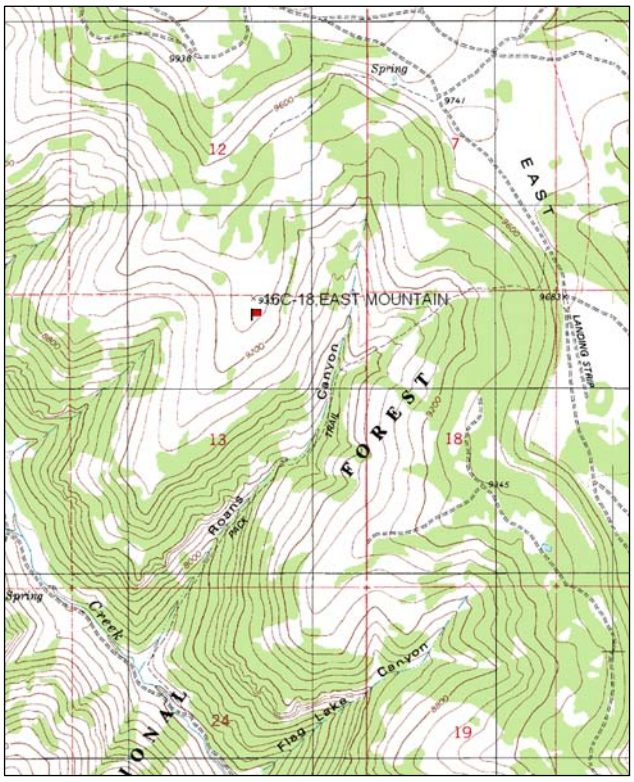
EAST MOUNTAIN - TREND STUDY NO. 16C-18-09

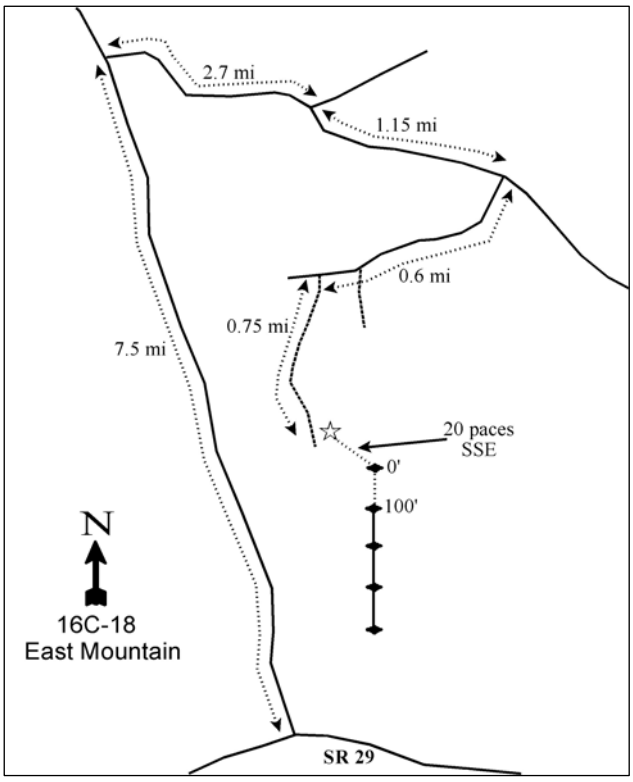
Vegetation Type: Mountain Big Sagebrush
Range Type: Crucial Deer Winter, Substantial Elk Winter
NRCS Ecological Site Description: Not Available
Land Ownership: USFS
Elevation: 9,200 ft (2,804 m)
Aspect: South
Slope: 6%-8%
Transect bearing: 180 degrees magnetic.
Belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft)

Directions:
From Orangeville, go up Straight Canyon to a major fork at Cottonwood Creek. Bear right up Cottonwood Creek approximately 7.5 miles to Mill Canyon. Turn right and go up Mill Canyon 2.7 miles to a fork at the top of East Mountain. Bear right on the main road 0.6 miles to a fork to Pine Springs - Snow Lake. Continue on the main road 0.55 miles. Turn right here down off the main road. Go 0.15 miles to a spring. Continue 0.15 miles to the creek at the bottom of the dugway. Go 0.3 miles to a fork past the first patch of aspen clones to the second patch (2nd faint road), bear left on the 2nd faint road. Wind down through the trees and out onto the sage/grass ridge for 0.75 miles. There is a witness post on the left side of the road. From the witness post, walk 20 paces SSE to a 18" fencepost marked by a red browse tag, #7162. This is the 0-foot baseline stake.

Map Name: Mahogany Point




Diagrammatic Sketch:




Township: 17S, Range: 6E, Section: 13

GPS: NAD 83, UTM 12S 483613 E 4355578 N

EAST MOUNTAIN - TREND STUDY NO. 16C-18

**Site Information**

Site Description: The study is located on a low point on the west side of the plateau above Roans Canyon and Cottonwood Creek. The area is managed by the Forest Service as part of the East Mountain allotment. Much of the area was treated with herbicide to kill sagebrush in the late 1960's. The site is located on a slope where the majority of the mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) was not affected. The lower end of the study baseline was affected more by the treatment and has shown a lower density of mountain big sagebrush than the beginning of the study baseline. Elk winter on the points and windswept south-facing slopes. Deer sign was only occasionally observed. Pellet group data has estimated heavy elk use and light deer use since 1999. Estimated cattle use was light in 2009, but was not sampled in the previous sample years (Table - Pellet Group Data).

Browse: The dominant browse species is mountain big sagebrush which provides the majority of the browse cover on the site (Table - Browse Trends). The mountain big sagebrush population is comprised of mostly small statured plants with a high amount of decadence. The proportion of mountain big sagebrush plants displaying poor vigor has steadily increased since 1988, but is still moderately low. Utilization of mountain big sagebrush has been mostly moderate with some heavy use in a few sample years. Additional browse species that occur in limited abundance are low rabbitbrush (*Chrysothamnus viscidiflorus*), snowberry (*Symphoricarpos oreophilus*), and gray horsebrush (*Tetradymia canescens*) (Table - Browse Characteristics).

Herbaceous Understory: The herbaceous understory is abundant and diverse. Large bunches of Salina wildrye (*Elymus salina*) dominate the grass component. Associated grass species are mutton and Sandberg bluegrass (*Poa fendleriana* and *P. secunda*), western wheatgrass (*Agropyron smithii*), and a sedge (*Carex sp.*). Perennial forbs are also diverse and prevalent. Desert phlox (*Phlox austromontana*), looseflower milkvetch (*Astragalus tenellus*), silvery lupine (*Lupinus sericeus*), Wyoming painted-cup (*Castilleja linariafolia*), and a penstemon (*Penstemon sp.*) are common species (Table - Herbaceous Trends).

Soil: The loose surface soil has a clay loam texture and neutral pH. Phosphorus has a limited availability for plant growth and development at 3.8 ppm (Tiedemann and Lopez 2004) (Table - Soil Analysis Data). Scattered small gullies, which begin on the upper portions of the slope, converge and deepen on the steeper side hills. There has been a moderately high amount of bare ground cover over the sample years with most of the protective ground cover provided by herbaceous vegetation and litter cover (Table - Basic Cover). The soil erosion condition was classified as slight in 2004 due to soil movement and pedestaling around plants, but was classified as stable in 2009.

**Trend Assessments**

Browse:

- **1988 to 1994 - stable (0):** Differences in density may be related to the larger sample area used in 1994; therefore, trend was determined using other parameters. There was little change in decadence or poor vigor of mountain big sagebrush, though recruitment of young plants decreased.
- **1994 to 1999 - stable (0):** The density and cover of mountain big sagebrush increased slightly, though decadence increased from 23% to 30%.
- **1999 to 2004 - stable (0):** Density of mountain big sagebrush increased by 17% from 3,140 plants/acre to 3,700 plants/acre, but decadence also increased to 43%. Cover of big sagebrush decreased from 15% to 14% and poor vigor increased from 10% to 14%. Recruitment of young big sagebrush plants did increase slightly from 7% of the population to 11%.
- **2004 to 2009 - stable (0):** There was little change in the density of mountain big sagebrush, though cover decreased to 11%. Decadence remained high at 38% and poor vigor increased to 17%. Recruitment of young big sagebrush plants increased to 13% of the population.

Grass:

- **1988 to 1994 - down (-2):** Perennial grass sum of nested frequency decreased by 22% with a significant decrease in nested frequency of western wheatgrass and Sandberg bluegrass. Salina wildrye increased significantly in nested frequency.
- **1994 to 1999 - stable (0):** There was little change in the sum of nested frequency of perennial grasses though cover increased slightly. There was a significant increase in the nested frequency of western wheatgrass and a significant decrease in Salina wildrye.
- **1999 to 2004 - slightly up (+1):** The sum of nested frequency of perennial grasses increased by 10% and cover increased from 10% to 12%.
- **2004 to 2009 - slightly down (-1):** The sum of nested frequency of perennial grasses decreased by 11% and cover decreased to 8%.

Forb:

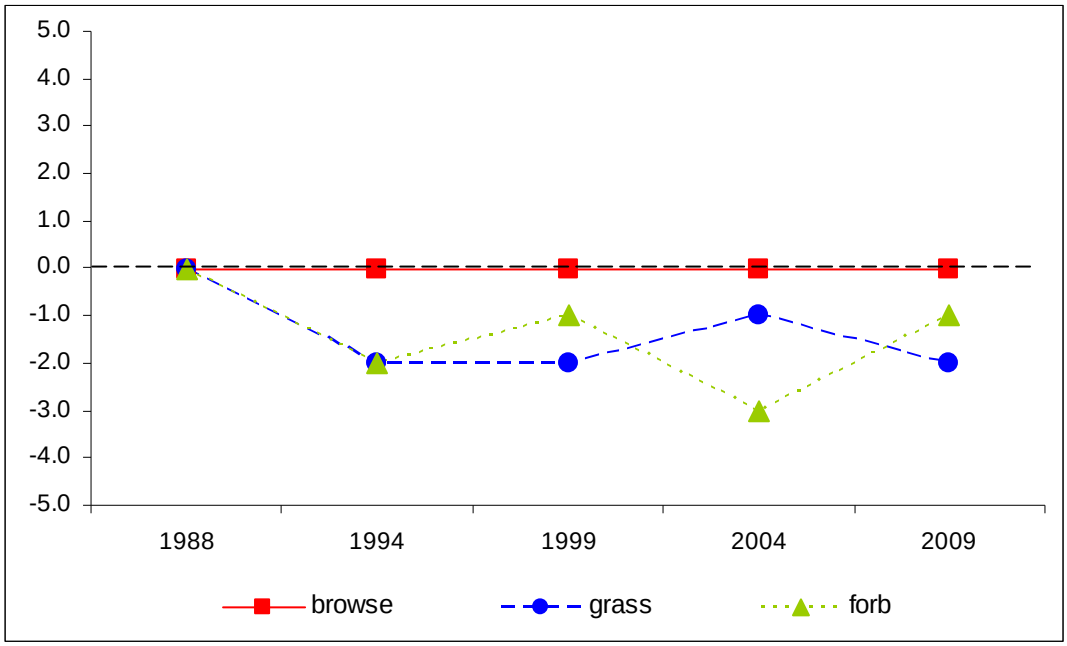
- **1988 to 1994 - down (-2):** Perennial forb sum of nested frequency decreased by 27%.
- **1994 to 1999 - slightly up (+1):** The sum of nested frequency of perennial forbs increased by 16% and cover increased from 7% to 17%. The large increase in cover is primarily due to increases in Wyoming painted-cup, looseflower milkvetch, and silvery lupine.
- **1999 to 2004 - down (-2):** The sum of nested frequency of perennial forbs decreased by 31% and cover decreased to 9%.
- **2004 to 2009 - up (+2):** Perennial forb sum of nested frequency increased by 27% and cover increased to 11%.

DEER DESIRABLE COMPONENTS INDEX - MID-LEVEL POTENTIAL SCALE --
Management unit 16C, study no: 18

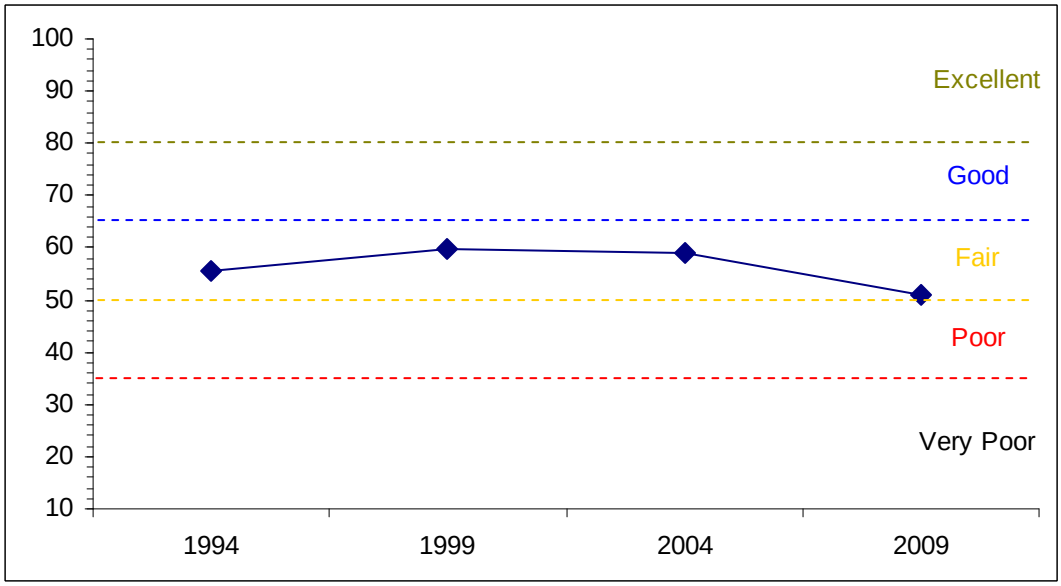
| Year | Preferred Browse Cover | Preferred Browse Decadence | Preferred Browse Young | Perennial Grass Cover | Annual Grass Cover | Perennial Forb Cover | Noxious Weeds | **Total Score** | Ranking |
|---|---|---|---|---|---|---|---|---|---|
| 94 | 16.5 | 8.1 | 2.5 | 18.3 | 0.0 | 10.0 | 0.0 | **55.4** | Fair |
| 99 | 19.3 | 6.2 | 3.7 | 20.6 | 0.0 | 10.0 | 0.0 | **59.8** | Fair |
| 04 | 18.0 | 2.6 | 5.4 | 23.3 | 0.0 | 10.0 | 0.0 | **59.2** | Fair |
| 09 | 14.3 | 4.0 | 6.7 | 16.1 | 0.0 | 10.0 | 0.0 | **51.1** | Poor-Fair |

## Trend Summary

CUMULATIVE RANGE TREND ASSESSMENT--
Management unit 16C Study no: 18




DEER DESIRABLE COMPONENTS INDEX TREND, MID-LEVEL POTENTIAL
Management unit 16C, Study no: 18



HERBACEOUS TRENDS--
Management unit 16C, Study no: 18

| Type | Species | Nested Frequency | | | | | Average Cover % | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | '88 | '94 | '99 | '04 | '09 | '94 | '99 | '04 | '09 |
| G | Agropyron smithii | $_{c}$69 | $_{a}$13 | $_{bc}$44 | $_{ab}$34 | $_{ab}$33 | .02 | .55 | .61 | .21 |
| G | Agropyron spicatum | - | - | - | 5 | 6 | - | - | .06 | .06 |
| G | Bromus anomalus | $_{ab}$12 | $_{a}$- | $_{ab}$7 | $_{b}$12 | $_{a}$1 | - | .09 | .24 | .03 |
| G | Bromus japonicus (a) | - | - | - | - | - | - | .00 | - | - |
| G | Carex sp. | 24 | 18 | 37 | 22 | 36 | .38 | 1.39 | 1.61 | 1.61 |
| G | Elymus salina | $_{a}$115 | $_{b}$167 | $_{a}$115 | $_{a}$125 | $_{a}$122 | 7.71 | 5.26 | 5.10 | 4.43 |
| G | Oryzopsis hymenoides | - | - | 2 | - | - | - | .00 | - | - |
| G | Poa fendleriana | 68 | 80 | 63 | 97 | 58 | .89 | 2.28 | 2.46 | 1.19 |
| G | Poa pratensis | - | - | - | 7 | 7 | - | - | .53 | .06 |
| G | Poa secunda | $_{c}$92 | $_{b}$24 | $_{ab}$13 | $_{a}$4 | $_{ab}$5 | .06 | .02 | .03 | .02 |
| G | Sitanion hystrix | - | - | - | 1 | 1 | - | - | .00 | .00 |
| G | Stipa lettermani | 15 | 7 | 14 | 17 | 20 | .07 | .69 | .96 | .43 |
| Total for Annual Grasses | | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0 | 0 |
| Total for Perennial Grasses | | 395 | 309 | 295 | 324 | 289 | 9.14 | 10.31 | 11.63 | 8.07 |
| Total for Grasses | | 395 | 309 | 295 | 324 | 289 | 9.14 | 10.31 | 11.63 | 8.07 |
| F | Androsace septentrionalis (a) | - | $_{ab}$9 | $_{b}$14 | $_{a}$3 | $_{a}$- | .30 | .05 | .03 | - |
| F | Antennaria rosea | - | - | - | 4 | - | - | - | .01 | - |
| F | Arabis sp. | $_{b}$7 | $_{a}$- | $_{ab}$3 | $_{a}$- | $_{a}$- | - | .01 | - | - |
| F | Aster sp. | - | - | 2 | - | - | - | .00 | - | - |
| F | Astragalus convallarius | $_{a}$- | $_{a}$3 | $_{ab}$5 | $_{ab}$4 | $_{b}$15 | .00 | .01 | .03 | .13 |
| F | Astragalus megacarpus | $_{b}$9 | $_{a}$1 | $_{ab}$4 | $_{a}$- | $_{a}$- | .00 | .03 | .03 | - |
| F | Astragalus tenellus | $_{ab}$26 | $_{a}$13 | $_{b}$48 | $_{ab}$26 | $_{b}$39 | .72 | 3.22 | 1.52 | 1.29 |
| F | Castilleja linariaefolia | $_{b}$88 | $_{ab}$59 | $_{b}$79 | $_{a}$27 | $_{b}$84 | .45 | 3.53 | .76 | 2.74 |
| F | Caulanthus crassicaulis | 5 | - | - | - | - | - | - | - | - |
| F | Chaenactis douglasii | $_{b}$17 | $_{ab}$4 | $_{ab}$13 | $_{a}$3 | $_{ab}$6 | .01 | .08 | .00 | .19 |
| F | Comandra pallida | $_{a}$3 | $_{a}$2 | $_{a}$14 | $_{a}$9 | $_{b}$24 | .01 | .12 | .12 | .52 |
| F | Crepis acuminata | 1 | - | - | - | - | - | - | - | - |
| F | Erigeron pumilus | 12 | 6 | 3 | 5 | - | .01 | .00 | .06 | - |
| F | Eriogonum alatum | - | 11 | 10 | 7 | 12 | .08 | .24 | .13 | .15 |
| F | Eriogonum racemosum | - | - | 2 | - | - | - | .03 | - | - |
| F | Eriogonum sp. | - | - | 1 | - | - | - | .00 | - | - |
| F | Eriogonum umbellatum | 14 | 17 | 16 | 20 | 21 | .07 | .40 | .35 | .64 |
| F | Hymenopappus filifolius | - | - | - | 7 | 2 | - | - | .33 | .01 |
| F | Hymenoxys richardsonii | $_{a}$39 | $_{b}$94 | $_{a}$36 | $_{a}$44 | $_{a}$40 | 1.32 | .61 | .76 | .45 |
| F | Ipomopsis aggregata | 9 | - | 1 | 2 | 2 | - | .00 | .00 | .30 |
| F | Lesquerella alpina | $_{a}$11 | $_{ab}$20 | $_{b}$35 | $_{a}$13 | $_{ab}$16 | .10 | .22 | .03 | .06 |
| F | Linum lewisii | $_{ab}$5 | $_{ab}$10 | $_{b}$12 | $_{ab}$6 | $_{a}$- | .02 | .08 | .22 | - |
| F | Lupinus sericeus | $_{d}$71 | $_{bc}$32 | $_{c}$42 | $_{ab}$5 | $_{a}$5 | 1.83 | 3.08 | .42 | .21 |
| F | Machaeranthera canescens | - | 5 | 5 | - | 1 | .01 | .06 | - | .03 |
| F | Machaeranthera grindelioides | 11 | 4 | 3 | 3 | 8 | .04 | .03 | .18 | .10 |
| F | Penstemon comarrhenus | $_{ab}$23 | $_{a}$10 | $_{b}$38 | $_{b}$39 | $_{b}$35 | .06 | 1.39 | .60 | .95 |
| F | Penstemon watsonii | 13 | 14 | - | 7 | 5 | .16 | - | .31 | .09 |
| F | Phlox austromontana | $_{b}$160 | $_{a}$108 | $_{a}$108 | $_{a}$87 | $_{ab}$118 | 2.11 | 3.28 | 3.23 | 3.22 |

| Type | Species | Nested Frequency | | | | | Average Cover % | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | '88 | '94 | '99 | '04 | '09 | '94 | '99 | '04 | '09 |
| F | Phlox longifolia | $_{b}$42 | $_{ab}$10 | $_{a}$- | $_{ab}$18 | $_{a}$2 | .02 | - | .06 | .03 |
| F | Salsola iberica (a) | - | - | - | - | 1 | - | - | - | .00 |
| F | Senecio multilobatus | 11 | 1 | 8 | 5 | 1 | .00 | .02 | .02 | .00 |
| F | Taraxacum officinale | 8 | 2 | 7 | 2 | 1 | .00 | .07 | .01 | .03 |
| F | Tragopogon dubius | 1 | 2 | - | - | - | .00 | - | - | - |
| Total for Annual Forbs | | 0 | 9 | 14 | 3 | 1 | 0.30 | 0.05 | 0.03 | 0.00 |
| Total for Perennial Forbs | | 586 | 428 | 495 | 343 | 437 | 7.10 | 16.60 | 9.24 | 11.16 |
| Total for Forbs | | 586 | 437 | 509 | 346 | 438 | 7.41 | 16.65 | 9.27 | 11.17 |

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS--
Management unit 16C, Study no: 18

| Type | Species | Strip Frequency | | | | Average Cover % | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | '94 | '99 | '04 | '09 | '94 | '99 | '04 | '09 |
| B | Artemisia frigida | 19 | 16 | 15 | 14 | .08 | .43 | .55 | .39 |
| B | Artemisia tridentata vaseyana | 68 | 71 | 76 | 79 | 13.11 | 15.06 | 13.92 | 11.10 |
| B | Chrysothamnus viscidiflorus | 53 | 38 | 49 | 52 | .65 | .34 | 1.47 | .96 |
| B | Gutierrezia sarothrae | 28 | 23 | 31 | 15 | .37 | .43 | .39 | .19 |
| B | Rosa woodsii | 0 | 1 | 1 | 1 | - | .00 | .00 | .00 |
| B | Symphoricarpos oreophilus | 21 | 22 | 30 | 29 | 1.24 | .52 | .60 | .47 |
| B | Tetradymia canescens | 25 | 30 | 34 | 31 | 1.64 | 1.42 | 1.44 | .97 |
| Total for Browse | | 214 | 201 | 236 | 221 | 17.10 | 18.23 | 18.37 | 14.09 |

CANOPY COVER, LINE INTERCEPT--
Management unit 16C, Study no: 18

| Species | Percent Cover | |
|---|---|---|
| | '04 | '09 |
| Artemisia frigida | .28 | .11 |
| Artemisia tridentata vaseyana | 13.19 | 16.26 |
| Chrysothamnus viscidiflorus | 1.53 | 1.96 |
| Gutierrezia sarothrae | .55 | .15 |
| Symphoricarpos oreophilus | 1.01 | 1.08 |
| Tetradymia canescens | 1.63 | 1.11 |

KEY BROWSE ANNUAL LEADER GROWTH--
Management unit 16C, Study no: 18

| Species | Average leader growth (in) | |
|---|---|---|
| | '04 | '09 |
| Artemisia tridentata vaseyana | 2.1 | 1.2 |

BASIC COVER--
Management unit 16C, Study no: 18

| Cover Type | Average Cover % | | | | |
|---|---|---|---|---|---|
| | '88 | '94 | '99 | '04 | '09 |
| Vegetation | 10.75 | 31.36 | 37.50 | 34.54 | 32.37 |
| Rock | 2.50 | 5.98 | 8.07 | 6.71 | 6.90 |
| Pavement | 0 | 1.34 | 1.92 | 1.00 | 1.15 |
| Litter | 45.25 | 34.56 | 29.52 | 28.28 | 35.93 |
| Cryptogams | 0 | .43 | .09 | .03 | .03 |
| Bare Ground | 41.50 | 43.59 | 35.87 | 44.90 | 35.90 |

SOIL ANALYSIS DATA --
Management unit 16C, Study no: 18, Study Name: East Mountain

| Effective rooting depth (in) | pH | clay loam | | | %0M | PPM P | PPM K | ds/m |
|---|---|---|---|---|---|---|---|---|
| | | %sand | %silt | %clay | | | | |
| 17.4 | 7.3 | 40 | 27.4 | 32.6 | 2.8 | 3.8 | 99.2 | 0.6 |

PELLET GROUP DATA--
Management unit 16C, Study no: 18

| Type | Quadrat Frequency | | | |
|---|---|---|---|---|
| | '94 | '99 | '04 | '09 |
| Rabbit | 20 | 10 | 8 | 4 |
| Elk | 36 | 24 | 45 | 36 |
| Deer | 2 | 4 | 4 | 2 |
| Cattle | - | - | 1 | 1 |

| Days use per acre (ha) | | |
|---|---|---|
| '99 | '04 | '09 |
| - | - | - |
| 55 (136) | 56 (137) | 76 (187) |
| 17 (42) | 21 (53) | 2 (5) |
| - | - | 15 (38) |

BROWSE CHARACTERISTICS--
Management unit 16C, Study no: 18

| | | Age class distribution | | | | Utilization | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Plants per Acre (excluding seedlings) | % Young | % Mature | % Decadent | Seedling (plants/acre) | % moderate | % heavy | % poor vigor | Average Height Crown (in) |
| Artemisia frigida | | | | | | | | | |
| 88 | **265** | 0 | 75 | 25 | - | 25 | 25 | 25 | 4/2 |
| 94 | **560** | 11 | 89 | 0 | - | 0 | 0 | 0 | 5/4 |
| 99 | **660** | 21 | 79 | 0 | 40 | 0 | 0 | 0 | 5/7 |
| 04 | **520** | 4 | 96 | 0 | - | 12 | 4 | 0 | 6/7 |
| 09 | **420** | 24 | 76 | 0 | - | 24 | 0 | 0 | 6/8 |
| Artemisia tridentata vaseyana | | | | | | | | | |
| 88 | **4265** | 30 | 48 | 22 | 133 | 38 | 5 | 2 | 13/31 |
| 94 | **3060** | 5 | 72 | 23 | 40 | 41 | 1 | 7 | 15/32 |
| 99 | **3140** | 7 | 63 | 30 | 140 | 61 | 10 | 10 | 16/33 |
| 04 | **3700** | 11 | 45 | 43 | 700 | 42 | 15 | 14 | 14/31 |
| 09 | **3680** | 13 | 50 | 38 | 480 | 47 | 21 | 17 | 11/26 |

| | | Age class distribution | | | | Utilization | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Plants per Acre (excluding seedlings) | % Young | % Mature | % Decadent | Seedling (plants/acre) | % moderate | % heavy | % poor vigor | Average Height Crown (in) |
| Chrysothamnus nauseosus | | | | | | | | | |
| 88 | **0** | 0 | 0 | - | - | 0 | 0 | 0 | -/- |
| 94 | **0** | 0 | 0 | - | - | 0 | 0 | 0 | -/- |
| 99 | **0** | 0 | 0 | - | - | 0 | 0 | 0 | -/- |
| 04 | **0** | 0 | 0 | - | - | 0 | 0 | 0 | 16/28 |
| 09 | **0** | 0 | 0 | - | - | 0 | 0 | 0 | -/- |
| Chrysothamnus viscidiflorus | | | | | | | | | |
| 88 | **2465** | 38 | 41 | 22 | 333 | 22 | 14 | 0 | 5/5 |
| 94 | **2420** | 2 | 98 | 0 | - | 0 | 0 | 0 | 7/9 |
| 99 | **1460** | 19 | 75 | 5 | 20 | 0 | 1 | 1 | 7/11 |
| 04 | **2060** | 3 | 83 | 14 | 20 | 8 | 2 | 4 | 7/11 |
| 09 | **2860** | 1 | 97 | 2 | 20 | 0 | 0 | 1 | 6/7 |
| Gutierrezia sarothrae | | | | | | | | | |
| 88 | **0** | 0 | 0 | 0 | - | 0 | 0 | 0 | -/- |
| 94 | **1480** | 3 | 89 | 8 | - | 0 | 0 | 0 | 6/6 |
| 99 | **1240** | 10 | 90 | 0 | - | 0 | 0 | 0 | 7/8 |
| 04 | **1240** | 2 | 98 | 0 | - | 0 | 0 | 0 | 7/9 |
| 09 | **500** | 0 | 100 | 0 | - | 0 | 0 | 0 | 6/7 |
| Rosa woodsii | | | | | | | | | |
| 88 | **0** | 0 | 0 | - | - | 0 | 0 | 0 | -/- |
| 94 | **0** | 0 | 0 | - | - | 0 | 0 | 0 | 10/18 |
| 99 | **60** | 0 | 100 | - | - | 0 | 0 | 0 | 9/12 |
| 04 | **80** | 100 | 0 | - | - | 0 | 0 | 0 | 5/4 |
| 09 | **140** | 29 | 71 | - | - | 0 | 0 | 0 | 6/8 |
| Symphoricarpos oreophilus | | | | | | | | | |
| 88 | **864** | 69 | 23 | 8 | 199 | 23 | 0 | 0 | 13/21 |
| 94 | **1240** | 42 | 56 | 2 | 60 | 15 | 0 | 0 | 10/20 |
| 99 | **1060** | 28 | 58 | 13 | 120 | 34 | 0 | 0 | 11/26 |
| 04 | **1520** | 13 | 70 | 17 | - | 18 | 13 | 1 | 9/16 |
| 09 | **1400** | 6 | 91 | 3 | 40 | 9 | 6 | 0 | 10/18 |
| Tetradymia canescens | | | | | | | | | |
| 88 | **0** | 0 | 0 | 0 | 66 | 0 | 0 | 0 | -/- |
| 94 | **1440** | 4 | 92 | 4 | - | 0 | 0 | 1 | 7/11 |
| 99 | **1120** | 16 | 80 | 4 | 100 | 18 | 0 | 4 | 8/11 |
| 04 | **1680** | 8 | 83 | 8 | - | 37 | 13 | 2 | 7/10 |
| 09 | **1420** | 23 | 62 | 15 | 60 | 24 | 4 | 7 | 7/12 |