

**Methodology for 2002 / 2003 Wildfire Hazard Mitigation Project  
Gunnison County**

**Code explanation**

Example:

41 / AS / Ac / 1 / 0  
1            2            3            4            5  
 41 / Ag / 4C / 1 / 0  
1            2            3            4            5

↙ Swiss #1

1. Land cover / use
2. Specie
3. Density
4. Ladder fuel
5. Insect and Disease

**Species:**

As = Aspen; CW = Narrow leaf Cottonwood; Wi = Willows  
 DF = Douglas Fir; SF = Subalpine Fir; ES = Engelmann Spruce; PP = Ponderosa Pine  
 GO = Gamble Oak; SB = Sagebrush; RMJ = Rocky Mountain Juniper

**Density:**

Because of an important part of Gamble oaks in this area we made an additional density rate. Following densities are set for shrub seedlings:

Code	Stand size Class	Diameter	Crown Cover	Rating
2a	seedling / sapling	1.5"	11-50%	0
2b	seedling / sapling	1.5"	51-100%	1

# Methodology for 2003 Wildfire Hazard Mitigation Project Gunnison and County

## THE GIS PROCESS

### 1. Fuel Hazard Evaluation

The evaluation formula uses the below fuel rating from USGS fuel cover types.

U.S.G.S. Land Cover Type	Rating
Cropland and Pasture 21	1
Orchards, Groves, Vineyards, and Nurseries 22	2
Other Agricultural Land 24	1
Herbaceous Rangeland 31	1
Shrub and Brush Rangeland 32	2.5
Mixed Rangeland 33	2
Deciduous Forest Land 41	2
Evergreen Forest Land 42	3
Mixed Forest Land 43	3
Forested Wetlands 61	2
Shrub and Brush Tundra 81	1
Herbaceous Tundra 82	1
Mixed Tundra 85	1
<i>Non Forest wetlands 102</i>	<i>1</i>

*Table 1: USGS Land Cover Types and Fuel Hazard Rating*

The remaining 23 categories contain little or no natural wildfire fuels, and therefore carry a Fuel Hazard Rating of 0.

### 2. Slope Hazard Evaluation

Slope Type	Slope Value	Rating
Mild	0-8%      0-8	1
Moderate	9-20%     8-20	2
Steep	21-30%    20-30	3
Extreme	31+        30+	4

*Table 2: Slope Hazard Rating*

Slope values are obtained from the USGS DEMs. They are categorized by slope value in percent and are assigned a Slope Hazard Rating from 1 to 4 in accordance with Table 2.

### 3. Aspect Evaluation

Aspect, or compass orientation of a slope, accounts for the fact that vegetation on south-facing slopes will have lower moisture content than similar surrounding vegetation with a different orientation. Aspect is treated as an "Additional Factor" in NFPA 299, and is assigned a Aspect Hazard Rating as follows:

Aspect in Degrees (N=0, E=90)	Rating
170-240	3
165-170 or 240-270	2
90-165	1
0-90 or 270-360 or -1 (flat)	0

Table 3: Aspect Hazard Rating

Aspect in degrees is also calculated from the DEMs. Again, the data are categorized and assessed from 0 to 3 in accordance with Table 3.

### 4. Ladder Fuels

Ladder fuels such as saplings, shrubbery, and low branches allow for fire to climb into overstory. Ladder fuels are treated as an additional factor. Ladder fuels are assigned a Hazard Rating in accordance with Table 4.

Low	0
Moderate	1
High	2

Table 4: Ladder Fuel Rating

### 5. Forest Density

All forests were evaluated for density. This is described as percent of crown closure. Density is treated as an additional factor and categorized in accordance with Table 5.

Structural Stage	Code	Stand Size Class	Diameter Range for Most Trees	Crown Cover %	Rating
Grass-Forb	1	nonstocked	any	0 - 10	0
Shrub-Seedling	2a	seedling/sapling	< 1.5" diameter	11 - 50	0
	2b	Seedling/sapling	<1.5" diameter	51 - 100	1
Sapling-Pole	3a	seedling/sapling or poletimber	1.5" to 9" diameter	11 - 40	0
	3b	"	"	41 - 70	1
	3c	"	"	71 - 100	2
Mature	4a	sawtimber	9" and larger	11 - 40	0
	4b	"	"	41 - 70	1
	4c	"	"	71 - 100	2

Table 5: Forest Density Rating

2 = 0

**6. Insects and Disease**

Code	Insect and Disease	Rating
0	None Visible	0
1	Moderate WSBW	0
2	Heavy WSBW	1
3	Heavy Aspen Cankers	1
4	Moderate Mistletoe	0
5	Heavy Mistletoe	1
6	Moderate Bark Beetle	0
7	Heavy Bark Beetle	1

Table 6: Insect and Disease Rating

This category includes pests and pathogens that increase dead ground and aerial fuels, thereby increasing fire hazard. Insect and Disease ratings are in accordance with Table 6.

**7. Total Hazard Calculation**

**(FUEL HAZARD\*SLOPE) + ASPECT HAZARD+LADDER FUEL+DENSITY+INSECT & DISEASE = TOTAL HAZARD**

The result is a range of Wildfire Hazard of from 0 to 20, minimum to maximum. The final GIS process evaluates the total hazard and categorizes their values as follows:

Total Hazard Rating	Wildfire Hazard Severity
0	None 1
1-4	Low 2
5-8	Moderate 3
9-12	High 4
13+	Extreme 5
	Hot Happed 6

Table 7: Quantifying Wildfire Hazard Severity

This calculation produces the final, new map layer. The new target data may now be displayed in a graphic map composition.

## APPENDIX A

### U.S.G.S. Land Use/Land Cover Classifications

- 1 Urban or Built-Up Land
  - 11 Residential
  - 12 Commercial Services
  - 13 Industrial
  - 14 Transportation, Communications
  - 15 Industrial and Commercial
  - 16 Mixed Urban or Built-Up Land
  - 17 Other Urban or Built-Up Land
- 2 Agricultural Land
  - 21 Cropland and Pasture
  - 22 Orchards, Groves, Vineyards, Nurseries
  - 23 Confined Feeding Operations
  - 24 Other Agricultural Land
- 3 Rangeland
  - 31 Herbaceous Rangeland
  - 32 Shrub and Brush Rangeland
  - 33 Mixed Rangeland
- 4 Forest Land
  - 41 Deciduous Forest Land
  - 42 Evergreen Forest Land
  - 43 Mixed Forest Land
- 5 Water
  - 51 Streams and Canals
  - 52 Lakes
  - 53 Reservoirs
  - 54 Bays and Estuaries
- 6 Wetland
  - 61 Forested Wetlands
  - 62 Nonforested Wetlands
- 7 Barren Land
  - 71 Dry Salt Flats
  - 72 Beaches
  - 73 Sandy Areas Other than Beaches
  - 74 Bare Exposed Rock
  - 75 Strip Mines, Quarries, and Gravel Pits
  - 76 Transitional Areas
  - 77 Mixed Barren Land
- 8 Tundra
  - 81 Shrub and Brush Tundra
  - 82 Herbaceous Tundra
  - 83 Bare Ground
  - ~~84 Wet Tundra~~
  - 85 Mixed Tundra
  - 91 Perennial Snowfields
  - 92 Glaciers