# Ecological site R042BF020NM
# Limestone Hill, Desert Foothills

Accessed: 05/21/2024

## General information

**Provisional**. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

**Figure 1. Mapped extent**

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | Not specified |
| Herbaceous | Not specified |

## Physiographic features

This site occurs as hills, low mountains or the lower footslopes of higher mountains. Slopes are from 15 to 60 percent, averaging about 25 percent. Direction of slope varies and is important. The north and east slopes are cooler and moister than the south and west facing slopes. This has an effect on the kind and amount of vegetation present. Elevations range from 3,500 to 4,500 feet.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Hill<br>(2) Mountain slope<br>(3) Fan piedmont |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 1,067–1,372 m |
| Slope | 15–50% |
| Aspect | Aspect is not a significant factor |

## Climatic features

The climate of the area is “semi-arid continental”. The average annual precipitation ranges from 8 to 13 inches. Variations of 5 inches, more or less, are common. Over 80 percent of the precipitation falls from April through October. Most of the summer precipitation comes in the form of high intensity – short duration thunderstorms. Temperatures are characterized by distinct seasonal changes and large annual and diurnal temperature changes. The average annual temperature is 61 degrees with extremes of 25 degrees below zero in the winter to 112 degrees in the summer. The average frost-free season is 180 to 220 days. The last killing frost is in late March or early April, and the first killing frost is in late October or early November. Temperature and rainfall both favor warm season perennial plant growth. In years of abundant spring moisture, annual forbs and cool season grasses can make up an important component of this site. Effective precipitation on the soil is significantly enhanced by the runoff from the adjacent rock outcrop. This factor serves to nearly double the effective precipitation, when plant cover and litter

are present to aid in absorption of moisture. Due to the shallow nature of the soil areas between the rocks, excellent plant growth can be made from even light rain showers. Heavy rains result in excessive runoff. Natural geological erosion and sedimentation rates from this site are high.

Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html web site using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F respectively.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (average) | 220 days |
| Freeze-free period (average) | 240 days |
| Precipitation total (average) | 330 mm |

## Influencing water features

This site is not influenced by wetlands or streams.

## Soil features

The soils of this site are very shallow and shallow and well drained. The surface textures are very stony loam, very cobbly loam, extreamly cobbly loam. Limestone bedrock is at a depth of 8 to 20 inches. Limestone rock outcrop is a component of the unit.

Minimum and maximum values listed below represent the characteristic soils for this site.

Characteristic Soils Are:
Lozier
Ector
Alturda
Bankston

**Table 4. Representative soil features**

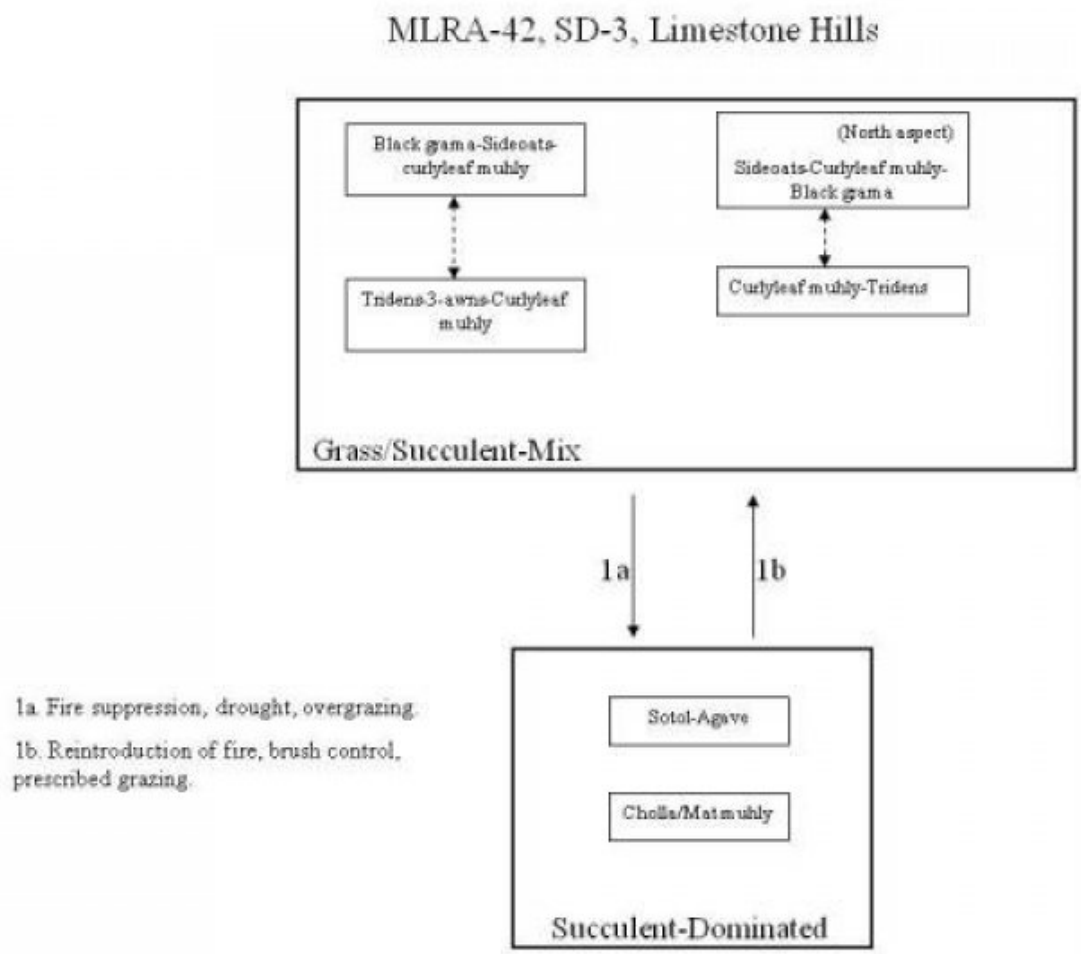
| | |
|---|---|
| Surface texture | (1) Extremely cobbly loam<br>(2) Very cobbly loam<br>(3) Very stony loam |
| Family particle size | (1) Loamy |
| Drainage class | Moderately well drained to well drained |
| Permeability class | Moderately slow to moderate |
| Soil depth | 8–64 cm |
| Surface fragment cover <=3" | 15–30% |
| Surface fragment cover >3" | 10–40% |
| Available water capacity (0-101.6cm) | 2.54–7.62 cm |
| Calcium carbonate equivalent (0-101.6cm) | 15–60% |
| Electrical conductivity (0-101.6cm) | 0–2 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0–1 |
| Soil reaction (1:1 water) (0-101.6cm) | 7.8–8.4 |

| | |
|---|---|
| Subsurface fragment volume <=3" (Depth not specified) | 15–50% |
| Subsurface fragment volume >3" (Depth not specified) | 20–40% |

## Ecological dynamics

The Limestone Hills site is associated with both Draw and Gravelly sites. Draw sites often dissect the lower footslopes of Limestone Hills. The Gravelly site occurs as upland plains adjacent to, but topographically lower than the Limestone Hills site. The historic plant community of Limestone Hills has the aspect of a Grass/Succulent mix. Grasses are the dominant component followed by succulents and shrubs. Forbs are the minor component, but can increase significantly during years of abundant rainfall. Slope, aspect, soil properties, and landscape position all contribute to the diversity of plant communities. Black grama, sideoats grama, and curlyleaf muhly are the dominant grasses. Lechuguilla, agave, sotol, yucca species, and sacahuista are succulents common to this site. Retrogression within this state is characterized by a decrease in the more palatable grasses, and an increase in tridens species, threeawns, and curlyleaf muhly. The stony surface on this site serves as a rocky armor that helps to protect this site from erosion and grass loss by decreasing runoff velocities and protecting grass crowns from overgrazing. Drought, and/or over grazing can initiate a transition to a succulent dominated community.

## State and transition model




**State 1**
**Historic Climax Plant Community**

**Community 1.1**

## Historic Climax Plant Community

Grass/Succulent Mix: The aspect of this site is a grass/succulent mix with a high degree of diversity in plant communities. This diversity is a reflection of aspect, slope, elevation, and soil depth. Grasses are the dominant component followed by succulents and shrubs. Black grama, sideoats grama, and curlyleaf muhly are the dominant grasses. Black grama tends to dominate on south, west and neutral aspects, and lower elevations, while sideoats grama prefers the cooler moister north and east aspects and higher elevations. Curlyleaf muhly seems to be adapted across a wide range of temperature and moisture regimes and can come to dominate due to selective grazing pressure on most aspects. Lechuguilla, Parry agave, sotol, yucca species, and sacahuista are the dominant succulents. Most succulents seem to be better adapted to the warmer south and west facing slopes and lower elevations. Sacahuista however is more tolerant of cooler temperatures and higher elevations.1 Catclaw mimosa, littleleaf sumac and creosotebush are shrubs common to this site. In general shrubs are more prevalent along drainages and on benches formed by outcrops of limestone bedrock. They are less dense and more evenly distributed across steeper slopes between drainageways. Creosotebush is usually confined to the lower footslopes of hills. Littleleaf sumac densities are higher along drainages. Catclaw mimosa prefers south and west aspects with somewhat deeper skeletal soils across side slopes of hills. As retrogression within this state occurs plants such as black grama, sideoats grama, plains bristlegrass, and green sprangletop decrease and grasses that are most readily grazed while actively growing, such as curlyleaf muhly, and less palatable grasses such as tridens and threeawns will increase. Fire suppression drought, and/or overgrazing may facilitate areas within this site becoming dominated by succulents Diagnosis: Black grama, sideoats grama, and curlyleaf muhly are the dominant grass species. Grass cover is uniformly distributed, however, large bare areas exist as rock outcrop, or over extremely shallow soils. Succulents and shrubs are common and generally more prevalent on south and west aspects, at lower elevations, and along drainageways. There is limited evidence of active rills and gully formation if plant cover remains intact. Litter movement associated with overland flow is limited to smaller size class litter and short distances. Litter size class and distance moved increases as slopes exceed 25 percent.

**Table 5. Annual production by plant type**

| Plant Type | Low (Kg/Hectare) | Representative Value (Kg/Hectare) | High (Kg/Hectare) |
|---|---|---|---|
| Grass/Grasslike | 370 | 616 | 863 |
| Shrub/Vine | 235 | 392 | 549 |
| Forb | 67 | 112 | 157 |
| **Total** | **672** | **1120** | **1569** |

**Table 6. Ground cover**

| | |
|---|---|
| Tree foliar cover | 0% |
| Shrub/vine/liana foliar cover | 0% |
| Grass/grasslike foliar cover | 15-20% |
| Forb foliar cover | 0% |
| Non-vascular plants | 0% |
| Biological crusts | 0% |
| Litter | 10-12% |
| Surface fragments >0.25" and <=3" | 0% |
| Surface fragments >3" | 0% |
| Bedrock | 0% |
| Water | 0% |
| Bare ground | 18-24% |

**Figure 5. Plant community growth curve (percent production by month). NM2820, R042XC020NM Limestone Hills HCPC. R042XC020NM Limestone Hills HCPC Mixed grass-shrub plant community.**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 2 | 5 | 8 | 10 | 25 | 30 | 15 | 5 | 0 | 0 |

### State 2
### Succulent-Dominated

### Community 2.1
### Succulent-Dominated

Additional States: Succulent-Dominated: This state is characterized by the predominance of succulents, with perennial grasses as the subordinate component. Sotol, Parry agave, lechuguilla, sacahuista, or cholla may become the dominant succulent. Sotol and agave are often co-dominant in local areas, usually on south and west aspects along side slopes of hills. In the absence of fire, lechuguilla may form extensive clonal colonies often with sotol as a sub-dominant.1 Black grama and tridens species are typically the main grass species on these sites. Sacahuista is better adapted to the cooler north and east aspects and higher elevations and may dominate with sideoats and curlyleaf muhly as subordinate species. Cholla may be the dominant on the slightly deeper soils of ridge tops and benches historically overgrazed by sheep, with mat muhly and common horehound as subordinate components. Certain areas seem to be naturally dominated by succulents. Highly calcareous limestone derived, shallow rocky soils on south and west aspect slopes provide the ideal habitat for agaves and sotol with their shallow, dense, spreading root systems and tend to naturally have greater densities of succulents. Diagnosis: Succulents are found at increased densities. Grass cover is variable ranging from relatively uniform to patchy with frequent areas of bare ground present. On areas that are overgrazed or during periods of extended drought there is a decrease in percent composition of sideoats and black grama, and increased representation of tridens species, threeawns, and fluffgrass. Transition to Succulent Dominated (1a): Transitions from Grass/Succulent mix to a Succulent Dominated state may occur as a result of fire suppression, drought, and overgrazing. Most of the succulents are susceptible to mortality following fire. Historically fire may have played a role in limiting the density of succulents by reducing the number of young plants, and in cases of more severe fire, killing mature plants.1 Fire may also cause mortality by weakening the plants and making them more susceptible to damage by insects and rodents. Overgrazing by livestock may help disseminate seed and increase establishment of succulents. Loss of grass cover due to overgrazing or drought reduces fine fuel loads necessary to carry fire. Key indicators of approach to transition: ?? Decrease or change in composition or distribution of grass cover. ?? Increase in the amount of succulent seedlings. ?? Increased cover of succulents. Transition back to Grass/Succulent Mix (1b) Fire is an effective means of controlling succulents provided adequate grass cover remains to carry fire.1 Chemical control is also successful in controlling cholla; apply when growth starts in May. Prescribed grazing will help ensure proper forage utilization and sustain grass cover.

## Additional community tables

**Table 7. Community 1.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production (Kg/Hectare) | Foliar Cover (%) |
|---|---|---|---|---|---|
| **Grass/Grasslike** | | | | | |
| 1 | | | | 280–448 | |
| | black grama | BOER4 | *Bouteloua eriopoda* | 280–448 | – |
| | curlyleaf muhly | MUSE | *Muhlenbergia setifolia* | 280–448 | – |
| 2 | | | | 168–336 | |
| | sideoats grama | BOCU | *Bouteloua curtipendula* | 168–336 | – |
| | plains lovegrass | ERIN | *Eragrostis intermedia* | 168–336 | – |
| 3 | | | | 56–112 | |
| | blue grama | BOGR2 | *Bouteloua gracilis* | 56–112 | – |
| | hairy grama | BOHI2 | *Bouteloua hirsuta* | 56–112 | – |
| 4 | | | | 56–112 | |
| | green sprangletop | LEDU | *Leptochloa dubia* | 56–112 | – |

| | | | | | |
|---|---|---|---|---|---|
| | green sprangletop | LEDU | *Leptochloa dubia* | 56–112 | – |
| | plains bristlegrass | SEVU2 | *Setaria vulpiseta* | 56–112 | – |
| 5 | | | | 56–112 | |
| | tridens | TRIDE | *Tridens* | 56–112 | – |
| 6 | | | | 56–78 | |
| | threeawn | ARIST | *Aristida* | 56–78 | – |
| 7 | | | | 34–56 | |
| | common wolfstail | LYPH | *Lycurus phleoides* | 34–56 | – |
| 8 | | | | 34–56 | |
| | Grass, perennial | 2GP | *Grass, perennial* | 34–56 | – |
| **Shrub/Vine** | | | | | |
| 9 | | | | 56–112 | |
| | lechuguilla | AGLE | *Agave lechuguilla* | 56–112 | – |
| | Parry's agave | AGPA4 | *Agave parryi* | 56–112 | – |
| | yucca | YUCCA | *Yucca* | 56–112 | – |
| | lechuguilla | AGLE | *Agave lechuguilla* | 56–112 | – |
| | Parry's agave | AGPA4 | *Agave parryi* | 56–112 | – |
| | yucca | YUCCA | *Yucca* | 56–112 | – |
| 10 | | | | 34–56 | |
| | catclaw mimosa | MIACB | *Mimosa aculeaticarpa var. biuncifera* | 34–56 | – |
| 11 | | | | 56–112 | |
| | common sotol | DAWH2 | *Dasylirion wheeleri* | 56–112 | – |
| | sacahuista | NOMI | *Nolina microcarpa* | 56–112 | – |
| 12 | | | | 22–56 | |
| | brickellbush | BRICK | *Brickellia* | 22–56 | – |
| 13 | | | | 22–56 | |
| | littleleaf sumac | RHMI3 | *Rhus microphylla* | 22–56 | – |
| 14 | | | | 22–56 | |
| | broom snakeweed | GUSA2 | *Gutierrezia sarothrae* | 22–56 | – |
| 15 | | | | 22–56 | |
| | yerba de pasmo | BAPT | *Baccharis pteronioides* | 22–56 | – |
| 16 | | | | 22–56 | |
| | Shrub (>.5m) | 2SHRUB | *Shrub (>.5m)* | 22–56 | – |
| **Forb** | | | | | |
| 17 | | | | 22–56 | |
| | buckwheat | ERIOG | *Eriogonum* | 22–56 | – |
| 18 | | | | 34–56 | |
| | woolly groundsel | PACA15 | *Packera cana* | 34–56 | – |
| | globemallow | SPHAE | *Sphaeralcea* | 34–56 | – |
| 19 | | | | 34–56 | |
| | fetid marigold | DYPA | *Dyssodia papposa* | 34–56 | – |
| | Goodding's tansyaster | MAPIG2 | *Machaeranthera pinnatifida ssp. gooddingii var. gooddingii* | 34–56 | – |
| 20 | | | | 22–56 | |
| | Forb (herbaceous, not grass | 2FORB | *Forb (herbaceous, not grass nor grass-* | 22–56 | – |

| | | | | | |
|---|---|---|---|---|---|
| | Forb (herbaceous, not grass nor grass-like) | 2FORB | *Forb (herbaceous, not grass nor grass-like)* | 22–66 | |

## Animal community

This site provides habitats which support a resident animal community that is characterized by mule deer, desert cottontail, cave myotis, rock squirrel, Botta’s pocket gopher, cactus mouse, white-throated woodrat, ringtail, bobcat, verdin, rock wren, black-throated sparrow, brown towhee, canyon wren, scaled quail, Say’s phoebe, collared lizard, tree lizard, Texas banded gecko, leopard lizard, rock rattlesnake, mountain patchnose snake and Sonora mountain kingsnake. The cave swallow nests in the vicinity of Carlsbad Caverns. The white-throated swift, prairie falcon and golden eagle nest on vertical cliffs and crevices associated with this site. These raptors also hunt over this site. White-winged dove nest on the eastern side of the Guadalupe Mountains. Lark sparrows have also been known to nest on this site.

## Hydrological functions

The runoff curve numbers are determined by field investigations using hydrolic cover conditions and hydrologic soil groups.

Hydrologic Interpretations Soil Series

Hydrologic---- Group
Ector--------- C
Lozier-------- D
Altuda ------- D
Bankston ----- D

## Recreational uses

This site offers recreation potential for hiking, horseback riding, nature observation and photography, rock hounding. This site also offers hunting opportunities for quail, antelope, deer and predators. This site has striking natural beauty, especially during June through August when many of the native shrubs are blooming in a riot of color. The elevations and relief of this site offer vistas from which to review the surrounding terrain.

## Wood products

This site provides no commercial wood products. However, the wood portions of many of the picturesque desert shrubs, such as parry's agave and walkingstick cholla, provide attractive materials for arts and crafts and home decorations in the southwestern traditions.

## Other products

This site is suitable for grazing by all kinds and classes of livestock during all times of the year. It is most efficiently utilized by combinations of sheep, goats, and cattle. As retrogression occurs, plants such as black and sideoats grama, plains lovegrass, plains bristlegrass and green sprangletop will decrease and the unpalatable grasses and woody plants will increase.

## Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index--- Ac/AUM
100 - 76---------- 3.5 – 4.3
75 – 51---------- 4.0 – 6.4
50 – 26---------- 6.2 – 11.0
25 – 0---------- 11.0 - +

## Inventory data references

Data collection for this site was done in conjunction with the progressive soil surveys within the Southern Desertic Basins, Plains and Mountains Major Land Resource Area of New Mexico. This site has been mapped and correlated with soils in the following soil surveys: South Chavez, Eddy, Lea and Otero County.

## Other references

Literature Cited:

1. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (2002, September). Fire Effects Information System, [Online]. Available: http://www.fs.fed.us/database/feis/ [accessed 12/05/02].

## Contributors

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## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

| | |
|---|---|
| Author(s)/participant(s) | |
| Contact for lead author | |
| Date | |
| Approved by | |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth ( in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not**

**invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**

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