Ecological site R038XB204AZ
Granitic Hills
16-20" p.z.

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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): 038X–Mogollon Transition South

AZ 38.2 - Middle Mogollon Transition Elevations range from 4000 to 5500 feet and precipitation averages 16 to 20 inches per year. Vegetation includes turbinella oak, Wright silktassel, hollyleaf buckthorn, desert buckbrush, one-seed juniper, alligator juniper, pinyon, algerita, sugar sumac, prairie junegrass, blue grama, curly mesquite, bottlebrush squirreltail, muttongrass, cane beardgrass, plains lovegrass and bullgrass. The soil temperature regime ranges from thermic to mesic and the soil moisture regime is aridic ustic. This unit occurs within the Transition Zone Physiographic Province and is characterized by canyons and structural troughs or valleys. Igneous, metamorphic and sedimentary rock classes occur on rough mountainous terrain in association with less extensive sediment filled valleys exhibiting little integrated drainage.

Associated sites

R038XA104AZ	**Granitic Hills 12-16" p.z.** Granitic Hills 12-16" p.z.
R038XB215AZ	**Clayey Hills 16-20" p.z.** Clayey Hills 16-20" p.z.

Similar sites

R038XB215AZ	**Clayey Hills 16-20" p.z.** Clayey Hills 16-20" p.z. North aspect has high canopy cover of shrubs but a very high component of herbaceous production on both aspects

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Quercus turbinella* (2) *Arctostaphylos pungens*
Herbaceous	Not specified

Physiographic features

This site occurs in the mid to upper elevations of the Mogollon Transition zone south of the Mogollon Rim in central Arizona. It occurs on rugged mountain slopes, ridge-tops and mesa sides.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mountain slope (3) Ridge
Flooding frequency	None
Elevation	1,340 – 1,710 m
Slope	20 – 70 %
Aspect	N, E, W

Climatic features

Precipitation in this common resource area averages 16 to 20 inches annually. The winter-summer rainfall ratio ranges from about 60/40% in the western part of the area to 45/55% in the eastern part. Summer rains fall July through September; and are from high-intensity, convective, thunderstorms. This moisture originates primarily from the Gulf of Mexico, but can come from the remnants of Pacific hurricanes in September. Winter moisture is frontal, originates in the north Pacific, and falls as rain or snow in widespread storms of low intensity and long duration. Snowfall ranges from 5 to 35 inches per year and can occur from November through April. Snow seldom persists for more than a week. May and June are the driest months of the year. Humidity is moderate to low all year. Average annual air temperatures range from 51 to 60 degrees F (thermic temperature regime). Daytime temperatures in the summer are commonly in the low 90’s. Freezing temperatures are common from October through April. The actual precipitation, available moisture and temperature vary, depending on, region, elevation, rain shadow effect and aspect.

Table 3 Representative climatic features

Frost-free period (average)	180 days
Freeze-free period (average)	240 days
Precipitation total (average)	510 mm

Influencing water features

There are no water features associated with this site.

Soil features

Granite is the dominant parent material for the ecological site in this Common Resource Area. These are shallow soils (10-20") formed on acid igneous parent material (granite) and its extrusive counterpart, rhyolite. Soils are also formed over arkose, schist, gneiss, and diabase. Bedrock is usually slightly weathered into grus material at the soil juncture. They are non-calcareous, coarse textured, and have well developed covers of gravels and cobbles. Rock and gravel covers are light colored. Numerous areas of rock outcrop occur intermingled with soil areas. Outcrops can be as high as 25% of the area. Plant-soil moisture relationships are fair on soils over slightly weathered parent material to good on highly weathered parent material. While soil development may be minimal in shallow soils, granites

in California chaparral can be weathered to 30 feet deep with roots of shrubs to at least this depth. Water holding capacity of these parent materials ranged from 0.1 to 0.8 inch per foot of material depending on degree of weathering (Graham and Jones 1992). Soil erosion hazard is slight due to a very high density of shrubs and gravel, cobble and rock covers.

The soils mapped on this site include: SSA627 Southern Mohave County MU 42 Far, SSA663 Gila-Duncan Area MU 35 Mokiak & SSA675 San Carlos IR Area MU's 42 haplastalfs, 51 & 90 Nugget, 89 & 90 Turquoise, 89 Coppercan and 97 Budlamp and Woodcutter.

Table 4. Representative soil features

Surface texture	(1) Very gravelly sandy loam (2) Gravelly sandy loam (3) Very cobbly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid to moderate
Soil depth	10 – 50 cm
Surface fragment cover <=3"	30 – 60 %
Surface fragment cover >3"	10 – 30 %
Available water capacity (0-101.6cm)	1.52 – 6.1 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 10

Subsurface fragment volume <=3" (Depth not specified)	40 – 70 %
Subsurface fragment volume >3" (Depth not specified)	0 – 20 %

Ecological dynamics

The Chaparral State is the Reference Plant Community. Turbinella oak is the dominant shrub species over much of this MLRA. Manzanita is the next most common species. Turbinella oak is a vigorous root sprouting species after most fires. Manzanita germinates readily following fire (USFS Fire Effects Information System) and can become the dominant species in isolated patches. Wildfire is a natural component in this plant community but return intervals are relatively long. Estimates of fire return intervals are from 50-100 years (Pase, Charles P.; Lindenmuth, A. W., Jr. 1971, USFS Fire Effects Information System). Pinyon and juniper can occupy areas of this site throughout its elevation range. Pinyon pine 20-30 feet tall can occur at canopy levels of 10-20% throughout the entire elevation range of this site. This species is fire sensitive and will only occur in areas that have not burned in substantial lengths of time.

Perennial grasses and forbs are a minor component in the reference plant community. However, in some locations following fire perennial and annual species increase for a period of 10-20 years until sprouting shrub species regain their dominance in the plant community. The plant community may need up to 20 years before it can burn again (USFS Fire Effects Information System).

Slope is site differentiating at elevations near the Land Resource Unit (LRU) boundaries. Warmer aspects at the lower elevations appear like LRU 38-1 plant communities. Cooler aspects at the upper elevations develop fair covers of ponderosa pine, Arizona cypress and alligator juniper.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Shrub/Vine					
1	**Dominant Shrub**			476-729	
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	476-729	38-79
2	**Other Shrubs**			179-785	
	pointleaf manzanita	ARPU5	*Arctostaphylos pungens*	6-269	2-25
	redberry buckthorn	RHCR	*Rhamnus crocea*	56-157	1-10
	Wright's silktassel	GAWR3	*Garrya wrightii*	22-101	5-10
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	11-78	1-7
	skunkbush sumac	RHTR	*Rhus trilobata*	22-50	1-15
	desert ceanothus	CEGR	*Ceanothus greggii*	39-50	1-3
	sugar sumac	RHOV	*Rhus ovata*	17-45	1-5
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	6-34	2-6
4	**Succulents**			157-247	
	banana yucca	YUBA	*Yucca baccata*	112-135	4-10
	sacahuista	NOMI	*Nolina microcarpa*	45-112	4-10
5	**Trace Shrubs**			0-11	
	fairyduster	CAER	*Calliandra eriophylla*	0-6	0-1
	bastardsage	ERWR	*Eriogonum wrightii*	0-6	0-1

	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0-2	0-1
	Wright's deervetch	LOWR	*Lotus wrightii*	0-1	–
	red barberry	MAHA4	*Mahonia haematocarpa*	0-1	–
	turpentine bush	ERLA12	*Ericameria laricifolia*	0-1	–
Tree					
3	**Trees**			67-226	
	Emory oak	QUEM	*Quercus emoryi*	67-146	5-15
	twoneedle pinyon	PIED	*Pinus edulis*	0-34	0-2
	singleleaf pinyon	PIMO	*Pinus monophylla*	0-34	0-2
	Arizona white oak	QUAR	*Quercus arizonica*	0-17	0-9
	redberry juniper	JUCO11	*Juniperus coahuilensis*	0-11	0-1
	oneseed juniper	JUMO	*Juniperus monosperma*	0-11	0-1
	alligator juniper	JUDE2	*Juniperus deppeana*	0-6	0-1
	gray oak	QUGR3	*Quercus grisea*	0-2	0-2
Grass/Grasslike					
6	**Trace Grasses**			0-28	
	sideoats grama	BOCU	*Bouteloua curtipendula*	0-6	–
	blue grama	BOGR2	*Bouteloua gracilis*	0-6	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	0-2	–
	green sprangletop	LEDU	*Leptochloa dubia*	0-2	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	0-1	–
	muttongrass	POFE	*Poa fendleriana*	0-1	–
	curly-mesquite	HIBE	*Hilaria belangeri*	0-1	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0-1	–
	squirreltail	ELEL5	*Elymus elymoides*	0-1	–
	black grama	BOER4	*Bouteloua eriopoda*	0-1	–
	purple threeawn	ARPU9	*Aristida purpurea*	0-1	–
Forb					
7	**Trace Perennial Forbs**			0-11	
	brownfoot	ACWR5	*Acourtia wrightii*	0-1	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0-1	–
	perennial rockcress	ARPE2	*Arabis perennans*	0-1	–
	bluedicks	DICA14	*Dichelostemma capitatum*	0-1	–
	New Mexico groundsel	PANE7	*Packera neomexicana*	0-1	–
	desert penstemon	PEPS	*Penstemon pseudospectabilis*	0-1	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	0-1	–
8	**Trace Annual Forbs**			0-11	
	western tansymustard	DEPI	*Descurainia pinnata*	0-1	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 9. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 10. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Animal community

Due to the very dense nature of shrub cover this plant community has very light use by larger prey species of wildlife. Deer do occupy this site but their densities are not the same as adjacent more open habitats. Elk will come out of adjacent ponderosa pine and alligator juniper communities and use the site where mountain mahogany is abundant. Bear do occupy this site and take advantage of manzanita berries in season. This site is suitable for grazing year round, but is not easily traversed by livestock due to the very high density of shrubs. Livestock grazing use is concentrated on south slopes, canyon bottoms and ridgetops. Very dense north slopes are little used. Slopes greater than 50% and areas with very cobbly surfaces limit grazing use by cattle. Areas of rock outcrop and rock slides form barriers to livestock movement. The site is not very susceptible to erosion due to its very high canopy of shrubs and the minimal impact livestock grazing has on these shrubs.

Hydrological functions

This site has very rough surfaces, due to a high cover of gravels, cobbles and stones, which act to hold water on the site. It produces little runoff from rainfall due to the high canopy cover of shrubs. It produces significant runoff only when heavy rain falls on snow or moist soils.

Recreational uses

Hunting, camping, horseback riding, backpacking, rock hounding, photography.

Wood products

Limited harvest of fuel-wood, fence posts and stays from pinyon, juniper and oak species.

Other products

There is some native harvest of food plants like; acorns, juniper berries, pinyon nuts, grass nuts, thistle, and mescal. There is some harvest of beargrass and skunkbush sumac as fiber for basket making. There is some harvest of pinyon pine, pitch for waterproofing baskets. There is some harvest of herbaceous sage for a variety of uses.

Other references

Graham, Robert C. and Jones, David P. 1992. Water-holding characteristics of weathered granite rock. Final report submitted to USDA Forest Service, Angeles National Forest by Department of Soil & Environmental Sciences, University of California, Riverside.

Pase, C. P. And G. E. Granfelt. 1977. The use of fire on Arizona rangelands. Arizona Interagency Range Committee Publication No. 4, 15p. Fort Collins, CO: USDA Forest Service. Rocky Mtn. Forest & Range Experiment Station.

Pase, Charles P.; Lindenmuth, A. W., Jr. 1971. Effects of prescribed fire on vegetation and sediment in oak-mountain mahogany chaparral. Journal of Forestry. 69: 800-805.

Pase, Charles P. 1965. Shrub seedling regeneration after controlled burning and herbicidal treatment of dense pringle manzanita chaparral. Res. Note RM-56. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 2 p.

USFS Fire Effects Information System available online at: http://www.fs.fed.us/database/feis/

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.

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Date	05/04/2007
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills: Uncommon on most of this site. Some areas with moderately deep soils and low rock fragment cover may have rills in the few areas between shrub interspaces in the climax plant community.**

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2. **Presence of water flow patterns: Indiscrete and uncommon; probably cover no more than 10% of area; flow paths are very short, usually less than 1 foot in length on high gravel cover sites that have burned. Flow paths are nearly unobservable when shrub canopy is at its highest before burning. Flow paths (>1ft.) and rills (short lived) can occur in the interspaces on moist soils following intense precipitation events; these flow paths are highly sinuous around litter accumlations under shrub canopies. Heavy trailing by livestock and wildlife may lead to extended flow patterns, terracettes and litter dams that are stable once established.**

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3. **Number and height of erosional pedestals or terracettes: Pedestals do not exist on most of the site because of high shrub cover or rock fragments. Pedestals and terracettes are uncommon on mod deep soils with low rock cover due to the dominance of shrub cover.**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground): 10-20%.**

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5. **Number of gullies and erosion associated with gullies: Infrequent but these do occur from historic and geologic erosion. Gullies are easily formed if extremely high rainfall events occur 0-15 years after this site burns. Shrub cover returns to nearly pre-burn levels in 10-**

15 years.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None present on this site. Canopy gaps > 2-4 feet are very rare on this site.

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7. **Amount of litter movement (describe size and distance expected to travel):** All litter size classes stay in place.

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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):** No slake test done. Expect values of 1-3 in canopy interspaces, and 4 - 6 under plant canopies.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Not applicable. Surface soil organic matter is primarily concentrated under shrub canopies and not easily affected by management.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Cover estimated as: Canopy 50-70%, Basal 5-10%, Litter 60-80% (primarily under shrubs), and Gravel 5-60% (on mod deep soils gravels tend to be < 1/8" diameter); 90-95% of canopy cover is shrubs, 0-1% perennial grasses, 0-1% perennial forbs. Cover is well dispersed throughout site and canopy cover so dense transecting the site often requires stepping on shrubs.

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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):** None present 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: shrubs >> trees

    Sub-dominant: succulents >> sub shrubs

    Other: annual forbs > annual grasses > perennial grass

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** 10-15% canopy mortality of most shrubs and trees. Some areas have high mortality of juniper and Arizona Cypress due to prolonged drought. Desert buck brush has 80-90 mortality. Pinyon pine has variable mortality across the CRA, primarily on shallower sites and induced by drought and bug kill.

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14. **Average percent litter cover (%) and depth (in):** Litter recover restricted to beneath shrubs.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** **805 lbs/acre unfavorable precipitation, 1,310 lbs/acre normal precipitation, 1,827 lbs/acre favorable precipitation.**

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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:** **Red brome, wild oats, and Boer Lovegrass primarily after a fire. Wait-a-bit has a fair representation in the plant community and can increase significantly after fire.**

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17. **Perennial plant reproductive capability:** **All shrubs except desert buckbrush (CEGR) are not affected even following several years of prolonged drought period for region. CEGR has 80-90% canopy mortality.**
