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During a visit to the National Archives in Washington, D.C., I found a 1902 map of southeastern Arizona's Chiricahua Mountains (Figure 1, page 45). I had searched for nearly a decade for this map drawn by Albert F. Potter when he and Royal S. Kellogg were sent by the Forestry Bureau of the General Land Office (GLO) to the Arizona Territory. Their purpose was to determine the feasibility of establishing the Chiricahua Forest Reserve (Potter, 1902; Kellogg, 1902a). They spent one week in April in the northern part of the Chiricahuas at Brannock Riggs' sawmill in Barfoot Park and one week in May in the southern part of the range at the Benton and Woolf ranch in Tex Canyon. The result of their investigation — favoring a reserve — is contained in "Report of an Examination of the Chiricahua Mountains in Arizona." It was submitted by Kellogg to the GLO on May 22, 1902 (1902a) but the map was not included in the copy of the report I examined in the Special Collections Library at the University of Arizona. Eventually, I found it in the Bureau of Land Management's National Forest Files in the National Archives.

Potter's map is a remarkable discovery for researchers interested in how human endeavor has affected Arizona's vegetation because it clearly shows extensive logging and numerous sawmills in the coniferous forests of the Chiricahuas before the forest reserve was established in July 1902. Logging is only one of many historic land uses such as grazing, fuelwood cutting, and mining that have affected the range's ecology during the past 120 years. Few modern ecologists, especially those with a preservationist tilt, are aware of the role of human disturbances in the evolution of vegetation in the Chiricahuas or other mountain ranges in southeastern Arizona. More important, Potter's map confirms that the Chiricahuas were not pristine wilderness in the late 19th century, while Kellogg's report points out that the reserve was needed to protect resources in danger of degradation. Clearly, by 1902 much of the Chiricahuas had been grazed, logged, and cut over for fuelwood, and the fire regime had changed (Bahre, 1991).

Major Anglo-American impacts on the range began after the Chiricahua Apache Reservation was disestablished by Executive Order on October 30, 1876 (Wilson, 1987). Although Anglo-Americans and Mexicans had prospected in the Chiricahuas before the Apache reservation was established in 1872, and American troops from Fort Bowie had logged parts of Pine and Pinery Canyons in 1865 (Wilson, 1987:401), European settlement in the area was inconsequential before 1877. Even the Apaches, in all probability, did not settle in the range until the late 17th century (DiPeso, 1956; Aschmann, 1970).

Tombstone's silver mines and renewed mining of the old Mexican copper mines at Bisbee in 1878 created demand for lumber from the Chiricahuas. The extension of the Southern Pacific Railroad across southeastern Arizona in 1881 opened up the range to major livestock grazing (Myrick, 1975; Bahre, 1991). Next to the Huachuca Mountains, the Chiricahuas were the major source of lumber and mine timbers for Bisbee, Tombstone and the latter's stamp-mill towns of Contention, Charleston, Boston, and Fairbank (Gird, 1907; Bisbee Review, August 8, 1923; Spude, 1979). Even Tucson, some 160 miles distant received lumber from Chiricahua sawmills.

Here briefly, is an overview of the major land uses affecting the Chiricahua Mountains between 1877 and July 1902, when the Chiricahua Forest Reserve was established.

Logging

Late 19th century Tombstone and Tucson newspapers refer often to Chiricahua logging and sawmill operations. Between 1879 (when the first sawmill was established) and 1902, eleven sawmills were operated in the Chiricahuas and roughly 30 percent of the range's coniferous forests was logged (Potter ,1902). According to Kellogg (1902a:2), the 50,000 acres of coniferous forest in the Chiricahuas constituted the single largest acreage of coniferous forest on any mountain in Arizona south of the Mogollon Rim. The forest averaged 5 MBF (thousands of board feet) per acre, 1.2 MBF less than the 6.2 MBF estimated for ponderosa pine (*Pinus ponderosa*) stands in Arizona by Alexander (1974:26). Some fully stocked stands on good sites, however, are capable of yielding 25 to 35 MBF per acre (ibid.) and, according to Kellogg (1902a:3), about 400 acres of forest near Barfoot Park averaged 10 MBF per acre in 1902.

The Arizona Daily Star (July 23, 1879; May 28, 1880) and Parsons (1939) indicate that the first sawmill in the Chiricahuas, Philip Morse and Co., was established in June or July 1879 in Morse Canyon. It produced about 50 MBF weekly. Production in the early Chiricahua sawmills seldom exceeded 100 MBF weekly, although the Ross Mill

supposedly turned out 20 MBF daily in 1889 (Figure 2) (Arizona Daily Star, October 24, 1889). Given the lack of accurate information on logging in the range, we cannot calculate how many MBF were cut between 1879 and 1902, but Kellogg (1902a:11) noted that "extensive cutting has taken place in Pine, Pinery, Rock, Morse, and Rucker Canyons" and that the forests in Morse and Rock Canyons had been destroyed by cutting. Further, Kellogg (1902a:7) pointed out that the mixed-conifer forests, especially those dominated by Engelmann spruce (*Picea engelmannii*), were little disturbed because they were beyond the reach of the sawmills.

Even after the Southern Pacific arrived, lumber from the Chiricahuas was cheaper than West Coast lumber and miners preferred using local lumber for mine timbers and laggins, especially in wet ground (Tombstone Prospector, October 19, 1889; Arizona Weekly Enterprise, April 5, 1890; Kellogg, 1902b:503). Bisbee's Copper Queen mine depended on timber from the Chiricahuas until the turn of the century (Bisbee Review, August 8, 1923). The Ross Sawmill from which the Copper Queen purchased its timbers was frequently cited for illegal cutting on public lands. For example, the Arizona Weekly Star (November. 12, 1885) reported:

"Timber Depredations...Parties from the Chiricahua Mountains say there is a large amount of timber being cut on government land in the mountains about fifty miles from Bisbee. If this is so, this is work for the U.S. timber agents. It is said the pine timber is being literally cleared off the government land, and if the depredations continue at the present rate, there will not be a stick left on that side of the mountain."

Eventually, the government filed both criminal and civil actions against Ross and the Copper Queen (Bisbee Review, August 8, 1923). According to Kellogg (1902b:505): "The cutting in the famous 'Copper Queen' case, which was decided recently in favor of the company, took place in the Chiricahua Mountains seven to twelve years ago, and the cut-over area was completely skinned." Kellogg (1902a:11) indicated that abusive logging practices led to erosion and possible dessication of some streams.

Fuelwood Cutting

It is clear in Kellogg's report (1902a) that fuelwood cutting, especially in the evergreen woodlands, mesquite (*Prosopis* spp.) thickets, and scattered stands of Arizona cypress (*Cupressus arizonica*), had a major impact. There is no evidence, however, that fuelwood cutting in the Chiricahuas was as extensive or as devastating as it was in those ranges nearer to the major mines in southeastern Arizona (Bahre and Hutchinson, 1985; Bahre, 1991). According to one report, however, most of the 24 cords of wood consumed daily at the Copper Queen came from the Chiricahuas (Arizona Weekly Enterprise December 14, 1889).

Figure 2. The Ross Lumber Mill. (Reprinted with permission from The Bisbee Mining and Historical Museum.)

Historically, wood had been the most important and often the only source of fuel in the region. Except for the English and Colorado coke used in the blast furnaces of the copper smelters, wood was historically the major fuel in the county until 1910. Up to 1940, wood accounted for 39 percent of the cooking fuel and 31 percent of the heating fuel in Cochise County (U.S. Bureau of the Census, 1975: 540). Wood was used under the boilers of the steam engines at virtually every step in mining — to run stamps, pumps, hoists, ore crushers, dryers, amalgamation pans, settlers, and converters; to roast ores; and to retort amalgam. Wood fueled every steam engine in the region from those powering trains to those making ice, and it also met all of the cooking and heating needs (Bahre, 1991). In addition, juniper (*Juniperus* spp.), mesquite, and desert willow (*Chilopsis linearis*) were cut for fenceposts, to make wood corrals, and, along with oak (*Quercus* spp.), to burn lime for cement and to kiln bricks. Cottonwood (*Populus fremontii*) and willow (*Salix* spp.) were especially preferred for kilning bricks, and willow leaves and cottonwood bark were used as livestock feed. Charcoal, made mostly from mesquite and oak, was used for several purposes from blowing in smelting furnaces to heating irons.

Kellogg (1902a) presented evidence that many Arizona cypress stands in the Chiricahuas had been cut for lumber and shakes by 1902. An advertisement in the Daily Tombstone (November 22, 1886) verifies his contention: "Attention Ranchmen: Shakes, shingles, etc. for sale from mill at the head of Morse Canyon... Juniper timbers 30 feet in length..." The latter were most likely cut from large Arizona cypress because there are no junipers large enough to cut 30-foot beams from in southeastern Arizona. Furthermore, Shake Canyon was named after the shakes cut from Arizona cypress there (Kellogg, 1902a:17).

Fire

Fire scar data indicate that the frequency of wildfires has decreased in the Chiricahuas since the end of the 19th century (Swetnam et al., 1989, 1992), probably as a result of livestock grazing and fire exclusion. In fact, overgrazing was once encouraged by early forest managers as a means to curtail fires in southeastern Arizona (Leopold, 1924). Even Kellogg (1902a:10) advocated fire exclusion in 1902:

"I do not know of a single region in these mountains that has not been burned over at least once during the last 20 or 30 years, and repeated fires have occurred in many places. The original forest was entirely destroyed on the south side of Cave Creek some years ago, and as yet only a small amount of aspen (*Populus tremuloides*) has come in. On the north side of Fly's Peak, 17 years ago, a dense forest of spruce and fir (*Pseudotsuga menziesii* and *Abies* spp.) was entirely ruined. This region contains much more aspen and the spruce is gradually coming back. Those are the worst old burns in the mountains; but many surface fires, while not killing the larger trees, have scarred them and checked their growth, as well as ruining the forest cover and the reproduction."

Kellogg (1902a:5,10) also noted that frequent fires in the range had negatively affected timber quality. Before the 20th century, most fires were surface fires, and early Anglo-Americans ranchers supposedly ignited fires in the forest litter and meadows to encourage growth of palatable grasses (Russell, 1982).

The catastrophic fire of June 1994, which started on Rattlesnake Peak, eventually burned more than 27,000 acres. This was the largest fire in the Chiricahuas since 1917 when a fire burned more than 22,000 acres (Cooperider and Hussey, 1924:53). The increase of biomass because of fire suppression management since 1900 probably led to these catastrophic fires (Arizona Daily Star, August 14, 1994; April 16, 1995). Probably the greatest ecological change in the Chiricahuas since the advent of large-scale livestock ranching has been the change in the fire regime from frequent small surface fires to occasional large crown fires.

Livestock Grazing

Although cattle probably grazed parts of the Chiricahuas during the early 18th century when Spanish and Mexican land grants for livestock grazing were established in nearby areas, major livestock grazing of the range did not occur until 1878 or 1879, when Anglo-American ranchers moved into the area. By 1879 Brannick Riggs had located his ranch in lower Bonito Canyon and the White brothers had their ranch near West Turkey Creek (Rockfellow, 1955). The White brothers later formed the Chiricahua Cattle Company (Wilson, 1987:353). By 1880, according to the Arizona Daily Star (January 20, 1880), all of the lower canyons in the Chiricahuas were "settled up" and the lower slopes of the range were covered by nutritious grasses. Robert's map in 1869 shows extensive grass all along the western slopes of the range in areas now covered largely by mesquite and acacia (*Acacia* spp.) (Robert 1869).

Before the drought of 1891-1893, when 50 to 75 percent of southeastern Arizona's cattle perished (Cameron, 1896), the Chiricahua Cattle Company had 30,000 cattle grazing in the Chiricahuas and Sulphur Springs Valley (Alverson, n.d.:1), Angora goats ranged in Rucker Canyon (Gray, 1940:74), and 20,000 sheep were pastured in the grasslands and meadows of the range (Arizona Daily Star, March 20, 1892).

A range appraisal for the Chiricahuas, done 22 years after the Kellogg report, yields a clear picture of range conditions in 1902. According to the appraisal (Cooperider and Hussey, 1924:53), the Chiricahuas were heavily grazed at the turn of the century by cattle, sheep and goats, and although sheep and goats were supposedly prohibited from the reserve after 1902, goats were still grazed in the northern parts of the Chiricahuas in 1921. The same report also pointed out that the northern end of the Chiricahuas was never heavily grazed by cattle because it was so rough that the cattle either went wild or "got crippled" (ibid.).

Mining

Mining began in the Chiricahuas in the late 1860s and most of the range was prospected before the Chiricahua Apache Reservation was estabished in 1872 (Keith, 1973:6; Wilson, 1987:293). Nonetheless, little mining was done until the Apache reservation was abandoned in 1876; even then, it was largely confined to the northwestern part of the range in the so-called California or Chiricahua Mining District. Some mining was also carried on in the upper reaches of Pinery Canyon and in Rucker Canyon, but production was insignificant. Keith (1973) points out that the first major strike in the Chiricahuas was near Galeyville in 1880, where between 1881 and 1882, 40 tons of lead, 857 pounds of silver and some copper were produced. Both the Arizona Daily Star (January 12, 1879; December 14, 1880) and the Tombstone Epitaph (December 5, 1880; June 16, 1881) discussed the growth of Galeyville to a population of 600 residents by 1881. By 1883, however, the smelter had closed and the town was abandoned (Barnes, 1935). The Arizona Marble Company mined some claims in 1909 from Nine-Mile Mountain to Whitetail Canyon (Artesian Belt, 1914; Wilson, 1987:300).

Wildlife

Wolves (*Canis lupus*), antelope (*Antilocapra americana mexicana*), Merriam turkey (*Meleagris gallopavo*), grizzly bear (*Ursus arctos*) and black-tailed prairie dogs (*Cynomys ludovicianus*) and possibly bighorn sheep (*Ovis canadensis*) and beaver (*Castor canadensis*) occurred in the Chiricahuas before the turn of the century (Cockrum, 1960; Davis, 1982; Brown, 1983, 1985). All were exterminated; only the turkey has been reintroduced. Cooperider and Hussey (1924:53) reported that lions (*Felis concolor*) and wolves had been largely cleared out of the range by 1924 and black bear (*Euarctos americanus*), which had been hunted to near extinction, had rebounded. Gray (1940:167) and Parsons (1939:227) noted that market hunters, who sold turkey, venison, and bear meat from the Chiricahuas in Tombstone and other nearby towns in the 1880s, wiped out most of the game.

Conclusions

Kellogg (1902a:11) concluded that the Chiricahuas should be established as a forest reserve:

"There is no doubt that in furnishing a perpetual supply of timber, even though small in quantity, and in improving water conditions, a reserve would be of much benefit to the surrounding country. Under Forest Reserve management, enough cutting would be allowed without injury to the forest to greatly reduce the local price of lumber. When no lumber is being sawed in the locality, the dealers always charge a very high price for that which is shipped in."

On July 30, 1902 the Chiricahua Forest Reserve was established by Presidential Proclamation.

Many ecologists believe that historic land uses are of minor significance in explaining the evolution of the wild landscapes of southeastern Arizona and they usually select some natural environmental factor, such as climate to explain recent vegetation changes. For the most part, they are unaware of how historic land uses have affected southeastern Arizona's landscapes in the past 120 years. Potter's map lends a quantifiable dimension to the impact of at least one historic land use in the Chiricahuas — logging — and points out that even in 1902 the Chiricahuas were not pristine.

The ways in which the vegetation of the Chiricahuas has changed as a result of historic disturbances are not known. Students of southeastern Arizona's wild landscapes must understand that in the late 19th and early 20th centuries most of the region suffered from the same types of land-use degradation that affect many Third World arid environments today. Most of the Chiricahuas had been affected by grazing, logging, and fuelwood cutting, when Potter and Kellogg did their survey in 1902. At present, we have little idea what the Chiricahuas would have looked like had they not been logged or grazed, had the fire regime not been manipulated, or had Forest Service management not occurred. Nevertheless, it is clear from the Potter map that the Chiricahuas were not without significant human disturbance in 1902.

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