

## GRUBBING YOUNG ONE-SEED JUNIPER WITH THE PIRANHA BLADE

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The "brush piranha"\* is a three-point hitch implement with a v-shaped grubbing blade, and ideally, should be attached to a tractor with sufficient clearance to pass over young trees up to 8 ft in height. The implement has been used widely in Texas on redberry juniper and mesquite. We evaluated the blade for grubbing young trees in a pasture where juniper had been mechanically cleared in the mid 1980s on the NMSU Corona Range and Livestock Research Center. In our test, trees were mostly 2-5 ft in height but some ranged up to 8 ft. Juniper densities ranged from 120 to 220 per acre. The study area had north, south, and level aspects with gentle relief and minimal erosion.

Our test was conducted in summer 2003 within a 20 acre portion of the larger pasture. The area was subdivided into 7 one-acre subplots and data was recorded on fuel used, time spent, and number of trees removed in each subplot. Trees cleared were counted by size class with <1ft, 1-3ft, 3-6ft, and >6ft divisions. For the remaining 13 acres, total time spent and total fuel used was recorded.

The grubbing implement is mounted with the v of the blade facing forward. The operator drives over a target tree, drops the blade to grab the plant at or under the soil surface, and then raises the blade up, pulling out the roots. When trees are sparsely scattered the tractor can continually move forward, without stopping. When encountering dense, isolated groups of small trees (i.e. densities over 400 trees per acre) it is more efficient to start on the outside portion of the patch and work towards the center by backing the implement over trees and then pulling forward to remove. A tractor that is fast in and out of reverse is very beneficial here.

We used a John Deere 4010 industrial tractor with a 6-cylinder diesel engine (rated at 84 hp), and an 8 speed syncro-range transmission. The tractor had rubber tires, and weighed approximately 9,500 lbs. The tractor had no weights, no water in the rear tires, and no sealant in the front tires, but other land and vegetation types may necessitate sealant. The tractor had no trouble even with the larger trees, probably due in part to the increased weight of the industrial components. Engine speed was kept at idle for most of the work (900 rpm), but it was increased to 1200-1400 rpm to cover distance between trees and also momentarily for more power to remove larger trees. Cotter pins were easily pulled out, and so they were replaced with nuts and bolts. Regardless of tractor used, measures should be taken to protect any hoses, wires, etc. underneath and on the sides of the tractor that could potentially be pulled out.

In our test trees were removed at an average of 300 per hour, and time spent grubbing averaged 31 minutes per acre. Fuel used averaged 0.86 gallons per acre in subplots, and about 0.5 gallons per acre in the surrounding 13 acres where plot boundaries were not an issue.

\*Mesquite Brush Piranha. Manufacturer: Harris Fabricating (512)547-6910. Model #132. Pat #US4-895-211

Incorporating labor, fuel, tractor, and implement costs, we calculated costs across the entire 20 acres at \$13.35 per acre. At a lower density (121 trees per acre), costs would be about \$11.36 per acre, and a higher density (220 trees per acre) would run \$19.14 per acre. Fuel costs are not great, so the majority of these costs are labor and equipment related. These figures are calculated using a \$10 per hour operator cost and \$15 per hour equipment cost derived from custom rate tractor rental (<100 hp) for the region.

Some notes about the tree grubbing process follow. As stated before, very dense areas where tree densities approach 400 per acre require special consideration. The method we used of starting at the edge of a patch and backing inwards requires patience and increases operator fatigue from looking backwards.

We found that removing smaller trees (<3 feet in height) presented the most difficulty. During our test the soil was moderately dry, and this combined with high clay content prevented the blade in some areas from easily going beneath the surface. Smaller trees in these circumstances often just fold over when the blade was unable to penetrate the soil surface. Larger trees having a more substantial trunk allow the blade to grab and easily remove trees in any situation. We did have problems with some large trees that stayed in the implement blade. These could sometimes be dislodged by dropping the blade in reverse but in other cases the trees had to be manually removed with a metal pry bar.

We successfully removed >99% of the juniper in the treated area. However, a follow-up treatment is anticipated to remove trees (mostly <1 ft in height) that were undoubtedly missed. Mechanical grubbing of mature one-seed and alligator juniper has been widespread across New Mexico. Work accomplished in previous decades still provides rewards in the form of increased forage production, plant diversity, and better soil and water conservation. However, young junipers are reinvading most areas. Without intervention, a closed canopy stand of juniper will eventually result. Controlling young junipers early can insure that the benefits from previous control are long lasting.

