USDA Natural Resources
Conservation Service

Ecological site R042CY152NM
Shallow

Last updated: 10/21/2024
Accessed: 11/21/2024

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.

Ecological site concept

This site occurs on gently sloping side slopes and tops of mountain foothills. Slopes vary from 1 to 9 percent, but average 5 percent.
The soils on this site are well-drained and shallow to very shallow over indurated caliche. Depth averages 9 to 18 inches. Surface textures vary from loam to cobbly loam.

Associated sites

R042CY151NM	**Limestone Hills** Limestone Hills occurs on limestone hills and footslopes of higher mountains. Slopes range from 10 to 60 percent. Soils are shallow, gravelly, and loamy. The reference plant community is mixed prairie grassland with scattered shrubs, forbs, and trees.
R042CY156NM	**Gravelly** Gravelly occurs on gravelly alluvial fans of higher limestone mountains. Slopes range from 5 to 20 percent. Soils are deep gravelly loams. The reference plant community is mixed prairie grassland with scattered shrubs, trees, and forbs.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Juniperus pinchotii*
Herbaceous	(1) *Muhlenbergia setifolia* (2) *Bouteloua eriopoda*

Physiographic features

This site consists of shallow soils occupying upland plains, gently sloping side slopes and tops of mountain foothills. Slopes vary from 1 to 9 percent, but average 5 percent. Direction of the slope varies and is not significant. Elevations range from 4, 000 to 7,000 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Fan remnant
Elevation	1,219–2,134 m

Slope	1–9%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this area is “semi-arid continental.”

Annual average precipitation ranges from 11 to 19 inches. Variations of 5 inches, more or less, are not uncommon. Approximately 70 percent of the precipitation occurs from May through October. Most of the summer rain comes in the form of high-intensity, short- uration thunderstorms. Winter moisture is usually negligible.

Temperatures are characterized by distinct seasonal changes and large annual and diurnal temperature changes. The average annual temperature ranges from 55 degrees to 60 degrees, with extremes of 20 degrees below zero in the winter to 110 degrees in the summer.

The average frost-free season is 170 to 189 days. The last killing frost is in early April and the first killing frost is in mid October.

Both temperature and precipitation favor warm-season perennial plant communities. Sufficient late winter and early spring moisture allows cool season species to occupy a minor component within the plant community in favorable years. Due to the shallow soil profile vegetation responds well to light rains. Strong winds blow from February through June from the west and southwest. This tends to dry out the soil during a critical period for cool season plant growth.

Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html web site.
Data interpreted utilizing NM NRCS Climate Summarizer spreadsheet.

Table 3. Representative climatic features

Frost-free period (average)	189 days
Freeze-free period (average)	211 days
Precipitation total (average)	483 mm

Influencing water features

This is an upland site, and is not associated with water features or wetlands. During heavy rain events, this site may receive run-on moisture from landforms above and contribute runoff to landforms below.

Soil features

The soils on this site are well-drained and shallow to very shallow over indurated caliche. Depth averages 9 to 18 inches. The soils have a moderate to moderately rapid permeability and a low water-holding capacity. Surface textures vary from loam to cobbly loam.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone
Surface texture	(1) Gravelly loam (2) Cobbly
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	10–51 cm

Surface fragment cover <=3"	15–35%
Surface fragment cover >3"	20–35%
Available water capacity (0-101.6cm)	2.54–7.62 cm
Calcium carbonate equivalent (0-101.6cm)	8–15%
Electrical conductivity (0-101.6cm)	0–1 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.6–8.2
Subsurface fragment volume <=3" (Depth not specified)	15–35%
Subsurface fragment volume >3" (Depth not specified)	15–35%

Ecological dynamics

The reference plant community of the Shallow site is a grassland/shrub-mix, dominated by grasses, with scattered shrubs and few trees. Dispersal of shrub seeds, competition for resources, loss of grass cover, and a decrease in natural fire regimes may facilitate the encroachment of shrubs. There is no evidence of a state where grasses are completely lost, perhaps due to low erodibility of high gravel soils and sufficient resources to support grass-shrub coexistence. All plant communities seem to occur within one stable state.

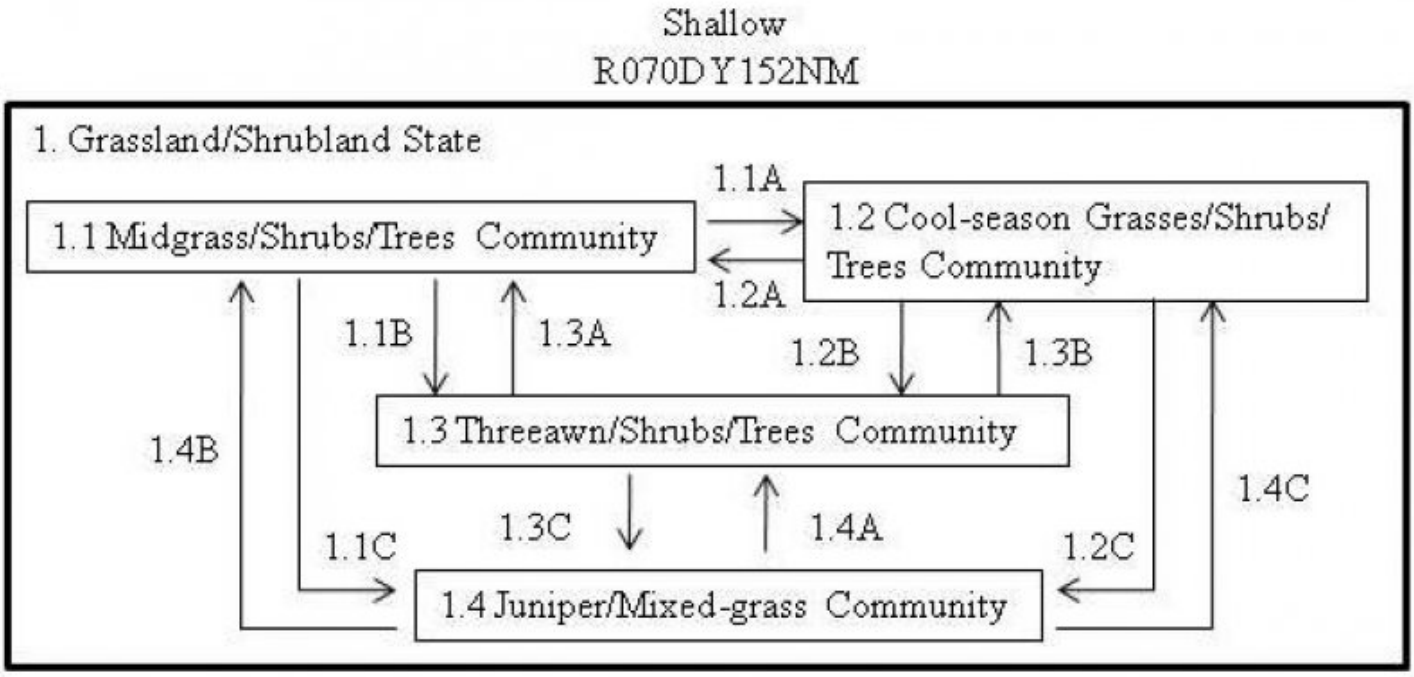
Fire plays an important role in maintaining the reference plant community. A fire frequency of 10-15 years would make this community type grassier (Ahlstrand 1982). However, Paysen et al. (2000) cautions that while fire can be used to accomplish objectives in grassy desert shrublands, it may also contribute to loss of desirable species. At Guadalupe Mountains National, pinyon pine is a minor component of this site, however frequent prescribed fires can potentially reduce its occurrence due to its sensitivity to fire.

Fluctuations in yearly weather conditions is another influential factor that helps shape the plant communities. Prolonged droughts will dramatically reduce herbaceous cover and production while wet summers will favor black grama dominance and wet winters will favor more mesic and cool-season grasses (Ludwig et al. 2000).

Bison may have utilized this site historically, but access to sufficient perennial water probably limited their stay. The reference community is suited for conservative or planned grazing but overutilization can reduce desirable grasses such as black grama and blue grama and increase less desirable grasses such as hairy grama, slim tridens, and perennial threeawn.

The following diagram suggests general pathways that the vegetation on this site might follow. There are other plant communities and states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances; it does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

State and transition model



LEGEND

1.1A Cool-season rainfall events
1.2A Warm-season rainfall events
1.1B Heavy Continuous Grazing
1.3A Prescribed Grazing or No Grazing Pressure
1.1C Fire Suppression, No Brush Management, Heavy Continuous Grazing
1.4B Prescribed Burning, Brush Management, Prescribed Grazing, Warm-season rainfall events
1.2B Heavy Continuous Grazing, Warm-season rainfall events
1.3B Prescribed Grazing or No Grazing Pressure, Cool-season rainfall events
1.2C Fire Suppression, No Brush Management, Heavy Continuous Grazing, Warm-season rainfall events
1.4C Prescribed Burning, Prescribed Grazing or No Grazing, Brush Management, Cool-season rainfall events
1.3C Heavy Continuous Grazing, No Fire, No Brush Management
1.4A Prescribed Grazing or No Grazing, Prescribed Burning, Brush Management

State 1
Grassland/Shrubland State

The reference community is the Midgrass/Shrubs/Trees Community (1.1). Curlyleaf muhly, black grama, and blue grama are common grasses. Common shrubs include redberry juniper, skunkbush sumac, wavyleaf oak, and sacahuista. Pinyon pine occurs as a minor component. Annual production ranges from 410 to 1010 pounds per acre. The Cool-season Grasses/Shrubs/Trees Community (1.2) is dominated by New Mexico feathergrass, a cool-season grass which dominates the herbaceous layer. Other cool-season grasses present in the plant community such as southwestern needlegrass may also increase. Warm-season grasses such as curlyleaf muhly, black grama, and blue grama occur as subdominants. The Threeawn/Shrubs/Trees Community (1.3)id dominated by less palatable grasses, such as perennial threeawns and hairy grama. Cover of black and blue grama is very low (<5%). With the reduction of grasses this site is very susceptible to shrub encroachment. Productivity of annual forbs will be higher in this phase following rain events. The Juniper/Mixed-grass Community (1.4) occurs when shrubs specifically redberry juniper to increase due to fire suppression. Overgrazing can cause this transition as well since in can reduce the fine fuels needed to carry a fire. Depending on grazing pressure this community can either be dominated my increaser or decreaser grasses. There has been no evidence of an alternate stable state with very high canopy cover of juniper (>75 percent) and grasses are completely lost.

Community 1.1
Midgrass/Shrubs/Trees Community

Figure 4. 1.1 Midgrass/Shrubs/Trees Community

This community phase is the reference plant community. Curlyleaf muhly, black grama, and blue grama are common grasses. Common shrubs include redberry juniper, skunkbush sumac, wavyleaf oak, and sacahuista. Pinyon pine occurs as a minor component. Annual production ranges from 410 to 1010 pounds per acre. Conservation practices such as prescribed fire and/or prescribed grazing can help maintain this plant community with a diverse mix of species. Lack of any disturbance overtime may favor more dominant plant life forms or particular species.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	516	773	1037
Shrub/Vine	202	325	448
Forb	39	67	101
Total	**757**	**1165**	**1586**

Figure 6. Plant community growth curve (percent production by month). NM4602, R070DY152NM Shallow Reference State. R070DY152NM Shallow Reference State Mixed short/mid warm-season grassland with significant shrub component. Forbs vary from year to year. .

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	5	10	10	25	30	12	5	0	0

Community 1.2
Cool-season Grasses/Shrubs/Trees Community

Figure 7. 1.2 Cool-season Grasses/Shrubs/Trees Community

New Mexico feathergrass, a cool-season grass dominates the herbaceous layer. Other cool-season grasses present in the plant community such as southwestern needlegrass may also increase. Warm-season grasses such as curlyleaf muhly, black grama, and blue grama occur as subdominants.

Community 1.3
Threeawn/Shrubs/Trees Community

This plant community phase is the result of heavy continuous grazing. Less palatable, grasses, such as perennial threeawns and hairy grama are dominant. Cover of black and blue grama is very low (<5%). With the reduction of grasses this site is very susceptible to shrub encroachment. In addition, the fine fuels needed to carry fires in reduced. Productivity of annual forbs will be higher in this phase following rain events. Hydrologic function is altered since runoff in increased due to reduces litter and grass cover.

Community 1.4
Juniper/Mixed-grass Community

This community phase is the result of fire suppression and/or heavy continuous grazing. Without fire natural succession will allow shrubs specifically redberry juniper to increase. Overgrazing can cause this transition as well since in can reduce the fine fuels needed to carry a fire. Depending on grazing pressure this community can either be dominated my increaser or decreaser grasses. There has been no evidence of an alternate stable state with very high canopy cover of juniper (>75 percent) and grasses are completely lost. Conservation practices such as prescribed burning, brush management, prescribed grazing or no grazing can facilitate a transition back to a warm or cool season reference community with a relatively low cover of shrubs.

Pathway 1.1A
Community 1.1 to 1.2

Midgrass/Shrubs/Trees Community

Cool-season Grasses/Shrubs/Trees Community

Above average cool-season precipitation and rainfall events will cause a shift from a warm-season grass community to a cool-season dominated grass community.

Pathway 1.1B
Community 1.1 to 1.3

Heavy continuous grazing or overutilization will decrease palatable grasses such as black grama and blue grama.

Less palatable grasses, such as perennial threeawns and hairy grama increase.

Pathway 1.1C
Community 1.1 to 1.4

The Midgrass/Shrubs/Trees Community will shift to the Juniper/Mixed-grass Community due to fire suppression, no brush management, and heavy continuous grazing.

Pathway 1.2A
Community 1.2 to 1.1

Cool-season Grasses/Shrubs/Trees Community

Midgrass/Shrubs/Trees Community

Above average warm-season precipitation will cause a shift from a cool-season grass community to a warm-season dominated grass community.

Pathway 1.2B
Community 1.2 to 1.3

With heavy continuous grazing pressure and warm-season rainfall events, the Cool-season Grasses/Shrubs/Trees Community will shift to the Threeawn/Shrubs/Trees Community.

Pathway 1.2C
Community 1.2 to 1.4

With fire suppression, no brush management, heavy continuous grazing, and warm-season rainfall events, the Cool-season Grasses/Shrubs/Trees Community will shift to the Juniper/Mixed-grass Community.

Pathway 1.3A
Community 1.3 to 1.1

With Prescribed Burning or No Grazing Pressure and Warm-season rainfall events, the Threeawn/Shrubs/Trees Community will revert back to the Midgrass/Shrubs/Trees Community.

Conservation practices

Prescribed Grazing

Pathway 1.3B
Community 1.3 to 1.2

With Prescribed Grazing or No Grazing Pressure and Cool-season rainfall events, the Threeawn/Shrubs/Trees Community can revert back to the Cool-season Grasses/Shrubs/Trees Community.

Conservation practices

Prescribed Grazing

Pathway 1.3C
Community 1.3 to 1.4

The shift from the Threeawn/Shrubs/Trees Community to the Juniper/Mixed-grass Community occurs due to heavy

continuous grazing, no fires, and no brush management.

Pathway 1.4B
Community 1.4 to 1.1

With Prescribed Burning, Prescribed Grazing or no grazing pressure, Brush Management, and Warm-season rainfall events, the Juniper/Mixed-grass Community can revert back to the Midgrass/Shrubs/Trees Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Pathway 1.4C
Community 1.4 to 1.2

With Prescribed Burning, Prescribed Grazing or no grazing pressure, Brush Management, and Cool-season rainfall events, the Juniper/Mixed-grass Community can revert back to the Cool-season Grasses/Shrubs/Trees Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Pathway 1.4A
Community 1.4 to 1.3

With Prescribed Grazing or no grazing pressure, the Juniper/Mixed-grass Community can be reverted back to the Threeawn/Shrubs/Trees Community.

Conservation practices

Prescribed Grazing

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Stoloniferous shortgrass**			174–347	
	black grama	BOER4	*Bouteloua eriopoda*	174–347	–
2	**Shortgrasses**			45–90	
	blue grama	BOGR2	*Bouteloua gracilis*	45–90	–
	curlyleaf muhly	MUSE	*Muhlenbergia setifolia*	17–45	–
3	**Midgrasses**			135–202	
	sideoats grama	BOCU	*Bouteloua curtipendula*	90–129	–
	little bluestem	SCSC	*Schizachyrium scoparium*	45–67	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	45–67	–
4	**Mid/Shortgrasses**			45–135	
		ERIN		17–45	

	plains lovegrass	ERIN	*Eragrostis intermedia*	17–45	–
	Hall's panicgrass	PAHA	*Panicum hallii*	17–45	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	17–45	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	11–45	–
5	**Shortgrasses**			101–224	
	tridens	TRIDE	*Tridens*	45–90	–
	threeawn	ARIST	*Aristida*	45–67	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	28–45	–
	burrograss	SCBR2	*Scleropogon brevifolius*	28–45	–
6	**Graminoids**			17–39	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	17–39	–
Forb					
7	**Forbs**			39–101	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	45–62	–
	dropseed	SPORO	*Sporobolus*	9–44	–
	croton	CROTO	*Croton*	9–26	–
	senna	SENNA	*Senna*	9–26	–
	pricklyleaf dogweed	THAC	*Thymophylla acerosa*	9–26	–
	buckwheat	ERIOG	*Eriogonum*	9–18	–
Shrub/Vine					
8	**Shrubs**			168–359	
	Pinchot's juniper	JUPI	*Juniperus pinchotii*	56–112	–
	pungent oak	QUPU	*Quercus pungens*	45–90	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	44–69	–
	little bluestem	SCSC	*Schizachyrium scoparium*	44–69	–
	algerita	MATR3	*Mahonia trifoliolata*	17–45	–
	catclaw acacia	ACGR	*Acacia greggii*	17–45	–
	resinbush	VIST	*Viguiera stenoloba*	17–45	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	11–28	–
	skunkbush sumac	RHTR	*Rhus trilobata*	11–28	–
9	**Fibrous/Succulents**			34–90	
	curlyleaf muhly	MUSE	*Muhlenbergia setifolia*	18–44	–
	green sotol	DALE2	*Dasylirion leiophyllum*	11–34	–
	pricklypear	OPUNT	*Opuntia*	11–34	–
	yucca	YUCCA	*Yucca*	11–34	–

Inventory data references

Data collection for this site was done in
conjunction with the progressive soil surveys
within the Pecos-Canadian Plains and Valleys Major Land Resource Area of New Mexico (MLRA 70).

This site has been mapped and correlated with soils in the following soil surveys:
Otero, Eddy, Chaves, Lincoln

Other references

References

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Approval

Kendra Moseley, 10/21/2024

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	11/21/2024
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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:**

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

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

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

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

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

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

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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:

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

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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:**

17. **Perennial plant reproductive capability:**