

HISTORICAL SILVICULTURAL TREATMENTS

Early Silvicultural Story

Modified from Gruell and others (1982)

The Lick Creek timber sale of 1906 attracted much attention because it was the first large National Forest timber sale (2,135 acres) in the ponderosa pine cover type in the USDA Forest Service Northern Region. A total of 37,600,000 board feet (bd ft) was cut (White 1924).

Professional forestry and the USDA Forest Service were in their infancy in the United States and there was little research or experience on which to base silvicultural prescriptions for any of our forest cover types. Ponderosa pine was, and continues to be, a high-value timber species.

Frequent, low-intensity fires had favored ponderosa pine and had suppressed its more shade-tolerant associates (in this area, primarily Douglas-fir). Douglas-fir was economically less desirable than the large old ponderosa pine, so silvicultural practices were aimed at perpetuating pine and reducing the fir component. Autecological requirements of all species were just beginning to be understood; therefore, silvicultural treatments were based on limited knowledge.

Harvest Cutting Treatments, 1907 to 1911

James P. Menakis

The virgin stand contained chiefly medium and large ponderosa pine (fig. 2). Douglas-fir of inferior wood quality made up about 10 percent of the stand volume. A small amount of grand fir and spruce was included in the Douglas-fir volume. Total volume of sawtimber (10 inches diameter at breast height, dbh, and larger) of all species averaged 20,810 bd ft per acre. Tree ages ranged from 200 to 400 years, with potential site indexes for uncrowded trees averaging about 52 to 55 ft tall at 50 years for ponderosa pine and Douglas-fir (Pfister and others 1977).

Although original descriptions of the Lick Creek cuttings did not classify the silvicultural system, it could best be described as a selective cutting. Timber

marking practices in this early cutting followed these criteria (Gruell and others 1982):

1. Leave 30 percent of the ponderosa pine volume for a future harvest 75 years later.
2. Leave ponderosa pine trees with good crown forms, or large trees if they were the best or only tree available.
3. Cut all Douglas-fir over 10 inches dbh.
4. Cut Douglas-fir heavily infected with witch's broom (caused by dwarf mistletoe).
5. Thin groups of small diameter ponderosa pine (this was later dropped because of dissatisfaction with the quality of the leave trees).

After the marking had started, Gifford Pinchot (first Chief of the Forest Service) inspected the site. Elers Koch, Bitterroot Forest Supervisor, described Pinchot's reaction to the marking. Pinchot "approved of most of what we had done, but felt we had been cutting too heavily, and made us go back and mark out some of the blazes on doubtful trees with red paint" (Koch 1998).

Actual cutting practices varied considerably during the 1907 to 1911 period (Gruell and others 1982). In a limited area, everything over 19 inches dbh was cut. Size class distribution of the residual stand was reported by White (1924) for the full cutting area and Menakis (1994) for 250 acres in the drier habitat types (table 2). The original stand contained an average of

Table 2—Estimated size class distribution of the residual stand by White (1924) and Menakis (1994).

Size class	White (1924)	Menakis (1994)
(inches)	- - - Number of trees per acre - - -	
2 to 4	—	14
6 to 8	2	10
10 to 12	6	11
14 to 16	6	7
18 to 20	5	6
22 to 24	3	3
26 to 30	2	2
32+	1	0

about 50 trees per acre (White 1924), with ponderosa pine representing about 87 percent and Douglas-fir about 13 percent in the drier habitat types (fig. 6) (Menakis 1994). Of these, an average of 25 trees per acre were cut in the 1907 to 1911 period (White 1924).

Estimates from approximately 250 acres of the original sale area indicate that about 22 ponderosa pine and three Douglas-fir per acre were cut (fig. 7). Average dbh of the pine cut was 23 inches, and for Douglas-fir, 20 inches (Menakis 1994). Most of the

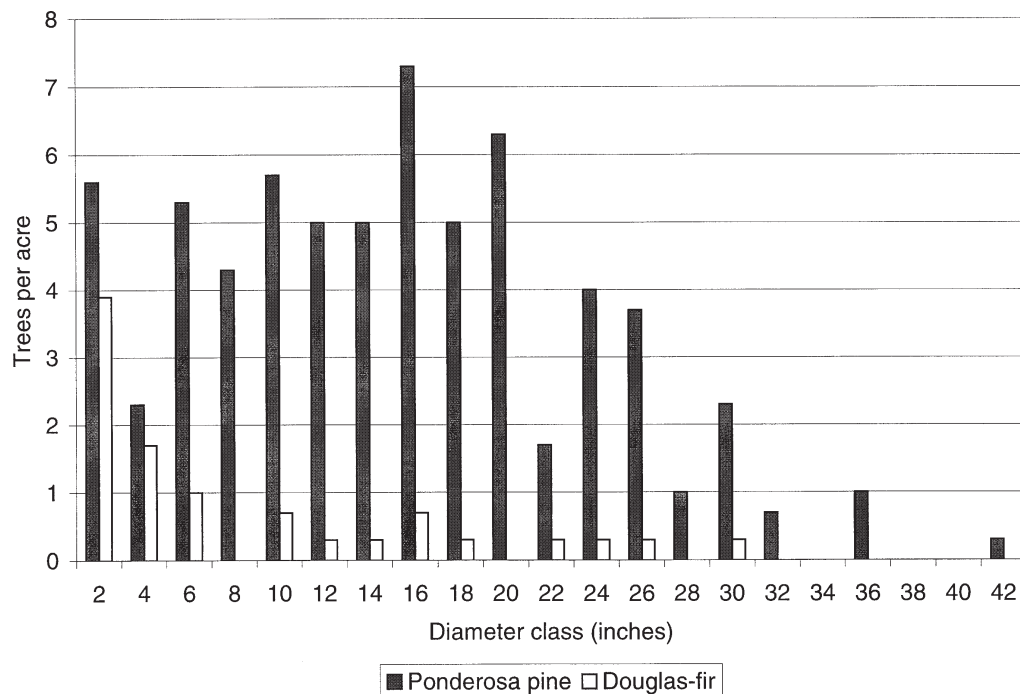


Figure 6—Estimated average diameter distribution for dry habitat type groups at Lick Creek in 1906, prior to logging (Menakis 1994).

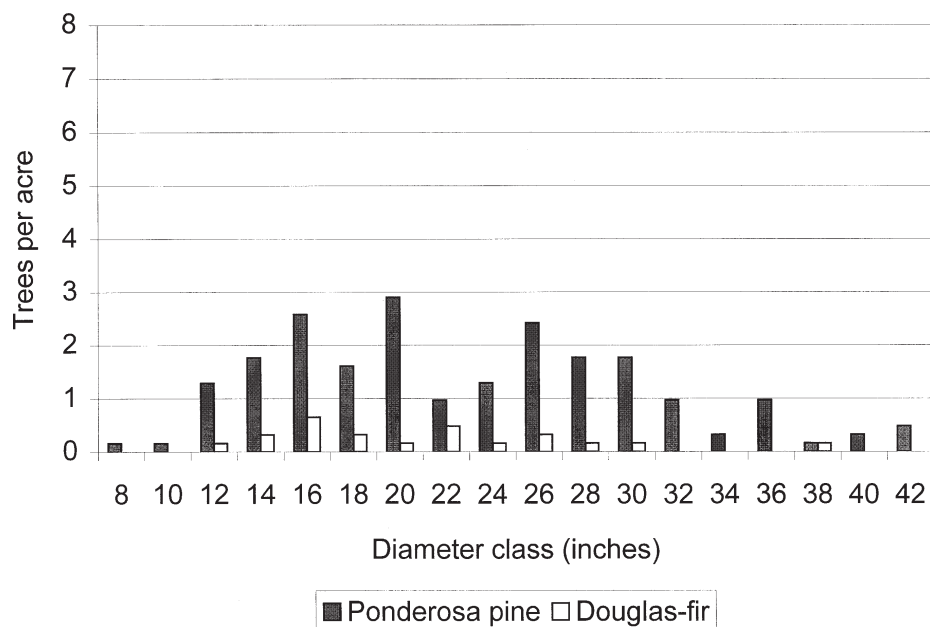


Figure 7—Estimated average diameter distribution of trees cut during the 1906 Lick Creek timber sale (Menakis 1994).

trees harvested were larger than the average of trees as a whole, so basal area remaining after logging averaged only 37 percent of the original 121 ft² per acre (White 1924), with ponderosa pine accounting for 97 percent of the remaining basal area in the drier habitat types (Menakis 1994).

Differences between White's and Menakis' diameter distributions could have resulted from different sizes and locations of the surveys, as well as different methodologies used. Boe (1948) observed that the residual basal area and volumes varied greatly over the cutover area, with ranges from about 5 to 50 percent of the original stand.

Of the 2,135 acres cut in the 1907 to 1911 period, 1,916 were of the ponderosa pine cover type and 219 were Douglas-fir, spruce, and grand fir (Gruell and others 1982). The potential vegetation for most of the area and all of the photopoints are within Douglas-fir habitat types (Pfister and others 1977). A grand fir habitat type, including some spruce trees, occurs in the moist sites along Lick Creek.

In addition to the thinning, an adjacent 320 acres of private land located along the southern borders of the Forest Service Lick Creek sale were clearcut in 1906. The clearcut was not part of the Lick Creek sale, but the land was later acquired by the Forest Service.

Residual Stand Growth Response

Modified from Gruell and others (1982)

An evaluation of the Lick Creek area 35 years after the 1907 to 1911 cutting showed that average stand volume of trees 10 inches dbh and larger had increased from 3,810 bd ft per acre in the residual stand in 1911 to 6,127 per acre in 1946 (Roe 1947a). This amounted to 66 bd ft per acre annual net growth. Fortunately, the residual stands that made up this average varied substantially and provided a basis to evaluate the effect of residual volume capital on subsequent growth. To make these evaluations, Roe (1947a) grouped the 1911 residual volumes into four broad classes averaging 627 residual bd ft per acre, 2,396 per acre, 4,655 per acre, and 9,089 per acre.

Largest net volume increments were made in the heaviest residual stands. Figure 8 shows that average annual increment ranged from 2 bd ft per acre where the reserve stand had averaged 627 bd ft per acre, to 126 bd ft per acre where the reserve stand had averaged 9,089 bd ft per acre. Most growth was made by merchantable-size trees reserved at the time of the

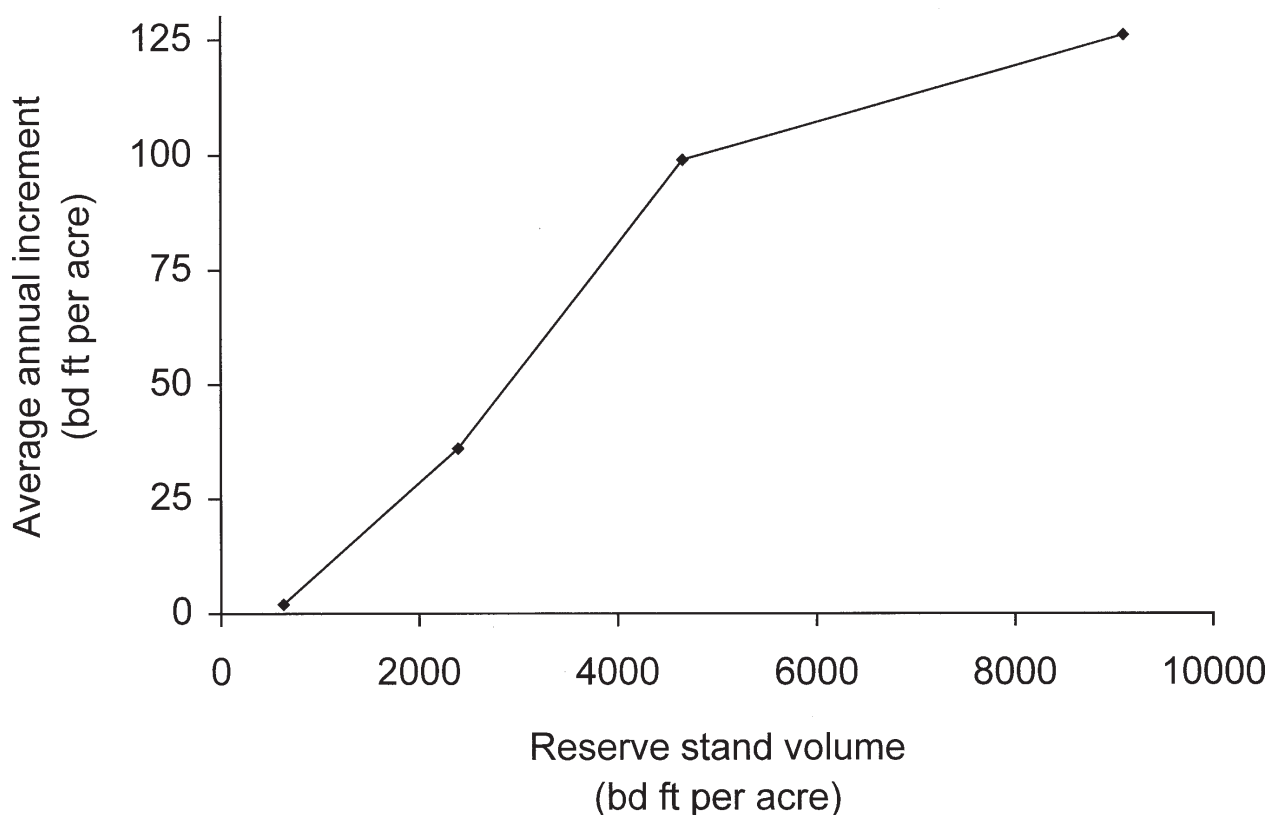


Figure 8—Average annual net volume increment for 35 years following harvest cutting in relation to reserve stand volume (Gruell and others 1982).

initial logging. Although the greatest per acre gains were in the heaviest residual volumes, on a percentage basis the most significant increases were in stands averaging 4,655 bd ft per acre (fig. 9) (Roe 1947b).

In the stands with the light residual volume, Douglas-fir contributed most to the ingrowth (trees less than 10 inches dbh at the time of the initial harvest that exceeded 10 inches dbh at the 35-year measurement). The opposite was true in stands with heavy residuals after the initial cutting. Here, nearly all of the 35-year growth was ponderosa pine 10 inches dbh and larger at the time of initial cutting. Intermediate reserve stand volumes resulted in intermediate response values in relation to both species composition and volume growth. Thus, stand volume capital played a role in evaluating the efficacy of reserving different levels of stand volume.

White (1924) described effects of release on individual ponderosa pine trees. He concluded: "It was noticed that the removal of one or more trees on the north seemed to have as much effect on increased growth as where the removal was on the south. This was so pronounced that the conclusion is reached that root competition in yellow pine stands is fully as important a factor as light."

Volume increment in stands with the heaviest residual volume increased rapidly. It peaked the second 5-year period after logging, remained relatively high for about 20 years, and then gradually declined (Roe 1947b). In stands with lighter residual volumes, the same trends were observed, except that ingrowth accounted for the increased increment growth.

Ingrowth played a relatively small part (in the residual stand growth) over all of the cutover area because there were few understory trees, seedlings, sapling, and poles in 1907. Frequent surface fires precluded survival of most understory trees before that time.

The reserve stand was apparently chosen with a good appreciation of tree vigor. Mortality averaged only 8 to 18 bd ft per acre annually for the 35-year period. No relationship of mortality rates to residual stand volume was detected. White (1924) concluded that most mortality was due to windfall shortly after the cuttings, but a small amount was due to bark beetles. About 90 percent of the wind losses occurred the first 3 years after cutting. Windfall was worst on the eastern and southeastern sides of large openings created by the logging. Western and northwestern winds were responsible for the wind losses.

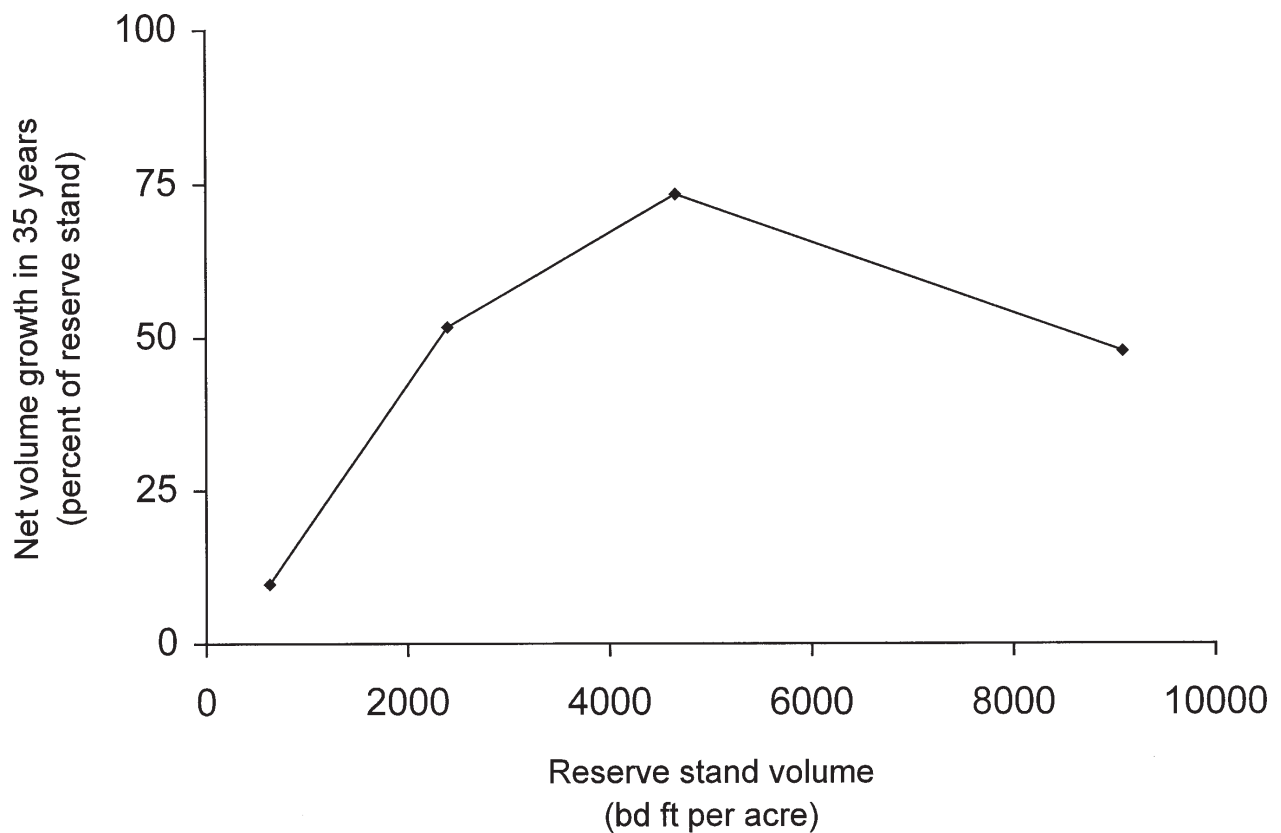


Figure 9— The 35-year net volume growth as a percent of the reserve stand volume (Gruell and others 1982).