Hydrologic Response to Mechanical Shredding in a Juniper Woodland in Utah

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Goals

To discover the hydrologic impacts of mechanical shredding

Background

- What: Range managers employ tree reduction methods, such as mechanical shredding (or Bull Hog®), to improve ecological function.
- Why: The method avoids the risks associated with other methods and the resulting mulch residue is thought to protect soils from erosion.
- How Much: More than 10,000 ha shredded in Utah since 2004.
- Questions: remaining concerns regarding the hydrologic effects of tracks and mulch residues that are left behind by the vehicle.

Methods

Location: Onaqui Mountains, UT
- lat 40°12.26’N, long 113°28.17’W
- Slope: 15%
- Aspect: North
- Dominant Vegetation: Utah juniper (pre-treatment), Black sagebrush, Blushbunch wheatgrass, Sandberg’s wheatgrass

Mechanical Shredding (BullHog®)
- Trees shredded in the fall of 2005 using Tigercat M728E Mulchit
- Tracks covered 15% of hill slope

Study Design
- Percent residue cover: Point frame (7 points on 15 transects)
- Microsite comparison: Interspace and bare interspace
- Sediment yield as a function of percent residue cover

With Residue vs without residue

Infiltration and sediment

Does tree residue increase infiltration and decrease sediment yield?

- No runoff from residue-covered plots during dry run.
- Residue for bare interspace significantly (P < 0.05) raised final and minimal infiltration rates.
- Sediment was significantly (P < 0.05) lower with residue cover compared to without on bare interspace.
- Residue bare interspace was similar to grass interspace.

Effects of tracks

Soil resistance

Does tracking result in Compaction?

- Shrub mound, grass interspace, and bare interspace have significantly higher soil resistance on tracked soils compared to untracked soils from 5 to 10 cm.
- Juniper mound showed little difference between tracked and untracked soils.
- For all plots, soil resistance increased as depth increased.

Infiltration and sediment

Does tracking reduce infiltration and increase sediment yield?

- Wet run (soil initially dry) had lower infiltration rate than untracked grass interspace.
- No other significant differences.

Implications

- Mechanical shredding (or Bull Hog®) is a viable method of vegetation control where juniper trees have excluded understory vegetation.
- Site and temporal characteristics should always be considered when applying mechanical treatments as specific soil conditions may be associated with low infiltration.
- During shredding, spread the mulch as much as possible.

Literature Cited


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