Ecological site R036XY112CO
Shallow Sandy Loam (pinyon-Utah juniper)

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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.

MLRA notes

Major Land Resource Area (MLRA): 036X–Southwestern Plateaus, Mesas, and Foothills

This MLRA is in New Mexico (58 percent), Colorado (32 percent), and Utah (10 percent). It makes up about 23,885 square miles (61,895 square kilometers). The major towns in the area are Cortez and Durango, Colorado; Santa Fe and Los Alamos, New Mexico; and Monticello, Utah. The city of Grand Junction in Colorado, and Interstate 70 are just outside the northern tip of this area. Interstate 25 crosses through the middle of the MLRA, and U.S. Highway 550 runs along the MLRA's southwest boundary in New Mexico. Mesa Verde National Park and the Bandelier, Hovenweep, Natural Bridges, Yucca House, and Colorado National Monuments are in the area. Many Indian reservations are in this MLRA. The largest are the Southern Ute, Ute Mountain, and Jicarilla Apache Reservations. Also in the area are the Cochiti, Jemez, Nambe, Navajo, Picuris, Pojoaque, San Felipe, San Ildefonso, San Juan, Sandia, Santa Ana, Santa Clara, Santa Domingo, Taos, Tesuque, and Zia Reservations.

This MLRA is within the Intermontane Plateaus Region. It is mainly in the Canyon Lands and Navajo Sections of the Colorado Plateau Province, partly in the Mexican Highland Section of the Basin and Range Province, and extends marginally into the Southern Rocky Mountains Province. Underlying sedimentary rock controls the landforms seen in most places, but fluvial landforms are in the Rio Grande Rift Basin at the southeastern portion of the MLRA. The elevation is commonly 4,600 to 8,500 feet (1,400 to 2,590 meters) and is generally highest (as high as 9,300 feet or 2,835 meters) in the foothills and high mesas that border the Southern Rocky Mountains. Relief is typically less than 1,500 feet (455 meters). The upper reaches of the Rio Grande and San Juan Rivers and their tributaries are in the part of this MLRA, near the Colorado and New Mexico state lines. The Rio Puerco and Rio Chama Rivers are in the New Mexico part of the MLRA. The Dolores and San Miguel Rivers are in the Colorado part of the MLRA, and a short reach of the Colorado River crosses this MLRA near the Utah and Colorado state lines.

Predominantly horizontal sedimentary beds from the Jurassic, Cretaceous, and Tertiary Periods underlie most of the MLRA. Representative formations are the Morrison Formation, Dakota Sandstone, Mancos Shale, Cliff House Sandstone, and other members of the Mesa Verde Group, including the Animas Formation and the San Jose Formation. The sedimentary rocks have eroded into plateaus, mesas, hills, and canyons. Thick eolian deposits from the Pleistocene Epoch blanket the tops of mesas in some areas. Small areas of Tertiary and Quaternary volcanic rocks, including cinder cones and lava flows, are in the Rio Grande Rift Basin in New Mexico. Broad valleys in the rift basin have accumulations of deep alluvial sediments, and fan remnants are commonplace.

The dominant soil orders in this MLRA are Alfisols, Inceptisols, Mollisols, Entisols, and Aridisols. The soil moisture regime is mainly ustic, but an aridic soil moisture regime that borders on ustic is present in some areas. The soil temperature regime is mesic or frigid. Mineralogy is dominantly mixed or smectitic. In warmer places of the MLRA, shallow Ustorthents (Menefee Series) formed in residuum on shale hills and mesas. Shallow Haplustalfs (Arabrab Series) and Torriorthents (Rizno Series) formed in material weathered from sandstone on mesas, hills, and cuestas. Moderately deep, loamy Haplargids (Gapmesa Series) and very deep, loamy Haplustalfs (Orlie series) formed in slope alluvium derived from sandstone and shale on mesas or fan remnants. Very deep, clayey Haplustepts (Roques series) formed in alluvium derived from shale on valley sides. Very deep, silty Haplustalfs (Cahona and Wetherill Series) formed in eolian deposits on hills and mesas. In cooler places, very deep, clayey Haplustalfs

(Goldbug Series) formed in slope alluvium derived from sandstone and shale on hills and mesas. Shallow Argiustolls (Fivepine Series) formed in slope alluvium and residuum derived from sandstone. Moderately deep Argiustolls (Nortez Series) formed in eolian deposits derived from sandstone on hills and mesas.

Water commonly is scarce in areas away from the major streams. The Dolores, Animas, and San Juan Rivers, which are perennial streams in the northern end of the area, are major sources of irrigation water. It is used for municipal and industrial supplies as well as irrigation. The quality of some surface water has been degraded by the effects of upstream mining activities in the late 1800s. This mining occurred mainly in the upper reaches of the streams outside this MLRA. Ground water is the primary source of drinking water in many areas. In places some irrigation water is obtained from deep wells. Cretaceous and Jurassic sediments (Dakota and Morrison Formations and Entrada Sandstone) provide some ground water of variable quality in southwestern Colorado

The potential vegetation is grass and sagebrush at the lower elevations. Pinyon-juniper woodland and ponderosa pine forests are at mid elevations. Forests of Rocky Mountain Douglas-fir and white fir are at the higher elevations. Some common plants are Wyoming big sagebrush, western wheatgrass, galleta, needleandthread, and blue grama at the lower elevations; twoneedle pinyon, Utah juniper, Indian ricegrass, mountain mahogany, ponderosa pine, Gambel oak, Arizona fescue, and muttongrass at mid elevations; and Rocky Mountain Douglas-fir, white fir, mountain muhly, common snowberry, Parry’s oatgrass, and mountain brome at the higher elevations. Some of the major wildlife species in this area are mule deer, elk, coyote, black bear, mountain lion, black-tailed jackrabbit, Gunnison’s prairie dog, badger, piñon jay, black-billed magpie, mountain chickadee, red-breasted nuthatch, white-breasted nuthatch, collared lizard, fence lizard, and western rattlesnake. Reservoirs and rivers provide most of the fish habitat in this area. The ones at the higher elevations have cold-water species, such as rainbow trout and brown trout, and the ones at the lower elevations may have warm-water species, such as bass, bluegill, crappie, and catfish,

The various kinds of land use include private cropland(3 percent), private grassland(41 percent), federal grassland (39 percent), private forest (7 percent), federal forest (5 percent), private urban development (2 percent), and other private uses (3 percent). A majority of this MLRA supports natural vegetation and is used as grazing land or forestland. Cropland is also a significant land use. Where irrigation water is available, irrigated crops, such as wheat, barley, beans, oats, alfalfa, and hay, are grown. An area in Colorado and Utah is used as non-irrigated cropland, growing beans and winter wheat. The pinyon-juniper woodlands are a source of fuel wood. At the higher elevations, commercial timber is harvested, principally ponderosa pine and Rocky Mountain Douglas-fir. Some urban development is occurring in the vicinity of Santa Fe. The major soil resource concerns are wind erosion, water erosion, maintenance of the productivity of the soils, and management of soil moisture. Conservation practices on cropland generally include crop residue management, minimum tillage, and irrigation water management. Proper grazing use is a concern on grazing lands. The primary concerns in timbered areas are controlling erosion along roads and skid trails and minimizing surface compaction during timber harvesting.

Classification relationships

NRCS :
Major Land Resource Area 36, Southwestern Plateaus Mesas and Foothills (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS:
341Bg - Northeast Flank Subsection <341B Northern Canyonlands Section < 341 Intermountain Semi-desert and Desert (Cleland, etal., 2007).

M331Gf - Hills and Plateaus Subsection M331G South CentralHighlands Section M331 Southern Rocky Mountain Steppe -Open Woodland - Coniferous Forest - Alpine Meadow (Cleland, etal., 2007).

EPA:
20c Semiarid Benchlands and Canyonlands, < 20 ColoradoPlateau < 10.l Cold Deserts < 10 North American Deserts(Griffith,2006).

USGS: Colorado Plateau Province (Canyonlands Section)

Ecological site concept

Shallow Sandy Loam (Pinyon- Utah Juniper) ecological site was drafted from the existing Shallow And Sandy Loam (Pinyon-Juniper) Range Site 34B (NRCS, March, 1996). This site was written prior to MLRA 36 being recognized in Colorado. This ecological site occurs on ridgelines, escarpments and side slopes. The soils are sandy in textures. Soils are derived from colluvium from igneous, metamorphic and sedimentary rock. The land cover is a grass community with a Pinyon and Utah Juniper community. It has an aridic ustic moisture regime and mesic temperature regime. The effective precipitation ranges from 12 to 16 inches.

Associated sites

R036XY114CO	**Mountain Pinyon** Mountain Pinyon is a gentle sloped (<25% slope) site with very shallow and shallow soils that are loamy in texture. This site is dominated by Pinyon, Utah Juniper. This site may have oakbrush in the understory. This site is in the 12 to 16 inch precipitation zone of foothills/upland.
R036XY445CO	**Steep Colluvial Slopes** Steep Colluvial Slopes is a very steep (>25% slope) sloped site with very shallow to shallow soils that are clayey in texture. This site is dominated by Utah Juniper and pinyon. This site may have Wyoming big sagebrush in the understory. This site has 12 to 16 inches of precipitation.
R036XY284CO	**Loamy Foothills** Loamy Foothills occurs on hills, benches and mesas on moderately deep to deep loamy textured soils derived from alluvium, slope alluvium eolian deposits, and colluvium. It is a Wyoming big sagebrush – Muttongrass community. It has an aridic ustic moisture regime and mesic temperature regime. The effective precipitation ranges from 12 to 16 inches.
R036XY287CO	**Stony Foothills** Stony Foothill is a gentle sloped (<25% slope) site with moderately deep to deep that are loamy-skeletal in texture. This site is dominated by Pinyon, Utah Juniper. This site may have oakbrush in the understory. This site is in the 12 to 16 inch precipitation zone of foothills/upland.
R036XY310CO	**Sandy Foothills** Site occurs on rolling uplands on mesas. Soils are deep sandy loams to loamy sands. Dominant plants are needle-and-thread, western wheatgrass, Wyoming big sagebrush, and balsamroot.

Similar sites

R036XY110CO	**Shallow Clay Loam (pinyon-Utah juniper)** Shallow Clay Loam Pinyon-Juniper is a gentle sloped (<25% slopes) site with shallow soils that are clayey in texture. This site is dominated by Utah Juniper and scattered pinyon. This site may have Wyoming big sagebrush in the understory. This site is in the 8 to 12 inch precipitation zone of semidesert.
R036XY114CO	**Mountain Pinyon** Mountain Pinyon is a gentle sloped (<25% slope) site with very shallow and shallow soils that are loamy in texture. This site is dominated by Pinyon, Utah Juniper. This site may have oakbrush in the understory. This site is in the 12 to 16 inch precipitation zone of foothills/upland.
R036XY315UT	**Upland Shallow Loam (pinyon-Utah juniper)** Soils are very shallow to shallow with loamy textures. Soil surface texture is usually fine sandy loam. Slope ranges from 3-10%. It occurs on hills, mesas and structural benches. This site is dominated by pinyon and Utah Juniper. This site may have black sagebrush and mormon tea in the understory. This site is in the 12 to 16 inch precipitation zone of foothills/upland.
R036XY113CO	**Semidesert Juniper Loam** Semidesert Juniper Loam is a gentle sloped (<25-30% slope) site with shallow soils that are loamy in texture. This site is dominated by Utah Juniper and scattered pinyon. This site may have Wyoming big sagebrush in the understory. Precipitation of this site is 8 to 12 inches.

Table 1. Dominant plant species

Tree	(1) *Pinus edulis* (2) *Juniperus osteosperma*
Shrub	(1) *Artemisia tridentata ssp. wyomingensis* (2) *Cercocarpus montanus*

Herbaceous	(1) *Achnatherum hymenoides* (2) *Elymus elymoides*

Physiographic features

This site occurs on nearly level to strongly sloping summits, footslopes, side slopes and knoll tops.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Hillslope (3) Scarp slope (4) Escarpment (5) Ridge (6) Mesa (7) Structural bench (8) Knoll
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	5,500–7,600 ft
Slope	3–35%
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation is about 12 to 16 inches. Of this, 40 to 50 percent falls as snow, and 40 to 45 percent falls between May 1 and September 30. Summer moisture is mostly from thundershowers in late July, August, and September. The driest period is usually from April to early June; and June is normally the driest month. There is fall growth from late summer rains on this site during August and September, usually from the warm season plants. The average annual total snowfall is 38.3 inches. The highest winter snowfall record in this area is 117.5 inches which occurred in 1978-1979.The lowest snowfall record is 3.0 inches during the winter of 1937-1938. This area is located where there is winter precipitation and summer monsoonal rains. Moisture that comes during summer will favor the warm-season plants. Mean daily annual air temperature is about 48 degrees Fahrenheit to 52 degrees Fahrenheit, averaging about 31degrees Fahrenheit for the winter and 60 degrees Fahrenheit through the growing season, March through October. Summer temperatures of 100 degrees Fahrenheit or more are not unusual. The frost-free period typically ranges from 110 to 130 days. The last spring frost is the end of April to the end of May and the first fall frost is the first week of October to the end of October. Mean annual temperature ranges from 37 to 64 degrees Fahrenheit. The coldest winter temperature recorded was -23 degrees Fahrenheit on February 8, 1933 and the coldest summer temperature recorded was 28 degrees Fahrenheit on June 3, 1908. The hottest day on record is 110 degrees Fahrenheit on June 22, 1905. Wide yearly and seasonal fluctuations are common for this climatic zone. Data taken from Western Regional Climate Center (2015) for Blanding, Utah' Colorado Climate Station. Blanding is on the Western edge of the MLRA. Most Climate stations in this Land Resource Unit (LRU) are either on the low end of the range (approximately 12 inches) or the high end (15 to 16 inches) of the precipitation range. Blanding and Uravan are the only stations with data averaging in the central range, and Blanding has the longest record.

Table 3. Representative climatic features

Frost-free period (characteristic range)	90-124 days
Freeze-free period (characteristic range)	113-157 days
Precipitation total (characteristic range)	12-16 in
Frost-free period (actual range)	85-140 days

Freeze-free period (actual range)	109-171 days
Precipitation total (actual range)	12-16 in
Frost-free period (average)	104 days
Freeze-free period (average)	137 days
Precipitation total (average)	14 in

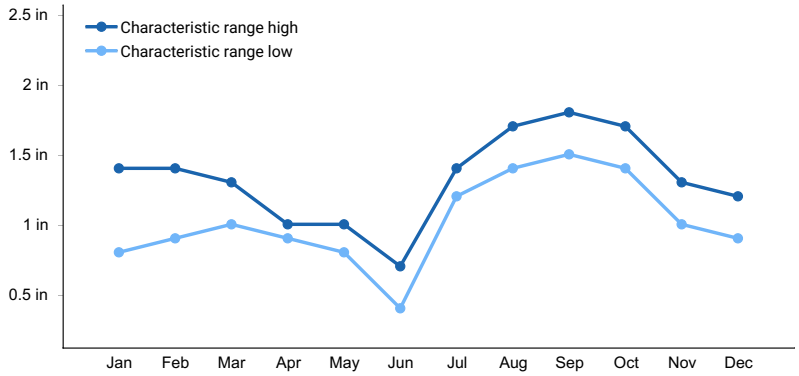


Figure 1. Monthly precipitation range

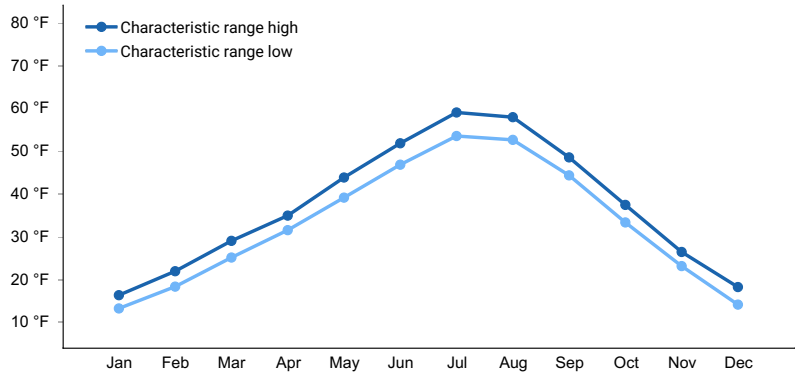


Figure 2. Monthly minimum temperature range

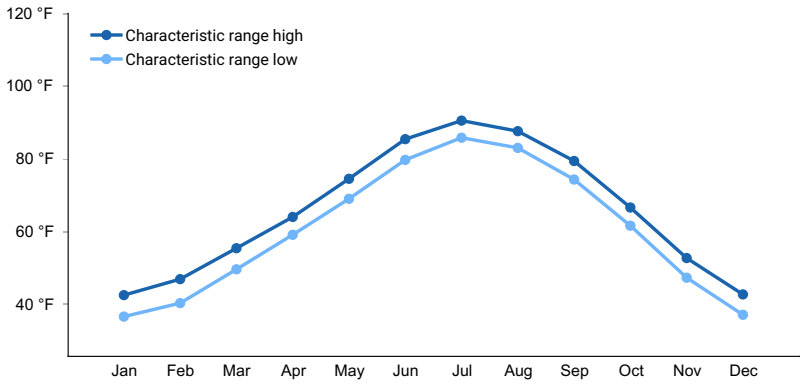


Figure 3. Monthly maximum temperature range

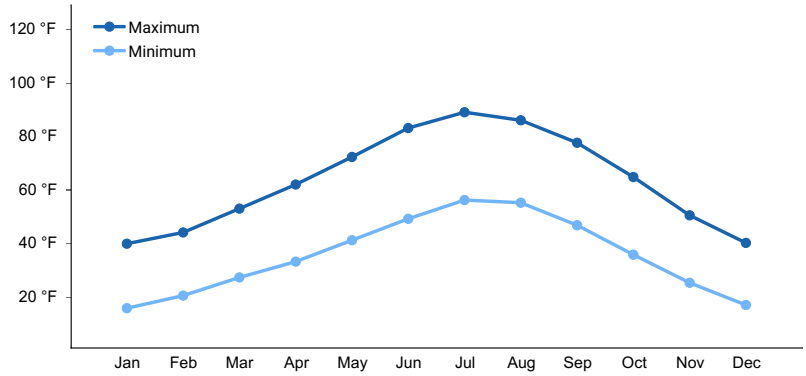


Figure 4. Monthly average minimum and maximum temperature

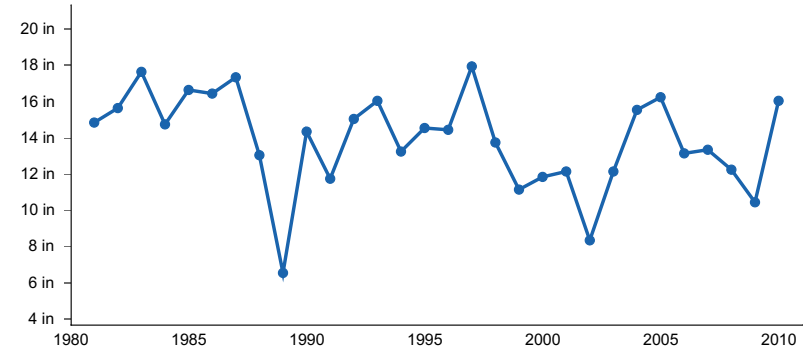


Figure 5. Annual precipitation pattern

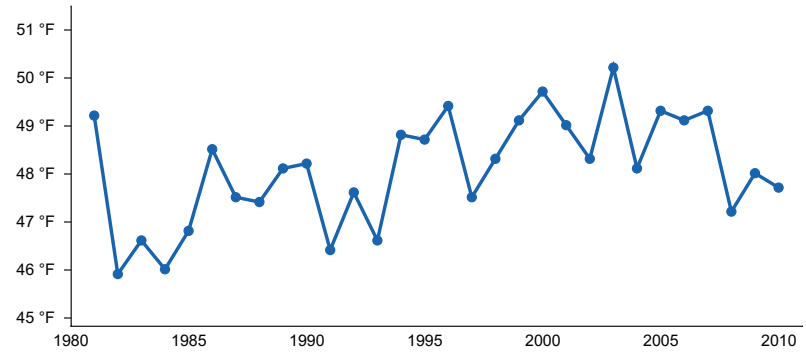


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BLANDING [USC00420738], Blanding, UT
- (2) MONTICELLO 2E [USC00425805], Monticello, UT
- (3) NORTHDALE [USC00055970], Dove Creek, CO
- (4) YELLOW JACKET 2 W [USC00059275], Yellow Jacket, CO
- (5) CORTEZ [USC00051886], Cortez, CO
- (6) LA SAL 1SW [USC00424947], Monticello, UT
- (7) URAVAN [USC00058560], Naturita, CO
- (8) GLADE PARK 17W [USC00053307], Moab, CO

Influencing water features

This site is not influenced by additional effective moisture and is not associated with a water table.

Wetland description

No wetland description applies.

Soil features

The surface soils of this ecological site are loamy fine sands, fine sandy loams or sandy loams. Clay content of the surface horizon is between 6 and 15 percent clay. Surface horizon depth ranges from 4 to 9 inches. The subsoils are sandy or sandy skeletal. Subsoil textures range from very gravelly loamy fine sand to sandy loam. Subsurface clay content ranges from 6 to 16 percent clay. Subsoil may have rock fragments. The parent material is residuum and colluvium over residuum from sandstone. Depth is very shallow to shallow. Occasionally soil depths will be between 20 and 30 inches in depth. When soils are moderately deep they are stone, gravel or cobble filled which causes the soil respond similar to a shallow soil because of the reduced water holding capacity. This ecological sites commonly occurs with rock outcrop.

The major soil series correlated to this ecological site are Arches (Lithic Torripsamments) and Sedgran (Lithic Ustic Torriorthents).

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone (2) Colluvium–sandstone
Surface texture	(1) Very gravelly, gravelly loamy fine sand (2) Fine sandy loam (3) Sandy loam
Family particle size	(1) Sandy (2) Sandy-skeletal (3) Not used
Drainage class	Somewhat excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	5–20 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (Depth not specified)	0.7–1.9 in
Calcium carbonate equivalent (Depth not specified)	0–5%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–25%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

This MLRA has records of prehistoric human use for thousands of years. They used pinyon-juniper woodlands for hunting, fuelwood, and food like pinon nuts. MLRA 36 have archaeological evidence indicating pinyon-juniper woodlands where modified by prehistoric humans and not pristine at the time of European settlement (Cartledge & Propper, 1993).

Most pinyon-juniper on the northern half of MLRA 36 (Colorado and Utah) can be described as a persistent woodland type. The bimodal climate is conducive to producing Pinyon/juniper, and sagebrush complexes. Natural influences of herbivory, fire, and climate influence the plant communities: however, large herds of native herbivores

nor large frequent historic fires were recorded because of the broken topography.

Pinyon-Juniper expansion into deeper well drained soils began during the late 1800s (Tausch et al. 1981, Miller and Tausch, 2001). The causes of woodland expansion are often attributed to reduction in fires, introduction of livestock grazing, shifts in climate, and increases in atmospheric CO2 (Miller and Rose 1999). Prior to European settlement, Pinyon juniper woodland species were primarily found on shallow soils and rocky ridges. Few fire history studies and pinyon-juniper chronologies have been done in the southwest. Literature states that woodland on the Colorado Plateau are more susceptible to die off from severe drought (Miller and Tausch, 2001).

Historically, fires before European settlement in the southwest occurred late spring to mid-summer (Miller and Tausch, 2001). Historic fire return intervals (300-1000 years) are long, possibly indicating that fire did not play a frequent role in community dynamics. Pinyon and Juniper communities near Mesa Verde were established before European settlement with a fire return interval of approximately 400 years (Floyd et al., 2000). Shinneman and Baker (2009) estimated the FRI on the Uncompahgre Plateau to be 400 to 600 years. Mesa Verde (Floyd et al., 2000) and Uncompahgre (Shinneman and Baker, 2009) are in the foothills/upland zone (12 to 16 inches annual precipitation) of MLRA 36.

One other known study is the Colorado National Monument on the northeastern extent of the Uncompahgre Plateau suggest that a lower climatic zone (semi-desert) (9 to 12 inches of annual precipitation) have a fire return interval of 300 to 1,000 years (Kennard and Moore, 2013). The semi-desert zone is prone to small isolated fires more than the infrequent larger fires found in other studies.

Fire intervals can be influenced by the landscape. Pinyon juniper woodlands occurring with sagebrush burn more frequently due to fine fuels loads provided by sagebrush communities. The rough broken terrain burns less frequently than the gentler and broader landscapes. The Colorado Plateau woodlands generally don’t have enough fine fuels to support large scale fires. In exception, multiple contiguous wet years allows a build up of fine fuels creating a higher potential for fire.

In lower elevations and lower precipitation areas, Utah Juniper is dominant over Pinyon. As the precipitation and effective moisture increases, so will pinyon. The lower extent of the pinyon-juniper woodland is comprised of Utah Juniper with pinyon being dominant in the upper end of the pinyon-juniper woodland.

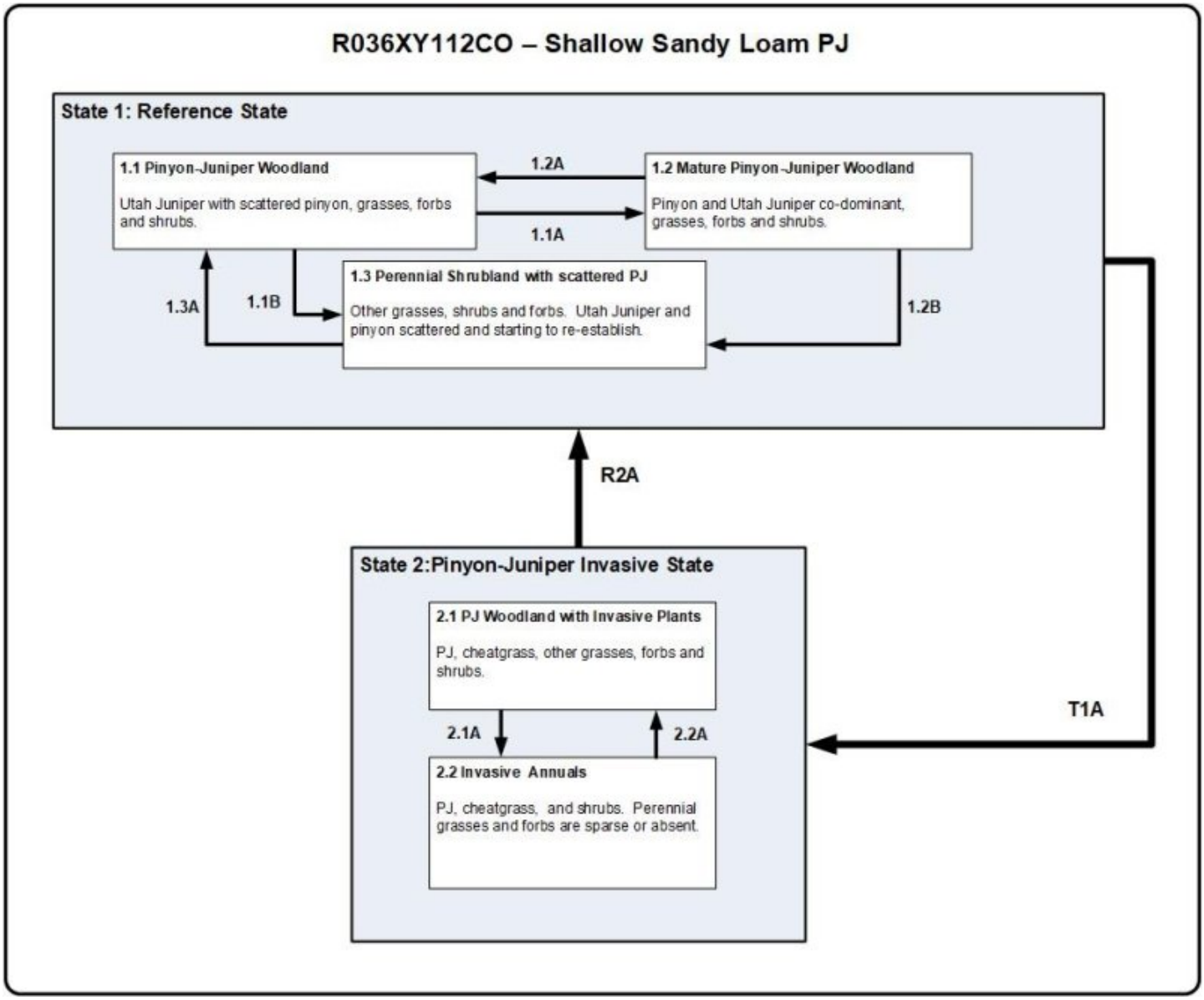
The driving factors in Pinyon Juniper woodlands seem to be weather patterns. Drought and insects outbreaks appear to be the main driving factors for mortality in many of the Pinyon Juniper communities. (Shinneman and Baker, 2009, Floyd et al., 2004) Wet periods seem to enhance and promote pinyon and juniper establishment. Betancourt (1993), noted that Pinyon and Juniper woodlands in the southwest appear to be more susceptible to large die offs during drought, while the Utah juniper trees survive. Pinyon die-off opens the canopy and with sufficient moisture, grasses and forbs respond favorably. Two studies on the Uncompahgre Plateau found that pinyon began increasing in the 1700s, during a wet period that followed a long dry period. Associated fire reduction and livestock grazing effect of European settlers had an impact on this pre-settlement expansion. Since the 1900s, two significant wet periods were recorded in the southwest, the occured from 1900s to 1920s and 1970s to 1990s. These periods saw an increase in Pinon establishment. During the drought of the 1950s and the drought mid-1990s to early 2000s, Pinyon mortality was extensive. (Romme, et al. 2009)

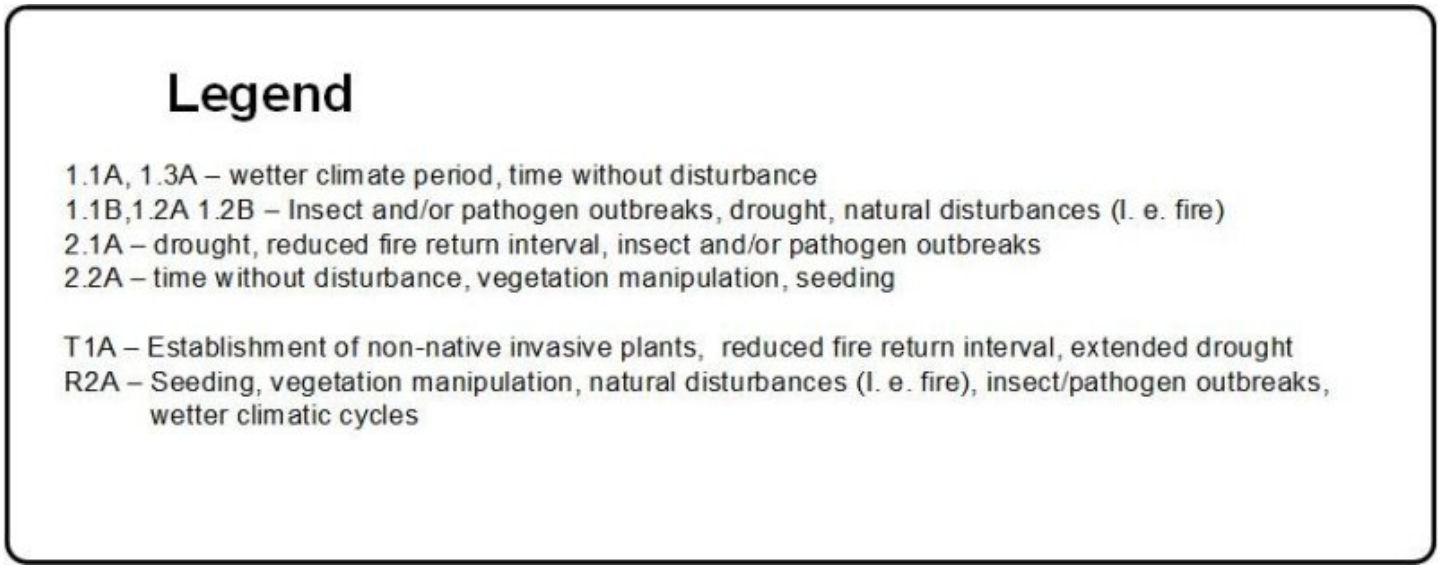
Disturbances such as improper grazing (continuous season long grazing, heavy stocking rates, etc.), and recreation activities can remove herbaceous vegetation and compact the soils. The unpredictability of the annual growing conditions make these communities susceptible to the loss of understory and the resulting accelerated erosion. This ecological site has been grazed by domestic livestock since they were introduced into the area, though grazing has been light due to the lack of water and difficult terrain. The introduction of domestic livestock and the use of fencing and reliable water sources have influenced the disturbance regime. To date, the invasive annual grasses common in the Great Basin following severe disturbance are not as prevalent in MLRA 36, potentially due to the remote location, climate, and soils.

Pinyon-juniper sites were treated as one vegetation dynamic type when developing the provision ecological sites for MLRA 36. These sites will need to be re-evaluated as more data and knowledge becomes available. The species lists are representative and not a complete list of occurring or potential species. Species lists are not intended to cover the full range of conditions, species and responses of the site. The state and transition model is based on available research, field observations and interpretations by experts and could change as knowledge increases. As

more data is collected, plant communities may be added, revised or removed. The following diagram does not depict all transitions and states, but shows the most common plant communities.

State and transition model





State 1

Reference

This state represents the natural variability and dynamics of this ecological site, prior to European settlement. The dominant aspect of this site is Pinyon and Utah Juniper with an understory of shrubs and associated grasses. The primary disturbance mechanisms for this ecological site in reference condition include drought, insects, and infrequent fire. Because catastrophic disturbances like a crown fire or drought happen with long intervals, these communities have long periods of succession (i.e. long periods of dense Pinyon and Juniper) of 300 to 600 years in upland ecological sites within the foothills, and 300 to 1,000 in semi-desert ecological sites. The timing of drought, and fire, coupled with surface disturbance can dictate whether the community can stay within the reference state or if the community transitions into another state. Fluctuations in species composition and relative production may change from year to year dependent on climatic factors. At the lower end of precipitation and elevation ranges the deciduous shrubs (gambel oak, alderleaf mountain mahogany and wild crab apple) will be less abundant in the understory and will be more abundant at the higher precipitation and elevations, and north and east slopes. Winterfat and fourwing saltbush will be found predominantly at the lower elevations, lower precipitation, and on south and west facing slopes.

Community 1.1
Pinyon-Juniper Woodland

When the tree canopy cover increases to 15 to 35 percent, the same plants are present; however, the amounts of grasses and shrubs have decreased. Pinyon and Utah juniper trees have increased and are larger in size. At this stage Utah juniper may be dominant over Pinyon. Pinyon trees are more susceptible to drought, insects, and disease than Utah Juniper trees. In fact, it is difficult to identify methods beside fire that naturally reduce Utah juniper. After long periods of drought weaken the Pinyon trees, beetle kills can become quite extensive, especially after the droughts. Drought periods can also weaken and reduce the understory. Plant establishment is mainly limited by the available moisture. Total annual production: In an average year, the approximate total annual production (air-dry) is as follows: Tree canopy cover of 0 to 15 percent is 300 to 525 pounds per acre. Grass and grass-likes have approximately 8 percent canopy cover and 5 percent basal area cover with an average height of 1 foot. Forbs have approximately 1 percent canopy cover and 1 percent basal area cover with an average height of 0.5 foot. Shrubs have approximately 1 percent canopy cover and 1 percent basal area cover with an average height of 2 feet. Trees have approximately 20 percent canopy cover and 3 percent basal area cover with an average height of 8 feet.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	215	240	275
Grass/Grasslike	35	80	140
Shrub/Vine	35	50	65
Forb	15	30	45
Total	**300**	**400**	**525**

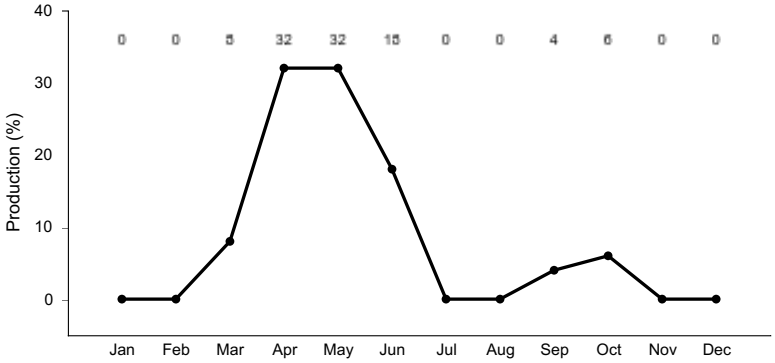


Figure 8. Plant community growth curve (percent production by month). CO0103, MLRA 36 - Foothills Mesic. MLRA 36.

Community 1.2
Mature Pinyon-Juniper Woodland

As tree canopy cover increases to greater than 35 percent, the trees become dominant, and are larger in size. The tree size and density is directly correlated to precipitation. There is almost no understory production at all. Mature pinyon and Utah juniper woodland characterized this community phase. When weather patterns favor an increase

of pinyon and Utah juniper canopy with the associated understory of shrubs, grasses and forbs. Canopy cover may increase to the point where understory vegetation is completely shaded out. Total annual production: In an average year, the approximate total annual production (air-dry) is as follows: Tree canopy cover of 0 to 15 percent is 100 to 450 pounds per acre Grass and grass-likes have approximately one percent canopy cover and one percent basal area cover with an average height of one foot. Forbs have approximately one percent canopy cover and one percent basal area cover with an average height of half foot. Shrubs have approximately 1 percent canopy cover and 1 percent basal area cover with an average height of 1.5 feet. Trees have approximately 40 percent canopy cover and 12 percent basal area cover with an average height of 12 feet.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	93	300	410
Grass/Grasslike	5	15	20
Forb	1	5	10
Shrub/Vine	1	5	10
Total	**100**	**325**	**450**

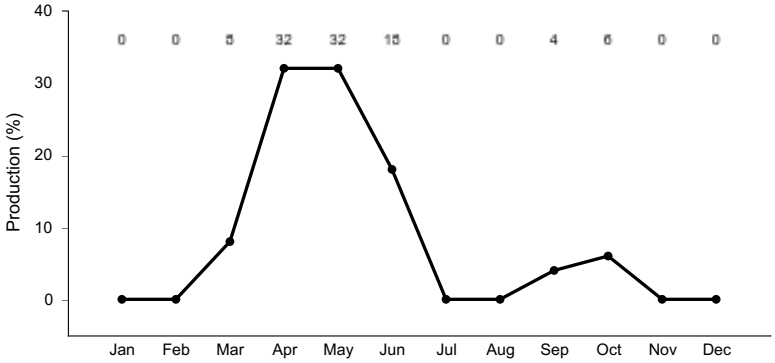


Figure 10. Plant community growth curve (percent production by month). CO0103, MLRA 36 - Foothills Mesic. MLRA 36.

Community 1.3
Perennial Shrubland with Scattered Pinyon-Juniper

This community phase is grassland with scattered pinyon and Utah juniper. The herbaceous understory has a mix of grasses and forbs. This community phase is a result of a crown fire or sufficiently large and hot ground fire that will kill many of the trees, combined with sufficient seed-banks and moisture for reestablishment of grasses and

forbs. It is common that after a crown fire many patches of trees will remain unburned, because of fire's unpredictability and broken topography. This leaves a seed bank for the burned areas. This community phase is very short lived in comparison to the other community phases in this state. Sparse invasive introduced plants species would be present in this phase. When the tree canopy cover is less than 15 percent, grasses and shrubs coexist with scattered pinyon and Utah juniper. Grasses include bottlebrush squirreltail, western wheatgrass, Indian ricegrass, Sandberg bluegrass, needle and thread, prairie Junegrass, sand dropseed, muttongrass, and Wyoming big sagebrush. Common forbs include fernleaf biscuitroot, rock goldenrod, longleaf phlox, threadleaf ragwort and heartleaf twistflower. Shrubs, half-shrubs, and trees that occur on this site are yellow rabbitbrush, Wyoming big sagebrush, true mountain mahogany, Utah serviceberry, Utah juniper, and two-needle pinyon. As elevation and moisture increase, Utah juniper gives way to pinyon. Total annual production: In an average year, the approximate total annual production (air-dry) is as follows: Tree canopy cover of 0 to 15 percent is 350 to 600 pounds per acre Grass and grass-likes have approximately 15 percent canopy cover and 10 percent basal area cover with an average height of 1 foot. Forbs have approximately one percent canopy cover and one percent basal area cover with an average height of a half foot. Shrubs have approximately two percent canopy cover and one percent basal area cover with an average height of 3.5 feet. Trees have approximately 10 percent canopy cover and less than 1 percent basal area cover with an average height of 5 feet.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	245	255	310
Tree	20	75	125
Shrub/Vine	65	80	95
Forb	20	40	70
Total	**350**	**450**	**600**

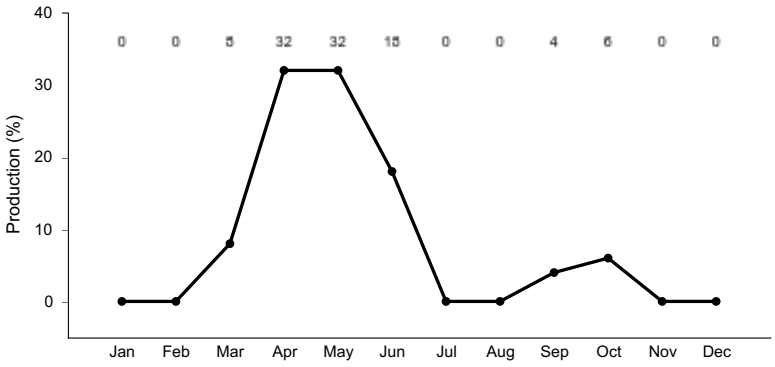


Figure 12. Plant community growth curve (percent production by month). CO0103, MLRA 36 - Foothills Mesic. MLRA 36.

Pathway 1.1A
Community 1.1 to 1.2

Pinyon-Juniper Woodland

Mature Pinyon-Juniper Woodland

This pathway occurs when events create a wetter climate cycle, favoring pinyon and perennial bunchgrass establishment. Following several favorable precipitation years and lack of surface disturbances, native perennial plants will reestablish.

Pathway 1.1B
Community 1.1 to 1.3

Pinyon-Juniper Woodland

Perennial Shrubland with Scattered Pinyon-Juniper

This pathway occurs during and after events such as fire, drought or insect and pathogen outbreaks. Droughts and insects weaken and eventually kill the tree cover, allowing an increase in grasses and forbs in the short term, until juniper and pinyon recover. Vegetation manipulation can be used to remove trees and mimic the natural disturbance regime. Fire events leading to this pathway include 1) an understory burn allowed after several wet years of fine fuels accumulated, or 2) crown fires supported by late successional growth of pinyon and juniper with dense crown cover.

Pathway 1.2A
Community 1.2 to 1.1

Mature Pinyon-Juniper Woodland

Pinyon-Juniper Woodland

This pathway occurs during and after events such as fire, natural disturbances, drought or insect and pathogen outbreaks. Droughts and insects weaken and eventually kill the tree cover, increasing nutrient availability in the system. The natural conditions of drought limit the grasses ability to utilize the additional nutrients for a sustained period of time. Grasses and forbs increase initially in the community, but as the juniper and pinyon recover, the grasses and forbs diminish. Small patch fires from lightning strikes are typical of this pathway rather than large scale fires.

Pathway 1.2B
Community 1.2 to 1.3

Mature Pinyon-Juniper Woodland

Perennial Shrubland with Scattered Pinyon-Juniper

This pathway occurs during and after events such as fire, drought or insect and pathogen outbreaks. Droughts and insects weaken and eventually kill the tree cover, allowing an increase in grasses and forbs in the short term, until juniper and pinyon recover. Vegetation manipulation can be used to remove trees and mimic the natural disturbance regime. Fire events leading to this pathway include 1) an understory burn allowed after several wet years of fine fuels accumulated, or 2) crown fires supported by late successional growth of pinyon and juniper with dense crown cover.

Pathway 1.3A
Community 1.3 to 1.1

Perennial Shrubland with Scattered Pinyon-Juniper

Pinyon-Juniper Woodland

This pathway occurs with a wetter precipitation years and time without disturbance, providing trees the ability to

establish and grow. The tree cover reduces the available nutrients and energy for other vegetation, reducing understory as length between fires and drought increases. Shrub establishment in the understory provides a zone of protection to allow seedling trees to establish further enabling the transition.

State 2
Pinyon-Juniper Invasive

This state occurs when there is an absence of natural disturbance (i.e. Insects, drought, or fire) over long time frames (Zlatnik, 1999). Also, management actions could have allowed trees to become very mature and have effectively removed understory. Invasive plants have increased in abundance. This state has the lowest resiliency and resistance. Seeding, with either natural disturbance or vegetation management to mimic the historic disturbance regime, may be necessary to transition to State 1 (Reference State). In some cases, there may be no practicable way back to reference, due to the large amounts of energy and monetary inputs that are needed.

Community 2.1
Pinyon-Juniper Woodland with Invasive Plants

A lack of understory with a canopy of older Pinyon and Juniper is the characteristics of this community phase. Interspaces of woody species and cover are very large and interconnected. This community phase occurs when natural or management actions allow for the increase in Pinyon and Utah juniper and a decrease in the grass and forb understory. Invasive or introduced plants species are present and are increasing.

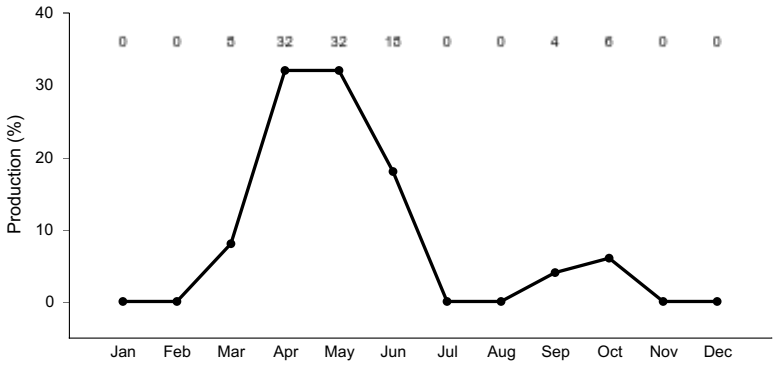


Figure 13. Plant community growth curve (percent production by month). CO0103, MLRA 36 - Foothills Mesic. MLRA 36.

Community 2.2
Invasive Annuals

This community phase is characterized by annual invasive grasses, like cheatgrass, dominating the understory. Other invasive species, like storkbill, may be present. This community phase has active erosion under the pinyon and Utah juniper canopy. Utah Juniper has allelopathic effects on some plants (i.e. Sandberg bluegrass) minimizing

the native understory. Cheatgrass does not appear to be affected by this allelopathic effect when growing under juniper canopies (Zlatnik, 1999).

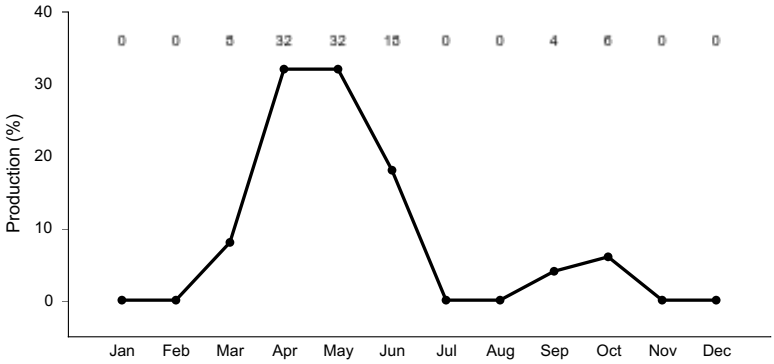


Figure 14. Plant community growth curve (percent production by month). CO0103, MLRA 36 - Foothills Mesic. MLRA 36.

Pathway 2.1A
Community 2.1 to 2.2

Pinyon-Juniper Woodland with Invasive Plants

Invasive Annuals

This pathway occurs when events such as frequent fire (reduced fire return interval) or drought remove the trees and shrubs. Other factors in this pathway include be insect and pathogens outbreaks. Removal of canopy cover with reduced understory facilitates the establishment of cheatgrass or other invasive annuals. Cheatgrass will typically invade in the woody canopy interspaces when Pinyon-Juniper communities are degraded. Once the cheatgrass establishes, fine fuels increase exponentially in the community. The increase in fine fuels leads to shorter fire return interval inhibiting the recover and establishment of trees and shrubs. Cheatgrass and other invasive annuals can persist for long periods of time. The competitive nature of annuals alters the soil and other abiotic conditions of the community.

Pathway 2.2A
Community 2.2 to 2.1

Invasive Annuals

Pinyon-Juniper Woodland with Invasive Plants

This pathway occurs with a lack of fire and other disturbances. The use of firebreaks, invasive management, and fire suppression extend the fire return interval. Time without disturbance allows perennial grasses and woody species to establish with natural processes or may require further vegetation manipulation.

Transition T1A
State 1 to 2

This transition from the native perennial grass and shrub understory in the reference state to a state that has been invaded by naturalized species such as crested wheatgrass (blown in or seeded), cheatgrass, mustards, and other introduced or exotic plants. This transition occurs as natural and management actions favor an increase in non-native grasses and forbs, especially annuals. When this transition to State 2 occurs, the ecological site has lost much of its expected resistance and resilience. At this point natural and management actions have decreased the understory and erosion increases. Reduced influence from fire, insects, and drought could cause the tree canopy to

close, effectively reducing the herbaceous understory, facilitating the transition. Improper grazing or increased surface disturbance combined with periods of drought can facilitate this transition because soil stability is lost and susceptibility to soil loss increases.

Constraints to recovery. Improper grazing or increased surface disturbance combined with periods of drought

Restoration pathway R2A
State 2 to 1

This transition is reducing tree canopy and re-establishment of grasses and forbs. This pathway may facilitate the recovery of the soils. The infrequent naturally occurring fires or other natural disturbances (insect/pathogen outbreak, wetter climatic cycles) could also cause this transition. Reseeding after a disturbance may be the only way to successfully restore the ecological dynamics to a site. Either way this pathway could involves large energy, time and monetary inputs by man.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
1				220–260	
	Utah juniper	JUOS	*Juniperus osteosperma*	60–150	–
	twoneedle pinyon	PIED	*Pinus edulis*	60–150	–
Grass/Grasslike					
2	**Cool Season Bunchgrasses**			35–100	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	20–40	–
	squirreltail	ELEL5	*Elymus elymoides*	10–20	–
	needle and thread	HECO26	*Hesperostipa comata*	0–20	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	5–20	–
	Sandberg bluegrass	POSE	*Poa secunda*	5–20	–
	muttongrass	POFE	*Poa fendleriana*	0–5	–
3	**Cool Season Rhizomatous**			5–20	
	western wheatgrass	PASM	*Pascopyrum smithii*	5–20	–
4	**Warm Season**			0–5	
	blue grama	BOGR2	*Bouteloua gracilis*	0–5	–
5	**Annual Grasses**			0–5	
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–5	–
Forb					
6				20–40	
	tapertip onion	ALAC4	*Allium acuminatum*	0–5	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–5	–
	Crandall's beardtongue	PECR5	*Penstemon crandallii*	0–5	–
	sego lily	CANU3	*Calochortus nuttallii*	0–5	–
	sanddune cryptantha	CRFE3	*Cryptantha fendleri*	0–5	–
	fernleaf biscuitroot	LODI	*Lomatium dissectum*	0–5	–
	rock goldenrod	PEPU7	*Petradoria pumila*	0–5	–
	longleaf phlox	PHLO2	*Phlox longifolia*	0–5	–
	threadleaf ragwort	SEFLF	*Senecio flaccidus var. flaccidus*	0–5	–

	threadleaf ragwort	SELI	*Senecio flaccidus var. flaccidus*	0–5	–
	heartleaf twistflower	STCO6	*Streptanthus cordatus*	0–5	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–5	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–5	–
	buckwheat	ERIOG	*Eriogonum*	0–5	–
	cryptantha	CRYPT	*Cryptantha*	0–5	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	0–5	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–5	–
	spearleaf stonecrop	SELA	*Sedum lanceolatum*	0–5	–
	Forb, perennial	2FP	*Forb, perennial*	0–5	–
	Forb, annual	2FA	*Forb, annual*	0–5	–
Shrub/Vine					
7	**Non-Sprouters**			20–40	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	20–40	–
	black sagebrush	ARNO4	*Artemisia nova*	0–10	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–5	–
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–5	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–5	–
8	**Re-Sprouters**			5–20	
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	1–10	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	1–10	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–5	–
	mormon tea	EPVI	*Ephedra viridis*	0–5	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–5	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–5	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–5	–
	Gambel oak	QUGA	*Quercus gambelii*	0–5	–
	wild crab apple	PERA4	*Peraphyllum ramosissimum*	0–5	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–5	–
9	**Succulent**			5–20	
	plains pricklypear	OPPO	*Opuntia polyacantha*	5–20	–

Table 9. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
1				250–350	
	Utah juniper	JUOS	*Juniperus osteosperma*	150–250	–
	twoneedle pinyon	PIED	*Pinus edulis*	150–250	–
Grass/Grasslike					
2	**Cool season bunchgrasses**			0–20	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–5	–
	squirreltail	ELEL5	*Elymus elymoides*	0–5	–

	needle and thread	HECO26	*Hesperostipa comata*	0–5	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–5	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–5	–
	muttongrass	POFE	*Poa fendleriana*	0–5	–
3	**Cool season rhizomatous grasses**			0–5	
	western wheatgrass	PASM	*Pascopyrum smithii*	–	–
4	**Warm Season Grasses**			0–5	
	blue grama	BOGR2	*Bouteloua gracilis*	–	–
5	**Annual Grasses**			0–5	
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–5	–
Forb					
6				0–10	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–5	–
	longleaf phlox	PHLO2	*Phlox longifolia*	0–5	–
	threadleaf ragwort	SEFLF	*Senecio flaccidus var. flaccidus*	0–5	–
	heartleaf twistflower	STCO6	*Streptanthus cordatus*	0–5	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–5	–
	buckwheat	ERIOG	*Eriogonum*	0–5	–
	cryptantha	CRYPT	*Cryptantha*	0–5	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	0–5	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–5	–
	spearleaf stonecrop	SELA	*Sedum lanceolatum*	0–5	–
	Forb, perennial	2FP	*Forb, perennial*	0–5	–
	Forb, annual	2FA	*Forb, annual*	0–5	–
	tapertip onion	ALAC4	*Allium acuminatum*	0–5	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–5	–
	sego lily	CANU3	*Calochortus nuttallii*	0–5	–
	sanddune cryptantha	CRFE3	*Cryptantha fendleri*	0–5	–
	fernleaf biscuitroot	LODI	*Lomatium dissectum*	0–5	–
	rock goldenrod	PEPU7	*Petradoria pumila*	0–5	–
	Crandall's beardtongue	PECR5	*Penstemon crandallii*	0–5	–
Shrub/Vine					
7	**Re-Sprouters**			0–10	
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–10	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–10	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–5	–
	mormon tea	EPVI	*Ephedra viridis*	0–5	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–5	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–5	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–5	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–5	–
	Gambel oak	QUGA	*Quercus gambelii*	0–5	–
	wild crab apple	PERA4	*Peraphyllum ramosissimum*	0–5	–

8	**Non-Sprouters**			0–10	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	0–10	–
	black sagebrush	ARNO4	*Artemisia nova*	0–5	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–5	–
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–5	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–5	–
9	**Succulent**			0–10	
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–10	–

Table 10. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
1				25–125	
	twoneedle pinyon	PIED	*Pinus edulis*	5–75	–
	Utah juniper	JUOS	*Juniperus osteosperma*	5–75	–
Grass/Grasslike					
2	**Cool season bunchgrasses**			100–250	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	25–45	–
	squirreltail	ELEL5	*Elymus elymoides*	25–45	–
	Sandberg bluegrass	POSE	*Poa secunda*	5–30	–
	needle and thread	HECO26	*Hesperostipa comata*	0–25	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	5–25	–
	muttongrass	POFE	*Poa fendleriana*	0–5	–
3	**Cool season rhizomatous grasses**			5–25	
	western wheatgrass	PASM	*Pascopyrum smithii*	5–25	–
4	**Warm season grasses**			0–15	
	blue grama	BOGR2	*Bouteloua gracilis*	0–15	–
5	**Annual Grasses**			0–5	
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–5	–
Forb					
6				25–75	
	tapertip onion	ALAC4	*Allium acuminatum*	0–5	–
	threadleaf ragwort	SEFLF	*Senecio flaccidus var. flaccidus*	0–5	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–5	–
	cryptantha	CRYPT	*Cryptantha*	0–5	–
	buckwheat	ERIOG	*Eriogonum*	0–5	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	0–5	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	0–5	–
	heartleaf twistflower	STCO6	*Streptanthus cordatus*	0–5	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–5	–
	spearleaf stonecrop	SELA	*Sedum lanceolatum*	0–5	–
	Forb, perennial	2FP	*Forb, perennial*	0–5	–

	Forb, annual	2FA	*Forb, annual*	0–5	–
	sego lily	CANU3	*Calochortus nuttallii*	0–5	–
	sanddune cryptantha	CRFE3	*Cryptantha fendleri*	0–5	–
	Crandall's beardtongue	PECR5	*Penstemon crandallii*	0–5	–
	rock goldenrod	PEPU7	*Petradoria pumila*	0–5	–
	longleaf phlox	PHLO2	*Phlox longifolia*	0–5	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–5	–
	fernleaf biscuitroot	LODI	*Lomatium dissectum*	0–5	–
Shrub/Vine					
7	**Re-Sprouters**			15–50	
	Utah serviceberry	AMUT	*Amelanchier utahensis*	5–25	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	5–15	–
	mormon tea	EPVI	*Ephedra viridis*	0–15	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–5	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–5	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–5	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–5	–
	Gambel oak	QUGA	*Quercus gambelii*	0–5	–
	wild crab apple	PERA4	*Peraphyllum ramosissimum*	0–5	–
8	**Non-Sprouters**			45–90	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	45–90	–
	black sagebrush	ARNO4	*Artemisia nova*	0–45	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–15	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–15	–
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	0–5	–
9	**Succulent**			5–25	
	plains pricklypear	OPPO	*Opuntia polyacantha*	5–25	–

Animal community

Harvesting, chaining, and burning of juniper trees and shrubs can improve big game forage. Some blocks of juniper should be left undisturbed to provide cover for wildlife species. In large areas where sagebrush and other shrubs become dominant, land treatment to thin the shrub cover and restore a mix of grasses and forbs is beneficial for many wildlife species. Areas of sagebrush along drainages and south and west facing slopes should be left undisturbed to provide critical winter forage for mule deer. Water developments for livestock and wildlife can be a useful management tool on this site.

Wildlife Species List:
Mule deer, coyote, cottontail, bushy tailed rat, golden eagle, sage grouse, pinyon jay, rock wren, Rocky Mountain elk, mountain lion, white-tailed jackrabbit, side blotched lizard, red-tailed hawk, ash-throated flycatcher, western bluebird, hairy woodpecker, bobcat, rock squirrel, gopher snake, sagebrush lizard, chukar, mourning dove, and plain titmouse.

Hydrological functions

Adapted from the existing range sites, 1996 version, states that most of the soils for this ecological site are grouped

into the “C” or “D” hydrologic groups, as outlined in the Soils of Colorado Loss Factors and Erodibility Hydrologic Groups 1979 Handbook. Field investigations are needed to determine hydrologic cover conditions and hydrologic curve numbers. Refer to NRCS National Engineering Handbook, Section 4, and Peak Flows in Colorado Handbook for more information.

Recreational uses

The site provides cover for wildlife and may be a good area for hunting big game during the fall season. Other recreational pursuits, such as hiking and sightseeing, are available on this site.

Wood products

This ecological site does not produce trees for lumber. Potential use as fence posts and fire wood is present when the canopy class is at or greater than 15 percent. The most prominent harvest for fence post and firewood occurs when canopy class exceeds 30 percent with increased numbers and size of trees. Tree canopies less than 15 percent provide a minor supply of firewood and potential for christmas trees.

Other information

Major Poisonous Plants to Livestock:
Utah juniper may be poisonous to cattle if large quantities of barriers are eaten but this occurs only when more desirable forage s not available.

ENDANGERED PLANTS AND ANIMALS:
Bald eagles can be found on this site during the winter season. The spineless hedgehog cactus grows on this ecological site. It was observed under juniper canopy cover averaging 20 percent. Treated and denser canopy cover was not recorded as supporting the cactus.

Inventory data references

Colorado counties where this ecological site occurs are the Mesa, Montrose, Ouray, San Miquel and Delta.

Type locality

Location 1: Mesa County, CO	
Township/Range/Section	T12 S R103W S19
General legal description	660’ S & 2560’ W of NE corner Sec 19, T12S, R103W, Mesa Co
Location 2: Mesa County, CO	
Township/Range/Section	T12S R104W S35
General legal description	2620’ E & 2430’ N of SW corner Sec 35, T12S, R104W, Mesa Co
Location 3: Mesa County, CO	
Township/Range/Section	T14S R99W S8
General legal description	1800’ E & 600’ S of NE corner Sec 8, T14S, R99W, Mesa Co
Location 4: Mesa County, CO	
Township/Range/Section	T49S R18W S16
General legal description	2000’ N & 500 E of SW corner Sec 16, T49S, R18W, Mesa Co
Location 5: Mesa County, CO	
Township/Range/Section	T50S R18W S17
General legal description	1200’ N & 1200’E of SW corner Sec 17, T50S, R18W, Mesa Co
Location 6: Mesa County, CO	
Township/Range/Section	T12S R104W S22

General legal description	1100’ S & 1300’ W of NE corner Sec 22, T12S, R104W, Mesa Co
Location 7: Mesa County, CO	
Township/Range/Section	T12S R103W S31
General legal description	1350’ E & 2250’ S of NW corner Sec 31, T12S, R103W, Mesa Co
Location 8: Mesa County, CO	
General legal description	1500’ E & 500’ N of SW corner Sec 12, T49S, R18W, Mesa Co

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--Site Development and Testing Plan--:

Future work to validate and further refine the information in this Provisional Ecological Site Description is necessary. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data.

Additional information and data is required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 36 must be further investigated.

Field testing of the information contained in this Provisional ESD is required. As this ESD is moved to the Approved ESD level, reviews from the technical team, quality control, quality assurance, and peers will be conducted.

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	12/16/2024
Approved by	Kirt Walstad
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:**

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

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):**

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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):**

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

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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:**