

Determination of Scalps per Unit Area Produced by the Bracke Scarifier¹

Steven E. Long, Alvin A. Alm, and David L. Eggen

Research assistant and professor, University of Minnesota,
College of Forestry, St. Paul, and president, Woodland
Services, Moose Lake, MN

The Bracke scarifier mechanically produces scalped planting sites. Considerable error can result from small variations in planned distances between passes. The features of the scarifier and its operation are described, and a table that can be used for quick determinations of the distance between passes of the equipment is included. Tree Planters' Notes 37(4):29-30; 1986.

The Bracke scarifier (figure 1) is manufactured in Sweden and is used for approximately 70 percent of the mechanized site preparation done in that country. The equipment has been used in Canada since the early 1970's. Hand seeding in Canada with the device is discussed by Winton and Schneider (3).

The Bracke was introduced to the Lake States in 1978 and its use is described by Cutler (1) and Nelson and Oldford (2). The equipment has gained in popularity as evidenced by its use on approximately 5,000 acres in Minnesota in 1985.

The Bracke is pulled by a variety of forwarders with horsepower ranging from 90 to 210.



Figure 1—The Bracke scarifier.

The device has two scarifying wheels, each of which has four sets of scarifying teeth. The scarifying wheels are chain driven from the rubber tires on the Bracke. The scarifying teeth rotate in the same direction as the tires but turn slower so that they drag in the soil and scarify a microsite or scalp for planting or seeding.

Each pass of the scarifier produces two rows of scalps 6.6 feet (2.0 meters) apart (measured between scalp centers). Within rows, spacings of 6.6 feet (2.0 meters), 8.2 feet (2.5 meters), or 9.8 feet (3.0 meters) between scalps are possible using axle

gears with 19, 17, or 15 teeth, respectively.

The Bracke is a durable machine that can be used in rugged terrain, and on relatively steep slopes, with a winch cable. It prepares intermittent scalps rather than a continuous row. This minimizes erosion because no water travel path is created. An often cited advantage with the equipment is that it lays out the planting site and increases speed and efficiency by providing a pattern that tree planters can follow. This also makes it easier for forest managers to plan and properly allocate the number of trees for planting on a unit area basis.

¹ University of Minnesota Experiment Station Science Journal Series Paper. This paper is based on work supported by the U.S. Department of Agriculture Office of Grants and Program Systems under agreement no. 85-SBIR-8-0066.

Table 1—Scalps per unit area for various axle gear settings (which determine distance between scalp centers) and various distances between passes with the Bracke Scalper

Distance between passes (ft)				Distance between passes (m)			
Gear 19 (6.6 ft)	Gear 17 (8.2 ft)	Gear 15 (9.8 ft)	No. of scalps/acre	Gear 19 (2.0 m)	Gear 17 (2.5 m)	Gear 15 (3.0 m)	No. of scalps/ha
27.3	20.4	15.8	400	8.2	6.1	4.7	1000
23.5	17.4	13.3	450	7.3	5.4	4.1	1100
20.4	14.9	11.3	500	6.5	4.7	3.6	1200
17.9	12.9	9.7	550	5.8	4.2	3.2	1300
15.8	11.3	8.3	600	5.2	3.8	2.8	1400
14.1	9.9	7.1	650	4.7	3.4	2.5	1500
12.6	8.7	6.1	700	4.3	3.0	2.2	1600
11.3	7.7	5.3	750	3.9	2.7	1.9	1700
10.2	6.8	4.5	800	3.6	2.5	1.7	1800
9.2	6.0	3.9	850	3.3	2.2	1.5	1900
8.3	5.3	3.3	900	3.0	2.0	1.3	2000
7.5	4.7	—	950	2.8	1.8	1.2	2100
6.8	4.1	—	1000	2.6	1.7	1.0	2200
6.1	3.6	—	1050	2.4	1.5	—	2300
5.6	3.1	—	1100	2.2	1.3	—	2400
5.0	—	—	1150	2.0	1.2	—	2500
4.5	—	—	1200	1.9	1.1	—	2600
—	—	—	—	1.7	1.0	—	2700
—	—	—	—	1.6	—	—	2800
—	—	—	—	1.5	—	—	2900
—	—	—	—	1.3	—	—	3000

The critical factor in attaining the desired number of scalps or planting spots per unit area is maintaining proper distance between passes. Table 1 provides a quick reference to determine the number of scalps that will be made with varying distances between passes. The data in the table were generated with the following assumptions.

1. A four-toothed mattock wheel is used.

2. The initial pass is made at an edge of the site.
3. Passes are longitudinal and not circular in pattern.
4. Width of a pass is measured from center to center of adjacent scalps.
5. Distance between passes is measured from center to center of scalps on outside rows.
6. All scalps are plantable.

Maintaining the proper distance between passes is difficult under field conditions. However, even small variations in distance between passes can result in considerable error in number of scalps per unit area. For example, a variation of 1 foot between passes results in a difference of about 50 scalps per acre (table 1). Similarly, one-third of a meter variation in distance results in a difference of more than 100 scalps per hectare. In order to calculate the number of trees needed for planting, the operator and landowner should determine the average spacing between passes and assess the number of plantable scalps, which may vary with site conditions.

Literature Cited

1. Cutler, Richard W. Site preparation with the Bracke scarifier. Proceedings, Artificial Regeneration of Conifers in the Upper Great Lakes Region, 1982. Houghton, MI: Michigan Technological University; 1982: 227-229.
2. Nelson, David E.; Oldford, Gordon C. Swedish Bracke cultivator: site preparation and seeding. Tree Planters' Notes 30(3):24-26; 1979.
3. Winston, D.A.; Schneider, G. Conifer establishment by hand seeding on sites prepared with the Bracke cultivator. Rep. 0-X-255. Sault Ste. Marie, ON: Canadian Forestry Service, Great Lakes Forest Research Centre; 1977. 11 p.