Introduction

This paper describes some important contributions that several American Indian tribes have recently made, applying their traditional knowledge to the management of forest resources in the United States. The major federal laws mandating tribal consultation are briefly reviewed. As a result of tribal consultation, the value of American Indian traditional knowledge is beginning to be recognized and understood by United States Department of Agriculture (USDA) Forest Service officials in charge of managing the nation's National Forests. Some examples are given of how forest management is changing when National Forests and American Indian tribes work in partnership, applying new solutions using traditional knowledge. A case study of the Hopi Tribe outlines their unique relationship with nature, and how the Hopi Tribe has worked with the USDA Forest Service and other federal agencies to provide traditional knowledge, as they work together to become more effective in providing sustainable land stewardship. Emerging issues from a national perspective are discussed in the final section, including consultation guidelines, the need for forest policies for collection of forest resources for traditional uses by American Indians, and the need to seriously consider compensating tribes for their intellectual property rights or traditional knowledge.

Forest Ecosystems and American Indian Tribes

Over 500 federally recognized American Indian tribes and native Alaskan villages are located on or near National Forests, with most National Forests and tribes located west of the 100th meridian or west of the Mississippi River. The United States of America covers numerous forested ecosystems, from the vast ponderosa pine forests of the west and temperate rainforests of the northwest, to the mixed hardwoods of the eastern states, tropical forests of Florida and Puerto Rico, and mixed conifer forests of the Rocky
Mountain states. For centuries humans have played a key role in managing these forested ecosystems. The National Forests which stand today, are the legacy of human decisions and actions from early woods burning by American Indians, to cutting of forests on a grand scale a century ago by early American settlers, to modern day forest ecosystem management. Ecosystem management today reflects human values of a heightened concern for "natural" systems. This includes ecosystem restoration as a tool to reverse the trend of degraded ecosystems, loss of habitats, and the increasing threat of large-scale wildfire. Indigenous peoples may play a significant role in restoring the forests of the future.

Federal Laws, National Forest System Lands, Rights of American Indians

A host of federal laws enacted over the last 30 years have changed the way the USDA Forest Service interacts with American Indian tribes, resulting in new working relationships, new exchanges of technical information, and new ways of managing forests by incorporating traditional knowledge from American Indian tribes. Aboriginal rights to occupy and use land that American Indians have traditionally used, stem from possession and use that predates the establishment of the National Forest System over a hundred years ago. Numerous treaties were signed in the last two centuries between different Indian tribes and the United States of America, affecting tribal rights to settlement and use of lands. Subsequent laws established National Forests on land once inhabited by Indian tribes and how the National Forests were to be managed. "Many National Forest System lands are adjacent to American Indian or Alaska Native Tribes or tribal lands. Federally Recognized Indian tribal governments have a unique government-to-government relationship with the United States Government. In some cases, tribal governments have reserved rights on what are present-day national forests or grasslands, that were retained when the tribes relinquished lands to the United States Government" (USDA-FS, 1997). During the past century, some National Forest land managers generally either ignored neighboring American Indian tribes or dealt with them as trespassers and law breakers, arresting American Indians for trespass or illegal hunting and fishing on National Forests, when members of the tribes asserted their traditional rights and uses.

However, beginning with the National Environmental Policy Act (NEPA) in 1969, Federal agencies began to invite Indian tribes to participate in forest management projects and activities that may affect them. The National Forest Management Act of 1976 also directs consultation and coordination of National Forest System planning with Indian tribes. The National Historic Preservation Act of 1966, amended in 1992, states that "the historical and cultural foundations of the Nation should be preserved as a living part of our community life...." (USDA-FS, 1997), and requires cooperation between Federal agencies and American Indian tribes and Native Hawaiian Organizations. The Indian Self Determination
and Education Assistance Act of 1975 encourages tribes to assume responsibility of Federally funded programs previously administered by the Bureau of Indian Affairs (BIA). Since then most tribes are now dealing directly with other federal and state agencies, and no longer rely on the Bureau of Indian Affairs to speak on their behalf. The American Indian Religious Freedom Act of 1978 states that the policy of the United States is to protect and preserve religious rights, practices and beliefs of American Indian, Eskimo, Aleut, and Native Hawaiian which includes, but is not limited to: access to sites including those sites located on national forests, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites. The Archeological Resources Protection Act of 1979 requires a permit process for the scientific study including excavation of cultural sites on Federal lands, providing for consultation with affected tribal governments. The Native American Graves Protection and Repatriation Act passed in 1990 recognizes the Federal government's responsibility to respect the cultural and religious beliefs of Native Americans, requiring consultation with tribes that may be affected by federally planned undertakings (Jenkins et al., 1994). In 1996, President Clinton signed Executive Order 13007, "Indian Sacred Sites" directing Federal agencies to accommodate access to and ceremonial use of Indian sacred sites, and to avoid adversely affecting such sites. Additionally, two laws apply specifically to Alaska: the Alaska Native Claims Settlement Act of 1971 and the Alaska National Interest Lands Conservation Act of 1980 (USDA-FS, 1997). These laws provide for settlement of Alaska Native land claims, Federal benefits and services for those lands, development of Native corporations, and recognition of subsistence hunting and fishing rights.

These laws along with their implementing regulations and policies, have created more opportunities for open dialog and consultation between American Indian tribes and the USDA Forest Service, as they work together to protect cultural values and natural resources on National Forest System lands. As a result of improved government-to-government relationships, USDA Forest Service managers are beginning to realize that many American Indian tribes have valuable traditional knowledge that can be applied to modern day natural resource management. Below are a few examples of traditional tribal knowledge applied to modern day natural resource management on National Forest System lands.

**American Indian Contributions to Forest Ecosystem Management**

**Collaboration on Ecosystem Management**

- Forested ecosystems extend far beyond land ownership boundaries making it essential for cooperation and collaboration between the USDA Forest Service and other federal land management agencies, tribal, state and private landowners. The exchange of research, technology transfer, technical assistance, shared skills, and cooperative planning and implementation of project activities involving all affected landowners, are examples of cooperation and collaboration. Tribal members can make
significant contributions as they share their knowledge of traditional ecosystems. Traditional ecosystem knowledge can be defined as a body of information and skills learned and passed down by clans, societies, and tribes through generations of living in a close relationship with the land and resources. It includes a framework of classification, a set of empirical observations about the local environment, and a manner of living in balance and harmony with all things.

- Traditional knowledge is adaptive and dynamic, and offers a means to evaluate new technologies and socio-economic situations. It also offers a unique opportunity for sharing knowledge and expertise needed for land and resource restoration and management. The USDA Forest Service is beginning to recognize that traditional knowledge is valuable in forming land management goals and objectives, that traditional knowledge is a part of the whole, and that it can be blended with western science to benefit all.

- Tribal members can tell us something about the ecosystems of the past and how to manage these ecosystems for present and future generations. With a long history of living and learning from the land, American Indians can contribute to a better understanding of our human relationship among all things within an ecosystem. Traditional knowledge can also guide the maintenance of natural resource uses and needs of American Indian and Alaska Native peoples. Forest ecosystem managers from the across the United States working on National Forests, Research Stations, and in State and Private Forestry, are starting to consult with neighboring tribes to identify what forested ecosystems were like in the past, and how they can be restored and maintained (USDA-FS, 1997).

Examples of Tribal Traditional Knowledge Contributing to Natural Resource Management

- The Chippewa Tribe has off-reservation rights to gather miscellaneous forest products from National Forests that are within the territories ceded by treaties signed in 1837 and 1842. The Chippewa Tribe in the Great Lakes region has developed a joint research and monitoring initiative through the Great Lakes Fish and Wildlife Commission and the Forest Service Northeast Research Station to "investigate acceptable harvest levels of wild plants and examine the effects of other management activities on these species: to properly monitor harvests; and to participate in the long-range planning efforts to ensure that wild plant resources continue to be provided on USDA Forest Service managed lands." Ginseng and club moss are the species identified for this collaborative research effort, and
both species are relatively rare or endangered, with little available information on sustainable harvest levels (USDA-FS, 1997).

- In Alaska the Kenaitze Interpretive Site on the Chugach National Forest was established in 1992 with a cooperative agreement between the Kenaitze tribe and the USDA Forest Service to preserve, protect and present the area's important natural and archeological resources. Drawings, exhibits and traditional dancing by tribal youth depict Dena'ina life; family memories of living, hunting, and trapping on the land are shared by tribal elders. Because the site is located on the Russian River, a very popular red salmon fishing area, the site and its resources were suffering from overuse by the general public. This significant Alaska Native culture site has now been protected, preserved and interpreted through this collaborative effort (USDA-FS, 1997).

- The Mendocino National Forest in northern California is studying the possibility of reintroducing beargrass (*Xerophyllum tenax*) populations in part of the forest. Courses in traditional basketry are taught at Round Valley Reservation adjacent to the forest, but no local populations of beargrass, an important basketweaving plant, were known. This plant also has potential use for restoration efforts on highly erosive serpentine soils found on the Forest. The Mendocino National Forest purchased all the available plants from a local nursery and propagation efforts are continuing at the Genetic Research Center in Chico, California (USDA-FS, 1994).

- Several workshops on traditional basketweaving have been held in recent years in the California Region with traditional basketweavers and USDA Forest Service employees. As a result of the workshops the basketweavers have acquainted others with various types of baskets they weave and the materials they need; the USDA Forest Service has begun to compile lists of basketry plants and materials and to develop maps of collection areas; and the USDA Forest Service in the Pacific Southwest Region now has a better understanding of the need for access to these areas and no longer requires a permit for collection of traditional materials from American Indian tribal members. Descendants of traditional basketweavers also understand today the ways to gather basketry materials. "It is the way of the Great Spirit for people to always have and show respect for all things and to give offerings to the spiritual value of all things. The more the USDA Forest Service sees the ways of the Indian, the more the agency will begin to understand and respect Indian cultural values. It is good to see the Tribes and the USDA Forest Service are continuing to work with each other" (USDA-FS, 1993). The original Forest Plan for the Cleveland National Forest did not address traditional forest
uses. Basketweavers from 18 different reservations and even Mexico have helped the Cleveland National Forest identify plants needed for basketweaving, their locations and management concerns to maintain the key plant species needed. The Cleveland National Forest is now more aware of traditional uses and has more data to use in revising its Forest Plan, which will consider traditional forest uses (Craig, Pfeiffer, 1995).

- On the Lake Tahoe Basin Management Unit, a botanical and ethnographic study was initiated to document the effects of Washoe tribal horticulture practices on bracken fern. Master basketmakers participated in a series of field trips to identify suitable stands of bracken, and helped document plant attributes sought and maintained by harvesting. The results of this pilot study were presented in a poster session in 1995, at the annual meeting of the Society of Ethnobiology in Santa Barbara, California (USDA-FS, 1995).

- Members of the Karuk Tribe of California exchange information and participate in frequent meetings with the Klamath National Forest, to provide input in project planning, including the design and execution of many projects and work activities such as timber harvest, prescribed burning to improve hazel and beargrass production, recreation site improvements, and land use permits. As a result of improved working relationships, tribal consultants participated as monitors and advisors during the Pony Wildland Fire, providing advice relating to spiritual use in the salvage recovery area and acting as monitors during field surveys. In addition, Cultural Awareness Day brought Karuk elders and Forest Service employees together for a day of acorn gathering and processing, including traditional acorn cooking methods (USDA-FS, 1996).

- The Hopi Tribe: A Case Study in Gathering and Applying Traditional Knowledge

Stewards of the Earth

The Hopi Tribe, today with a population of about 10,000 occupies twelve villages on three mesas on the Hopi Reservation in northern Arizona. The village of Old Oraibi, located on Third Mesa, is considered to be the oldest, continuously inhabited settlement on the North American continent (Taylor, 1995). The Hopi ancestral lands cover a much larger territory and include most of the Kaibab National Forest directly north and south of the Grand Canyon National Park. According to clan tradition, Hopi clans emerged in this world, the Fourth World, and encountered the guardian of the world, Ma'saw. A spiritual covenant was submitted to by the clans, whereby the Hopi people earned the right to be the
stewards of the earth by placing their footprints throughout the Fourth World while migrating on a spiritual quest to find their place at the center of the universe. During the migrations the clans established themselves throughout the land by cultivating and caring for the earth. The "footprints" that they left behind consist of ritual springs, petroglyphs, pilgrimage trails and shrines. Ancestral burials, potsherds, and ruins found on the landscape today are further evidence that they had vested the land with their spiritual stewardship, as they fulfilled the way of *Ma'saw* (Ferguson et al., 1995).

This covenant forms the basis for the responsibility that the Hopi Tribe feels for the land of their ancestors and where their ancestors still rest. They have told representatives of the Kaibab National Forest that, "You are the present physical caretakers of the Forest, but we are the spiritual caretakers and we must work together." Because land management decisions can affect the "footprints" as well as the landscape itself, the Hopi Tribe formed a Cultural Preservation Office to interact with the various federal and state agencies and private organizations that make land use decisions over the Hopi ancestral lands that cover much of the states of Arizona, Utah, Colorado, and New Mexico. Many of the laws mentioned previously, such as the National Historic Preservation Act and National Environmental Policy Act, require consultation with affected tribes during the federal decision making process. The Hopi Tribe has found a way to gather traditional knowledge and integrate this knowledge during the course of consultation with the USDA Forest Service and other federal agencies, by use of the Cultural Preservation Office and the Cultural Resource Advisory Task Team.

**Keepers of the Knowledge**

The Cultural Preservation Office forms a bridge between the traditional social organization and the administrative government, by working directly with the keepers of the knowledge, and thereby using traditional knowledge during consultation with federal and state agencies. This is not an easy task, as Hopi culture is very unique and complex. The traditional histories are long and complicated, involving many individuals and Hopi clans. Therefore, there are multiple histories at multiple levels, rooted in religious beliefs, giving this knowledge an esoteric nature and thus it becomes guarded and sacred (Dongoske et al., 1997) Although there is general agreement of the basic tenets of Hopi religion, there is considerable variation among clans, religious societies, and villages. Each clan and society has a unique tradition that is not even shared with other clans or societies, so information gathering can be difficult. The approximately ten staff members of the Cultural Preservation Office cannot represent the views of each of these individual clans, but they have creatively devised a way to reach consensus with the formation of the Cultural Resource Advisory Task Team. This advisory team guides and assists the Cultural Preservation Office staff in management recommendation and research efforts. Most Hopi
villages as well as a number of prominent clans, priesthoods and religious societies have a representative on the Cultural Resource Advisory Task Team. Although there are Hopi villages that remain autonomous and refuse to recognize the Hopi Tribal Council as their government, they nevertheless participate with the Cultural Preservation Office by having representatives on the advisory team (Ferguson et al., 1993).

Advisory team members often distinguished positions of authority within the traditional village structure, but their team participation is a separate activity from their traditional duties. The advisory team meets once a month, but special meetings are also added to address more time consuming issues. Frequent field trips help clarify specific projects, identify sites and features that are important to the Hopi Tribe, but which are not likely to be found by archeologists or known by others outside the Tribe (Ferguson et al., 1995). Through this process the Cultural Preservation Office has been able to identify Traditional Cultural Properties, (places specific to and important to maintaining a cultural identity), evaluate potential impacts to these places, and recommend mitigation measures for some land management projects on the federal, state and private lands in the Four Corners area. This information is then used during consultation with appropriate agencies.

Former Hopi Tribal Chairman, Ferrell Secakuku, once said, "All land should be respected and all land is used only for survival, whether it be physical, spiritual, or mental. Our religion does not teach us to subdue the earth. Our religion teaches us to take care of the earth in a spiritual way as stewards of the land" (Secakuku, 1993). Taking this wisdom into consideration, there is meaningful dialog between the Hopi Tribe and the USDA Forest Service and other federal agencies. The Hopi people understand that the land is to be used by people, but used respectfully. Often the advisory team makes suggestions for projects or activities that benefit wildlife that will be hunted, or plants species which are traditionally collected. For example, the use of fire can encourage the growth of many plants important to wildlife and to the Hopi Tribe. The advisory team has supported and suggested such projects as well as others that improve overall forest health.

**Traditional Knowledge is Living and Dynamic**

Reciprocity is a principal social concept for the Hopi as it is for many American Indian tribes. In this regard the Hopi have accepted many scientific concepts and technical land management strategies, and have applied these to their own lands on the Hopi reservation. It is important to understand that traditional knowledge is living and dynamic, and also must respond to present day problems that were unknown in the past. When the Hopi Tribe decided to close and obliterate several illegal roads on the Hopi reservation, they requested a training session with USDA Forest Service experts to learn the current techniques of road closures and restoring natural conditions. Likewise, the Hopi Tribe consulted with the
Coconino National Forest to develop a comprehensive, integrated plan to manage pinyon-juniper woodlands covering 79,757 hectares of the Hopi reservation (Koyiyumptewa, 1993). This plan recognizes traditional cultural, spiritual, and economic and subsistence uses of these woodlands and integrated technical silvicultural tools with cultural and human needs to manage and protect the forests, watersheds and soils, while addressing wildlife, recreation, range and other concerns.

**Holistic View of Ecosystems**

Science-based suggestions for managing land are essential, but philosophical attitudes are also paramount. When Hopi tribal members were surveyed to identify problems in the woodlands of the reservation, the most common replies were: sacred area desecration, artifact theft, and religious interference. Issues such as fuelwood theft, overgrazing, and lack of fuelwood were secondary (Miller, 1997). It is interesting to note that the first three problems involve the spiritual realm rather than the physical natural resources. This is not surprising when one understands that the Hopi view the spiritual and physical as intertwined, as one. The spiritual affects the physical, and vice versa in the Hopi world (Koyiyumptewa, 1993). For the Hopis, time is non-linear. The past is still living and the future is directly connected to the present. Since everything that we do is connected and affects everything else, a holistic view of the ecosystem results in more responsible stewardship. As we make decisions towards restoring natural landscapes and as we continue to use the forests for our own needs, this is a significant concept to consider.

The examples cited above represent only a small portion of the evolving partnerships between American Indian tribes and National Forests of the United States of America, where traditional knowledge is applied to the management of forest resources on both reservation and National Forest System lands. As the partnerships develop, new issues have emerged, while several old issues still remain unresolved.

**Emerging Issues From a National Perspective**

**Consultation procedures**

Because there is no uniform guideline to define consultation with Indian tribes, the approach federal agencies take is highly variable, ranging from a cursory letter requesting a quick response; to a notification that an action or decision affecting the tribe has already been made; to a sincere effort to elicit the advice and opinions of the tribes and their religious leaders. This has created a confusing situation for
a number of tribes. The Hopi Tribe has made the following recommendations to the Federal government to improve the situation:

- 1. A systematic review of national, regional, and local consultation procedures to assess current interpretation and implementation of applicable federal laws and policies.

- 2. Need to develop formal policies and procedures for federal agencies.

- 3. Initiate consultation with a formal letter describing the federal undertaking being proposed. Follow up with phone calls and face-to-face meetings with tribal officials.

- 4. On site visitation of proposed project or activity.

- 5. Compensate tribes to develop technical information needed by federal agencies.

- 6. Provide for longer response time, and initiate consultation early in the project development.

- 7. Understand that a "cookbook" approach may not accommodate the cultural diversity of all Indian tribes, yet there is a strong need for more uniform guidelines and principles to guide the consultation process (Jenkins., et al. 1994).

Accessibility to Traditional Forest Resources

For many American Indians, community identity and survival are dependent on continued access to National Forests and use of certain landscapes which are key locations or contain unique resources. Certain plants are meaningful to restore balance to the world, by ensuring the passage of a child into adulthood, and to health and social well-being. A particularly acute issue for American Indian and Alaska Native peoples are the maintenance of traditional gathering, hunting, fishing rights and other activities, when they are affected by changes in access to or availability of these important resources. The loss of traditional plants, uses, practices, and learning continue to be critical issues for tribal people.

Gathering rights and permits have been a source of frustration and confusion for many American Indians. Many feel a deep sense of resentment for even having to fill out a permit to gather in traditional areas, or for being told that they may not gather at all. Some National Forests are entering into agreements with tribal government representatives so tribal members can gather "miscellaneous forest products for personal use", replacing the permit process, thus allowing them to freely gather native resources.

Intellectual Property Rights
American Indian communities are also beginning to deal with intellectual property and indigenous rights as they realize that their traditional knowledge is unique and of high value. An obvious example is the commercial use of religious imagery on t-shirts and other artwork by the public at large, but this is also a concern within the consultation process. Some agencies or subunits consider tribal input no different than input from any other member of the public. Tribes consider their input as professional services, as true consultants who supply information not available elsewhere and thus worthy of compensation. Many large projects such as the Bureau of Reclamation's Glen Canyon Environmental Studies, now provide funding for ethnographic and traditional cultural property research that is paid directly to the appropriate tribes. The confidentiality of information is another tribal concern. Traditional places and materials can be misused by others. Therefore it is important that conditions of confidentiality are understood by all parties during the consultation. While most information is freely available from federal agencies, there are some safeguards that can be used to protect sensitive information such as provisions in the Freedom of Information Act, the National Historic Preservation Act [sec. 304 (a)], and the Archeological Resources Protection Act.

**Lessons Learned**

By officially recognizing American Indian tribes on a formal government-to-government basis and streamlining the process for American Indians to gather traditional resources, and by actively promoting indigenous management strategies, developing and protecting traditional gathering areas, National Forests across the United States are enriching the concept of multi-culturalism in land management. As tribes become more experienced with federal consultation laws, policies and regulations, it will be become paramount that the federal government speak with one voice, clearly interpreting the laws and policies to eliminate confusion and frustration. Intellectual property rights may become increasingly important, and unless this issue is taken seriously it may become a roadblock to future collaboration and consultation efforts between federal land managers and tribal officials. By working cooperatively with American Indian governments, the USDA Forest Service will be able to identify more specific, traditional and sustainable forest management strategies.

New efforts in ecosystem restoration may be more successful after carefully combining conventional western scientific principles with the traditional, more holistic view of ecosystem management embraced by many tribes of the United States. Incorporating traditional knowledge expands human understanding and may enhance biodiversity and resource sustainability for future generations. For generations American Indians have employed a body of knowledge and a variety of management tools to enhance the production and quality of key plants and animals in selected locations and predictable
times. Landscapes were created and maintained by burning the land. A complex system of spiritual, social, and political practices influenced the use of plants and foods. Applying traditional knowledge today may not only improve the USDA Forest Services' understanding of national forest ecosystems, but also guide the maintenance of forest resource uses and needs of American Indian and Alaska Native peoples (USDA-FS, 1997).

**References**


Forest Ecosystems is an open access, peer-reviewed journal publishing scientific communications from any discipline that can provide interesting contributions about the structure and dynamics of "natural" and "domesticated" forest ecosystems, and their services to people. The journal welcomes innovative science as well as application oriented work that will enhance understanding of woody plant communities. Very specific studies are welcome if they are part of a thematic series that provides some holistic perspective that is of general interest. Recent news. Forest Ecosystem...