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. <u>Create % rise raster</u>:
- Layer: 'pnf_10m30mdemnew'

B. <u>Create average slope by stand</u>:

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)*.
    - o Output = 4,465 records

C. <u>Join</u>:
- Layer: 'r2veg_UM_Post_Waldo_012313' with zonal statistics table 'step2_zonalstats_standavgslope'
    - o 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. <u>Determine maximum average slope per treated, awarded, and prepped FRLTSC Task Orders</u>.
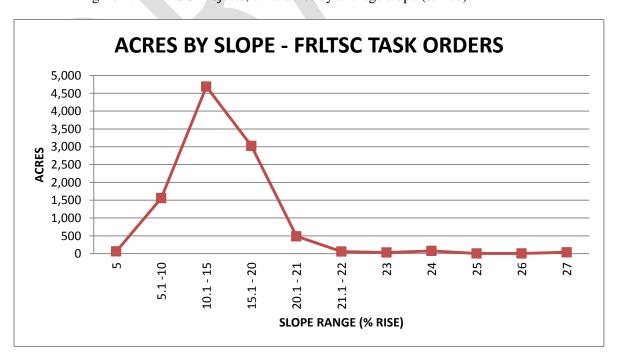
Results (assessment of 25 TOs)

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. <u>Remove Non-Forest Service Ownership</u>, 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. <u>Estimate Maximum Riparian Area in Buffers</u>

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. <u>Assess lower feasibility for mechanized treatment</u>

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.
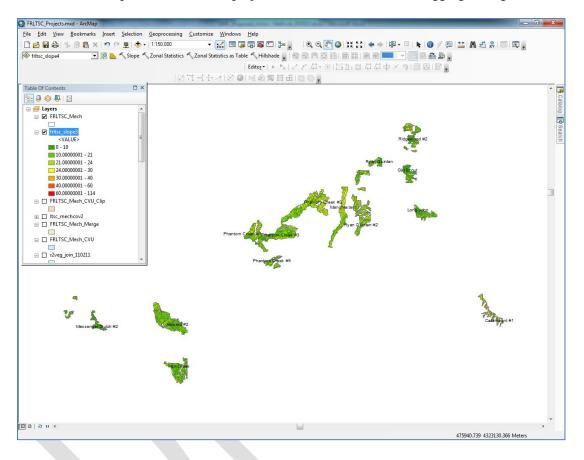
Results (mechanized treatment units only)

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 filed reconnaissance and added to the potential treatment dataset.

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

B. <u>Select stands with average slope ≥ 21% and < 25%.</u>

9,314 total acres

C. <u>Remove Non-Target Vegetation</u>.

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 ≥ 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

April 22, 2013

Jeff Underhill
Timber Program Manager / Forest Silviculturist
Pike & San Isabel NFs
Pueblo, CO
(719)553-1513

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 ≥ 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. <u>Select stands with average slope ≥ 25% and < 29.9%.</u>

279 total acres

C. <u>Remove Non-Target Vegetation.</u>

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 ≥ 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 ≥ 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

Manitou Experimental Forest

Palmer Lake

Upper Reservoir

Monument Lake

Rainbow Lake

Air Force Academy

Air Force Academy

Stanley Reservoir

Rampart Reservoir

Northfield Reservoir

Nicols Reservoir

N
W E
S

0 0.5 1   2 Miles

1:80,000

Legend

— Roads

Manitou Experimental Forest

Private Ownership

Air Force Academy

Waterbodies > 5 acres

Streams

Broadcast Burning 1st Entry

Results - Marginal Mechanized Acres (Slope 25 - 30%)

Results - Marginal Mechanized Acres (Slope 21 - 25%)

Results - Feasible Mechanized Acres by BPS

BPS

Dry-Mesic Mixed Conifer UMC

Lodgepole Pine Forest UMC

Mesic Mixed Conifer UMC

Ponderosa Pine/Douglas-Fir Woodland UMC

unclassified

Waldo Canyon Fire Perimeter July 6, 2012

Project Area Boundary

Colorado Roadless Area

Version 3, May 15, 2013