

Trend Study 17-30-07

Study site name: Spring Canyon.

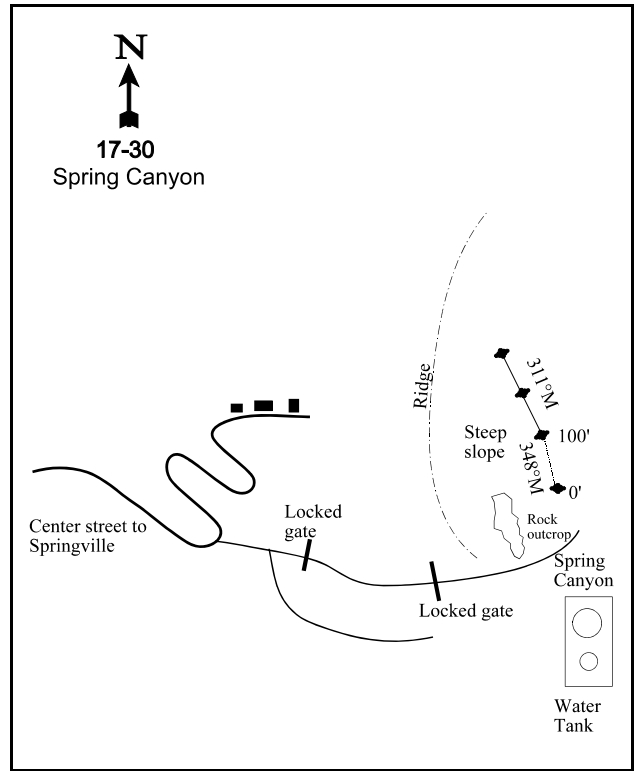
Vegetation type: Stansbury Cliffrose.

Compass bearing: frequency baseline 348 degrees magnetic (line 2-3 @ 311°M).

Frequency belt placement: line 1 (11 & 95ft), line 2 (34 & 71ft), line 3 (59ft). Rebar: belt 1 on 1ft., belt 5 on 1ft.

LOCATION DESCRIPTION

Follow Center Street in Springville easterly toward the mountain. From the first switchback where the main road goes up to houses on the bench north of Spring Canyon, continue towards the canyon mouth to the first gate. Continued development may alter the approach to the canyon. In 1989, you could walk 1/2 mile from the first locked gate to another gate up in the canyon. From this gate, continue 119 paces east up Spring Canyon. Uphill to the northwest (azimuth 271 degrees) there is a conspicuous group of rock outcroppings. Walk up the side hill to the uppermost rock near the top of the ridge. The 0-foot baseline stake, marked with a red browse tag #177, is north of the rock.



Map Name: Springville

Diagrammatic Sketch

Township 7S, Range 3E, Section 35

GPS: NAD 83, UTM 12T 451466 E 4446006 N

DISCUSSION

Spring Canyon - Trend Study No. 17-30

Study Information

This severe winter range study is located near the mouth of Spring Canyon [elevation 5,200 feet (1,585 m), slope: 60%-65%, aspect: south]. This is an area of critical importance, but also one which is seriously depleted. During the winter, the area is intensively used by deer and may also be used by elk. From the pellet group transect, there were 42 deer days use/acre (104 ddu/ha) in 2002 and 9 deer days use/acre (22 ddu/ha) in 2007. Elk use was estimated at 3 days use/acre (8 edu/ha) in 2002 and 60 days use/acre (147 edu/ha) in 2007. All pellet groups appeared to be from winter use.

Soil

The soil is exceptionally loose, rocky, and easily moved down the steep slope. The soil has a sandy loam texture and a neutral soil reaction (pH of 7.0). Both phosphorous and potassium levels are low at 5.9 ppm and 57.6 ppm, respectively. Levels less than 6 ppm for phosphorus and 60 ppm for potassium can limit normal plant growth and development (Tiedemann and Lopez 2004). No soil profile or horizon development was detectable. Surface rock is variable in size and appears to be limestone. The soil erosion condition was classified as slight in 2002 and 2007 due to moderate levels of surface litter movement, flow patterns, and rills.

Browse

The dominant browse species is Stansbury cliffrose (*Cowania mexicana* ssp. *stansburiana*). Canopy cover of cliffrose increased from less than 1% in 2002 to 6% in 2007. The density of cliffrose was estimated at 266 plants/acre (658 plants/ha) in 1983 and increased to 365 plants/acre (903 plants/ha) in 1989. In 1997, the density had decreased to 180 plants/acre (445 plants/ha), and increased to 380 plants/acre (940 plants/ha) by 2007. Because there were no dead plants sampled in 1997, the decrease in density between 1989 and 1997 was attributed to the larger area sampled. The population has consisted largely of mature plants all sample years. Seedlings were sampled at low densities in 1989 and 1997. The young age class has comprised between 0% and 18% of the population. Less than 10% of the population was classified as decadent, except in 1997 (22%) and 2007 (21%). With the exception of 1983, when 63% of the plants exhibited poor vigor, the population has had good vigor. Annual leader growth averaged 0.8 inches (2.1 cm) in 2002 and 1.1 inches (2.8 cm) in 2007. Browse use has ranged from moderate-heavy to heavy.

Though not a preferred species, broom snakeweed (*Gutierrezia sarothrae*) has the highest density of the browse species. The density has ranged from 580 plants/acre (1,435 plants/ha) to 2,760 plants/acre (6,830 plants/ha). The fluctuations in density have been attributed to changes in precipitation (Utah Climate Summaries 2007). A short distance up the canyon, there are a few patches of Gambel oak (*Quercus gambelii*), netleaf hackberry (*Celtis reticulata*), and Rocky Mountain smooth sumac (*Rhus glabra*).

Herbaceous Understory

Grasses are the dominant component of the vegetation cover. Since 1997, grass cover has averaged 36%. However, species diversity of perennial grasses is low. Bulbous bluegrass (*Poa bulbosa*) is the most abundant grass, comprising an average 23% cover since 1997. Bulbous bluegrass has a phenology similar to annual grasses (Stewart and Hull 1949) and may be limiting the establishment of other species. Bluebunch wheatgrass (*Agropyron spicatum*) is also present and has averaged 6% of the total ground cover since 1997. Cheatgrass (*Bromus tectorum*) cover has steadily increased from 3% in 1997 to 14% by 2007. In 2007, cheatgrass cover was similar to bulbous bluegrass cover, and both species have been sampled in over 90% of the quadrats since 1997.

The forbs present in the understory have a low forage value. Forb cover averaged 3% in 1997 and 2002, and increased to 7% in 2007. Much of the increase was attributed to storksbill (*Erodium cicutarium*) and pale

alyssum (*Alyssum alyssoides*). Otherwise, the dominant perennial forbs include cudweed sagewort (*Artemisia ludoviciana*) and shortstem wild buckwheat (*Eriogonum brevicaulis*).

1989 TREND ASSESSMENT

The browse trend is up. The density of cliffrose increased 37%. Seedlings were sampled for the first time, though still at a low density. Young plants increased from 12% to 18% of the population. Although decadence increased from 0% to 9%, plants with poor vigor decreased from 63% to 0% of the population. The average crown width decreased 17 inches (43 cm). Browse use on cliffrose shifted from moderate-heavy to heavy. The grass trend is down. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses decreased 38%. There was a significant decrease in the nested frequency of bluebunch wheatgrass. The forb trend is down. The sum of nested frequency of perennial forbs decreased 21%. Species composition remained low.

browse - up (+2)

grass - down (-2)

forb - down (-2)

1997 TREND ASSESSMENT

The browse trend is stable. The density of cliffrose decreased 51%. However, this decrease was attributed to the larger area sampled, and trend was determined from other parameters. For example, even though the density of seedlings increased more than two-fold, there were no young plants sampled. Additionally, decadence increased from 9% to 22% of the population. No plants had poor vigor, but browse use was exclusively heavy. The average height and crown measurements increased 21 inches (53 cm) and 19 inches (48 cm), respectively. The grass trend is up. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses increased 73%. There was a significant increase in bluebunch wheatgrass nested frequency, and quadrat frequency increased from 45% to 68%. There was also a significant increase in the nested frequency of bulbous bluegrass. The forb trend is stable. The sum of nested frequency of perennial forbs increased 4%, and the number of perennial forb species that were sampled increased from four to nine. The Desirable Components Index (DCI) score was very poor due to the low preferred browse cover, low perennial grass cover (excluding bulbous bluegrass), and low perennial forb cover.

winter range condition (DCI) - very poor (17) Mid-level potential scale

browse - stable (0)

grass - up (+2)

forb - stable (0)

2002 TREND ASSESSMENT

The browse trend is up. The density of cliffrose increased 33%. No seedlings were sampled, but young plants increased to 8% of the population. Decadence decreased to 8% of the population. No plants were classified as having poor vigor or dying. The proportion of plants with heavy browse use decreased from 100% to 58% of the population. The grass trend is slightly down. Excluding bulbous bluegrass, the sum of nested frequency of perennial grasses decreased 11%. There was no significant decrease of any one species. The forb trend is stable. The sum of nested frequency of perennial forbs did not change. There was a significant increase in the nested frequency of storksbill, and a significant decrease in that of pale alyssum. The DCI score remained very poor.

winter range condition (DCI) - very poor (19) Mid-level potential scale

browse - up (+2)

grass - slightly down (-1)

forb - stable (0)

2007 TREND ASSESSMENT

The browse trend is up. The density of cliffrose increased 58%, and most of the increase was attributed to the mature age class. However, there were no seedling or young plants sampled. Decadence increased to 21% of the population, and the density of dead plants increased from 0 to 20 plants/acre (50 plants/ha). Plants with poor vigor comprised 11% of the population, and 5% of the population was classified as dying. Heavy browse use increased to 89% of the sampled plants. The grass trend is stable. Excluding bulbous bluegrass, the sum

of nested frequency of perennial grasses did not change. There was a significant increase in the nested frequency of cheatgrass, and a significant decrease in that of bulbous bluegrass. Cheatgrass cover increased from 6% to 14%, and bulbous bluegrass cover decreased from 27% to 17%. The forb trend is slightly up. The sum of nested frequency of perennial forbs increased 13%, and the number of perennial species that were sampled increased from seven to 12. There were significant increases in the nested frequencies of pale alyssum and storksbill. The DCI score remained very poor.

winter range condition (DCI) - very poor (16) Mid-level potential scale
browse - up (+2) grass - stable (0) forb - slightly up (+1)

HERBACEOUS TRENDS --
 Management unit 17 , Study no: 30

| T y p e | Species | Nested Frequency | | | | | Average Cover % | | |
|-----------------------------|----------------------------|------------------|-------------------|------------------|------------------|------------------|-----------------|-------|-------|
| | | '83 | '89 | '97 | '02 | '07 | '97 | '02 | '07 |
| G | Agropyron spicatum | _b 157 | _a 97 | _b 162 | _b 148 | _b 139 | 3.85 | 5.75 | 5.75 |
| G | Aristida purpurea | - | - | - | - | 2 | - | - | .15 |
| G | Bromus tectorum (a) | - | - | _a 288 | _a 295 | _b 344 | 3.47 | 6.02 | 14.17 |
| G | Poa bulbosa | _a 294 | _{ab} 320 | _c 348 | _c 345 | _b 314 | 24.68 | 26.57 | 17.18 |
| G | Poa secunda | - | - | _a 6 | _a 1 | _a 8 | .18 | .00 | .19 |
| Total for Annual Grasses | | 0 | 0 | 288 | 295 | 344 | 3.47 | 6.02 | 14.17 |
| Total for Perennial Grasses | | 451 | 417 | 516 | 494 | 463 | 28.73 | 32.32 | 23.28 |
| Total for Grasses | | 451 | 417 | 804 | 789 | 807 | 32.20 | 38.35 | 37.46 |
| F | Alyssum alyssoides (a) | - | - | _b 53 | _a 17 | _c 131 | .14 | .04 | .53 |
| F | Ambrosia psilostachya | - | - | - | - | 17 | - | - | .40 |
| F | Amsinckia tessellata | - | - | - | - | 2 | - | - | .01 |
| F | Artemisia ludoviciana | _a 39 | _a 28 | _a 27 | _a 29 | _a 35 | .28 | .39 | 1.12 |
| F | Aster sp. | - | - | - | 3 | - | - | .03 | - |
| F | Astragalus utahensis | - | - | _a 6 | _a 2 | _a 4 | .06 | .03 | .01 |
| F | Cirsium undulatum | _a 8 | _a 15 | _a 16 | - | _a 4 | .59 | - | .05 |
| F | Cryptantha sp. | - | - | - | _a 3 | _a 1 | - | .00 | .01 |
| F | Descurainia pinnata (a) | - | - | - | - | 8 | - | - | .01 |
| F | Epilobium brachycarpum (a) | - | - | - | - | 4 | - | - | .03 |
| F | Eriogonum brevicaule | _b 89 | _{ab} 64 | _{ab} 52 | _{ab} 72 | _a 36 | 1.88 | 2.33 | 2.31 |
| F | Erodium cicutarium (a) | - | - | _a 4 | _b 30 | _c 88 | .01 | .17 | 2.35 |
| F | Erigeron pumilus | - | - | - | - | - | - | - | .00 |
| F | Eriogonum racemosum | - | - | - | 1 | - | - | .03 | - |
| F | Galium aparine (a) | - | - | - | - | - | - | - | .03 |
| F | Gilia sp. (a) | - | - | - | 14 | - | - | .03 | - |
| F | Heterotheca villosa | - | - | _a 2 | _a - | _a 6 | .03 | .00 | .04 |
| F | Lappula occidentalis (a) | - | - | - | _b 17 | _a 2 | - | .04 | .03 |
| F | Lactuca serriola | - | - | - | - | 7 | - | - | .02 |

| Type | Species | Nested Frequency | | | | | Average Cover % | | |
|---------------------------|---------------------------|------------------|-----|-----|-----|-----|-----------------|------|------|
| | | '83 | '89 | '97 | '02 | '07 | '97 | '02 | '07 |
| F | Lomatium sp. | - | - | 2 | - | - | .00 | - | - |
| F | Machaeranthera canescens | - | a1 | a3 | - | - | .04 | - | - |
| F | Oenothera caespitosa | - | - | - | - | - | - | - | .00 |
| F | Penstemon sp. | - | - | a3 | - | a1 | .03 | - | .15 |
| F | Phlox longifolia | - | - | - | - | 6 | - | - | .01 |
| F | Sisymbrium altissimum (a) | - | - | - | - | 4 | - | - | .01 |
| F | Tragopogon dubius | a1 | - | a1 | a2 | a8 | .03 | .00 | .04 |
| Total for Annual Forbs | | 0 | 0 | 57 | 78 | 237 | 0.15 | 0.29 | 3.00 |
| Total for Perennial Forbs | | 137 | 108 | 112 | 112 | 127 | 2.97 | 2.83 | 4.19 |
| Total for Forbs | | 137 | 108 | 169 | 190 | 364 | 3.12 | 3.13 | 7.20 |

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

BROWSE TRENDS --

Management unit 17 , Study no: 30

| Type | Species | Strip Frequency | | | Average Cover % | | |
|------------------|------------------------------------|-----------------|-----|-----|-----------------|------|------|
| | | '97 | '02 | '07 | '97 | '02 | '07 |
| B | Celtis reticulata | 0 | 0 | 0 | .03 | .53 | .41 |
| B | Chrysothamnus nauseosus albicaulis | 1 | 1 | 0 | .00 | .38 | - |
| B | Cowania mexicana stansburiana | 9 | 10 | 17 | 2.66 | 3.34 | 3.57 |
| B | Gutierrezia sarothrae | 48 | 22 | 26 | 1.89 | .09 | .19 |
| B | Purshia tridentata | 0 | 4 | 1 | - | .03 | - |
| B | Quercus gambelii | 1 | 1 | 1 | 1.03 | 1.23 | .79 |
| Total for Browse | | 59 | 38 | 45 | 5.63 | 5.61 | 4.97 |

CANOPY COVER, LINE INTERCEPT --

Management unit 17 , Study no: 30

| Species | Percent Cover | |
|-------------------------------|---------------|------|
| | '02 | '07 |
| Celtis reticulata | - | .26 |
| Cowania mexicana stansburiana | .25 | 6.40 |
| Gutierrezia sarothrae | - | .80 |
| Quercus gambelii | .20 | 2.50 |

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 17 , Study no: 30

| Species | Average leader growth (in) | |
|-------------------------------|----------------------------|-----|
| | '02 | '07 |
| Cowania mexicana stansburiana | 0.8 | 1.1 |

BASIC COVER --

Management unit 17 , Study no: 30

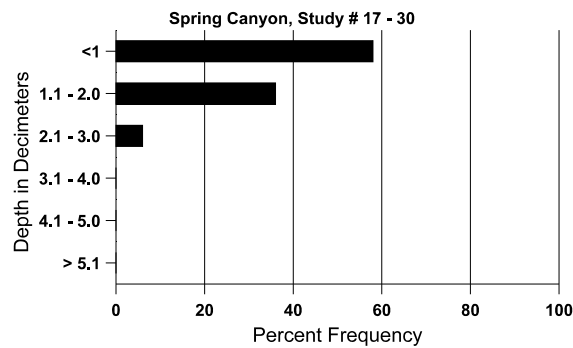
| Cover Type | Average Cover % | | | | |
|-------------|-----------------|-------|-------|-------|-------|
| | '83 | '89 | '97 | '02 | '07 |
| Vegetation | 4.50 | 8.25 | 39.04 | 48.04 | 48.13 |
| Rock | 14.00 | 12.50 | 13.13 | 16.63 | 17.46 |
| Pavement | 45.00 | 56.25 | 28.82 | 28.96 | 18.38 |
| Litter | 31.00 | 14.25 | 17.02 | 15.57 | 22.85 |
| Cryptogams | .75 | 0 | .43 | 0 | .30 |
| Bare Ground | 4.75 | 8.75 | 10.95 | 2.64 | 9.08 |

SOIL ANALYSIS DATA --

Herd Unit 17, Study no: 30, Spring Canyon

| Effective rooting depth (in) | Temp °F (depth) | pH | Sandy loam | | | %OM | ppm P | ppm K | dS/m |
|------------------------------|-----------------|-----|------------|-------|-------|-----|-------|-------|------|
| | | | %sand | %silt | %clay | | | | |
| 10.6 | 55.8 (12.6) | 7.0 | 61.8 | 22.4 | 15.8 | 2.0 | 5.87 | 57.6 | .6 |

Stoniness Index



PELLET GROUP DATA --

Management unit 17 , Study no: 30

| Type | Quadrat Frequency | | |
|--------|-------------------|-----|-----|
| | '97 | '02 | '07 |
| Rabbit | - | 1 | - |
| Elk | 22 | 2 | 17 |
| Deer | 38 | 32 | 47 |

| Days use per acre (ha) | |
|------------------------|----------|
| '02 | '07 |
| - | - |
| 3 (8) | 60 (147) |
| 42 (104) | 9 (22) |

BROWSE CHARACTERISTICS --
Management unit 17 , Study no: 30

| | | Age class distribution (plants per acre) | | | | | Utilization | | | | | |
|--|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year | Plants per Acre (excluding seedlings) | Seedling | Young | Mature | Decadent | Dead | % moderate | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Celtis reticulata</i> | | | | | | | | | | | | |
| 83 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 89 | 33 | - | - | 33 | - | - | 100 | 0 | - | - | 0 | 46/67 |
| 97 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | 24/104 |
| 02 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | 26/103 |
| 07 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | 42/96 |
| <i>Chrysothamnus nauseosus albicaulis</i> | | | | | | | | | | | | |
| 83 | 0 | - | - | - | - | - | 0 | 0 | 0 | - | 0 | -/- |
| 89 | 0 | - | - | - | - | - | 0 | 0 | 0 | - | 0 | -/- |
| 97 | 20 | - | - | 20 | - | - | 0 | 100 | 0 | - | 0 | 17/41 |
| 02 | 20 | - | - | - | 20 | - | 100 | 0 | 100 | 100 | 100 | 13/31 |
| 07 | 0 | - | - | - | - | - | 0 | 0 | 0 | - | 0 | 28/30 |
| <i>Cowania mexicana stansburiana</i> | | | | | | | | | | | | |
| 83 | 266 | - | 33 | 233 | - | - | 38 | 63 | 0 | - | 63 | 52/81 |
| 89 | 365 | 33 | 66 | 266 | 33 | - | 18 | 82 | 9 | - | 0 | 55/64 |
| 97 | 180 | 80 | - | 140 | 40 | - | 0 | 100 | 22 | - | 0 | 76/83 |
| 02 | 240 | - | 20 | 200 | 20 | - | 8 | 58 | 8 | - | 0 | 65/87 |
| 07 | 380 | - | - | 300 | 80 | 20 | 0 | 89 | 21 | 5 | 11 | 61/75 |
| <i>Gutierrezia sarothrae</i> | | | | | | | | | | | | |
| 83 | 899 | - | 533 | 366 | - | - | 0 | 0 | 0 | - | 0 | 11/14 |
| 89 | 866 | - | 100 | 633 | 133 | - | 0 | 0 | 15 | 4 | 15 | 6/5 |
| 97 | 2760 | 300 | 800 | 1960 | - | 20 | 0 | 0 | 0 | - | 0 | 8/11 |
| 02 | 580 | 20 | 160 | 240 | 180 | 520 | 3 | 0 | 31 | 3 | 10 | 5/7 |
| 07 | 1140 | - | 140 | 980 | 20 | 20 | 2 | 4 | 2 | 2 | 2 | 8/11 |
| <i>Purshia tridentata</i> | | | | | | | | | | | | |
| 83 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 89 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 97 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 02 | 100 | - | 20 | 80 | - | - | 40 | 60 | - | - | 0 | 38/9 |
| 07 | 20 | - | - | 20 | - | - | 0 | 100 | - | - | 0 | 6/11 |

| | | Age class distribution (plants per acre) | | | | | Utilization | | | | | |
|-------------------------|---------------------------------------|--|-------|--------|----------|------|-------------|---------|------------|---------|--------------|---------------------------|
| Year | Plants per Acre (excluding seedlings) | Seedling | Young | Mature | Decadent | Dead | % moderate | % heavy | % decadent | % dying | % poor vigor | Average Height Crown (in) |
| <i>Quercus gambelii</i> | | | | | | | | | | | | |
| 83 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 89 | 0 | - | - | - | - | - | 0 | 0 | - | - | 0 | -/- |
| 97 | 20 | - | - | 20 | - | - | 0 | 0 | - | - | 0 | 94/114 |
| 02 | 60 | 20 | - | 60 | - | - | 0 | 0 | - | - | 0 | 65/76 |
| 07 | 40 | 140 | - | 40 | - | - | 0 | 0 | - | - | 0 | 119/148 |