

Perry Pinyon Pines Protection Project

Daniel McCarthy

Daniel McCarthy is Tribal Relations Program Manager, San Bernardino National Forest, 602 S. Tippecanoe Ave, San Bernardino, CA 92408; E-mail: dfmccarthy@aol.com

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Abstract: Fuel reduction treatments around pinyon pine trees began as a simple project but ended in something more complex, enjoyable, and rewarding. The project eventually led to pinyon species (*Pinus monophylla* and *P. quadrifolia*) reforestation efforts, something that has been tried in the past with disappointing results. The Perry Pinyon Pines Protection Project and current efforts at propagation are described for areas on the San Jacinto Ranger District, San Bernardino National Forest, and on the Ramona and Santa Rosa Indian reservations. A greater measure of success in propagation of these pinyon species has been obtained through a better understanding of their environmental needs.

Keywords: Fuels reduction, *Pinus monophylla*, *Pinus quadrifolia*, propagation

Introduction and Background

The San Bernardino National Forest (SBNF) is host to 2 species of pinyon pine, *Pinus monophylla* (singleleaf pinyon) and *P. quadrifolia* (Parry pinyon). Singleleaf pinyon generally grows on the north slopes of the Transverse Mountain ranges, including the San Bernardino Mountains and on the southeast portion of the San Jacinto Ranger District (SJRD) in the Santa Rosa Mountains (Figure 1). In the San Bernardino Mountains, singleleaf pinyon is represented by extensive forests covering hundreds of thousands of acres. Singleleaf pinyon is represented in the Santa Rosa Mountains by moderate-sized forests to small groups of trees across portions of Pinyon Flat, Little Pinyon Flat, Pinyon Alta Flat, and areas in between.

In recent years, wildland fires have destroyed tens of thousands of acres of this habitat. In the northern Peninsular Range, within the Santa Rosa Mountains, singleleaf pinyon (also described as *P. californicum* after Bailey 1987) is found on the desert side (rain shadow effect) usually between 3800 and 6000 feet in elevation. The drought has affected this species drastically with thousands of trees dying between the years 2001 and 2008. In 2010 and 2011, singleleaf pinyon mortality seems to have been significantly reduced.

Parry pinyon grows on the southwest side of the SJRD, generally in the southern end of Garner Valley; also on Vandeverter Flat on the Santa Rosa Indian Reservation and western end of the Santa Rosa Mountains; on the southern end of Thomas Mountain; and on the north end of Anza Valley including the Ramona Indian Reservation (Figure 2). These populations are the northern extent of the range of the species which continues sporadically southward into San Diego County and northern Baja California where isolated, dense stands may occur. In Riverside County, the species grows from 4200 to 5700 feet in elevation. Today, with nearly 100 years of fire suppression activity and the suspension of native burning and traditional gathering practices, chaparral vegetation is very dense where this species grows. Forest populations are sporadic across the landscape, represented by single trees, several trees, to under several hundred trees in relatively small areas of 2-20 acres. Presently, surviving trees favor north facing and steep slopes of side drainages. They are found infrequently in the south half of the valley floor in Garner Valley today, but this may reflect recent historical land uses of clearing, firewood collection, and past fire history. For the past 100 years, this species has been much affected by wildfires thereby reducing their numbers and likely their distribution within this range. This species does seem to be much less affected by the drought, and mortality is noticeably less in recent years when compared to singleleaf pinyon in this area.

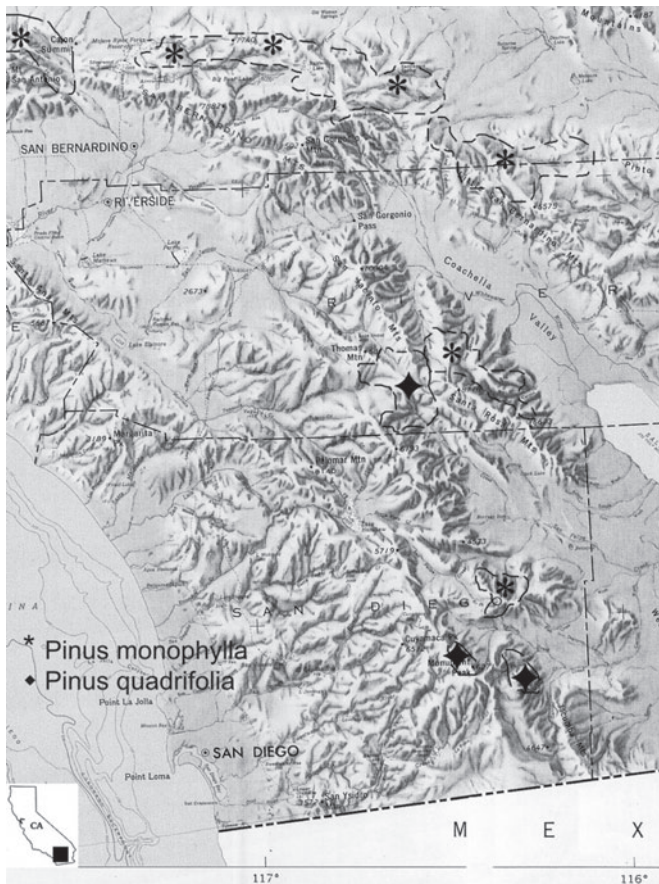


Figure 1. Singleleaf (*Pinus monophylla*) and Parry pinyon pine (*Pinus quadrifolia*) species distribution in southern California.

Both pinyon species are culturally important to the Cahuilla Indians and other southern California Tribes (Lanner 1981). Tevat is the Cahuilla Indian word for pine nut, and *Tevatwic* is the name for Parry pinyon. The suffix indicates “fat pinyon” and was held in high regard for its flavor and nutritional value (Bean and Saubel 1972).

Parry Pinyon Pine Protection Project

In 2005, at the request of the Ramona Band of Cahuilla Indians, a collaborative effort was explored with the SBNF initiating the Parry Pinyon Pines Protection Project (P4 Project). The Tribe, requesting under the authorities of the Tribal Forest Protect Act (2004), sought assistance in protecting Parry pinyon from catastrophic fires. The project was designed to partner with the Ramona Band and later the Santa Rosa Band of Cahuilla Indians. Parry pinyon occurs on both reservations which are within or adjacent to National Forest Lands.

Between 2004 and 2010, the SBNF fuel reduction program continued across the forest to remove dead trees and thin vegetation after the devastating last few years of drought and insect infestation. The P4 Project's effort has focused on removing the brush around the individual Parry pinyon pine trees. The concern is over the amount of vegetation build-up (undergrowth) near these trees. If a wildfire breaks out, these trees would not survive. By clearing away the vegetation and limbing lower branches, a wildfire could potentially burn around or under the trees and not cause lethal harm. This, in conjunction with the larger effort of fuels thinning and defensible space, will provide for better protection of the species from catastrophic fires. It will be much easier to defend existing trees than attempt reestablishment via seedling planting after a deadly wildfire.

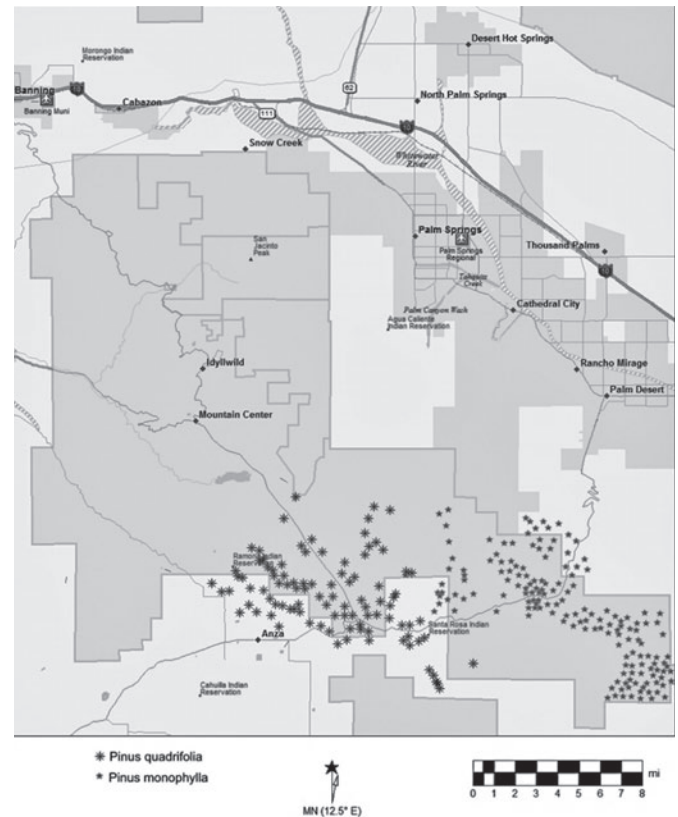


Figure 2. Singleleaf (*Pinus monophylla*) and Parry pinyon pine (*Pinus quadrifolia*) species distribution in the San Jacinto and Santa Rosa mountains.

This project consisted of removing vegetation around the base of individual trees to create a ‘safe’ or buffered zone against future wildfire. By creating the appropriate-sized buffer zone, severe and fatal fire effects can be reduced around the tree while at the same time preparing for prescribed burning or other fuels reduction treatments. It will also make the trees accessible for cultural gathering when there are cone crops. The P4 Project has had many benefits, including: satisfaction of management direction from Congress (e.g. earmarks), the Washington Office, or the Regional Office; contributing to meeting a target (fuels treated); protecting resource integrity to preserve and enhance future options and ensure there is no irrevocable loss of the resource base; enhancing the health and vigor of our resources and infrastructure; providing an opportunity for public involvement and education; having significant public benefit, such as affecting the local economy or numerous people; getting kids into the woods; and adhering to or implementing Forest strategic and tactical plans.

In 2005, both the SBNF and Santa Rosa Indian Reservation conducted independent efforts to gather pinyon cones with the intention of propagating the seeds for planting. The SBNF sent their collected seeds (both singleleaf and Parry pinyon) to a nursery in Placerville, California. The seeds had a very high germination success rate and over 4500 seedlings were propagated. In April 2007, the seedlings were transferred to the SBNF. Because winter precipitation during 2007 was unusually low, and contributed to dry soil conditions into the spring, most of the seedlings were placed in pots or heeled-in for fall planting. It was hoped that after summer and fall rains resumed, that conditions would be improved for planting. However, many of the seedlings remained heeled-in due to continued drought conditions.

and reduced workforce. Batches of trees were planted as time and windows of opportunity became available.

In April 2007, approximately 40 Parry pinyon seedlings, from the seed collected by the Santa Rosa Tribe, were planted on the reservation, where they continue to be monitored by tribal members. Other plantings have been undertaken in subsequent years, but the project emphasis has been primarily on fuel reduction surrounding pinyon trees.

The P4 Project was seen as on-going, similar to the way fuels reduction and healthy forest activities are. Over the last 6 years, efforts to protect specific trees were conducted at several locations on National Forest Lands and on Santa Rosa and Ramona Indian Reservations. Hundreds of trees have been treated within several hundred acres (Table 1). Over 1200 hours were volunteered in support of the project over the 6 years. Several volunteers returned each year and interest steadily increased; unfortunately, the lack of funding has curtailed the project.

Pinyon Pine Characteristics

Parry pinyon populations are small and widely scattered. We know it is possible for a single fire to eliminate 90 percent of the population. Thus, it is necessary to increase the number of stands within its range. If (or when) a large, catastrophic wildfire occurs, the Parry pinyon will be lost with no surrounding populations to support regeneration. Unlike many other species, seeds do not lie dormant in the soil creating a seed bank. Consequently, there are no pinyon seeds to sprout and carry on the next generation after a fire. Seed dispersal is contingent on being spread by birds, particularly jays: Steller's jay (*Cyanocitta stelleri*), western scrub-jay (*Aphelocoma californica*), and pinyon jay (*Gymnorhinus cyanocephalus*). Jays collect the seeds and fly about often dropping, planting, or losing them among the shrubs. If there are no shrubs in the burned area after a fire, jays are unlikely to fly into the area and spread pinyon seeds for future seedling establishment. Moreover, if maximum seed dispersal did occur in a burned area, without adequate ground cover (small shrubs) the pinyon seeds would not be successful in surviving because of the harsh conditions. When planting after a fire, it is necessary to wait until there is sufficient ground cover or provide shade of some sort to create adequate microsites for the establishing seedlings.

It is now recognized that seedlings need a proper environment to get established and survive. This includes having a 'nurse' plant to protect against harsh establishment conditions. Nurse plants are hypothesized to offer benefits to establishing seedlings by protecting them from direct sunlight, mitigating extreme soil temperatures, and

eliminating grass competition for surface water (Figure 3). Since the beginning of the project, it has been noted that all of the natural regeneration is occurring in dense vegetation (chaparral conditions; Figure 4); no seedlings have been observed growing alone or unprotected by some other shrub. This is further supported by observing that many of the young trees (less than 6 feet tall) are growing up inside or among other shrubs.

In a search for younger surviving singleleaf pinyon trees, it was concluded that many of the trees were growing in the northeast aspect of the vegetation cover. These younger trees are less than 5 feet in height. The chaparral community consists primarily of ribbonwood (*Adenostoma sparsifolium*), chamise (*Adenostoma fasciculatum*), scrub oak (*Quercus palmeri*, *Q. berberidifolia*), sagebrush (*Artemisia californica*) and manzanita (*Arctostaphylos* sp.). Some of the areas being treated for fuels have not burned in many decades and vegetation cover is often very dense and over 3 meters in height. Yet natural pinyon seedlings are doing very well. Eventually they grow tall enough to reach sunlight, and as time goes on, they become the dominant cover crowding out the less shade tolerant plant species. It appears that it may take up to 10 years before the needles harden and become acclimatized. After this period, the young trees can survive full exposure to the sun and other environmental conditions.



Figure 3. Pinyon seedlings emerging at the base a ribbonwood shrub (*Adenostoma sparsifolium*).

Table 1. Parry pinyon pine protection project accomplishments by site.

Location	Fuels Treatment (acres*)	# of Seedlings Planted
San Bernardino National Forest		
Thomas Mountain	75	-
Garner Valley 1	-	125
Garner Valley 2	-	10
Garner Valley 3	-	15
Garner Valley 4	2	-
Garner Valley 5	10	80
Ramona Indian Reservation	75	55
Santa Rosa Indian Reservation	80	85

*1 acre = 0.4 hectares



Figure 4. Pinyon pine habitat in southern California. The tops of Perry pinyon (*Pinus quadrifolia*) can be seen above the dense chaparral at the south end of Thomas Mountain Ridge.

Mapping the Distribution of Singleleaf and Parry Pinyon Pine

Little data is available about the distribution of singleleaf and Parry pinyon pines on a macro scale, let alone a micro scale. Early mapping and distribution efforts were satisfied with plant community mapping not specific to species. As a result, mapping became a priority for the P4 Project. It was deemed important because: 1) knowing where they grow today can provide protection from fuels projects or other management decisions in the future; 2) understanding their current range can give insight to their historic range; and 3) knowing their current distribution would prioritize outplanting efforts to increase populations and prevent habitat loss by catastrophic wildfire.

As a result of the P4 Project efforts, mapping of the species in Riverside County is complete. Stands of pinyons and individual trees are mapped at the 7.5' scale. These maps (covering U.S.G.S. 7.5' quads: Anza, Idyllwild, Palm View Peak, and Butterfly Peak for Parry pinyon; and Butterfly Peak, Rancho Mirage, Toro Peak, and Martinez Mountain for singleleaf pinyon) are now digitized and part of the SBNF corporate database. The presence or absence of pinyon trees is indicated. Figure 2 provides a general view of tree distribution for the 2 species.

Thinning, Restoration, Site Selection, and Regeneration Efforts

Subtle differences may exist between the successful propagation of singleleaf and Parry pinyon pine seedlings, but the differences have not yet been recognized. The treatments described here refer to both species. Natural habitat is similar for both species. While the surrounding vegetation around Parry pinyon is dense, vegetation around singleleaf pinyon is more open and contains a wider variety of shrubs. Because of this openness, no thinning treatments were conducted for singleleaf pinyon; all efforts focused on Parry pinyon.

The P4 Project was designed to have public volunteer participation. Volunteers were needed to help cut, clear away, and pile the treated vegetation. Only hand tools were used. Weekend activities were advertised in advance to attract interested parties. These advertisements explained the nature of the project and its importance. Native Americans participated in the project and shared their views on traditional gathering and uses of not just pinyon but other plants important to the local tribes. During the last 3 years, the first weekend (of 3 consecutive weekends) of the project was scheduled to begin on National Public Lands Day. Free camping was arranged at a SBNF campground for those who wanted to stay overnight during each weekend of the project.

When the project dates overlapped with a pinyon cone production year, pine nuts were gathered with the intent of seed propagation and outplanting. One of the communities was encouraged to collect seed from around their property. To facilitate this effort, a presentation was given outlining collection and storage techniques; the presentation also outlined how the seedlings would eventually be propagated. Many misunderstandings exist about pinyon pines. For example, it is common to think pine nuts need to be roasted before they are consumed, when in fact, they can be eaten raw. Some argue that roasting improves the flavor, but this process kills the embryo and allows for long-term storage and later consumption. Another misconception is the collection of green cones. While some thought it was not good to do this, it was explained that fire or kiln drying can be used to help open the scales for extracting the nuts. Some confusion also exists around the maturation of cones and cone bearing years. While it is true that it takes 2 years for a pine to produce a cone (once it is pollinated), good cone bearing years only occur once every 5 to 7 years depending on precipitation (Krugman and Jenkinson 1974).

The focus of the P4 Project was to thin vegetation specifically around pinyon trees (Figure 5 A&B). Areas were selected mostly because they were accessible by vehicle and there was a great need. Some areas were chosen because they had good defendable space; that is, they were associated with other fuel breaks, roads, or treatment areas that had a head start in fuels reduction. Volunteers were used over several weekends in late September and early October each year to coincide with a possible harvest of pine nuts. As the project grew, so did the accomplishments and outputs. In the fall of 2010, after a very good crop year, volunteers gathered hundreds of seeds. Over the winter, experiments investigated the best ways to germinate them. From these trials, many seeds did sprout and some have already been planted. Others were delegated to reforestation efforts where many trees have been lost to wildfires.

Documented restoration planting of pinyon pine species has not been successful following fires (Gifford 1987, 1994). This failure may be the result of planting in the open, without any vegetation cover to shade/shelter the seedlings (i.e., to act as a nurse plant).

Since Parry pinyon needs a nurse plant for protection from intense sunlight for the first 10 years or so (based on current observations), vegetation is thinned, but not eradicated, in the area surrounding young seedlings to prevent spread of wildfires. As the seedlings grow into mature trees, they will eventually dominate and become the over-story. Vegetation cover is critical in selecting areas to plant seedlings.

Project locations

The projects were implemented on National Forest System Lands and on the Ramona and Santa Rosa Indian Reservations. Figure 6 shows the general areas of where planting and fuels treatments took place.

As seedlings became available for planting, suitable areas were selected. Several areas in Garner Valley were selected because they were: deemed suitable habitat; near existing Parry pinyon populations; or determined to have been within its historic range. These areas are designated as Garner Valley #1, #, #3, #4 and #5 (Table 1).

During the time period when Parry pinyon could not be treated, the P4 Project continued working on the Ramona and Santa Rosa Indian Reservations. No new trees were planted on the Ramona Reservation. Previously planted trees were monitored and mortality was less than 40 percent during the first year.

Thomas Mountain

This was the area first selected to begin the project on SBNF lands. Many existing pinyon trees were adjacent to the road and an old fuel break. Other general fuels treatments were proposed that would enhance the efforts of the P4 Project. Environmental issues rose when the Quino Checkerspot Butterfly (*Euphydryas editha quino*) was observed. This species is listed on the Endangered Species List. Due to sensitive habitat issues, our project work in this area was suspended in 2009 and 2010 until consultation with Fish and Wildlife Service (FWS) could be completed. After the consultation, the FWS agreed that the P4 Project did not threaten the species but may enhance the habitat for the butterfly. See Table 1 for accomplishments.

Garner Valley #1

In March 2009, approximately 100 Parry pinyon seedlings were planted in a 10 acre area west of the CALTRANS Maintenance Station in the central part of Garner Valley. Three young, immature trees were identified during the mapping of the distribution of the species. These trees are located about 500 meters southeast of the planting area. These trees are less than 15 feet in height and may not be of cone-bearing age yet. The seedlings were monitored, and tree

A



B



Figure 5. Thinning vegetation around the base of trees and limbing branches when necessary: before treatment (A) and after treatment (B).

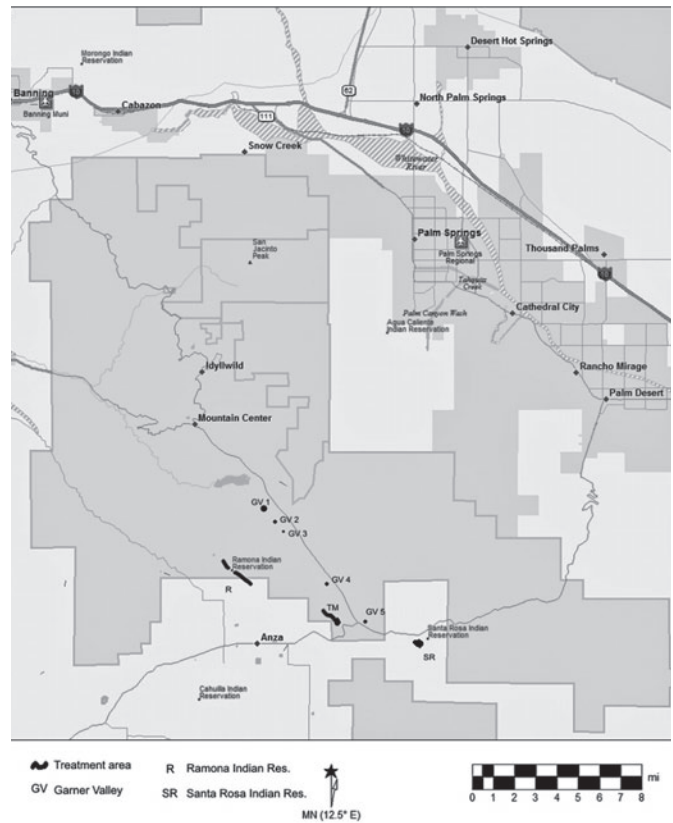


Figure 6. Seedling planting and fuel reduction locations of the Parry pinyon pine protection project.

mortality totaled about 40 percent after the first year. Rodent activity (gophers) seemed to be the primary reason for mortality but range cattle also may have contributed. An additional 60 seedlings were planted in 2011. Precipitation has been adequate and frequent enough to provide sufficient moisture for survival.

Garner Valley #2

Also in March 2009, a dozen seedlings were planted under the canopy of a live oak stand. All seedlings have done well.

Garner Valley #3

This unit is in a short, narrow draw that leads west from a power line road. Vegetation provides good cover and water was noted in the drainage over the 2009 and 2010 winters. Seedlings were planted where scrub oak, manzanita, and ribbonwood vegetation provided the most shade.

Garner Valley #4

This unit is located on the east facing side of the foothills within a steep drainage overlooking Garner Valley. The area contained dozens of pinyon trees of various ages amongst the dense vegetation. These trees are likely providing the seed stock for other younger trees growing nearby. In 2009, thinning was the focus of the project; however, much more work needs to be accomplished here in order for the efforts to be effective.

Garner Valley #5

The unit is located adjacent to private property along a fuel break to protect the community. This unit was planted with seedlings in June

and again in October 2011. For both plantings, the planting window was optimized so that natural precipitation provided adequate moisture and no supplemental watering was necessary. At last look these seedlings were doing fine. Local community residents have taken an interest in this project and have volunteered to monitor the seedlings, planting more when necessary.

Ramona Band of Cahuilla Indians Reservation

The Tribe originally requested assistance in 2005, resulting in the P4 Project beginning the following year. Fuel reduction and planting efforts has been very successful (Figure 7).

Santa Rosa Band of Cahuilla Indians Reservation

Tree planting and fuel reduction began in 2007. Volunteers including students from Sherman Indian School in Riverside have participated.

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Facts about Pinyon Pine trees

1. Four species of pinyon pine can be found throughout the southwest (and many more worldwide), all producing an edible nut that has been sought after by native people for thousands of years.
2. Pinyon seeds do not remain viable for very long (less than a year), so there is no seed bank in the soil after a burn.
3. Young pinyon seedlings can grow 1 to 3 inches in height each year during the first 6 years.
4. Pinyon trees can be slow growing. Parry pinyon may be 15 to 25 feet tall before it reaches maturity and more than 25 years old before it produces cones. Singleleaf pinyon are 20 to 50 feet tall before they reach maturity and must be 20 to 25 years old before they produce cones.
5. Both Parry and Singleleaf pinyon trees can reach ages well-over 350 years.
6. Like most other pine trees, pinyons take 2 years to produce a cone and seeds. Good pinyon crops are produced every 3 to 5 years depending on climatic conditions.
7. The largest known Parry pinyon is located north of Anza, California. It has been submitted as a Champion Tree in the American Forests: National Register of Big Trees.
8. Native American gathering and burning practices likely helped to protect the trees.
9. The needles of all pines can be boiled to make a tea that is high in vitamin C.
10. Pine needle baskets were made from pine trees that have longer needles (5-7 inches), not the pinyon.
11. Pine nuts can be eaten right from the cone; they do not have to be cooked or prepared.
12. Roasting pine nuts improves flavor and allows longer storage time for later consumption.
13. Pine pitch can: seal baskets to make them water tight; be a sun screen when applied to the face; and repair broken objects when used as a glue.



Figure 7. Two examples of tribal members clearing vegetation from trees on the Ramona Band of Cahuilla Indian Reservation

The content of this paper reflects the views of the authors, who are responsible for the facts and accuracy of the information presented within.