



## Indigenous Traditional Ecological Knowledge in Agroforestry

### Introduction

Communities around the world have practiced diverse and evolving forms of agroforestry for centuries.<sup>1</sup> While both indigenous and non-indigenous practitioners have developed agroforestry practices of great value, in this publication, we focus on the role of indigenous, traditional ecological knowledge. Indigenous communities include American Indians, Alaska Natives, Caribbean and Pacific Islanders, and others. Because indigenous groups have lived in the same areas for long periods of time, each generation has built on the knowledge of the previous generation through observation and experimentation. In this manner, indigenous groups have evolved intricate ways to manage [bioculturally diverse](#) ecosystems.<sup>2</sup> These ecosystems are managed to provide food, fuel, building materials, agricultural and plant-tending tools, hunting and trapping equipment, baskets, and ceremonial spaces essential to life and maintaining cultural traditions. Many agroforestry practitioners in the United States are learning from these complex systems.

### A Changed Landscape

Within the United States, many indigenous communities and practitioners continue to carry on traditional management practices, but others struggle to do so. While some indigenous communities have been able to continue managing their ancestral homelands, altered political boundaries, laws, regulations, economic incentives, and socio-cultural practices mean that most indigenous and tribal communities' ancestral homelands have not been managed in their traditional ways for over a hundred years. This has made it difficult—if not impossible—to continue traditional management practices. Some ancestral homelands have become cities, towns, and subdivisions. Others are managed by state and federal agencies or private individuals and companies whose management goals are different from the indigenous peoples'. Even when tribes and indigenous communities have been able to retain or secure management rights to land, they may need to do a significant amount of management (e.g. thinning, burning, pruning, planting) in order to restore relevant functions to the landscape (e.g. to provide food, medicine, basketry materials, etc.).

Additionally, climate change is altering storm, fire, disease, drought, and flooding patterns as well as the suitable ranges for many of the species upon which indigenous people traditionally rely. On top of this, invasive species continue to cause dramatic ecological changes. Thus, traditional practitioners are adapting their practices to suit the new conditions of today and to prepare for tomorrow. Many of these practices can inform climate adaptation strategies.<sup>3</sup>

### Learning from Traditional Ecological Knowledge

At the same time that indigenous practitioners are adapting to changing conditions, there is a burgeoning interest among landowners and land managers to manage their lands as more complex ecosystems. Whether they have a small woodlot, a large farm, or manage public lands, many people wish to meet several objectives on one piece of property. These objectives are often similar to the objectives for which indigenous communities traditionally managed, which including:

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|-----------------------------------|---|
| • food                            | • reduction of hazardous fuels around the home and valued resources |
| • firewood                        | • beauty  |
| • basketry and building materials | • recreation spaces   |
| • culinary and medicinal herbs    | • cultural values   |
| • clean and abundant water        | • sacred and historic sites   |
| • wildlife habitat                | • educational opportunities   |
| • privacy                         |   |

<sup>1</sup> Parrotta and Trosper 2012; Birkes et al. 2000; and Nair 1989.

<sup>2</sup> Maffi 2007.

<sup>3</sup> Lynn, et al. 2013.

**Definitions:**  
**Agroforestry**

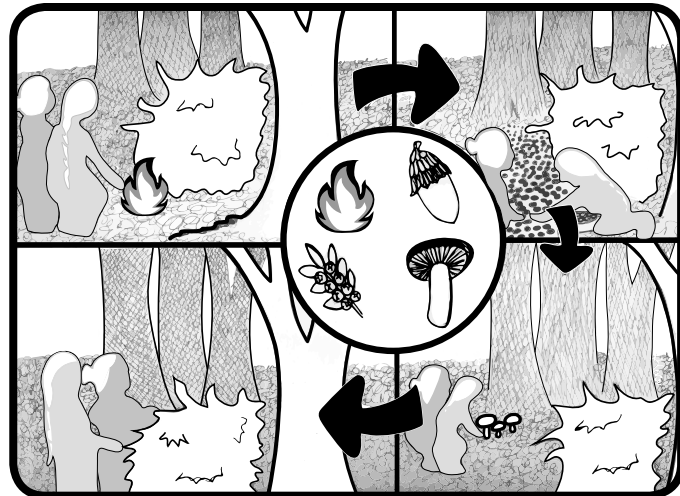
When land managers incorporate trees with crops and or livestock in an integrated, intentional, interactive and intensive way, they are practicing **agroforestry**. **Agroforestry** can take many forms, but there are five agroforestry practices typically described in the United States: forest farming, alley cropping, riparian forest buffers, windbreaks, and silvopasture.<sup>4</sup> While traditional ecological management knowledge likely has important insights relevant to all five of those practices, it can also describe additional agroforestry practices that address a range of human needs from food to water to tools to firewood. These needs are met through the design and management of entire agroforestry ecosystems and landscapes that integrate a diversity of interacting native plants, animal habitats, and valuable bio-cultural functions.

**Traditional Ecological Knowledge**

**Traditional ecological knowledge** is defined as “a cumulative body of knowledge, practice and belief ... about the relationship of living beings (including humans) with one another and with their environment.”<sup>5</sup> It evolves “by adaptive processes and [is] handed down through generations by cultural transmission.”<sup>6</sup> Often traditional ecological knowledge is a part of an indigenous world view or value system, and thus it is rooted in ceremonial or religious practices.

This knowledge of how to judiciously manage, harvest, and steward ecosystems without destroying them results from “observation, patience, experimentation, ... long-term relationships with plants and animals” and the lessons passed down through generations of observation and experimentation in the same place.<sup>7</sup> These lessons were traditionally taught by parents, aunts, uncles, grandparents, and other elders – in certain ways and at certain times of a young person’s life. For example, children might first learn from their elders to gather basketry materials from willows in early spring, and then to remove the bark and sort them by size. Only after they have enough materials will they learn to weave and how to use the baskets to gather, carry, cook and serve.

Traditional ecological knowledge facilitates the implementation of stewardship practices such as burning, pruning, sowing, tillage, and more.<sup>8</sup> For example, Northern California tribes light understory fires beneath acorn trees in the early fall, to remove weevil- and moth-ridden nuts prior to the full acorn harvest.<sup>9</sup> Later, mushrooms and huckleberries are harvested in the same landscape (see image right).



This image is based on the traditional agroforestry systems of Northern California tribes who use fire, pruning, and other management practices to produce acorns, huckleberries, mushrooms, and more for both people and wildlife. Illustration by Colleen Rossier.

Thus, traditional ecological knowledge is connected to certain places, peoples, cultures, spiritual beliefs, and a responsibility to family and community for the future. This knowledge must be practiced and constantly adapted to stay alive, current and able to meet the the evolving needs of indigenous individuals and communities.

<sup>4</sup> For more on agroforestry practices, please visit [USDA's agroforestry website](#) and the website of the [National Agroforestry Center](#).

<sup>5-6</sup> Berkes 2005.

<sup>7</sup> Anderson 2006.

<sup>8</sup> Anderson 1999.

<sup>9</sup> Anderson 2007.

<sup>10</sup> Walls and Whitbeck 2012; Adams 1995; Duran and Duran 1995.

**Revitalizing and Perpetuating Traditional Ecological Knowledge**

Disease, genocide, forced migration, assimilation policies and boarding schools have broken the chain of inter-generational knowledge transfer for many indigenous communities.<sup>10</sup> Thus, indigenous practitioners who wish to fill in knowledge gaps, people who wish to reestablish these traditional management practices and others who want to adjust them for today's world, all do research. They read ethnographies, ethnobotanical literature, and the diaries and field notes written by explorers, early settlers, and anthropologists about indigenous cultures. Many of these documents are only available in archives, libraries, and museums. Interested people also interview tribal elders who have lifelong experiences and remember the lessons taught them by their own elders, and record this information for future generations. To learn more about how the USDA defines and engaged traditional ecological knowledge, visit the [USDA-Natural Resources Conservation Service's](#) web page on [Indigenous Stewardship Methods](#), and read [Technical Note 1: Traditional Ecological Knowledge: An Important Facet of Natural Resource Conservation](#).<sup>11</sup>

Learning from the traditional ecological knowledge of indigenous elders and practitioners may enable landowners and managers to develop more robust and complex agroforestry systems that not only produce multiple products from the same piece of land, but emphasize the use of native plants suited to the local landscape and climate. In some cases, cultivated varieties (cultivars) of native plants can even be grown to reliably produce foods and other materials for the landowner. Being native, these plants fit particular ecological niches that they evolved to fill. For instance, a blueberry cultivar produced from blueberries native to a drought-prone region or microclimate may do well in a nearby dry location with similar temperature, moisture, and soil conditions. By planting this local variety rather than one developed from non-native stock, the landowner may be able to save time, water, and money by not having to irrigate or fertilize. This native variety may also provide more food and habitat for native pollinators, and therefore enhance the production of a range of crops beyond blueberries.

**Important Considerations**

While elders and practitioners have a wealth of experience with certain plants, animals, and fungi, and knowledge of how to manage complex ecosystems at local scales, it is important to respect each person's right to not share that information. Some knowledge is sacred, and some is considered intellectual property that belongs to a particular indigenous group and is not to be shared with those outside the group due to the risk that the information could be taken out of a specific cultural function and context. It is also important for the interviewer to ensure that both parties have the same understanding about which information can be published or disseminated to the public.

Many elders are eager to pass on their traditional ecological knowledge, especially if they have not had an opportunity to do so with their own children, grandchildren, or community. Others may be reticent to share such important information with someone they do not consider family or a part of their culture. Elders are more likely to share knowledge and details of traditional management practices with those who will take responsibility for this stewardship and these ways of knowing. It is important to be considerate of such sentiments, and to be attuned to the historical trauma that many indigenous people experience.<sup>12</sup>

Many modern management practices have their roots in indigenous knowledge, but those communities have not always been acknowledged for their contributions (e.g. crop varieties from corn to chilies to potatoes, applications of prescribed burning for forest and agricultural management, intercropping methods).<sup>13</sup> If a member of an indigenous group chooses to share their traditional knowledge, it is important to acknowledge the indigenous group or individual who provided the information whenever it is used. Additionally, some practitioners in indigenous communities have at times felt exploited by researchers who enter their communities to gain information, collect data, then leave, only to publish it without giving back to the community intellectually or in a tangible way. Thus, it is important to not only acknowledge the indigenous group or individuals as sources of information and the agroforestry practices, but also to ensure that both parties' needs and expectations are met. There should be a clear understanding about which information can be published or disseminated to the public.

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<sup>11</sup> The complete technical note is available at [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb1045244.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1045244.pdf)

<sup>12</sup> Walls and Whitbeck 2012.

<sup>13</sup> [http://nmai.si.edu/sites/1/files/pdf/education/thanksgiving\\_poster.pdf](http://nmai.si.edu/sites/1/files/pdf/education/thanksgiving_poster.pdf)

## Examples of Traditional Ecological Knowledge in Agroforestry

Below are a few examples of how Native Americans, Alaska Natives, and Pacific Islanders are using their traditional ecological knowledge to implement agroforestry systems.

**Haudenosaunee (Iroquois Six Nations):** People of the Mohawk Tribe of the Iroquois Six Nations are working with both New York State Department of Forestry and the US Fish and Wildlife Service to [restore black ash trees](#) for use in traditional basketry. Additionally, they [harvest maple syrup](#) from maple trees grown in an agroforestry context, as they have done for generations. Both the ash and maple trees were part of the Haudenosaunee agroforestry landscape that European colonists encountered when they came to America.

**Yakama Nation and Confederated Tribes of Warm Springs Reservation:** The Yakama Nation regularly does prescribed burns on their reservation to enhance huckleberry growth in forest understories. They also partner with the US Forest Service to thin out trees and do prescribed burns at the Gifford Pinchot National Forest in Washington in order to increase forest health and restore huckleberries. The huckleberries grow back from underground rhizomes more vigorously after fire, producing more berries in the third or fourth year, and thrive in the enhanced light conditions created when shady canopy trees are removed. The Confederated Tribes of the Warm Springs Reservation are also working with the US Forest Service to thin stands, and incorporate prescribed burns to enhance huckleberry production on the Mount Hood National Forest.

**Confederated Tribes of the Siletz:** The Confederated Tribes of Siletz worked with the US Forest Service's Willamette National Forest to turn a fallowed ranchland full of invasive European blackberry, Scotch broom, Queen Anne's-lace, and Oregon ash trees into a [productive agroforestry landscape](#). One of the main goals was to restore camas, a plant traditionally considered a delicious food by native peoples. Small populations of it had been found on the site, so the team reintroduced prescribed fire, a main tool traditionally used by the tribes, and planted camas after the burn. They also seeded other native plants used by the tribes, including meadow barley, western red cedar trees, and hazelnut.

**Karuk, Yurok, and Hoopa:** In Northern California, the Karuk, Yurok, and Hoopa Tribes are using thinning and prescribed burns to [manage tanoak and Douglas-fir dominated forests](#) for acorns, huckleberries, mushrooms, hazelnuts, firewood, and beargrass for basketry. Their burns clear dense underbrush, making it easier to access and harvest these resources. These projects are being conducted on reservation, tribal allotment, private, and adjacent public national forest lands.<sup>14</sup>

**Tohono O'odom and Pima:** The Tohono O'odom and Pima manage mesquite trees for their pods, which are eaten fresh or ground into flour. The Tohono O'odom also manage and consume [saguaro cactus fruit, tepary beans, chia seeds, acorns, and many other desert foods, which are part of their traditional systems](#).<sup>15</sup> Mesquite pods, tepary beans, and other traditional foods have been found to help native people struggling with diabetes caused by a less natural diet.<sup>16</sup>

**Alabama Coushatta:** In Texas, the Alabama-Coushatta Tribe is working with USDA's NRCS to [reestablish native longleaf pine ecosystems](#), and is using the needles for basketry in the years between timber harvests. Longleaf pines, which used to cover 90 million acres of the southeastern United States, now only cover [three percent](#) of that landscape. Longleaf pines provide a home for many native plant and animal species, and are adapted to grow with periodic fires.

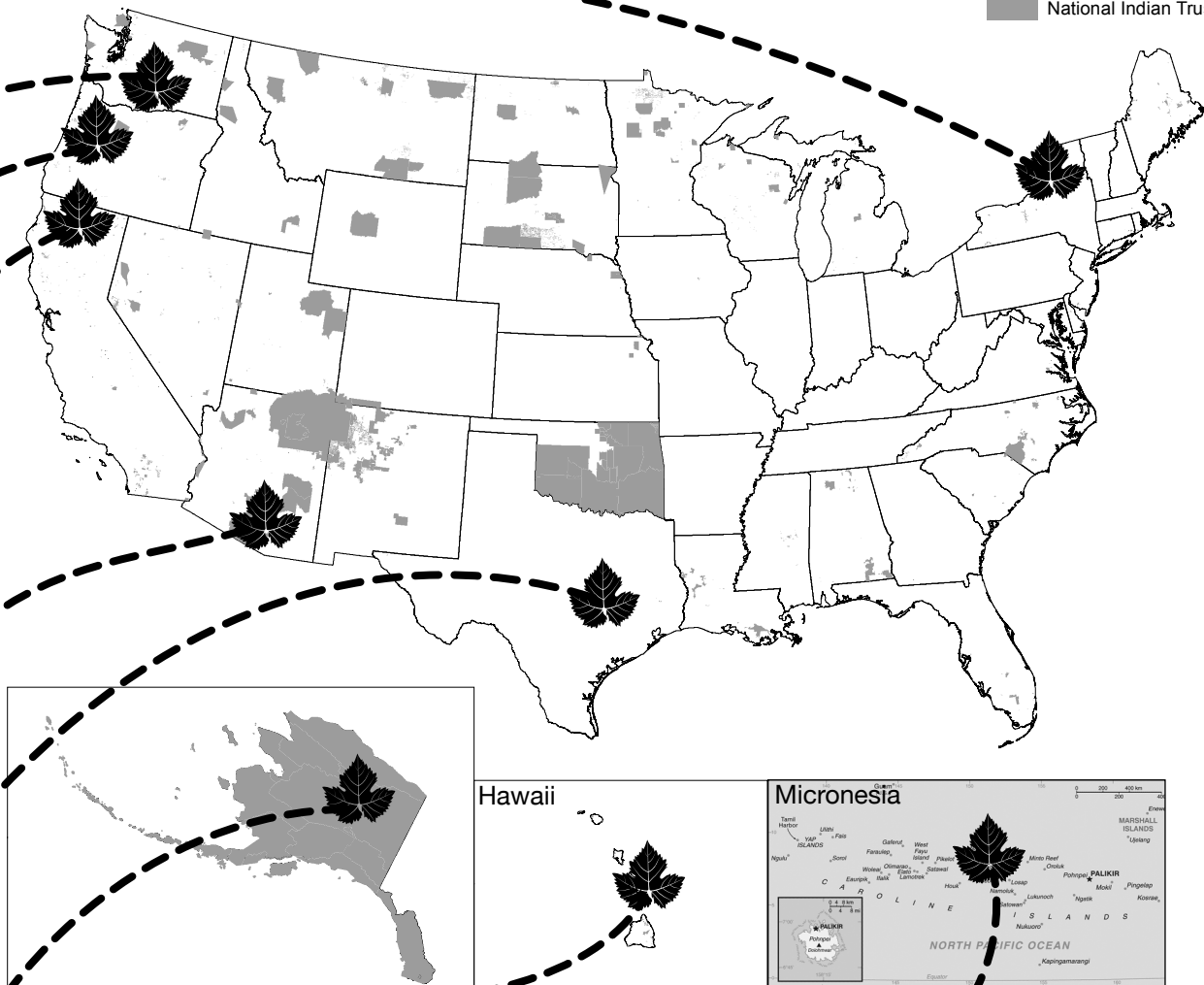
<sup>14</sup> Salberg 2006.

<sup>15</sup> Curtin 1984.

<sup>16</sup> George et al. 2011; Rodgers et al. 2007; Boyce and Swinburn 1993; Brand et al. 1990

## Legend

■ National Indian Trust Lands



**Micronesia:** Micronesians blend their traditional ecological knowledge with modern demands by growing [food forests](#) comprised of several layers. For example: an overstory of breadfruit, mango, and coconut; a mid-canopy of avocado, banana, coffee, cacao, noni, or citrus; and an understory of crops like sweet potato, yam, cassava, *sakau* (kava), taro, pepper vine, and chili. USDA's NRCS provides technical assistance to help small farmers establish such agroforestry practices.

**Hawaii:** For centuries, native Hawaiians have managed their agroforests and native forests for food, tools, clothing, construction, and support of cultural practices. For example, traditional agroforestry systems sometimes include a breadfruit overstory with an [understory](#) of traditional cultivars of sweet potatoes, bananas, and taro,<sup>17</sup> and sometimes also *'awa* (kava), medicinal herbs, and maile (used for lei). More recently, some innovative Hawaiian residents have also been integrating newer high-demand mid-story species such as [coffee](#) and cacao with their native overstory timber trees, such as *Acacia koa*.

**Sealaska Native Corporation:** The Sealaska Native Corporation recently partnered with USDA's NRCS to thin spruce trees in order to [produce more blueberries](#) in the understory for their members to harvest. They acquired [USDA organic certification](#) for those acres, and thus, their members are able to harvest and process wild organic blueberries in large quantities as they had traditionally done. Some of these blueberries are made into jams and jellies and sold in local markets.

<sup>17</sup> Abbot 1992.

## Conclusion

Many indigenous practitioners and communities historically managed complex agroforestry ecosystems to meet their physical, economic, cultural, and spiritual needs. Despite profound disruptions to their traditional education and natural resource management systems, some are still practicing and passing on their traditional ecological knowledge today, though often in a limited way.

As mentioned above, some indigenous communities wish to share this knowledge with people who are not members of their community, but others do not. It is important to respect and honor these wishes – and to acknowledge the indigenous group or individual member as the source of any information that is used in a mutually-agreed upon way.

Traditional ecological knowledge comprises a much broader set of ecological and cultural practices than those that fall within the category of agroforestry. Although indigenous communities may call agroforestry by a different name (e.g. traditional management, forestry, food security), their existing knowledge has important lessons for how to create and manage agroforestry systems across the United States.

Traditional ecological knowledge can help inform agroforestry practitioners today in many ways. Some examples may include: how specific plants interact synergistically, when and how to burn for different objectives, and how to harvest plants and mushrooms in a way that stimulates regrowth and/or propagation of offspring. The examples outlined in this publication demonstrate how traditional ecological knowledge can inform agroforestry practices, such as forest farming – both on and off of tribal lands. Since USDA estimates that less than one percent of the land in the United States with the potential for agroforestry actually has agroforestry on it, this is only the beginning. Traditional ecological knowledge can play a role in helping to bring additional lands into agroforestry management.<sup>18</sup>



**Harvesting wild organic blueberries on Sealaska Native Corporation land near Kake, AK. (Photos by Richard Harris and Brian Kleinhenz)**

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