

APPENDIX J: RANGELAND MECHANICAL TREATMENT GUIDE

When it has been determined that grazing management systems cannot reach desired goals in a realistic time, mechanical treatments with good grazing management practices can be considered.

The following information will be useful in selecting appropriate land treatments.

Pros and Cons of Rangeland Mechanical Treatment and Fertilization

The following conclusions on rangeland mechanical treatment and fertilization are drawn from: (1) Research; (2) Field observations; and (3) Ranchers' experience.

These treatments are designed to improve livestock grazing, watershed condition, wildlife habitat and recreation. These mechanical treatments result in long-term benefits of 20 years, or more.

Mechanical Treatments

Scalping and Furrowing

Advantages

1. Increases vegetative production, diversity and vigor.

2. Reduces runoff—captures moisture on site.
3. Increases soil moisture available for plant growth.
4. Provides forage during drier years.
5. Provides opportunities for seeding.
6. Improves vegetative ground cover.
7. Improves water quality.

Disadvantages

1. Livestock and wildlife dislike traversing furrows.
2. Extra forage may not be used if animals have another grazing choice.
3. May cause overuse of untreated areas in same pasture.
4. Reduces runoff into reservoirs.
5. Livestock can be trapped when lying down.
6. Equipment is not available to many ranchers.
7. Equipment and maintenance costs are high.
8. Labor intensive; extra care must be taken to lay out furrows on contour.
9. Restricts vehicle use.

Chiseling

Advantages

1. Increases vegetative production, diversity and vigor.
2. Equipment is available to many ranchers.
3. Movement of vehicles, livestock and wildlife are only slightly altered.
4. Increases soil moisture for plant growth.
5. Increases vegetative ground cover.
6. Easy to lay out and complete—exact contour is not necessary.
7. Chiseling equipment is flexible, shovel size, and nature of shank (straight or twisted) can be selected for soil and vegetation conditions.

Disadvantages

1. May be less productive (10-15%) than scalping or furrowing on most sites.

2. May require two passes to reach desired soil and vegetative disturbance, thus costs may be increased.

Prescribed Fire and/or Modified Suppression

Advantages

1. Reduce, control, or eliminate undesirable grasses, trees or shrubs.
2. Controls insects and diseases.
3. Increases desirable grass species.
4. Provide opportunity for reseeding; natural or mechanical.

Disadvantages

1. Increases rates of soil erosion and decreases water quality.
2. Increases soil temperature extremes.
3. Initial loss of vegetative productivity.
4. Requires a minimum of one growing season rest.
5. Reduces soil moisture levels.
6. Limited value on poorly managed, low condition class prairie rangelands of the Northern Great Plains.

Range Fertilization

Advantages

1. Increases vegetative production.
2. Increases nutrition and palatability of forage.
3. Draws animals into areas not ordinarily used.
4. Increases vegetative ground cover reducing runoff and erosion.

Disadvantages

1. Management needs are increased to prevent the following problems:
 - a. Vegetation tends to go to monoculture (favoring most vigorous species).
 - b. Undesirable vegetative species may increase due to overuse of more palatable species.
 - c. Vegetation and soils on small fertilized areas may be damaged due to concentration of animals.
2. Ecological condition may decrease.

Suitability Guide for Rangeland Mechanical Treatments

The following guide has been developed by BLM Soil Scientists, and other specialists, for use on Montana and Dakota public lands.

Mechanical treatments may be considered as an alternative method of increasing vegetative production and improving watershed condition. Treatment feasibility should be considered where grazing management systems cannot reach desired goals in a realistic time.

Factors influencing feasibility of treatments are: (1) soil properties, (2) existing plant community, (3) objectives of treatment, (4) anticipated response from treatment, (5) economics, (6) availability of equipment, (7) conditions that influence operation of equipment.

The objectives of mechanical treatment should be carefully analyzed. It may be desirable to: (1) change existing vegetation (i.e., reduce clubmoss-blue grama dominance) and/or (2) correct a soils problem (i.e., breakup of claypan or compacted layer). Vegetation can be changed to improve range condition or to maximize production. Treatment should be selected to best reach the desired objective.

To use the table, first consider each factor in the left column independent of others, then consider interrelated factors to reach a final rating. These are evaluated in the following table.

Relevant conditions not evaluated in the table must also be considered. For example, kinds of bedrock (i.e., consolidated, fractured, etc.) will influence suitability for mechanical treatments. Aspect will influence the amount of moisture available for plant use.

Treatment effect upon water infiltration and runoff is an important consideration. Many treatments will increase infiltration and reduce runoff; but less runoff may not be desirable in cases where downstream use of water has a higher priority.

Wildlife Considerations

Mechanical treatment of sagebrush land should not be done on sage grouse or sharptail strutting grounds, or on nesting or other special use areas. No vegetative control should be attempted along streams, meadows or secondary drainages (dry and intermittent) unless done as part of a planned meadow rehabilitation effort. Normally, a buffer strip of living sage should be retained on each edge of meadows and drainages. Onsite inspections by wildlife personnel should be made to determine these.

Projects to control sagebrush should be designed in irregular patterns. Design should consider natural terrain, vegetative types, brush density, sage grouse special use areas and

other habitat needs. No large blocks of sagebrush should be treated in occupied sage grouse range, or on antelope or deer winter range.

SUITABILITY GUIDE FOR RANGELAND MECHANICAL TREATMENT¹
Sedimentary Plains, Mountains, and Foothills
10 to 14 Inch PZ

Property Affecting Use	Chiseling or Scalping		Contour Furrowing		Plowing and Seeding	
	Suited	Unsuited	Suited	Unsuited	Suited	Unsuited
Slope	≤15%	>15%	≤15%	>15%	≤8%	>8%
Depth to Bedrock (Paralithic) ²	≥20"	<20"	≥20"	<20"	≥20"	<20"
Calcium Carbonate ³	≤ es	≥ ev	≤ e	≥ es	≤ e	≥ es
Texture of Surface Layer ³	All textures except cos, s, fs, lfs, ls	cos, s, fs, lfs, ls	All textures except cos, s, fs, lfs, ls	cos, s, fs, lfs, ls	All textures except cos, s, fs, lfs, ls	cos, s, fs, lfs, ls
Coarse Fragments in Surface Layer; (vol.)						
Gravel + Cobbles	≤35%	>35%	<35%	>35%	≤35%	>35%
Stones + Boulders	<3%	>3%	≤3%	>3%	<3%	>3%
Salts (mmhos/cm) ³	<12	≥12	<12	≥12	<4	>4
SAR ³	<12	≥12	<12	≥12	<4	>4
Structure of Surface Layer	All except those in unsuited.	Single grained w/coarse texture or >40% clay w/massive or vesicular crust.	All except those in unsuited.	Single grained w/coarse texture or >40% clay w/massive or vesicular crust.	All except those in unsuited.	Single grained w/coarse texture or >40% clay w/massive or vesicular crust.
Flooding Hazard	None to occasional	Frequent	None to occasional	Frequent	None to occasional	Frequent
Drainage Class	All except those in unsuited.	Excessively drained; poor or very poorly drained.	All except those in unsuited.	Excessively drained; poor or very poorly drained.	All except those in unsuited.	Excessively drained; poor or very poorly drained.
Tree Canopy Cover	<10%	>10%	<10%	>10%	0	>0

¹An on-site examination is necessary to determine if the landscape is suited for specific kinds of mechanical treatments, e.g., are shallow soils, steep slopes, or dissection in the landscape as limiting factors.

²Unconsolidated when moist.

³Applies to surface layer (upper 6 to 8 inches).

SUITABILITY GUIDE FOR RANGELAND MECHANICAL TREATMENT¹

**Glaciated Plains
10 to 14 and 15 to 19 Inch PZ**

Property Affecting Use	Chiseling or Scalping		Contour Furrowing		Plowing and Seeding	
	Suited	Unsuited	Suited	Unsuited	Suited	Unsuited
Slope	≤ 15%	> 15%	≤ 15%	> 15%	≤ 15%	< 15%
Depth to Bedrock (Paralithic) ²	≥ 20"	< 20"	≥ 20"	< 20"	≥ 20"	> 20"
Texture of Surface Layer ³	All textures except cos, s, fs, lfs, s	cos, s, fs, lfs, ls	All textures except cos, s, fs, lfs, ls	cos, s, fs, lfs, ls	All textures except cos, s, fs, lfs, ls	cos, s, fs, lfs, ls
Coarse Fragments in Surface Layer; (vol.)						
Gravel + Cobbles	≤ 35%	> 35%	≤ 35%	> 35%	≤ 35%	> 35%
Stones + Boulders	< 3%	> 3%	< 3%	> 3%	< 3%	> 3%
Salts (mmhos/cm) ³	< 12	≥ 12	< 12	≥ 12	< 4	> 4
SAR ³	< 12	≥ 12	< 12	≥ 12	≤ 4	> 4
Structure of Surface Layer	All except those in unsuited.	Single grained w/coarse texture or > 40% clay w/massive or vesicular crust.	All except those in unsuited.	Single grained w/coarse texture or > 40% clay w/massive or vesicular crust.	All except those in unsuited.	Single grained w/coarse texture or > 40% clay w/massive or vesicular crust.
Flooding Hazard	None to occasional	Frequent	None to occasional	Frequent	None to occasional	Frequent
Drainage Class	All except those in unsuited.	Excessively drained; poor or very poorly drained.	All except those in unsuited.	Excessively drained; poor or very poorly drained.	All except those in unsuited.	Excessively drained; poor or very poorly drained.
Tree Canopy Cover	0	> 0	0	> 0	0	> 0

¹An on-site examination is necessary to determine if the landscape is suited for specific kinds of mechanical treatments, e.g., are shallow soils, steep slopes, or dissection in the landscape as limiting factors.

²Unconsolidated when moist.

³Applies to surface layer (upper 6 to 8 inches).

SUITABILITY GUIDE FOR RANGELAND MECHANICAL TREATMENT¹
Sedimentary Plains, Mountains, and Foothills
15 to 19 Inch PZ

Property Affecting Use	Chiseling or Scalping Suited	Chiseling or Scalping Unsited	Contour Furrowing Suited	Contour Furrowing Unsited	Plowing and Seeding Suited	Plowing and Seeding Unsited
Slope	≤15%	>15%	≤15%	>15%	≤15%	>15%
Depth to Bedrock (Paralithic) ²	≥20"	<20"	≥20"	<20"	≥20"	<20"
Calcium Carbonate ³	≤ es	≥ ev	≤ e	≥ es	≤ e	≥ es
Texture of Surface Layer ³	All textures except cos, s, fs, lfs, ls	cos, s, fs, lfs, ls	All textures except cos, s, fs, lfs, ls	cos, s, fs, lfs, ls	All textures except cos, s, fs, lfs, ls	cos, s, fs, lfs, ls
Coarse Fragments in Surface Layer; (vol.)						
Gravel + Cobbles	≤35%	≥35%	≤35%	>35%	≤35%	>35%
Stones + Boulders	<3%	≥3%	<3%	>3%	<3%	>3%
Salts (mmhos/cm) ³	<12	>12	<12	≥12	≤4	>4
SAR ³	<12	>12	<12	≥12	≤4	>4
Structure of Surface Layer	All except those in unsited.	Single grained w/coarse texture or >40% clay w/massive or vesicular crust.	All except those in unsited.	Single grained w/coarse texture or >40% clay w/massive or vesicular crust.	All except those in unsited.	Single grained w/coarse texture or >40% clay w/massive or vesicular crust.
Flooding Hazard	None to occasional	Frequent	None to occasional	Frequent	None to occasional	Frequent
Drainage Class	All except those in unsited.	Excessively drained; poor or very poorly drained.	All except those in unsited.	Excessively drained; poor or very poorly drained.	All except those in unsited.	Excessively drained; poor or very poorly drained.
Tree Canopy Cover	<10%	>10%	<10%	>10%	<10%	>10%

¹An on-site examination is necessary to determine if the landscape is suited for specific kinds of mechanical treatments, e.g., are shallow soils, steep slopes, or dissection in the landscape as limiting factors.

²Unconsolidated when moist.

³Applies to surface layer (upper 6 to 8 inches).

SELECTION OF LAND TREATMENT BY RANGE SITE (Montana BLM – September 1984)

In addition to the interpretation guide on the suitability of soils and related factors for rangeland mechanical treatment, it may be helpful to consider the selection of land treatment according to range sites.

The following table shows the type of treatment (mechanical, burning or chemical) suited to correct common soil or vegetation problems found on certain range sites. Where two or more vegetation or soil problems are present (dense sagebrush on claypan soils) select the treatment that will solve both problems; the claypan problem can't be reduced just by burning sagebrush.

Range sites not shown in the table are generally unsited to mechanical treatments.

Note that vegetative changes can be accomplished with fire, chemicals or a surface layer treatment (i.e., chiseling) but to correct a subsoil problem may require a deeper treatment (i.e., furrowing or ripping).

Additional factors must be considered to determine the final suitability of a site for mechanical treatment. These factors are in the foregoing section, on rating soil properties and related factors. The narrative discusses objectives of a treatment.

Finally, land treatments cannot be considered an alternative to good management practices, but will require a high level of management following the treatments.

GUIDE TO TREATMENT SELECTION BY DOMINANT RANGE SITES¹

Vegetation or Soil Problem	Thin Claypan or Claypan	Clayey	Dense Clay	Overflow ²	Sandy	Silty
Blue grama and/or clubmoss	A4, A2, A1, A3 C1, C3, C2 D1, D2	A3, A2, A1 B1, B3, B2 D1, D2	N/A	A1, A2, A3, A4 D1, D2	A3, A2, A1 D1, D2	A3, A2, A1 B1, B3, B2 D1, D2
Claypan	A4, A2, A1, A3 C1, C3, C2 D1, D2	N/A	N/A	N/A	A4 D1, D2 E	N/A
Surface layer compaction Less than 8" deep	A3, A2, A1 B1, B3 D1	A3, A2, A1 B1, B3, B2 D1, D2	A2, A1 C1, C3	A2, A1, A3 D1	A3, A2, A1 D1, D2	A3, A2, A1 B1, B3, B2 D1, D2
Subsoil compaction below 8" deep	A4 C1, C3 E	A4 C1, C2, C3 D1, D2	N/A	A4 D1	N/A	A4
Dense big sagebrush (30% canopy cover)	E, G D2	E, G D2	E, G	N/A	N/A	E, G D2
Weedy or nearly barren areas	C2 D2, D1	D1, D2 B2, B1 C2 A2, A3, A1	A2, A1 C2	A2, A3 D1, D2	D1, D2	D1, D2 B2 C2
Borrow areas	D1, D2 F	D1, D2 F	D1, D2 F	D1, D2 F	D1, D2 F	D1, D2 F

¹Make choice of treatments based on range condition, planned grazing system, available equipment, desire of permittee and benefit/cost. The order of listed options may be changed based on local conditions.

²Includes loamy and clayey phases of overflow.

NOTE: Fertilizer is a tool that can be used to encourage better livestock distribution in addition to other uses.

These range sites are dominant in the treatment area.

KEY TO TREATMENTS ON RANGELAND

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| <p>A Chiseling at 4-6 inch depth</p> <p>A1 Using straight shanks - 2 operations (last on contour)</p> <p>A2 Using twisted shanks - 2 operations (last on contour)</p> <p>A3 Using 6-inch shovels (sweeps) - 1 operation (on contour)</p> <p>A4 Deep chiseling at 6-10 inch depth - 2 operations (last on contour)</p> <p>B Contour scalping at 2-4 inch depth</p> <p>B1 Interseed with alfalfa</p> <p>B2 Interseed with grass and alfalfa</p> <p>B3 No interseeding</p> | <p>C Contour furrowing at 4-10 inch depth</p> <p>C1 Interseed with alfalfa</p> <p>C2 Interseed with grass and alfalfa</p> <p>C3 No interseeding</p> <p>D Seedbed preparation and seeding</p> <p>D1 Two operations with chisel, then third operation with drill attached.</p> <p>D2 Plow and seed.</p> <p>E Burning</p> <p>F Fertilizing</p> <p>G Chemical</p> |
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Source: BLM, MT-MCDO 9/84