

## Vegetation Changes in Northern Arizona: The Alexander Gardner Photos

Bruce R. Gordon, Gary P. Parrott, and Jack B. Smith

Range conservationists and managers must frequently make recommendations and decisions on how to most efficiently allocate limited resources of money, time, and effort for range improvement. It is imperative to be able to differentiate those land areas that have the potential to improve from those areas that do not. This allows allocation of resources to the areas with the greatest potential for improvement.

It would be a mistake to assume that all ecosystems were at their highest potential states of productivity and species diversity prior to the arrival of European settlers and their livestock. Even so, it has been widely reported that productivity and diversity generally declined following the disturbances associated with settlement (Branson 1985). Comparison of ecosystems as they were prior to settlement with these same ecosystems as they are at present can give us much information on their potential for improvement.

Unfortunately, detailed information on the condition of ecosystems in pre-settlement times is extremely limited. Written records are rare and seldom provide much useful information. This is because few were written by trained biologists, plant taxonomy for the region was in its infancy, and modern quantitative methods had not yet been developed. Photographic records of adequate antiquity are even more rare. Where available, they have sometimes proven to be very useful sources of information on pre-settlement ecosystems (Hastings and Turner 1965, Johnson 1987).

In northern Arizona very few photographs of rangeland and woodland

ecosystems were taken prior to the vast increases in livestock numbers that occurred in the 1870's and 1880's. Some were taken in 1867 and 1868 by Alexander Gardner. This paper will present some historical background information on Gardner and his photographs. It will then compare the conditions of the areas shown in the early photos with conditions of the same areas over 120 years later.

### Historical Background

Following the end of the Civil War in 1865, the nation began to look westward for expansion. New surveys of the Southwest were ordered. A railroad survey was made across northern Arizona during the fall and winter of 1867–68 under the command of General William Jackson Palmer.

The party had originally left Fort Wallace, Kansas, in early July, 1867, under the command of W.W. Wright. Entering Colorado, they split up into smaller groups, exploring several possible routes for a railroad line to Albuquerque, New Mexico. Following reassembly at Fort Craig, New Mexico, General William Jackson Palmer was placed in command. The party then split again, with one group going south to the 32nd Parallel. The second group, led by William Jackson Palmer, left Albuquerque on October 1, 1867 and proceeded westward along the 35th parallel. Traveling with this group was the famed photographer, Alexander Gardner.

Alexander Gardner was born in Paisley, Scotland, on October 17, 1821. At an early age he became interested in chemistry and phonology, the science of speech sounds. He became an apprentice to a Glasgow jeweler at the age of 14, and continued in that trade until he was 21. Gardner then decided to try his hand at being a reporter for the

*Glasgow Sentinel*. He soon proved himself well and became the editor of the newspaper. During this time Gardner became interested in the art of photography. He also became indoctrinated in the theories of socialist reformer Robert Owen, and began a campaign to improve conditions for the working class in Scotland.

By 1848 Gardner decided to establish a utopian community in the United States. The following year he and his brother-in-law, Robert Sinclair, emigrated to America and founded the community of Clydesdale, Iowa, on the Mississippi River. Sometime before 1856, Gardner returned to Scotland to bring his family to America. Arriving at Newfoundland in late 1856, he received word that the Clydesdale community had been riddled with consumption and was in a state of disarray. Abandoning their utopian dream, the family settled in New York City. In 1857 Gardner was hired by Matthew Brady's photographic studio. The following year he was transferred to Brady's studio in Washington, D.C. In 1862 Gardner left Brady because of a copyright dispute.

Later in 1862, Gardner joined the headquarters staff of General George G. McClellan as official photographer for the Army of the Potomac. He served in this capacity until McClellan was relieved of duty on November 7, 1862 by President Lincoln.

Returning to Washington, Gardner established a studio with his brother, James, and Timothy H. O'Sullivan. Between 1863 and 1865, Gardner and O'Sullivan compiled their monumental photographic history of the Civil War. During this period, Gardner took his best known portraits of Abraham Lincoln. In 1867 he joined the survey crew of William Jackson Palmer at Fort Wallace, Kansas.

The route that this railroad survey expedition took from Albuquerque,

Gordon and Parrott are range conservationists, USDA Soil Conservation Service, Flagstaff, Arizona. Smith is an independent historian and author in Flagstaff, Arizona.

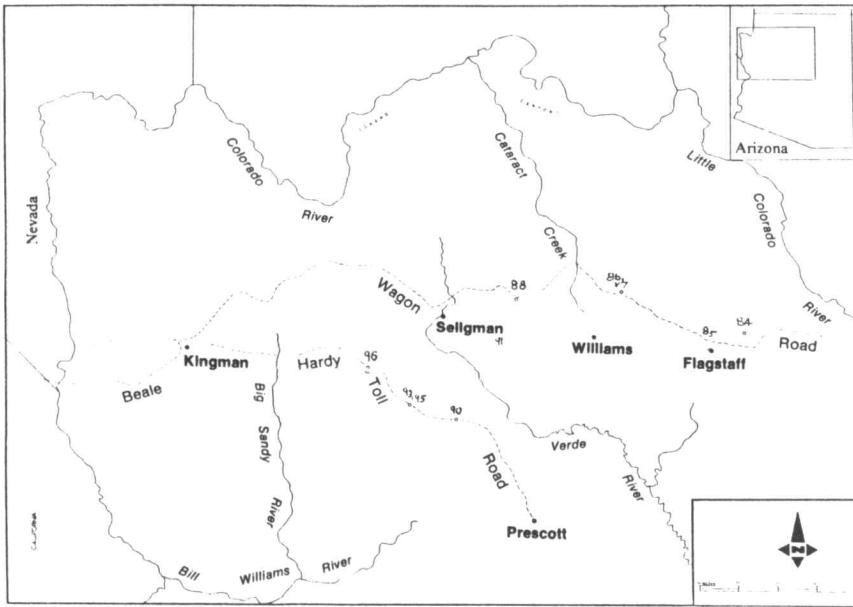


Fig. 1.

New Mexico was the famed Beale Wagon Road. This road had been explored and built by Lt. Edward F. Beale and his crew during the years 1857–1860. It was the first federally funded interstate highway built in the American Southwest, costing over \$200,000. The road ran from Fort Smith, Arkansas, to Los Angeles, California. By the time Palmer's survey crew travelled the Beale Road, the wagon road was being used heavily by immigrants and prospectors. Eleven of Gardner's 18 Arizona photos were taken on the Beale Road, starting with the first two photos of the San Francisco Peaks near Flagstaff, Arizona, and ending with the last four at Fort Mojave on the Colorado River.

While traveling across northern Arizona, General Palmer divided his party into several smaller groups to examine as much territory as possible for identifying the most feasible railroad route. Gardner stayed with the group led by Palmer. When the party arrived at Russel's Tank north of Ash Fork, Arizona, Palmer decided to leave the Beale Road and move southward to follow as closely as possible the route taken by Lt. Amiel Weeks Whipple in the first railroad survey across northern Arizona in the winter of 1853–54. Moving southward as near as possible to Partridge Creek, they took a photograph of

Picacho Mountain about nine miles south of Russel's Tank. This was the only photograph not taken on a wagon road.

Gardner's next photo was taken on the newly established Hardy Road, which was Arizona's first toll road. From that point, they moved westward and Gardner took five more photos along the way. They left the Hardy Road in what is now Kingman, Arizona, and proceeded westward on the Beale Road again until reaching Fort Mojave where Gardner took his last four photos in Arizona.

The results of the Palmer railroad survey were very positive. When the Atlantic and Pacific Railroad was built across northern Arizona in the early 1880's, Palmer's suggested route was followed very closely through most of the state. Gardner's photos were the first ever taken in northern Arizona.

### Vegetation Changes

We attempted to locate the eighteen points from which Alexander Gardner took his photos in northern Arizona, based on historical records, general knowledge of the area, and carefully examining copies of the photos themselves. These copies were obtained and made available for this article, by courtesy of the Boston Public Library, Print Department. In the following discussions and on the

map (Fig. 1), the photos are identified by the numbers assigned to them in the Boston Public Library collection. Location of the points from which the photos were taken was made more difficult by some inaccuracies in Gardner's notes. A couple of his chronologically numbered photos were out of sequence. Also some of the geographic features named in Gardner's descriptions were actually features other than those photographed. We were unable to locate one of the photo points. Some of the points we did not use because the photos do not offer information useful for comparison of ecosystems over time. Ten of the photo points that we were able to locate do provide useful information, and are reproduced here.

At each point we took photos showing the same views as the Gardner photos. We took black and white photos with a 4 by 5 sheet film camera and color photos with a 35 mm camera. We took the photos between December 1989 and April 1990, except the photo of point number 90 was taken in May 1991. In the vicinity of each photo point we also recorded present plant species composition and production on a dry weight basis, as determined by ocular estimation. We also made note of any known historic disturbances, such as road construction or mechanical treatment to remove pinyon and juniper trees.

Each of the paragraphs that follow address a specific photo view. Ecosystem changes are identified based on comparisons of the old and new photos, on the information we collected on present plant communities, and on the known historic influences.

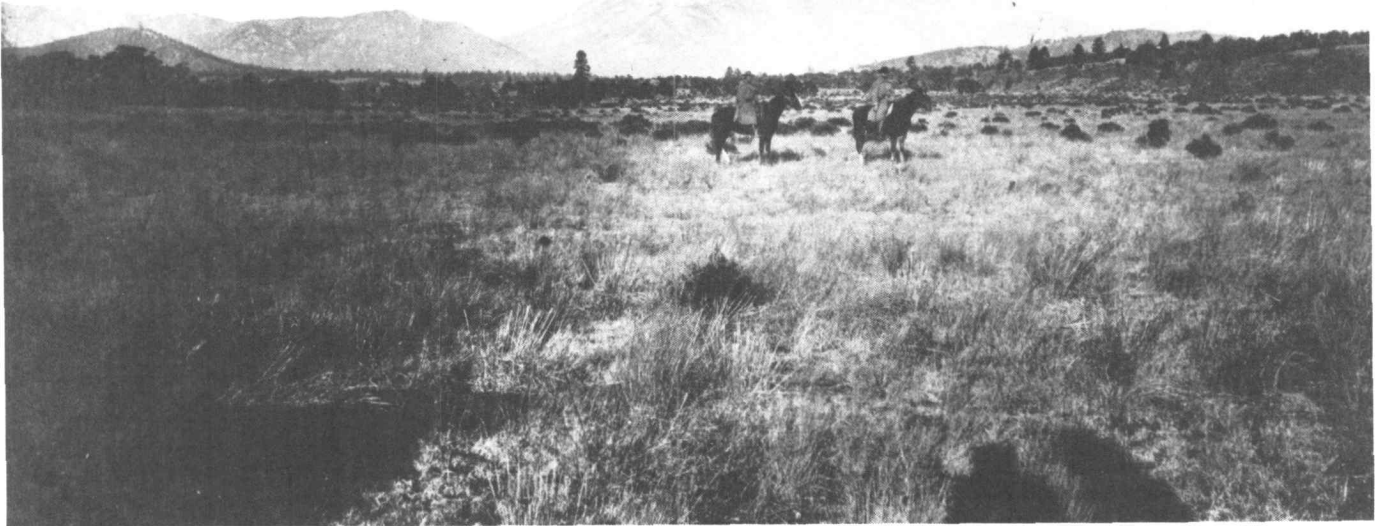


Fig. 2.



Fig. 3.

**No. 84:** "Mount Agassiz, Arizona, on the Mogoyon Range, in 'Tonto Pass', near Highest Summit of the Nine, Which is 7,510 Feet Above Tide: December, 1867; 1,200 Miles West of Missouri River". (Fig. 2 and 3) This photo was taken looking west from the Cosnino area at Mount Elden (upper left) and the San Francisco Peaks (upper center).

The 1989 photo was not taken from exactly the same point as the 1867 photo. The foreground has been cultivated and subsequently abandoned, and consequently is of little comparison value. The foothills and the San Francisco Peaks show a clear increase in tree cover. Mount Elden does not show this, due to a severe wildfire in 1977.



Fig. 4.

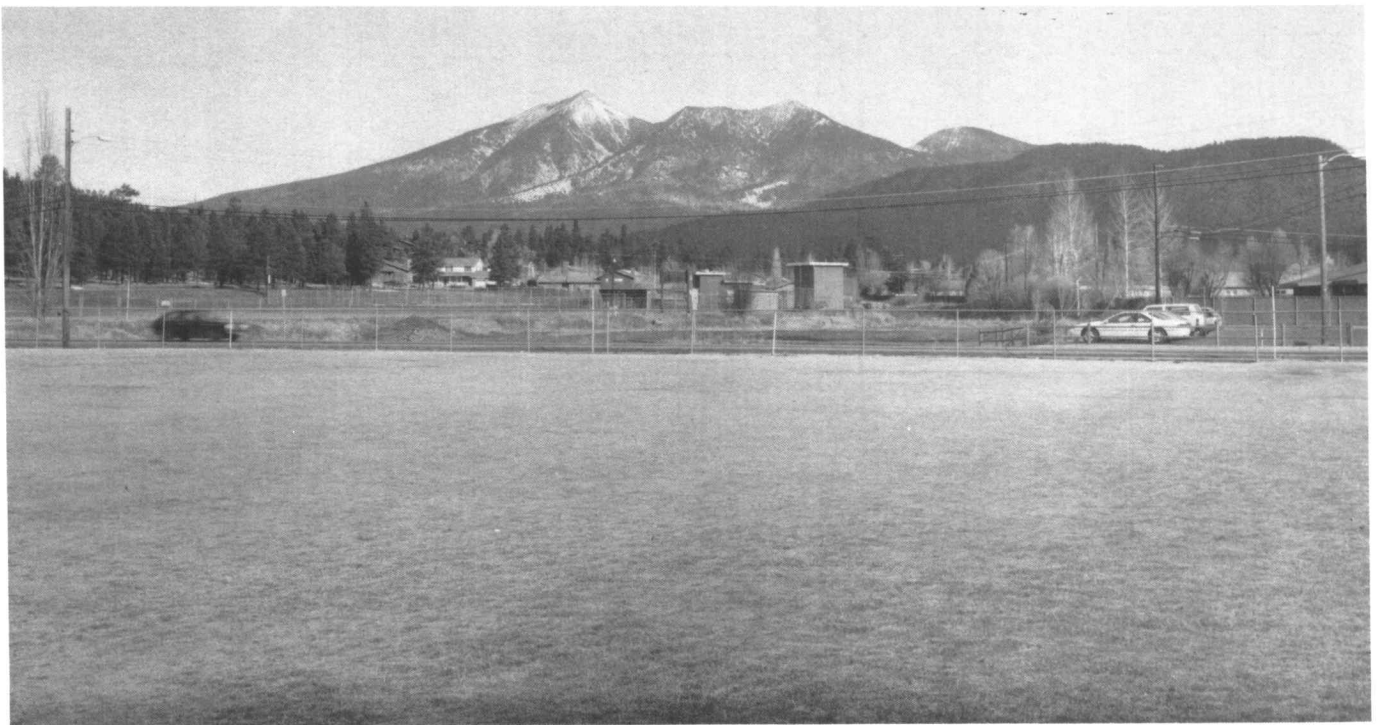


Fig. 5.

**No. 85:** "Mount Agassiz, Arizona; Extinct Crater, 12,000 Feet Above the Ocean; December, 1867; 1,200 Miles West of Missouri River" (Fig. 4 and 5) This photo was taken from what is now part of Flagstaff, Arizona. The fore-

ground is now urbanized, and of little comparison value. In the midground foothills a clear increase in ponderosa pine cover is evident. In the background, on the San Francisco Peaks, an increase in tree cover is apparent.



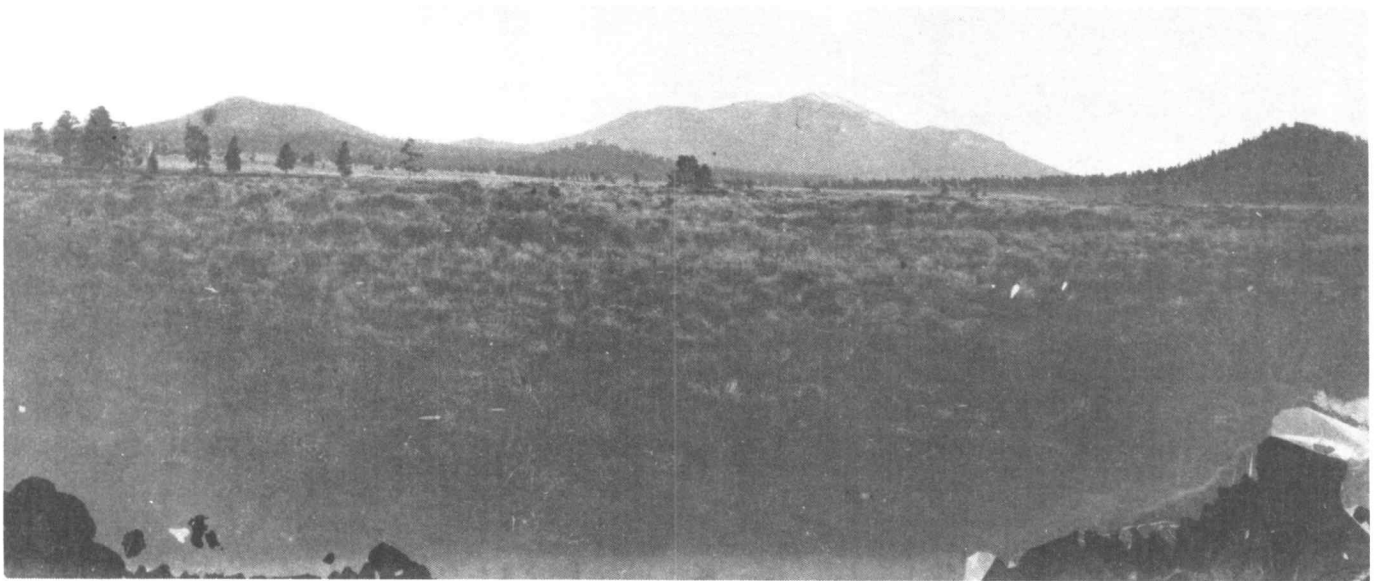


Fig. 6.



Fig. 7.

**No. 86:** "Bill Williams' Mountain; Peak in the Mogoyon Range, Arizona, 1,230 Miles from the Missouri River" (Fig. 6 and 7) The mountain in the photos is actually Mount Sitgreaves, viewed from near Laws Spring. There has been an increase in ponderosa pines in the drainage in the photo mid-ground, and to a lesser extent in the sur-

rounding area. There has been a major increase in rubber rabbitbrush, and a corresponding decrease in grass, especially mid-size grasses. The area in the foreground has been subjected to mechanical treatment for removal of pinyon and juniper. Pinyon and juniper are again starting to invade the area.



Fig. 8.



Fig. 9.

**No. 87:** "Laws Tank on Western Slope of Mogoyon Range, Arizona, 1,240 Miles West of Missouri River" (Fig. 8 and 9) These photos were taken from nearly the same point as No. 86, but with the camera facing a different direction. The 1990 photo was taken from a point slightly to the southeast of the 1867 photo in order to provide a less obstructed view of the hill in the background. There

has been an increase in pinyon and juniper, and to a lesser extent ponderosa pine. The foreground has had mechanical pinyon and juniper control. There has been an increase in rabbitbrush, with a corresponding decrease in grasses. Species composition of grasses has shifted away from mid-size grasses, in favor of blue grama.



Fig. 10.



Fig. 11.

**No. 88:** "Camp of Surveying Party at Russel's Tank, Arizona, on Eastern Slope of Laja Range, 1,271 Miles from Missouri River". (Fig. 10 and 11) Russel's tank is a wet area along Partridge Creek. There has been an apparent increase in pinyon and juniper on the flat and possibly the

draw. Several trees in the midground have been cut very recently. Blue grama is a dominant species in both photos. Continuous use by native ungulates near this natural water hole may have accounted for the low vigor of the blue grama in the earlier photo.





Fig. 12.

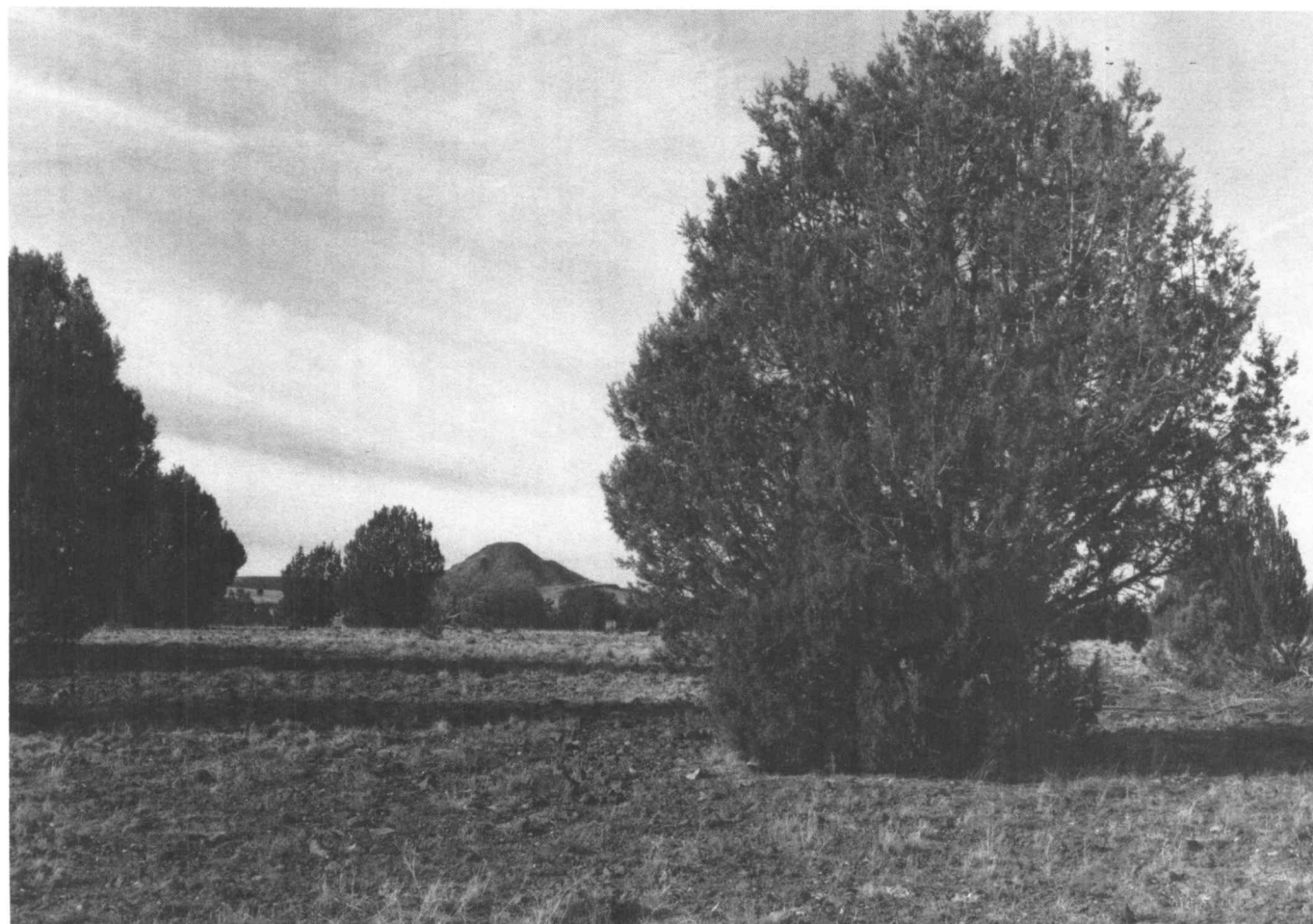


Fig. 13.

**No. 91:** "Dumpling Mountain, Adjoining Val De Chino, Arizona, 1,290 Miles West of Missouri River" (Fig. 12 and 13) Dumpling Mountain is now called Picacho Butte. The photos were taken from near the abandoned Pineveta railroad siding. We believe that a tree visible at the right of the older photo is also visible in the more recent photo.

There has been a marked increase in pinyon and juniper; a reduction in vegetative cover; loss of a relatively taller grass, possibly sideoats grama; loss of a shrub, possibly fourwing saltbush; and an apparent loss of soil to sheet erosion.





Fig. 14.



Fig. 15.

**No. 90:** (numbered out of sequence) "Partridge Creek, Western Base of Mogoyon Range, Arizona; Mescal Plant in Foreground, 1,280 Miles West of Missouri River" (Fig. 14 and 15) Actually this photo is of Walnut Creek, just north of the present day bridge along Prescott National Forest Road 6. The features in the foreground of the old photo were obliterated during construction of the road. The most obvious difference is the increase in large riparian hardwood trees along Walnut Creek. This surprised us, since riparian hardwood trees commonly decline over

time with the influence of livestock grazing. If in 1867 Walnut Creek was more marshy at this location than it is presently, the high water table may have inhibited tree growth. The actual stream course is now incised into its alluvium. This may have improved soil drainage enough to allow tree growth. There has been an increase in juniper and pinyon on the slopes on either side of the bottom. The toe slope on the north side of the creek has had recent mechanical removal of pinyon and juniper.

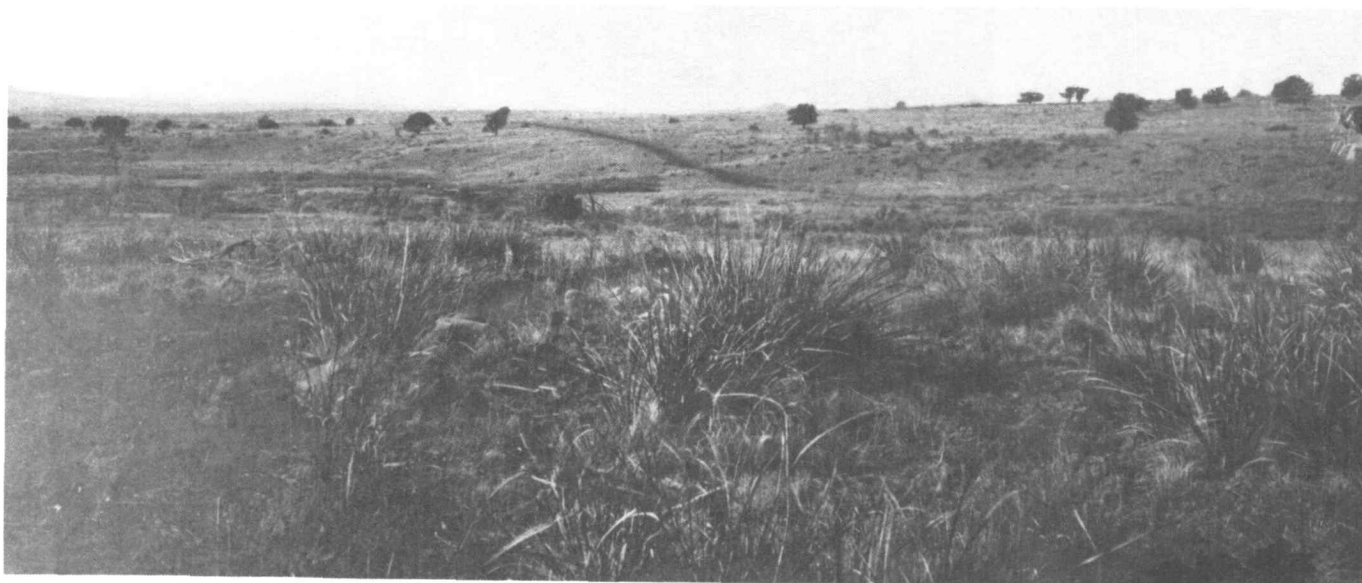


Fig. 16.



Fig. 17.

**No. 93:** "Looking West from Summit of Aztec Pass, Western Arizona, 1,332 Miles from Missouri River" (Fig. 16 and 17) These photos were taken on the present day ORO Ranch, looking west across a draw toward the landing strip. The ponderosa pine at left in the draw in the old photo is probably the same tree as in the same location in

the new photo. Sacahuista (the tall grass-like plant) has declined considerably. There has been a loss of ground cover and production, as well as an apparent loss of soil from sheet erosion. In the draw there has been an increase in woody species such as Apache plume and Gambel oak.



Fig. 18.



Fig. 19.

**No. 95:** "Cygnus Mountain, on Head-Waters of Bill Williams' River, Western Arizona, 1,350 Miles West of Missouri River" (Fig. 18 and 19) These photos were actually taken from near the same point on the ORO Ranch as number 93. The mountain just barely visible at left in the old photo is now called Mount Hope. The following evidence suggests that the new photo was taken from the exact point the old one was taken from. Two of the trees in the new photo appear to have been present in 1867. The stump of a third tree in the old photo was located. Some of

the rocks appear to be the same along the bed of the old road. Also, we found a corner of thin plate glass that we speculate may have been from one of Gardner's glass plate negatives. There has been a loss of sacahuista and a loss of vegetative cover. There has been an apparent loss of pinyon and juniper cover, in spite of absence of evidence that these species have been suppressed. This surprised us since these species more commonly have increased since the introduction of livestock grazing.



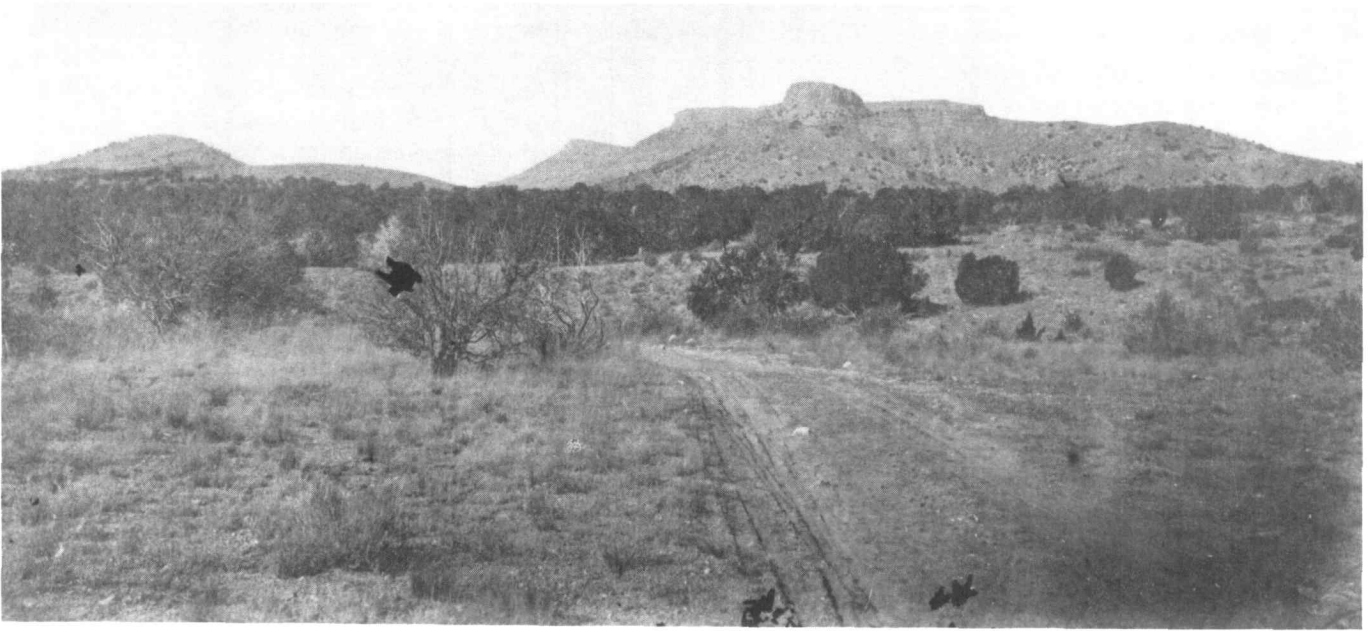


Fig. 20.



Fig. 21

**No. 96:** "Cross Mountain, Western Arizona, 1,350 Miles from Missouri River" (Fig. 20 and 21) The photo point is located on the present day Fort Rock Ranch. We are confident that the new photo was taken at the same spot as the old one. During our visit to the site in 1990 we found remains of the Fremont barberry at center left in the old photo, and the pinyon pine at right. We found traces of the old road curving into the draw, just as it did in the old photo. There has clearly been an increase in pinyon

and juniper on Cross Mountain, on the foothills at left, and in the midground draw. There has been an increase in blue grama, at the expense of some of the taller grasses. While vegetative cover has apparently decreased, this change is not as marked as at some of the other sites, possibly indicating the lower potential of the site. There has been mechanical treatment to thin woody plant species in the foreground.

## Vegetation Change Summary

Our observations on the changes that have taken place in these ecosystems over the last 120 years are summarized as follows:

1. Ponderosa pine has increased in four out of four photos of the ponderosa pine zone.

2. Pinyon and juniper have increased in seven out of nine photos of the pinyon and juniper zone.

3. Pinyon and juniper appear to have decreased in two out of nine photos of the pinyon and juniper zone, even in the apparent absence of mechanical or other treatment.

4. Herbaceous cover has decreased in seven out of seven photos where this comparison could be made.

5. Mid-size grasses have decreased in four out of seven photos where this comparison could be made.

6. Riparian hardwood trees have increased in one photo showing a riparian area.

7. Shrubs have increased in three out of eight photos, and decreased in

8. Sacahuista has decreased in two out of two photos showing this species.

9. Sheet erosion has apparently accelerated in three out of eight photos where this comparison could be made.

Better understanding of the conditions of ecosystems prior to settlement by European Americans can improve our understanding of their potentials for improvement. Many of the changes we observed in our comparisons of these photo views came as no surprise to us, but some of them did not follow our preconceived ideas of how ecosystems react to disturbance.

It is often necessary for us to make assumptions about ecosystem potentials. Comparison of these old and new photos has shown us that, in some cases, our assumptions would have been wrong. It is important for us to be open minded, and to always

try to fine-tune the assumptions we must make on the basis of all available evidence. In this way we will be most likely to make effective recommendations and decisions.

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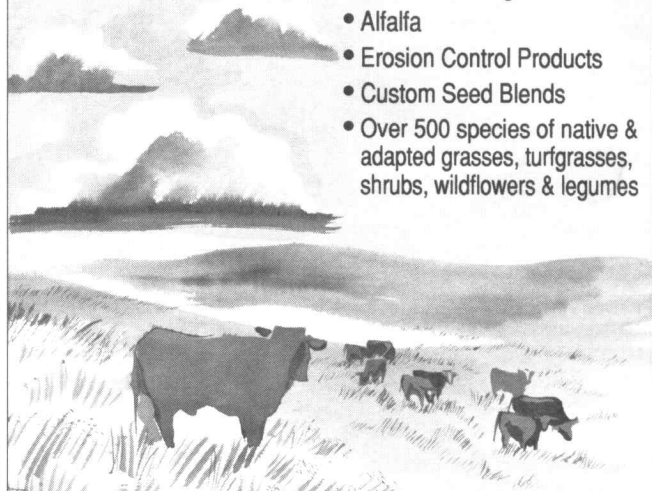
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