



Edward S. Curtis. *Winter - Apsaroke* (1908). Philadelphia Museum of Art, purchased with funds from the American Museum of Photography

In an effort to restore forest health and diversity, federal agencies are calling for management practices directed toward a "return to the presettlement equilibrium." Restoring forests to that presettlement structure and function is not possible without also understanding the relationship between the indigenous inhabitants and the land. Indigenous knowledge systems have much to offer in the contemporary development of forest restoration. Traditional knowledge is particularly useful in identifying reference ecosystems and in illuminating cultural ties to the land. Although Native peoples' traditional knowledge of the land differs from scientific knowledge, both have strengths that suggest the value of a partnership between them.

By Robin Wall Kimmerer

*When European settlers first set foot on this continent, they were awestruck by the bounty of the forest, its abundance of plant foods, fish, and game. They described the indigenous people as living off the "provender of the forest primeval" (Cronon 1983). The colonists were right about the abundance but mistaken about its source. Far from being a wilderness, the land was intensively managed by Native Americans to increase the availability of food.*

Today, in an effort to restore forest health and biodiversity, federal agencies are calling for, in Secretary of the Interior Babbitt's words, "a return to the presettlement equilibrium" (Kloor 2000). Implicit in this choice of time period as a goal for restoration are many complex cultural assumptions concerning the relationship of Euro-Americans to the land. We are attempting to turn back the clock of ecological history to an era that precedes the impact of the western world view on native ecosystems. But recreating forests of presettlement structure and function may not be possible without also understanding the relationship of the original inhabitants to the land.

### Native Species, Native Thinking

Conservation biologists have long recognized that introduced species can pose an impediment to ecological restoration when they replace native species and cause imbalance among members of the community. By analogy, might we also consider the impact that introduced knowledge systems have had on the sustainability and restoration of native North American ecosystems?

The seeds of Old World species came here on the feet of the colonists. Indeed, the Native American name for the introduced common plantain is "white man's footprints," for its association with the expansion of frontier settlements into native homelands. The colonists also brought their concept of land—that of an objectified, secular Nature, in which humans are separated from other members of the natural community.

With time and careful observation, native people came to learn the medicinal properties of plantain. The alien plant and the native people evolved a new, adaptive relationship in which its healing properties were used and respected. Similarly, with the passage of time and the experience of environmental degradation, the colonists may also come to understand and respect the native relationship to our shared land.

In indigenous knowledge systems, we understand a thing when we know

it with all four aspects of our being: mind, body, emotion, and spirit (Cajete 1994). As other articles in this issue demonstrate, we are beginning to know restoration intellectually and physically. This is a strong position from which to begin healing our forestlands. But we need not only to heal the land but also to heal our *relationship* to land. To undertake this challenge, we are called on to engage additional ways of knowing.

Gadgil et al. (1993, p. 151) wrote,

Modern scientific knowledge, with its accompanying worldview of human beings apart from and above the natural world, has been extraordinarily successful in furthering human understanding and manipulation of simpler systems. However, neither this worldview nor scientific knowledge has been particularly successful when confronted with complex ecological systems. . . . It is in this context that traditional ecological knowledge is of significance.

### Traditional Ecological Knowledge

*Traditional ecological knowledge* is the knowledge of relationships among humans, nonhumans, and the physical environment, held by peoples in relatively nontechnological societies that are directly dependent on the land (Berkes 1993). This knowledge differs from *scientific ecological knowledge* in important ways. Each has its strengths and weaknesses, which suggests that there may be value in partnership between them.

Traditional knowledge observations tend to be qualitative in nature and create a diachronic database, i.e., a record of observations from a single locale over a long time period. The knowledge base is highly localized rather than abstracted to a generalization of ecological communities. This perspective makes traditional knowledge particularly applicable to restoration design, which is also site specific. The observers tend to be the resource users themselves—the hunters, fishers, and gatherers whose harvesting success is inextricably linked to the quality and reliability of their ecological observations.

In contrast, scientific observations,

made by an elite cadre of professionals, tend to be quantitative in nature and represent synchronic data, i.e., short-term observations from a range of sites. Scientific ecological knowledge often culminates in abstraction and yields predictive models of generalized behaviors. Additional differences between scientific and traditional ecological knowledge are described in Berkes (1993).

Traditional ecological knowledge is increasingly being sought as a potential source of ideas for emerging models of ecosystem management. Indeed, the United Nations Convention on Biodiversity calls for recognition and protection of traditional knowledge. Pharmaceutical companies, agribusiness, and conservation biologists have found value in the rich empirical knowledge of native people. Commercial exploitation without cultural protection, however, threatens the knowledge base as surely as it endangers the target species. Application of intellectual property rights and fair compensation are appropriate remedies in some cases, but the highest protection is afforded when indigenous people and their homelands are made inviolate.

The nature of traditional ecological knowledge is much more than information concerning ecological relationships. Unlike scientific knowledge, it is woven into and inseparable from the social and spiritual context of the culture. Whereas traditional knowledge is laden with associated values, the scientific community prides itself on data that are "value-free." As western scientists come to recognize the value and validity of traditional knowledge, they often attempt to extract the kernel of objective "fact" and discard its cultural context, like the unwanted husk of a fruit. Separation of the knowledge from the culture devalues both.

For example, a promising extract from a plant used in indigenous medicine may prove ineffective in a Western setting of allopathic medicine. But when used in the appropriate cultural context of indigenous healing practices, it is a powerful curative. Land stewardship practices of indigenous peoples are similarly holistic. Manage-

ment practice is frequently tied to a cultural belief system, as opposed to the strictly objective approaches often taken in scientific land management. The challenge lies in creating a productive synergism between these two knowledge systems, brought to bear on our shared concerns for living sustainably on the land.

The qualitative and intuitive dimension of traditional knowledge can provide management insights that scientists might overlook. One example concerns caribou hunting in the Canadian Arctic, where wildlife managers dismissed traditional practices only to discover that they were more effective (Mander 1991). Wildlife biologists had instructed the Inuit to abandon their traditional practice and hunt only the oldest male caribou. The Inuit said this violated their traditional relationship with the animals and that the herd would suffer. When their "unscientific" input was ignored, the caribou population dropped sharply. The Inuit understood the role of experienced elder animals in locating scarce food sources and in modifying the behavior of the

goals articulated by indigenous people are often broader. The holistic cultural context is evident in the description of restoration from the mission statement of the Indigenous Peoples Restoration Network (SER 1995):

Ecological restoration is inseparable from cultural and spiritual restoration, and is inseparable from the spiritual responsibilities of care-giving and world renewal. Collectively and individually, these indigenous spiritual values must be central to the vision of ecological restoration. Western science and technology... is a limited conceptual and methodological tool; the "head and hands" of restoration implementation. Native spirituality is the "heart" that guides the head and hands.

The outcome of those differences is apparent in a comparison of forest management goals between tribal forests and commercial and federal forestlands in this country. The Indian Forest Management Assessment Team report (IFMAT 1993) documents that management priorities on tribal lands are more inclusive than the multiple-

restoration goals are widely divergent views of what constitutes a "natural" landscape. The fundamental differences hinge on whether humans are viewed as an integral part of nature.

*Authenticity: What is "natural"?* A frequently cited goal of restoration is to recreate a natural ecosystem, where "natural" is understood to be a "precontact ecosystem capable of maintaining itself with little or no human intervention" (Cairns 1988) or "an area that requires little or no cultural energy to be maintained in the present state" (Anderson 1991). The Leopold Report of 1963 called for restoring our national parks to "conditions that prevailed when the area was first visited by white man" (Sprugel 1991). The definition of "natural," once applied exclusively to pristine, undisturbed ecosystems, has since been expanded to encompass lands affected by natural disturbance regimes, such as fire and windstorm. Sprugel (1991) and others understand "natural" as a moving target dictated by a complex suite of unique characteristics, including equilibrium and nonequilibrium disturbance effects.

Federal guidelines for restoration planning recommend that projects be large enough to allow for a mosaic of patches produced by the prevailing disturbance regime (National Research Council 1992). Indeed, incorporation of natural disturbance processes has been found vital to the restoration of numerous species, from the classic examples of fire in the restored midwestern prairies to the oak savannas of California (Wells 1970; Anderson 1996; Martin 1996).

Although scientists willingly embrace so-called natural disturbances, until quite recently we have been unwilling to recognize that some of our most cherished natural landscapes were in fact anthropogenic in origin (Jordan 1992; Neiring 1992). To ignore the role of indigenous people is to ignore 12,000 years of ecological history. The presettlement landscape was often intensively managed by its original inhabitants, so what we viewed as pristine was the product of human intervention (Anderson 1996; Neiring 1992). The omission of indigenous practices from inclusion in the natural

## *Traditional ecological knowledge is born of long intimacy and attentiveness to a homeland.*

herd. Traditional knowledge has since been incorporated into caribou management plans and in a wide range of other examples.

### **Application to Restoration**

*Goals.* Explicit definition of the goal is a fundamental step in a restoration project (Meffe and Carroll 1994). Despite the shared commitment to restoration, indigenous and scientific knowledge systems may prioritize goals very differently. Cairns (1988) defines restoration as management to return a damaged ecosystem to its predisturbance condition. The goal is to emulate a healthy, natural, self-regulating ecosystem. In contrast, restoration

use guidelines established for federal and private timberlands. In addition to economic return on timber and non-timber forest products, tribal forests may be explicitly managed "to provide food, medicines and materials for transportation, household use and artistic expression and they serve as sanctuary for worship, contemplation and inspiration" (Morishima 1997). A balance is sought between economic return and maintenance and protection of traditional cultural values. Restoring the relationship to land is given equal weight with restoring the structure and function of the ecosystem (Martinez 1993). At the heart of the differences in native and Western

disturbance regimes has its roots in the Western belief that humans are distinct from nature and that human intervention is antithetical to "unspoiled nature." By contrast, in the indigenous view, human beings are part of nature; human intervention is understood to be vital to the ecological integrity of forest communities and is in fact a spiritual responsibility.

*Identifying the reference ecosystem.* In addition to the goal of recreating a "natural" ecosystem, restorationists debate what constitutes the appropriate "reference ecosystem." That is, to what condition shall we restore a given piece of land? To the state that immediately predated its disturbance? To the historic landscape that existed at the close of the little Ice Age? Many restorationists have chosen as their target the presettlement vegetation type. Since the presettlement period corresponds to a period of active manipulation by Native Americans, this view requires incorporating traditional land management practices into the ecosystem.

*Traditional resource management practices.* Contemporary restorationists are currently evaluating the effectiveness of a suite of land management techniques, from prescribed burning to direct seeding and control of exotics. These tools are designed to manipulate the patterns and processes of ecological succession and to produce the desired species composition and structure in the restored community.

Traditional resource management practices by Native Americans had similar objectives: to manipulate successional processes to produce a sustained yield of desirable foods and subsistence materials. Martinez (1994) has termed these practices "care giving." The ethnographic literature is replete with models of highly site-specific management practices available to the restorationist willing to cross disciplinary lines.

Anderson (1996) provides an excellent review of the wide array of indigenous land management practices that ensured sustainable harvest of culturally significant plant materials. These practices include burning, pruning, coppicing, weeding, transplanting, and sowing. These methods increased plant



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**Ecological restoration restores our relationship to the forest as much as it restores the ecosystem itself.**

production and modified community and landscape structure significantly. Fire was particularly important for control of pests, production of basketry materials, and fuel reduction to prevent catastrophic fire.

The reference ecosystem is also used as a standard for evaluating the accuracy and authenticity of the restoration (Meffe and Carroll 1994). Various measures have been formulated to assess accuracy—the degree to which the restored ecosystem resembles the reference in such ecological parameters as structure and function. Assessment of accuracy is an objective for which the tools and perspectives of western science may be most appropriate. Restoration of authenticity, with its qualities of aesthetics and history, remains an elu-

sive goal. The insights of traditional knowledge should prove useful in designing restored landscapes that explicitly integrate culture and nature.

*Cultural diversity and biodiversity.* North America was once peopled with at least 600 indigenous groups (Fiedler 1987), each with its own empirical knowledge of ecological relationships. Although much of this knowledge became fragmented through US assimilation policies, it still persists on reservations and in traditional communities. Native peoples' rich diversity of cultures and land-use practices contributed to the diversity of the presettlement landscape. The cessation of indigenous practices has led to a loss of biodiversity in natural communities ranging from northwestern prairies

(Bicknell et al. 1992) and fan palm oases (Cornett 1989) to forests and savannas (Anderson 1996).

In addition to guides for land-use practice, traditional knowledge is a repository of detailed species information. In defining a reference ecosystem, the original species composition of the presettlement forest may not be completely known. Ethnobotanical data may be used to identify the full species complement. In addition, the oral tradition of the native people may hold clues to the missing species. The native languages and artifacts of material culture are a living library of species information. The wealth of ecological information in native languages—many of which are

which may violate the Western vision of a natural, self-sustaining ecosystem.

Indigenous knowledge systems might resolve the issue differently because the conception of time is different. Rather than linear, as the metaphorical river, time in native traditions is a circle—a metaphorical lake. In this view, the process of restoration would not necessarily be constrained to a particular trajectory. Cycles of change are expected. Restoration would reestablish fundamental processes and species composition, and then the ecosystem would be left to develop without costly energy inputs.

That approach has been articulated by Janzen (1988) for restoration of a

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nearly extinct—supports the link between conservation of biodiversity and conservation of cultural diversity.

Traditional ecological knowledge is valuable in ecological restoration not only for its content of empirical information but for its cultural context as well. The philosophical foundations of traditional knowledge offer alternative interpretations for restoration outcomes that may address some concerns of practitioners. For example, restorationists have been criticized for attempting to construct ecosystems that are static “snapshots in time” (Dunwiddie 1992). While trying to recreate “natural” ecosystems, restorationists are often working to arrest succession and maintain stasis. This conflict becomes especially apparent in planning restorations in the face of accelerating climatic change. Adherence to a predefined state or particular successional trajectory is a construct of the Western conception of time. If time is understood as a linear, progressive process, then maintaining stasis requires significant subsidies of energy—and thus intensive and expensive management inputs,

tropical dry forest. The practice is in harmony with a basic tenet of indigenous belief—that lands left to themselves “will invite the compatible creatures to live on and with them. These species should be left to prosper and fulfill their given roles. Their contributions should be carefully observed so that their role in community recovery may be discovered” (Deloria 1992). The indigenous perspective does not claim control of the process; rather, it acknowledges and works in partnership with the wisdom of the land. This approach has been termed “spiritual management” (Deloria 1992; Tyler 1993)

*Spiritual responsibility and the web of reciprocity.* The longstanding barrier between scientific management and spiritual management is increasingly being challenged. In an address to the 1999 annual meeting of the Society of American Foresters, US Forest Service Chief Mike Dombeck characterized the activities of the agency as “spiritual work.” One of the founders of American conservation, Aldo Leopold, lamented the division between humanistic and scientific values (Kessler and

Booth 1998) in the education of natural resource managers. The scientific and spiritual perspectives of traditional knowledge are a legitimate part of the education of the next generation of forest managers (Kimmerer 1998).

In the native tradition, the spoken word is recognized as powerful because it is conveyed with the breath of life (Cajete 1994). Indeed, words have the capacity to reveal the world view at their roots. For example, in English, the forest is a natural resource—a raw material that can be transformed for human benefit. We “manage” the resource to increase its utility for us. In many Native American languages, there is no equivalent of the abstract term “natural resource,” and the meaning of “forest” is closer to the meaning of “home.” Forest restoration can be practiced and understood from either end of a continuum of meaning, ranging from “natural resource” to “home.” The way in which we participate in restoration offers the opportunity to locate ourselves along that continuum.

From the strictly scientific view, restoration serves the utilitarian purpose of recreating ecosystem structure and function. A restored landscape may exist as an imposed technological solution for delivery of ecosystem services and enhancement of biodiversity. Humans remain outside the system and play the role of engineering the machinery of nature.

For traditional native people, biodiversity encompasses much more than a collection of species and genetic entities. Each species and individual is endowed with personhood. All beings, human and nonhuman alike, possess a unique intelligence, consciousness, and role as a member of the community. Biodiversity encompasses the Lakota concept of “all our relations.” The forest sustains our material and spiritual well-being. As sources of knowledge, and as sustainers of life, forests are manifestations of the sacred.

The very process of participating in restoration is an act that reinforces the web of reciprocal relations between humans and nonhuman persons. In restoring a forest, we nurture the lives of our relatives, from the carpets of mosses to the owls in the treetops so

that they in turn may nurture our well-being and perpetuate life on the planet. In restoring land, we restore our sacred relationship to it.

The links between human intervention and ecological integrity are simultaneously pragmatic and spiritual. Elders from indigenous communities the world over hold the belief that if certain plants are not used by the people, they will decrease or disappear altogether. The validity of this belief is well documented in oral tradition and contemporary scientific literature (Anderson 1996; Anderson and Rowney 1999). For example, traditional harvesting practices both ensure a sustained yield and fulfill spiritual responsibilities for care giving. The widespread indigenous practice of replanting young bulbs after harvest of large ones and weeding around them exemplifies this relationship: The plant fulfills its role by providing food to the people, and the people fulfill their role by nurturing the plant.

Ceremony also serves to strengthen the spiritual connections between humans and land, which are vital in a culture that values reciprocal responsibility. Participation in restoration projects also has the potential to foster integration between people and land (Meekison and Higgs 1998). Community involvement provides an opportunity for people to forge emotional bonds with land and contribute to long-term sustainability.

*Partnerships for restoration.* Our efforts toward authentic restoration of damaged forest communities can be strengthened by partnerships with Native Americans. The Indigenous Peoples Restoration Network, under the leadership of Dennis Martinez and the Society for Ecological Restoration, seeks to facilitate such partnerships. Its goal is to use the tools of ecological restoration to enhance the survival of indigenous peoples and cultures and to incorporate the knowledge of these cultures into models of ecosystem management (SER 1995). Exploration of the integration between traditional practices and modern restoration is a fertile field for investigation.

*Becoming indigenous to a place.* As Americans seek to redefine their evolu-

ing relationship with nature, the knowledge systems of the original inhabitants can provide useful models. But this cannot be merely a wistful retrospective on indigenous relationships to land. Traditional ecological knowledge is not unique to Native American culture. It is born of long intimacy and attentiveness to a homeland and can arise wherever people are materially and spiritually integrated with their landscape. The writings of such luminaries as Aldo Leopold in "The Land Ethic" (1966) and others in the Western tradition express this imperative most powerfully. The goal should not be to appropriate the values of indigenous peoples. As an immigrant culture, Americans must start to engage in their own process of becoming indigenous to this place.

As we strive to heal not only the land but also our relationship to it, restoration can be the means by which we regain our roles as members of the community. In this way, we can start to develop the intimacy with our land that nurtures a deeper spiritual connection, transforming our forests from natural resources to our home.

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