



Figure 4—Control switch for the hydraulic power pack angles the rake and raises and lowers the wheels.

For a more positive removal of surface material, the scraping blade is an option (Figure 6). We preferred the action of the rake without the blade, because the rake seemed to roll rocks better than the blade, and there was less bouncing and chance of getting hung up on rocks.

In a third prototype, we have installed ripper teeth into the scraping blade to help loosen compacted tread material, making it easier to rake on subsequent passes when the blade and teeth are raised (Figure 7).

The 6-foot (1.8-m) rake was too wide to maneuver around some of the corners on the Wambaw Cycle Trail. Cam Lockwood thought the width was about right for trails on the Angeles National Forest. The York Rake is also available in a 5-foot (1.5-m) width. This width would have worked better on narrow trails. To keep the benefit of a longer width for road work while allowing the blade to be shortened for the narrow trails, we have hinged each side of the blade in our third prototype.

Parts for the trail rake cost about \$2,250. MTDC shop labor added another \$1,150, for a total prototype cost of about \$3,400.



Figure 5—With two passes, the trail rake could pull in berm material from both sides to the center of the trail or road. Here, the scraping blade is being used.

See page 20 to order engineering construction drawings of the trail rake: *MTDC-968, Trail Rake*. Brian Vachowski or Neal Maier at MTDC can provide additional information regarding alternatives for fabrication, including possible fabrication by MTDC for Forest Service units, depending on MTDC's shop workload.

Deschutes Trail Drag

After experimenting with several different designs over the years, longtime Deschutes National Forest employees Dick Dufourd and Kim Larsen designed a trail drag that grades tread material to the center of the trail. Dick Dufourd reports that it has been working extremely well.

MTDC fabricated another prototype, a wider version of the Deschutes Trail Drag, and tested it in South Carolina. The principal difference was that the MTDC drag was 34 inches (86 cm) wide (Figure 8). For trail work, we found it was a mistake to widen the drag from its original 28 inches (71 cm). The extra width made it more difficult to wind around trees and curves in the trail. This, of course, would be more of a problem on some trails than on others.

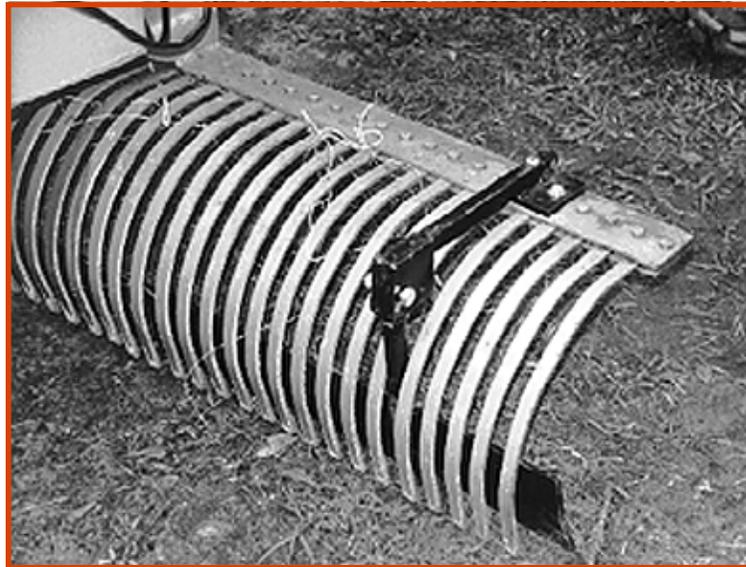


Figure 6—The scraping blade flips up out of the way when not in use.



Figure 7—Ripper teeth attached to the scraping blade in an untested third prototype. The ends of the 6-foot (1.8-m) rake were hinged (center) to narrow the rake for trails and widen it for roads.



Figure 8—MTDC's version of the Deschutes Trail Drag. The original was only 28 inches (71 cm) wide, a better width for trails than this one, which is 34 inches (86 cm) wide. Angled blades on the drag provide a cutting action, pulling in loose tread material to the center of the trail. A straight blade on the rear, and a beavertail metal grate behind the rear wheels, smooth out the graded material.

An electric actuator, controlled by the ATV operator, raises and lowers the wheels to control the amount of soil cutting.

In South Carolina, the Deschutes Drag effectively flattened the washboarded whoop-de-doo. However, the actuator that operates the wheels failed. We were unable to make the number of passes down the trail needed to smooth it completely. The Deschutes National Forest, working in pumice soil, reports that their version of the drag works fine in removing whoop-de-doo, and that usually about three to four passes are needed to grade the trail smooth. They, too, reported actuator problems. Our engineering plans now specify a heavy-duty actuator that should correct the problem.

If you would like to build the Deschutes Trail Drag, contact MTDC and ask for Engineering Drawing *MTDC-969, Deschutes Trail Drag*. Call Brian Vachowski or Neal Maier to talk about fabrication questions.

Parts for the Deschutes Trail Drag cost about \$1,050. Labor is estimated at \$1,400, for a total cost of \$2,450 for our prototype.

Ultra Light Terrain Grader

A commercially available product, the Terra Master ULTG 12-04 Ultra Light Terrain Grader, was the third piece of equipment we evaluated in South Carolina. It is manufactured by The Shop Industrial, Lively, Ontario, Canada (Figure 9).

The Ultra Light Terrain Grader is based on the successful design of the The Shop Industrial's Mogul Master line of snowmobile trail groomers (Figure 10). Its long planing length and grader blades produce a smooth and very flat surface after several passes down the trail. Each rear wheel is independently adjusted manually for the degree of cutting desired, as well as to adjust the slope of the finished grade. Usually, the wheels have to be adjusted only infrequently. Outslope or crowning is possible with this machine.

The Ultra Light Trail Grader is designed to be pulled with a four-wheel drive ATV or similar vehicle. The grader's cutting depth and load are controlled by the operator. A handlebar control switch activates an electric actuator that is mounted between the hitch and main frame of the grader.

The Shop Industrial markets the Ultra Light Terrain Grader for use on ATV and dirt bike trails, bicycle paths, roads, parking lots, and driveways, for landscaping, or for any application where the terrain needs to have a smooth, flat finish.

Ultra Light Terrain Grader Specifications

Width: 4 feet 3 inches (1.3 m)
 Length: 14 feet (4.3 m)
 Height: 25 inches (64 cm)
 Weight: 450 pounds (204 kg)
 Four heat-treated serrated grader blades
 One rear heat-treated straight grader blade
 Eight-inch (20-cm) stroke, 12-volt electric actuator
 Front hitch with 1 $\frac{7}{8}$ -inch (48-mm) trailer ball receiver
 Control switch and wiring harness
 Dual rear wheels with manual "top link" adjusters.