Major Land Resource Area 040X
Sonoran Basin and Range

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Description

Major Land Resource Area (MLRA) 40 is the portion of Sonoran Desert that extends from northwest Mexico into southwestern Arizona and southeastern California. This MLRA is hot desert characterized by bimodal precipitation coupled with hot summers and mild winters. These conditions give rise to a rich biological diversity visually dominated by columnar cactus (saguaro) and leguminous trees (palo verde). This unit occurs within the Basin and Range Physiographic Province and is characterized by numerous mountain ranges that rise abruptly from broad, plain-like valleys and basins. Igneous and metamorphic rock classes dominate the mountain ranges, and basin sediments are combinations of fluvial, lacustrine, colluvial and alluvial deposits.

Geographic subunits

Land Resource Unit 1. Land Resource Unit (LRU) 40-1, Upper Sonoran Desert, is characterized by desert scrub vegetation with no desert pavement present. Trees grow on uplands as well as in washes and on hillslopes. Elevations range from 2000 to 3800 feet, and precipitation averages 10 to 13 inches per year. Vegetation includes saguaro, palo verde, mesquite, creosotebush, triangle bursage, prickly pear, cholla, limberbush, wolfberry, bush muhly, threeawns, ocotillo, and globe mallow. The soil temperature regime is thermic and the soil moisture regime is typic aridic.

Land Resource Unit 2. Land Resource Unit (LRU) 40-2, Middle Sonoran Desert, is characterized by desert scrub vegetation with a moderate percentage of desert pavement on relic fan remnants; trees are common in all washes, bottoms and hillslopes but largely absent from uplands. Elevation ranges from 1200 to 2000 feet and precipitation averages 7 to 10 inches per year. Upland vegetation includes saguaro, palo verde, creosotebush, white bursage, brittlebush, prickly pear, cholla, desert saltbush, wolfberry, and big galleta. The soil temperature regime is hyperthermic and soil moisture regime is typic aridic.

Land Resource Unit 3. Land Resource Unit (LRU) 40-3, Colorado Sonoran Desert, is characterized by desert scrub vegetation and a high percentage of desert pavement on relic fan remnants. Trees are limited to large washes and hillslopes. Elevations range from 300 to 1200 feet and precipitation averages 3 to 7 inches per year. Vegetation includes creosotebush, white bursage, brittlebush, Mormon tea, teddybear cholla, elephant tree, smoke tree, ocotillo, and big galleta. Soil temperature regime is hyperthermic and soil moisture regime is typic aridic.

Ecological site keys

MLRA 40-2 Ecological Sites

I. Bottom position (plant community reliant upon run-on from valley-side or over-bank)
- A Slightly to strongly saline soils (ECe ≥ 4 dS/m) ... R040XB227AZ – Saline Bottom 7"-10" p.z.
- B Non-saline to very slightly saline soils (ECe < 4 dS/m)
  - 1 Soils with water table available to plant community
    - i. Soils with visible reduction-oxidation features ... F040XB215AZ – Sandy Bottom, Woodland 7" - 10" p.z.
    - ii. Soils without reduction-oxidation features ... F040XB214AZ – Loamy Bottom, Woodland 7"-10" p.z.
  - 2 Soils without a water table available to the plant community
    - i. Narrow drainage, active channel ≤4' width ... R040XB229AZ – Sandy Loam Drainage 7"-10" p.z.
    - ii. Wide drainage, active flow path >4' width

a. Soils sandy ... R040XB216AZ – Sandy Wash 7"-10" p.z.

b. Soils fine sandy loam to clay loam ... R040XB211AZ – Loamy Swale 7"-10" p.z.

c. Soils clayey ... R040XB203AZ – Clayey Swale 7"-10" p.z.

II. Upland position (plant community reliant upon on-site precipitation, run-on ≤ run-off)

A. Slightly to strongly saline soils (ECe ≥ 4 dS/m)

1 Soils sandy, eolian ... R040XB224AZ – Sandy Upland, Saline 7"-10" p.z.

2 Soils sandy loam ... R040XB226AZ – Sandy Loam Upland, Saline 7"-10" p.z.

3 Soils loam to clay loam ... R040XB225AZ – Loamy Upland, Saline 7"-10" p.z.

4 Soils silty to clayey with salic or natric horizon (<12") ... R040XB223AZ – Clayey Upland, Saline 7"-10" p.z.

B. Non-saline to very slightly saline soils (ECe < 4 dS/m)

1 Gently sloping terrain (slopes predominantly ≤ 15%)

i. Soil surface armored with interlocking rock fragments, 1-3" vesicular horizon ... R040XB230AZ – Desert Pavement 7"-10" p.z.

ii. Soil surface without interlocking rock fragments

a. Soils shallow (≤20" depth)

1) Soils calcareous ... R040XB210AZ – Limy Upland 7"-10" p.z.

2) Soils non-calcareous ... R040XB220AZ – Granitic Upland 7"-10" p.z.

b. Soils moderately deep to deep (>20" depth)

1) Soils calcareous

a) Soils skeletal ... R040XB208AZ – Limy Upland, Deep 7"-10" p.z.

b) Soils not skeletal

(1) Soils loamy, not gypsic ... R040XB207AZ – Limy Fan 7"-10" p.z.

(2) Soils loamy and gypsic ... R040XB234AZ – Limy Fan, Gypsum 7"-10" p.z.

2) Soils non-calcareous

a) Soils with an argillic (or clay cambic) horizon

(1) Soils with sandy loam surface ≥4" depth ... R040XB218AZ – Sandy Loam Upland 7"-10" p.z.

(2) Soils with loam surface (any depth) OR sandy loam surface <4" depth ... R040XB213AZ – Loamy Upland 7"-10" p.z.

(3) Soils with clay loam surface (not vertic) ... R040XB205AZ – Clay Loam Upland 7"-10" p.z.

(4) Soils with clayey surface (vertic) ... R040XB204AZ – Clayey Upland 7"-10" p.z.

b) Soils without an argillic horizon

(1) Soils sandy, eolian ... R040XB217AZ – Sandy Upland 7"-10" p.z.

(2) Soils loamy fine sand to sandy loam, alluvial ... R040XB221AZ – Sandy Loam, Deep 7"-10" p.z.

2 Steeply sloping terrain (slopes predominantly >15%)

i. Soils shallow (≤20" depth)

a. Soils calcareous

1) Surface fragments black or nearly so (Munsell color value <4) ... R040XB201AZ – Basalt Hills 7"-10" p.z.

2) Surface fragments not black (Munsell color value ≥4)

a) Parent material weathered/fractured (can dig into with shovel) ... R040XB202AZ – Paralithic Hills 7"-10" p.z.

b) Parent material indurated (cannot dig into with shovel) ... R040XB231AZ – Lithic Hills 7"-10" p.z.

b. Soils non-calcareous in upper 10 inches

1) Parent material weathered/fractured (can dig into with shovel) ... R040XB206AZ – Shallow Hills 7"-10" p.z.

2) Parent material indurated (cannot dig into with shovel) ... R040XB222AZ – Volcanic Hills 7"-10" p.z.

ii. Soils moderately deep to deep (>20" depth)

a. Soils fine sand, eolian ... R040XB232AZ – Sandy Slopes, Dunes 7"-10" p.z.

b. Soils calcareous, not gypsic ... R040XB209AZ – Limy Slopes 7"-10" p.z.

c. Soils calcareous and gypsic ... R040XB233AZ – Limy Slopes, Gypsum 7"-10" p.z.

d. Soils non-calcareous in the upper 10 inches ... R040XB212AZ – Loamy Slopes 7"-10" p.z.

MLRA 40-3 Ecological Sites

I. Bottom position (plant community reliant upon run-on from valley-side or over-bank)

A. Slightly to strongly saline soils (ECe ≥4 dS/m)

1 Soils with a high water table ... R040XC315AZ – Saline Bottom 3"-7" p.z.

2 Soils without a high water table ... R040XC314AZ – Saline Swale 3"-7" p.z.

B. Non-saline to very slightly saline soils (ECe <4 dS/m)

1 Soils with water table available to plant community

i. Soils with a reduced matrix ... R040XC331AZ – Sandy Bottom, Ciénaga 3"-7" p.z.

ii. Soils with visible reduction-oxidation features ... F040XC327AZ – Sandy Bottom, Woodland 3"-7" p.z.

iii. Soils without visible reduction-oxidation features ... F040XC328AZ – Loamy Bottom, Woodland 3"-7" p.z.

2 Soils without water table available to plant community

i. Narrow drainage, active flow channel <5' width ... R040XC330AZ – Sandy Loam Drainage 3"-7" p.z.

ii. Wide drainage, active flow channel >5' width

a. Soils sandy ... R040XC318AZ – Sandy Wash 3"-7" p.z.

b. Soils fine sandy loam to clay loam ... R040XC312AZ – Loamy Swale 3"-7" p.z.

c. Soils clayey ... R040XC303AZ – Clayey Swale 3"-7" p.z.

II. Upland position (plant community reliant upon on-site precipitation, run-on ≤ run-off)

A. Gently sloping terrain (slopes <15%)

1 Soil surface armored with interlocking rock fragments, well-developed vesicular surface horizon ... R040XC326AZ – Desert Pavement 3"-7" p.z.

2 Soil surface not armored with interlocking rock fragments, soil surface horizon lacking vesicular crust

i. Soils shallow (≤20" depth)

a. Soils calcareous ... R040XC310AZ – Limy Upland 3"-7" p.z.

b. Soils non-calcareous ... R040XC322AZ – Shallow Upland 3"-7" p.z.

ii. Soils moderately deep to deep (>20" depth)

a. Soils moderately saline to strongly saline (EC >8 dS/m) ... R040XC317AZ – Saline Upland 3"-7" p.z.

b. Soils non-saline to slightly saline (EC ≤8 dS/m)

1) Soil calcareous

a) Soil skeletal ... R040XC311AZ – Limy Upland, Deep 3"-7" p.z.

b) Soil not skeletal

(1) Soil sandy, eolian ... R040XC307AZ – Limy Fan, Sandy 3"-7" p.z.

(2) Soil loamy, slopes 0-6% ... R040XC306AZ – Limy Fan 3"-7" p.z.

(4) Soil loamy, slopes >7% ... R040XC302AZ – Limy Slopes 3"-7" p.z.

(5) Soil gypsic, slopes >7% ... R040XC309AZ – Limy Slopes, Gypsum 3"-7" p.z.

2) Soil non-calcareous in upper 10 inches

a) Argillic horizon present ... R040XC320AZ – Sandy Loam Upland 3"-7" p.z.

b) No argillic horizon, soil eolian ... R040XC319AZ – Sandy Upland 3"-7" p.z.

B. Steeply sloping terrain (slopes >15%)

1 Soils shallow, calcareous (≤20" depth)

i. Surface fragments black or nearly so (Munsell color value <4) ... R040XC301AZ – Basalt Hills 3"-7" p.z.

ii. Surface fragments not black (Munsell color value ≥4)

a. Parent material fractured or weather, able to dig into with shovel ... R040XC305AZ – Paralithic Hills 3"-7" p.z.

b. Parent material indurated for not weathered, unable to dig into with shovel ... R040XC324AZ – Lithic Hills 3"-7" p.z.

2 Soils moderately deep to deep, calcareous (>20" depth)

i. Soils fine sandy, eolian ... R040XC329AZ – Sandy Slopes, Dunes 3"-7" p.z.

ii. Soils loamy, alluvial ... R040XC302AZ – Limy Slopes 3"-7" p.z.

iii. Soils gypsic ... R040XC309AZ – Limy Slopes, Gypsum 3"-7" p.z.

MLRA 40-1 Ecological Sites

I. Bottom position (plant community reliant upon run-on from valley-side or over-bank)

A. Soils with water table available to the plant community

1 Soils with visible reduction-oxidation features ... R040XA125AZ – Sandy Bottom, Woodland 10"-13" p.z.

2 Soils without visible reduction-oxidation features ... R040XA124AZ – Loamy Bottom, Woodland 10"-13" p.z.

B. Soils without a water table available to the plant community

1 Soils sandy ... R040XA115AZ – Sandy Wash 10"-13" p.z.

2 Soils fine sandy loam to clay loam ... R040XA112AZ – Loamy Swale 10"-13" p.z.

3 Soils clayey ... R040XA102AZ – Clayey Swale 10"-13" p.z.

II. Upland position (plant community reliant upon on-site precipitation, run-on ≤ run-off)

A. Gently sloping terrain (slopes predominantly <15%)

1 Soils shallow (≤20 inches)

i. Soils calcareous ... R040XA111AZ – Limy Upland 10"-13" p.z.

ii. Soils non-calcareous ... R040XA121AZ – Granitic Upland 10"-13" p.z.

2 Soils moderately deep to deep (>20 inches)

i. Soils calcareous in the upper 10" or throughout

a. Soils gypsic ... R040XA126AZ – Gypsum Upland 10"-13" p.z.

b. Soils not gypsic

1) Soils with argillic horizon (or clay cambic) ... R040XA130AZ – Loamy Upland, Limy 10"-13" p.z.

2) Soils skeletal (≥35% fragments) ... R040XA106AZ – Limy Upland, Deep 10"-13" p.z.

3) Soils not skeletal (<35% fragments) and without argillic ... R040XA108AZ – Limy Fan 10"-13" p.z.

ii. Soils non-calcareous in the upper 10 inches

a. Soils without an argillic horizon

1) Soils sandy and eolian ... R040XA116AZ – Sandy Upland 10"-13" p.z.

2) Soils loamy fine sand to sandy loam ... R040XA117AZ – Sandy Loam Upland, Deep 10"-13" p.z.

b. Soils with an argillic horizon

1) Soils with sandy loam surface ≥4" over argillic ... R040XA118AZ – Sandy Loam Upland 10"-13" p.z.

2) Soils with sandy loam surface <4" or loam surface any depth over argillic ... R040XA114AZ – Loamy Upland 10"-13" p.z.

3) Soils with a clayey surface, not vertic ... R040XA120AZ – Clay Loam Upland 10"-13" p.z.

4) Soils with a clayey surface, vertic ... R040XA104AZ – Clayey Upland 10"-13" p.z.

B. Steeply sloping terrain (slopes predominantly ≥15%)

1 Soils shallow (≤20 inches)

i. Soils calcareous throughout

a. Soils over limestone parent materials ... R040XA107AZ – Limestone Hills 10"-13" p.z.

b. Soils over fanglomerate and conglomerate ... R040XA128AZ – Conglomerate Hills 10"-13" p.z.

c. Soils over basalt parent materials ... R040XA101AZ – Basalt Hills 10"-13" p.z.

d. Soils over volcanic rock, breccia, and agglomerates ... R040XA129AZ – Limy Hills 10"-13" p.z.

ii. Soils non-calcareous in upper 10 inches

a. Soils over granite, gneiss, schist, rhyolite ... R040XA105AZ – Shallow Hills 10"-13" p.z.

b. Soils over andesite, dacite, basalt, welded tuff ... R040XA123AZ – Volcanic Hills 10"-13" P.Z.

c. Soils over schist ... R040XA119AZ – Schist Hills 10"-13" p.z.

2 Soils moderately deep to deep (>20 inches)

i. Soils calcareous throughout

a. Soils gypsic ... R040XA127AZ – Gypsum Slopes 10"-13" p.z.

b. Soils not gypsic ... R040XA110AZ – Limy Slopes 10"-13" p.z.

ii. Soils non-calcareous in the upper 10 inches

a. Soils sandy loam to clay loam ... R040XA113AZ – Loamy Slopes 10"-13" p.z.

b. Soils clay loam to clay ... R040XA103AZ – Clayey Slopes 10"-13" p.z.

DRAFT LRU Key

I. Broad visual assessment of uplands with slopes <15%. Desert pavement present, elevations <2,000' above sea level

A. Leguminous trees present in all washes and drainages; generally absent from uplands between them ... Key 1 – MLRA 40-2 Ecological Sites

B. Leguminous trees ONLY present in largest washes ... Key 2 – MLRA 40-3 Ecological Sites

II. Broad visual assessment of uplands with slopes <15%. Desert pavement absent; elevations generally >2,000' above sea level ... Key 3 – MLRA 40-1 Ecological Sites

MLRA 31

I. Site occurs on the basin floor.

A. The site occurs on well-drained, moderately rapidly permeable soils in lacustrine basins and large floodplains. Slopes are gently sloping to nearly level. Elevation ranges from 230 feet below sea level to 800 feet above.

III. Site occurs on any part of a hill and/or hillslope

A. Surface fragments, including rock outcrop, over 3 inches in diameter cover greater than 15% of the soil surface

1 Less than 15% slope; pediment: Please refer to R030XY023CA Hyperthermic Dissected Shallow Pediment.

2 Greater than 15% slope.

i. . Generally greater than 15% cover of fragments over 10 inches diameter; non-northerly aspects

ii. Generally less than 15% cover of fragments over 10 inches diameter; northerly aspects

iii. Colluvium/residuum from plutonic and plutonic metamorphosed

B. 8’ Surface fragments over 3 inches in diameter cover less than 15% of the soil surface

IV. Site occurs on any type or part of alluvial fan (e.g. inset fan, fan remanent, ballena, fan apron etc.)

A. Alluvial fan with no water flow patterns; fluvial processes are no longer evident due to fan abandonment

1 Desert pavement, all ages; vesicular pores in the soil surface horizon reduce moisture infiltration as well as severely limit plant germination and establishment

2 Not a desert pavement or dissimilar enough to allow more moisture infiltration and plant establishment, if a vesicular horizon is present it is very thin and weak and if uneven surface fragements are present, they may assist with moisture infiltration

iii. Surface fragments over 3 inches in diameter cover greater than 15% of the soil surface. Elevation above 1650 ft (500m) elevation

iii. Surface fragments over 3 inches in diameter cover less than 15% of the soil surface

iv. Surface fragments over 3 inches in diameter cover greater than 15% of the soil surface. Elevation below 1650 ft (500m) elevation

v. Surface fragments over 3 inches in diameter cover greater than 15% of the soil surface with cobbles being the predominent size.

B. Active alluvial fans with water flow patterns

1 Greater water flow patterns, and small drainages due to run-off from higher areas.

2 Less water flow patterns with very occasional runoff and presence of brittlebush.

3 The site occurs primarily on fan piedmonts but can also be found in some minor drainageways. Receiving slightly higher run-off and/or rainfall than other creosotebush-white bursage communities, it is a higher producing site.

V. Site occurs within a confined and/or semi-confined channel, avulsion rare to frequent

A. Small drainages order 3 or smaller draining the convex summit position of alluvial fans.

F. Landscape shape is concave which concentrates sheetflow as an ephemeral stream.

1 Braided stream

i. Sandy soils with loose single grain surface structure

ii. Sandy skletal and/or massive surface structure

iii. Sandy skletal and/or massive surface structure with stones on the surface. Blue paloverde is dominant

2 Stream confined to the extent that braided channels do not exist, usually between fan remnants in the upper piedmont slopes

i. Wash drains desert pavement landforms

ii. Wash does not drain desert pavement landforms

a. Drains sandstone material; steeper (greater than 4% slope) less infiltration

b. Drains plutonic and plutonic metamorphosed material such as schist, lower sloping with greater

infiltration

iii. Drains desert pavement with argillic and/or calcic pr petrocalcic horizon.

VIII. Site occurs on sand dunes or sandsheets

A. This ecological site is found on sand sheets, coppice dunes, and semi-stabilized dunes.

[Label] [Criteria]