# Management Guidelines for Expanding Pinyon Nut Production in Colorado's Pinyon-Juniper Woodlands

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**I. Management Context**

Pinyon trees are the dominant overstory species on more than 36 million acres of land in the southwestern United States. These short, twisted trees with large branching crowns live in association with more than 1000 species of microbes, plants, insects, birds, and mammals. The two most abundant species of pinyon are the Colorado pinyon (Pinus edulis), found in New Mexico, Arizona, Colorado, and eastern Utah, and the singleleaf pinyon (Pinus monophylla) which grows primarily in Nevada and western Utah. Colorado pinyon trees are widely distributed throughout Colorado, where pinyon-juniper woodlands cover more than 4.8 million acres.

Once considered weeds by rangeland ecologists and removed by the millions from the best growing sites in the Southwest between 1950 and 1980, pinyons are now recognized as foundation species in pinyon-juniper ecosystems. Foundation species provide core ecological structures and functions, stabilizing local environmental conditions in ways that permit numerous other species to thrive. The removal or death of a large percentage of a foundation species population leads to rapid loss of biodiversity and serious negative impacts on the ecosystem's overall health.

A century of fire suppression and overgrazing across the Southwest created abnormally dense thickets of pinyon trees in areas unaffected by mid-20th century pinyon clearing programs. The 1990s drought increased the vulnerability of these trees to insect attacks, leading to the death of large numbers of pinyon trees in Colorado, New Mexico, and Arizona during the early 2000s. These dead trees, as well as the remaining stands of live pinyon trees, are now at extreme risk from wildfire. Management approaches are badly needed that facilitate the restoration of healthy pinyon stands in the face of global warming and the likelihood of a shift toward warmer, drier conditions in the Southwest. One approach that scientists have suggested for decades, but which federal land management agencies have yet to take under serious consideration, is managing pinyon-juniper ecosystems as nut groves rather than as grazing lands.

The notion of managing forested ecosystems for nut production is neither new nor far-fetched. In the Mediterranean region, humans have actively managed stone pine (Pinus pinea) for its edible nuts for

at least 6000 years. In Spain, Portugal, and Italy, stone pine stands are thinned and treated against insects to enhance seed production. Chinese scientists have recently completed an applied research project to identify harvesting guidelines for managing wild stands of Korean pines (Pinus koraiensis) for timber and nut production simultaneously. In North America, indigenous peoples nurtured pinyon nut groves by raking litter and duff away from nut-bearing trees, weeding vegetation from around pinyon trees, and pruning away lower branches to reduce the risk of fire.

This report lays out guidelines managers can draw on to integrate pinyon nut production into regional management strategies for pinyon-juniper ecosystems. The guidelines address three topics: vegetation management strategies, regulations for allocating access to pinyon nut harvesting sites, and strategies for gathering and disseminating the information needed to implement a management system for pinyon nut enhancement.

## II. Best Management Practices for Enhancing Wild Pinyon Nut Production

Managing pinyon juniper ecosystems sustainably requires treating a significant portion of pinyon forests as nut orchards rather than as rangelands (Lanner 1993). The first step in developing such orchards is to identify mixed aged stands of pinyons located on flat ground with deep soils. Such sites have the best potential for becoming productive nut orchards in a relatively short time.

Ideally, these sites would be managed using horticultural techniques such as irrigation, fertilization, pest management, and plant breeding and propagation techniques aimed at developing rapidly maturing trees that produce frequent and prolific crops of large, thin-shelled nuts. Developing and implementing these techniques would require establishing a research and extension program encompassing a variety of topics including pinyon genetics, selective breeding for an array of desired qualities, crop storage, shelling technology, and marketing. However, federal and state agencies currently do not have the capacity to implement such an intensive management approach, nor are they likely to in the foreseeable future. The following best management practices thus focus on how managers can achieve pinyon nut production objectives within the existing management and research context.

**Selective thinning** - Very densely spaced stands of pinyons do not provide room for the trees to develop free-spreading crowns capable of producing large quantities of nuts. Judicious thinning in such stands can enhance nut production, but results are likely to be most effective in mixed aged stands on highly productive growing sites. When thinning for nut production, the objective is to select the best nut producers as leave trees. Pinyon trees with large spreading crowns and lots of old cones on the grounds are typically the most prolific nutbearers.

**Pruning lower branches** - Pruning the lower branches of a pinyon tree decreases the risk of fire damage and makes trees less susceptible to infections and pests that affect cone crops.

**Weeding or clearing away shrubs** - Judicious weeding of large shrubs that form fuel ladders decreases the risk of fire damage and makes trees less susceptible to infections and pests that affect cone crops.

**Fertilization** - The addition of fertilizer, particularly nitrate nitrogen, stimulates cone production. However, applying chemical fertilizer would likely be too costly, too labor intensive, ecologically questionable, and certainly politically contentious. However, future research might investigate whether the presence of a limited number of domesticated livestock and their manure in pinyon-juniper woodlands positively affects pinyon cone production. Evidence from Africa indicates that domesticated livestock can play an important role in fertilizing trees and crops in semi-arid environments.

**Irrigation** - Increasing the amount of water available to pinyon trees can also enhance nut production. However, the construction of elaborate irrigation systems is not a very practical alternative in a region experiencing chronic water shortages and conflicts over management activities that involve significant

sub-surface disturbance. Horticulturalists have suggested the use of very shallow ditching techniques that direct small but critical amounts of water to individual trees as a low-cost, low impact alternative. Indigenous water diversion systems in use for centuries on the Colorado Plateau could serve as models for such low-impact pinyon irrigation systems.

## III. Regulating Pinyon Nut Harvesting

Aside from ecological benefits such as a reduction in the risk of intense fires, decreased vulnerability of pinyon populations to insect attacks, and increased food supply for birds and small mammals, managing pinyon-juniper ecosystems for pinyon nut production will enhance opportunities for people to harvest the nuts for home consumption, gifting, and commercial exchange. As the overall health of pinyon tree populations improves, managers will need to consider whether existing systems for allocating access to prime pinyon harvesting sites are adequate. Guidelines for regulating the pinyon nut harvest are provided below.

### Keep regulation to a minimum

Existing regulatory systems on BLM and U.S. Forest Service lands are based on the following three-tiered system.

- **Incidental use**: Incidental use is the harvesting of pinyon nuts for personal consumption that day. Neither the BLM nor U.S. Forest Service requires permits for incidental use.
- **Personal use**: Personal use is the harvesting of small amounts of pinyon nuts for non-commercial purposes. The BLM and the U.S. Forest Service generally do not require harvesters to obtain permits for personal use pinyon nut harvesting. Personal use limits vary from 25 pounds per year on most BLM and Forest Service lands in Nevada and western Utah to 75 pounds per year on most BLM and Forest Service lands in Colorado and northern New Mexico.
- **Commercial use:** Both agencies require harvesters to obtain commercial use permits for amounts exceeding the personal use limit even if the nuts are not intended for commercial exchange. Permit prices vary from 20 to 25 cents per pound. In Nevada and western Utah, the BLM and the

U.S. Forest Service allocate access to pinyon nut harvesting sites through a combination of sealed bid and standard commercial permits. Sealed bid auctions are used to allocate harvesting sites where intense competition exists for commercial harvest and where competitive bidding will bring in more revenues to the agencies. Commercial permits on BLM lands in Nevada and western Utah authorize the holder to remove pinyon nuts from specified geographic areas. Other commercial pickers cannot pick pinyon nuts in an area already permitted. However, individuals and families picking for personal use may harvest in areas for which commercial permits and leases have been issued. This system helps minimize tensions among commercial pickers while ensuring that non-commercial pickers have access to prime harvesting sites.

This three-tiered system works reasonably well for current levels of commercial harvest and agency enforcement capabilities. Unless chronic conflict among harvesters or between agencies and harvesters emerges, the system is probably best left unchanged except for occasional minor modifications.

**Take pinyon crop variability into account**

A key characteristic of pinyon trees is the variability in their seed production over time and space. The existing permit system generally addresses the issue of pinyon crop variability in that they provide the permit holder access to a designated area for one season, rather than for multiple seasons. Managers can foster commercially viable permitting systems by putting areas up for bid by mid-summer so that harvesters and brokers have adequate time to prepare for the fall harvest.

Long-term leases are unlikely to work well for most pinyon harvesting sites given the difficulty of accurately predicting the size of the pinyon crop in an area more than a year in advance. In areas where competition for pinyon nuts is high, managers should investigate the feasibility of establishing seasonal stewardship contracts, in which harvesters perform services such as pruning, thinning, and weeding, in exchange for exclusive access to pinyon harvesting sites.

**Take cultural traditions into account**

Management systems need to take into account the cultural significance of the pinyon tree in general and the pinyon nut in particular. This means developing policies compatible with Native American use rights formalized through treaties or other government-to-government agreements. For example, since the mid-1990s, the BLM in Nevada has closed some traditional gathering areas to commercial harvest to ensure that treaty obligations are met. When formulating pinyon harvesting policies, managers also need to acknowledge the existence and cultural importance of gathering traditions that are not protected under treaty rights. Given the many and diverse gathering traditions, significant harvesting policy changes are best addressed through multi-stakeholder discussions.

## IV. Developing A Pinyon Nut Management Information System

The biggest impediment to managing pinyon-juniper ecosystems for pinyon nut production is the lack of information within land management agencies about the pinyon resources located within their administrative jurisdictions. Guidelines for filling three key information gaps are listed below.

### Integrating local and traditional ecological knowledge with scientific management

Pinyon nut harvesters and brokers spend a substantial amount of time identifying viable harvest sites and tracking the development of pinyon cone crops. Land managers and researchers could benefit from developing mutually beneficial partnerships with long-term harvesters and brokers.

### Regional pinyon nut crop forecasting

From 1938 to 1948, the U.S. Forest Service distributed yearly pinyon crop forecasts to pinyon nut traders throughout the Southwest. These traders in turn relayed the information to pinyon nut harvesters. Today’s land managers could establish a regional web-based crop forecasting system. Eventually the website could include other landowners, such as state land offices and private landowners.

### Participatory inventory and monitoring

Many pinyon nut pickers and dealers have difficulty obtaining information from land managers about the location of nut bearing trees and their age and yield characteristics. At the same time, land managers lack information about the extent and impacts of pinyon harvesting on the lands they administer. Participatory inventory and monitoring systems involving partnerships between land management agencies, harvesters, and other interested stakeholders could help fill these information gaps. Such systems have been used successfully in a variety of natural resource management contexts in the United States and Canada (Pilz et al. 2006).

In the pinyon nut sector, participatory inventory and management programs could address questions of interest to pickers, dealers, and land managers alike:

How much area is in pinyon?
How many trees are pinyons?
What age classes are they and where?
What are their cone bearing qualities?
What are their seed yields?
Where are there concentrations of high-yield nut bearing trees?
How have seed yields varied with climatic conditions over time?
What impacts, if any, have harvesting efforts had on yields?

The centralized website used to post regional crop forecasts could serve as the distribution venue for the information obtained through such an effort. Data on the impacts of various harvesting practices could also be collected and made available.

Over the long term, gathering and disseminating this type of information has the potential to improve the viability of both the household consumption and commercial pinyon nut sectors. It would also provide land managers with a much better understanding of the overall reproductive health of pinyon populations, and could help identify areas where management interventions might be useful to deal with insect epidemics. In short, putting into place such a tracking system could help all interested stakeholders "read the pulse" of the pinyon-juniper ecosystem.

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