

**SWEDISH BRACKECULTIVATOR:
SITE PREPARATION AND SEEDING**
David E. Nelson and Gordon C. Oldford
Forester, Wisconsin Department of Natural Resources, and Forest Management Supervisor, Ontario Ministry of Natural Resources

The Brackecultivator can be used as a site preparation tool for either hand planting or direct seeding. Figure 1 shows the cultivator hitched to an articulated wheeled skidder. A chain drive runs from the rubber tires of the cultivator back to the two scarifying wheels, each of which has four sets of scarifying teeth. The scarifying wheels rotate in the same direction as the rubber tires, but at a slower rate so that the teeth drag in the ground.

Each set of teeth thus produces a scarified spot about 1 ½ feet wide, 2 feet long, and about 6 inches deep. Each pass of the cultivator produces two rows of scarified spots, at roughly 7- by 7-foot spacing. An automatic seeding unit is located behind each scarifying wheel; these units can be used to drop seed in each scarified spot. The seeding units can be removed when treating areas for subsequent hand planting or manual seeding.

Forest cultivators (such as the SFI and Bracke) perform approximately 70 percent of the site preparation in Sweden,¹ yet these cultivators have had little use in the United States and have only recently become popular in Canada. Presently there are about 20 Brackecultivators in use in North America (10 in Ontario),

¹ Appelroth, S. E. 1976. Site preparation in Scandinavia. *Forestry Chronicle*. June:133-136.

The Swedish Brackecultivator is an effective site preparation tool for either hand planting or direct seeding. Advantages are low per-acre cost, low energy consumption, minimal environmental disturbance, and the ability to treat an area immediately after clearcutting.

and a dealership has been established at KBM Forestry Consultants, Thunder Bay, Ontario.

The Bracke is designed to be pulled by a wheeled skidder, though a crawler tractor can be used if necessary. The cultivator is pulled by the winch cable of the skidder, through a specially designed hitch mounted on the skidder. Under difficult conditions (such as a steep slope) the operator can release the winch cable, travel forward, and then winch the cultivator back to the skidder. The cultivator will continue scarifying while it is being winched to the skidder.

Skidder sizes used with the cultivator have varied from 90 to 185 horsepower. On level to rolling sandy sites with light to moderate slash, a 100 horsepower skidder will prepare two to three acres per machine working hour. Large) skidders can achieve production rates as high as four acres per hour, and can handle steeper slopes and heavier slash conditions. Fuel consumption with a 90 to 100 horsepower skidder on level to rolling sites is about 1¼ gallons diesel fuel per acre.

On many sites, the Bracke can be used immediately after clearcutting without prior slash disposal. On one clearcut area in Wisconsin, from which 18 cords per acre of jack pine and aspen pulpwood had been removed, about one eighth of the spots were "missed" because of excessive

slash concentrations. If necessary, prescribed fire can be used to reduce the slash volume and increase the efficiency of the scarification. Stumps and rocks are not a serious problem for the cultivator. If the scarifying teeth strike an immovable object, the rubber drive tire will slip, thus releasing the teeth. Prompt reforestation returns the land to production quickly, and enables the seedlings to get an even start with the competition.

If the areas to be treated are small and scattered, the Bracke is very useful because it can be moved quickly and conveniently by the skidder for distances of 15 miles or more. When the scarifying wheels are raised, the cultivator can be pulled on its rubber tires like a two-wheel trailer.

Scarification with the Bracke causes little environmental disturbance, and can be used on fragile sites where more severe site preparation methods might cause erosion problems. Since individual spots are scarified, there are no continuous channels to collect runoff and start erosion. On dry slopes the scarified spots have the advantage of intercepting and holding runoff for the seedlings.

Direct Seeding

The Brackecultivator can be used as a site preparation method



Figure 1.—*Brackecultivator hitched to a tree skidder. The seeding units are located in the rectangular housings between the teeth of the scarifying wheels. Seed drops from the small hole visible near the bottom of each housing.*

for direct seeding. Actual seeding can be done manually or with the cultivators' automatic seeders. Since seed is only applied to the scarified spots, seed required per acre is much less than with broadcast seeding methods.

Winston and Schneider² conducted hand seeding trials in Ontario on sites scarified with the Brackecultivator. A "moist" upland site and a "very dry" upland site were selected. Jack pine, lodgepole pine, and black spruce were hand seeded, at rates of roughly 5 to 8 seeds per spot for each of the pines, and 9 to 12 seeds per spot for the spruce. At the end of four growing seasons, stocking (percent of spots with seedlings) of each pine species was at least 60 percent on both sites. Spots seeded to black spruce were 37 and 39 percent stocked on the moist and dry sites, respectively.

In Ontario most operational seeding has been with jack pine. Seeding success is usually greatest when seeding is done in the spring or fall, so the usual practice is to use the cultivator's automatic seeders when scarifying during those periods. When summer site preparation is done, the area is often seeded manually the fol-

lowing fall or hand planted the next spring. Seed is usually applied at a rate of about 10 seeds per spot.

Excessive burial of seed is a problem that sometimes occurs when seeding jack pine with the cultivator's automatic seeders. The slumping and washing that occurs after site preparation covers some of the seed, reducing seeding success. Two methods of minimizing this problem are use of packing wheels, or by hand seeding after rains have created a more stabilized condition. Burial of seed would probably be less of a problem with larger seeded species.

Approximately 11,000 acres have been seeded to jack pine with the Brackecultivator in the northern region of Ontario. Seeding success has varied, and is affected by the seeding rate, seeding method, and the number of scarified spots per acre. As a general rule, about one in every two spots will be stocked at the end of the fifth year. Therefore, 1,000 spots per acre can be expected to produce about 50 percent stocking, plus any natural regeneration. Projects that are not up to stocking standards may be upgraded by retreating the area with the Bracke. This can be done with little damage to the existing seedlings.

Very little seeding has been done with species other than jack pine. In Ontario, one area was operationally seeded to black spruce in the fall of 1973, and another area was seeded

with white pine in the fall of 1975. Preliminary observations indicate that the white pine trial was successful, while the black spruce trial was a failure. In Wisconsin, trial areas were seeded with red pine, white pine, and white spruce in the fall of 1977. The seed dispensing unit on the cultivator can be modified to accept seeds of varying sizes, or to change the seeding rate.

² Winston, D. A., and G. Schneider. 1977. Conifer establishment by hand seeding on sites prepared with the Brackecultivator. Report O-X-255, Great Lakes Forest Research Centre, Sault Ste. Marie, Ontario. 11 p.