

Aspen Fencing in Northern Arizona: A 15-Year Perspective

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Abstract—Aspen clearcuts in the 1960s and 1970s on the Peaks Ranger District of the Coconino National Forest in northern Arizona failed to regenerate successfully because of browsing primarily by elk. Since 1985, over 400 acres have been successfully regenerated using fencing of various designs to exclude elk. The expense and visual impact of establishing and maintaining over 20 miles of fence along with continued damage to aspen greater than 3.0 inches d.b.h. outside the fenced areas have resulted in the Arizona Game and Fish Department increasing the elk hunting permits by 400% in an effort to reduce the elk herd in the area of the San Francisco Peaks.

The Coconino National Forest, located in northern Arizona, encompasses 1.5 million acres of forested land consisting mostly of ponderosa pine (*Pinus ponderosa*) and pinyon pine-juniper (*Pinus edulis-Juniperus* spp.) woodland. Aspen (*Populus tremuloides*) comprises 10,500 acres (less than 1%) of the forest. The forest around the San Francisco Peaks contains 98% of the aspen on the Coconino. In most cases aspen is a minor component of extensive ponderosa pine and mixed conifer forests. Pure aspen stands are usually small and surrounded by encroaching conifers, especially on warmer, drier sites. Many of these isolated stands consist of a single genotype (clone) that is critical to the forest ecosystem. Often, these isolated clones occur in environments where competition for moisture and light, or pressure from browsing animals, severely stress aspen's ability to persist in the landscape. These forests are heavily used during the summer and winter by recreationists and highly valued during the fall leaf change by the public from around the state. Public interest in the scenic beauty of aspen and the limited quantity of aspen on the forest have focused management objectives on perpetuating these aspen stands while maintaining mature aspen in our landscapes.

While the Forest Service manages the vegetation, the Arizona Department of Game and Fish manages the wildlife populations. The original population of Merriam elk (*Cervus elaphus merriami*) went extinct during the period of market hunting and agriculture at the end of the 19th century. Elk numbered only 90,000 across North America in 1922, and of these, 40,000 were in Yellowstone Park. The Park's herds became a reservoir for breeding elk. Between 1912 and 1967, more than 13,500 elk were transplanted from the Park. In February 1913, 83 elk were released in Cabin Draw near Chevelon Creek in east-central Arizona. From these transplants, the Arizona elk population has grown to nearly 35,000 animals. This population is very important to the economy of northern Arizona through revenue generated from hunting and tourism.

In the 1960s, the Peaks Ranger District began regenerating aspen using public fuelwood clearcuts. A total of 254 acres were treated with cattle fencing as the only protection. Nearly all of these areas failed as repeated browsing prevented the successful regeneration of the aspen (figure 1).

In 1985, a one-half acre portion of one of the earlier clearcuts was fenced with salvaged material to exclude deer and elk. The fencing was stapled to live

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Figure 1—Failed aspen fuelwood treatment.



trees surrounding a clearcut that had been cut several years earlier. The suckers were heavily browsed, but existing root reserves were sufficient to regenerate the area once the fence had removed the browsing pressure.

Since 1986, approximately 400 acres have been treated and protected with fencing. This required construction of over 20 miles of fence. Over the years, several different designs have been tried in an effort to find the best balance between durability and cost. The majority of the fences consist of two 39 inch panels of 14-gauge field fence overlapped and joined with hog-rings to create a 6½-foot fence. The fence is stretched between existing trees, especially at the corners, to avoid building braces. Where trees are used to support the fence, the fencing is stapled to 8-foot wooden 2 x 2s wired to the tree to avoid stapling directly to the trees. Eight-foot steel T-posts are placed at 22-foot intervals between trees to provide additional support. These fences were constructed at a cost of \$6,000/mile evenly split between labor and materials. The current fence design utilizes a single 47 inch panel of 14-gauge field fence together with three strands of high-tensile wire instead of two 39-inch panels. The first strand of high-tensile wire is positioned 6 inches off the ground with another 6 inches to the bottom of the field fence panel. The second and third high-tensile strands are positioned above the top of the field fence panel at 6–12 inch intervals (figure 2).

The high-tensile wire is stretched with wire strainers between the same trees that are used to stretch the field fence. Steel posts and wooden 2 x 2s are placed the same as the previous design. Eliminating the second field fence panel reduces the cost of materials by \$1,200/mile and saves an additional \$1,000/mile in labor. We also built several solar powered electric fences using ½-inch polytape and 9-strand polywire in a double fence design. Two areas of 35 acres were fenced using this design. This promised a 60% savings in material and labor costs, but the design was ultimately rejected because of extremely high maintenance cost and low durability.

Funds for the fencing projects came from three sources. The fuelwood clearcuts generated sufficient revenue from the sale of aspen fuelwood and pine sawtimber greater than 12 inches d.b.h. to pay for the material and labor costs

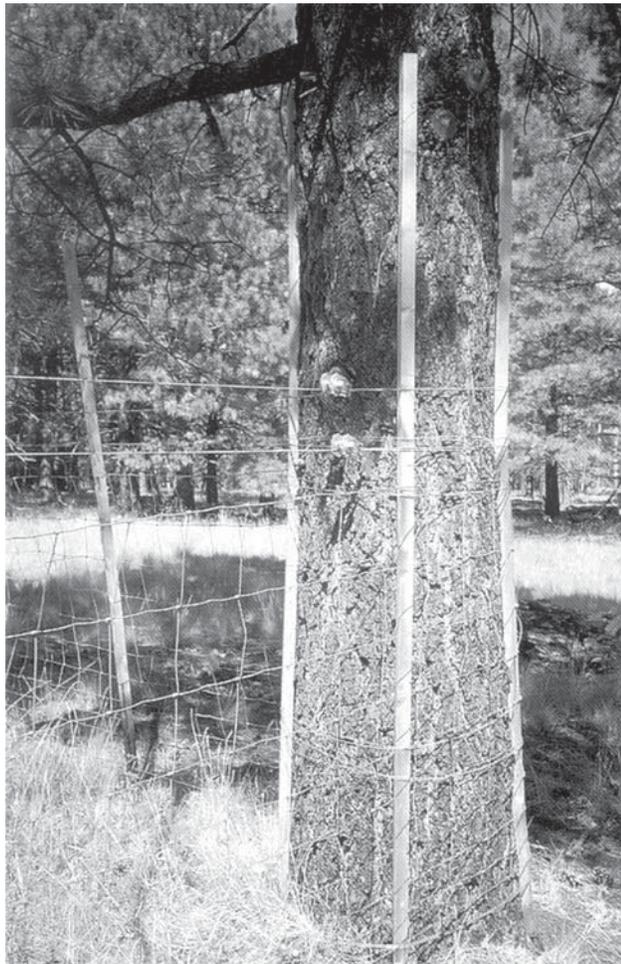


Figure 2—Current fence design.

of the fences. The areas were between 16 and 40 acres. These were handled under our small sales program and involved quantities less than 50,000 board feet. Numerous small clones less than 5 acres in size were treated as part of a larger timber sale that removed the competing pine and provided Knutson-Vandenberg (K-V) funds to pay for the fences. Several individual small clones were fenced with material donated by partners (i.e., Coconino Sportsman, Rocky Mountain Elk Foundation, and Arizona Game and Fish Department) and constructed with volunteer labor (Elderhostel International, Coconino County Probation Crew, Americorps, and Youth Conservation Corps).

The original prescription required that the fences be removed after 70% of the aspen stems were over 12 feet tall and beyond the reach of the elk. It was anticipated that 3 to 5 years would be needed to reach these conditions. A 22-acre aspen stand clearcut in 1986 had the fence removed in October 1991 with 20,000 stems per acre and dominant stems 12–15 feet tall after five growing seasons. By October 1992, most of the stems in one clone had been severely damaged by elk. Damage was caused by biting and breaking the stems at a height of 5 feet, stripping the terminal foliage, and infecting the residual stem. This clone was almost completely gone by October 1994 (figure 3).

Although other clones also suffered extensive browsing, stems larger than 1.5 inches d.b.h. were too large for animals to break. Unfortunately, elk are stripping the bark from the larger stems, resulting in infection and/or girdling. Current estimates are 10 to 15 years before fence removal.

Figure 3—Severe elk damage.



With fences between 5 and 50 acres in size, some amount of damage can be expected during the first couple of months as elk and deer crash into the fence until they learn to travel around it. On fences under 5 acres, little or no damage occurs as animals can easily move around the fences. The one fence greater than 50 acres is 130 acres and 2 miles in length. With the exception of the solar powered electric fences, this fence has experienced the highest amount of damage from elk, tree tops falling on the fence, runoff washing out sections of the fence, and woodcutters breaking the fence to access the fuelwood. The fence bisects several travel corridors and the animals have persisted in going over or through the fence. A different design consisting of two smaller fences with room to travel in-between would be a better solution. The addition, 1 year ago, of two strands of high tensile wire at the top of the fence has greatly reduced the impacts from elk.

In the summer of 1996, about 16,000 acres burned north of the San Francisco Peaks. About 1,200 of these acres contained aspen. In spite of a reduction of the elk herd in the Unit by about 30% (2,500 to 1,870) over the last 4 years, elk made heavy use of most aspen suckers that grew after the burns of 1996. These aspen stands have a 3- to 5-year period to become established before exhausting the root reserves. The fire that produced the new aspen suckers burned in the San Francisco Peaks area, Game Management Unit 7 East. The Arizona Game and Fish Department proposed to significantly reduce the elk herds in Unit 7 for a period of 10 to 15 years. This effort should enable aspen suckers resulting from the wildfire of 1996 to survive and grow sufficiently to withstand the browsing of elk. It is also expected that there will be a decline in the barking and browsing damage to the larger established aspen trees.