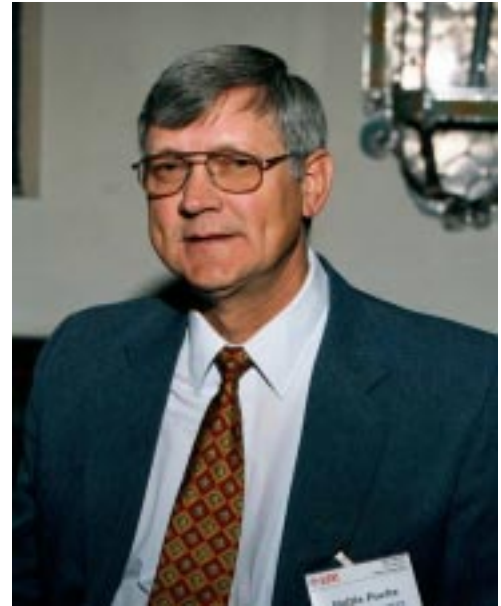


Hollis Fuchs was born and raised in Lincoln County, New Mexico. He received a B.S. degree in agriculture from New Mexico State University in 1971. Hollis owns and operates a small business. He has worked for 26 years as a soil conservationist, District Conservationist, and Area Manager for the Bureau of Land Management and Natural Resources Conservation Service (NRCS) in Arizona, Idaho, and New Mexico. Currently, Hollis is the NRCS Team Leader for Southeast New Mexico, with its headquarters in Carrizozo.



THE CHANGING FACES OF LINCOLN COUNTY'S WATERSHEDS

E. Hollis Fuchs

USDA - Natural Resources Conservation Service, Southeast Team, New Mexico, and
Carrizozo Soil & Water Conservation District
PO Box 457
Carrizozo, NM 88301

INTRODUCTION

The author has assembled a collection of approximately 180 historic photographs showing the landscapes of Lincoln County, New Mexico, which date from about 1870 to 1958. From 1995 to present, approximately 100 of these historic photographs have been re-taken. The exact site of each old photograph is found and the photograph is re-taken to show precisely the same scene, as nearly as possible. By comparing the sets of past and present photographs, noticeable changes in vegetation can be recorded. With photographs re-taken at elevations from about 4,500 feet to about 11,600 feet, *in every case*, from past to present, the sets of comparison photographs show an obvious increase in woody vegetation. In many cases, the proliferation of shrubs and/or trees has overwhelmed the landscape. Historic vegetation changes have clearly impacted the watersheds of Lincoln County. Vegetation changes also have

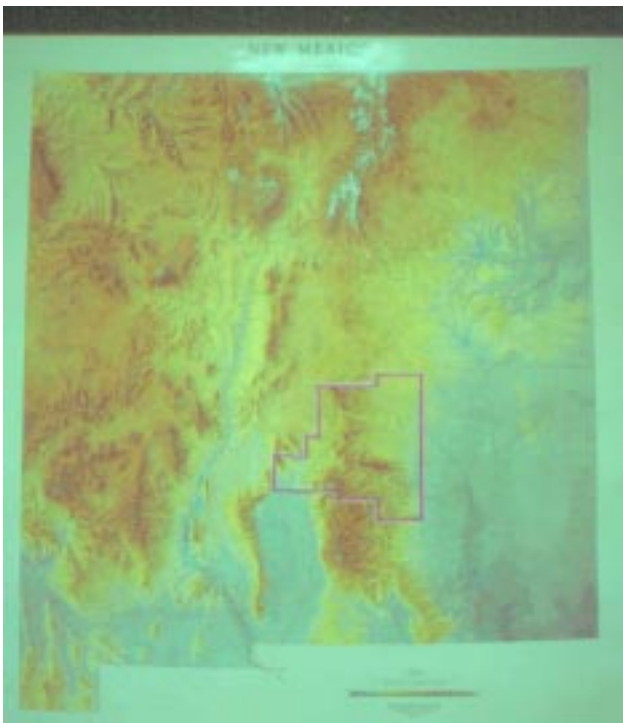
implications for impacts on water resources, soil erosion, habitat change, and other natural resource values, not to mention hazards of catastrophic wildfire. While the causes of historic changes in native vegetation are argued, there is no reasonable doubt that the vegetation of Lincoln County has in fact changed, with numerous impacts on natural resource values.

The Changing Faces of Lincoln County's Watersheds

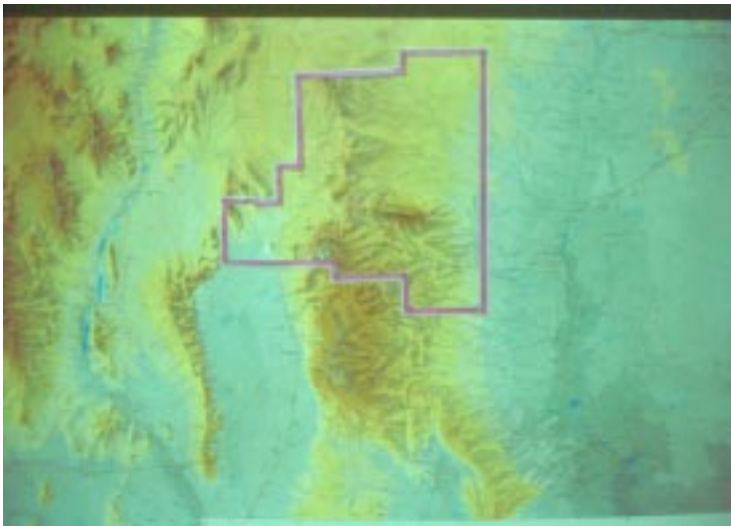
*A photographic documentation of
vegetation change.*

E. Hollis Fuchs

**U.S.D.A. Natural Resources Conservation
Service
Carrizozo Soil and Water Conservation
District**

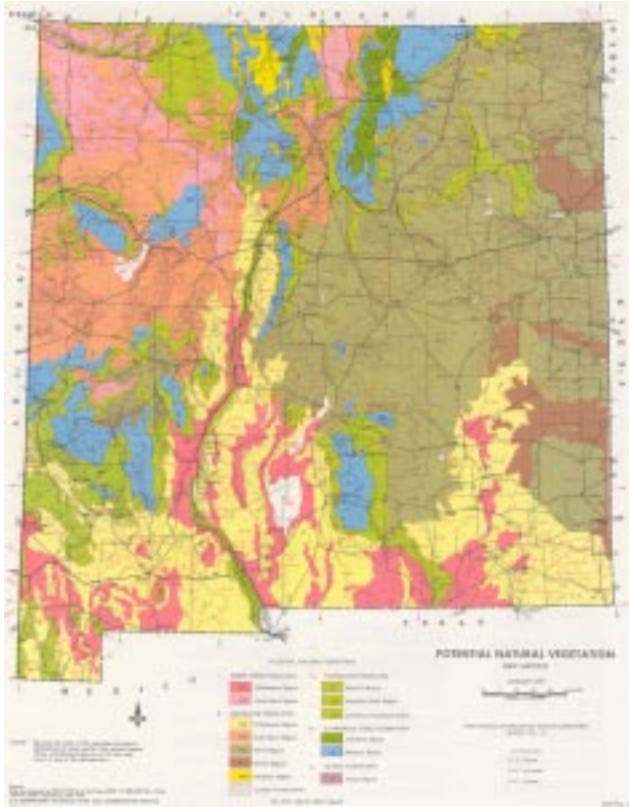


Lincoln County is located in southcentral New Mexico. Like the rest of New Mexico, Lincoln County's topography is quite diverse.

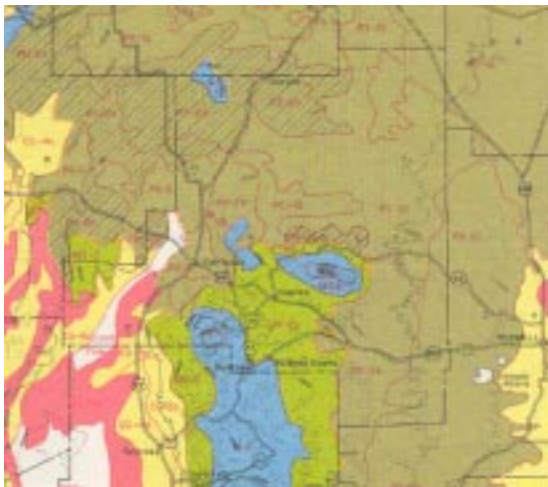


Elevations in Lincoln County vary from about 4,500 ft. to 11,600 ft. The terrain varies from Chihuahuan Desert, to rolling plains, to rugged mountains.

The Changing Faces of Lincoln County's Watersheds



This map shows the diverse Potential Natural Vegetation areas of New Mexico.



Potential Natural Vegetation areas of Lincoln County include Desert Grassland, Desert Shrubland, Plains Grassland, Plains Grassland with Juniper in association, Mountain Shrubland, Mountain Grassland, and Montane areas in the high elevation.

Lincoln County European Settlement

- Explored by Spain and Mexico, but no land grants or settlements.
- First known habitation: About 1850, following the Mexican War of 1847-48, and the Treaty of Guadalupe - Hidalgo.
- Fort Stanton established 1855, abandoned and largely destroyed 1862, re-occupied under primitive conditions 1863, rebuilt 1870.
- Significant settlement began in the late 1870s.

Historic vegetation changes that have occurred during the past approximately 130 years are generally attributed to disturbances resulting from European settlement. In order to understand these vegetation changes, it is important to understand the settlement of Lincoln County. Compared to other parts of New Mexico, Lincoln County was settled quite late.

E. Hollis Fuchs

Circa 1878 - 1879



The next five slides illustrate the onset of historic vegetation change, and a graphic comparison of past conditions with the current situation.

1887



From the 1878 view to 1887, no appreciable vegetation change is noticeable.

Circa 1920



From the 1878 and 1887 views, by 1920, the beginnings of change are visible. In this 1920 view, numerous small ponderosa pines have appeared.

The Changing Faces of Lincoln County's Watersheds

2000



Today the same view is within Ruidoso, New Mexico. The former open stand of ponderosa pine has become a dense thicket, filled with buildings.



1887

In this slide, we see a comparison spanning 111 years. The vegetation change represents a phenomenal increase in woody plants. This is a condition that is present throughout Lincoln County.



1998

Plant Succession

- **Evergreen Trees/Shrubs**
- **Deciduous Trees/Shrubs**
- **Perennial Grasses and Forbs**
- **Annual Grasses and Forbs**
- **Bare Ground**

This phenomenon of increasing woody plants can generally be explained by the concept of *plant succession*. This concept indicates that bare or disturbed ground progressively advances toward higher stages of plant succession.

The highest stage of plant succession is often referred to as *climax*. This is sometimes defined as *a plant community evolved in the absence of human disturbance*.

**Climax Plant Community =
state of dynamic equilibrium.**

Pre-Settlement Condition

- **Plant communities were sub-climax, induced by periodic, recurrent fires**
- **Ponderosa Pine zone - 20 to 50 trees per acre, multi-aged, clumps, large open areas.**
- **Average fire occurrence at 5500 to 8500 ft. elevation: 3 to 10 years. Low intensity ground fires. Crown fires rare.**

Prior to European settlement, the plant communities of Lincoln County were different than today. The plant communities were influenced by frequent low intensity fires. Climax plant communities were *fire induced*.

Current Situation

- **Fire absent from many areas for more than 100 years. Intense crown fires are common.**
- **Ponderosa Pine forests - 180 to 220 trees per acre. Often more than 1000 trees per acre, counting those less than 5 inches diameter.**
- **Most open areas gone, completely filled with trees.**

The current situation in Lincoln County represents a phenomenal increase in woody vegetation. While the causes are not simple, the common denominator is *the absence of the effects of wildfire*.

The Changing Faces of Lincoln County's Watersheds



Fire-Scarred-Ponderosa Pine (*Pinus ponderosa* Laws.)

Collected at:
Lincoln National Forest
Sacramento Mountains, NM
Smokey Bear Ranger District
Cedar Creek Road Area
6600 ft. elevation

Collected May 23, 1995 by:
Jorge Alzaga, Chris Baisan,
James Rise, Margot Wilkinson

Dated by: Margot Wilkinson

Inner Ring: A.D. 1667

Outer Ring: A.D. 1830

Fire Dates: A.D. 1725, 1739, 1750, 1763,
1772, 1779, 1782, 1789, 1792,
1795, 1800, 1809, 1814, 1818,
1821.

Prior to European settlement, low-intensity ground fires burned across Lincoln County's landscapes, generally every 3 to 10 years. This is illustrated by evidence collected from fire-scarred trees such as this local tree section that recorded numerous fires.



Circa 1890 - 1891

Photographic evidence of pre-settlement fires can sometimes be found. Examples of this are shown in the next four slides of comparison photo sets. These were taken near White Oaks.



1998



1890 - 1891



1999

E. Hollis Fuchs



October, 1912

This is a closer look at the area shown in the two previous slides, from a different direction.



**November, 1996
from a tree, 15 ft.
above the ground**



October, Oct 1912

This is also taken from a different direction, showing the phenomenal increase in woody plants.



**November, 1996
from a tree, 15 ft.
above the ground**

1998



This photo of Patos Mountain, near White Oaks, shows the aftermath of the 1993 wildfire. These burned areas look quite similar to some of the previous photo sets that are thought to demonstrate areas that had been scoured by wildfire.

The Changing Faces of Lincoln County's Watersheds



October, 1912

Beginning at the lower elevations of the County, we will look at different landscapes. This photo set, from about 5,100 ft elevation in the Chihuahuan Desert area of Lincoln County, demonstrates a decrease in grass cover and an increase in mesquite and other shrubs. The six surface conditions of this site have changed, altering the surface hydrology. Sheet erosion is occurring currently.



October, 1997



October, 1912

Taken from the same point as the previous photo set, this slide illustrates a shift from desert grassland to shrubland dominated by mesquite and creosote bush. Sheet erosion is occurring.



October, 1996



Summer, 1899

This photo set, taken in the plains grassland vegetation type, has undergone an increase in both grass cover and woody plant cover, including bigelow sagebrush and juniper. The early photo represents light, infrequent grazing use, as it was far from drinking water. Yucca, previously low-growing, now has tall stems or tree-like trunks. Several indicators point to a previous presence of periodic fire followed by at least 100 years without fire.



January, 1997

E. Hollis Fuchs



Circa 1911

The next six photo sets illustrate a phenomenal increase in woody plants, in the elevation range of about 6,200 feet to 6,800 feet.



1999



July 4th rodeo, 1917



July, 1997



Summer, 1899



June, 1996

The Changing Faces of Lincoln County's Watersheds



1900

The increase in tree cover also represents a large increase in moisture consumption, as evergreen trees consume water year-round, while deciduous plants and grasses consume water only during their growing seasons.



1999



1905



1996



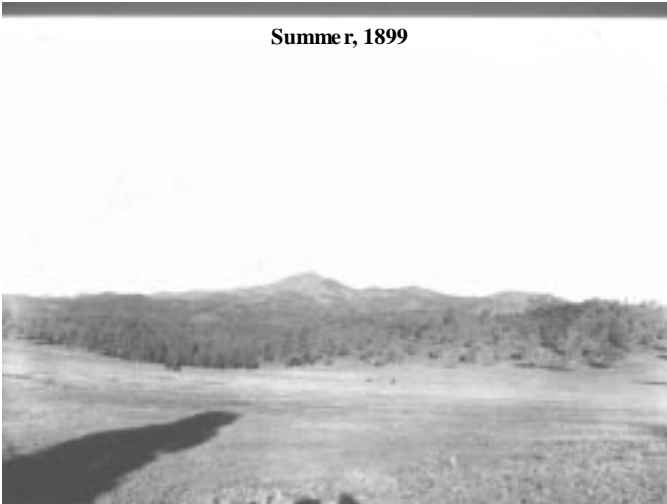
1912

This photo set illustrates a former grassland that has undergone woody plant encroachment.



1996

Summer, 1899



July, 2000



These two photos illustrate one of the few mountain meadows in Lincoln County to survive the changes of the past 100 years. The tree cover has changed from an open stand of large ponderosa pines and huge, old alligator juniper trees, to dense thickets of spindly trees, with increasing numbers of houses and other buildings. These changes have been detrimental to watershed health, and the risk of catastrophic wildfire is high.



1915

In 1915, this site already illustrated an absence of fire, as shown by the dense stand of small, even-aged mixed conifer trees.



1998

In 1998, the site had been without a fire for more than 100 years. Water consumption has increased with the woody plant increase. Water infiltration and groundwater recharge has decreased.

The Changing Faces of Lincoln County's Watersheds



1915

At 8,500 feet elevation, during the interval illustrated here, open meadow areas completely disappeared. Shrub oak areas have decreased, and the mixed conifer tree cover has dramatically increased. Water yields have decreased, as much as an estimated two inches per acre.



1998



1917

At about 10,000 feet elevation, grass cover has increased, evergreen tree and shrub cover has increased, and deciduous plant cover has decreased. Water yield from these sites has decreased. The aftermath of a fire is illustrated in the 1917 photo. In 1998, there has been no fire since before 1917.



1998



1914

These photos were taken at the highest point in Lincoln County, 11,600 feet elevation, showing Sierra Blanca Peak, in Otero County. The mixed conifer tree cover has encroached upon the grassy meadows, reducing their size. Scientific studies have estimated that restoration of the grassy meadow areas could increase water yields by as much as two inches per acre.



1999

Some Suggested Reading:

- John, E.A.H. and Wheat, J. (1989) *Views from the Apache Frontier, 1799, Report on the Northern Provinces of New Spain, by Jose Cortes, Lieutenant, Royal Corps of Engineers*. Norman, OK. University of Oklahoma Press. This reference describes how Apache people set and used wildfires during the pre-settlement period.
- Allen, Craig D. (1998) *Where Have All the Grasslands Gone? Fire and Vegetation Change in Northern New Mexico*. Los Alamos, NM. Article, U.S. Geological Survey, Jemez Mountains Field Station. Title is self-explanatory.
- Kaye, M.W. and Swetnam, T.W. (1998) *An Assessment of Fire, Climate, and Apache History in the Sacramento Mountains, New Mexico, U.S.A.* Tucson, AZ. University of Arizona, Laboratory of Tree Ring Research. This reference describes how dendrochronology has demonstrated that fires frequently burned across Lincoln County landscapes prior to 1900.
- Garrett, L.D. and Garrett, P.J. (2001) *Evaluating Forest Restoration Opportunities on the Lincoln National Forest*. Olathe, CO. Research Paper, M3 Research. This title is self-explanatory.