

# UPPER MONUMENT CREEK LANDSCAPE RESTORATION PROJECT

## METHODOLOGY - MECHANIZED TREATMENT FEASIBILITY ANALYSIS

Objective: Perform a spatial analysis based on slope, access, ownership, vegetation composition, structure, and riparian area, to assess the maximum mechanized treatment potential. This analysis is intended to:

- Estimate the maximum available area by level of difficulty ranges.
- Approximate the general location of treatment blocks.
- Estimate the cover type (Biophysical Setting), and S-Class of potential treatment vegetation.

### STEP 1. Calculate Average Slope (% Rise) by Stand

A. Create % rise raster:

- Layer: 'pnf\_10m30mdemnew'

B. Create average slope by stand:

Create table via 'Zonal Statistics as Table'; zone field = 'VEG\_LINK'

- Layer: 'r2veg\_UM\_Post\_Waldo\_012313' – Revised existing vegetation layer (66,211 ac, 6,424 records, including multiple polygons with same stand ID).
  - Output = 4,465 records

C. Join:

- Layer: 'r2veg\_UM\_Post\_Waldo\_012313' with zonal statistics table 'step2\_zonalstats\_standavgslope'
  - Output = 97 of 6,424 records were null. These records were sliver polygons along the project boundary. Total acres of sliver polygons = .03. These records were deleted. (6,327 records, 66,211 ac)

Final layer = 'Step1\_r2veg012313\_avgslope'

### STEP 2. Select Stands Suitable for Ground Based Logging by Average Slope (%)

A. Determine maximum average slope per treated, awarded, and prepped FRLTSC Task Orders.

Results (assessment of 25 TOs)

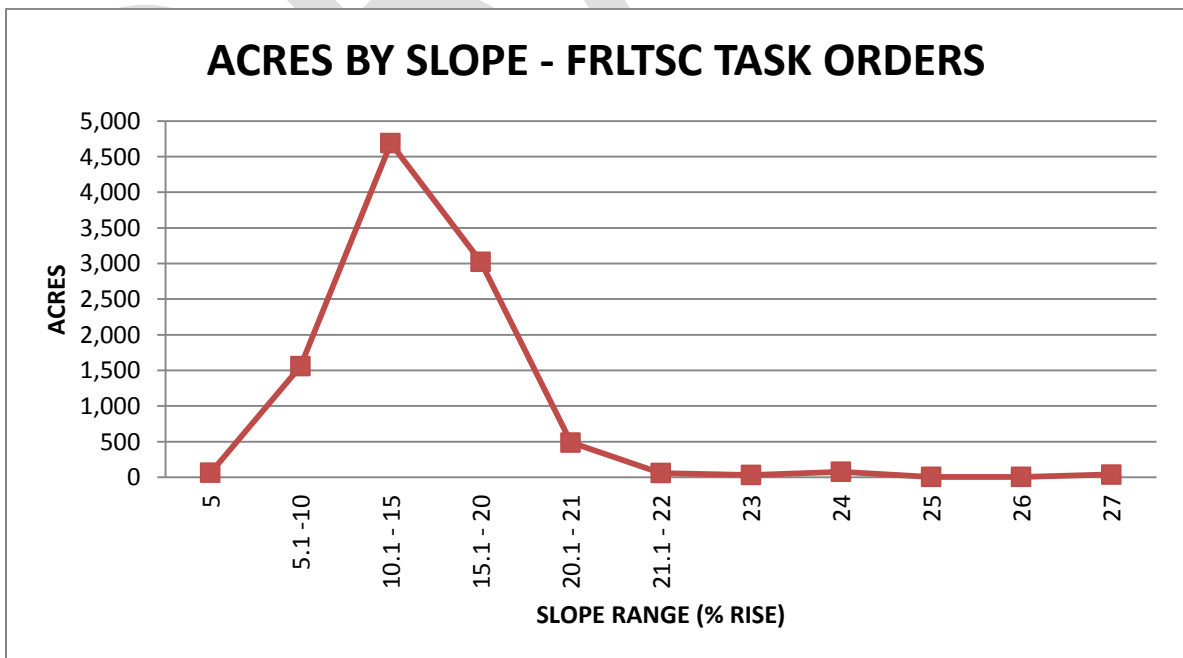
Table 1. FRLTSC Mechanized Thinning Projects by acres and status.

| PROJECT STATUS         | ACRES  |
|------------------------|--------|
| Complete               | 8,541  |
| In Progress            | 704    |
| Inactive (not started) | 548    |
| Prepped (not awarded)  | 260    |
|                        | 10,053 |

Table 2. FRLTSC Projects; unit acres by average slope (% rise).

| % SLOPE   | ACRES  | % of TOTAL AREA |
|-----------|--------|-----------------|
| 5         | 64     | 0.6%            |
| 5.1 -10   | 1,559  | 15.5%           |
| 10.1 - 15 | 4,690  | 46.7%           |
| 15.1 - 20 | 3,027  | 30.1%           |
| 20.1 - 21 | 489    | 4.9%            |
| 21.1 - 22 | 61     | 0.6%            |
| 23        | 33     | 0.3%            |
| 24        | 78     | 0.8%            |
| 25        | 6      | 0.1%            |
| 26        | 6      | 0.1%            |
| 27        | 40     | 0.4%            |
|           | 10,053 | 100.0%          |

Figure 1. FRLTSC Projects; units acres by average slope (% rise).



B. Select stands with average slope < 21%.

**15,376 total acres**

Table 3. Stands with average slope less than or equal to 21% by BioPhysical Setting and S-Class.

| BPS                                     | S-CLASS | ACRES |
|---|---------|-------|
| Dry-Mesic Mixed Conifer UMC             | A       | 223   |
| Dry-Mesic Mixed Conifer UMC             | B       | 2,051 |
| Dry-Mesic Mixed Conifer UMC             | C       | 825   |
| Dry-Mesic Mixed Conifer UMC             | D       | 75    |
| Dry-Mesic Mixed Conifer UMC             | E       | 181   |
| Gambel Oak-Mixed Montane Shrubland UMC  | A       | 13    |
| Gambel Oak-Mixed Montane Shrubland UMC  | B       | 427   |
| Gambel Oak-Mixed Montane Shrubland UMC  | C       | 307   |
| Lodgepole Pine Forest UMC               | B       | 101   |
| Lodgepole Pine Forest UMC               | C       | 36    |
| Lodgepole Pine Forest UMC               | D       | 10    |
| Lodgepole Pine Forest UMC               | E       | 1,456 |
| Mesic Mixed Conifer UMC                 | A       | 109   |
| Mesic Mixed Conifer UMC                 | B       | 1,465 |
| Mesic Mixed Conifer UMC                 | C       | 120   |
| Mesic Mixed Conifer UMC                 | D       | 71    |
| Mesic Mixed Conifer UMC                 | E       | 654   |
| Montane Riparian Systems                | A       | 767   |
| Montane Riparian Systems                | B       | 169   |
| Montane Riparian Systems                | C       | 500   |
| Montane Riparian Systems                | N       | 87    |
| Montane-Subalpine Grassland UMC         | A       | 25    |
| Montane-Subalpine Grassland UMC         | B       | 1,392 |
| Montane-Subalpine Grassland UMC         | U       | 9     |
| NON VEGETATED                           | N       | 214   |
| Ponderosa Pine/Douglas-Fir Woodland UMC | A       | 380   |
| Ponderosa Pine/Douglas-Fir Woodland UMC | B       | 1,038 |
| Ponderosa Pine/Douglas-Fir Woodland UMC | C       | 788   |
| Ponderosa Pine/Douglas-Fir Woodland UMC | D       | 245   |
| Ponderosa Pine/Douglas-Fir Woodland UMC | E       | 732   |
| ROAD AND BUILDINGS DOMINATED            | N       | 226   |
| Unclassified                            | A       | 7     |
| Unclassified                            | C       | 114   |
| WATER                                   | N       | 558   |

15,376

C. Remove Non-Target Vegetation.

The following BPSs / S-Classes were deleted:

| BPS   | ACRES |
|---|-------|
| S-Class A   | 1,518 |
| Gambel Oak-Mixed Montane Shrubland UMC; typically a mastication treatment     | 734   |
| Montane Riparian Systems; typically treated manually                          | 1,401 |
| Montane –Subalpine Grassland UMC  | 756   |
| Non-Vegetated   | 214   |
| Road and Buildings Dominated  | 226   |
| Unclassified; S-Class A only (Unclassified S-Class C was retained (114 acres) | 7     |
| Water   | 558   |
|   | 5,414 |

**Results (acreage balance) = 9,962 acres** (5,414 total acres removed)

**STEP 3. Other Refinements - Remove Outliers**

A. Remove all stands with centroid in the Waldo Canyon Burn, 152 acres

Layer: 'Perimeter20120706\_WaldoCanyon\_FirePerimeter'

B. Remove all stands outside of a ½ mile road buffer, 345 acres

C. Remove outliers:

These are isolated stands, generally less than 5 acres that may require temp roads, stream crossings, a long haul route, and/or not adjacent to or in closed proximity to private property/non-FS ownership, 193 acres.

- This was a manual/ocular operation.
- Approximately 44 acres in the Colorado Roadless Area (north-central portion of the project area) was as removed. These acres appeared to be primarily riparian stringers.

**Results (acreage balance) = 9,272 acres**

#### STEP 4. Other Refinements

##### A. Remove Non-Forest Service Ownership, 954 acres

- For this project area only Non-FS property was classified as private
- The clip operation created sliver polygons. All sliver polygons < 1 acre were deleted (total of 3.2 acres)

**Results (acreage balance) = 8,318 acres**

##### B. Estimate Maximum Riparian Area in Buffers

A 100 foot riparian buffer layer was created to 1) estimate the overall area reduction due to riparian buffering during layout and, 2) to produce a final estimate for feasible ground base logging/mechanized thinning acres by BPS and S-Class. The intent of this operation was not to identify actual on-the-ground riparian buffers or map likely layout grade unit boundaries due to the precision of the forest streams layer.

**Results (acreage balance) = 7,596 acres** (8.7% reduction in operable acres due to riparian areas).

#### STEP 5. Calculate Marginal Mechanized Treatment Area

##### A. Assess lower feasibility for mechanized treatment

Determine next average slope ranges that will contain some feasible mechanized treatment terrain but also contain a high level of area that is suitable for on-site treatment only. Per the average slope assessment performed in Step 2 (See Table 2), the ranges of 21 – 24.9 and 25 – 29.9 % slope were considered the next logical range to assess.

These average slope breaks (0 - 20.9, 21 - 24.9, and 25.0 – 29.9%) were compared to acres by mean stand slope for area within treatment units.

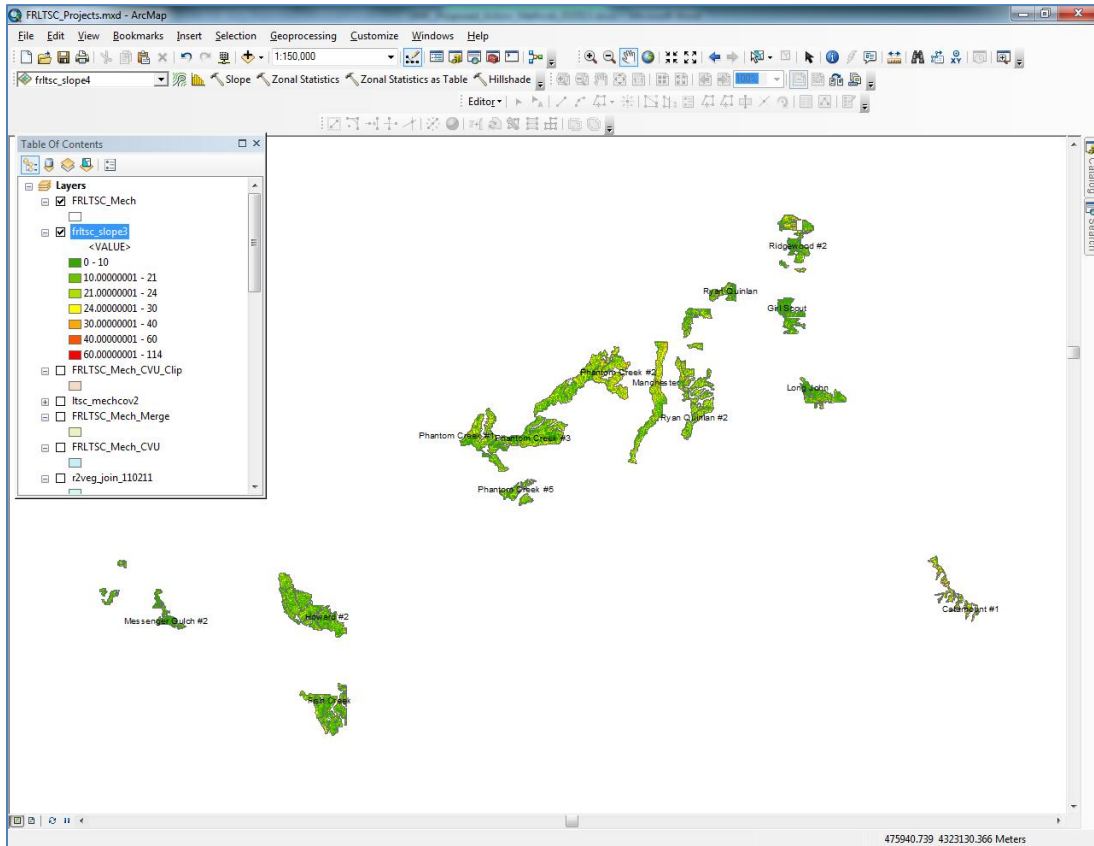
**Results (mechanized treatment units only)**

| SLOPE BREAKS  | ACRES  | %    |
|---------------|--------|------|
| < 21          | 8,565  | 84%  |
| ≥ 21 and < 25 | 1,035  | 10%  |
| ≥ 25 and < 30 | 603    | 6%   |
|               | 10,202 | 100% |

- Final unit grade spatial data was not available for all projects assessed in Step 2. The available layers also includes approximately 181 acres of mastication units for the Ridgewood #2 project (avg. slope for these units was in the 11-15% range).
- Approximately 278 acres (3%) of the total treatment area occurred in stands with an average slope ≥ 30%.

Although areas may be treated via mechanized equipment on steeper slopes, these areas are usually small portions of units containing more gentle terrain. Feasible areas on the steepest terrain are the most difficult to assess per spatial analysis in ArcGIS. A small portion of steep area will likely be identified during field reconnaissance and added to the potential treatment dataset.

Figure 2. Results of slope calculations for projects treated via mechanized logging through the FRLTSC.



B. Select stands with average slope  $\geq 21\%$  and  $< 25\%$ .

**9,314 total acres**

C. Remove Non-Target Vegetation.

The following BPSs / S-Classes were deleted:

| BPS   | ACRES |
|---|-------|
| S-Class A   | 1,155 |
| Gambel Oak-Mixed Montane Shrubland UMC; typically a mastication treatment | 251   |
| Montane Riparian Systems; typically treated manually                      | n/a   |
| Montane –Subalpine Grassland UMC  | 103   |
| Non-Vegetated   | 6     |

1,515

- D. Remove all stands with centroid in the Waldo Canyon Burn, 420 acres
- E. Remove all isolates stands and stands within private property boundaries, 312 acres
- F. Remove outliers, 479 acres

Since a high percentage of this area is estimated to be suitable for on-site treatment including manual work, no deductions was made for riparian areas.

**Results (acreage balance) = 6,588 acres**

- G. Select stands with average slope  $\geq 25\%$  and  $< 29.9\%$ .

**10,227 total acres**

- C. Remove Non-Target Vegetation.

The following BPSs / S-Classes were deleted:

| BPS   | ACRES |
|---|-------|
| S-Class A   | 1,181 |
| Gambel Oak-Mixed Montane Shrubland UMC; typically a mastication treatment | 198   |
| Montane Riparian Systems; typically treated manually                      | n/a   |
| Montane –Subalpine Grassland UMC  | 41    |
| Non-Vegetated   | 8     |

1,428

- D. Remove all stands with centroid in the Waldo Canyon Burn, 543 acres
- E. Remove all isolates stands and stands within private property boundaries, 457 acres
- F. Remove outliers, 1,105 acres

Since a high percentage of this area is estimated to be suitable for on-site treatment including manual work, no deductions was made for riparian areas.

**Results (acreage balance) = 6,694 acres**

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AIR FORCE ACADEMY

Feasible Mechanized

Start at Step 2.

CVU layer does not cover all of AFA property (eastern parcel).

Clip stands with avg. slope < 21% to AFA ownership 'Step2b\_r2veg012313\_avgslope\_LTE\_21'.

Results = 1,369 ac

C. Remove Non-Target Vegetation.

The following BPSs / S-Classes were deleted:

| BPS  | ACRES |
|--|-------|
| S-Class A  | 59    |
| Gambel Oak-Mixed Montane Shrubland UMC; typically a mastication treatment    | 93    |
| Montane Riparian Systems; typically treated manually                         | 0     |
| Montane –Subalpine Grassland UMC   | 467   |
| Non-Vegetated  | 0     |
| Road and Buildings Dominated   | 107   |
| Unclassified; S-Class A only (Unclassified S-Class C was retained (38 acres) | 0     |
| Water  | 32    |

758

Results = 611 ac

Step 3. 2.5 acres of outliers deleted. No adjustment made for roads.

Step 4. Riparian exclude (70 acres)

Results = 539 acres.

**STEP 5. Calculate Marginal Mechanized Treatment Area**

B. Select stands with average slope  $\geq$  21% and < 25%.

**204 total acres**

C. Remove Non-Target Vegetation.

The following BPSs / S-Classes were deleted:

| BPS   | ACRES |
|---|-------|
| S-Class A   | 0     |
| Gambel Oak-Mixed Montane Shrubland UMC; typically a mastication treatment | 39    |
| Montane –Subalpine Grassland UMC  | 27    |



Since a high percentage of this area is estimated to be suitable for on-site treatment including manual work, no deductions was made for riparian areas.

**Results (acreage balance) = 138 acres**

G. Select stands with average slope  $\geq 25\%$  and  $< 29.9\%$ .

**279 total acres**

C. Remove Non-Target Vegetation.

The following BPSs / S-Classes were deleted:

| BPS   | ACRES |
|---|-------|
| S-Class A   | 5     |
| Gambel Oak-Mixed Montane Shrubland UMC; typically a mastication treatment | 14    |
| Montane Riparian Systems; typically treated manually                      | n/a   |
| Montane –Subalpine Grassland UMC  | 8     |

253

Since a high percentage of this area is estimated to be suitable for on-site treatment including manual work, no deductions was made for riparian areas.

**Results (acreage balance) = 253 acres**

PRIVATE NON AFA

Feasible Mechanized

Start at Step 2.

Clip stands with avg. slope < 21% to private non-AFA ownership  
'Step2b\_r2veg012313\_avgslope\_LTE\_21'.

Results = 1,774 ac

C. Remove Non-Target Vegetation.

The following BPSs / S-Classes were deleted:

| BPS   | ACRES |
|---|-------|
| S-Class A   | 128   |
| Gambel Oak-Mixed Montane Shrubland UMC; typically a mastication treatment   | 150   |
| Montane Riparian Systems; typically treated manually                        | 34    |
| Montane –Subalpine Grassland UMC  | 606   |
| Non-Vegetated   | 42    |
| Road and Buildings Dominated  | 101   |
| Unclassified; S-Class A only (Unclassified S-Class C was retained (8 acres) | 0     |
| Water   | 112   |

1,173

Results = 601 ac

Step 3. 20 acres of outliers deleted. No adjustment made for roads.

Remove areas within Waldo Canyon burn area (Palmer Reservoir) 14 ac.

Step 4. Riparian exclude (53 acres)

Results = 514 acres.

**STEP 5. Calculate Marginal Mechanized Treatment Area**

B. Select stands with average slope  $\geq$  21% and < 25%.

**347 total acres**

C. Remove Non-Target Vegetation.

The following BPSs / S-Classes were deleted:

| BPS   | ACRES |
|---|-------|
| S-Class A   | 78    |
| Gambel Oak-Mixed Montane Shrubland UMC; typically a mastication treatment | 8     |
| Montane Riparian Systems; typically treated manually                      | n/a   |
| Montane –Subalpine Grassland UMC  | 44    |
| Non-Vegetated   | 4     |

134

Since a high percentage of this area is estimated to be suitable for on-site treatment including manual work, no deductions was made for riparian areas.

Delete outliers (primarily Waldo Canyon burn area) 57 ac

**Results (acreage balance) = 156 acres**

G. Select stands with average slope  $\geq 25\%$  and  $< 29.9\%$ .

**477 total acres**

C. Remove Non-Target Vegetation.

The following BPSs / S-Classes were deleted:

| BPS   | ACRES |
|---|-------|
| S-Class A   | 127   |
| Gambel Oak-Mixed Montane Shrubland UMC; typically a mastication treatment | 40    |
| Montane Riparian Systems; typically treated manually                      | n/a   |
| Montane –Subalpine Grassland UMC  | 24    |

191

Since a high percentage of this area is estimated to be suitable for on-site treatment including manual work, no deductions was made for riparian areas.

Delete outliers (primarily Waldo Canyon burn area) 124 ac

**Results (acreage balance) = 162 acres**

# UPPER MONUMENT CREEK LANDSCAPE RESTORATION INITIATIVE

## MECHANIZED TREATMENT FEASIBILITY ANALYSIS

