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Aspen Harvesting And Reproduction[1]

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Abstract.--When aspen stands are clearcut, regeneration by root suckers is usually prompt and abundant and grows rapidly. Partial cutting results in an inferior replacement stand. Dense young stands thin themselves. Artificial thinning is not advised. Many old stands are too decayed to harvest, and constitute a major management problem. Additional overmature stands, uncut, continually move into the cull category.

INTRODUCTION

A major purpose in harvesting aspen is to perpetuate aspen forest for all of its resource values--esthetics, wildlife habitat, and watershed cover as well as for lumber and fiber. Timely and proper harvest is especially important with aspen because aspen does not store well on the stump. Old aspen trees usually become rotten, and old stands may be succeeded by conifers or possibly by sagebrush and bunchgrass (DeByle 1975). Besides harvesting, the other major means of rejuvenating aspen stands, a severe fire, is hard to get when you want it (Fechner and Barrows 1976). And severe fire may be undesirable in many cases, or even unacceptable, for assorted reasons.

To get healthy fully stocked aspen replacement stands that are esthetically pleasing and will produce good crops of timber requires more than just harvesting however. It requires correct harvesting.

Kim Harper and I are writing a book on the ecology and management of western aspen, with help from Norb DeByle and Gene Wengert. It is a detailed reference work. Here I will simply hit some key features of harvesting and reproduction.

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SITES

Many aspen stands grow on sites that don't have the potential to produce economic crops of lumber or fiber. They may however produce usable crops of browse, autumn color, or fuelwood. The culture of aspen may be desirable on such sites, and the most economical means may be deficit sales for fuelwood or chips.

But in this talk I will consider only sites that can produce sawtimber at reasonable rotation ages. Decay makes long rotations highly questionable on most sites. A site that takes, say, 130 years to produce codominant trees 10 to 12 inches in diameter is seldom a commercial site for aspen because of decay. It may be someday, but not today or tomorrow.

Aspen stands on some sites may be heavily invaded by Engelmann spruce, subalpine fir, white fir or Douglas-fir in various combinations, or occasionally by other conifers. Where such a site produces good crops of aspen it may still be preferable to favor the coniferous understory in management and grow a coniferous forest on the site. But even very careful harvesting of the aspen will cause some gaps in the coniferous understory, and aspen root suckers will then result in at least a light mixture of aspen, occupying gaps. That is desirable. Should wildfire, wind, or beetles ravage the conifers later, the scattered aspen would reforest the site promptly with root suckers, once again to provide a favorable microsite for reestablishment of the conifers.

From here on I will talk about the harvesting of productive sites where aspen is to be retained as the cover type.

HARVESTING

HOW HEAVILY TO CUT

In general, researchers and experienced aspen managers in the Lake States, Canada, and the West favor or even insist on clearcutting aspen, to get regeneration stands with a minimum of gaps and the best possible growth (Weigle and Frothingham 1911; Sampson 1919; Baker 1925; Zehngraff 1947, 1949; Curtis 1948; Sandberg 1951; Perala 1972; Brinkman and Roe 1975).

On the other hand, Steneker (1972) stated that in central Canada, leaving culls was not detrimental to suckering if the culls "do not form a closed canopy." Larson (1959) reported that cutting only 45 percent of an Arizona stand provided full restocking, with sucker height at age 7 not much less than on an adjacent clearcut. That paper may have influenced thinking on how heavily aspen must be cut to get a good replacement stand in the West. However, the much more complete data in the office report do not agree with the publication. On the study block, in contrast to the operation as a whole, partial cutting had reduced stocking much more than 45 percent--actually to less than 15 ft^2 of basal area per acre. That approaches a clearcutting.

A nearby 50-year-old stand had been high-graded, leaving a basal area of 69 ft^2 per acre. Fifteen years later, whatever suckers may have resulted had disappeared (Martin 1965).

Aspen harvests on the San Juan National Forest have been partial cuts, often heavy. Culls and trees too small for the market were left. They were more or less numerous. Suckering often was heavy, but somewhat irregular. Sucker growth was even more irregular. Growth has been good in the open, for these are good sites. Where residual canopy trees were more numerous, the suckers did not grow well. The result is a stand of irregular structure and growth, distinctly inferior to the parent stands.

These young stands would be better, in many cases much better, if the unmerchantable older trees had been felled at the time of logging or right afterward. The felling of unmerchantable trees on new aspen cutovers has been a standard practice on National Forests in the Lake States for many years (Brinkman and Roe 1975).

As a rule of thumb, I suggest that if the residual unmerchantable stand will be as much as 10 ft^2 of basal area per acre, unmerchantable trees should be felled. That is a judgement figure.

Aspen advance regeneration is likely to be of inferior quality. If there are patches of it in the stand, they usually should be destroyed. They are good places to fell tops or rout skidders through.

Curtis (1948) cited a suggestion from Utah that about 60 percent of the stand volume be taken in a first cut, accelerating growth in the smaller canopy trees, which would be cut about 10 years later when they had grown larger. Something much like that was done in a Minnesota experiment. Variable suckering resulted from the partial cuttings. Sucker growth was inferior to that on an adjacent clearcut. The residual stands were completely removed 6 years later. The suckers resulting from the final cut were suppressed by the poor suckers from the first cut. The replacement stands were the inferior result of the first cut--poor stands on good sites.

A poor stand on a good site is not what we want. We have too many of those already.

SKIDDING

Heavy equipment running all over the place can be bad news. This is particularly obvious on sites where a stand of mixed conifers has been heavily cut and the slash bulldozed. On such areas, even where aspens were numerous in the overstory, suckering is often very patchy--largely absent where traffic was heaviest. There may be very few or no suckers on and around the sites of slash piles or log landings.

Almost all aspen suckers arise from roots within a few inches of the surface (Sandberg 1951). Jammer skidding and heavy tractor traffic tear up a lot of these shallow roots, and poor restocking can result. Skidders can move around freely to hook up with no harm. But once they have their load they should use established trails repeatedly instead of bee-lining for the landing.

This may sound peculiar to some of you who are aware that disking was at one time recommended in the Lake States to stimulate suckering (Zehngraff 1946, 1949; Zillgitt 1951). Stimulation of suckering probably resulted from destruction of competing hazel and mountain maple brush to a large extent. Disking also disrupted the apical dominance of remaining unmerchantable trees.

This too should have helped suckering (Zehngraff 1949). Development of the regenera-

tion stands after disking was not good however, and disking is no longer recommended (Perala 1972, Brinkman and Roe 1975).

THE SUCKER STAND

Aspen sucker stands on a clearcut or burn can look terribly overstocked. Actually, 20 or 30 thousand suckers per acre does not seem excessive at all, and there is no evidence that even 100,000 are too many to start with. Studies in Utah and Arizona (Sampson 1919, Baker 1925, Smith et al. 1972, Jones 1975, Jones and Trujillo 1975) as well as in Michigan (Graham et al. 1963) and Canada (Pollard 1971) indicate that early natural thinning is heavy and effective. The least vigorous suckers die during the first year or two. This first thinning reduces sucker clumps to one or two dominant sprouts. Many other suckers are overtopped soon afterward and die within a few years. Four years after clearcutting on some Arizona plots, about 40 percent of the recognizable suckers had died, leaving about 15,700 survivors per acre. About 40 percent of the survivors were overtopped. As stands continue to develop there is a constant dropping out of canopy trees into the overtopped class, and periodic die-offs of overtopped trees.

Dominants in the sucker stand commonly measure 5-10 feet tall 4 years after clearcutting in the West (Smith et al. 1972; Jones 1967a, 1975; Jones and Trujillo 1975).

During the first few years there are continuous losses of suckers to browsing by deer and elk. In heavily stocked sucker stands these losses are of little consequence, even if they number a few thousand per acre (Smith et al. 1972, Jones 1975). Heavy stands provide an adequate buffer unless sheep use the area the first 3 or 4 years or unless the concentrations of elk or deer are exceptionally high (Sampson 1919, Westell 1956, Packard 1942, Larson 1959, Jones 1967b, Smith et al. 1972). Poorly stocked stands are much more susceptible to being browsed out.

Everything considered, the dense regeneration which normally follows the clearcutting of aspen stands is a plus in providing abundant high-quality forage for big game while providing enough survivors for well-stocked sapling stands. And self thinning avoids stagnation.

None the less, the high density of many aspen regeneration stands has repeatedly spurred interest in thinning. A considerable literature has grown up on precommercial thinning of young aspen (Baker 1925; Zehngraff 1947, 1949; Zasada 1952; Strothmann and Heinselman 1957; Steneker and Jarvis 1966; Sorensen 1968; Schlaegel 1972; Bella 1975). Precommercial thinning has only a minor effect on the diameter growth of dominants, although the growth improvement in codominants is more substantial. Thinning reduces stand volume growth.

Thinned plots in young aspen appear to be growing much better than adjacent unthinned plots, but the appearance is deceiving. The many scrawny overtopped trees on the unthinned plots have a strong visual impact. On the thinned plots one sees only dominants and strong codominants.

Meanwhile thinning increases susceptibility to the poplar borer (Ewan 1960). Sunscald has not been reported from thinned sapling stands. But hypoxylon canker, and in the West other cankers, increase after thinning, because of bark wounding and perhaps in part to increased insect activities (Gruenhagen 1945, Graham and Harrison 1954, Anderson and Anderson 1968, Bagga and Smalley 1969, Hinds 1976).

Having said all this, I will mention a stand in which thinning at age 5 ot 6 is said to have improved volume growth markedly. No particular disease problem resulted. This stand is on the Mancos District of the San Juan National Forest. I hope to measure some plots there shortly.

Compared to precommercial thinning, commercial thinning has the added attraction of partly or entirely paying for itself, and a number of studies have been reported (Bickerstaff 1946, Pike 1953, Heinselman 1954, Martin 1965, Steneker and Jarvis 1966, Schlaegel and Ringold 1971, Hubbard 1972). There have been modest growth increases on the remaining trees. In some cases subsequent veneer production was increased. Trees which would otherwise have been lost were salvaged. Overexposed trunks are subject to sunscald however, and canker infections may increase substantially.

I do not recommend commercial or precommercial thinning. There may be situations where thinning is desirable--where it improves stand values and is safe. If so, we need to define situations and methods before we launch any thinning programs

DECADENT STANDS

Many good aspen sites bear stands that are growing poorly and have litte commercial volume This is because of old age, fire scars, irregular stand structures or other reasons. These stands may be almost completely cull, and in some locales they are the rule.

Yet the sites they occupy have the potential to grow 100-200 cubic feet of usable bole wood per acre per year (Green and Setzer 1974, Jones and Trujillo 1975). Occupied by cull stands they produce no usable wood at all.

These are the real problem stands.

Fortunately, if stocking is not extremely poor, old cull stands have the potential to produce heavy stands of healthy suckers if clearcut or burned (Weigle and Frothingham 1911, Båker 1925, Maini 1968, and personal observation). Uncut, they get worse year by year, and additional stands join their ranks. At the present rate of cutting, cull stands will be a much greater problem in the year 2010 than they are now.

Replacing existing cull stands with young vigorous stands is not a matter of marketing and utilization. It is a matter of purpose, will, and financing. However, harvesting other mature and overmature stands on good sites--stands still merchantable--can reduce recruitment to the cull class. And that is a matter of marketing and utilization.

CONCLUSION

Aspen on good sites is a highly productive forest type, and silviculturally our simplest. It is currently suffering from neglect or poor handling because markets do not support satisfactory silviculture. We have the know-how right now, however, to manage aspen well on good sites when markets allow.

LITERATURE CITED

Anderson, Gerald W., and Ralph L. Anderson.
1968. Relationship between density of quaking aspen and incidence of hypoxylon canker. For. Sci. 14:107-112.

Bagga, Davinderjit, and Eugene B. Smalley.
1969. Factors affecting canker development on Populus tremuloides artificially inoculated with Hypoxylon pruinatum. Can. J. Bot. 47:907-914.

Baker, Frederick S.
1925. Aspen in the central Rocky Mountain region. U.S. Dep. Agric., Bull. 1291, 47 p.

Bella, I. E.
1975. Growth-density relations in young aspen sucker stands. North. For. Res. Cent., Inform. Rep. NOR-X-124, 12 p. Edmonton, Alta., Can.

Bickerstaff, A.
1946. The effect of thinning upon the growth and yield of aspen stands. Dom. For. Serv., Silvic. Res. Note 80, 30 p.

Brinkman, Kenneth A., and Eugene I. Roe.
1975. Quaking aspen: silvics and management in the Lake States. U.S. Dep. Agric., For. Serv., Agric. Handb. 486, 52 p.

Curtis, James D.
1948. Aspen: the utility timber crop of Utah. Timberman 49:56-57, 116.

DeByle, Norbert V.
1975. The aspen ecosystem in the mountainous west--a quest for acceptable management. Paper read at the 26th Annual AIBS Meeting, Corvallis, Ore., Aug. 18, 1975.

Ewan, Herbert G.
1960. The poplar borer in relation to aspen stocking. U.S. Dep. Agric., For. Serv., Lake States For. Exp. Stn., Tech. Note 580, 2 p. St. Paul, Minn.

Fechner, Gilbert H., and Jack S. Barrows.
1976. Aspen stands as wildfire fuel breaks. Eisenhower Consortium Bull. 4, 26 p.

Graham, Samuel A., and Robert P. Harrison.
1954. Insect attacks and hypoxylon infections in aspen. J. For. 52:741-743.

Graham, Samuel A., Robert P. Harrison, Jr., and Casey E. Westell, Jr.
1963. Aspens: phoenix trees of the Great Lakes Region. 272 p. Univ. Mich. Press, Ann Arbor.

Green, Alan W., and Theodore S. Setzer.
1974. The Rocky Mountain timber situation, 1970. USDA For. Serv., Resour. Bull. INT-10, 78 p. Intermt. For. and Range Exp. Stn., Ogden, Utah.

Gruenhagen, R. H.
1945. Hypoxylon pruinatum and its pathogenesis on poplar. Phytopathology 35:72-89.

Heinselman, Miron L.
1954. Thinning from above reduces total yields in medium site aspen. U.S. Dep. Agric. For. Serv., Lake States For. Exp. Stn., Tech. Note 411, 1 p. St. Paul, Minn.

Hinds, Thomas E.
1976. Aspen mortality in Rocky Mountain campgrounds. USDA For. Serv. Res. Pap. RM-164, 20 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Hubbard, John W.
1972. Effects of thinning on growth and yield. Pages 126-130 in Aspen: symposium proceedings. USDA For. Serv., Gen. Tech. Rep. NC-1. North Cent. For. Exp. Stn., St. Paul, Minn.

Jones, John R.
1967a. Aspen site index in the Rocky Mountains. J. For. 65:820-821.

Jones, John R.
1967b. Regeneration of mixed conifer clearcuttings on the Apache National Forest, Arizona. U.S. Forest Service, Res. Note RM-79, 8 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Jones, John R.
1975. Regeneration on an aspen clearcut in Arizona. USDA For. Serv., Res. Note RM-285, 8 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Jones, John R., and David P. Trujillo.
1975. Development of some young aspen stands in Arizona. USDA For. Serv., Res. Pap. RM-151, 11 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Larson, Merlyn M.
1959. Regenerating aspen by suckering in the Southwest. U.S. Dep. Agric., For. Serv., Rocky Mt. For. and Range Exp. Stn., Res. Note 39, 2 p. Fort Collins, Colo.

Maini, J. S.
1968. Silvics and ecology of Populus in Canada. Pages 20-69 in J. S. Maini and J. H. Cayford, Growth and utilization of poplars in Canada. Can. For. Branch, Dep. Publ. 1205.

Martin, E. C.
1965. Growth and change in structure of an aspen stand after a harvest cutting. U.S. For. Serv., Res. Note RM-45, 2 p. Rocky Mt. For. and Range Exp. Stn., Fort Collins, Colo.

Packard, Fred Mallery.
1942. Wildlife and aspen in Rocky Mountain National Park, Colorado. Ecology 23:478-482.

Perala, D. A.
1972. Regeneration: biotic and silvicultural factors. Pages 97-101 in Aspen: symposium proceedings. USDA For. Serv., Gen. Tech. Rep. NC-1. North Cent. For. Exp. Stn., St. Paul, Minn.

Pike, R. T.
1953. Thinning aspen, Duck Mountain Forest Reserve Manitoba. Can. For. Branch, Silvic. Leafl. 89, 3 p.

Pollard, D. F. W.
1971. Mortality and annual changes in distribution of above-ground biomass in an aspen sucker stand. Can. J. For. Res. 1: 262-266.

Sampson, Arthur W.
1919. Effect of grazing upon aspen reproduction. U.S. Dep. Agric., Bull. 741, 29 p.

Sandberg, Dixon.
1951. The regeneration of quaking aspen by root suckering. 172 p. Grad. rep., Sch. of For., Univ. Minn.

Schlaegel, Bryce E.
1972. Growth and yield of managed stands. Pages 109-112 in Aspen: symposium proceedings. USDA For. Serv., Gen. Tech. Rep. NC-1. North Cent. For. Exp. Stn., St. Paul, Minn.

Schlaegel, Bryce E., and Stanley B. Ringold.
1971. Thinning pole-sized aspen has no effect on number of veneer trees or total yield. U.S. For. Serv., Res. Note NC-121, 2 p. North Cent. For. Exp. Stn., St. Paul, Minn.

Smith, Arthur D., Paul A. Lucas, Calvin O. Baker, and George W. Scotter.
1972. The effects of deer and domestic livestock on aspen regeneration in Utah. Utah Div. Wildl. Resour., Publ. 72-1, 32 p.

Sorensen, Ronald W.
1968. Size of aspen crop trees little affected by initial sucker density. U.S. For. Serv., Res. Note NC-51, 4 p. North. Cent. For. Exp. Stn., St. Paul, Minn.

Steneker, G. A.
1972. The growth and management of trembling aspen. Can. For. Serv., North. Res. Cent., For. Rep. 2 (2):5.

Steneker, G. A., and J. M. Jarvis.
1966. Thinning in trembling aspen stands, Manitoba and Saskatchewan. Can. Dep. For., Publ. 1140, 28 p.

Strothmann, Rudolph O., and Miron L. Heinselman.
1957. Five-year results in an aspen sucker density study. U.S. Dep. Agric., For. Serv., Lake States For. Exp. Stn., Tech. Note 490, 2 p. St. Paul, Minn.

Weigle, W. G., and E. H. Frothingham.
1911. The aspens: their growth and management. U.S. Dep. Agric., For. Serv., Bull. 93, 35 p.

Westell, Casey E., Jr.
1956. Ecological relationships between deer and forests in Lower Michigan. Soc. Am. For. Proc. 1955:130-132.

Zasada, Zigmond A.
1952. Does it pay to thin young aspen? J. For. 50:747-748.

Zehngraff, Paul.
1947. Possibilities of managing aspen. U.S. Dep. Agric., For. Serv., Lake States For. Exp. Stn., Lake States Aspen Rep. 21, 23 p. St. Paul, Minn.

Zehngraff, Paul J.
1946. How to improve aspen stocking following summer logging. U.S. Dep. Agric., For. Serv., Lake States For. Exp. Stn., Tech. Note 251, 1 p. St. Paul, Minn.

Zehngraff, Paul J.
1949. Aspen as a forest crop in the Lake States. J. For. 47:555-565.

Zillgitt, W. M.
1951. Disking to increase stocking in aspen stands. U.S. Dep. Agric., For. Serv., Lake States For. Exp. Stn., Tech. Note 357, 1 p. St. Paul, Minn.