RANGELAND ECOLOGICAL SITE KEY -- Soil Site Component (Version 13.0)

For MLRA's 43A, 43B, 44A 44B, 46X, 52X, 53A, 58A, & 60B

This KEY is used to identify one component of an ecological site. An ecological site is the site keyed, specific to the MLRA and LRU it is located in. A site is only an ecological site in the context of the MLRA and LRU nested hierarchy.

LRU Matrices by MLRA are available at: ftp://ftp-fc.sc.egov.usda.gov/MT/www/technical/range/Montana%20LRU%20Matrix's%207-10%20.pdf

NOTE: Part I of the key describes ecological sites existing individually within soil components. Refer to Part II of the key for sites that are ecological site complexes. (For planners that are unsure on what ecological sites to use due to changes in naming conventions see page 4)

Part I. Soil Component Ecological Site Key

A. Site receives additional effective moisture[1]

1a. Soil saline (EC> 4 within surface 4") and water table > 24"

2a. Seasonal high water table 24-40" from ground surface; salt tolerant plants dominate site – Saline Subirrigated (SSb)

2b. Seasonal high water table ≥ 40" from ground surface; salt tolerant plants dominate site; site regularly receives more than normal soil moisture because of run-in or stream overflow – Saline Overflow (SOv)

1b. Site not as above

3a. Site is a closed depression with run-in – Pothole (Ph)

3b. Site is not a closed depression

4a. Seasonal high water table ≥ 40" from ground surface; site regularly receives more than normal soil moisture because of run-in or stream overflow – Overflow (Ov)

4b. Seasonal high water table < 40" from ground surface

5a. Soil organic (organic surface > 8" thick) – Wet Meadow, Organic (WMO)

5b. Site not as above

6a. Site located in the flood plain

7a. Seasonal high water table < 24 "

8a. Seasonal high water table < 12" – Riparian Wet Meadow (RWM)

8b. Seasonal high water table 12" to 24" – Riparian Meadow (RM)

7b. Seasonal high water table 24" to 40"

9a. Soil sandy-skeletal to within 20" of surface – Wet Gravelly (WGr)

9b. Soil not sandy-skeletal – Riparian Subirrigated (RSb)

6b. Site not located in flood plain

10a. Seasonal high water table < 24"

11a. Seasonal water table < 12" – Wet Meadow (WM)

11b. Seasonal high water table 12" to 24"– Meadow (M)

10b. Seasonal high water table 24" to 40" – Subirrigated (Sb)

B. Site does not receive additional effective moisture[1]

1a. Soil saline or saline-sodic within surface 20" or soils with natric or relic natric horizons.

2a. No columnar structure; site dominated by salt tolerant plants – Saline Upland (SU)

2b. Columnar structure present, abrupt root or water restrictive clay layer present within 8" of soil surface

3a. Less than 4” of surface over clay layer (evidenced by columnar structure) – Thin Claypan (TCp)
3b. Soil has 4 to 8” of surface over clay layer (evidenced by columnar structure) – Claypan (Cp)
1b. Site not as above
4a. Coarse granular clay (typically acid shales), site contains sandy vegetation (e.g. Prairie sandreed) – Coarse Clay (CoC)
4b. Site not as above
5a. Soils shallow to very shallow (< 20” deep to bedrock, lithic, or paralithic root restrictive layer)
6a. Highly fractured lithic bedrock to soil surface.
7a. Non-sedimentary bedrock that is lithic and or fractures dominates the site; roots penetrate into cracks; weak soil development. (Mountain mahogany usually present) -- Fractured Rock (Fr)
7b. Eroded exposed limestone of mostly shallow and very shallow limy ecological sites. (Mountain /mahogany and juniper are the dominant vegetation, > 15% cover) -- Fractured Rock, Limy (FrLy)
6b. Site not as above
8a. Soil very shallow (< 10” deep to bedrock, lithic, or paralithic root restrictive layer)
9a. Soil strongly or violently effervescent (calcareous) in surface 4”, lime concentration increasing with depth. (typically limestone parent material) – Very Shallow Limy (VSwLy)
9b. Other – Very Shallow (VSw)
8b. Soil shallow (10” – 20” deep to bedrock, lithic, or paralithic root restrictive layer)
10a. Soil is strongly or violently effervescent (calcareous) in surface mineral 4”, lime concentration increasing with depth. (typically limestone parent material)
11a. Soil skeletal – Shallow Limy, Droughty (SwLyDr)
11b. Soil not skeletal – Shallow Limy (SwLy)
10b. Other
12a. Soil skeletal – Shallow Droughty (SwDr)
12b. Soil not skeletal
13a. Clay content ≤ 32% in surface mineral 4” (able to make a ribbon ≤ 2” long)
14a. Soil texture within surface mineral 4” is typified by sand to sandy loam – Shallow Sandy (SwSy)
14b. Soil texture within surface mineral 4” is typified by loam, clay loam, or silt loam – Shallow Loamy (SwLo)
13b. Clay content > 32% in surface mineral 4” (ribbon length > 2” long) – Shallow Clay (SwC)
5b. Soils moderately deep, deep, or very deep (≥ 20” deep to bedrock, lithic, or paralithic root restrictive layer)
15a. Stones and/or boulders cover > 15% surface area (> 30% cover measured by step transect) – Rubbly (Ry)
15b. Site not as above
16a. Soil skeletal to within 20” of soil surface (averages > 35% rock fragments in the 10”-20” layer)
17a. Soil sandy-skeletal
18a. Sandy-skeletal within 10” of soil surface – Gravelly (Gr)
18b. Sandy-skeletal within 10-20” of soil surface & typically consists of gravels and/or cobbles
19a. Strongly or violently effervescent within surface mineral 4”, lime concentration increasing with depth. (typically limestone parent material) – Shallow to Gravel, Limy (SwGrLy)
19b. Not strongly or violently effervescent within surface mineral 4”-- Shallow to Gravel (SwGr)
17b. Soil loamy-skeletal or clayey-skeletal
20a. Strongly or violently effervescent within top 4”, lime concentration increasing with depth. (typically limestone parent material) – Limy Droughty (LyDr)
20b. Not strongly or violently effervescent within surface mineral 4”
21a. Slope < 15% – Droughty (Dr)
21b. Slope ≥ 15% – Droughty Steep (DrStp)
16b. Soil not skeletal within 20” of soil surface (averages < 35% rock fragments in the 10”-20” layer)

22a. Strongly or violently effervescent in surface mineral 4", lime concentration increasing with depth. (typically limestone parent material) – Limy (Ly)

22b. Not strongly or violently effervescent in surface mineral 4"

23a. Sand or loamy sand texture within surface mineral 4" – Sands (Sa)

23b. Site not as above

24a. Slope < 15%

25a. Coarse sandy loam to fine sandy loam texture within surface mineral 4"

26a. Any argillic horizon in surface 20" with > 20% clay – Sandy Argillic (SyA)

26b. Argillic horizon, if present, has ≤ 20% clay – Sandy (Sy)

25b. Site not as above

27a Clay content is > 32% in surface mineral 4" of mineral soil (ribbon ≥ 2" long)

28a. Soil 32% to 45% clay within surface mineral 4" – Clayey (Cy)

28b. Soil > 45% clay within surface mineral 2" – Dense Clay Nonsodic (DCX)

27b. Clay content is ≤ 32% in surface mineral 4"

29a. Stones and/or boulders cover 3-15% surface area (15-30% cover measured by step transect) – Stony (St)

29b. Site not as above

30a. Any argillic horizon in surface 20" with >35% clay (ribbon ≥ 2" long) – Loamy Argillic (LoA)

30b. Argillic horizon, if present, has ≤ 35% clay of mineral soil (ribbon < 2" long) – Loamy (Lo)

24b. Slope ≥15%

31a. Mollic epipedon present

32a. Clay content is > 32% (ribbon ≥ 2" long) in surface mineral 4" – Clayey Steep (CyStp)

32b. Clay content is ≤ 32% (ribbon < 2" long) in surface mineral 4" – Loamy Steep (LoStp)

31b. Mollic epipedon not present

33a. Coarse sandy loam to fine sandy loam texture – Thin Sandy (TSy)

33b. Other texture

34a. Clay content > 32% (ribbon ≥ 2") in surface mineral 4" – Thin Clayey (TCy)

34b. Clay content ≤ 32% (ribbon < 2") in surface mineral 4" – Thin Loamy (TLo)

[1]For areas recognized to have received additional moisture through snow trapping, consider adjusting to a moister LRU consistent with the vegetation observed for the site keyed. It is anticipated that most snow-trap sites will not have a water table. For high very cold environments, the snow trap effect may be neutral or negative and no LRU adjustment is anticipated.

Part II. Rangeland Ecological Site Complex Key (Site is a complex of intermingled ecological sites)

Panspots (Ps) Saline or saline-sodic (includes natric and relic natric) with an abrupt root or water restrictive clay layer present within 8" of soil surface, and areas of loamy, sandy, or clayey soils in complex with shallow depressions of nearly impervious materials at or near the surface. Saline uplands sites occupy 20 to 50% of the area.

Thin Breaks (TB) A complex of intermingled sites comprised of 30-70% exposed sedimentary bedrock that is paralithic or lithic; may contain fractures; slopes generally > 30%.

Badlands (BL) A complex of sites composed of > 70% barren lands (paralithic sedimentary bedrock) broken by drainages and intermingled small grazable areas.

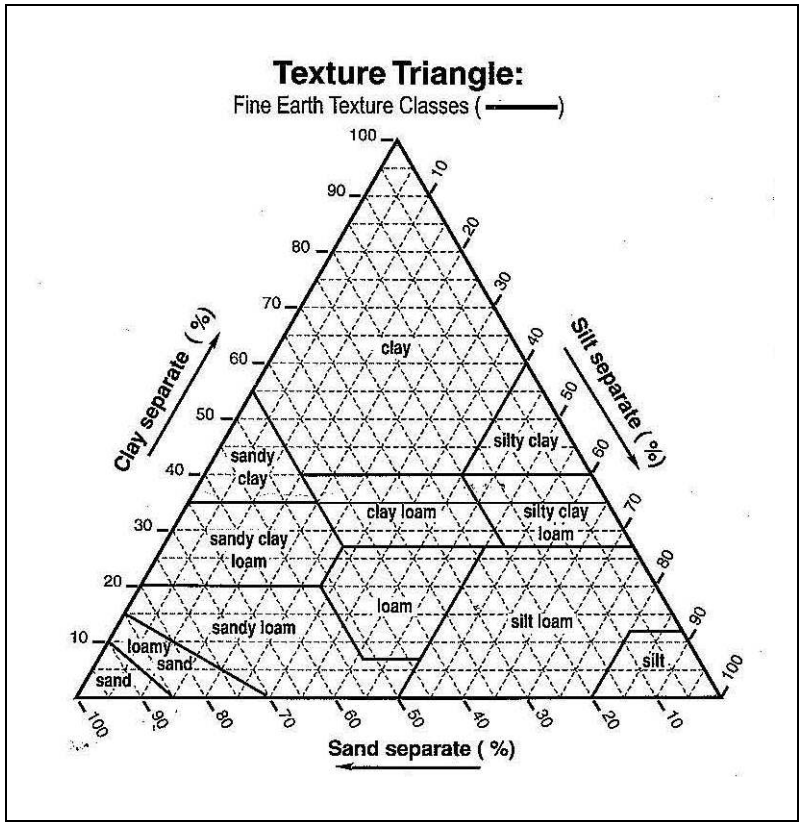
Shale (Sh) A complex of intermingled sites where soil depth varies from very shallow to deep (>10"); weak soil development; angular shale fragments on surface.

Thin Hilly (TH) Area intermingled with a complex of ≥ 2 thin ecological sites (thin loamy, thin sandy, and/or thin clayey sites) difficult to separate.

Correlation for planners using the key

If the site keys out to an ecological site in this key that did not exist or was not used at the time the soil survey was completed, correlate using the table below or contact the Area Rangeland Management Specialist. (It is not always a 1 to 1 relationship; choose the closest description based on properties of the site)

Ecological Site Keyed	Old Range Site Name
Loamy	Silty
Loamy Argillic	Silty
Loamy Steep	Silty Steep or Thin Silty
Thin Loamy	Thin Silty or Silty Steep
Saline Overflow	Saline Lowland
Saline Subirrigated	Saline Lowland
Limy	Silty Limy
Sandy Argillic	Sandy
Droughty	Silty Droughty or Silty
Droughty Steep	Silty Steep
Shallow Limy	Shallow
Shallow Loamy	Shallow
Shallow Droughty	Shallow
Shallow Sandy	Shallow
Shallow Limy Droughty	Shallow
Very Shallow Limy	Very Shallow



BRIEF DESCRIPTION of ECOLOGICAL SITES

Badlands (BL) (000)	Nearly barren lands broken by drainages and intermingled small grazable areas. Formed by geological erosion of soft sedimentary beds (paralithic). Occurs on Steep escarpments, narrow ridges, isolated buttes, and deeply entrenched ravines. This site is also characterized by the complexity of other ecological sites occurring within and throughout its extent – it is truly a complex of ecological sites.
Clayey (Cy) (001)	Site typically occurs on alluvial fans, hills, plains, stream terraces, knolls or other similar landforms. Soil is greater than 20" deep and surface textures are typically clay loam, silty clay loam, silty clay or clay. Slopes range from 0 to 15%. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 10-20% composition by dry weight. Vegetation may include bluebunch wheatgrass, green needlegrass, western or thickspike wheatgrass, prairieclovers, dotted gayfeather, American vetch, scarlet globemallow, winterfat and other miscellaneous shrubs such as Wyoming big sagebrush, silver sagebrush, saltbushes, and fringed sagewort.
Clayey Steep (CyStp) (005)	Site generally occurs on moderately steep to steep hills, divides, plains, and ridges. Slopes are ≥15% but usually less than 45%. Soils are >20" deep and a mollic epipedon is present. Surface textures have >32% clay content and vary from clay loam, silty clay loam, silty clay to clay.
Claypan (Cp) (006)	Site primarily occurs on till plains, alluvial fans, plains, stream terraces, hills, and lake plains. Soil surface textures vary from fine sandy loam to silty clay loam. Within 4 to 8 inches of the soil surface, a hard to extremely hard argillic horizon occurs. This horizon has a strong columnar structure. Salt and/or lime ($CaCO_3$) accumulations are often evident in the lower part of the B horizon. Slopes range from 0 to 15%, but are mainly less than 8%. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 5-20% composition by dry weight. Vegetation may include western or thickspicke wheatgrass, bluebunch wheatgrass, green needlegrass, prairie thermopsis, American vetch, wild onion, buckwheat species, western yarrow, Wyoming big sagebrush, fringed sagewort, and other miscellaneous shrubs such as saltbushes, greasewood and rabbitbrush.
Coarse Clay (CoC) (007)	Site primarily occurs on hills and plains. Soils are formed from acid shales and are coarse and granular clay. Soil surface textures are typically silty clay loam, silty clay, or clay. Soil depths vary but are dominantly shallow to moderately deep (10" to 40" deep). Slopes range from 0 to 30%. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 20 to 30% composition by dry weight. Vegetation may include prairie sandreed, bluebunch wheatgrass, sun sedge, Indian ricegrass, western or thickspike wheatgrass, little bluestem, dotted gayfeather, scurfpeas, prairie thermopsis, American vetch, Wyoming big sagebrush, rubber rabbitbrush, and other miscellaneous shrubs such as longleaf sagebrush, prairie rose, and skunkbush sumac.
Dense Clay Nonsodic (DCX) (011)	Site typically occurs on till plains, plains, hills, and alluvial fans on slopes less than 15%. Soil surface textures are silty clay or clay and are nonsodic. Pendroy and potentially Marias are series examples that would represent this site.

Droughty (Dr) (036)	Site mainly occurs on alluvial fans, stream terraces, hills, mountain slopes, mountains, plains, ridges, drainageways, and moraines on slopes <15%. Soils are >20" deep and consist of loamy skeletal or clayey skeletal soil material (averages >35%rock fragments by volume in 10-20" layer). This skeletal soil material decreases the water holding capacity of the ecological site. This site's climax community typically produces 25% less than a similar Loamy ecological site. Surface textures can be almost anything. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs each comprising of 10% composition by dry weight.
Droughty Steep (DrStp) (038)	Site commonly occurs on hills, mountain slopes, mountains, alluvial fans, moraines, ridges and escarpments on moderately steep to steep slopes greater than or equal to 15%. Soils are >20" deep and consist of loamy skeletal or clayey skeletal soil material (averages >35%rock fragments by volume in 10-20" layer). This skeletal soil material decreases the water holding capacity of the ecological site. Surface textures can be almost anything.
Fractured Rock (Fr) (015)	Soil only found in cracks. Mountain mahogany is the dominant species on this site. Non-sedimentary bedrock that is lithic and or fractures dominates the site; roots penetrate into cracks; weak soil development.
Fractured Rock, Limy (FrLy) (017)	Eroded exposed limestone of mostly very shallow limy ecological sites (usually <4" deep) in complex with shallow limy and limy ecological sites. Shrubs grow on soil inclusions and roots penetrate into cracks of exposed limestone (mountain mahogany and juniper are the dominant vegetation, >15% cover).
Gravelly (Gr) (020)	Site typically occurs on stream terraces, paleoterraces, hills, outwash terraces, outwash plains alluvial fans, hillslopes and mountain slopes. Soils textures are typically loam, sandy loam, or loamy sand. Slopes can range from 0 to 70%. Soil consists of sandy skeletal soil material (>35% rock fragments by volume in less than 10" from soil surface). This skeletal soil material decreases the water holding capacity of the ecological site. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 5 to 20% composition by dry weight. Vegetation may include bluebunch wheatgrass, needleandthread, plains muhly, little bluestem, prairieclovers, prairie coneflower, dotted gayfeather, scurfpea species, winterfat and other miscellaneous shrubs such as prairie rose, silver sagebrush, and fringed sagewort.
Limy (Ly) (030)	Site often occurs on stream terraces, alluvial fans, hillslopes, hills, fan remnants, and escarpments and is dominantly associated with limestone parent material. Can occur on slopes 0-40% but mainly exists on slopes less than 8%. Soil surface textures vary from sandy loam to clay loam. >5% CaCO3; Strongly or violently effervescent within top 4" with lime concentration increasing with depth.
Limy Droughty (LyDr) (031)	Site regularly occurs on alluvial fans, stream terraces, fan remnants, moraines, and hills on slopes ranging from 0-65%. Soils are >20" deep and consist of loamy skeletal or clayey skeletal soil material (averages >35%rock fragments by volume in 10-20" layer). This skeletal soil material decreases the water holding capacity of the ecological site. Soil surface textures range from sandy loam to clay loam. > 5% CaCO3; Strongly or violently effervescent within top 4" with lime concentration increases with depth. Site typically associated with limestone parent material.
Loamy (Lo) (032)	Site often occurs on alluvial fans, hills, plains, till plains, low hills and stream terraces. Soil surface textures are typically very fine sandy loam, loam, silt loam, silt, sandy clay loam, or clay loam and clay content is ≤32%. Slopes can range from 0 to 15%. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 5 to 20% composition by dry weight.
Loamy Argillic (LoA) (033)	Site often occurs on alluvial fans, steam terraces and toe slopes. Soil surface textures are generally loams or silt loams; or clay loams or silty clay loams with less than 32 percent clay. These soils also have an argillic horizon within 20 inches of the soil surface that has greater than 35 percent clay.
Loamy Steep (LoStp) (040)	Site typically occurs on moderately steep to steep hills, alluvial fans, mountain slopes, ridges, mountains, and moraines. Slopes are ≥15% but usually less than 50%. Soils are >20" deep and a mollic epipedon is present. Surface textures usually range from coarse sandy loam to clay loam and must have a clay content ≤32%.

Meadow (M) (082)	
Overflow (Ov) (060)	Site occurs on swales, drainageways, and floodplains. Site regularly receives more than normal soil moisture because of run-in; or stream overflow at least one occurrence every three years. Soil textures vary, but are typically loam, sandy loam, or clay loam. Slopes range from 0 to 5%. This site does not include "snoverflow sites" (They are handled with LRU adjustments) Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 10 to 25% composition by dry weight. Vegetation may include basin wildrye, green needlegrass, big bluestem, western wheatgrass, Maximilian sunflower, scurfpea species, American vetch, Missouri goldrod, snowberry species and other miscellaneous shrubs such as silver sagebrush, chokecherry, Woods rose, and golden currant.
Panspots (Ps) (070)	Site occurs on level to gently rolling uplands and plains. Areas generally having mainly Sandy, Loamy, Clayey or Claypan ecological site(s) with 20 to 50% of the area consisting of shallow depressions of Saline Upland ecological site(s).
Pothole (Ph) (071)	Site is located in a closed depression. It benefits from additional moisture and occurs on outwash plains or till planes.
Riparian Meadow (RM) (080)	
Riparian Wet Meadow (RWM) (083)	
Riparian Subirrigated (RSb) (081)	Site occurs on floodplains, with a seasonal high water table within 24-40 inches of the soil surface. Soil textures are typically loamy, silty, or sandy, with redoxomorphic features. Slopes can range from 1 to 4%, but can be as much as 15%. Characteristic climax vegetation is approximately 45 to 55% grasses, and 45 to 55% forbs and shrubs. Vegetation may include tufted hairgrass, beaked sedge, Nebraska sedge, mannagrasses, field mint, cinquefoil species, willow herb species, leafy aster, willows and other miscellaneous shrubs such as Woods rose and Missouri gooseberry.
Rubbly (Ry) (140)	Site occurs on level to strongly sloping hills, mountains, and alluvial fans. >15% of surface area covered by stones or boulders greater than or equal to 10" diameter. (>30% cover if measured by step transect)
Saline Overflow (SOv) (091)	Site occurs on swales, depressions, drainageways, stream terraces and alluvial fans. This site regularly receives more than normal moisture from run-in. Soil textures are typically silty clay loam, loam, or clay loam, and are moderately to very strongly saline or sodic. Slopes can range from 0 to 4%. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 10 to 30% composition by dry weight. Vegetation may include alkali cordgrass, alkali sacaton, basin wildrye, Nuttall's alkaligrass, seepweed, poverty sumpweed, asters, slimleaf goosefoot, Nuttall's saltbush and other miscellaneous shrubs such as buffaloberry, greasewood, and winterfat.
Saline Subirrigated (SSb) (092)	Site occurs on drainageways, stream terraces, and high floodplain steppes, with a seasonal high water table within 24 to 40 inches of the soil surface. Soil textures are typically silty clay loam or loam, and are moderately to very strongly saline or sodic. Slopes can range from 0 to 4%. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 20 to 30% composition by dry weight. Vegetation may include alkali cordgrass, alkali sacaton, basin wildrye, western wheatgrass, seepweed, poverty sumpweed, asters, blue lettuce, Nuttall's saltbush and other miscellaneous shrubs such as silver buffaloberry and greasewood.

Saline Upland (SU) (093)	Site occurs on sedimentary plains, hills, stream terraces, alluvial fans, and fan aprons. Soil textures are typically loam, silty loam, silty clay loam, clay loam, or silty clay, and are moderately to strongly saline. Slopes are mainly 0 to 20%, but can be up to 35 to 40%. Characteristic climax vegetation is approximately 50 to 70% grasses and 30 to 50% forbs and shrubs by dry weight. Vegetation may include alkali sacaton, western or thickspike wheatgrass, inland saltgrass, Nuttall's alkaligrass, poverty sumpweed, buckwheat species, American vetch, scarlet globemallow, winterfat and other miscellaneous shrubs such as fourwing saltbush, Nuttall's saltbush, and greasewood.
Sands (Sa) (100)	Site occurs on rolling uplands, outwash terraces, hills, and dunes. Soil textures are typically sand or loamy sand. Slopes can range but are usually less than 8%. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 15 to 25% composition by dry weight. Vegetation may include big bluestem, prairie sandreed, sand bluestem, little bluestem, black Samson, scurfpea species, prairieclovers, dotted gayfeather, prairie rose, and other miscellaneous shrubs such as fringed sagewort, yucca, and winterfat.
Sandy (Sy) (110)	Site occurs on plains, alluvial fans, stream terraces, hills, and till plains. Soil textures are typically coarse sandy loam to fine sandy loam. Slopes can range from 0 to 15% but are usually less than 12%. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 10 to 20% composition by dry weight. Vegetation may include bluebunch wheatgrass, prairie sandreed, little bluestem, needleandthread, dotted gayfeather, prairieclovers, American vetch, scurfpea species, winterfat, and other miscellaneous shrubs such as snowberry, rose, and silver sagebrush.
Sandy Argillic (SyA) (115)	
Shale (Sh) (120)	Site predominantly occurs on hills and plains. Soil textures are typically silty clay loam, silty clay, or clayey, and are slightly to moderately saline. Slopes can range from 0 to 45%, but are usually less than 8%. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 20 to 40% composition by dry weight. Vegetation may include western or thickspike wheatgrass, bluebunch wheatgrass, alkali sacaton, Montana wheatgrass, scurfpea species, hairy goldenaster, American vetch, buckwheat species, longleaf sagebrush, and other miscellaneous shrubs such as slenderbush eriogonum, Nuttall's saltbush, and Wyoming big sagebrush.
Shallow Clay (SwC) (131)	Site often occurs on hills, plains, hillslopes, knolls and escarpments. Soil surface textures are typically clay loam, silty clay loam, silty clay, sandy clay, or clayey. Soils are shallow, 10"-20" deep to bedrock, lithic, or paralithic root restrictive layer. Slopes can range from 0 to 70%. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 10 to 25% composition by dry weight. Vegetation may include bluebunch wheatgrass, western or thickspike wheatgrass, green needlegrass, plains muhly, prairieclovers, scurfpea species, American vetch, scarlet globemallow, Nuttall's saltbush, and other miscellaneous shrubs such as winterfat, silver sagebrush, and big sagebrush.
Shallow Droughty (SwDr) (138)	Site usually occurs on hills, plains, mountain slopes, escarpments, mountains, knolls, ridges, and hillslopes. Slopes widely vary from 0-60%. Soils are shallow, 10"-20" deep to bedrock, lithic or paralithic root restrictive layer and consist of loamy skeletal or clayey skeletal soil material (averages >35%rock fragments by volume in 10-20" layer). This skeletal soil material decreases the water holding capacity of the ecological site. Surface textures can be almost anything.
Shallow Limy (SwLy) (132)	Site mainly occurs on hills, escarpments, plains, knolls, low hills and mountains on slopes ranging from 0%-50%. Soil surface textures are typically fine sandy loam, loam, silt loam, or clay loam. Soils are shallow, 10"-20" deep to bedrock, lithic, or paralithic root restrictive layer. >5% $CaCO_3$; Strongly or violently effervescent within top 4" with lime concentration increases with depth. Site typically associated with limestone parent material.

Shallow Limy, Droughty (SwLyDr) (135)	Site mainly occurs on mountain slopes, hills, escarpments, ridges, mountains and divides on slopes ranging from 0%-60%. Soil surface textures typically are sandy loam, fine sandy loam, very fine sandy loam, or loam. Soils are shallow, 10"-20" deep to bedrock, lithic, or paralithic root restrictive layer and consist of loamy skeletal or clayey skeletal soil material (averages >35% rock fragments by volume in soil surface 10-20"). This skeletal soil material decreases the water holding capacity of the ecological site. >5% CaCO3; Strongly or violently effervescent within top 4" with lime concentration increases with depth.
Shallow Loamy (SwLo) (136)	Site normally occurs on hills, plains, low hills, knolls, drainage ways, and escarpments on slopes ranging from 0%-70%. Soil surface textures are very fine sandy loam, loam, silt loam, sandy clay loam, or clay loam. Soils are shallow, 10"-20" deep to bedrock, lithic, or paralithic root restrictive layer.
Shallow Sandy (SwSy) (133)	Site typically occurs on hills, plains, low hills, escarpments, and mountain slopes. Slopes range from 0%-55%. Soil surface textures range from sand to sandy loam. Soils are shallow, 10"-20" deep to bedrock, lithic, or paralithic root restrictive layer.
Shallow to Gravel (SwGr) (134)	Site generally occurs on stream terraces, knolls, outwash plains, high floodplain steppes, terrace escarpments, or alluvial fans. Slopes can range from 0 to 45%, but are usually less than 15%. Soil surface textures are typically silty loam, loam, sandy loam, fine sandy loam, and very fine sandy loam. Soil is deep with a sandy skeletal soil material (averages >35% rock fragments by volume in 10-20" layer). This skeletal soil material decreases the water holding capacity of the ecological site. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 10 to 20% composition by dry weight. Vegetation may include bluebunch wheatgrass, needleandthread, little bluestem, western or thickspike wheatgrass, plains muhly, prairieclovers, scurfpea species, scarlet globemallow, black Samson, creeping juniper, and other miscellaneous shrubs such as silver sagebrush, skunkbush sumac, and fringed sagewort.
Shallow to Gravel, Limy (SwGrLy) (137)	Site generally occurs on stream terraces, escarpments, fan remnants and alluvial fans on slopes ranging from 0%-50%. Soil surface textures are typically silty loam, loam, sandy loam, fine sandy loam, and very fine sandy loam. Soil is deep with a sandy skeletal soil material (averages >35% rock fragments by volume in 10-20" layer) This skeletal soil material decreases the water holding capacity of the ecological site. >5% CaCO3; Strongly or violently effervescent within top 4" with lime concentration increases with depth. Site typically associated with limestone parent material.
Stony (St) (041)	Site occurs on level to strongly sloping plains, hillslopes, and alluvial fans. 3-15% of surface area covered by stones or boulders greater than or equal to 10" diameter. (15-30% cover if measured by step transect) This site is limited to otherwise loamy or loamy argillic sites, lacking skeletal material of significance above 20 inches in the soil profile.
Subirrigated (Sb) (150)	Site occurs on stream terraces, hill slopes (when near spring or seep), and alluvial fans; and has a seasonal high water table within 24-40 inches of the soil surface. Soil textures are typically loam, sandy loam, or clay loam. Slopes can range from 0 to 2%, or greater when on a hill slope. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 5 to 15% composition by dry weight. Vegetation may include basin wildrye, slender wheatgrass, prairie cordgrass, reedgrasses, cinquefoil species, goldenpea, dotted gayfeather, prairie thermopsis, rose, and other miscellaneous shrubs such as willows, snowberry, and buffaloberry.
Thin Breaks (TB) (160)	Site consists of mixed soils of mainly shallow and very shallow depths with hard rock or resistant sedimentary bed outcroppings at various levels on steep to very steep, irregular slopes. Trees may occur locally above outcroppings.
Thin Clayey (TCy) (161)	Site consists of clay loam, silty clay loam, silty clay, sandy clay or granular clay soils on moderately steep, steep or hilly landscapes (>15% slope). Effective rooting depth is greater than 20 inches. Weak to no structure in subsoil.
Thin Claypan (TCp) (165)	Soil is saline or saline sodic. Less than 4" of soil over root or water restrictive clay layer. Columnar structure present.

Thin Hilly (TH) (164)	A complex of Thin Sandy, Thin Clayey or Thin Loamy ecological sites that are intricately intermingled and difficult to separate with mapping, management, or otherwise. Often occurs on terrace edges and slopes into stream channels.
Thin Loamy (TLo) (162)	Site consists of loam, silt loam and very fine sandy loam soils on moderately steep, steep or hilly landscapes (>15% slope). Effective rooting depth is greater than 20 inches. Weak to no structure in subsoil.
Thin Sandy (TSy) (163)	Site consists of coarse sandy loams, sandy loams and fine sandy loams on moderately steep, steep or hilly landscapes (>15% slope). Effective rooting depth is greater than 20 inches. Weak to no structure in subsoil.
Very Shallow (VSw) (170)	Site occurs on ridges, shoulders of hills, and escarpments. Soil textures are typically loam, sandy loam, silt loam, or clay loam. Slopes can range from 2 to 70%. Characteristic climax vegetation is dominated by grasses, with forbs and shrubs comprising 15 to 30% composition by dry weight. Vegetation may include bluebunch wheatgrass, little bluestem, prairie sandreed, needleandthread, prairieclovers, scurfpea species, hairy goldenaster, milkvetch species, skunkbush sumac, and other miscellaneous shrubs such as fringed sagewort, yucca, and juniper species.
Very Shallow, Limy (VSwLy) (171)	Site usually occurs on mountains, hills, ridges, and escarpments on slopes ranging from 0%-70%. Soils are very shallow, 0”-10” deep to bedrock, lithic, or paralithic root restrictive layer. >5% CaCo3 by content; Strongly or violently effervescent within top 4” with lime concentration increases with depth. Site typically associated with limestone parent material. Production of this site is about 25% of a Very Shallow site.
Wet Gravelly (WGr) (180)	
Wet Meadow (WM) (181)	Site occurs on fens, meadows, bogs, depressions, and drainage ways; and has a seasonal high water table within 12 inches of soil surface. Soil textures are typically loam or sometimes clayey, and are mucky. Slopes range from 0 to 1%. Characteristic climax vegetation is about 40 to 45% grasses; 40 to 45% sedges and rushes; and 0 to 10% forbs and shrubs. Vegetation may include prairie cordgrass, mannagrasses, reedgrasses, beaked sedge, Nebraska sedge, wooly sedge, wool fruit sedge, field mint, cinquefoil species, asters, horsemint, silver buffaloberry, willows, and rose.
Wet Meadow, Organic (WMO) (182)	

Standardized Site Name Abbreviations (combine as needed)

A	Argillic	**Ps**	Panspots
B	Breaks	**Ph**	Pothole
BL	Badlands	**R**	Riparian
C	Clay	**Ry**	Rubbly
Co	Coarse	**S**	Saline
Cb	Cobbly	**Sa**	Sands
Cp	Claypan	**Sb**	Subirrigated
Cy	Clayey	**Sh**	Shale
D	Dense	**Si**	Silty
Dr	Droughty	**St**	Stony
Fr	Fractured rock	**Stp**	Steep
Gr	Gravel or Gravelly	**Sw**	Shallow
H	Hilly	**Sy**	Sandy
L	Lowland	**T**	Thin
Lo	Loamy	**U**	Upland
Ly	Limy	**V**	Very
M	Meadow	**W**	Wet
O	Organic	**X**	Nonsodic
Ov	Overflow		

GLOSSARY of TERMS

Argillic horizon	1) A soil horizon that shows evidence of movement or accumulation of silicate clays, and possesses a higher clay content than an overlying horizon. RIP 2) A mineral soil horizon that is characterized by the illuvial accumulation of phyllosilicate clays. The argillic horizon has a certain minimum thickness depending on the thickness of the solum, a minimum quantity of clay in comparison with an overlying eluvial horizon depending on the clay content of the eluvial horizon, and usually has coatings of oriented clay on the surface of pores or peds or bridging sand grains. SSSA
Available Water (holding) Capacity (AWC)	The ability of a soil to hold water in a form available to plants expressed in inches of water per inch of soil depth (Low = 0-.12, Moderate = 0.13-0.17 and High + >0.17). Ecological sites use a soil depth of 40". RIP
Calcareous soil	Soil containing sufficient free $CaCO_3$ and other carbonates to effervesce visibly when treated with cold HCl (10%). SSSA
Clayey Skeletal	Soil textures greater than 35% clay and also averages 35 percent or more (by volume) rock fragments.
Claypan	A dense, compact, slowly permeable layer in the subsoil having a much higher clay content than the overlying material, from which it is separated by a sharply defined boundary. Claypans are usually hard when dry, and plastic and sticky when wet. SSSA
Closed depression	Any relatively sunken part of the Earth's surface; especially a low-lying area surrounded by higher ground. A closed depression has no natural outlet for surface drainage (e.g., a sinkhole). An open depression has a natural outlet for surface drainage. SSSA
Columnar	Vertically elongated structure units with rounded tops which commonly are bleached. (Also known as biscuit caps). HAND
Effervescence classes	Very slight effervescent - few bubbles form; Slightly effervescent - numerous bubbles form; Strongly effervescent – bubbles form a low foam; Violently effervescent – bubbles form a thick foam. HAND
Ephemeral stream	Generally a small stream, or upper reach of a stream, that flows only in direct response to precipitation. It receives no protracted water supply from melting snow or other sources and its channel is above the water table at all times. NSSH
Epipedon	The epipedon is a horizon that forms at or near the surface and in which most of the rock structure has been destroyed. It is darkened by organic matter or shows evidence of eluviation, or both. KSTX
Flood plain	The nearly level plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the streams. NSSH
Granular	Small soil aggregates <10mm with curved or very irregular faces.
Hardpan	A soil layer with physical characteristics that limit root penetration and restrict water movement. SSSA
Intermittent stream	A stream, or reach of a stream, that does not flow year-round (commonly dry for 3 or more months out of 12) and whose channel is generally below the local water table; it flows only when it receives a) base flow (i.e., solely during wet periods) or, b) ground-water discharge or protracted contributions from melting snow or other erratic surface and shallow subsurface sources. NSSH
Lithic contact	A boundary between soil and continuous, coherent, underlying material. The underlying material must be sufficiently coherent to make hand-digging with a spade impractical. SSSA
Loamy skeletal	Soil textures are sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, or silty clay loam with less than 35% clay and also averages 35 percent or more (by volume) rock fragments.
Mollic epipedon	Usually a surface horizon of mineral soil that is dark colored and relatively thick; See *STX definition of "mollic epipedon"*.
Natric horizon	An argillic horizon that has columnar or prismatic structure in some part (generally the upper part). Has either: a. An exchangeable sodium percentage (ESP) of 15 percent or more (or a sodium adsorption ratio [SAR] of 13 or more) in one or more horizons within 40 cm of its upper boundary; or b. More exchangeable magnesium plus sodium than calcium plus exchange acidity (at pH 8.2) in one or more horizons within 40 cm of its upper boundary if the ESP is 15 or more (or the SAR is 13 or more) in one or more horizons within 200 cm of the mineral soil surface.
Organic soil	A soil in which the sum of the thicknesses of layers containing organic soil materials is generally greater than the sum of the thicknesses of mineral layers. SSSA

Paralithic contact	Similar to a lithic contact except that it is softer, can be dug with difficulty with a spade. SSSA
Perennial stream	A stream or reach of a stream that flows continuously throughout the year and whose surface is generally lower than the water table adjacent to the region adjoining the stream. NSSH
Petrocalcic horizon	A continuous, indurated calcic horizon that is cemented by calcium carbonate and, in some places, with magnesium carbonate. It cannot be penetrated with a spade or auger when dry, dry fragments do not slake in water, and it is impenetrable to roots. SSSA
Prismatic	Vertically elongated structure units with flat tops. HAND
Relict Natric	Lacks the chemical characteristics of a Natric horizon but retains the physical characteristics such as columnar structure.
Riparian	Areas associated with streams, rivers, and drainageways with a defined channel and floodplain that is an open conduit of perennial water flow. RIP
Rock fragments	Unattached pieces of rock 2 mm in diameter or larger that is strongly cemented or more resistant to rupture. Coarse (rock) fragments include gravel, cobbles, stones, boulders, channers and flagstones, depending on their shape and size. NSSH
Saline soil	1) A nonsodic soil containing sufficient soluble salt to adversely affect the growth of most crop plants. The lower limit of saturation extract electrical conductivity (EC) of such soils is conventionally set at >4 mmhos/cm(at 25°C). Sensitive plants are affected at half this salinity and highly tolerant ones at about twice this salinity. SSSA 2) Soil which has an excess of total soluble salts. Sodium absorption ratio (SAR) <12 and exchangeable sodium percentage (ESP) <15. pH <8.5. Occurs with high water table. Plants have a reduced ability to absorb salinized water. PROP
Sandy skeletal	Soil textures are loamy sand or sand and also average 35 percent or more (by volume) rock fragments.
Skeletal soil material	Soil which averages 35 percent or more (by volume) rock fragments (>2mm).
Slick spots	areas having a puddled or crusted, very smooth, nearly impervious surface. The underlying material is dense and massive. The material ranges from extremely acid to very strongly alkaline and from sand to clay.
Sodic soil	1) A nonsaline soil containing sufficient exchangeable sodium to adversely affect crop production and soil structure under most conditions of soil and plant type. The sodium adsorption ratio of the saturation extract is at least 13. SSSA 2) Soil with excess sodium salts. Electrical conductivity (EC) <4mmhos/cm, Sodium absorption ratio (SAR) >12, pH>8.5. Sodium is held by clay particles and causes plant growth problems. Usually appears as slick spots or pan spots. PROP
Stoniness classes Stony Rubbly	1) Stony – Stones or boulders cover about 3-15% of the surface, correlating to an extremely stony or extremely bouldery classes in soil survey. 2) Rubbly- Stones or boulders cover >15% of the surface correlating to rubbly and very rubbly classes in soil survey. For more information on Montana Stoniness Classes, refer to http://www.mt.nrcs.usda.gov/soils/mtsoils/guides/soilprop/stoniness.html
Stream terrace	One or a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream and representing the remnants of an abandoned flood plain, stream bed, or valley floor produced during a former state of fluvial erosion or deposition (i.e., currently very rarely or never floods; inactive cut and fill and/or scour and fill processes). NSSH

REFERENCES

HAND - Schoeneberger, P.J., Wyosocki D.A., Benham, E.C., and Broderson, W.D. (editors), 2002. Field book for describing and sampling soils, Version 2.0. Natural Resources Conservation Service. National Soil Survey Center, Lincoln, NE.

KSTX - United States Department of Agriculture, Natural Resources Conservation Service. 2003. Keys to Soil Taxonomy. Ninth Edition.

NSSH - U.S. Department of Agriculture, Natural Resources Conservation Service. 2003. National Soil Survey Handbook, Title 430-VI, Part 629 – Glossary of Landform and Geologic Terms. http://soils.usda.gov/technical/handbook

PROP - Brady, N. 1984. The Nature and Property of Soils, Ninth Edition

RIP - Hansen, P.L., R.D. Pfister, K. Boggs, B.J. Cook, J. Joy and D.K. Hinkley. 1995. Classification and Management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana. Misc. Publication number 54. 646 pp.

SSSA - Soil Science Society of America glossary of soil science terms. 2004. http://www.soils.org/sssagloss

STX - United States Department of Agriculture, Natural Resources Conservation Service. 1999. Agriculture Handbook 436. Soil Taxonomy. Second Edition. http://soils.usda.gov/technical/classification/taxonomy/