

# Major Land Resource Area 070A

## High Plateaus of the Southwestern Great Plains

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### Ecological site keys

#### ESD Key for the Canadian Plateaus LRU of the High Plateaus of the Southwestern Great Plains (MLRA 70A)

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1a. Site occurs on one of the following water-collecting landforms: lower stream terraces, floodplains, drainageways, and bottoms of closed depressions (playas). The following landforms are excluded: fan remnants, alluvial flats, strath terraces, and toeslopes, as well as higher stream terraces where soils have  $\geq 35\%$  rounded fragments (old stream gravels and cobbles) in a layer at least 50 cm thick within the upper 100 cm. Site receives significant additional moisture.

2a. Site occurs in a closed depression (playa). ... GX070A01X017 – Playas

2b. Run-on sites that are along perennial streams of river valley bottomland. These sites include streams that were historically perennial but now have diverted water.

3a. Site has an active channel, active floodplain, and a floodplain step. The soils of either floodplain positions have one or more of the following: i. Stratified sediments within 100 cm of soil surface; ii. One or more soil layers within 100 cm have a matrix chroma  $< 2$  (may have some high chroma mottles of iron concentrations); iii. Site has a historic flooding frequency of  $< 10$  years. ... GX070A01X010 – Riparian

3b. Run-on sites occurring on stream terraces adjacent to perennial floodplains that do not have stratified sediment layers within 100 cm of the surface, but still have slopes less than 2%. ... GX070A01X012 – Low Terraces

2c. Other sites that occur in drainageway bottoms of an ephemeral waterway. Average flooding frequency is typically  $< 10$  years but can vary due to order of waterway. ... GX070A01X008 – Ephemeral Drainageways

1b. Site does not meet the criteria for 1a.

4a. Site occurs on elevated terraces where soils have  $\geq 35\%$  rounded fragments (old stream gravels and cobbles) in a layer at least 50 cm thick within the upper 100 cm. ... GX070A01X019 – Gravelly Terraces

4b. All other sites.

5a. Slope  $\geq 10\%$  (this excludes microrelief such as cutbanks and gullies).

6a. Site meets all the following criteria: 1) Soil surface has strong or violent effervescence (immediate frothy reaction to an acid such as white vinegar or dilute HCl). 2) at least 5% cover of calcareous rock fragments (limestone or limy sandstone/shale, or carbonate-coated fragments). 3) Occurs on an escarpment (see Appendix Item B). 4) Contains bedrock outcrop somewhere on escarpment (look for small exposed benches of limestone or gullies cut into shale; ... GX070A01X007 – Limy Escarpments

6b. All other steep sites. ... GX070A01X006 – Slopes

5b. Slope  $< 10\%$  (this excludes tiny benches on otherwise steep slopes).

7a. Soils  $\leq 50$  cm to lithic contact.

8a. Soils are underlain by limestone bedrock. ... GX070A01X017 – Playas

8b. Soils are underlain by sandstone bedrock where rock outcrop is visible somewhere within the site and/or there is a minimum of 10% large fragments (cobbles or larger) on the soil surface. ... GX070A01X013 – Lithic Sandstone

8c. If neither 8a nor 8b apply, go to 9.

7b. No lithic contact in the upper 50 cm.

9a. Soils  $\leq 50$  cm to paralithic materials (soft shale bedrock or weathered calcareous sandstone). ...

## GX070A01X004 – Shallow Loamy

### 9b. All other sites.

10a. Eolian sites where soils have surface textures of sandy loam or sandier, with sandy clay loam or sandier textures throughout. User tip: these sites are usually downwind of larger stream channels, canyons or playas. ... GX070A01X021 – Sandy

10b. Sites that meet both of the following conditions: 1) Site has slopes less than 1 percent and occurs on a broad alluvial fan, alluvial flat, or terrace. 2) Soils have  $\geq 35\%$  clay starting within 6" (15 cm) of the surface. ... GX070A01X015 – Clayey Flats

### 10c. All other sites.

11a. Sites where soils have both of the following conditions at the soil surface: strong or violent effervescence, and at least 5% calcareous rock fragments (limestone or limy sandstone/shale, or carbonate coated fragments). ... GX070A01X005 – Limy

### 11b. [Criteria]

12a. Soils contain materials within the upper 50 cm with  $\geq 35\%$  clay. Occurs on well drained landforms such as plateaus, as well as on some strath terraces. ... GX070A01X002 – Clayey Uplands

12b. Soils lack materials within the upper 50 cm with  $\geq 35\%$  clay. ... GX070A01X003 – Loamy Uplands

<sup>D</sup> Appendix D. D. Lithic Contact- solid bedrock underlying soil or other unconsolidated material, strongly cemented or harder, and usually performs a structural role in the landform (i.e. Dakota Sandstone, photo 5).

<sup>C</sup> Appendix C. C. Bedrock Contact- Cretaceous bedrock contact can be either lithic (Limestone, photo 3) or non-lithic (Shale, photo 4).

<sup>E</sup> Appendix E. E. Sandy Textures (>50% sand) - to determine sandy textures, place a small sample (coffee bean sized) in the palm, puddle with water and smear with finger. Then pour off suspended liquid so that only sand grains remain. If at least 50% of volume remains, then textures are sandy.

<sup>F</sup> Appendix F. F. Fine textures (>35% clay) - a soil texture that has 35% clay will, when moistened and worked into a texture ball, usually form a wire (3mm thick when rolled between fingers or palm) or ribbon that supports its own weight when at least 2" long

<sup>4a</sup> User Tip 4a. (User tip: User tip: These are dynamic hydrologic systems which, in most cases, have been impaired due to diversion or withdrawals of water resources leading to lowered water tables and reduced streamflow or flooding frequency. As such, they are drier than their historic condition. A general rule for identifying Riparian sites, if the watershed source begins within the Rocky Mountains, it is probably a Riparian site, regardless of current hydrology.)

<sup>A</sup> Appendix A. A. Argillic Horizon - a subsurface horizon with any pronounced increase in clay relative to the surface horizons. This will act to perch, or retain moisture within the horizon/s directly above.

<sup>B</sup> Appendix B. B. Escarpment - a break in the plateau from a canyon, faulting, or by regional erosion where a steep drop occurs that breaks the general continuity of more gently sloping land above.

## LRU Key for High Plateaus of the Southwestern Great Plains (MLRA 70A)

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I. The site exists on a landform of volcanic origin, such as a basalt plateau, or is part of an escarpment system that rises directly to a volcanic structure. These escarpments are included if they have volcanic alluvium or colluvium (i.e. basalt, rhyolite, tuff, cinders) overlying non-volcanic residuum or bedrock (i.e. sandstone, shale). → VOLCANIC PLATEAUS LRU (VP)

II. All other sites. User tip: Other alluvial or colluvial landform features extending below the escarpments are not included in VP unless they have a predominance of volcanic fragments at the surface. Also, note that playas atop volcanic plateaus are included within the VP-LRU.

A. The site exists in the annulus or floor of a playa. → CANADIAN PLATEAUS LRU (CP)

B. All other sites.

1 Site on escarpment or on canyon/valley/small basin confined by such escarpments. At upper boundary of LRU,  $\geq 4$  of 5: I. Shallow or very shallow soils are present in at least 50% of the landform area; II. Soils are underlain by sandstone bedrock of the Cretaceous Dakota Formation or older; III. Presence or historical evidence of a conifer stand IV. Slope  $\geq 10\%$ ; V. Site drains towards steep-walled escarpments/canyons below Dakota Sandstone.

2 Fewer than 4 of the above criteria are met. User tip: The MCB sites also occur on any colluvial or alluvial bottomlands confined within escarpments or canyons. Some valleys transition from CP to MCB, or back to CP, and the turning point can be difficult to determine. Generally, the landforms are part of the MCB when confined between Dakota sandstone breaks or escarpments on both sides.

- i. . The soil is on a plateau summit position (tread) and is within 50 cm to contact with either plateau bedrock (non-soil bedrock of cemented sandstone, limestone, or shale) or strath terrace cobbles<sup>2</sup>, but not a petrocalcic contact (caprock or caliche of cemented calcium carbonate). → CANADIAN PLATEAUS LRU (CP)
- ii. No plateau bedrock or strath terrace cobbles within 50 cm.
  - a. Fragments are entirely absent.
    - 1) All horizons in the upper 100 cm of soil have textures of sandy clay loam or sandier. → CANADIAN PLATEAUS LRU (CP)
    - 2) At least one horizon in the upper 100 cm of soil has a texture that is less sandy than sandy clay loam. → HIGH PLAINS LRU (HP)
  - b. Fragments (>2 mm) are visible within the soil profile and/or on the surface. If fragments cannot be found in the profile, it is acceptable to look nearby on ant mounds or around burrows. If site is in a drainageway, one can look for fragments on landforms immediately upslope.
    - 1) Fragments are mostly petronodes or High Plains gravels. → HIGH PLAINS LRU (HP)
    - 2) Fragments are mostly plateau bedrock fragments<sup>5</sup>. → CANADIAN PLATEAUS LRU

<sup>1</sup> User Tip 1. Other alluvial or colluvial landform features extending below the escarpments are not included unless they have a predominance of volcanic fragments. Also, note that playas atop volcanic plateaus fit in the VP LRU.

<sup>2</sup> User Tip 2. The site may also occur on any colluvial or alluvial bottomlands contained within these escarpments or canyons. → MESOZOIC CANYONS AND BREAKS LRU (MCB) User tip: some river valleys transition from CP to MCB, and the turning point can be difficult to determine. Generally, the valley becomes MCB when entrenched between Dakota sandstone breaks or escarpments on both sides. Much of this acreage in the MCB is aproned by colluvial debris fans—composed of sandy materials with lots of sandstone fragments, including large stones or boulders. The soils in the bottoms of these valleys will also be in the MCB.

## **Key to the LRU Subsets (Climate Zones) of the Volcanic Plateaus (70A.3)**

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