Appendix F - Kenney Flats Photographs and Simulations

Ponderosa pine may be referred to as blackjack pine and yellow pine. Blackjack pine is typically younger in age, has a relatively pointed crown, black bark with small plates, small-diameter branches and significant taper along the bole. Yellow pine is older, with yellow bark and large, flat plates, and typically has a flattened crown and large, heavy limbs along boles with little taper. Data collected at Kenney Flats shows that yellow pine tend to be 200 years old and older, though yellow pine differentiation varies with site quality and tree vigor.

The differentiation between blackjack pine and yellow pine is of interest at Kenney Flats because yellow pine has typically been of higher economic value than younger ponderosa pine. For this reason, historic logging activity concentrated on the harvest of yellow pine and large blackjack pine. Where accessible, nearly every yellow pine was harvested. Only a small number of identifiable yellow pine sites remain at Kenney Flats.

Yellow pine presence, and absence, improve our understanding of forest dynamics and the importance of fire, climate variability, and their relationship to stand density.

Blackjack pine serve as an important reminder of the persistence and adaptability of ponderosa pine. They are the dominant feature of contemporary Kenney Flats' forests, and they are at the same time a liability and an important resource. Importantly, blackjack pine are at the focus of forest restoration efforts to rebuild stand structure in a manner consistent with the ecological parameters to which ponderosa pine forests are adapted.

These images portray current forest conditions at Kenney Flats and describe proposed treatments designed to reduce the risk of catastrophic forest fires while simultaneously initiating necessary steps in the long-term process of forest restoration.

Fig. X.1 shows the location of photo points described below. Post-treatment simulation images are included for points 2-4.

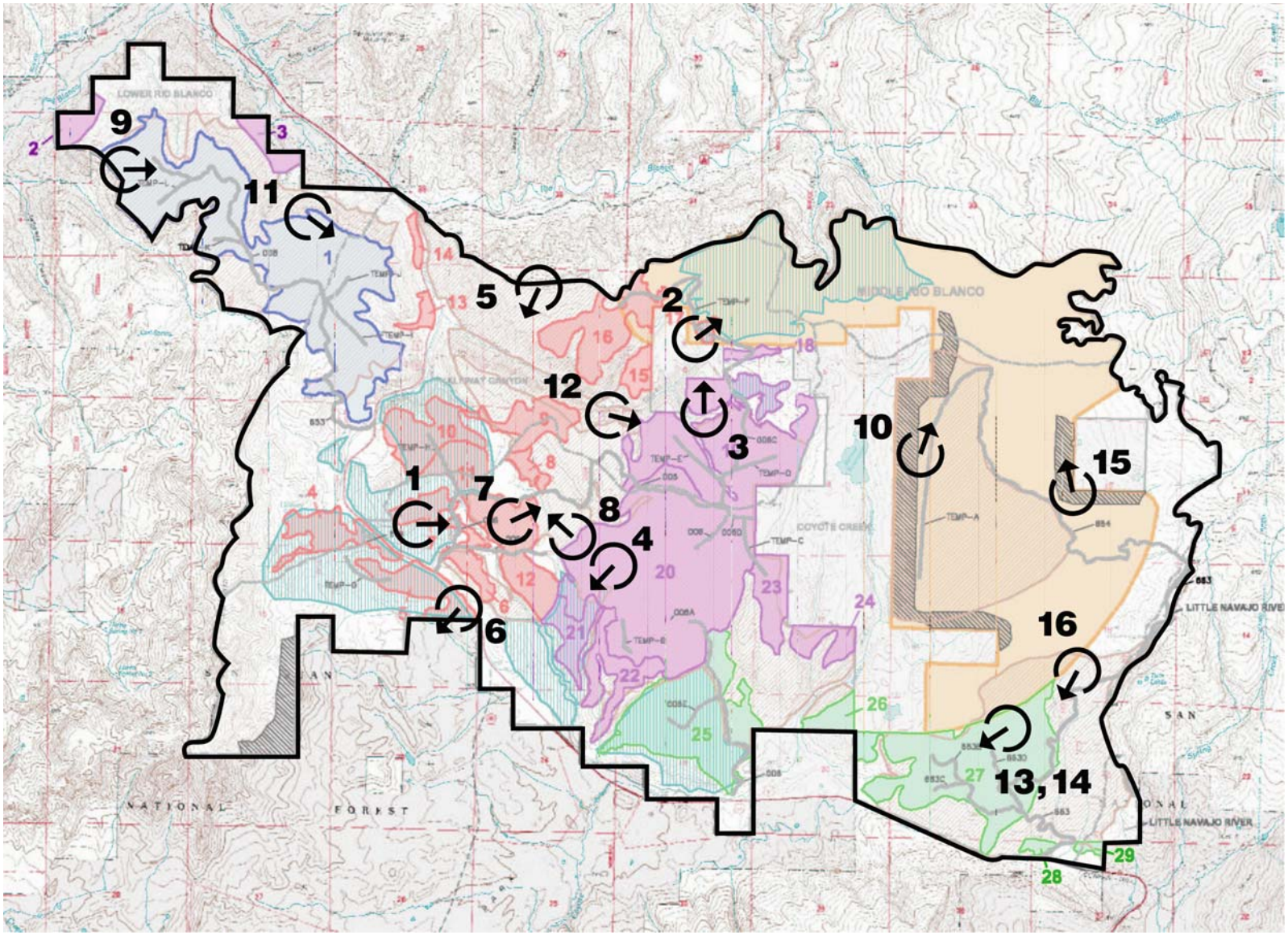

Fig. X.1. Photo points and photo direction within the Kenney Flats Analysis Area.

Front Cover Photo
Photo Point 1

Kenney Flats

Date: November 6, 2002

Photo Point 1 is located in Section 11 approximately 1/4 mile northeast of Highway 84 and 1/4 mile north of USFS Road 006, in the west-central portion of the Kenney Flats Analysis Area. View is toward the southeast, across central Kenney Flats.

The dense, homogeneous ponderosa pine stands across the landscape are dominated by a cohort, or age class, of blackjack pine established approximately during the period 1908-1929. It will be referred to here as the 1910 cohort. By stand, older, larger trees (yellow pine) are rare to non-existent, as are younger ponderosa pine that are found only infrequently along openings such as the one in the foreground.

Photo Point 2

Image 2.1. Yellow Pine with blackjack pine understory

Date: October 25, 2002

Located in Section 6, north-central Kenney Flats Analysis Area. View is toward the northeast, across an open meadow.

The understory consists of dense blackjack pine and scattered yellow pine, including the group of yellow pine in the foreground on approximately 1/3 acre.

Yellow pine were common across the Analysis Area until most were removed through timber harvesting in the early 20th century. This group of yellow pine at Photo Point 2 includes the tallest yellow pine found at Kenney Flats.

The two yellow pine at the center of the photo, leaning away from each other and with the left tree marked with orange flagging, were measured and aged. In 2002, the left tree (DBH=35.0", height=114') was approximately 297 years old, and the right tree (DBH=29.6", height=116') was approximately 319 years old. The understory consists primarily of the 1910 cohort. The blackjack and yellow pine are competing with each other for site resources.

The yellow pine became established prior to early settlement, and periodic fire maintained lower stand densities conducive to full crown development, corresponding good diameter growth and attainment of large size. Reduced fire activity in the early 20th century allowed the 1910 cohort to become well established without the benefit of frequent fire that would have reduced stocking levels. The result has been the dominance of the site by small-diameter blackjack pine and an increased likelihood of losses to catastrophic crown fire and other damaging agents.

The dominance of Kenney Flats forests by the 1910 cohort has created an imbalance in age classes because openings that would have otherwise been created and maintained by periodic fire and senescing yellow pine, and that therefore would be available growing space for the establishment of new cohorts over time, generally do not exist in dense stands such as this. Without a reduction in stand density, the entire stand is at risk of damage or loss.

Image 2.2. Yellow Pine with blackjack pine understory: Artist's rendition of post-treatment condition

IMAGE2_ANIM.HTML is an animation demonstrating conditions before and after proposed treatments.

Removal of most of the understory in the group of yellow pine will reduce competition for nutrients and moisture and reduce fuel loads, including ladder fuels, that threaten the yellow pine. Thinning of the surrounding blackjack pine improves growing conditions, allowing site productivity potential to be concentrated on fewer stems and enabling accelerated growth, a condition similar to that experienced during most of the history of the yellow pine. Small openings created within the existing 1910 cohort improve wildlife habitat and prepare the stand for coming regeneration events - new groups of ponderosa pine will eventually become established as the stand is moved toward an uneven-aged condition with improved representation in age and size classes. Prescribed burns following silvicultural treatments further reduce fuel loads, return nutrients to the soil, and allow grasses and forbs to become re-established on the site.

Few areas at Kenney Flats have quality yellow pine as shown in these images. However, the image shows how yellow pine may have appeared across the area in previous centuries, and it demonstrates the actions necessary to maintain the few yellow pine that still exist.

Image 2.1. Yellow Pine with blackjack pine understory.

Image 2.2. Yellow Pine with blackjack pine understory: Artist's rendition of post-treatment condition.

Photo Point 3

Image 3.1. Developing yellow pine mixed with dense blackjack pine

Located in Section 6, north-central Kenney Flats Analysis Area. View is toward the north on Forest Service land. A private land boundary runs east and west, about 70 feet behind the group of trees. Trees in the background are on private land on a steep slope that leads into Spiler Canyon.

Date: October 25, 2002

The large-diameter tree on the left is approximately 224 years old (DBH=27.0", height=85'). The large tree on the right is about 244 years old (DBH=32.5", height=82'). The smaller understory blackjack pine belong to the 1910 cohort.

The large yellow pine on the right has an 8-foot-high fire scar facing the camera and was likely left uncut in the early 20th century due to fire damage and sweep in the bole. The large tree on the left was probably too small to cut at the time. Around these large trees, the blackjack pine are competing fiercely with each other, and with the large overstory trees, for light, moisture and nutrients. The gambel oak in the small forest opening in the foreground is experiencing strong competition for light from nearby ponderosa pine and it is attempting to grow upward out of the shade. Past fire activity, prior to settlement, likely maintained lower stand densities that enabled the large trees to utilize ample resources that would have provided for large crowns and correspondingly high diameter growth rates. The successful establishment of the 1910 cohort, and its increased utilization of site resources over the last several decades, has started to impact the growth and vitality of the overstory trees. Simultaneously, the dense stocking inhibits blackjack crown development, resulting in decreased diameter growth rates and an inability to attain large diameters. High stand densities have increased the risk of losses to catastrophic crown fires and bark beetles.

Image 3.2. Developing yellow pine mixed with dense blackjack pine: Artist's rendition of post-treatment condition

IMAGE3_ANIM.HTML is an animation demonstrating conditions before and after treatment.

The small group of large diameter trees is freed of competition from the understory blackjack pine. In combination with prescribed fire, fuels in the forest canopy and fuels on the ground have been reduced, allowing grasses and forbs to become better established. Increased light in the small forest opening (foreground) benefits the large-diameter gambel oak, while smaller patches of gambel oak clones are reduced in size by fire. A small opening behind the group of trees, adjacent to the break in slope, receives more light otherwise blocked by the dense blackjack pine.

Importantly, the large-diameter ponderosa pine at this site represent an atypical condition at Kenney Flats. These are "young" yellow pine - the large tree on the left has not yet fully attained yellow pine characteristics, and it is only in recent decades that the tree on the right has attained full yellow pine characteristics. Along with older yellow pine standing at the time, most of this cohort was also harvested in the early 20th century, the exception being the few trees that were too small or defective relative to merchantability standards of the time. These trees are an important component of Kenney Flats forests that are to be maintained and promoted for yellow pine characteristics in coming decades.

Image 3.1. Developing yellow pine mixed with dense blackjack pine.

Image 3.2. Developing yellow pine mixed with dense blackjack pine: Artist's rendition of post-treatment condition

Photo Point 4

Image 4.1. Dense blackjack pine

Date: November 6, 2002

Image 4.1 shows the most common and dominant forest condition at Kenney Flats: dense blackjack pine of the 1910 cohort, with no older or younger cohorts represented. Current tree diameter is a function of the competition experienced by individual trees for site resources. As forest conditions have become more dense with time, all trees are now competing vigorously with their neighbors. Had a fire burned through the stand when it was young, and at somewhat regular intervals since then, stand densities would have been reduced, growing space for remaining trees would have increased, and this stand might have been on its way to being a vigorous stand of future yellow pine with broader age class representation. Instead, the stand is highly susceptible to a hot crown fire that would leave virtually no live trees in its wake. In addition, as mean stand diameter and stand density have increased, it has become increasingly susceptible to bark beetle attacks that could be nearly as destructive as a crown fire.

The Pagosa District has an active prescribed fire program at Kenney Flats, and burned trunks of live trees can be found similar to the foreground trees in this photo. However, these fires must be kept cool and low to the ground because of the high risk that fire could enter the canopy. These cool burns reduce ground fuels, but have no impact on dangerous fuel loads in the forest canopy, and are not effective at increasing available growing space needed to promote vigorous diameter growth supported by full, healthy crowns of individual trees.

Image 4.2. Dense blackjack pine: Artist's rendition of post-treatment condition

IMAGE4_ANIM.HTML is an animation demonstrating conditions before and after treatment.

Trees that have good competitive positions, and that will respond well to thinning by expanding their root systems and crowns, are first identified as leave trees that will be cultivated as future yellow pine. These trees will tend to be dominant and codominant trees that have already taken advantage of their competitive circumstances as demonstrated by their size, growth rates, crown vigor and position. Here, these potential yellow pine are in a group located to the right side of the image, in the foreground and midground. Rather than leave trees at approximately equal distances from each other as would be the case for conventional timber management, tree spacing is allowed to vary. For yellow pine cultivation, residual stocking is low enough to promote quality crown and root system development that supports rapid diameter growth. In conjunction with repeated prescribed burns, sufficient stocking is maintained to thwart the establishment of young unwanted seedlings that would otherwise again occupy the site and create new, overstocked forest conditions that have become the hallmark of the last century. These residual trees must be thinned periodically in the future to continue to promote diameter growth. In about 110 years, they will begin to assume yellow pine characteristics, and mortality trees will contribute toward the building of a quality snag component.

On the left side and background of the post-treatment rendition, trees have been thinned to promote vigorous tree development. This area is in "transitional stocking", meaning that the trees are managed to meet multi-resource objectives rather than explicit yellow pine goals. It is "transitional stocking" because historical logging activities, combined with the highly successful establishment of the 1910 cohort and parallel fire suppression, have created an abundance, and imbalance, of trees that are 70 to 90 years old. Had history not occurred as it has, we might see a group of large yellow pine mixed with large-diameter snags, or an opening, or a large patch of seedlings or saplings or another stand development condition in at least a portion of this "transitional stocking". Over time, transitional stocking must be managed to meet multi-resource needs while preparing for the recruitment of younger trees to correct the current age class imbalance. The cultivation of yellow pine on the right of the image prepares the way for growth of large, older trees. On the left, an intermediate condition is prepared in transitional stocking that will, over time, be slowly opened over the coming century for recruitment of groups of younger

age classes. For the current entry, it is thinned from below to create a sustainable forest condition that is less susceptible to losses from fire and other damaging agents. Because the adjacent group of trees on the right have been identified and treated for accelerated diameter growth, transitional stocking may be retained at higher

Image 4.1. Dense blackjack pine.

Image 4.2. Dense blackjack pine: Artist's rendition of post-treatment condition.

residual stocking levels to meet other resource needs such as timber production, wildlife cover and Abert squirrel habitat needs, while meeting overall fuels reduction objectives.

Importantly, it is not possible to know if future generations will have the luxury of proceeding with forest restoration objectives. However, proposed treatments will improve forest growth and sustainability, and provide future forest managers with improved options for management.

Image 5.

Photo Point 5

Kenney Flats view across Spiler Canyon from the north boundary of the Analysis Area

Date: October 23, 2002

Much of the south-facing slope along this ridge is relatively barren, consisting of patches of small gambel oak and sparse grasses, intermixed with scattered, isolated pockets of resilient ponderosa pine growing on difficult soils. This site was too remote for timber harvesting activities in the early 20th century, and yellow pine are still present. Even here, however, reduced fire frequencies have allowed younger ponderosa pine to become well-established to compete with the older overstory trees. Yellow pine, such as the large tree in the right foreground, the snag at lower center, and the yellow pine overhead represented by the large, heavy limb on the left, were once common on Kenney Flats but were nearly completely removed at the time of early timber harvesting. A fortuitous coincidence of early timber harvest and a highly successful regeneration event during a period of above-normal precipitation, combined with a long period of fire suppression, has created the dense cover of even-aged ponderosa pine we see today across Kenney Flats.

The mixed conifer stand on the steep, inoperable slope of Spiler Canyon is dominated by dense, small-diameter Douglas-fir and occasional white fir. No older overstory trees are evident in the photo. Historically, frequent fire maintained conditions of low stocking in mixed conifer stands, as evident by the uncommon remnants of large-diameter shade-tolerant Douglas-fir and shade-intolerant ponderosa pine in Kenney Flats mixed conifer stands. Current dense conditions inhibit diameter growth and attainment of large diameter trees. The prescribed burn proposed for this mixed conifer stand will reduce fuel loads and create openings consistent with past stand conditions.

Image 6.

Photo Point 6

Ponderosa pine clump adjacent to historical stumps

Date: December 6, 2002

Several stands proposed for treatments consist of groups of ponderosa pine intermixed with patches of gambel oak and grassy meadow. As seen in this photo, stumps remaining from timber harvesting in the early 20th century indicate ponderosa pine will become established under the favorable combination of available seed source and accommodating climatic conditions. To meet forest restoration objectives, thinning in the group of live trees will provide growing space necessary for remaining trees to improve crown size and condition, hence improving diameter growth rates that will favor development of large-diameter yellow pine in the future. Prescribed burning will reduce ground fuels, control the spread of gambel oak, improve native grass composition and prepare new microsites for establishment of ponderosa pine.

Image 7.

Photo Point 7

Ponderosa pine group with prescribed burning only, photo 1

Date: November 6, 2002

Recent prescribed burns at Kenney Flats have resulted in reduced ground fuels, but fire alone is not an adequate tool for thinning. Several trees in this group were inadvertently killed by fire, at the risk of losing all of the trees in the group. Note that three trees on the left are well-spaced, and were able to take advantage of available light, moisture and nutrients - they have larger crowns and, as a result, are of larger diameter. However, one was lost to the prescribed fire. In contrast, trees tightly packed in the group are competing fiercely with each other, and individual tree growth is negatively impacted.

Ponderosa pine saplings such as the one in the left foreground are uncommon at Kenney Flats. Microsite conditions, including soils variability and competing vegetation, combined with limited moisture and warm, dry summers, inhibit successful seedling establishment. It is common to see large individual trees from the 1910 cohort that overcame the difficulties in group openings such as these. Should a future seed crop from the ponderosa pine group in the background disperse at the same time as an extended period of favorable climatic conditions, as was the case for the 1910 cohort and likely for older cohorts, additional trees will become established in this opening. Regular prescribed fires will improve the probability of successful establishment by exposing mineral soils for newly germinated seedlings. The result will be an improvement in age class representation, consistent with group dynamics evident in existing yellow pine at Kenney Flats.

Image 8.

Photo Point 8

Ponderosa pine group with prescribed burning only, photo 2

Date: November 6, 2002

On the opposite side of the group seen at Photo Point 7, the contrast in tree competition among the 1910 cohort is evident. The four trees on the right are well positioned to become quality yellow pine more than a century from today. When combined with cool prescribed burns, thinning of the group on the left will improve the competitive position of remaining trees, while reducing the chance that embers from a wildfire will enter the crowns and consume these fine trees. Prescribed fire will also reduce competing gambel oak, and regeneration will eventually gain hold in the opening in the foreground - a new group that will one day replace the age and diameter class position of surrounding trees.

Image 9.

Photo Point 9

Old stumps and blackjack pine offer historical contrast

Date: November 1, 2002

The open forest conditions of a century ago are evident, as is the contemporary ponderosa pine forest condition. Where two large trees once stood (stumps, right foreground in the shade, and in the left-side opening), a dense thicket of low-vigor blackjack pine compete for available resources. There is virtually no chance that any one tree will reach the size and stature of their predecessors without thinning. Instead, the risks of total loss to crown fire, or dramatic losses to bark beetles, are increasing. Historically, periodic fire would likely have thinned the trees when very young, putting the few survivors in a beneficial competitive position.

Thinning from below will free residual trees to take advantage of newly available growing space. Prescribed fire will reduce fuel loads after thinning, and reduce oak competition in the opening on the left. In patchy stands such as this one, adequate openings exist in preparation for future regeneration events. New ponderosa pine can be expected to become established in the opening on the left that will improve the uneven-aged structure of the stand.

Image 10.1

Photo Point 10

Open-grown yellow pine and cohort establishment

The ability of ponderosa pine to become successfully established and to eventually mature into majestic trees is not readily apparent from existing site conditions and current vegetation alone. First, a seed source must be available nearby. Second, adequate mineral soil must be available for seedlings to become firmly established, to ensure survival during dry summers and through periods of desiccating winds. Existing ground vegetation, including grasses, forbs and shrubs, must not be so dense as to inhibit successful germination and establishment. The young trees must survive passing fire. Finally, a series of years with above-normal precipitation increases survival probabilities.

It is evident at Kenney Flats that this combination of factors come together infrequently. The 1910 cohort shows how truly successful ponderosa pine can be at dominating sites across the landscape - an observation that would otherwise be contradicted by the contemporary sparsity of young age classes. The early 20th-century cohort establishment was not an exceptional or novel event. Increment cores from older ponderosa pine across the area show a periodicity in primary regeneration events that likely occurs, on average, about every 90 years (with a range of 80 to 110 years). Though trees do become established

during intermittent periods, conditions are likely dry and difficult, particularly when combined with frequent fires.

Image 10.2

Older trees that existed during the regeneration event that created the 1910 cohort show how climate conditions became favorable for successful ponderosa pine establishment. Increment cores show that a dry period dominated the Kenney Flats area from about 1888 to 1908. Beginning around 1908, there was a significant increase in tree growth that continued to as late as 1929. This period corresponds in part with a recorded period of above-normal precipitation at Dulce, New Mexico from 1914 to 1929, and it corresponds with ages of the existing blackjack pine cohort.

A portion of an example core from a Kenney Flats ponderosa pine is shown in Image 10.2. The cored tree was approximately 213 years old in 2002, and it is a member of the primary cohort established around 1790-1800. Recall that this cohort consists of "borderline" yellow pine in that they are usually just developing yellow pine characteristics. It was about 29" in diameter at breast height in 2002, and about 19" in diameter in 1908 - just an inch or two smaller than the largest trees commonly found in the 1910 cohort.

The dramatic increase in growth that started in 1908 could in part be attributed to a release following early timber harvesting. However, this growth response was noted in many older trees regardless of the presence or absence of nearby stumps. Even yellow pine in remote locations, already old in the early 1900s and distant from early logging actvities, show the period of sustained rapid growth.

It is clear that increased precipitation, perhaps in combination with cooler temperatures and increased cloudiness, created favorable growing conditions for establishment of the 1910 cohort.

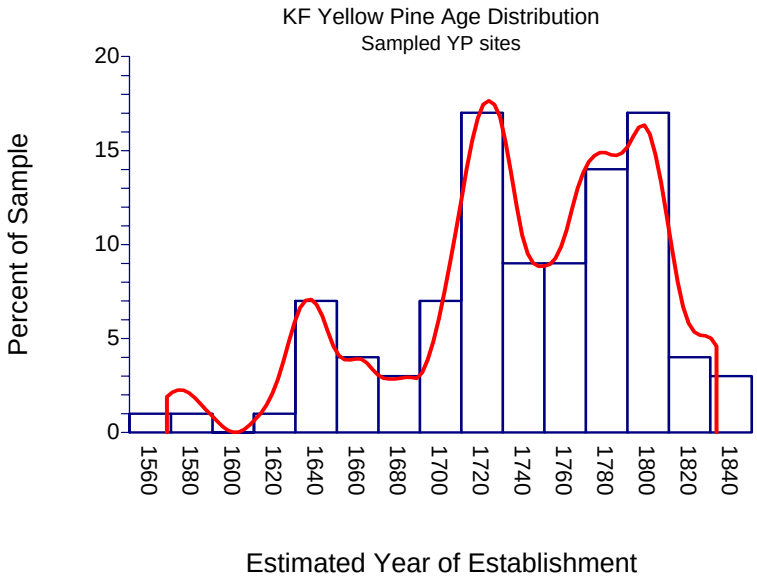

Fig. X.2. Estimated year of establishment for sampled largest, oldest yellow pine within the Kenney Flats analysis area.

Increment cores from 70 yellow pine across the Kenney Flats Analysis Area show an evident periodicity in the establishment of primary cohorts (Fig. X.2). When considered in the context surrounding the establishment of the 1910 cohort, and acknowledging that younger age classes of ponderosa pine, established since the 1930s, are nearly absent, it is highly probable that regional climate variations drive forest structure and stand dynamics at Kenney Flats. In turn, long-term climate cycles may drive historical fire regimes - an issue that is complicated by the use of fire by Native Americans that will not be further discussed here.

These cycles of cohort establishment, occurring in conjunction with intermittent periods where regeneration is more difficult to come by, coincide with the establishment of groups and patches of ponderosa pine across the landscape, as well as with yellow pine cohorts observed to be represented as scattered individuals across sites such as that shown in Image 10.1.

Significant senescence sets in for yellow pine at about 280 years of age (Fig. X.2). Space created by these mortality trees, in conjunction with periodic fire, serve as new group openings available for new cohort establishment, or perhaps establishment by the individual survivors during intermittent periods as seen in Image 7.

Fire suppression over the last century, combined with reduced ignition frequency as Native American lifestyles were altered, have negated an important component of the ponderosa pine ecosystem and stand dynamics. In Image 10.1, the dense field of gambel oak has been free of fire for many decades. The two yellow pine in the photo make it clear that ponderosa pine is well adapted to site conditions, once established. Behind and to the left of the camera, and to the right of the large yellow pine in the background, large dense patches of ponderosa pine (the 1910 cohort) also provide further evidence of the ramifications of fire absence.

Here in Image 10.1, on the east side of the Kenney Flats Analysis Area, prescribed fire will reduce ground fuels and diminish the likelihood that "remnant" yellow pine are lost to a hot wildfire. Establishment opportunities for new scattered ponderosa pine seedlings, eventual replacements for these yellow pine in what is now a field of dense oak, may improve.

The yellow pine in the background, 34.4 inches in diameter and 90 feet tall, was established around 1719. The yellow pine in the foreground (DBH=32.6", height=82') was established in 1717. A third yellow pine, to the right and behind the camera (DBH=35.8", height=96') dates to 1726. As an identifiable cohort, these trees coincide with the significant regeneration event centered around 1720.

Early 20th-century logging was sporadic on this west-facing slope - few stumps are present. Existing yellow pine are scattered across the slope, and are commonly spaced up to several hundred feet apart. Here, it is likely that frequent fire maintained a very open forest condition that was almost savannah-like, with gambel oak maintained at diminished levels. In the absence of fire, forest and vegetation conditions have changed significantly.

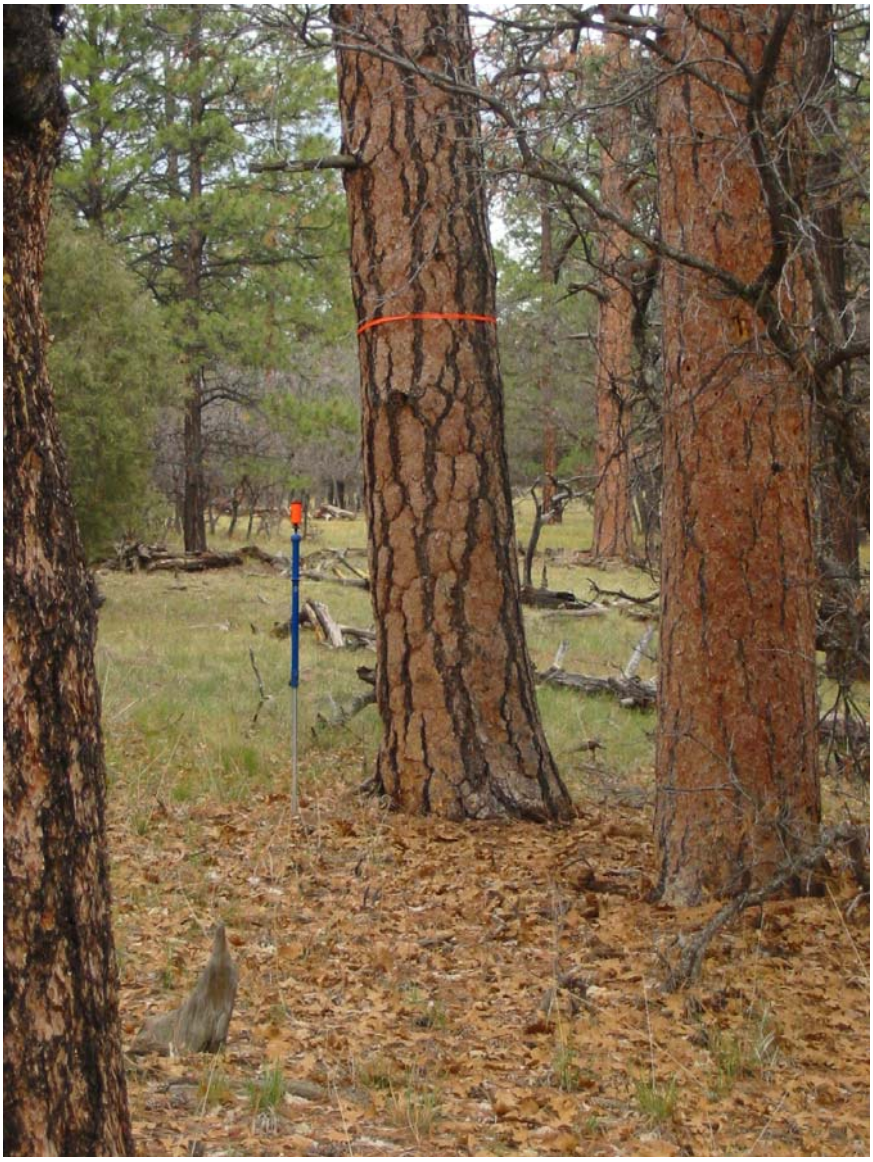

Image 11.

Photo Point 11

Yellow pine with open view

Date: November 1, 2002

This ponderosa pine site, above the Rio Blanco, is perhaps the one site in the Kenney Flats Analysis Area that represents, in part, likely forest conditions of earlier centuries. The flagged yellow pine (DBH=24.7", height=92') became established around 1721. Two nearby yellow pine were established in 1726 and 1796, with the last tree corresponding to a primary regeneration event identified around 1800. The tree on the right is a snag.

With a frequent fire regime, the downed logs would be mostly consumed or perhaps entirely absent, oak clones would be smaller, and dense clumps of blackjack pine would consist instead of fewer, vigorous individuals. The Rocky Mountain juniper on the left would likely have been consumed by flames long ago. Along this gentle ridge, yellow pine distribution is highly variable, ranging from smaller groups as seen in the photo foreground, to scattered individual trees over many acres, similar to the background trees. Thinning from below in the scattered groups of blackjack pine, including dense patches behind the camera and also surrounding the yellow pine on the left and right, combined with prescribed burning, will improve structure in the uneven-aged portions of this stand while increasing the likelihood that the yellow pine will survive a wildfire.

Image 12.

Photo Point 12

Spiler Canyon

Date: October 23, 2002

Prescribed fire in Spiler Canyon will stimulate the growth of aspen from root sprouts and reduce fuel loads in mixed conifer stands (photo, right side).

Image 13.

Image 14.

Photo Points 13 and 14

Dwarf mistletoe, southeast Kenney

Date: November 13, 2002

Dwarf mistletoe exists in scattered small pockets across the Kenney Flats Analysis Area. For the most part, these infestations are not serious.

However, a dwarf mistletoe infestation in southeast Kenney is spreading rapidly, as is resultant mortality. As seen in Image 14, dwarf mistletoe may quickly spread to both overstory trees and newly established ponderosa pine. In these circumstances, the parasite will ultimately kill the trees. By removing heavily infected trees, newly established trees will be at reduced risk of infection, and the dwarf mistletoe can be managed over time at tolerable levels.

The origin of this outbreak appears to be from scattered, older trees that were not cut in the early 20th century. When forest stocking was lower under the influence of frequent fire events, it was likely more difficult for dwarf mistletoe to spread because the host (ponderosa pine) was less common, and distance between trees was much greater than in the contemporary stand. With the establishment of the 1910 cohort, ample hosts are now available for infection by the existing yellow pine. A low-level infestation in open stands may be beneficial for wildlife, but large-scale outbreaks result in excessive mortality and a loss of growth and vigor. The trees shown above, and many others like them, simply could not develop to be large yellow pine like the hosts that contributed to their demise.

Image 15.

Photo Point 15

Gambel oak, east side of Kenney Flats Analysis Area

Date: November 2, 2002

Much of the east side of the Kenney Flats Analysis Area consists of vast stands of gambel oak. Very few large diameter oak are present - and these are usually old snags. In the past, recurrent fire likely reduced the dominance of oak on these sites. In this photo, private land is located to the right of the fenceline, and U.S. Forest Service land is on the left. Proposed mowing on the left side will reduce oak cover by 60-70%, while clumps of larger oak, such as those seen in this photo, will be retained. Resulting lowered fuel loads will reduce the probability of wildfire crossing into private land.

Image 16.1.

Image 16.2.

Photo Point 16

Largest Yellow Pine and root system

Date: November 3, 2002

This yellow pine is the largest tree measured within the Kenney Flats Analysis Area (DBH=48.3", height=90'). Located in an open draw with relatively abundant moisture, it is an open-grown tree with a large crown that is still growing rapidly in diameter for a 300-year-old yellow pine.

It's large size has been achieved in part because of the absence of competing trees. The root system extends far beyond the limits of its crown, as is typical for ponderosa pine, and even though it would be suspected that abundant moisture is available at the bottom of the draw. In Image 16.2, a staff and backpack mark exposed roots 66 feet away from the base of the tree, 5 and 6 inches in diameter, along an old 4x4 trail. It is conceivable (though unproven) that the root system could extend 1.5 tree heights or more from the base of the tree.

This yellow pine demonstrates that ponderosa pine are competing fiercely for moisture and nutrients with their root systems long before their crowns approach each other as the trees grow. Good spacing is required to grow root systems that support full crowns and good diameter growth that allow large trees to develop. Matters of tree silvics are directly related to the development of large yellow pine in ponderosa pine stands. Dense blackjack stands are unable to support quality diameter growth in the absence of significant periodic fire or mechanical thinning that makes needed growing space available to residual trees.