine (29) Level III Eco-Regions. For purposes of the NP-NH Climate Workshop, this large cultural area was divided into three sub-areas: The focus of this section is the Eastern Woodlands of the Northeast, including ten (10) distinct level III eco-regions; the more western Great Lakes area, embracing eleven (11) level III eco-regions, which is treated separately; and the eleven (11) level III eco-regions of the Southeastern Woodlands area which is not treated as a separate region due to the limited workshop participation from that region.

The Eastern Woodlands area has a climate that may be described as humid continental with relatively short summers to the north. Vegetation in the Eastern Woodland area is primarily broadleaf with mixed coniferous forests in the northern extreme. The eastern coastal area has historically received from 40 to 80 inches of rainfall per year, with the interior receiving only about half as much.

Due to the historical circumstances of contact and Euro-American settlement, many of the Tribal nations of the northeastern, middle Atlantic, and southeastern Woodlands were wiped out or forcibly removed to the west of the Mississippi. However, a significant number of nations, particularly in the northern and southern extremes, have withstood the cultural and ecological onslaughts of the past five centuries on or near their home

ground. These nations have already survived environmental transformations of their homelands, altered ecologies, and the loss of control of their traditional resources far exceeding the potential changes expected from climate change and global warming. Dramatic changes in their social and natural physical environments from diseases borne in the early sporadic coastal contacts, to the agriculture, industry, pollution and population growth have transformed their historically forested homelands into their present conditions. From the local Native perspective, human induced climate variability and change are viewed as the ongoing, logical consequence of such long-term transformative activities upon the land, water and now atmospheric resources of this continent.

Seven of USGCRP’s regional workshops were held in the Eastern Woodland culture area, including the Appalachians, Eastern Mid-West, Great Lakes, Mid-Atlantic, New England, and Southeast regions, along with the Metropolitan East Coast workshop, which looked specifically at East Coast urban issues. Their reports, if available, can be found at <http://www.usgcrp.gov/usgcrp/nacc/allreports.htm>.

The Eastern Woodlands area is heavily urban and sub-urbanized, particularly along the Atlantic coast. The inland areas, from New England through the southern Appalachian Mountains, are extensively forested. Energy, manufacturing, agriculture, and tourism are identified as the primary industries in New England and New York, with coal mining included in Appalachia. The interior Southeast provides vegetables, fruits, fish, shellfish, and wood products. Numerous industrial and commercial activities are carried on throughout this area.

Current Regional Stresses:

Specific regional stresses identified in the Southeast to be considered in conjunction with future climate change include:

- Recent population increases of about one and a half times the national average during the 1990s.

- Variable tropical weather events are typical, with strong sensitivity to El Niño-Southern Oscillation (ENSO) fluctuations, resulting in significant inter-annual and seasonal climate variations.
- Drastic land use changes during the 20th century converting cropland to urban and residential uses.

Common Concerns:

Commonly identified regional concerns include:

- Extensive urbanization and development.
- Air pollution in urban and rural areas.
- Contamination of surface and ground water resources from industrial, chemical, mining, agricultural, and other wastes.
- Contamination of coastal waters, affecting coastal fisheries and creating human health risks for recreational users.

Anticipated Climate Change and Variability:

Generally, the climate change scenarios anticipate a rise in greenhouse gases with a concomitant rise in global temperature, resulting in shorter, warmer, wetter winters and longer, hotter, drier summers. With increased weather variability, extreme weather events may become more frequent. Both the natural and human systems in the Eastern United States are likely to be directly and indirectly affected by the impact of climate change to a significant degree. Uncertainty with regard to the frequency and intensity of weather events is likely to increase, particularly with regard to the mid-winter into spring precipitation (including extreme rain, snowfall and ice storm events) and periods of extended drought conditions through summer and fall, with extended summer heat wave events.

Anticipated Climate Related Impacts:

Coastal inundation from rising sea levels. Low-lying coasts and fresh water resources are at risk from flooding and inundation by rising sea level. Increased



winter and spring precipitation would likely increase flooding along Northeastern waterways. Projected warmer winters are expected to reduce the risk of ice jams and concomitant flooding in early spring. However, with higher winter precipitation, including more extreme rain-falls, snowfalls, and especially ice storms, the frequency of flooding and ice jams could increase in the more extreme northern reaches of the region around the Great Lakes, along the St. Lawrence River, and through Maine. Port cities and low-lying coastal areas all along the east are likely to experience increased erosion from salt water inundation from rising sea levels, higher tides, and amplified storm surges, as well as from reduced flow in freshwater river systems due to drought. Freshwater resources, aquifers and wetland ecosystems would become threatened by contamination, pollution, inundation and salt intrusion, particularly along the Gulf coast and Atlantic coast south of Cape Cod. This same area is especially at risk to more intensified and erratically pathed hurricanes.

Seasonal shifts in energy demands in fossil fuel dependent areas. With shorter, warmer and wetter winters, the Northeastern U.S. may experience lower energy demand for winter space heating and transportation/maintenance, such as snow removal, etc. Longer, hotter, drier summers would bring greater demand for energy for air conditioning, more rapid road weathering and buckling, along with increases in other infrastructure costs associated with drought conditions. Southern energy demands are likely to increase especially in the summer, with an increase of energy related (fossil fuel and nuclear power) pollution.

Greater frequency of temperature related health conditions in urban areas (more severe pollution and heat related deaths) and previously uncommon diseases: Threats to human health could come from the impacts listed above, as well as from extreme summer temperature, coupled with air pollution, particularly in the urban areas, where higher mortality is expected among the elderly, the very young and other vulnerable groups. Warmer summer-time climate conditions could also lead to increased incidence of exotic (tropical) diseases throughout the south, and accelerated spread of existing diseases such as Lyme disease in the north.

Expansion, and then decline of broad-leaf forests, with the retreat of boreal forests to the north; and the decline of mangrove in south: Northern broadleaf forests are expected to expand their range over the short term, while more boreal forests adapted to cooler climates may decline in the U.S., with their habitat retreating to

Canada and higher altitudes. Southern forest and agricultural economies may suffer from water-stress and more frequent drought conditions. Forest fires are likely to increase, and there is expected to be a decline of certain species with increased drought conditions. Southern mangrove forests could be reduced with rising sea levels.

Shift in fisheries and coastal resources: Increased water temperatures would result in a decline of cold, freshwater fisheries (trout) and a shift northward of cold ocean fisheries. The flooding of southern mangroves and bayous would reduce the habitat for shellfish, shrimp and other saltwater fish. As ocean waters warm, coral reef mortality will increase.



The Eastern Woodlands Cultural Area

Wisdom Circle (Breakout Group) Report

1. **CURRENT STRESSES:** What are the current stresses affecting the social systems, natural resources and economic sectors in your Cultural Area?

Culture and Values:

Stresses:

- Impact on our Native life-ways and various cultures.
- There is a breakdown of Native families as a result of mono-cultures (plant, animal, human, media, market)
- Casinos in Native communities represent a different value system: Fast buck and greed approach could result in self-termination.
- Fear of Nature is new for us, and is contrary to traditional Native cultural attitudes toward Nature as Mother.
- Science tries to help, but the approach is so alien to our people that it is resisted.

Sources of Stress:

- Not just climate change but the set of market-centric values affecting Native Peoples and the environment.
- A lack of respect for spirituality and nature by the dominant society.
- Euro-centric values that have interfered with Native cultural cycles and have disrespected our human rights in North America are now global in scope and impact.
- Many Anglo-Americans have lost their own identity and yet they push their culture on to Native Peoples.

Ecosystems/Wild Life/Subsistence:

- Inability of the Euro-American society to have a primary relationship with the land.
- Damage to traditional foods.
- Industrial pollution impacts our diet, polluting our water, plants, fish, and other animals.
- Black ash trees and sweet grass are disappearing.

- In Maine, higher level of black flies and mosquitoes, and fewer humming birds.
- Sugar maple trees are dying from the top down.
- Mono-planting (agriculture and forestry) is impacting biodiversity.
- Greater natural imbalances, such as more predatory fish.

Government:

Stresses:

- Imposition of foreign social, cultural, governmental, and religious structures upon our communities and environment.
- Impacts that Western “global” values have upon international forums and how this negatively affects Indigenous peoples.
- Imposition of governmental protocols and processes has damaged and could ultimately destroy Native cultures.
- Deregulation schemes make it easier to take our natural resources.

Sources of Stress:

- Shortsighted notions of “progress,” government policy, and the fundamental drives of the Euro-centric model are having a devastating effect on our communities.
- Decision-makers lack a connection to the land. Most decisions that impact our community are made by Urban Dwellers, who have little connection to the land.

Health:

- Damage to our physical, spiritual, and mental health.
- More sedentary family lifestyles, with less participation in more active traditional pursuits.
- Impacts on our diet: Loss of traditional subsistence foods, and eating foods that lack nutritional value, contribute to health problems.

Water:

- Severe water pollution. Impacts caused by not being able to fish.
 - a) diet was less balanced
 - b) food costs increased
 - c) intergenerational relationships were harmed as there was less time for grandfathers to pass on their culture through stories to the young children.
- Drought in Maine, water table dropped, reducing river flow that created standing water.
- In the Caribbean, Mexico, and Central America, people are experiencing extremes of drought and storms more severe than in the past.

2. CLIMATE CHANGE IMPACT: Consider how weather extremes, climate change and variability might either amplify or dampen these stresses, or create new ones?

Impact on Native Peoples:

- Severe ice storms made our people realize how dependent we have become on energy sources.
- Refer to the “findings” part of the Albuquerque Declaration. Our Planet/home is at risk.

Ecosystems/Wild Life/Subsistence:

- It is harder for people who lack a primary relationship with the land to notice, or be concerned about, the impacts of climate changes.
- Damage to our traditional foods can come from shifting climate, natural disasters, and current practices, although those with seeds and traditional knowledge can survive.
- Extreme weather events could release more industrial pollution, impacting our diet, polluting our water, plants, fish, and animals.
- Mono-planting in agriculture and forestry impacts bio-diversity and sustainability.
- Culturally significant sugar maples and birch trees will be gone from our territories.

- Black ash trees and sweet grass are already disappearing, plants cannot adapt fast enough to changing environments.
- Greater imbalance in insect and animal communities: high level of black flies and mosquitoes, predatory fish, and fewer hummingbirds.

Government:

- Present governmental stresses will become worse, as government policies continue to have devastating effects on our communities.
- Decisions will be made to favor those that are not connected to the land.
- Outside governments will attempt greater impositions on our communities.
- Climate change will offer opportunities for further imposition of foreign, non-indigenous values, structures, protocols, and processes that are damaging and even destroying Native cultures.
- Outside pressure to control our natural resources will increase.

Health:

- Damage to our health, both physical and mental, especially for those who are not prepared for the changes that are coming.
- The increased sedentary lifestyle of our families will continue to be less healthy than the traditional, active life of Native community inhabitants.

Water:

- Severe water pollution will result from flooding, which will mobilize chemicals applied to the land, and from droughts, and which will concentrate materials already present in our waters.
- More severe, destructive storms will impact communities in the Caribbean and Central America, as well as the United States.

3. **ACTION STRATEGIES:** What coping or action strategies might address the additional stresses created by extreme weather events, climate variability, and climate change, as well as helping to address existing non-climate stresses?

Call to Action to Address Global Change:

- Corporations and businesses must be held accountable.
- Potential strategies: Focus on one transnational corporation, and offer to help them become “green.”
- Incentives to reduce emission of pollutants.
- Remind corporate executives that they are human beings:
 - When do CEO’s become “grandfathers?”
 - When do corporate executives’ concerns move from the corporate bottom line to the welfare of their future generations?
- Respect for treaties as international law.

What Native Peoples Can Do:

- Link this environmental work to the International Decade of the World’s Indigenous Peoples and the Draft Declaration on the Rights of the World’s Indigenous Peoples.
- Work with children to help prepare them for the things facing their generations.
- Do demonstration projects: Hopi Project, reforestation, fish farming, renewable energy technologies.
- Communities need to become self-sufficient, growing our own food, producing our own energy.
- Control the flow of our money and local economies.
- Create a Spiritual Network, one that goes beyond organized religion.
- Create a clearing-house for information.

4. **INFORMATIONAL NEEDS:** What new or additional information would allow people to better understand the linkage between the current stresses and weather extremes, climate variability and change?

Communications:

- Communication for Grassroots Action. Native peoples need a national communication network, a strategy to foster grass roots voice, and efforts to encourage non-Native people to hear and join “popular” grassroots movements.
- Need better information on infrastructure development by and for communities.
- Need better information networks and resources for Indian communities.
- Need improved climate and environmental educational materials for schools and Indian communities.

Strategies:

- Develop strategies to affect big business through people’s purchasing power.
- Develop strategies for families to undertake, for example, not buying Styrofoam products and organizing consumer boycotts.
- Require accountability for business, organized religion, and political activities.
- Zero tolerance – with heightened penalties.
- Native peoples and friends “speak out” and take leadership role to help save the Earth.
- Re-teach youth how to be thankful – so they can have better value foundation when they grow older (Jake Swamp’s book).

Actions:

- Demonstration projects: Pollution prevention, emission credit offsets, alternative fuels, fish farming, tree planting, and renewable energy projects, like Hopi Solar and Native Sun.
- Demand that treaties be upheld as international agreements between two nations guaranteeing respect for the development of two separate societies, with different lifestyles, culture, language and values.

The Great Lakes

“First came what we now call the inanimate life – the soils for growth and the water and air for life. Then the vegetation – where all our medicines come from. And then, came the animals – our teachers. Finally, came the people.

“Each creation is dependent on the other. The people, the last creation, are the weakest and most dependent. Yet, it is us pitiful people who are destroying all the other creations. We have forgotten both the vision and where we fit in our relationship. Once we destroy the other creations, we destroy ourselves.”

— Eugene Begay, Anishinabe elder, in a U.S. Forest Service training session, April 1991, Lac du Flambeau Reservation, Wisconsin, and it appears in *Walleye Warrior*, by Walt Bresette.

Great Lakes Region Key Characteristics

The Woodland Tribes and Nations have occupied an area of the United States most easily understood as east of the Mississippi River for thousands of years. Due to the historical circumstances of earlier occasions of contact from the east along the Atlantic Ocean, followed by northern Euro-American settlement occurring primarily from east to west, many of the northeastern Tribal nations moved westward in advance of settlement, or were later removed to the western extreme of the Woodlands, to join the resident Indian nations of that area. Known at the time as the Old Northwest Territory, this area embraces the Mid-West (Heartlands) and the Western or Upper Great Lakes regions and includes some twelve (12) level III eco-regions. Despite subsequent settlement of the rich agricultural lands of the mid-west, a significant number of tribes have continued their Woodland cultural and ecological adaptations, particularly in the more forested regions of the Upper Great Lakes. Native peoples here have continued with a greater reliance on the remaining game (deer and rabbit), fish (inland lake, river, and Great Lake freshwater fisheries) and plants (maple sugar, paper birch, wild rice, berries, fruits, corn, beans, squash, and other medicine plants).

The resident Native nations have already survived the in-migration of the relocating Woodland tribes and

subsequent Euro-American settlement. As a group, the Native peoples of the Great Lakes have weathered re-settlement and the environmental transformation of their homelands, with an extreme loss of both territory and resources, in excess of the climate changes expected from global warming. However, with critically diminished homelands, Great Lakes tribes, which still depend primarily upon the resources of the natural Woodlands habitat, have a greatly reduced capacity to adjust as they have done in the past. Existing changes in agriculture, industry, pollution, and population growth in the region, which have reduced and transformed their historic woodland environment into its present state, continue and today contribute to the causes identified with global warming.

Current Regional Stresses:

Tribes in the Western Great Lakes region are in a particularly vulnerable area, because this region borders upon the Mid-Western Prairie and Great Plains habitats to the south and west. Along with a dozen distinct, terrestrial eco-regions, the Great Lakes – the world’s largest expanse of fresh water– represent another variety of distinct eco-regions, which are threatened by pollution from area growth in industry and commerce.

Two regional workshops were held in the Great Lakes culture area: the Upper Great Lakes (Minnesota, Wisconsin and Michigan, and Canadian Lakes Provinces) and Eastern Mid-West workshops (including the lands in the states of Iowa, Illinois, Indiana and Ohio).

The Great Lakes region is moderately urbanized, with a mix of forests, rural agriculture and several industrial centers, particularly along the southern Great Lakes. Shipping and trade in agricultural production (dairy, livestock, and grain) from within the region, along with that brought in from the western plains, are the region’s economic mainstay. Tourism and four seasons recreation are based upon the region’s abundant natural resources, particularly, hunting, fishing, and vacationing associated with the region’s forests, rivers, and lakes in both summer and winter. Many of these resources are presently threatened by ground, water, and air pollution from agriculture, mining, sprawl, and contamination from various sources,

including man-made and natural toxins. The Eastern Mid-West Region identified agriculture, forestry, industrial (coal, steel, and electricity), manufacturing, and transportation identified as the region's key issues for considerations.

Anticipated Climate Change and Variability:

Generally, the climate change scenarios anticipate a rise in greenhouse gases with a concomitant rise in global temperature resulting in shorter, warmer, wetter winters, and longer, hotter, drier summers. While all regions of the United States are susceptible to the impacts of climate change, the western Great Lakes region, particularly in the southern and western areas will be more dramatically affected, as summer water temperatures rise and lake levels in Lake Superior and Michigan recede. The climate, and thus eventually the habitats, of southern Minnesota and Wisconsin may come to resemble those of Nebraska and Kansas. The course of Interstate 94 from Fargo to Chicago roughly describes the "ecological tension zone" between the prairie-plains and the northeastern forests. It is in this zone where climatic disruptions of habitat associated with global warming will move towards the forests of the western Great Lakes. Both the natural and human systems will be affected by the impacts of climate change to a significant degree. Uncertainty with regard to the frequency and intensity of weather events is likely to increase, particularly with regard to mid-winter and spring precipitation (including extreme rainfall, snowfall and ice storm events) and longer periods of extended drought through summer and fall south and west of the Lakes.

Anticipated Climate Related Impacts:

Shifts in, and then decline of, forest species: Broad-leaved forests may show enhanced growth and short-term expansion, but will ultimately face shifts in species composition and decline in the long term. Birch and maple habitat in the region will probably decline, if not disappear south of Canada. Fire danger will rise through the transition period.

Reduced water quality and quantity: Higher atmospheric temperatures will increase evaporation from the Great Lakes, affecting water temperature and quality



along with shifts in fish stocks. River and stream flows will be reduced, affecting marshes, wetlands, and lakes, and eliminating critical cold-water fish and bird habitats.

Wetter, warmer, and truncated winters: Shorter, later, and warmer winters may occur, with increased winter precipitation result in an increase of severe spring flooding from sudden thaws. Disruption may occur in winter subsistence, industry, and recreation activities such as skiing, snowmobiling, ice fishing, hunting, and winter logging in otherwise marshy areas. Some lakes in southern Wisconsin may fail to freeze over during winter.

Longer growing season, shift in crops: Corn and soybeans may give way to wheat through southern reaches, with more costly irrigation required, as ground water and summer precipitation become increasingly scarce. Extended seasonal insect viability may be expected.

Summertime heat waves: Extreme heat wave events could increase human mortality, especially in urban areas and among vulnerable populations. Increased stress on wild plants and animals, as well as upon domesticated crops and livestock is likely.

The Great Lakes Cultural Area Wisdom Circle (Breakout Group) Report

1. **CURRENT STRESSES:** What are the current stresses affecting the social systems, natural resources and economic sectors in your Cultural Area?

Stresses on Culture and Values:

- Social systems of Great Lakes Native communities have already undergone centuries of stress.
- Non-native development is impacting sacred sites.
- Historical imposition of Christian philosophy has interfered with natural Native spiritual philosophy.
- The educational system is moving us away from our traditional values.
- Increase of criminal and life-threatening activities (gangs).
- Renewed social stresses from eco-system impacts of mining and industrial forestry.
- Communities fear losing funding, and individuals fear being fired.
- Indian people have fear of being arrested discriminatorily.

Ecosystems/Wild Life/Subsistence:

- Historical invasion of non-native species.
- Decline of wild rice due to changes in water levels and pollution.
- Increased levels of toxins in Lake Superior.
- Wildlife habitats destroyed by clear-cutting.
- Invasion of exotic species, such as lampreys and purple loosestrife, are now controlled primarily by poisoning the land and water.
- Warming effects on habitats and natural resources, including traditional medicines and herbs, berries, flora, and fauna. Impact of current warming on plants with shorter growing cycles.

Energy:

- Too many cars.
- Reliance on nuclear power has created lasting consequences.
- Unreliability and power outages during storms.
- Building of additional utility transmission lines through forest habitats.

Government:

- There is a lack of good, local leadership on environmental issues, where political leaders fail to listen to the spiritual leaders.
- Loss of traditional spiritual focus caused by influence of European social and religious values.
- Euro-centric thinking dominates government and institutions.
- Takeover of state and provincial government by international mining cartels.
- Diversion by government leaders of federal funds that are supposed to help people.
- The current monetary system is eroding Native values.
- Impact of globalization of economics and markets on resources from Native lands.
- Economic stresses resulting from federal and international government policies: e.g. North American Free Trade Agreement (NAFTA), World Trade Organization (WTO), General Agreement on Tariffs and Trade (GATT), and Multilateral Agreements on Investments (MAI).

Health:

- Problems of drugs and alcohol abuse in the community, including some Tribal leaders who do not have their minds focused on the welfare of the people.

- Casinos, and other economic developments based upon gaming, are threatening moral and social health of communities.
- Communities fear being poisoned by environmental pollutants in the water, air and food chain.
- Unborn and young children are being poisoned from same sources.

Natural Resources:

- Industrial forestry, treating forests like cropland – monoculture lacking bio-diversity.
- Extraction and distribution of natural resources to far away markets without consideration of local concerns.
- Globalization of local economies and resultant trail of pollutants and greenhouse gases.
- Sports hunting and fishing have an impact upon animal nations used for subsistence.

Pollution:

- Agriculture and non-point sources of pollution.
- Urban sprawl and development.
- Mining– near Menominee, Forest County Potawatomi and Mole Lake reservations, where air, wild and scenic river, ground water and traditional food sources (fish and wild rice) are threatened by sulfide mineral development.
- Mercury contamination of air, land, and water from various sources, including fossil fuels.
- Current climate changes impacting water/land temperatures.
- Nuclear cycle (e.g., mining, uses for power and weapons, and waste-dumping) threaten reservations throughout the country.
- Lack of monitoring transportation of nuclear (hazardous) waste.
- Chemical trespass by Persistent Organic Pollutants (POPs).
- Paper sludge waste.

Sovereignty:

- Lack of Tribal jurisdictional control over reservation resources.
- State governmental blackmail: Linking trade-offs between casinos for treaty resource rights in state-Tribal gaming compact negotiations.
- Failure of the United States to honor its Federal Trust Responsibility to Indians.

Water:

- Water levels – competition/conflict over water resources.
- Ground and surface water contamination.
- North American Free Trade Agreement – water sale being proposed.

2. CLIMATE CHANGE IMPACT : Consider how weather extremes, climate change and variability might either amplify or dampen these stresses, or create new ones (including possible surprises)?

Cultural and Social Stresses:

- Cultural ties to “Great Lakes” could be destroyed – climate change could eliminate cultural way of life for the Great Lakes People. Loss of culture and identity through inability to practice traditional sustainable lifestyles in absence of traditional resources
- Migration of people from southern to northern climates.
- Increased variability will make crop planning more difficult.
- Dried wetlands will affect traditional foods and medicines.
- Increased storm damage and fatalities from flooding, tornadoes, and windstorms.

Economic Stresses:

- Investments could be at higher risk – loans would be more difficult to get.
- Increased crime from competition for limited resources.
- Major restructuring of regional and local economy.
- Forestry and natural resource economies (lumbering, fishing, agriculture, and tourism) could suffer.
- Inland lake-level changes will affect wild rice: decreasing lake size, increasing plant competition.
- Maple sap and syrup production will decline, as trees weaken due to climate stress, until no sugar maples are left.
- International shipping practices could be disrupted – channel and harbor dredging will disturb mercury and PCB's and other toxins in sediment.
- Pressure for more development will increase.
- Insurance rates could increase.

Ecosystem Stresses:

- Climate change will change existing forest ecosystem and could dry up the wetlands – favoring more prairie-type habitats.
- Lake levels and temperature changes will affect natural habitats, including native plants and spawning of native species of fish, while exotic species flourish.
- Inland lake-level changes will affect wild rice: decreasing lake size, increasing plant competition.
- Loss of cold water habitats and cold water fish species.
- Migration of plant and animal species from southern to northern climates.
- Animals/insects are impacted because the seasons are changing.
- Fires from dried-up peat (from reduced lake levels) could destroy viable species and promote erosion.
- Softwood trees will be destroyed from changes in habitat conditions, insect migration, drying, and fire.



- Increased imbalances in populations of certain plants and animals, with communities out of balance.
- Increased POPS (persistent organic pollutants) released into environment.

Energy:

- Increased summer energy consumption could worsen the problem of energy shortages.
- Increased fossil and nuclear energy use would generate more pollution and waste.
- Increased energy demands would cause domino effect with brown outs and black outs. We cannot rely upon the aging nuclear, fossil fuel, or hydropower plants, which we depend upon now.
- Increased energy production will create more dioxins and other pollutants that can affect mammals and, particularly, human reproduction.

Governmental:

- Land use changes will increase regulations and zoning.
- Increased challenges by the states to Tribal jurisdiction to regulate Tribal environmental standards.
- Increased corporate control of governments.
- Greater civil disorder and unrest from anger at government.
- Greater government intervention in local affairs and personal privacy, with increased police intervention.

Water:

- Accelerated water cycling (with increased trans-evaporation) will affect patterns of toxic migration: e.g. droughts will dry areas and expose toxins, then floods and winds will move them elsewhere across the environment.
- Loss of drinking water quantity and quality.

3. ACTION STRATEGIES: What coping or action strategies might address the additional stresses created by extreme weather events, climate variability, and climate change, as well as helping to address existing non-climate stresses?

“Coping” is not a Preferred Option:

- “Coping” seems more like simply accepting and accommodating or conforming to the coming changes.
- Using models is still like putting on a band-aid on the problem. We will never completely know everything about how the planet works or what is involved in climate change through science.
- We should be less concerned about perfecting the scientific models than about preparing the people to meet the known variations and extremes that are coming.
- Our elders are telling us to prepare now, not just cope when it happens.
- We cannot plan only human coping strategy for the long term, because all nature is interconnected.
- Need to get Tribal communities working toward sustainability.
- Need to get Congress to affirmatively support clean and renewable energy initiatives and other “no-regrets” strategies.

Need to Act Now:

Environmentally:

- We must reduce greenhouse gas emissions.
- Look again at impact of present forestry practices in light of climate variability and change.
- Reduce non-point source pollution.
- Promote bio-diversity to strengthen the health of our ecosystems to better withstand climate change and weather extremes.

Governmentally:

- Re-establish Tribal jurisdiction over threatened areas.
- Use and support indigenous sovereignty to co-manage different regions.
- Need to protect spiritual sites.

Socially:

- Need to create a story which lays out all the steps in unsustainable industrial activities such as industrial forestry, i.e. how such practices cause local environmental damage, yet are tied to the global economic picture.
- Need policies to protect and strengthen what is still there, especially pristine areas and areas of food production like wild rice lakes and sloughs, and maple sugar bushes.
- Need to preserve historic and cultural practices for food production.
- Use traditional knowledge and cultural ways for food preservation.
- Examine how western technology and free market policies have impacted food production and sacred sites.
- Develop educational materials to communicate indigenous ways.

Spiritually:

- RESPECT – GIVE THANKS – CONDUCT CEREMONIES.
- Must recognize the existence, nature, and importance of sacred sites.
- Assure Tribal access and control over sacred sites.
- Must make offerings to all spirits - earth, wind, rain, and moon.
- Make offerings as part of a personal and responsible relationship with nature.
- Use traditional ceremonies for answers, such as tent shakers.

Tribal Peoples Must Lead the Way:

- Tribal Peoples must take control of our own resources.
- People need to follow existing rules, laws, including husbandry; follow natural laws

- Indigenous knowledge must be used if people really want to know how to bring back balance, such as protecting and restoring species like the wolf and other animals.

4. INFORMATIONAL NEEDS: What new or additional information would allow people to better understand the linkage between the current stresses and weather extremes, climate variability and change?

This question on informational needs was not addressed in any detail because the group, instead, discussed one special issue of concern to a number of the participants, the Department of Defense's project called the "High-Frequency Active Auroral Research" (HAARP). There was significant concern expressed about the project's purpose, technologies, result, and its effects on humans and the environment. The participants requested information on HAARP and on NASA's role on that project.



The Great Plains

“You have to give thanks. You have to acknowledge the Wind. You have to acknowledge the Earth, and the Sun. We have a song that says: ‘The Tree is my friend; the Sun is my friend.’ This is the kind of relationship we are talking about.”

— Albert White Hat (Sicagu Lakota) Lakota Studies Department, Sinte Gleska University and SunDance leader speaking at the Native People-Native Homelands Climate Change Workshop, Albuquerque, NM, Oct. 29, 1998.

The Great Plains Region Key Characteristics:

The northern, central, and southern Great Plains of the United States is largely a prairie grassland ecosystem, an area of approximately 400 million acres, stretching at its northern end from the Canadian province of Saskatchewan to northern Mexico in the south and from the Rocky Mountains in the west to the woodlands of Wisconsin in the east. The Great Plains includes portions of Montana, Wyoming, North Dakota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, New Mexico, and Texas, occupying the central third of the U.S. continental land mass. The Culture Area is drained and nourished with rivers, streams, and creeks that make up lush riparian areas and fish and wildlife habitat.

It is a former seabed that drained at the time when the Rocky Mountains surfaced. Deeper topsoil is found in the eastern portions due to glaciations from the last Ice Age, which extended into the central areas. The prairie consists of three distinct types of native grasses, the short grass in the west, the mid-grass, and the tall-grass in the east. The temperate areas within the Great Plains are further defined by the amounts of moisture that precipitate eastward traveling storms. The Great Plains are characterized by extremes of climate. The land areas within the larger Culture Area are also well defined by traditional hunting grounds and agrarian areas near water of the Tribal Nations that occupied the lands and were later recognized by treaties with the U.S. government. The Native people existed in a close symbiotic and spiritual relationship with the buffalo that also lived in the Great Plains and maintained the balance of creation. In addition to national parks and monuments, the majority

of the remaining contiguous native grasslands are home to the Native people on the islands established by the government and called reservations.

Characteristics of the region include major human transformation of land by extensive and mechanized agriculture, increasing population shifts from rural to urban areas, thriving trade activities, and an increase of high-tech farm enterprises. The major land uses are agriculture and livestock; these are restricted by variability in temperature and precipitation. Over 90% is in farms and ranches and 75% is cultivated. The five major production systems are range livestock, crop fallow, groundwater irrigation (aquifer dependent), river valley (snowmelt-dependent) and confined livestock feeding. In addition, water availability is becoming limited because of over subscription due to multiple demands for drinking water, agriculture, and wildlife conservation.

Current Regional Stresses:

The existing stresses in the Great Plains include water resources, weather extremes, agriculture economics, ecosystems, and demographic population shifts; all of which impact the agriculture and tourism industries, two important components of the economics of the region.

Greater demands for already scarce water resources among various future users are predicted for urban demands for drinking water, irrigation of agricultural lands, and wetlands wildlife conservation. The Great Plains is well known for extreme weather events including severe winter snow and ice storms, strong winds, hail, tornadoes, lightning, droughts, intense heavy precipitation, floods, heat waves, extreme cold spells, and unexpected frosts. The temperature can change by 30°F in less than a 24-hour period. Family versus corporate farming interests and low market prices for agricultural commodities are continual stresses in the region. The conversion of native lands into monoculture agricultural production areas impact heavily on the protection of natural ecosystems and best management practices for flora and fauna and maintenance of wildlife habitat that contribute greatly to recreation and tourism economies. Within an overall aging population for the larger society, the migration from

rural to urban areas and the emergence of bedroom communities impact labor and resources for health, education, and community services.

There are both similar and unique concerns of Tribal people and lands in the Great Plains that exist within the larger land and economic bases in the region. Water quality, quantity, and water rights are also key issues in Indian Country. Native people on the Great Plains have been very successful at understanding weather extremes and adapting to natural cycles; however, confinement to reservations has restricted that ability to move. So natural disasters such as blizzards and floods have serious impacts on already stressed resources managed by Tribal governments for people on reservations and those returning home due to flooding, as experienced in Grand Forks, ND in 1997. Indian economies are significantly impacted by agricultural economics because the largest private sector industry in the Northern Plains is ranching and farming. Tribes have always been concerned with the protection of prairie ecosystems that have provided sustenance and medicine for millennia; this concern is a spiritual responsibility that is viewed by the larger society as environmental protection. As part of that responsibility, the Tribes have all reintroduced buffalo (and some elk) and food production to contribute to health and economic development.

The Native populations are different than the larger population in that they are extremely youthful with the median age being 20 years as compared to 30 years nationally. The provision of health, education, and economic opportunity is vital to the survival of the Tribal Nations. Another issue unique to Native people is the continued struggle to educate the larger society on treaty rights, trust responsibilities, and the need to maintain respect for Tribal sovereignty by federal, state, and private agencies in regard to protection and development of natural resources, economic restoration, and the provision of human services for Tribal populations.

Anticipated Climate Change and Variability:

Most of the climate change scenarios look to a continued rise in greenhouse gas concentrations concurrent with warmer average temperatures causing shorter, wetter winters and longer, hotter, drier summers. Both natural

and human systems will be affected directly and indirectly by the impacts of climate to a significant degree. The El Niño and La Niña cycles occurring generally affect the frequency and intensity for seasonal weather patterns in other parts of the country; however, in the Great Plains, they may not have as much influence as the inherent climate variability. El Niño has generally produced mild winters in the Northern Plains, but the beginning of the La Niña cycle has produced similar mild winters. Extreme weather events tend to produce intense and violent storms in both summer and winter seasons.

Uncertainty with regard to the frequency and intensity of weather events is likely to increase, particularly with regard to mid-winter into spring precipitation (including extreme rain, snowfall, and ice storm events) and periods of extended drought conditions through summer and fall, with extended summer heat waves. Should winter and spring precipitation be less than anticipated, the reduction of runoff will have significant impacts on water resources in both groundwater aquifers and the reservoir systems.

Anticipated Climate Related Impacts:

Less snowfall and more droughts: Water resources with water quality may decrease with less precipitation and extended heat waves that increase evaporation and depletion of underground resources at rates greater than recharge. There may be large impacts on health, plant cover, wildlife populations, Tribal water rights, the viability of Tribal and individual agricultural operations, and a reduction of Tribal services due to decreases in income from land leases.

Extreme weather events: Natural disasters such as blizzards, ice storms, and floods that isolate communities and result in electric power outages, can result in lack of transportation, fuel depletion, food supply shortages, dangers to people due to cold temperature exposure, stress, illness, and accidents. Poor housing conditions and high energy costs and limited access to off reservation emergency assistance resources contribute to the risks for Native people. Livestock loss due to a severe blizzard can force Tribal ranchers out of business due to lack of financial resources. The Tribal governments are dependent on lease income for operations. With extreme weather events, the risk of land transfer to non-Tribal use and ownership increases.

Summer heat waves: Extended heat waves and droughts in the summer months increase the health risks and mortality for elderly and children. The human community is impacted by the decrease of medicinal plants and the ecosystem is stressed by a loss of wildlife habitat, population reduction, and a loss of wild food plants.

Extended growing seasons: Increased temperatures may result in longer growing seasons. Increased crop variability may contribute to diversifying farming operations and individual gardens. The costs for irrigation are likely to increase and scarce water resources are likely to be further depleted. Higher temperatures also increase the risk of new and vector-borne diseases that migrate north.

Reduction of native grasses and invasive plant species: Higher temperatures over extended periods result in the loss of native grasses and medicinal plants, and erosion that allows the invasion of non-native plants. The zones of semi-arid and desert shrubs, cactus, and sagebrush move northward.



The Great Plains Cultural Area

Wisdom Circle (Breakout Group) Report

1. **CURRENT STRESSES:** What are the current stresses affecting the social systems, natural resources and economic sectors in your Cultural Area?

Agriculture:

- Land management/natural resources; bison vs. cattle.
- Non-native plants crowding native plants.
- Corporate agriculture and sustainable food security.

Cultural Resources:

- Power of one mind; spiritual intelligence, knowledge, ecology.
- Access to and the protection of sacred and ceremonial areas.
- Repatriation of sacred objects being held and not properly cared for.
- Noticed changes in the Sun's characteristics during the Sundance ceremonies

Ecology:

- Maintenance of bio-diversity and sustainable development.
- Buffalo is the most important; also other food stocks.
- Endangered plant and animal species.
- Loss of native plants and habitat.

Economics:

- Economic stresses on women and children.
- Supranational agreements: i.e., NAFTA.
- Tribal governments recognition and economic pressures.

Energy:

- Clean energy (production and usage).
- Increasing fuel costs.
- Energy efficiency to reduce demand and consumption.
- Natural disasters that cut off electrical power, fuel delivery, and communications.

Government:

- Legal issues relative to trust responsibility and sovereignty.
- Recognition of Tribal governments and treaty councils.
- Political survival and political dilution.
- Lack of voice in international discussions of next steps in this process: Native issues in Framework Convention on Climate Change (FCCC) in Buenos Aires.

Health:

- Increase in respiratory diseases.
- Loss of natural medicinal plants.
- Historical grief.
- Disease – nutritional, vector-borne and infectious diseases.

Water:

- Water quality.
- Agriculture chemical run-off.
- Oil and gas production pollution.
- Missouri River system: tree loss, evaporation from reservoirs.

2. CLIMATE IMPACT: Consider how weather extremes, climate change and variability might either amplify or dampen these stresses, or create new ones?

Agriculture:

- Retain sovereign power to manage the land and natural resources.
- Corporate agribusiness (e.g., massive hog farms) pollutes resources.
- Crops may not be viable with changes in temperature.
- New crops may be introduced with longer growing seasons.

Ecology and Cultural Resources:

- Highest human priority is the protection of Mother Earth.
- Human beings are entrusted to use their spiritual intelligence.
- Impacts on sacred sites through erosion, drought, or flood.
- Change may prevent ceremonies in specific sacred places, e.g., the sacred Black Hills and the gathering of medicines at specific times.
- People must be free to practice ancient lifeways.
- Preserve the livability of the planet.

Economics:

- Extreme weather events create financial risk for Indian agricultural operators.
- Cattle unable to survive some extreme weather events.
- Potential for non-Indian operators to use Indian lands.
- Opportunity for large corporations to lease Tribal lands and ignore sustainability.
- Agricultural leases primary source of income for Tribal services.

Energy:

- Global warming is obvious need for clean energy.
- Focus on “green” energy such as wind or solar energy.
- Build energy efficient homes using indigenous building materials.
- Xeriscaping landscapes.

Government:

- Tribal governmental resources already stretched to the limits without climate stress.
- Challenges to the legitimacy of Tribal governments from state and Federal Government.
- Governmental responsibility for sustainable Tribal economies.
- Continued education regarding climate change issues.

Health:

- Risk of increased illness and death from heat and hypothermia.
- Diseases in humans, wildlife, and plant life.
- Increase in pests and vector-borne diseases.
- Loss of natural medicines and plants.

Water:

- Quantity and allocation of water rights.
- Decreasing quality of water available to sustain livelihoods.
- Increased evaporation and water loss.
- Increased dryness and droughts in the summer.
- Missouri River system, tree loss, reservoirs, and evaporation.

3. ACTION STRATEGIES: What coping or action strategies might address the additional stresses created by extreme weather events, climate variability and climate change, as well as helping to address existing non-climate stresses?

The comments and issues expressed feelings and views about social and economic sovereignty and security of natural resources. The trust obligations of the U.S. government have not been fulfilled and it is a continual struggle to maintain a basic level of community services on reservations with high levels of unemployment and lack of financial resources. The term “coping strategies” might better be interpreted or changed to “action strategies” or sustainable development planning.

Agriculture:

- Save the prairie ecosystem before actual extinction.
- Develop native land use practices to revert to a buffalo economy to obtain sustainable food security.
- Plan and develop Tribal food production projects for local consumption and USDA Commodity Program market.

Ecology and Cultural Resources:

- Remember to use our spiritual intelligence in any approaches chosen, based in our traditional teachings.
- Education is the most important issue; science curriculum is needed, generations are needed to fix it.
- Use available technology and funding (NASA, Department of Interior, and others) to research information on our lands; evaluate the data, ourselves, to determine potential impacts from climate change, economic development, environmental degradation, land fills, and waste sites.

Economics:

- Implement planned comparative analysis between beef and buffalo economies.
- Request increased funding for federal financing programs to provide for sustainable agricultural development and maintenance of Tribal operations and renewable energy sources.

- Develop intertribal markets and trade agreements to support sustainable development in food production and energy use.

Energy:

- Propose “green” energy technologies to Tribal councils (wind, solar, low-impact hydropower).
- Research resource pools and economic viability for different technologies.
- Develop Tribal energy efficiency codes and weatherization programs to maximize energy efficiency and reduction of illness and death from extreme heat and cold conditions.
- Develop renewable energy resources as a “no regrets” climate strategy and sell energy to other Tribes and on the green power market and develop the red power market.

Health:

- Develop sustainable agriculture and food systems security and address nutritional issues and the Native diets.
- Protect medicine plants and transplant to safe land areas.
- Develop Tribal energy efficiency codes and weatherization programs to increase energy efficiency and reduction of illness and death from extreme heat and cold conditions.
- Utilize elders to train teachers to develop curriculum/materials on environment and ecology (work with science agencies like NASA, USGS).

Land:

- Plant and protect trees, as they are very important in soil conservation and ceremonial use.
- Educate Tribal members and the general public about the importance of preserving our traditional ways and sacred sites as part of a seven generation plan to save Mother Earth.
- Implement environmental protection codes and enforce provisions.

Political:

- Continue to remind Federal Government of trust responsibility in protection of lands and resources.
- Use of Tribal resources by Tribal people for restoration of sustainable economies.
- Seek alliances and partnerships with other Tribes and groups for sustainable development; i.e., agriculture community or energy consumers, and academic institutions.
- Communicate Native perspectives and recommendations and participate in the international forums and conventions as Tribal Nations.

Water:

- Go home from this conference and develop at least a 50-year Tribal water plan, now!
- Propose increase in cost or periodic rebates to initiate conservation.
- Use “green” (micro chemistry) chemicals in agriculture.

4. INFORMATIONAL NEEDS: What new or additional information would allow people to better understand the linkage between the current stresses and weather extremes, climate variability and change?

First and foremost, we need information and guidance from our spiritual leaders and elders. Other information is meaningless without this foundation first.

The following is a list the Great Plains group was able to generate within the time allowed. This is by no means an exhaustive list.

- Real, honest health information—current and projected (statistics) for Indian health issues such as:
 - a) Diabetes
 - b) Respiratory
 - c) Heart Problems
 - d) Cancers
 - e) Children’s health

- More research by Native people on environmentally related illness
- Tribal community development of 50-year water plan
- Information about potential climate change models - specific to region
- Information about alternative and renewable energy development (redefine “efficient”) as a “no-regret” strategy
- Information on funding resources: people and agencies
- Educational information and training on Emergency Response Plans from FEMA
- Information about social and environmental stress management
- Information regarding alternative medicines other than Indian Health Service (IHS)
- Native nutrition - real traditional foods preparation and nutritional values
- Information regarding waterway rehabilitation
- Land rehabilitation/restoration, including plants and animals
- Environmental justice and asset development
- Legal enforcement of EPA regulations, environmental justice laws, and treaty obligations
- Using networking within our communities. Identify Native scientists and professionals and bring the children home
- Information networks and resources - e-mail, Internet, develop and maintain regional networks among Tribes
- Professionals on loan - “friendly allies”
- Information on technology transfer and its relation to tribes
- Information on sustainable development (energy, food, water, and ecology)
- Information on infrastructure development by and for communities

The Southwest

The Southwest Region Key Characteristics:

This region includes Arizona, New Mexico, and parts of California, Colorado, Nevada, and Utah, and includes the climate workshop regions of the Southwest and Southwest Border areas. This area includes eight (8) distinct Level III eco-regions. The arid nature of much of the West combined with rapid population growth and increasing demand for water resources, means that this area is vulnerable to climate change and climate variability. The economy is a mix of ranching, dryland and irrigated agriculture, mining, tourism, retail, manufacturing, and high technology industries.

Much of the region is sparsely populated, with perhaps a dozen major, and very rapidly growing, high-density urban centers. These urban and economic systems are based on a rich mix of ecosystems including alpine mountains, deserts, and many fertile valleys riparian ecosystems, all of which will potentially be affected by climate variability and change.

Current Regional Stresses:

Water availability is among the top concerns in the region. Use of water exceeds sustainable supply, and demand grows at current water prices. Surface water supplies are insufficient, and groundwater use in many areas exceeds recharge rates, leading to lowering of aquifer levels, contamination, and subsidence. Agriculture, livestock, urban centers, tourism, and recreation already face extreme pressures from the limits of water supplies.

Water "shortage" is a function of price and distribution among water users. Between 60% to 80% of the water used in the Inter-mountain West and California goes to agriculture, much of which is subsidized. An important policy issue identified is the impact of subsidies. Marketing of water without subsidies would make some forms of agriculture uncompetitive, making more water available for environmental needs and for urban and industrial uses. With greater precipitation, shortages would diminish.

Large seasonal, annual, and decadal climate fluctuations have always had major impacts on ranching and agriculture. Analyses of climate records for the 20th century for Arizona, New Mexico, Nevada, and Utah, suggest that there has been a slight increase in both minimum and maximum temperatures, but no detectable change in precipitation.

In many parts of the West, historic and current land use patterns and the present growing population have stressed natural ecosystems and increased the number of threatened and endangered species. Many of these species inhabit riparian, wetland, and aquatic ecosystems. As responses to climate variability and change are developed, the need to maintain adequate water flows in natural systems is an important consideration.

Anticipated Climate Change and Variability:

Future projections of climate in the Southwest indicate that it faces very significant climate changes in the next century:

- An increase in annual average temperatures of 5-9 degrees F.
- More extreme hot days, fewer cold days, and a decrease in daily temperature range.
- Decreased summer precipitation, and an increase in winter precipitation and its intensity.

Current biographical model simulations indicate up to a 200% increase in leaf area index (vegetation) in the desert southwest region of North America and a northern migration and expansion of arid-land species into the Great Basin region. Fires will likely increase in frequency and severity, with greater loss of life and property damage.

The Southwest Cultural Area

Wisdom Circle (Breakout Group) Report

1. **CURRENT STRESSES:** What are the current stresses affecting the social systems, natural resources and economic sectors in your Culture Area?

Cultural Resources and Sacred Sites:

- Destruction of cultural and burial sites for development; removal of remains in spite of Native American Graves Protection and Repatriation Act (NAGPRA).
- Chemical pollution destroying medicinal plants.

Ecology:

- The border regions can sustain only so many people and development.

Economic:

- Poverty and economic underdevelopment.
- Jobs for Indians are on a lower wage scale.

Health:

- Women ingesting contaminated medicinal plants breast-feeding babies.
- Substance abuse higher due to economic conditions.

Natural Resources:

- Land and resource overuse including: water, firewood, and hunting.
- Solid waste disposal.

Social:

- Lack of concern for Indians killed by drug smugglers and held hostage in their communities.
- The South and Central America push factors; there is a stress on the land.
- RAND Corporation study indicated political instability, poor people, low development, and possible political unrest.

Urbanization:

- Over population and urban sprawl and the demand to feed urban society.
- Many new houses are being built with no infrastructure planning (e.g. sewers).

Water:

- With shortage of water and Indians paying for water; there could be a water war.
- Water development on Indian lands with the benefits of water resource and income going to non-Indians.
- Underground storage of fossil fuels is contaminating water.

2. **CLIMATE IMPACTS:** Consider how weather extremes, climate change and variability might either amplify or dampen these stresses, or create new ones?

Cultural Resources:

- Ceremonial resources are not as readily available as in the past.

Economics:

- Children have to leave home to look for income to buy food.
- Armed conflict and lack of income forcing Indians from other countries to migrate to United States to survive.
- Climate variability could affect income from tourism.

Ecosystem:

- The impacts in Alaska and British Columbia will be similar.
- We used to have four seasons; now it seems like only two seasons. After, there is no spring.
- Elk immigration causes food shortage for deer.
- Long-term changes in climate may cause drought and changes in crops (e.g. corn).

Government:

- Lack of leadership with respect to planning for climate change and sustainable development.
- Indians are renting land with the water provided to the owner with a government reimbursement.

Health:

- Concerns about impact on health of elders.
- There are more people with eyesight problems.
- Heat exhaustion has been increasing (e.g. while harvesting mesquite).

Science and Cultural Attitudes:

- There are global sources causing climate change impacts.
- When will we address the emission sources that degrade our land?
- The merging of science and tradition is good.
- Scientists need to decode climate change impacts.
- Part of dealing with climate change is accepting it.
- People only worry about something when it directly affects them.

Sustainability:

- Overpopulation and tremendous growth rates often take away areas of needed resources.
- Culture and religion depend on the land and an environment that sustains ecology.
- Weather changes, unexpected tornadoes, and natural disasters.
- Flooding and backwater; houses built in river valleys are destroyed and built again.

Water:

- Loss of wetlands.
- Need to drill deeper wells for water at higher cost. Insufficient budgets.
- Water is everything in the Southwest and pollutants can have huge effects.
- Impact on the Rio Grande River also impacts life and community along the river.
- Climate change has significantly increased the impact of water shortage.
- What were previously three-year periods of drought are now lasting twenty years.

3. ACTION STRATEGIES: What coping strategies might address the additional stresses created by extreme weather events, climate variability, and climate change, as well as helping to address existing non-climate stresses?

Agriculture:

- Research methods of adaptability in cropping patterns with climate variability.
- Revert to an agricultural economy and impose management of water.
- Create a better understanding that there is a real connection with weather variability, cultural life, spiritual responsibility, and the impact on cultural resources.

Cultural Resources:

- Maintain traditions in spite of problems.
- Understand and apply both traditional ways and science.
- Develop and use cultural knowledge and contribute by example.
- Indians should devise means to maintain the integrity of Indian culture such as the protection of Indian intellectual property rights and ceremonies.
- Federal, state, county and Tribal governments should promote access for Indians to all sacred areas that support Indian cultural expression.
- Cautionary adaptation or approaches to the scientific technological systems available.
- Indians must understand the individual components of technological developments but also understand the purpose of utilizing each technology.

Education:

- Change wasteful lifestyles, environmental risks, and global warming.
- Respect elders' wisdom.
- Learn what non-Indian elders teach their children.
- Consider this workshop and discussions a beginning; look for solutions.
- Develop ways to share information.
- Encourage scientists to integrate their studies with Indian knowledge. Indigenous ways and values are also science.
- Recognize that Indian youth are educated, have a right to be involved, and have a contribution to make to the future.
- Educate Indian children in their own Indian traditional methods of survival, e.g., planting seasons, control of traditional knowledge, values, and ceremonies.

Energy:

- Develop renewable resources such as photovoltaic (solar) energy sources to reduce the need for carbon-based energy.
- Generate renewable energy for home use and sale back to power plants.
- Stop the sale of native resources such as coal and uranium that contribute to pollution.
- Develop manufacturing plants for renewable technology production.
- Look at development of solar and wind energy.
- Develop rammed earth or other type of energy efficient housing. (Perhaps, NASA or DOE could help interact with HUD and other agencies to provide more appropriate Indian housing.)

Government:

- Support no further flow of military equipment and resources used against Native people in Mexico.
- Take a pro-active stance in dealing with climate change.
- Undertake land and water use planning.
- Federal agencies must listen to Native people and develop a process to continue dialogue.
- Better Indian representation of Indian positions in all areas of Indian concerns, i.e., legislation, local, state, and national.
- Indian self-determination should be supported from Indian point of view.

Natural Resources:

- Need to understand that our resources are manageable.
- Support the Native people in Alaska and the maintenance of a good standard of living for us all.
- Support the protection of Indian lands and resources for Indian use.
- Snow pack management must be considered to enhance water storage.

Actions to Take:

- Change the way we all live.
- Continue adaptability, e.g., horse, computers, clothes.
- Conclude and adjudicate legal issues.
- Get regulations in place: e.g., water use contracts.
- Solidify your finite land/space resources.
- Quantify, qualify resource management (Indian Quantitative Data under Indian terms)
- Improve or eliminate detrimental obstacles.
- Consider both positive and negative consequences of alternative resource management.
- The plan of action for this dilemma must be based on sound information and good decisions.
- National laws should not impose non-Indian values on Indian peoples.

4. INFORMATIONAL NEEDS: What new or additional information would allow people to better understand the linkage between the current stresses and weather extremes, climate variability and change?

- Knowledge about and access to scientific, technical, and other relevant information from government agencies.
- Personal feedback.
- Tribal input.
- Community input.
- Climate-related education and scientific data to all of the above.
- Educational materials for farmers and others regarding use of safe fertilizers, etc.
- Diet and nutrition education materials.
- A stronger technical relationship between tribes and science agencies such as NASA and USGS.
- Tribes need technical assistance and education to develop processes for community awareness.
- Climate-related education focused on promoting healthy lifestyles and environmental consciousness.
- Education materials need to be made available to tribes.
- Tribes need to be included at the negotiating tables of planners and developers, large corporations, and other governments planning to engage in development or other activities that could impact neighboring Native homelands.
- NASA's technical and space-based capabilities to assist tribes in developing land use plans, (e.g., identifying potential land use mapping, road planning, identifying irrigable lands, mapping water resources, etc.).
- Clearer definition of responsibilities of Federal Government (under the Trust Responsibility) to assist tribes in protecting their homelands from negative impacts of climate change.

Pacific Coastal and Intermountain Areas

“Our elders used to tell us that they knew it was coming. They would tell us: ‘One day this water, these mountains, you will see a time of change where it is going hurt our people.’ That almighty dollar, the corporations, that greed for money, is what is hurting our climate today, and hurting our people, our animal life, and our water supply, and all our mountains where our berries are. We never used to get the kind of heat we see today in Washington and Oregon. We never did see our waters, our rivers, or our lakes get so warm. Who is creating it? Not Indian people.”

– Chief Johnny Jackson (Columbia River Tribes)
Coastal breakout group, Native People-Native
Homelands Climate Change Workshop,
Albuquerque, NM, Oct. 29, 1998.

(1) Coastal Areas and Pacific and Caribbean Islands and

(2) Rocky Mountain and Great Basin

It was decided to form one, combined group for most discussions for these two large diverse geographic regions (Pacific coastal and Inter-Mountain) because (1) they were represented by a relatively small number of Native participants and (2) many inter-area linkages occur between these areas with regard to weather patterns and conditions and to water resource issues (precipitation, rivers, and ocean). However, they met separately to address the first set of questions about existing stresses in their specific areas and the likely impacts of climate change on their present conditions. Then, the two groups (Coastal and Intermountain) combined to discuss the second set of questions concerning the action strategies and informational needs.

1. Coastal Areas and Pacific and Caribbean Islands

The American west contains the most diversified third of the continent in terms of elevation, climate, habitat and cultural adaptation. Due to the historical immigration patterns and the widespread removal of many Native peoples from the eastern coastal regions, the American west and Pacific coastal areas remain the home

of many Native peoples. One of the consolidated workshop breakout groups was the American western Coastal Area, which included the Pacific Coastal areas ranging from Alaska (coastal and the interior western subarctic) down along the western edge of the United States from Washington to California, and including Hawaii and other Pacific islands. This area consists of over 30 distinct Level III eco-regions on the mainland alone. While the Caribbean Islands were not directly represented at the workshop, similar considerations may be applicable.

Along the American Coastal west, elevations range from sea level to mountain. From north to south, climates range from tundra, taiga, west temperate margin, mountain, mediterranean, steppe, and desert. Vegetation zones include tundra, coniferous forest, mediterranean scrub forest, steppe, and desert scrub. Rainfall is usually abundant, ranging from more than 80 inches annually along the northern coast, to between 40 to 80 inches through northern California and 20 to 40 inches in southern California. Culture areas include Arctic, Subarctic, Northwest Coast, Plateau, and California, wherein traditional subsistence focused upon marine game, fish, and a mix of land based game and wild plants for food and material resources. Historically, the coastal region from the states of Washington to California – a relatively small sliver of the entire continent— supported the highest Native regional population density in America north of Mexico. It was rivaled only by the densely populated pueblo settlements of the Southwest.

Hawaii and most of the other Island Homelands located elsewhere in the Pacific as well as in the Caribbean Sea and Atlantic Ocean, have environments of predominantly sea-level beaches and more isolated rain-forested uplands. These islands have tropical or subtropical climates. Island habitats depend upon abundant rainfalls, and their traditional cultures are attuned to fishing and mixed hunting, gathering, and gardening patterns of subsistence. Today, many Native islanders rely more on tourism and import/export economies than directly on more self-sufficient patterns of the past due to increased competition for natural resources and habitats, often from the tourism industry itself.

2. Intermountain Area: Rocky Mountain and Great Basin Areas

A second consolidated group is the Intermountain Area, which included participants from the Rocky Mountains and Great Basin regions of the interior western United States. This area is bounded by the California and Pacific Coastal areas to the west; Northwest Coast and Plateau area to the north; the Great Plains to the east, and the Southwest to the south. This large natural desert-like basin is virtually surrounded by uplands including the Sierra Nevada mountains to the west, the Columbia plateau to the north, the Wasatch and Rocky mountains to the east, and the Colorado plateau to the southeast. Climates range from steppe and desert to humid continental and mountain. This area holds a limited range of vegetation that includes primarily desert shrub and coniferous forest, due largely to the area's limited rainfall of often less than 10 inches per year. This area includes some 16 Level III eco-regions. This area continues to support a far smaller population than that of any of its neighboring cultural areas.

There is an overlap among these areas with respect to the other, state-based groupings of regional climate workshops. For example, Alaska includes both Arctic and Pacific coastal areas along with vast interior mountain and tundra areas, and the Pacific Northwest includes both Pacific coastal and interior basin areas of Washington and Oregon along with the plateau and mountain regions of Idaho. Native participants were asked to speak to issues arising in their particular homelands as well as to concerns of the larger regions from which they came.

Key Characteristics:

The Native peoples of the coastal areas are marked by their proximity to, or dependence upon, coastal and marine resources. This region, from north to south, consists of the Alaskan Western Arctic, the Pacific Northwest, including the states of Washington, Oregon, and parts of Idaho (as well as parts of the Yukon Territory and British Columbia in Canada), California, Hawaii and numerous island territory communities of the Pacific and Atlantic Oceans and the Caribbean Sea.

Melting ice and permafrost, sea-level rise, coastal storms over ice free oceans, increased fresh water inputs

and salt water intrusion, changes in ocean and coastal water temperatures, ocean currents, and related atmospheric impacts, are interrelated changes anticipated under global warming scenarios. Some of these changes are already occurring in the northern extremes.

ALASKA: Alaska is not only the largest, but it is also the single, most ecologically diverse state with twenty distinct Level III eco-regions ranging from mountain glaciers, peatlands and tundra, to boreal spruce and coastal rainforests. Native subsistence and economies depend upon a diversity of marine and land based natural resources highly sensitive to climatic alterations. Greater detail on the characteristics of Alaska is provided elsewhere in this report.

PACIFIC COASTAL WEST: The historic economic base in the Pacific West (Washington, Oregon, and Idaho) has been primary production of forest products (about 50% of the nation's softwood lumber and plywood) and agriculture. Of perhaps greater importance traditionally to the 38 Indian Reservations in these three states are the fisheries and marine (sea mammal and shellfish) resources of the region, especially the several salmon species that depend upon both the river and ocean habitats. Extensive timbering and hydroelectric power generation have altered the natural river and watershed environment and, coupled with increased marine fishing pressures, have reduced the traditional abundance of salmon in a region that once supported the largest Native population in North America.

CALIFORNIA: One quarter of a million American Indians, many drawn from all over the country, reside in California, giving it the second largest population of any single state, after Oklahoma. There are over 100 federally recognized reservations in the state, with some 40 more Indigenous groups seeking federal recognition. Most Indians in California reside in urban areas for employment reasons. California was historically the home of over 500 distinct tribes, reflecting the great ecological diversity of the state. Today, the homelands may be broadly grouped into three primary cultural areas: Northern California, with an orientation similar to that of the Pacific Northwest, Sierra Nevada, with an Intermountain or Great Basin orientation, and Southern California, with a more desert Southwestern orientation.

ISLAND COMMUNITIES: No specific information was obtained on total island populations or land areas. Like continental North America, however, the largest concentrations of population, infrastructure and economic development occur along the coastal areas, making them susceptible to sea level rise and coastal impacts. On some of the Pacific Islands, “Native Peoples” make up the majority of resident populations. In Hawaii and on many of the Caribbean islands, however, a great deal of the resident population is composed of relatively recent immigrants, not necessarily culturally attuned to the native ecologies. Island economies, once primarily based upon subsistence fishing and agriculture, are now highly dependent upon tourism and export agriculture, which are more climate sensitive.

Specific Concerns/Identified Stresses:

ALASKA: Fisheries, transportation and energy, forestry, subsistence, and wildlife. Fisheries in the region are also a major part of the national economy. The Bering Sea is one of the world’s largest remaining international fisheries, heavily utilized by the United States, Russia, and Japan. The two largest U.S. fishing ports are located in Alaska, along with major wildlife resources in parks, wildlife refuges, and preserves (the “Serengeti of the Arctic”). Numerous Native villages with their subsistence economies and lifestyles add to the complex economy of the region.

Observed changes in the climate over the last three decades are larger than in any other region in the U.S., and are close to the changes predicted by Global Climate Models. The warmer climate has resulted in reduction in sea ice extent, receding glaciers, and thawing of the discontinuous permafrost, which has already put serious stresses on the region.

PACIFIC COASTAL WEST: The regional economy in the Pacific Northwest is presently dominated by trade and services, with a significant growth in employment and income, with recent declines in forest product employment and productivity. Important products and industries for regional use and export include potatoes, apples, fruits, nuts, and berries, along with marine and freshwater fish. The region is also in the top ten in terms of national non-agricultural job growth.

Regional growth and changing allocation priorities are stressing the Columbia Basin river system, which is shared by many users for multiple purposes. As with the over allocation of the waters of the Colorado River, there is already not enough water to meet the current and potential future demands on the supply. Over the next two decades, regional planners anticipate very high rates of in-migration. This level of population density will severely stress an already over-stressed system. Forestry, water, marine ecosystem, coasts, agriculture and health are the major areas of concern presently under stress in the region.

CALIFORNIA: Urban system impacts, water systems, coastal impacts, agriculture bio-diversity and ecosystems, and fire. Key issues here include water supply and use, agriculture, forestry, coastal zones, protected areas, recreation, fisheries, land-use, and ports.

ISLAND COMMUNITIES: Coastal communities on islands, as well as along the continental areas and especially along the shallow Gulf coast, are particularly susceptible to the impacts of sea level rise, hypoxia, and salt-water intrusion to freshwater hydrological systems and wetlands. In the Pacific Islands, water, extreme weather events and coastal hazards, threaten coastal and marine ecosystems. In the South Atlantic Coast-Caribbean areas water resources, human health, coastal impacts, tourism, agriculture, diverse ecosystems and wildlife, and urban areas present issues of concern.

Anticipated Climate Change and Variability:

ALASKA: This northern area is already warmer and wetter than previous normal levels. The Arctic is one of the areas of the world expected to receive the most significant climate change impact. Major impacts in the Western Arctic due to decreases in snow cover and glacier mass balances, thawing of the permafrost and reductions in sea ice extent include: costly damage to roads and other infrastructure, large-scale changes in ecosystems when permafrost thaws, changes in the productivity of marine ecosystems, economic impacts on the Bering Sea fisheries and on petroleum and other human activities in the region, and social impacts on northern indigenous populations. Many of these impacts are already observed and will become even more pronounced if present climate trends continue.

PACIFIC COASTAL WEST: Temperature increases are likely to be smaller than in the continental interior, and changes west of the Cascades are likely to be smaller than east of the Cascades. With climate change projections for the Northwest for warmer, wetter winters, and warmer, drier summers, expectations are for:

- Increased winter flooding west of the Cascades.
- Saturated soil, resulting in increased landslides.
- Reduced snow-pack, earlier snow-melt, leading to:
 - less water available for irrigation and urban water supply
 - greater disparity in timing between hydropower supply and demand.
- Diminished forest vitality east of Cascades owing to increases in:
 - drought stress
 - pest infestations, and
 - intensity and extent of fires.
- Increased coastal SST's (sea surface temperatures) could inhibit upwelling, diminishing nutrient supply for the entire marine food chain.
- Increased coastal erosion and flooding.

Critical changes to the hydrological cycle affecting water availability and timing of supply are predicted. Coastal and estuarine ecosystems, aquatic ecosystems, agriculture, energy, forests and rangelands, and urban centers will all be affected. Salmon will be especially hard-hit in their freshwater and early ocean phases of their life cycle. Sea level rise could also affect both coastal and urban centers.

CALIFORNIA: Key issues include water supply and use, agriculture, forestry, coastal zones, protected areas, recreation, fisheries, land-use, and ports. There is a strong correlation between warm, dry weather patterns and fire frequency. Coupled with fuel accumulation in areas where human settlement has led to fire suppression, there is a strong likelihood that property damage and loss of life will occur with greater and increasing severity under conditions of climate change.

ISLAND COMMUNITIES: Key issues identified for island communities include the maintenance of fresh-water resources, protecting public health and safety from weather extremes, protecting remaining ecosystems and biodiversity, and responding to changes in sea level and storm surge incidents.



The Pacific Coastal and Intermountain Areas

Wisdom Circle (Breakout Group) Report

1. **CURRENT STRESSES:** What are the current stresses affecting the social systems, natural resources and economic sectors in the Tribal regions in your cultural area? and
2. **CLIMATE CHANGE IMPACT:** Consider how weather extremes, climate change and variability might either amplify or dampen these stresses, or create new ones?

Note: This group considered the first two questions together during their first breakout session.

Climatic Changes:

- Changing air and water temperatures.
- Increased winds caused by changes in atmosphere.
- Increased winds not just periodic any more, but tend to be constant.
- Winds are now very, very strong.
- Violent weather changes where storms wipe out intertidal shellfish and hurt economy.

Culture and Social:

- Cultural practices are endangered due to lack of necessary natural resources.
- Loss of cultural assets because traditional ways of life are not supported in present economies.
- Non-Indians unwilling to listen to Indian concerns regarding environment and wildlife and fish.
- Must listen to learn from elders. Important to record oral histories now.
- Cannot compartmentalize regions and/or issues: Important to work together and share lessons and insights.
- Start with consideration of environment and natural resources.

- Economic growth derives from healthy environment.
- Cultural traditions, social and community health are all dependent on environment.

Economics:

- Unemployment due to less availability of natural resources.
- Economic “booms” happening at the expense of Indian people and their resources.
- Economic health of Native peoples depends on ecological health of their environment: An altered ecology changes the Native economy.
- Too much emphasis on non-Native definitions of, and attention to, “economic growth” (as now defined, “economic growth” threatens traditional lifestyles and Native communities — “It all comes down to greed.”)
- Economic changes and environmental changes are interrelated.
- Unfortunate reliance on industries that cause or exacerbate problems.

Fisheries:

- Declining salmon runs.
- Logging and silting of salmon beds stress production.
- Netting of “by-catch” by fisherman.
- Deformed fish.
- Tumors and cancers on fish and frogs.

Health:

- Potential and existing effects / deformities / high infant mortality due to exposure to pollutants (e.g. chemical, nuclear).
- Significant decrease in life spans of Indians due to unavailability of traditional foods.

Infrastructure:

- Housing has to be moved due to erosion.
- Transportation and shipping costs are affected by changing weather.
- Highways are affected in Arctic and Sub-Arctic regions as permafrost melts.

Natural Resources (plant and wildlife):

- In Alaska - see Alaska report information
- “Bruises” on polar bears causing bad taste in the meat.
- Berries burning in the mountains due to abnormally high temperatures.
- Deformed and disappearing plant life.
- No more birds, frogs along the river.
- No more gray squirrels in the forest.
- Subsistence harvesting hindered by laws, by poor quality stocks, disease, and depleted populations of fish, seals, berries, kelp, and seaweed.

Pollution:

- Air pollution due to burning forests.
- Pollution of ocean water by fertilizers and chemicals from development, farms, golf courses etc.

- Polluted rivers and streams from industry.
- Harmful effect of UV radiation with depletion of ozone layer.

Tourism:

- Hurricanes have major effect on tourist industry in Hawaii and Atlantic island communities.
- Increased tourism also adversely impacts Native lands and waters.

Water:

- Melting polar ice.
- Change in ocean salinity.
- Changes in land cover - to support industries - affecting water quality and related resources.
- Changing rainfall and snowfall patterns and amounts.
- Minimum river and stream flows for fish at critical seasons.
- Too much rain saturates soil, causing erosion.
- Erosion due to rising sea levels.
- Contamination of fresh water sources by saline water.



Rocky Mountain and Great Basin Area

*"I sit in your crowded classroom
And learn to read about Dick, Jane, and Spot.
Yet, I can remember how to catch a deer ...
I can remember how to do beadwork ...
I can remember the stories told by The Old ...
But Spot keeps showing up ... and my grades are bad."*

– A Shoshone-Bannock poem read in the
Breakout Session believed written about 1956.

Key Characteristics:

This region includes southeastern California, Nevada, Utah, southeastern Oregon, southern Idaho, southwestern Montana, and western Wyoming and Colorado. The arid nature of much of the West, combined with rapid population growth and increasing demand for water resources, means that this area is vulnerable to climate change and climate variability. The economy is a mix of ranching, dryland and irrigated agriculture, tourism, retail, manufacturing, and high technology industries.

Despite vast areas of low population densities, this region is extremely urbanized. Much of the region is sparsely populated, with perhaps a dozen major, and very rapidly growing, high-density urban centers. For example, Utah is the sixth most urban state in the U.S. Native populations and reservations remain primarily rural. These urban and economic systems are based on a rich mix of ecosystems including alpine mountains, deserts, and fertile valley riparian ecosystems, all of which will potentially be affected by climate variability and change.

Specific Concerns/ Identified Stresses:

Flash flooding is already of particular concern throughout the Great Basin as a region surrounded by the Rocky Mountain uplands, where the frequency, magnitude and intensity of precipitation events could increase in both winter and summer. Reduced snowpack due to warmer winters will shift water runoff and thus impact the present scheduling and management of water delivery for power, irrigation, fisheries, and consumption or human use.

Anticipated Climate Change and Variability:

Future projections of climate change in the Great Basin indicate that it faces the prospect of significant climate changes in the next century:

- An increase in annual average temperatures of 5-9 degrees F.
- More extreme hot days, fewer cold days, and a decrease in daily temperature range.
- Increased and intensified winter precipitation and its intensity, with possible increase in summer precipitation in some areas.

Northern migration and expansion of arid-land species move from the desert southwest into the Great Basin region. Landslides and debris flows in unstable Rocky Mountain areas and possibly elsewhere could become more common as winter rain and snowfall increases, permafrost degrades and/or glaciers retreat. Fires will likely increase in frequency and severity, with greater loss of life and property damage.

Where summer rain may increase in the Great Basin, results would be mixed. Productivity of native vegetation would increase, with more grasses in the shrub-steppe areas and improved livestock conditions. Fire frequency could also increase with more fuel and lightning strikes, degrading the land and reducing regional bio-diversity. If there is less snow accumulation and more rapid run-off in the higher elevations, there will be negative effects on recreational industries (skiing) and various impacts to downstream users. Changing and more variable rainfall and mountain snow-pack patterns will impact long-range water supply planning strategies for irrigation, flood control, and electricity generation.

Current Regional Stresses:

Water availability is among the top concerns in the region. Use of water exceeds sustainable supply, and demand grows at current water prices. Surface water supplies are insufficient, and groundwater use in many

areas exceeds recharge rates, leading to lowering of aquifer levels, contamination, and subsidence. Agriculture, livestock, urban centers, tourism, and recreation already face extreme pressures from the limits of water supplies.

Water “shortage” is a function of price and distribution among water users. Between 60% to 80% of the water used in the Intermountain West and California goes to agriculture, much of which is subsidized. An important policy issue identified is the impact of subsidies. Marketing of water without subsidies would make some forms of agriculture uncompetitive, making more water available for environmental needs and for urban and industrial uses. With greater precipitation, shortages would diminish.

Large seasonal, annual, and decadal climate fluctuations have always had major impacts on ranching and agriculture. Analysis of climate records for the past century for Arizona, New Mexico, Nevada, and Utah, suggests that there has been a slight increase in both minimum and maximum temperatures, but no detectable change in precipitation.

In many parts of the West, historic and current land use patterns and the present growing population have stressed natural ecosystems and increased the number of threatened and endangered species. Many of these species inhabit riparian, wetland, and aquatic ecosystems. As responses to climate variability and change are developed, the need to maintain adequate water flows in natural systems is an important consideration.

Rocky Mountain and Great Basin Area Wisdom Circle (Breakout Group) Report

1. **CURRENT STRESSES:** What are the current stresses affecting the social systems, natural resources and economic sectors in the Tribal regions in your cultural area?

Cultural and Social:

- Unsustainable and destructive human behaviors and activities in terms of land, water, and energy.
- Lack of thankfulness and care for nature.
- Inadequate housing stock, lack of funding for sustainable housing, and improper setting and location of development.
- Lack of responsibility for negative actions.
- Increased population pressure on limited local resources.
- Main regional driver is economics and Native peoples lack economic power.
- Loss of spiritual values and lack of faith in the Spirit.
- Need to challenge attitudes of dominant society.
- Need for Religious/Spiritual perspectives to be taught in schools.

Ecology:

- Changes in “normal” seasonality.
- Summers are somewhat shorter and much drier.
- Winters are now shorter: once spanned from early November to late March.
- Unpredictable and unseasonal freezes and cold snaps.
- Erratic seasonality promotes early growth of vegetation, which dries, dies, and then promotes summer wildfires.
- Heightened fire danger threatens wildlife and reduces opportunities for livestock grazing.
- Snow-pack much higher in the mountains.
- Failure to recognize that all elements of nature breathe, drink, and are alive, just as we are.

- Effects of fire are both good and bad.
- Humans are overwhelming the ability of natural systems to maintain themselves, e.g., recharging, cleansing, purification, etc.

Economic:

- More sustainable economic opportunities needed.
- Jobs for Indians are on lower wage scale.
- Many decisions with environmental consequences are made for economic reasons.
- Economic choices have caused the loss of natural checks and balances.
- We are not living within a sustainable local economy.
- The main driver of many decisions is economics and Native peoples have very little influence in the global economic arena.
- Gaming revenues have increased employment along with demand for development of infrastructure and services.

Health:

- Loss of traditional healthy diet has people depending on unhealthy foods.
- Developing serious health concerns, i.e. diabetes, need to look at trends and try to find causes.
- Health resources treat individuals’ symptoms and do not adequately address prevention of the causes of diseases.

Infrastructure:

- Failure of earthen dams present major hazards.
- Development fails to stay within limits of sustainable local economy.
- Most infrastructure and policy developed without regard to their long-term impacts.

Natural Resources:

- Traditional subsistence food supplies are disappearing.
- Loss of native plant and animal diversity.
- Pine nuts (pinion), acorns, berries, and grasses not ripening normally, not healthy, dry/brittle due to late rains and lack of summer water in upland areas.
- Berry blossoms freeze and grasses are not growing.
- Loss of traditional trout streams due to dams and lack of water.

Political:

- Participants had concerns about how the output of this conference will be used.
- Participants asked if anyone would really listen to the Native perspective if it is given.
- There seems to be a lack of conscience in government and in industry.
- There seems to be a lack of environmental laws or environmental law enforcement- with results like polluted air, water, and extremely hazardous earthen dam remaining in place.
- The other side of the political issue includes the roles and responsibilities of the Tribal governments, the need for Tribal peoples to get involved in government and for all of us - regardless of which government we respond to, realizing and acting in unity to save Mother Earth.
- Not enough focus/publicity on environmental issues/ concerns.

Pollution:

- Air pollution from chemical factories and refining.
- Pollution from chemicals into ground and surface water.
- Agriculture practices add nitrates to water.

Science:

- Scientific findings need to include Native knowledge, oral histories, and cultural perspectives, e.g., range and ancient use of native fruiting palm trees by Moapa Paiutes in Nevada.
- Presentation of theories as facts, and unwillingness to change theories in face of new scientific facts, i.e., the Bering land bridge theory to explain Native origins.
- Native speakers are sometimes discounted.
- Scientific establishment's worldview does not include Native peoples' knowledge.

Water:

- Water quality and pollution concerns:
 - Contamination of ground and surface water limits available building sites.
 - Pollution from chemical seepage.
 - High arsenic concentrations.
- Water quantity concerns:
 - Little or no snowfall.
 - Loss of aquifer water, loss of fast flowing streams.
 - Late winter and early spring precipitation comes too early and all at once.
 - Flash flooding threatens existing dams and infrastructure.
 - Excess water run-off and erosion.
- Benefits of water projects go primarily to non-Indians.

2. CLIMATE CHANGE IMPACT: Consider how weather extremes, climate change and variability might either amplify or dampen these stresses, or create new ones?

Economic:

- Snow-pack important for recreation.
- Without snow, recreationalists move to places that could impact wildlife.
- Moving could result in damage to wildlife and loss to local economy.
- Loss of livestock.
- Damages and impact from flooding.

Environmental:

- Many plants are freezing before the berries are ready.
- Impact of weather changes on health of vegetation.
- Stress to black oak-loss of acorns loss of tree pollination.
- Early blooming, bear grass- brittle, not good for baskets
- Leaves staying on trees longer and freezing while green.
- Mild winters/rainy springs result in increased deer mice populations and concern for Hantavirus in larger range (23 states).
- Harsh winters hold pests in check.
- Late spring storms affect kidding/calving seasons.
- Loss of snow-pack affects land erosion and water availability.

Social:

- Extreme weather events impact poorer people more.
- Warm weather may lead to not being prepared for “normal” weather or extremes.
- Human use of resources vs. wildlife use of resources resulting in loss of wildlife.

Political:

- Salmon in Snake River – Four dams are present.
- Science says remove the dams for better salmon recovery; politics say “no”.

Coastal/Rocky Mountain and Great Basin Areas

Wisdom Circle (Combined Break-out Group)

3. ACTION STRATEGIES: What coping or action strategies might address the additional stresses created by extreme weather events, climate variability, and climate change, as well as helping to address existing non-climate stresses?

Action:

- Reduce Greenhouse Gas (GHG) emissions.
- Increase carbon sinks by reducing forest harvesting and increase replanting.
- Avoid actions that reduce stream integrity and change runoff patterns.
- Restore stream ecosystems.
- Use native or natural controls to replace chemicals in agriculture.
- Give nature a rest from agriculture.
- Conserve natural habitats.
- Fight for sensible and sustainable development.
- Maintain and appreciate wildlife.
- Develop buffers and plant riparian zones.

Corporate:

- Industries must adapt to the realities of a rapidly changing climate.
- Climate change and variability must be incorporated into business plans and activities.
- Corporate environmental policies must be developed or divulged.
- Climate consequences must be factored into corporate decisions, costs and regulations.
- Corporate mind-set must change: energy companies need to adapt and change.

Education:

- Educate the young people about climate change.
- Educate children in traditional knowledge and cultural ways, language, spirituality, and science for long-term sustainable living.
- Address “chemical addiction” in agriculture, energy and industry.
- Promote graduate programs in Native colleges and educational institutions.

Political:

- Develop stronger Native American office in federal science agencies such as NASA, USGS, etc.
- U.S. Government must recognize Native American sovereignty and stewardship of the environment.
- Federal programs should encourage Tribal capacity building in science and application of renewable energy technologies.
- Become involved in political negotiations on the international level.
- Consolidate efforts: Native Americans must unite on the issue of climate change.
- Lead by example and increase Native American leadership in U.S. Government climate change activities.

Research:

- Establish baseline data on fish, especially their health and harvest data.
- Develop environmental research capacity in the Tribal governments and colleges.
- Traditional knowledge must be added to the science of climate change.
- Incorporate geographic information systems (GIS) and global positioning systems in Tribal management.

Spiritual:

- Must look and plan for the long-term, at least seven generations into the future.
- Record oral histories and traditional perspectives.
- Think with your heart and mind and not your wallet.
- Appreciate air, land, water, and all living things.
- Acknowledge the spirit in all things, pray together.
- Maintain hope.
- Must find ways to cooperate and share.

Urban Planning:

- Accommodate flood zones and wetlands.
- Remove dikes which lead to silt buildup and flooding.
- Do not build in flood zones.
- Move infrastructure out of flood zones.

4. INFORMATIONAL NEEDS: What new or additional information would allow people to better understand the linkage between the current stresses and weather extremes, climate variability and change?

Information Concerns:

- Gathering information may be an excuse not to act.
- Information from this conference must be communicated to our elders and constituents.
- Traditional knowledge must be guarded from misuse by government and New Agers.

Information Exchange:

- Information needs to be gathered from and delivered to peers in Native communities.
- Information exchange needs to be a two-way street.
- Scientist and policy makers need to learn the protocols of dealing with the Native peoples.
- Research activities need to monitor and collect information on native plants.
- Native peoples want to negotiate with U.S. governments regarding informational needs, including methodologies, means and personnel.

Education:

- Native information is available; the task is to find ways to use it.
- Information can be delivered formally in K-12 and Colleges, as well as informally through gatherings and meetings.

Strategies:

- Find out about various environmental groups and their positions on cooperation.
- Educate “environmental allies”, Non-Governmental Organizations (NGOs), and other ecology and environmental groups.
- Incorporate climate considerations in other regional meetings and agenda.
- Concentration on health and pollution sources recommended.

III. Key Issues



Following this workshop, the discussion results from the Breakout Groups were synthesized and augmented based upon comments from a number of workshop participants and other reviewers into what is now Chapter 12 of the U.S. National Assessment. Because the U.S. National Assessment chapter was put together based upon the material from our workshop discussions, the “Key Issues” section is reprinted in the following pages. (For additional details, see Chapter 12 of *Climate Change Impacts on the United States* section in Appendix.)

Key Issues – Summary

Reprinted from Chapter 12 of Climate Change Impacts on the United States, see Appendix D.

“Tourism and Community Development: In a number of regions, Native economies are strongly dependent on tourism, agriculture, and other environmentally sensitive activities, so that shifts in temperature and precipitation and the ecosystems that are based on the prevailing climate are likely to require adjustments away from traditional activities. For example, hotter and drier summer conditions are likely to limit recreational use of forest campgrounds and lakes at lower elevations while allowing potentially more use at higher elevations.

Human Health and Extreme Events: As a result of insufficient economic development, the Native housing stock is more sensitive to the prevailing climatic conditions than the national median. As a result, increasing use of air-conditioning is not as ready a means of addressing an increasing frequency of very hot conditions. In addition, increased dust and smoke loadings may well exacerbate respiratory conditions.

Rights to Water and Other Natural Resources: Native water rights are established in a variety of treaties, agreements, and court decisions. Significant amounts of potentially irrigable land exists on reservations, and the potential exercising of these rights along with precipitation changes are likely to complicate water resource allocations, negotiations, planning, and management.

Subsistence Economies and Cultural Resources: Although only a few Tribal economies in Alaska and other regions are primarily based on subsistence, many Tribal communities depend on their environment for many types of resources. A changing environment puts such resources at risk, which will affect both sustenance and cultural dependence on environmental resources.

Cultural Sites, Wildlife, and Natural Resources: The environment, both climate and the landscape, provide an important sense of place for Native peoples, both for historical and cultural reasons. As the climate changes and vegetation patterns and the presence of wildlife and migrating species shifts, the cultural context of Native peoples, who view themselves as tightly coupled to the natural environment, will be disrupted, with little recourse as the shifts occur.”

1. Tourism and Community Development

The most urgent priority for Tribal governments and communities over the past thirty years has been economic development and job creation. Many tribes have based their development initiatives around land-based enterprises, including dryland and irrigation-based agriculture in the central and western US; forestry and forest products in the central, western and subarctic regions; and recreation- and tradition-based tourism in areas ranging from Hawaii and Alaska to the central, western, and southwestern US. All of these activities are dependent on favorable weather and climatic conditions. Although few of these enterprises have generated enough income to develop a strong economic base for entire tribes, they are all vital to underpinning economic development for Tribal communities. Adverse conditions, from severe winter storms to unusually wet or dry conditions can have important economic effects, especially because Tribal communities are already economically stressed. The 1990 census indicated that 31.6% of all Indian people were below the poverty line, compared to 13.1% of the total population (US Bureau of the Census, 1990). From 1969 through 1989, of the 23 reservations, which have data for the period, per capita income declined on 18 reservations during the second

decade (Trosper, 1996). The sustained growth of the American economy over the past decade has, for the most part, bypassed Indian households and reservations.

Although none of the primary barriers to development on reservations is currently a result of long-term climate change, recent variations and changes in weather patterns are requiring tribes to adapt and adjust their actions and plans. Tribes have already identified many local needs in response to an increasing frequency of disruptions from severe storms, including: improving or re-routing roads (many of which are unpaved); providing new or more reliable water and drainage services for industrial sites; strengthening communications links and power supplies; and altering schedules and calendars at schools and medical clinics to adapt to changing weather conditions. Tribal communities now experiencing sharp changes in precipitation patterns are already modifying reservation infrastructures to deal with such situations.⁴ Projections of increased occurrence of extreme rains are likely to intensify the need to improve infrastructure on reservations. Significant warming and the rise in the heat index are likely to necessitate alterations in community buildings and water supply systems. For the future, longer-term changes in water resources on which many tribes, particularly those in the Southwest depend, are likely to have significant consequences for resource-based sectors such as agriculture and industry that depend on stable water supplies.

Many tribes also are basing an increasing share of their economic development on recreation and tourism (Tiller, 1996). Tourism and recreation-based activities take advantage of the attractions of rivers, lakes, mountains, forests, and the other elements of the natural aesthetic beauty of reservations without, in most cases, causing long-term change. Cultural and historical sites and ceremonies of Native peoples can also be used to attract tourists. These activities provide income while also encouraging the re-establishment of customs and traditions that had been suppressed for many decades by federal policies.

The economic viability of many aspects of recreation and tourism, however, is based on natural attractions that depend on the prevailing climate — rivers and lakes provide water-based recreation opportunities, forests provide campsites and trails, and the wildlife, including migrating fish and birds and flowering of plants, attract many visitors. As the climate changes, these environments will change: reduced winter runoff from reduced snow cover are likely to reduce the flow in many streams; drier summer conditions are likely to increase the fire risk and require closure of campgrounds, and the combined effects of climate and ecosystem change are likely to disrupt wildlife and plant communities.

Cultural traditions that draw visitors (and their money) are often tied to the cycles of the seasonal rhythms in plant and animal life, with some traditions honoring annual weather-related events that are likely to be significantly affected by climatic change. The willingness to visit reservations for such events is dependent on the existence (and even the perception) of a safe and healthy environment. Such conditions can be disrupted by unusual climatic occurrences. In 1993, for example, a hantavirus outbreak associated with unusually heavy rains induced by El Niño conditions created a perception of an unhealthy environment (Schmaljohn and Hjelle, 1997). The rains were conducive to high production of piñon nuts and other food sources, leading to an explosion in the hanta-bearing mouse population. This high mouse population then encroached on human populations, resulting in a number of virus-caused deaths (Engelthaler et al., 1999). This one event led to a significant reduction in tourist visits to the Southwest, especially to Pueblo country, indicating the vulnerability of sensitive tourist-based economies can be in the event of the outbreak of rare, but frightening, diseases, even when they are not occurring primarily on Indian reservations. It is possible that a change toward more intense El Niño/La Niña variations could increase the likelihood of such conditions arising in that they would likely upset the predator-prey relationships that develop during less variable conditions.

⁴Repeatedly during the assessment process, participants raised issues about the development of rural transportation systems. Reliable transportation is a major concern in many Tribal communities, where many individuals cannot afford newer, more reliable, and fuel-efficient vehicles. Providing effective public transportation in rural communities – most particularly communities with limited incomes – improves access to employment, education, and medical services, and has the additional benefit of improving the efficiency of the use of fossil fuels, thus reducing the production of greenhouse gases.

While some economic diversification of reservation economies is underway, and casino gambling is becoming a basis for attracting tourists in a number of regions, Tribal economies tend to be more closely tied to their environments than is typical for the economies in regions where the reservations are located. Because of this, Tribal economies tend to, on the one hand, be more vulnerable to adverse changes, and, on the other hand, likely to benefit more from climatic changes that provide opportunities by enhancing water availability.

Adaptation Potential: With many Tribal lands already under climatic stress and with the economies of Indian Nations strongly dependent on climatically sensitive activities such as agriculture and tourism, the lands and economies of many Native peoples are vulnerable to climate change. As a result of the less diversified Native economies, a larger share of financial resources will likely need to be devoted to ongoing adaptation than is the case for society as a whole, thereby possibly making Tribal economies less competitive. To address this issue, enhancement and diversification of reservation resources and the strategic integration of Tribal economies with local non-Indian economies could help to make the Tribal economies more resilient and sustainable.

At the same time, climate change (and resulting policy actions) are likely to create some economic opportunities; for example, an increased demand for renewable energy from wind and solar energy could make Tribal lands an important resource for such energy, replacing fossil fuel-derived energy and limiting greenhouse gas emissions. For example, the Great Plains provide a tremendous wind resource and its development could help to reduce greenhouse gas emissions as well as alleviate the management problem of Missouri River hydropower, helping to maintain water levels for power generation, navigation, and recreation. In addition, there may be opportunities for carbon sequestration.

2. Human Health and Extreme Events

The rural living conditions of many Native peoples amplify exposure to variations in the weather. Due to the poor economic conditions, housing on many reservations is old and not well protected from the environment. Although many traditional structures are designed to take advantage of the natural warmth or coolness of the landscape (e.g., by being located below ground, having thick walls, and being exposed to or sheltered from the Sun), acclimation, both physiologically and through use of appropriate clothing, is critical because homes in many areas lack effective heating and cooling systems. A recent study of energy consumption on Indian lands (EIA, 2000) found that reservation households are ten times more likely to be without electricity (14.2%) than the national average (1.4%). While warming in colder regions will relieve some stresses, some acclimation has already occurred so this will not significantly reduce stresses. In presently hot regions, however, there is likely to be a significant increase in stress that will require new acclimation and response as new extremes are reached. While an increase in the presence of air-conditioned facilities would help, it would also require changes in behavior toward a more indoor lifestyle along with improved housing.

Climate change is also likely to exacerbate the delivery of and need for health services. The delivery of health care to rural communities throughout the United States has already been affected significantly by widespread changes in demographic and economic patterns. Rates of depopulation in the least densely populated portions of the country are accelerating. As communities lose population and economic conditions stagnate, the numbers of doctors, pharmacists, and other health care professionals attracted to rural communities has been declining. Full-service health care is increasingly concentrated in regional centers, and consultation with a specialist increasingly involves, for rural residents, an extensive trip.

Reservation populations, on the other hand, are continuing to increase, as birth rates remain high, longevity increases, and Tribal members move back to their home communities from urban areas. The institutional structure of health care delivery to Native peoples, however, differs sharply from the market-driven system that provides medical care for rural non-Indians. The Federal Government, as part of its trust responsibility for Indian people, provides the

health care systems for reservation residents. The Indian Health Service (IHS), part of the United States Department of Health and Human Services, is the primary provider of medical services to Native peoples. IHS operates clinics, pharmacies, and hospitals in many Tribal communities; in others, tribes have contracted with the Federal Government to operate health care facilities themselves.

Access to these health care facilities, however, is not always easy for reservation residents, particularly in under extreme weather conditions. A single hospital, for example, serves the entire Rosebud Sioux reservation in South Dakota, where many roads are unpaved. The external boundaries of the reservation are approximately 120 miles east-to-west, and 60 miles north-to-south. The hospital is located in the southwestern part of the reservation and access can be disrupted or cut-off by extreme precipitation conditions (whether as rain or snow). Because of the distances that many Native peoples must travel to health care facilities and the conditions of the roads, their access to health care is more subject to sharp variations in the weather than those living and working in cities and extreme weather events are likely to cause significant interruptions in access.

Changes in climate would also create new challenges for community health. Drier summer conditions and the projected increase in forest fire incidence would likely lead to increased lofting of dust and dust-borne organisms and an increase in forest fire incidence. The poorer air quality resulting from increases in smoke and dust would likely increase respiratory illnesses such as asthma. Hypertension and adult-onset diabetes are pandemic in Tribal communities. As lifetimes increase, larger portions of the populations are becoming increasingly vulnerable to extreme temperatures, and increasingly dependent on uninterrupted access to such therapeutic interventions as kidney dialysis. Further, direct and side effects of many standard medications are affected by climatic conditions.

Adaptation Potential: Health delivery systems that serve Native communities will need to educate health professionals, paraprofessionals, and patients on the potentials for dehydration, overexposure to light, and needs to restrict activity during hot weather. This need for education and appropriate care is intensified because many Indian people live in substandard housing that exposes them to heat and cold. Much of the most

effective health education in Native communities is carried out by Community Health Representatives (CHRs), paraprofessionals employed and trained by the Indian Health Service or individual Tribal health programs. Specific training, focusing on climate-related health and wellness issues, and targeted towards CHRs could enhance use of a system that has already demonstrated its abilities to reduce infant mortality rates and improve care for the elderly among many Native peoples.

In addition, consideration needs to be given to the design and construction of appropriate housing for Native peoples. Most housing construction on many reservations is financed through the federal Department of Housing and Urban Development. Tribal housing authorities, however, have taken over much of the responsibility for design, construction, and management of both rental and mutual self-help (purchasable by the occupant) housing units. Given the likelihood of significant changes in average temperatures, precipitation levels, and severe weather events, training and regular updates for decision-makers and technical specialists within Tribal housing authorities are needed to assist in improving the design, construction, or remodeling of homes to increase resilience to extreme weather conditions.

3. Rights to Water and Other Natural Resources

For Native peoples, water is recognized as a cultural as well as a physical necessity. Water is vital for life and livelihood, especially for those relying on the resources provided by natural ecosystems. Water is necessary for community use and the production of food as well as for fish, riparian plants, and wildlife. Water is particularly valued where it is most scarce, such as in the southwestern US. Prior to European settlement, water was not owned, but was viewed as a gift to be shared by all. Settlement — both by tribes on reservations and by other Americans — brought increasing demands for water and concepts of ownership that were not traditional to Native peoples. As a result, rights to water, including access to sufficient quantity and quality, are now established and guaranteed by treaties, statutes, and decisional law. Changes in the amount, timing, and variability of flows will affect the exercise of these rights.

Despite the many agreements, quantitative determination of existing Native rights to water remains a contentious legal issue over much of the western US. Access to water was a key issue in many of the treaties negotiated between tribes and the US government, especially when relocation of tribes to reservations restricted or eliminated their access to traditional homelands. These provisions became the subject of litigation, as expectations were not met. The concept of reserved Indian and federal water rights originated in the landmark case *Winters v. United States* [207 US 564 (1908)] involving withdrawal of water from the Milk River along the Fort Belknap Reservation. The Winters Doctrine provided that in the treaties the Federal Government entered into with various tribes, the government had implicitly reserved a quantity of water necessary to supply the needs of the reservation⁵. Under this provision, the Federal Government's commitment of water rights would be paramount because it had created the Indian reservations and therefore had a fiduciary duty to protect water implicitly reserved by and for the tribes. The doctrine was based on a set of principles underpinning reservation establishment that retained for Indian tribes all rights not explicitly waived.

Indian reserved water rights have become a subject of considerable importance to tribes, states, the Federal Government and private water users due to: (i) the scarcity of water, particularly in the Southwest and Great Plains; (ii) the reality of drought conditions; and (iii) uncertainties arising because of fully (or even over) appropriated watersheds and international water commitments (some of which do not account for Tribal water rights at all). The courts have often had to resolve conflicting interests in the allocation of water rights, usually using a standard known as "practicable irrigable acreage" for determining the allotment to Indian reservations. This standard quantifies *Winters* rights by providing that allotments include sufficient water to provide for agriculture, livestock, domestic, recreational, cultural, and other uses. In addition, for some tribes, specific legal language also reserves water to maintain in-stream flows necessary to sustain fish or riparian areas. Figure 3 compares the acreage of Indian lands that are currently being irrigated in eleven western states with the areas that could potentially be irrigated under the *Winters* doctrine. Quite

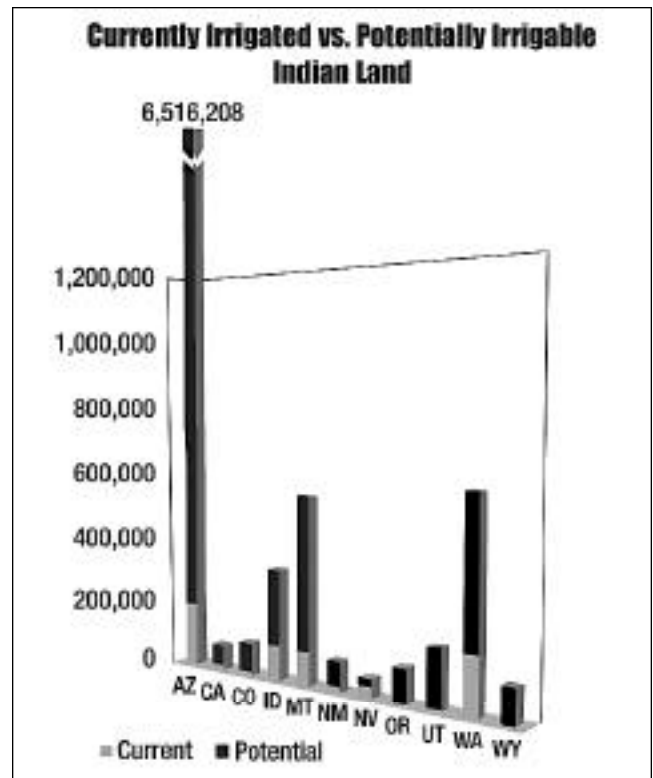


Figure 3.

clearly, substantially increasing the areas of irrigated lands would significantly increase the amount of water being withdrawn from current resources, increasing the competition for water among the various users.

In some cases, despite having high priority (i.e., senior) rights to sufficient water, tribes have often had to compete for access to water with non-Tribal water users, including federal, state and local governments. This has required negotiations, which have often proven to be time-consuming, costly, and complex. The potential for changes in the amounts and timing of water flows caused by climate change are likely to add to the complexity of the allocations, negotiations, agreements, and management of water resources.

As an indication of the complexity of the issues involved, consider the Southwest, where climate models project that there is likely to be additional precipitation (most probably as rain) in winter, but with earlier

⁵The *Winters Doctrine* later also formed the basis for federal reserved water rights asserted by the government to obtain water for national forest, wetland, wildlife refuge, military, and other reservations.

snowmelt and generally warmer and drier conditions during the summer. If this occurs, overall winter runoff is likely to increase while summer runoff is likely to decrease significantly. While an increase in annual precipitation could ease overall management of water resources (at least to the extent that increases in the amount of vegetation do not counterbalance the likely increase in runoff), if the extra runoff in winter is not retained in reservoirs, then the increased needs for water in summer would be likely to increase water demands. Further, water storage that benefits some could be detrimental to others, an example of which is described in the box on “Shifting Ecosystem Boundaries” later in this chapter). With Native peoples exercising more fully their historical water rights, and with federal policies requiring additional amounts of water to protect the environment, the amount of water available for irrigation, communities, and other uses is likely to decline, particularly during years in which climate fluctuations lead to reduced overall water flows.

Water quality is a major issue that is coupled to the issue water rights and water quantity; as water quantity changes, water quality is likely to change as well. Water quality affects everything from the environment for fish to the purity of drinking water to the quality of aquifers. In addition, because of the cultural connection of Native peoples, water pollution and poor water quality can have unusual ramifications. In the Northeast, for example, streams that have been polluted by persistent organic pollutants and heavy metals, and from which fish are not to be taken, have affected not only the diets of Native peoples who observe such restrictions (many do not for cultural reasons), but has also reduced the opportunity for intergenerational connection while fishing. In the Southwest, water purity has become an issue based on water’s use in religious ceremonies (see box “Ensuring Water Quality for Religious Ceremonies”). The prospect of diminished summertime water flows, along with more intermittent flow of some streams as a result of an increase in frequency and intensity of extreme rains, introduces the potential for water quality to become an issue in some regions.

Adaptation Potential: Where water is scarce, it merits careful stewardship. Improving the efficiency of water capture and use through more efficient irrigation practices

and choosing and growing crops that need less water are steps that can be taken now. As an additional possibility, increased use of cisterns of the type used several centuries ago by tribes living in the Southwest could also provide a very localized means of conserving water. Increasing in-ground storage of water is another possibility. Other historical practices of Pueblo cultures may also be applicable; mapping of ancient land use practices show extensive use of water management techniques, including gritting of gardens to slow runoff, pebble mulch fields to reduce evaporation, stone-lined drainage channels to reduce leakage, and terraces on hillsides to retain water and prevent erosion. Quite clearly, however the climate changes, ensuring the reliability and availability of water resources for Tribal lands and surrounding users will require special consideration.

4. Subsistence Economies and Cultural Resources

Native lands have provided a wide variety of resources for Native peoples for thousands of years. Forests, grasslands, streams, coastal zones, and more have provided, and for many groups still provide, substantial amounts of food, fiber, fish, medicines, and culturally important materials. Native traditions are also very closely tied to natural events and resources, including migrating birds and fowl, land animals, fish, and medicinal plants, creating an important cultural link to the land. Indeed, subsistence economies were the predominant form of community organization in North America prior to the colonization of the continent by Europeans. It is clear from oral traditions of Native peoples themselves throughout the continent, and from the accounts of the first Europeans who contacted them, that subsistence economies were able to sustain communities in lives of comfort, relative stability, and abundance, with sophisticated artistic and intellectual traditions.

With the spread of the market economy across the US, especially during the 20th century, subsistence economies began to disappear as the resources necessary to support them were absorbed by commercial markets. By the end of the 20th century, subsistence economies among Native peoples were significant as a basis for family life

Ensuring Water Quality and Quantity for Legally Protected Religious Ceremonies and Cultural Practices

In 1986, the USEPA was authorized to treat tribes as states for purposes of grant and contract assistance, regulatory program development, and permitting and enforcement. This has allowed some tribes to propose water quality standards. As for other states, these then must be approved by EPA. One example where this has occurred is the Pueblo of Isleta, which is located immediately south of Albuquerque. This was the first Native government in the US to obtain approval and Treatment-as-State (TAS) status from the EPA, pursuant to Section 518 of the Clean Water Act.

When the Pueblo of Isleta acted to protect its water quality, the City of Albuquerque sued the EPA for approving Isleta's standards in Federal District Court. In October 1997, the US Supreme Court upheld the tribe's standards as approved by the lower court. The case was decided in the favor of the Pueblo of Isleta, with reasoning that has implications for Native governments throughout the country. Isleta Pueblo's standards were based on three significant use designations: use for irrigation, use for recreation, and use for religious ceremonies. The last reason is important to emphasize because no Native government had ever before asserted its right to religious freedom for the protection of its waters. The Pueblo's contention was based on the fact that Tribal religious ceremonies were adversely impacted by the contamination of the river water by toxic discharges from Albuquerque's run-off and from the municipal waste treatment facility located four miles north of the Pueblo. Although the city claimed that the tribe's standards were arbitrary and capricious and would create an undue burden on the city to comply, the court upheld the Pueblo's water quality standards.

With projections indicating that climate change is likely to lead to changes in the amounts and timing of water flows, it is possible that changes in water quality, especially during the summer, could become an issue in other regions. Lower lake levels in the upper Great Lakes region and reduced flows in western rivers may be examples of where this issue could arise.

only in the far north of Canada and Alaska, where some communities still support themselves by a combination of subsistence, welfare, and market economies; mixed market-subsistence-welfare economies also exist in some Tribal communities in the conterminous US.

The values that have supported subsistence economies have persisted, however, and this is a major feature that distinguishes Native peoples from other contemporary rural residents. The ethics embodied in these subsistence systems continue to form the core set of values in many modern Native communities, even as they are also integrated, in varying degrees, into mainstream market economies. These values are incorporated into, and

reinforced by spiritual teachings, moral principles, and community and family relationships. To the extent that these values continue to shape contemporary attitudes and relationships of Native peoples, they form a crucial part of the treasury of values on which the Nation may draw in addressing global climate change (see box on Premises Underpinning Subsistence Economies).

Relying on a closed system involving primarily local resources rather than on a global network that provides food and goods introduces much greater elements of risk. Membership in a community provides one means of limiting risk, because each household has more or less equal opportunities to share in the community's resources.⁶ Under such circumstances, special compassionate

⁶The Lakota (western Sioux) begin each traditional religious ceremony with the phrase "Mitakuye Owasin" which can be translated as "All my relatives" or more freely "We are all related." In the world-view of many Native Peoples, this concept includes not only all of humanity, but also all life, and physical objects including rocks, the earth, stars and water. Many traditional Native spiritual leaders have expressed immediate comfort with the concepts of all life sharing a foundation in DNA, and all of life and physical matter sharing common structures at the atomic and molecular level.

provisions are often made for individuals such as the elderly and the sick who might be unable to contribute regularly to the community's present food supply (Axelrod, 1984, 1987; Brams, 1996). Prosperity, in this economic system, is measured not exclusively in terms of accumulated possessions – food, fields, and horses – but in terms of personal relationships. Having a large and healthy family, respectful and aware of their obligations, provides assurance of mutual support by spreading widely the responsibilities for care and sustenance (Olson, 1965; Hardin, 1982; Houser and White Hat, 1993).⁷

Generosity, in this economy, is a highly prized virtue. When generosity is linked with the obligation for reciprocity, the development of positive human relationships through sharing becomes the most effective way to limit risk for any particular family or individual. Among many Native peoples, there were historically – and continue to be – regular, institutionalized opportunities to show generosity, by giving food and material gifts to members of the community. During dances and special celebrations, Pueblo families open their homes to invited guests and community members for home-cooked feasts, and give away baskets of food and cloth to honor family members who are participating in ceremonies. Northern Plains' tribes hold giveaways in honor of particular individuals – the honoree is celebrated, not by receiving presents, but by having gifts given to others by the family in his or her name. Families may save for a year or more in order to provide appropriate honor to a family member.

Traditional subsistence economies use a second method of managing risk – the avoidance of overspecialization or over-dependence on single sources of food. In the past, woodlands tribes, for example, raised corn, beans, and squash, while also gathering wild rice, berries, acorns and nuts, wild turnips and onions, other edible and medicinal roots and plants (Vennum, 1988; Ritzenthaler and Ritzenthaler, 1991). These tribes also fished, and hunted large and small animals and waterfowl. Pueblo communities developed extensive systems of agriculture, but were likewise active hunters. Inuit communities still rely on caribou, whaling, fishing, and gathering of plants and berries for balance in their diets. For each of these economic systems, the likelihood of all sources of food failing

simultaneously in a relatively quiescent climatic period is considerably less than the likelihood of one source declining for a particular period (Trosper, 1999).⁷

During the Native People-Native Homelands workshop, Native peoples from the Arctic and sub-Arctic presented substantial evidence that their communities are immediately jeopardized by changes in global climate. In Alaska (see box “A Circle of Life: A Lesson from Alaska”), rapid warming, and the environmental consequences it brings, started about 30 years ago, and the lives of Native peoples there are already being seriously affected (Gibson and Schullinger, 1998). Changes in climate, coupled with other human influences, are now becoming more and more rapid in other regions, with projections of much more rapid change in the future. These changes are likely to bring much larger changes in land cover and wildlife than have occurred in the past. As the world warms, as precipitation patterns shift, as sea level changes, as mountain glaciers and sea ice melt (IPCC, 1996a), just as in Alaska, ecosystems elsewhere are likely to change in complex and often unexpected ways, affecting the resources that can be drawn from them (IPCC, 1996b). In the Plains, warmer winter conditions are already favoring certain types of grasses, thereby changing the mix of vegetation types. The distributions, timing of migrations, and abundances of waterfowl and other birds are also changing (Sorenson et al., 1998; Price, 1999; T. Root, Univ. of Michigan, unpublished data). These changes have been and will be affected not only by temperature and precipitation changes, but also by changes in the timing of the ripening of plants and crops, and other ecosystem factors on which Native peoples depend. How much longer these types of changes can go on without a serious disruption of the services and diversity provided by the various ecosystems that support subsistence economies is not known, although there are signs that some systems are already being seriously stressed.

Adaptation Potential: While local environments have changed significantly over past centuries, changes have often been slow enough to allow adjustment or for local environments to be managed. Historically, Native peoples actively worked to manage their environments in ways that led to desired and productive results. Native peoples

⁷References are listed at the end of the chapter reprint included as Appendix D.

Premises Underpinning Sustainable Subsistence Economies

The most important differences between market economies and the subsistence economies of Native peoples involve concepts of surplus, accumulation, ownership and private property, and individuality and community. Participation in a sustainable subsistence economy demands knowledge, attitudes, behaviors, and expectations that differ significantly from those that work in market economies. The basic premises that have emerged and still generally prevail include recognition that:

1. Sustainable subsistence activities require traditional ecological knowledge acquired over generations (LaDuke, 1994)
2. Subsistence communities are fairly, though not completely, closed economic systems. For day-to-day necessities, people rely primarily on goods and services produced within their own community. Other goods might be acquired from external sources through trading (or, in earlier times, raiding), but sustenance depends on work done within the community.
3. Most subsistence communities use a variety of food sources and methods of food production, including hunting, fishing, gathering, and agriculture.
4. Success in food production varies from individual to individual within each community, and varies for each individual over time.
5. Food preservation technologies are often limited primarily to drying and smoking, technologies that do not support the storage of large amounts of foodstuffs over several years.
6. Food is sought in the amounts needed to sustain the community, with perhaps a small surplus for trading. Hoarding of food makes very little sense because it generally cannot be preserved, and so is actively discouraged.
7. Subsistence communities are small enough so that everyone within an individual community knows and acknowledges their relationships with everyone else. Kinship ties, in particular, are widely recognized (Akerlof, 1984; Schelling, 1978, 1984).
8. Family relationships carry with them obligations of mutual support and sharing of resources.
9. Use of resources by the current generation must take into account the needs of future generations. An individual might gather, harvest, or hunt enough for household and family use, but must leave enough to ensure regeneration of renewable resources.).

were not passive inhabitants of their homelands, simply fitting into niches conveniently provided by a supportive environment. Tribes used a variety of consciously developed technologies and culturally based choices to improve opportunities for obtaining resources. The Paiutes, Hopi, Apaches, and Tohono O'odham, all lived in desert environments, but employed significantly different methods of land use. The Paiutes based their subsistence on a wide variety of plants, fish, and animals, and took advantage of whichever food supplies were most abundant, even if this meant making short migrations to take advantage of each season's particular opportunities. Boundaries between the various Paiute bands were relatively flexible, and permitted

hunting and gathering over relatively extensive areas of the Great Basin. The Hopi, in contrast, settled in villages on Black Mesa and created permanent fields that sustained repeated harvests of corn, squash and beans. The Apaches, on the other hand, used fire as a technique for hunting, driving animals in a single direction for harvest. Regular burning of hunting areas (a technique also used by the Paiutes) had the additional effect of promoting plant growth and improving forage for game animals (White and Cronon, 1988). The Tohono O'odham developed a sophisticated system of irrigation to support extensive agriculture. Many of these techniques are no longer available or are not likely to be adequate, however,

A Circle of Life: A Lesson from Alaska

Caleb Pungoyiwi is a Yupik Eskimo who moves back and forth between Alaska and Siberia in pursuit of walrus and other sea mammals. Gathering food directly from the land and the sea makes the Yupiks very careful observers of their surroundings. In recent years, they have noticed that the walrus are thinner, their blubber less nutritious, and the oil from walrus fat does not burn as bright in their lamps as in times of old. At the same time, they have noticed that there are fewer and weaker seals. The Yupik hunters have had to go farther and farther from shore to reach the ice pack to find the newborn seals that are being fed fish from nearby waters by their parents. Concurrently, scientists have observed that the sea ice over much of the Arctic is thinner and melting back, with the changes encompassing a broader area than that observed by the Yupiks earlier (Rothrock et al., 1999).

Both the Yupiks and the scientists have come to understand the intertwined chain of events that is occurring. The retreat of the sea ice due to large-scale warming has reduced the platform that seals and walrus have used to rest between searches for fish and mussels; weakened and less productive, they provide less sustenance for both the Yupiks and the whales. The Yupiks have also observed some killer whales eating sea otters, an unusual shift in the whales' diet apparently brought on by the reduced number of seals. The loss of sea otters is important because sea otters control the number of sea urchins. With fewer sea otters, there are more urchins and therefore less kelp (which the urchins eat). And with less kelp, there is reduced habitat for fish; it is fish that would normally be the major food source for the whales as well as the Yupiks, the Inupiat, and other northern peoples. As another part of this ecological continuum, the sea ice quiets ocean waters during winter storms, helping protect young fish; it also accumulates nutrients that, when the ice melts, creates a springtime algal bloom on which the fish feed at a critical stage in their development. What has occurred may seem like only a little warming in a very cold place, but as the Native traditions make clear, everything is woven together — disruption in one place affects everything else (NPNH, 2000; Moreno, 1999).

to sustain subsistence economies in the event of the large changes in climate that are projected.

When changes were rapid and Native peoples were faced with inadequate resources, several approaches were used to adapt. Historically, many Tribal communities could rely on migration to adapt to changing resource bases in any particular local area. However, the establishment of reservations has limited the option of entire tribes moving to more hospitable locations to seek water, cropland, forests, or cooler temperatures. While individuals can pursue that option, it is not an option that is available to most tribes because they are tied to where they are by land ownership and governance issues.

A second approach when Native peoples were challenged by radical changes in their physical environments was to incorporate new technologies. As the Lakota (western Sioux) moved from forests around the Great Lakes to the Great Plains, they found the most suitable

agricultural lands—the bottomlands along the Missouri River—already occupied by residents of large and stable villages. Within two generations, however, they adopted the complex technologies of horsemanship and the gun. This rapid adaptation provided the Lakota with both military and economic advantages, and provided the material foundation for a prosperous and vital culture (Houser, 1995). This willingness to absorb new technologies, new materials, and new ways of doing things forms a common theme in the histories of many Native peoples. Cloth (and the complexities of sewing woven textiles) replaced hides. Glass beads from Bohemia replaced porcupine quills. Aniline dyes replaced vegetable colorings. Steel knives replaced stone or bone implements. Cotton thread replaced sinew. For the future, adopting new technologies is likely to be the only means for dealing with the disruptions to the traditional subsistence economies.

5. Cultural Sites, Wildlife, and Natural Resources

Ceremonial and historic sites, graves and archeological locations, special mountain and riverine environments, and seasonal cycles and migrations are a central part of the cultural traditions and traditional indigenous knowledge to Native peoples. Taken together, atmospheric conditions and the character of local landscapes—both the vegetation cover and the wildlife—help to shape people’s sense of place and how they relate to what surrounds them. While Native Peoples have no monopoly among Americans on love of land, water, wildlife, and the sea, their interests start from different premises and have developed over thousands of years of living on this continent. As a result, the connections of Native peoples to their homelands and by extension to all of North America differ, at fundamental levels, from the kinds of relationships developed in densely populated suburban and urban environments. These differences are frequently explained in spiritual terms, although the differences also include traditional ecological and intellectual knowledge and historical familiarities. These understandings and relationships have been, and continue to be, transmitted orally and through ceremonial forms that carry the interconnections of nature and histories forward to future generations (Brody, 1982; Goodman, 1990; Hiss, 1991; Gallagher, 1993; Basso, 1996; Bordewich, 1996).

Changes in climate and in ecosystems in the decades ahead are likely to have consequences and influences that are both practical and that affect deeper life experiences. A variety of indigenous plants and animals, including migrating fish and waterfowl, provide many tribes with both sustenance, as indicated in the previous section, and essential components of many cultural traditions. As climate shifts, the habitat for various plants (including medicinal plants) and fish runs are likely to shift while the presence of other plants is likely to become more abundant, altering the resource base and cultural experience for many Tribal communities. And at deeper levels, humans’ whole experience of their environment is likely to diverge from what has been sustained through many generations via historical and religious traditions. For Native peoples, externally driven climate change will be disrupting the long history of intimate association with the environment.

SONG OF THE SKY LOOM

*Oh our Mother the Earth, oh our Father the Sky
Your children are we, and with tired backs
We bring you the gifts that you love.
Then weave for us a garment of brightness;
May the warp be the white light of morning,
May the weft be the red light of evening,
May the fringes be the falling rain,
May the border be the standing rainbow.
Thus weave for us a garment of brightness
That we may walk fittingly where birds sing,
That we may walk fittingly where grass is green,
Oh our Mother the Earth, oh our Father the Sky!*

Found in Songs of the Tewa, translated by Herbert Joseph Spinden, copyright 1933.

Central to the worldviews of Native peoples is an acknowledgement of kinship with all of creation. Through honoring and paying close attention to their relatives, no matter how those relationships are defined, Native peoples have acquired and draw strength from unique insights about the interactions of climate and the environmental health of their homelands. These insights can have very practical significance. For example, in the 1970s and 80s, elders on the Rosebud Sioux Reservation in South Dakota raised many questions about the potential implications of proposed efforts to exterminate prairie dogs in the sparsely settled western portions of their reservation. Although the elders expressed their objections in the language of Lakota spirituality, which values balance in nature and emphasizes the importance of each part of Creation, wildlife biologists have since come to recognize that prairie dogs are a “keystone species” that plays a pivotal role in the maintenance of ecosystems on the Great Plains.⁸ Additional examples of the value of this close local knowledge are abundant: the exceptionally successful forestry management of the Menominee Nation; the care of Cree bands in harvesting animals to ensure that all generations of game and fish survive in sufficient quantities to ensure the continuity of all species.

⁸Personal communications from Lionel Bordeaux and Ronald Trospen.



Climate change will bring changes to the landscapes and wildlife that are important to Native peoples, changing the surroundings in ways that will change human experiences. Mountain environments, edges of ecosystems, and bird populations will be especially vulnerable. For example, the “Sky Islands” in the mountainous west and the prairie-forest interface between the Great Plains and Great Lakes will be places where significant change seems likely (see box on “Shifting Ecosystem Boundaries and the Sense of Place”). Wildlife, which is central to the cultural life of many tribes, is likely to be significantly affected over coming decades. For example, under the equilibrium climate conditions of the Canadian Climate Scenario, models of bird distributions project a gross loss of up to 27% of the neotropical migratory birds, 32% of the short-distance migratory birds, and 40% of the resident bird species in Arizona (J. Price, draft report prepared for the Environmental Protection Agency). Because some extirpations (local extinctions) are likely to be offset by immigrations, this study suggests that the net changes are not likely to be as severe (6% loss of neotropical migrants, 15% loss of short-distance migrants and 30% gain in resident species). Whether colonizing species can “replace” extirpated species in an ecological sense is unknown at this time, as are the overall rates of change. From the point-of-view of Native peoples, what may be as important is the degree to which any of these changes will impact their cultures or religions (see box on “Wildlife and Ceremonies”).

Adaptation Potential: In some cases, improved or altered land management practices (e. g., fire management) may be able to sustain the presence of particular types of useful plants or animals for at least a while longer. Where ecosystems shift from Native land holdings to nearby non- Native lands, new areas may need to be developed or acquired to allow access to traditional food sources. Increased involvement of Native experts in resource management in these new areas may improve the quality of the new environment as well as provide helping to sustain traditional plants. Where climatic and ecosystem shifts are significant, new approaches will be needed. In all of these situations, adapting to changing wildlife and land cover on Tribal lands will be challenging because options for continued access by Native peoples to traditional ecosystem resources on neighboring lands may be limited.

In planning and working to meet the changing conditions, experience indicates that both traditional knowledge and contemporary scientific understanding can help to understand and improve the environment. The relationships between Native peoples and their environment provide significant insights and context for the scientific findings about climate change and its implications for human life. Building the bridge will be essential,

Wildlife and Ceremonies

Many Native peoples use wildlife as integral parts of their cultural and religious ceremonies. Among the various Pueblos (e. g., Hopi, Zuni, Keres, Tewas, Tiwas, and Towas), religious ceremonies are the center of their cultural lives (Tyler 1991). Birds are seen as spiritual messengers and are completely integrated into the traditions of these Native American communities. More than 200 species of birds have unique Native names, and more than 100 are essential to parts of the Pueblo culture. Birds mark the passing of the seasons and are considered to have valuable spiritual properties needed by members of these pueblos. Among the Zuni, prayer sticks are used as offerings to the spirit realm. Each prayer stick, depending on its purpose, requires a particular combination of feathers drawn from among 72 different species of birds (Tyler 1991). Prayer sticks serve many of the same spiritual purposes in the Zuni religion that rosary beads serve to the Catholic religion.

Zuni also have separate names for the Western and Mountain Bluebirds. These species are only found on the Pueblo in winter and are used as symbols of transitions for fall and spring. Among both the Hopi and the Zuni, bluebirds are associated with puberty rituals surrounding the passage from girlhood into womanhood (Tyler 1991). Shifts in climate and consequent shifts in the timing or the distributions of wildlife species are therefore likely to have profound impacts on the cultural and religious lives of these peoples.

for many Tribal communities use such traditional understandings, developed over many generations, to guide their uses of lands within their immediate political jurisdictions. Because land use decisions on reservations will have influences on, and be influenced by, the health and services provided by wider regional ecosystems, it will be essential for Indian and non-Indian people to be working together towards understanding each others' perspectives and choices about climate change, its implications, and how best to adapt.

Coping and Adaptation Strategies

During the assessment process, speakers from Tribal communities consistently attributed the endurance of Native peoples, through extreme conditions and brutal transitions, to spiritual and cultural values. Although public and ceremonial expressions of these values differ considerably from tribe to tribe, Native peoples identify many commonalities across wide geographical, linguistic, and environmental distances. These values form a pivot between the past and future, bringing important lessons learned through tens of thousands of years on the continent into the frameworks for choices that will need to be made about the futures of Native peoples and homelands. From the analyses to date, it is clear that responding to substantial changes in climate, while populations remain in fixed and permanent locations, is very likely to require new technologies, skilled personnel, and financial resources. These three necessities, however, are desperately scarce in many Tribal communities. Most Tribal communities are limited in ways of creating wealth and they continue to rely heavily on transfer payments from the Federal Government. Adjusting plans for economic and social development to account for climate change may require fresh thinking in federal and Tribal policies and budgets. Several options are emerging from consideration of adaptation and coping options.

Enhance Education and Access to Information and Technology: Becoming educated on issues concerning climate change will be critical for Native peoples throughout the country. Both those who live in Tribal

communities and those who make their home elsewhere need to develop the understanding and skills to deal with a changing climate.⁸ This education needs to be both comprehensive and widespread (see Native AMERICAS, 1999). It is especially important to improve the quality of education in the sciences and technology in the K-12 schools and Tribal colleges that serve Native youth. It will be essential to enlist individuals within each Native community (including within each culturally distinct region) to assist in the integration of contemporary information and traditional values.

Promote Local Land-use and Natural Resource Planning: In 1976, with the passage of the Indian Self-Determination and Education Act, the Federal Government began to encourage Tribal governments to take responsibility for developing and implementing plans for use of Tribal lands and natural resources. Since that action, several tribes have received international recognition for success in managing their local resources. The Menominee Nation of Wisconsin regularly trains managers from all parts of the world because of the effectiveness of the tribe's sustainable timber and forestry practices. The Spokane Tribe of Indians has built an exemplary water resources program. Cost-effective ways – using existing networks and organizations – need to be developed to inform decision-makers in Tribal communities, and to provide shared access to adequate technical resources. Technologies now exist that can assist tribes to make thoughtful and informed choices. Ways need to be found to provide information that will support the abilities of Native peoples and their leaders to make prudent choices based on appropriate knowledge and appropriate values, using appropriate processes aimed at promoting and enhancing diversified and sustainable economies in Tribal communities.

Participate in Regional and National Discussions and Decision-making: One result of the trusteeship system has been the tight concentration of the attentions of Tribal governments on their relationships with the Bureau of Indian Affairs. Creating relationships with agencies of state governments has frequently been viewed by tribes as threatening their sovereignty. Gradually, however, since the late 1960s federal agencies have begun to recognize

⁸A variety of professional organizations provide assistance to tribes working on natural resource issues: the Native American Fish and Wildlife Society; Inter-Tribal Timber Council; Indian Agriculture Council; National Tribal Environmental Council, and the American Indian Higher Education Consortium.

that the trust responsibility to Native Peoples extends through all parts of the Federal Government. Tribes, which once viewed the creation of relationships with federal agencies other than the BIA risky at best and irrelevant at worst, are working increasingly successfully across agency and departmental lines. Federal agencies are also learning how to provide appropriate kinds and levels of service to Native Peoples. Although the trust relationships between the Federal Government and Native Peoples are complex, they are not impenetrable. New relationships are essential to address issues of climate change. Serious discussions about climate change – at regional, state, and national levels– need to include informed stakeholders from every relevant jurisdiction. A pertinent model of interaction and collaboration that provides technical support, advice and assistance to Tribal

environmental officers has been developed between tribes in the northern Great Plains and the University of North Dakota. Similarly, the Southwest Strategy, an initiative of all stakeholders in Arizona and New Mexico, serves as a useful framework for strengthening communication and collaboration with tribes and federal agencies. Their success in broadening participation and making knowledge available in useful ways could provide helpful lessons for other states, tribes, and regions

Crucial Unknowns and Research Needs

Reprinted from Chapter 12 of Climate Change Impacts on the United States, see Appendix D.

Because there are many hundreds of tribes, there are many hundreds of situations facing Native peoples as they seek to understand and prepare for climate change. Having better estimates of the patterns, magnitude and rate of climatic changes to be expected is essential. Accurate weather data from Tribal communities – particularly those in remote rural areas – have rarely been compiled. Anecdotal information indicates that some reservations, by virtue of topography, may have microclimates, but little systematic effort has been made by federal, Tribal, or state agencies to gather such information. One significant research priority, therefore, requires the training of members of Tribal communities to collect and interpret weather information, including providing for the acquisition, installation, and maintenance of appropriate instrumentation to support the collection and recording of these data .

A second urgent research need requires inventories of the uses and conditions of land and natural resources on each reservation . Such an inventory can integrate information from remote sensing and geographic information systems, as well as first-hand personal observations and culturally based knowledge. While Native oral histories clearly have many insights to offer, data acquisition and sharing of information have become especially complicated issues for Native peoples. Generations of scholarly objectification of Native peoples, and appropriation of knowledge, objects, and human remains have created severe problems of mistrust of scholarly inquiry, and strong resistance to the sharing of sacred or privileged information. The legitimacy of Native concerns over these issues cannot be dismissed, nor can the urgent needs for research to be conducted from within Native communities. As these essential and primary needs are satisfied, Native peoples have consistently demonstrated willingness to take part in broader conversations, as teachers and students, colleagues and leaders, with individual and culturally-based perceptions that can enrich discussions and strengthen decisions for all parties involved. Equipping

tribes with the capability to scientifically sample and analyze plant and animal populations will enhance the opportunities for broadening Tribal participation in such conversations.

Such inventories are needed to provide the basis for establishing baselines on each reservation of environmental conditions and economic and cultural activities. This needs to be followed by assessments of the opportunities and vulnerabilities that change in climate might bring. These sectoral analyses will require regional projections of future changes for a variety of climate variables, so that the wide range of potential impacts (and opportunities) can be evaluated by the various tribes. Especially important are predictions of changes in water availability and flows because water is the underpinning resource for agriculture, tourism, and other vital activities.

Native communities also need to understand how ecosystems are likely to respond to climate changes, both large-scale and small. What will happen to migrations of birds, waterfowl and fish? What will happen to forests and grasslands? What will happen to the rich mix of flora and fauna on which traditional cultures and subsistence economies depend? How will ecosystems function differently in the future? Will they provide greater or fewer resources, and in what mixtures? That large changes are possible is evident from the changes occurring in response to climate variations. For example, variations in Pacific Ocean temperatures associated with the Pacific Decadal Oscillation seem to cause changes in the migration path of salmon returning to spawn, thereby affecting whether fish pass through traditional harvesting areas (see Figure 4). Gaining a better understanding of such variations, and then of the changes that will be brought on by climate change will be essential.

The rates at which Native communities will be able to induce and respond to major changes vary widely from group to group. Many Native peoples continue to view human actions and community decisions in terms of generations. This perspective sometimes means that reaching conclusions may require more time and discussion than is

customary in market-driven societies. Other groups clearly thrive on change and move aggressively to take advantage of new opportunities for education, economic development, and technological innovation. Some of the challenges presented by changes in climate may require relatively rapid adaptation and swift action. Other challenges may require the capacity to endure discomfort and examine new situations from a variety of perspectives until appropriate responses can be formulated.

Education and the exchanges of information across cultural boundaries, activities that enhance the abilities of Native and non-Native peoples to cope with systemic changes, have been occurring at the individual level for several generations. The Native People-Native Homelands assessment process has started to advance these interactions. Whatever changes befall Earth's climate, there is now fresh grounds for hope that Native peoples and non-Natives may be able to address the challenges collaboratively, as relatives. *Mitakuye Owasin* (we are all related)!"

IV. The Albuquerque Declaration



The Albuquerque Declaration from the “Circles of Wisdom”

*Native People-Native Homelands
Climate Change Workshop-Summit,
November 1, 1998
Albuquerque, New Mexico*

The Indigenous Peoples of the Turtle Island of North America recently completed a four-day gathering, “Circles of Wisdom,” Native People-Native Homelands Climate Change Workshop held in Albuquerque, New Mexico within what is known as the United States. The Indigenous Peoples of North America sent over 180 delegates to share ideas on the impact of climate change and climate variability on Indigenous Peoples and all life on Mother Earth. The Indigenous Peoples worked together to offer solutions to reduce global warming and contribute to the restoration of sustainable economies on Native homelands for our future generations.

This gathering was a historic gathering that enabled a meeting between the Indigenous elders, governmental, environmental, educators and many other community leaders and United States scientists involved in identifying the impacts of climate change. Both advice and action were offered from spiritual and scientific perspectives to restore balance to Mother Earth. The gathering provided a teaching and reminder to the scientists working on climate change issues that these things were foreseen and global warming is being caused by unsustainable technologies and developments throughout the world.

We have been delegated as an ad hoc group of the Indigenous Peoples in attendance at this gathering to prepare and send the following

ALBUQUERQUE DECLARATION

to appropriate contacts in attendance at the Conference of the Parties Four (COP-4) at the United Nations Framework Convention on Climate Change (FCCC) being held in Buenos Aires, Argentina, November 2-13, 1998. We are

requesting the FCCC allow a voice for Indigenous Peoples be added to the global discussions on the impacts of climate imbalance to all life on the sacred Mother Earth.

On behalf of the delegates at this Albuquerque gathering (partial list of delegates attached), we are sending this ALBUQUERQUE DECLARATION throughout the world for global dissemination. The words within the PREAMBLE and other parts of this declaration is a CALL FOR ACTION that the people of the world must open their eyes to the dangerous situation ALL humans are in - if we continue this path of unsustainable developments - we may not have a future for our children.

Oren Lyons, Faithkeeper, Chief, Onondaga Nation
Tom “Mato Awanyankapi” Goldtooth, National
Spokesperson, Indigenous Environmental Network
(IEN)

Patrick Spears, President, and Bob Gough, Secretary,
Intertribal Council On Utility Policy (COUP)

Jackie Warledo, Field Representative, International
Indian Treaty Council (IITC)

THE ALBUQUERQUE DECLARATION FROM THE
“CIRCLES OF WISDOM” NATIVE PEOPLES-
NATIVE HOMELANDS CLIMATE CHANGE
WORKSHOP-SUMMIT, NOVEMBER 1, 1998,
ALBUQUERQUE, NEW MEXICO

TO BE PRESENTED TO THE CONFERENCES OF
THE PARTIES FOUR (COP-4) OF THE UNITED
NATIONS FRAMEWORK CONVENTION ON
CLIMATE CHANGE (FCCC), BUENOS AIRES,
ARGENTINA, NOVEMBER 2-13, 1998

PREAMBLE

As Indigenous Peoples, we begin each day with a prayer, bringing our minds together in thanks for every part of the natural world. We are grateful that each part

of our natural world continues to fulfill the responsibilities that have been set for it by our Creator, in an unbreakable relationship to each other. As the roles and responsibilities are fulfilled, we are allowed to live our lives in peace. We are grateful for the natural order put in place and regulated by natural laws.

Most of our ceremonies are about giving thanks, at the right time and in the right way. They are what were given to us, what makes us who we are. They enable us to speak about life itself. Maintaining our ceremonies is an important part of our life. There is nothing more important than preserving life, celebrating life, and that is what the ceremonies do. Our instruction tells us that we are to maintain our ceremonies, however few of us there are, so that we can fulfill the spiritual responsibilities given to us by the Creator.

The balance of men and women is the leading principle of our wisdom. This balance is the creative principle of Father Sky and Mother Earth that fosters life. In our traditions, it is women who carry the seeds, both of our own future generations and of the plant life. It is women who plant and tend the gardens, and women who bear and raise the children. The women remind us of our connection to the earth, for it is from the earth that life comes.

We draw no line between what is political and what is spiritual. Our leaders are also our spiritual leaders. In making any law, our leaders must consider three things: the effect of their decisions on peace; the effect on the natural order and law; and the effect on future generations. The natural order and laws are self-evident and do not need scientific proof. We believe that all lawmakers should be required to think this way, that all constitutions should contain these principles.

Our prophecies and teachings tell us that life on earth is in danger of coming to an end. We have accepted the responsibility designated by our prophecies to tell the world that we must live in peace and harmony and ensure balance with the rest of Creation. The destruction of the rest of Creation must not be allowed to continue, for if it does, Mother Earth will react in such a way that almost all people will suffer the end of life as we know it.

A growing body of western scientific evidence now suggests what Indigenous Peoples have expressed for a

long timelife as we know it is in danger. We can no longer afford to ignore the consequences of this evidence. We must learn to live with this shadow, and always strive towards the light that will restore the natural order. How western science and technology is being used needs to be examined in order for Mother Earth to sustain life.

Our Peoples and lands are a scattering of islands within a sea of our neighbors, the richest material nations in the world. The world is beginning to recognize that today's market driven economies are not sustainable and place in jeopardy the existence of future generations. It is upsetting the natural order and laws created for all our benefit. The continued extraction and destruction of natural resources is unsustainable.

There is a direct relationship between the denial of Indigenous Peoples land and water rights, along with the appropriation without consent of Indigenous Peoples' natural resources, and the causes of global climate change today. Examples include deforestation, contamination of land and water by pesticides and industrial waste, toxic and radioactive poisoning, and military and mining impacts.

The four elements of fire, water, earth and air sustain all life. These elements of life are being destroyed and misused by the modern world. Fire gives life and understanding, but is being disrespected by technology of the industrialized world that allows it to take life such as the fire in the coal-fired powered plants, the toxic waste incinerators, the fossil-fuel combustion engine and other polluting technologies that add to greenhouse gases. Coal extraction from sacred earth is being used to fuel the greenhouse gases that are causing global climate warming.

Because of our relationship with our lands, waters and natural surroundings, which has sustained us since time immemorial, we carry the knowledge and ideas that the world needs today. We know how to live with this land we have done so for thousands of years. We are a powerful spiritual people. It is this spiritual connection to Mother Earth, Father Sky, and all Creation that is lacking in the rest of the world.

Our extended family includes our Mother Earth, Father Sky, and our brothers and sisters, the animal and plant life. We must speak for the plants, for the animals,

for the rest of Creation. It is our responsibility, given to us by our Creator, to speak on their behalf to the rest of the world.

For the future of all the children, for the future of Mother Earth and Father Sky, we call upon the leaders of the world, at all levels of governments, to accept responsibility for the welfare of future generations. Their decisions must reflect their consciousness of this responsibility and they must act on it. We demand a place at the table in discussions that involve and affect our future and the natural order and natural laws that govern us.

THEREFORE

We, the participants in the “Circles of Wisdom” Native People-Native Homelands Climate Change Workshop, held in Albuquerque, New Mexico of the United States, in the traditional territory of the Pueblo Peoples, express profound concern for the well being of our sacred Mother Earth and Father Sky and the potential consequences of climate imbalance for our Indigenous Peoples and the significance of these consequences for our communities, our environment, our economies, our culture and our relationships to the natural order and laws.

Indigenous prophecy now meets scientific prediction. What we have known and believed, you also now know. The Earth is out of balance. The plants are disappearing, the animals are dying, and the very weather —rain, wind, fire itself — reacts against the actions of the human being. For the future of the children, for the health of our Mother Earth, Father Sky, and rest of Creation, we call upon the people of the world to hold your leaders accountable.

We submit this declaration to the Fourth Conference of the Parties (COP-4) to the United Nations Framework Convention on Climate Change (FCCC) being held in Buenos Aires, Argentina, November 2-13, 1998. We wish to add our voices to ongoing global discussions regarding the impact of climate imbalance on forests, oceans, plants, animals, fish, humans and biodiversity.

PRINCIPLES

The following principles are self-evident and guide our beliefs and actions.

- Mother Earth, Father Sky, and all of Creation, from microorganisms to human, plant, trees, fish, bird, and animal relatives are part of the natural order and regulated by natural laws. Each has a unique role and is a critical part of the whole that is Creation. Each is sacred, respected, and a unique living being with its own right to survive, and each plays an essential role in the survival and health of the natural world.
- As sovereign Peoples and Nations, we have an inherent right to self-determination, protected through inherent rights and upheld through treaties and other binding agreements. As Indigenous Peoples, our consent and approval are necessary in all negotiations and activities that have direct and indirect impact on our lands, ecosystems, waters, other natural resources and our human bodies.
- Human beings are part of the natural order. Our role and responsibility, as human beings, is to live peacefully and in a harmonious balance with all life. Our cultures are based on this harmony, peace and ecological balance, which ensure long-term sustainability for future generations. This concept of sustainability must be the basis of the decisions and negotiations underway on national and international levels.
- The Creator has entrusted us a sacred responsibility to protect and care for the land and all of life, as well as to safeguard its well being for future generations to come.
- Indigenous Peoples have the right and responsibility to control access to our traditional knowledge, innovations and practices, which constitute the basis for the maintenance of our lifestyles and future [The Draft Declaration of the Rights of Indigenous Peoples];

CONCLUSIONS

Indigenous Peoples of North America were invited by neither the United States nor Canada to participate in the negotiations of the United Nations Convention on Climate Change.

In June 1997, more than 2,000 U.S. scientists, from over 150 countries, including Nobel Laureates, signed the Scientists Statement on Global Climate Disruption which reads, in part, the “accumulation of greenhouses gases commits the sacred earth irreversibly to further global climate change and consequent ecological, economic, social and spiritual disruption” (Intergovernmental Panel on Climate Change, December 1995). Climate imbalance will cause the greatest suffering to the Indigenous peoples and most pristine ecosystems globally.

The migration of Persistent Organic Pollutants (POPs) through the air and water pathways continues from warmer southern climates to the colder climates of the Great Lakes and Arctic climates of North America and the Arctic Circle. Increased temperatures and persistent organic pollutants (POPs) disproportionately impact Indigenous Peoples, through their food web systems, causing health and ecosystem impacts.

Within the next 20 years, temperatures over land areas of North America, Europe and Northern Asia will increase as much as 5 to 15 degrees Fahrenheit over today’s normal temperatures, well in excess of the global average (IPCC Report 1998). This increase in temperature will cause the sea level to rise (5-25 feet over the next 500 years), drying out North America’s soil moisture (20 - 50%), and result in major increases in the summer heat index (10 - 25 degrees F).

The burning of oil, gas, and coal (“fossil fuels”) is the primary source of human-induced climate change. The increasing demand and use of fossil fuels continues to have adverse impacts on natural forests. Natural forests are critical parts of the ecosystems that maintain global climate stability. The continued large-scale taking of fossil fuels results in numerous impacts on these vital areas through deforestation and pollution from drilling operations and ultimately forest degradation from the global climate imbalance. The mining and drilling for coal, oil, and gas, as well as other mineral extractions, results in substantial local environmental consequences, including severe degradation of air, forests, rivers, oceans and farmlands. Cultural impacts, forced removal, land appropriation, destruction of sacred and historical significant areas, breakdown of Indigenous social systems, and violence against women and children are too often the outcomes of fossil fuel development on Indigenous Peoples. Fossil fuel extraction areas are home to some of

Mother Earth’s last and most vulnerable Indigenous Populations, resulting in accelerated losses of biodiversity, traditional knowledge, and ultimately in ethnocide and genocide.

ACTIONS

We request that the potential consequences of climate imbalance for Indigenous Peoples and our environments, economies, culture, place and role in the natural order be addressed by:

1. Establishing and funding an Inter-sessional Open-ended Working Group for Indigenous Peoples within the Conference of the Parties (COPs) of the UN Framework Convention on Climate Change (FCCC);
2. Provisions for case studies be established within the framework of FCCC that would allow for assessing how climate changes effect different regions of Indigenous Peoples and local communities; assessing climate changes on flora and fauna, freshwater and oceans, forestry, traditional agricultural practices, medicinal plants and other biodiversity that impact subsistence and land-based cultures of Indigenous Peoples; and other case studies that would provide a clearer understanding of all effects and impacts of climate change and warming upon Indigenous Peoples and local communities;
3. Indigenous Peoples have the right, responsibility and expertise to participate as equal partners at every level of decision-making including needs assessments, case studies, within national and international policy-making activities concerning climate change impacts, causes and solutions;
4. Within the FCCC, establish protocols that would actively promote international energy efficient and sustainable forms of development, including the wide-spread use of appropriately scaled solar energy and renewable energy technologies as well as sustainable agricultural and forestry practice models;
5. Mandating a moratorium on new exploration and projects for extraction for fossil fuel reserves in pristine areas. Exploration and development in the traditional territories of Indigenous Peoples of the world must be

done with the full consent of Indigenous Peoples, respecting their right to decline a project that may adversely impact them;

6. Imposing a legally binding obligation to restore all areas already affected by oil, gas, and coal exploration and exploitation by the corporations or public entities that are responsible. This restoration must be done such that Indigenous Peoples can continue traditional uses of their lands.

This is a partial list of additional Indigenous and non-Indigenous groups signing in support of the Declaration. The following Indigenous Peoples and Nations attended this Albuquerque Workshop-Summit and fully endorse this declaration:

- Haudenosaunee Environmental Task Force - Mohawk, Oneida, Onondaga, Cayuga, Seneca and Tuscarora
- Native Coalition for Cultural Restoration of Mount Shasta and Medicine Lake Highlands Defense
- Columbia River Alliance for Economic and Environmental Education
- International Movement Against All Forms of Discrimination and Racism
- International Indian Treaty Council
- Intertribal Council On Utility Policy
- Native American Council of New York City
- Seventh Generation Fund
- Roundtable of Institutions of People of Color
- Sapa Dawn Center
- Dine' Citizens Against Ruining the Environment (CARE)
- Anishinabe Nijiji
- North American Indigenous Peoples Biodiversity Project
- Gwiichin Steering Committee
- Alaska Council of Indigenous Environmental Network
- Eastern Cherokee Defense League

- Great Lakes Regional Indigenous Environmental Network
- White Clay Society of Gros Ventre
- Oklahoma Regional Indigenous Environmental Network
- Shundahai Network
- American Indian Chamber of Commerce of New Mexico
- American Indian Law Alliance

Traditional and Spiritual Leaders:

Oren Lyons, Onondaga
Kendall Rice, Potawatomi
Arvol Looking Horse, Lakota
Marvin Stevens, Kickapoo
Tom Stillday Jr., Red Lake Ojibway
Johnny Jackson, Yakama Cascade Band
Corbin Harney, Western Shoshone
Jake Swamp, Mohawk
Albert Yazzie, Navajo
Richard Dalton Sr, Tlingit

Individuals:

Tonya Gionella Frichner, Onondaga
Chuck Crowe, Eastern Band of Cherokee
Kent Lebsack, Lakota
Fidel Moreno, Yaqui/Huichol
Carlton Ami, Hopi/Tewa
Mary Louise Defender-Wilson, Dakota/Hidatsa
Jan Stevens, Sac & Fox
Walt Bresette, Red Cliff Ojibwe
Earl Tulley, Diné
Floyd Buckskin, Pitt River
Andrew Becenti, Diné
Barbara Bernacik, Laguna Pueblo
M.C. Balwin, Diné

Joseph Campbell, Dakota
Elena Bautista Sparrow, Yujpik
Joseph Chasing Horse, Lakota
Charlotte Caldwell, Menominee
Tami Soreson, Ojibwe
Marylou Stillday, Ojibwe
Sarah James, Neestaii Gwichin Athapascan
Tom Goldtooth, Diné/Dakota
Michael Sturdevant, Menominee
Jose Barrero, Taino
James Main, Sr, Gros Ventre
Roy Taylor, Pawnee/Choctow
Barbara McCloud, Puyallup
Janet McCloud, Tulalip
Valerie Taliman, Diné
Wilbur Slockish Jr, Yakama Klickitat Band
Dana Mitchell, Penobscot
James Ransom, Haudenesaunee
Robert Shimek, Ojibwe
Jimbo Simmons, Choctow
Patrick Spears, Lakota
Carlos Pelayo, Yoreme
Dean Suagee, Oklahoma Band of Cherokee
Angel Valencia, Yaqui
Mose Walkingstick, Eastern Band of Cherokee
Geraldine Warledo, Cheyenne/Arapaho
Jackie Warledo, Seminole
This is a partial list.

V. Appendices



APPENDICES

- A. Steering Committee and Advisory Committee List
- B. Workshop Agenda
- C. Participant List
- D. Chapter 12: Potential Consequences of Climate Variability and Change for Native Peoples and Homelands

Chapter 12: Potential Consequences of Climate Variability and Change for Native Peoples and Homelands, by Schuyler Houser, Verna Teller, Michael MacCracken, Robert Gough, and Patrick Spears, pp. 351–377 in *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change. Foundation Report*, prepared by the National Assessment Synthesis Team, U.S. Global Change Research Program, published by Cambridge University Press, Cambridge UK, 2001, 612 pp.

Appendix A: Native People-Native Homelands Steering Committee

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Appendix B: Workshop Agenda

Appendix C: Participant List

Name	Affiliation	Name	Affiliation
Abeita, Eugene	Isleta Pueblo	Enote, Jim	Zuni Pueblo
Agoyo, Herman	New Mexico Governor's Office	Escarcega, Tom	Ft. Peck Tribe
Allen, Jonathan	NA Prep School	Eskeets, Edison	Dean of Students/NA Prep School
Ami, Carlow	Hopi/Tewa	Farmer, Delbert	Shonshone-Bannock Tribe
Archambault, Dave	Hunkpapa Lakota	Frichner Gonnella, Tonya	Onondaga Nation
Arenas, Germaine	Pechenga Tribe	Garcia, Ted	San Felipe Pueblo
Awhinona, Jacob	Nome Eskimo	Garrett, Jim	Cheyenne River Lakota
Baldwin, M.C.	Navajo Nation	Gilbert, Lewis E.	Columbia University, NY
Barrero, Jose	Taino Nation	Gobert, Judy	Blackfeet Nation
Basquez, Raymond	Pechenga Tribe	Goes in Center, Jhon	Oglala Lakota Nation
Bautista Sparrow, Elena	Yujpik/University of Alaska, Fairbanks	Goldtooth, Tom	Dine/Lakota
Becenti, Andrew R.	Navajo Nation	Goodhouse, Cedric	Hunkpapa/Lakota
Begay, Tony	Navajo Nation/Southwest Polytechnic Institute, NM	Gorospe, Kathy	Laguna Pueblo
Benally, John	Navajo Nation	Gough, Robert	Intertribal Council On Utility Policy
Bernacik, Barbara	Pueblo of Laguna	Graham, Steven	NASA GSFC
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Bordeaux, Lionel	Lakota	Harney, Corbin	Western Shoshone
Boyer, Lionel	Shoshone-Bannock Tribe	Harwood, Kyle	University of New Mexico School of Law
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Cheek, James E.	Cherokee	James, Sarah	Neestaii Gwichin
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Cochran, Michael	Lummi	Johnson, Charles	White Mt. Bering Straits
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Crowe, Chuck	Eastern Band Cherokee	Kalahahele, Imaikalani	Native Hawaiian
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Maynard, Nancy	NASA Headquarters	Stillday, Mary Lou	Red Lake Nation
McCloud, Barbara	Puyallup Tribe	Sturdevant, Michael	Menominee
McCloud, Janet	Tulalip	Suagee, Dean	First Nations Mohawk
McKenzie, Garnett	Meherrin	Suazo, Gilbert	Pueblo of Taos
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Moreno, Fidel	Yaqui/Huichol	Valencia, Angel	Yaqui Indian Tribe
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Mortensen, Lynn	Office of U.S. Global Change Research Program	Walkingstick, Mose	Eastern Band Cherokee
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Ojima, Dennis	Colorado State University	Warledo, Jackie	Seminole
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Patiamo, Stanley	Pueblo of Acoma	Whitelighting, Joan	NA Prep School
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Periman, Richard	Choctaw	Whitney, Janice	HETF Fiduciary
Peters, Christopher	Yurok/Karuk	Williams, Daryl	Tulalip
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Price, Michael	Ojibwe	Winter, Elizabeth	Pueblo of Picuris
Punjawiyi, Caleb	Siberian Yupik	Wisipan, Garriott	NA Prep School
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Reed, Amy	Pimo-Wasco	Yazzie, Alfred	Navajo Nation
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		Zuni-Cruz, Christine	Isleta/San Juan Pueblos

Appendix D: Chapter 12 of Climate Change Impacts on the United States



National Aeronautics and
Space Administration

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