

Major Land Resource Area 040X

Sonoran Basin and Range

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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 ($EC_e \geq 4$ dS/m) ... R040XB227AZ – Saline Bottom 7"-10" p.z.
 - B Non-saline to very slightly saline soils ($EC_e < 4$ 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 $\leq 4'$ 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 \leq run-off)
 - A. Slightly to strongly saline soils ($EC_e \geq 4$ 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 ($EC_e < 4$ dS/m)
 - 1 Gently sloping terrain (slopes predominantly $\leq 15\%$)
 - 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 ($\leq 20"$ 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 ($EC_e \geq 4$ 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 ($EC_e < 4$ 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 predominant 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 skeletal and/or massive surface structure
- iii. Sandy skeletal 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 or 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]