Major Land Resource Area 032X
Northern Intermountain Desertic Basins

Accessed: 05/21/2025

Ecological site keys

MLRA 32 Key to Historic and LRU/Subsets Keys

I. Within the 5-9 inch precipitation zone or central portion of either the Big Horn Basin or the Wind River Basin.

A. Within the Big Horn Basin proper.

1 Keying to most recent data for within the MLRA, focused on Mesic, Typic Aridic (5-9 inch precipitation) in the Big Horn Basin. - Big Horn Basin Core. ... Key 2 – MLRA 32 Big Horn Basin Core (LRU 01 Subset A) Ecological Site Key

2 Keying to the historic data for within the MLRA, focused on 5-9 inch precipitation in the Big Horn Basin. ... Key 6 – Historic Key MLRA 32X Zone 5: 5-9 BH

B. Within the Wind River Basin proper.

1 Keying to most recent data for within the MLRA, focused on Mesic, Typic Aridic (5-9 inch precipitation) in the Wind River Basin. - Wind River Basin Core. ... Key 4 – MLRA 32 Wind River Basin Core (LRU 02 Subset A) Ecological Site Key

2 Keying to the historic data for within the MLRA, focused on 5-9 inch precipitation in the Wind River Basin. ... Key 7 – Historic Key MLRA 32X Zone 8 - 5-9 WR

II. Within the 10-14 inch precipitation zone or outer skirts and lower foothills portion of either the Big Horn Basin or the Wind River Basin, and portions of the surrounding foothills east of the continental divide.

A. Keying to most recent data for within the MLRA, focused on Mesic, Ustic Aridic (10-14 inch precipitation) within the Big Horn and Wind River Basins.

1 Big Horn Basin 10-14 inch precipitation within the Mesic Ustic Aridic soil moisture and temperature regime. - Big Horn Basin Rim ... Key 3 – MLRA 32 Big Horn Basin Rim (LRU 01 Subset B) Ecological Site Key

2 Wind River Basin 10-14 inch precipitation within the Mesic Ustic Aridic soil moisture and temperature regime. - Wind River Basin Rim ... Key 5 – MLRA 32 Wind River Basin Rim (LRU 02 Subset B) Ecological Site Key

B. Keying to the historic data for within the MLRA, focused on 10-14 inch precipitation in the basins and foothills east of the continental divide, including the Big Horn and

Wind River Basin and surrounding areas. ... Key 8 – Historic Key MLRA 32X Zone 7: 10-14 E

MLRA 32 Big Horn Basin Core (LRU 01 Subset A) Ecological Site Key

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I. Site receives additional effective moisture[1] (If No, Go to II.)

A. Site with a water table present for at least part of the growing season, site dominated by hydrophytic plants (ie. Wetland sedges, bulrushes, willows, tufted hairgrass, etc)

1 Site has water above soil surface for part of the growing season, and a water table present within 0-12” (0-30 cm) annually ... DX032X01W178 – Wetland (WL) Big Horn Basin Wet

2 Site has a seasonal water table

i. Soil is saline, saline-sodic, or sodic[5] (SAR ≥ 13, or an EC ≥ 4 dS/m) in the upper 4” (10 cm)) of mineral soil; salt tolerant plants dominate site (i.e. greasewood, alkali sacaton, Nuttall’s alkaligrass, alkli bluegrass, alkali cordgrass, inland saltgrass, etc)[2]

a. Seasonal water table is between 12-40” (30-100 cm) below the soil surface ... DX032X01W142 – Saline Subirrigated (SS) Big Horn Basin Wet

b. Seasonal water table > 40” (100 cm) below mineral soil surface; site regularly receives higher than normal soil moisture because of run in or stream overflow ... DX032X01W138 – Saline Lowland (SL) Big Horn Basin Wet

ii. Soil is non-saline, non-saline-sodic, or non-sodic

a. Seasonal water table is between 12-40” (30-100 cm) below the soil surface ... DX032X01W174 – Subirrigated (Sb) Big Horn Basin Wet

b. Seasonal water table > 40” (100 cm) below the mineral soil surface; site regularly receives higher than normal soil moisture because of run in or stream overflow ... DX032X01W128 – Lowland (LL) Big Horn Basin Wet

B. Site receives periodic overflow from adjacent slopes, but no water table within 78” (200 cm)

1 Soil is saline, saline-sodic, or sodic[5]; site typically occurs on stream terraces along incised channels, and is dominated by greasewood[2] and other salt tolerant plants (i.e. Gardner’s saltbush, alkali sacaton)[2] ... DX032X01W140 – Saline Lowland Drained (SLDr) Big Horn Basin Wet

2 Soil is non-saline, non-saline-sodic, or non-sodic, occur on floodplain steps,

terraces, concave landscape positions, and positions lower in the landscape

i. Soil has ≥ 35% clay in the upper 8” (20 cm) of mineral soil surface ... DX032X01W106 – Clayey Overflow (CyO) Big Horn Basin Wet

ii. Soil has < 35% clay in the upper 8” (20 cm) of mineral soil surface ... DX032X01W130 – Overflow (Ov) Big Horn Basin Wet

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

A. Soil is saline, saline-sodic, or sodic[5] (SAR ≥ 13, or an EC ≥ 4 dS/m) in the upper 20” (50 cm) of the mineral soil surface; site is dominated by salt tolerant plants (i.e. Gardner’s saltbush, greasewood, alkali sacaton, alkali seepweed, etc)[2]

1 Soil is very shallow (< 10” (25 cm) to shale (lithic or paralithic contact)); productivity very low ... DX032X01A154 – Shale (Sh) Big Horn Basin Core

2 Soil is shallow to very deep (≥10” (25 cm) to bedrock (lithic or paralithic contact))

i. Soil has ≥ 35% clay starting within 4” (10 cm) of the mineral soil surface ... DX032X01A143 – Saline Upland Clayey (SUC) Big Horn Basin Core

ii. Soil has < 18% clay starting within 4” (10 cm) of the mineral soil surface ... DX032X01A145 – Saline Upland Sandy (SUS) Big Horn Basin Core

iii. Soil has ≥ 18% but < 35% clay starting within 4” (10 cm) of the mineral soil surface ... DX032X01A141 – Saline Upland Loamy (SUL) Big Horn Basin Core

B. Soil is non-saline, non-saline-sodic, or non-sodic

1 Soil is very shallow (< 10” (25 cm) or shallow (< 20” (50 cm) to bedrock (lithic or paralithic contact)

i. Soil is very shallow to bedrock, commonly on windswept ridges and escarpments, productivity very low (if productivity is higher than expected and > 35% rock fragments are present use II.B.2i.a.1) Gravelly (Gr) ... DX032X01A176 – Very Shallow (VS) Big Horn Basin Core

ii. Soil is shallow to bedrock

a. Soil has ≥ 35% clay ... DX032X01A158 – Shallow Clayey (SwCy) Big Horn Basin Core

b. Soil has < 18% clay ... DX032X01A166 – Shallow Sandy (SwSy) Big Horn Basin Core

c. Soil has ≥ 18% but < 35% clay ... DX032X01A162 – Shallow Loamy (SwLy) Big Horn Basin Core

2 Soil is moderately deep to very deep (≥ 20” (50 cm) to bedrock (lithic or paralithic contact)

i. Soil is skeletal (≥ 35% rock fragments[7]) in the upper 20” (50 cm) of mineral soil surface

a. Soil is skeletal throughout the majority of the upper 20” (50 cm) of mineral soil surface

1) Soil has < 18% clay; surface fragments and fragments in the soil

profile are dominantly < 3” (76mm) in diameter, but may range in size ... DX032X01A112 – Gravelly (Gr) Big Horn Basin Core

2) Soil has ≥ 18% but < 60% clay; surface fragments and fragments in the soil profile are dominantly ≥ 3” (76mm) in diameter but < 10” (250 mm), but may range in size

a) Violent[3] effervescence starting within 4” (10 cm) of the mineral soil surface, calcium carbonate increases with depth[4] ... DX032X01B121 – Limy Skeletal (LiSk) Big Horn Basin Rim

b) None to strong[3] effervescence in the upper 4” (10 cm) of mineral soil surface ... DX032X01A175 – Skeletal (Sk) Big Horn Basin Core

b. Soil is skeletal starting within 8-20” (20-50 cm) of the mineral soil surface

1) Soil has ≥ 18% but < 60% clay in the upper 10” (25 cm) of mineral soil, decreasing to < 18% clay within 10-20” (25-50 cm) of the mineral soil surface

a) Violent[3] effervescence starting within 4” (10 cm) of the mineral soil surface, calcium carbonate increases with depth[4] ... DX032X01B172 – Stony Upland (StU) Big Horn Basin Rim

b) None to strong[3] effervescence in the upper 4” (10 cm) of the mineral soil surface ... DX032X01A167 – Shallow To Gravel (SwGr) Big Horn Basin Core

2) Soil has ≥ 18% but < 60% clay throughout the upper 20” (50 cm) of the mineral soil surface

a) Fragments typically consisting of stones and boulders (fragments > 10" (250 mm) in diameter), surface fragments (5-15%) are dominantly stones and boulders (specific to glacial outwash by Clark, WY; for other correlations use b) cobbly upland) - ... DX032X01B120 – Limy Upland (LiU) Big Horn Basin Rim

b) Fragments typically consisting of cobbles (fragments are dominantly > 3” (76 mm) but < 10” (250 mm) in diameter); few stones and boulders (0-5%) are present ... DX032X01A109 – Cobbly Upland (CoU) Big Horn Basin Core

ii. Soil is not skeletal in the upper 20” (50 cm) of the mineral soil surface

a. Soil has ≥ 35% clay throughout the upper 20” (50 cm) of the mineral soil – may have a lighter textured cap or may decrease lower in the profile

1) Abrupt clay increase[6] to > 40% clay present within 4-8” (10-20 cm) of the mineral soil surface, severe surface cracking during dry conditions; plant dominated by birdfoot sagebrush ... DX032X01A110 – Dense Clay (DC) Big Horn Basin Core

2) Soil has ≥ 35% clay starting within the upper 4” (10 cm) and

continues throughout the upper 20” (50 cm) of mineral soil surface ... DX032X01A104 – Clayey (Cy) Big Horn Basin Core

b. Soil has < 35% clay throughout the upper 20” (50 cm) of the mineral soil – may see individual horizons that are above 35% clay, but on average, the soil profile is less than 35% clays

1) Soil has < 18% clay throughout the upper 20” (50 cm) of mineral soil surface; may see clay increase below 8" (20 cm) of mineral soil surface

a) Soil has < 15% clay starting within the upper 4” (10 cm) from the mineral soil surface and lacks structure; soil textures include coarse sands to loamy fine sand ... DX032X01A146 – Sands (Sa) Big Horn Basin Core

b) Soil has < 18% clay starting within the upper 4” (10 cm) from the mineral soil surface; soil textures include loamy very fine sands to loams ... DX032X01A150 – Sandy (Sy) Big Horn Basin Core

2) Soil has ≥ 18% but < 35% clay starting within the upper 8” (20 cm) of mineral soil surface[4]

a) Soil is calcareous (violent effervescence[3]) within 20” (50 cm) of the mineral soil surface

(1) Soil is calcareous within the upper 4” (10 cm) of mineral soil surface; calcium carbonate increases with depth[4] (for soils between 4 and 8 inches start of calcareous layer, use STM to assist decision) ... DX032X01B120 – Limy Upland (LiU) Big Horn Basin Rim

(2) Soil is calcareous starting within the upper 8-20” (20 to 50 cm) of the mineral soil surface[4] ... DX032X01B123 – Loamy Calcareous (LyCa) Big Horn Basin Rim

b) Soil is non-calcareous within 20” (50 cm) of the mineral soil surface ... DX032X01A122 – Loamy (Ly) Big Horn Basin Core

[2] 2. Specific plant species listed in the key are not to be used as the only determining factor. Management or disturbance may have removed or altered the plant composition that could reflect the wrong ecological site.

[3] 3. Soils derived from Dolomite or similar geology may not react as “violently” as other calcareous parent materials; dolomite site may be limy or loamy calcareous with only a strong effervescence. Soils with <18% clays only need a CCE of 5% to be calcic or calcareous, while soils with >18% clays need a CCE of 15%.

[5] 5. Saline, saline sodic, and sodic soils have a pH of 7.9 to 9.0 and an EC (electrical conductivity) > 4 dS/m [dS/m = mmhos/cm]. Salts, including gypsum will lower the pH without affecting the EC, but may still fit into the salt effected sites. Soils that are sodic generally have a SAR of ≥ 13 typically have a pH of 8.8 or higher.

[6] 6. The Dense Clay ecological site will have a lighter textured cap or “A” horizon with an abrupt clay increase, commonly the clay percent will then decrease as move lower in the profile. The abrupt increase in the upper portion of the profile with significant cracking is the key for this site. The Clayey ecological site may have a lighter textured cap but typically maintains or increases in clay as move through the profile. The presence of birdfoot sagebrush and lack of Wyoming sagebrush is a plant indicator for the Dense Clay ecological site.

[1] 1. For areas that receive additional moisture through snow trapping, consider adjusting to a wetter LRU or Subset consistent with the vegetation observed for the site keyed. It is anticipated that most snow-trap sites will not have a water table.

[7] 7. When calculating percent rock fragments in the profile to determine if a site is skeletal, pararock fragments (parachanners) are not considered, however, channers are. The difference between a parachanner and a channer is how “hard” the rock is. Soft flat fragments (ruptured by hand) are parachanners, while harder flat fragments are channers.

[4] 4. Ecological site does not fit within one LRU, written to encompass Subset A and B, labeled as 032X01B or 032XB in the BHB.

MLRA 32 Big Horn Basin Rim (LRU 01 Subset B) Ecological Site Key

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I. Site receives additional effective moisture[1] (If No, Go to II.)

A. Site with a water table present for at least part of the growing season, site dominated by hydrophytic plants

1 Site has water above soil surface for part of the growing season, and a water table present within 0-12” (0-30 cm) annually ... DX032X01W178 – Wetland (WL) Big Horn Basin Wet

2 Site has a seasonal water table

i. Soil is saline, saline-sodic, or sodic[5] (SAR ≥ 13, or an EC ≥≥ 4 dS/m) in the upper 4” (10 cm)) of mineral soil; salt tolerant plants dominate site (i.e. greasewood, alkali sacaton, Nuttall’s alkaligrass, alkli bluegrass, alkali cordgrass, inland saltgrass, etc)[2]

a. Seasonal water table is between 12-40” (30-100 cm) below the soil surface ... DX032X01W142 – Saline Subirrigated (SS) Big Horn Basin Wet

b. Seasonal water table > 40” (100 cm) below mineral soil surface; site regularly receives higher than normal soil moisture because of run in or stream overflow ... DX032X01W138 – Saline Lowland (SL) Big Horn Basin Wet

ii. Soil is non-saline, non-saline-sodic, or non-sodic

a. Seasonal water table is between 12-40” (30-100 cm) below the soil surface ... DX032X01W174 – Subirrigated (Sb) Big Horn Basin Wet

b. Seasonal water table > 40” (100 cm) below the mineral soil surface; site regularly receives higher than normal soil moisture because of run in or stream overflow ... DX032X01W128 – Lowland (LL) Big Horn Basin Wet

B. Site receives periodic overflow from adjacent slopes, but no water table within 78” (200 cm)

1 Soil is saline, saline-sodic, or sodic[5]; site typically occurs on stream terraces along incised channels, and is dominated by greasewood[2] and other salt tolerant

plants (i.e. Gardner's saltbush, alkali sacaton)[2] ... DX032X01W140 – Saline Lowland Drained (SLDr) Big Horn Basin Wet

2 Soil is non-saline, non-saline-sodic, or non-sodic, occur on floodplain steps, terraces, concave landscape positions, and positions lower in the landscape

i. Soil has ≥ 35% clay in the upper 8" (20 cm) of mineral soil surface ... DX032X01W106 – Clayey Overflow (CyO) Big Horn Basin Wet

ii. Soil has < 35% clay in the upper 8" (20 cm) of mineral soil surface ... DX032X01W130 – Overflow (Ov) Big Horn Basin Wet

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

A. Soil is saline, saline-sodic, or sodic[5] (SAR ≥ 13, or an EC ≥ 4 dS/m) in the upper 20" (50 cm) of the mineral soil surface; site is dominated by salt tolerant plants(i.e. Gardner's saltbush, greasewood, alkali sacaton, alkali seepweed, etc)

1 Soil is very shallow (< 10" (25 cm) to shale (lithic or paralithic contact)); productivity very low ... DX032X01B154 – Shale (Sh) Big Horn Basin Rim

2 Soil is shallow to very deep (≥10" (25 cm) to bedrock (lithic or paralithic contact))

i. Soil has ≥ 35% clay starting within 4" (10 cm) of the mineral soil surface ... DX032X01B143 – Saline Upland Clayey (SUC) Big Horn Basin Rim

ii. Soil has < 18% clay starting within 4" (10 cm) of the mineral soil surface ... DX032X01B145 – Saline Upland Sandy (SUS) Big Horn Basin Rim

iii. Soil has ≥ 18% but < 35% clay starting within 4" (10 cm) of the mineral soil surface ... DX032X01B141 – Saline Upland Loamy (SUL) Big Horn Basin Rim

B. Soil is non-saline, non-saline-sodic, or non-sodic

1 Soil is very shallow (< 10" (25 cm) or shallow (< 20" (50 cm) to bedrock (lithic or paralithic contact)

i. Soil is very shallow to bedrock, commonly on windswept ridges and escarpments, productivity very low (if productivity is higher than expected and > 35% rock fragments are present use II.B.2i.a.1) Gravelly (Gr) ... DX032X01B176 – Very Shallow (VS) Big Horn Basin Rim

ii. Soil is shallow to bedrock

a. Soil has ≥ 35% clay ... DX032X01B158 – Shallow Clayey (SwCy) Big Horn Basin Rim

b. Soil has < 18% clay ... DX032X01B166 – Shallow Sandy (SwSy) Big Horn Basin Rim

c. Soil has ≥ 18% but < 35% clay ... DX032X01B162 – Shallow Loamy (SwLy) Big Horn Basin Rim

2 Soil is moderately deep to very deep (≥ 20" (50 cm) to bedrock (lithic or paralithic contact)

i. Soil is skeletal (≥ 35% rock fragments[7]) in the upper 20" (50 cm) of mineral soil surface

a. Soil is skeletal throughout the upper 20” (50 cm) of mineral soil surface

1) Soil has < 18% clay; surface fragments and fragments in the soil profile are dominantly < 3” (76mm) in diameter, but may range in size ... DX032X01B112 – Gravelly (Gr) Big Horn Basin Rim

2) Soil has ≥ 18% but < 60% clay; surface fragments and fragments in the soil profile are dominantly ≥ 3” (76mm) in diameter but < 10” (250 mm), but may range in size

a) Violent[3] effervescence starting within 4” (10 cm) of the mineral soil surface, calcium carbonate increases with depth ... DX032X01B120 – Limy Upland (LiU) Big Horn Basin Rim

b) None to strong[3] effervescence in the upper 4” (10 cm) of mineral soil surface ... DX032X01B175 – Skeletal (Sk) Big Horn Basin Rim

b. Soil is skeletal starting within 8-20” (20-50 cm) of the mineral soil surface

1) Soil has ≥ 18% but < 60% clay in the upper 10” (25 cm) of mineral soil, decreasing to < 18% clay within 10-20” (25-50 cm) of the mineral soil surface

a) Violent[3] effervescence starting within 4” (10 cm) of the mineral soil surface, calcium carbonate increases with depth ... DX032X01B120 – Limy Upland (LiU) Big Horn Basin Rim

b) None to strong[3] effervescence in the upper 4” (10 cm) of the mineral soil surface ... DX032X01B167 – Shallow To Gravel (SwGr) Big Horn Basin Rim

2) Soil has ≥ 18% but < 60% clay throughout the upper 20” (50 cm) of the mineral soil surface

a) Fragments typically consisting of stones and boulders (fragments > 10” (250 mm) in diameter), surface fragments (5-15%) are dominantly stones and boulders (specific to glacial outwash by Clark, WY; for other correlations use 14b) - ... DX032X01B172 – Stony Upland (StU) Big Horn Basin Rim

b) Fragments typically consisting of cobbles (fragments are dominantly > 3” (76 mm) but < 10” (250 mm) in diameter); few stones and boulders (0-5%) are present ... DX032X01B109 – Cobbly Upland (CoU) Big Horn Basin Rim

ii. Soil is not skeletal in the upper 20” (50 cm) of the mineral soil surface

a. Soil has ≥ 35% clay throughout the upper 20” (50 cm) of the mineral soil – may have a lighter textured cap or may decrease lower in the profile

1) Abrupt clay increase[6] to > 40% clay present within 4 8” (10 20 cm) of the mineral soil surface, severe surface cracking during dry conditions; plant dominated by birdfoot sagebrush ... DX032X01B110 – Dense Clay

(DC) Big Horn Basin Rim

2) Soil has ≥ 35% clay starting within the upper 4” (10 cm) and continues throughout the upper 20” (50 cm) of mineral soil surface ... DX032X01B104 – Clayey (Cy) Big Horn Basin Rim

b. Soil has < 35% clay throughout the upper 20” (50 cm) of the mineral soil – may see individual horizons that are above 35% clay, but on average, the soil profile is less than 35% clays

1) Soil has < 18% clay throughout the upper 20” (50 cm) of mineral soil surface; may see clay increase below 8" (20 cm) of mineral soil surface

a) Soil has < 15% clay starting within the upper 4” (10 cm) from the mineral soil surface and lacks structure; soil textures include coarse sands to loamy fine sands ... DX032X01B146 – Sands (Sa) Big Horn Basin Rim

b) Soil has < 18% clay starting within the upper 4” (10 cm) from the mineral soil surface; soil textures include loamy very fine sands to loams ... DX032X01B150 – Sandy (Sy) Big Horn Basin Rim

2) Soil has ≥ 18% but < 35% clay starting within the upper 8” (20 cm) of mineral soil surface

a) Soil is calcareous (violent effervescence[3]) within 20” (50 cm) of the mineral soil surface

(1) Soil is calcareous within the upper 8” (20 cm) of mineral soil, calcium carbonate increases with depth ... DX032X01B120 – Limy Upland (LiU) Big Horn Basin Rim

(2) Soil is calcareous starting within the upper 8-20” (20 to 50 cm) of the mineral soil surface ... DX032X01B123 – Loamy Calcareous (LyCa) Big Horn Basin Rim

b) Soil is non-calcareous within 20” (50 cm) of the mineral soil surface ... DX032X01B122 – Loamy (Ly) Big Horn Basin Rim

[1] 1. For areas that receive additional moisture through snow trapping, consider adjusting to a wetter LRU or Subset consistent with the vegetation observed for the site keyed. It is anticipated that most snow-trap sites will not have a water table

[7] 7. When calculating percent rock fragments in the profile to determine if a site is skeletal, pararock fragments (parachanners) are not considered, however, channers are. The difference between a parachanner and a channer is how “hard” the rock is. Soft flat fragments (ruptured by hand) are parachanners, while harder flat fragments are channers.

[2] 2. Specific plant species listed in the key are not to be used as the only determining factor. Management or disturbance may have removed or altered the plant composition that could reflect the wrong ecological site.

[3] 3. Soils derived from Dolomite or similar geology may not react as “violently” as other calcareous parent materials; dolomite site may be limy or loamy calcareous with only a strong effervescence. Soils with <18% clays only need a CCE of 5% to be calcic or calcareous, while soils with >18% clays need a CCE of 15%.

[5] 5. Saline, saline sodic, and sodic soils have a pH of 7.9 to 9.0 and an EC (electrical conductivity) > 4 dS/m [dS/m = mmhos/cm]. Salts, including gypsum will lower the pH without affecting the EC, but may still fit into the salt effected sites. Soils that are sodic generally have a SAR of ≥ 13 typically have a pH of 8.8 or higher.

[6] 6. The Dense Clay ecological site will have a lighter textured cap or “A” horizon with an abrupt clay increase, commonly the clay percent will then decrease as move lower in the profile. The abrupt increase in the upper portion of the profile with significant cracking is the key for this site. The Clayey ecological site may have a lighter textured cap but typically maintains or increases in clay as move through the profile. The presence of birdfoot sagebrush and lack of Wyoming sagebrush is a plant indicator for the Dense Clay ecological site.

[4] 4. Ecological site does not fit within one LRU, written to encompass Subset A and B, labeled as 032X01B or 032XB in the BHB.

MLRA 32 Wind River Basin Core (LRU 02 Subset A) Ecological Site Key

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I. Site receives additional effective moisture[1] (If No, Go to II.)

A. Site with a water table present for at least part of the growing season, site dominated by hydrophytic plants (ie. Wetland sedges, bulrushes, willows, tufted hairgrass, etc)

1 Site has water above soil surface for part of the growing season, and a water table present within 0-12” (0-30 cm) annually ... R032XC178WY – Wetland (WL) 5-9” Mesic Wind River Basin

2 Site has a seasonal water table

i. Soil is saline, saline-sodic, or sodic[5] (SAR ≥ 13, or an EC ≥ 4 dS/m) in the upper 4” (10 cm)) of mineral soil; salt tolerant plants dominate site (i.e. greasewood, alkali sacaton, Nuttall’s alkaligrass, alkli bluegrass, alkali cordgrass, inland saltgrass, etc)[2]

a. Seasonal water table is between 12-40” (30-100 cm) below the soil surface ... DX032X02W142 – Saline Subirrigated (SS) Wind River Basin Wet

b. Seasonal water table > 40” (100 cm) below mineral soil surface; site regularly receives higher than normal soil moisture because of run in or stream overflow ... DX032X02W138 – Saline Lowland (SL) Wind River Basin Wet

ii. Soil is non-saline, non-saline-sodic, or non-sodic

a. Seasonal water table is between 12-40” (30-100 cm) below the soil surface ... R032XC174WY – Subirrigated (Sb) 5-9" Mesic Wind River Basin

b. Seasonal water table > 40” (100 cm) below the mineral soil surface; site regularly receives higher than normal soil moisture because of run in or stream overflow ... R032XC128WY – Lowland (LL) 5-9” Mesic Wind River Basin

B. Site receives periodic overflow from adjacent slopes, but no water table within 78” (200 cm)

1 Soil is saline, saline-sodic, or sodic5; site typically occurs on stream terraces along incised channels, and is dominated by greasewood[2] and other salt tolerant plants (i.e. Gardner’s saltbush, alkali sacaton)[2] ... DX032X02W140 – Saline Lowland Drained (SLDr) Wind River Basin Wet

2 Soil is non-saline, non-saline-sodic, or non-sodic, occur on floodplain steps, terraces, concave landscape positions, and positions lower in the landscape

i. Soil has ≥ 35% clay in the upper 8” (20 cm) of mineral soil ... R032XC106WY – Clayey Overflow 5-9” Mesic Wind River Basin

ii. Soil has < 35% clay in the upper 8” (20 cm) of mineral soil ... R032XC130WY – Overflow 5-9” Mesic Wind River Basin

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

A. Soil is saline, saline-sodic, or sodic[5] (SAR ≥ 13, or an EC ≥ 4 dS/m) in the upper 20” (50 cm) of the mineral soil surface; site is dominated by salt tolerant plants (i.e. Gardner’s saltbush, greasewood, alkali sacaton, alkali seepweed, etc)

1 Soil is very shallow (< 10” (25 cm) to shale (lithic or paralithic contact)); productivity very low ... DX032X01A154 – Shale (Sh) Big Horn Basin Core

2 Soil is shallow to very deep (≥10” (25 cm) to bedrock (lithic or paralithic contact)) ... DX032X02A144 – Saline Upland (SU) Wind River Basin Core

B. Soil is non-saline, non-saline-sodic, or non-sodic

1 Soil is very shallow (< 10” (25 cm) or shallow (< 20” (50 cm) to bedrock (lithic or paralithic contact)

i. Soil is very shallow to bedrock, commonly on windswept ridges and escarpments, productivity very low (if productivity is higher than expected and > 35% rock fragments are present use II.2i.a.1) Gravelly (Gr) ... R032XC176WY – Very Shallow (VS) 5-9” Mesic Wind River Basin

ii. Soil is shallow to bedrock

a. Soil has ≥ 35% clay ... R032XC158WY – Shallow Clayey (Swcy) 5-9” Mesic Wind River Basin

b. Soil has < 18% clay ... R032XC166WY – Shallow Sandy (Swsy) 5-9” Mesic Wind River Basin

c. Soil has ≥ 18% but < 35% clay ... DX032X02A162 – Shallow Loamy (SwLy) Wind River Basin Core

2 Soil is moderately deep to very deep (≥ 20” (50 cm) to bedrock (lithic or paralithic contact)

i. Soil is skeletal (≥ 35% rock fragments[7]) in the upper 20” (50 cm) of mineral soil surface

a. Soil is skeletal throughout the upper 20” (50 cm) of mineral soil surface

1) Soil has < 18% clay; surface fragments and fragments in the soil profile are dominantly < 3” (76mm) in diameter, but may range in size ... R032XC112WY – Gravelly (Gr) 5-9” Mesic Wind River Basin

2) Soil has ≥ 18% but < 60% clay, surface fragments and fragments in the soil profile are dominantly ≥ 3” (76mm) in diameter but < 10” (250 mm), but may range in size

a) Violent[3] effervescence starting within 4” (10 cm) of the mineral soil surface, calcium carbonate increases with depth ... DX032X02A121 – Limy Skeletal (LiSk) Wind River Basin Core

b) None to strong[3] effervescence in the upper 4” (10 cm) of mineral soil

b. Soil is skeletal starting within 8-20” (20-50 cm) of the mineral soil surface

1) Soil has ≥ 18% but < 60% clay in the upper 10” (25 cm) of mineral soil, decreasing to < 18% clay within 10-20” (25-50 cm) of the mineral soil surface

a) Violent[3] effervescence starting within 4” (10 cm) of the mineral soil surface, calcium carbonate increases with depth ... DX032X02A169 – Shallow To Gravel Limy (SwGrLi) Wind River Basin Core

b) None to strong[3] effervescence in the upper 4” (10 cm) of the mineral soil surface ... DX032X02A167 – Shallow To Gravel (SwGr) Wind River Basin Core

2) Soil has ≥ 18% but < 60% clay throughout the upper 20” (50 cm) of the mineral soil

a) Fragments typically consisting of stones and boulders (fragments > 10” (250 mm) in diameter), surface fragments (5-15%) are dominantly stones and boulders

b) Fragments typically consisting of cobbles (fragments are dominantly > 3” (76 mm) but < 10” (250 mm) in diameter); few stones and boulders (0-5%) are present ... DX032X02A109 – Cobbly Upland (CoU) Wind River Basin Core

ii. Soil is not skeletal in the upper 20” (50 cm) of the mineral soil surface

a. Soil has ≥ 35% clay throughout the upper 20” (50 cm) of the mineral soil – may have a lighter textured cap or may decrease lower in the profile

1) Abrupt clay increase[6] to > 40% clay present within 4-8” (10-20 cm) of the mineral soil surface, severe surface cracking during dry conditions; plant dominated by birdfoot sagebrush ... DX032X02A110 – Dense Clay (DC) Wind River Basin Core

2) Soil has ≥ 35% clay starting within the upper 4” (10 cm) and

continues throughout the upper 20” (50 cm) of mineral soil surface ... R032XC104WY – Clayey (Cy) 5-9” Mesic Wind River Basin

b. Soil has < 35% clay throughout the upper 20” (50 cm) of the mineral soil – may see individual horizons that are above 35% clay, but on average, the soil profile is less than 35% clays

1) Soil has < 18% clay throughout the upper 20” (50 cm) of mineral soil surface; may see clay increase below 8" (20cm) of mineral soil surface

a) Soil has < 15% clay starting within the upper 4” (10 cm) from the mineral soil surface and lacks structure; soil textures include coarse sands to loamy fine sands ... R032XC146WY – Sands (Sa) 5-9” Mesic Wind River Basin

b) Soil has < 18% clay starting within the upper 4” (10 cm) from the mineral soil surface; soil textures include loamy very fine sands to loams ... DX032X02A150 – Sandy (Sy) Wind River Basin Core

c) Site intermixed with a distinct band of sandstone with Desert Wyethia present, and a distinct band of shales running below supporting minimal vegetation. ... R032XC148WY – Sandstone Breaks (SaB) 5-9” Mesic Wind River Basin

2) Soil has ≥ 18% but < 35% clay starting within the upper 8” (20 cm) of mineral soil surface

a) Soil is calcareous (violent effervescence[3]) within 20” (50 cm) of the mineral soil surface

(1) Soil is calcareous within the upper 8” (20 cm) of mineral soil, calcium carbonate increases with depth ... DX032X02A120 – Limy Upland (LiU) Wind River Basin Core

(2) Soil is calcareous starting within the upper 8-20” (20 to 50 cm) of the mineral soil surface ... DX032X02B123 – Loamy Calcareous (LyCa) Wind River Basin Rim

b) Soil is non-calcareous within 20” (50 cm) of the mineral soil surface ... DX032X02A122 – Loamy (Ly) Wind River Basin Core

[2] 2. Specific plant species listed in the key are not to be used as the only determining factor. Management or disturbance may have removed or altered the plant composition that could reflect the wrong ecological site.

[3] 3. Soils derived from Dolomite or similar geology may not react as “violently” as other calcareous parent materials; dolomite site may be limy or loamy calcareous with only a strong effervescence. Soils with <18% clays only need a CCE of 5% to be calcic or calcareous, while soils with >18% clays need a CCE of 15%.

[5] 5. Saline, saline sodic, and sodic soils have a pH of 7.9 to 9.0 and an EC (electrical conductivity) > 4 dS/m [dS/m = mmhos/cm]. Salts, including gypsum will lower the pH without affecting the EC, but may still fit into the salt effected sites. Soils that are sodic generally have a SAR of ≥ 13 typically have a pH of 8.8 or higher.

[6] 6. 6The Dense Clay ecological site will have a lighter textured cap or “A” horizon with an abrupt clay increase,

commonly the clay percent will then decrease as move lower in the profile. The abrupt increase in the upper portion of the profile with significant cracking is the key for this site. The Clayey ecological site may have a lighter textured cap but typically maintains or increases in clay as move through the profile. The presence of birdfoot sagebrush and lack of Wyoming sagebrush is a plant indicator for the Dense Clay ecological site.

[7] 7. When calculating percent rock fragments in the profile to determine if a site is skeletal, pararock fragments (parachanners) are not considered, however, channers are. The difference between a parachanner and a channer is how “hard” the rock is. Soft flat fragments (ruptured by hand) are parachanners, while harder flat fragments are channers.

[1] 1. For areas that receive additional moisture through snow trapping, consider adjusting to a wetter LRU or Subset consistent with the vegetation observed for the site keyed. It is anticipated that most snow-trap sites will not have a water table.

[4] 4. Ecological site does not fit within one LRU, written to encompass Subset A and B (was C and D), labeled as 032X02B or 032XD for the WRB.

MLRA 32 Wind River Basin Rim (LRU 02 Subset B) Ecological Site Key

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I. Site receives additional effective moisture[1] (If No, Go to II.)

A. Site with a water table present for at least part of the growing season, site dominated by hydrophytic plants (ie. Wetland sedges, bulrushes, willows, tufted hairgrass, etc)

1 Site has water above soil surface for part of the growing season, and a water table present within 0-12” (0-30 cm) annually ... R032XD178WY – Wetland (WL) 10-14" Mesic Wind River Basin

2 Site has a seasonal water table

i. Soil is saline, saline-sodic, or sodic[5] (SAR ≥ 13, or an EC ≥ 4 dS/m) in the upper 4” (10 cm)) of mineral soil; salt tolerant plants dominate site (i.e. greasewood, alkali sacaton, Nuttall’s alkaligrass, alkli bluegrass, alkali cordgrass, inland saltgrass, etc)[2]

a. Seasonal water table is between 12-40” (30-100 cm) below the soil surface

b. Seasonal water table > 40” (100 cm) below mineral soil surface; site regularly receives higher than normal soil moisture because of run in or stream overflow

ii. Soil is non-saline, non-saline-sodic, or non-sodic

a. Seasonal Water table is between 12 40” (30-100 cm) below the soil surface ... R032XD174WY – Subirrigated (Sb) 10-14" Mesic Wind River Basin

b. Seasonal water table > 40” (100 cm) below the mineral soil surface; site regularly receives higher than normal soil moisture because of run in or stream overflow ... R032XD128WY – Lowland (LL) 10-14" Mesic Wind River Basin

B. Site receives periodic overflow from adjacent slopes, but no water table within 78” (200 cm)

1 Soil is saline, saline-sodic, or sodic[5]; site typically occurs on stream terraces along incised channels, and is dominated by greasewood[2] and other salt tolerant plants (i.e. Gardner’s saltbush, alkali sacaton)[2]

2 Soil is non-saline, non-saline-sodic, or non-sodic, occur on floodplain steps, terraces, concave landscape positions, and positions lower in the landscape

i. Soil has ≥ 35% clay in the upper 8” (20 cm) of mineral soil surface ... R032XD106WY – Clayey Overflow 10-14" Mesic Wind River Basin

ii. Soil has < 35% clay in the upper 8” (20 cm) of mineral soil surface ... R032XD130WY – Overflow 10-14" Mesic Wind River Basin

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

A. Soil is saline, saline-sodic, or sodic[5] (SAR ≥ 13, or an EC ≥ 4 dS/m) in the upper 20” (50 cm) of the mineral soil surface; site is dominated by salt tolerant plants (i.e. Gardner’s saltbush, greasewood, alkali sacaton, alkali seepweed, etc)

1 Soil is very shallow (< 10” (25 cm) to shale (lithic or paralithic contact)); productivity very low ... R032XD154WY – Shale (Sh) 10-14" Mesic Wind River Basin

2 Soil is shallow to very deep (≥10” (25 cm) to bedrock (lithic or paralithic contact)) ... DX032X02B144 – Saline Upland (SU) Wind River Basin Rim

B. Soil is non-saline, non-saline-sodic, or non-sodic

1 Soil is very shallow (< 10” (25 cm) or shallow (< 20” (50 cm) to bedrock (lithic or paralithic contact)

i. Soil is very shallow to bedrock, commonly on windswept ridges and escarpments, productivity very low (if productivity is higher than expected and > 35% rock fragments are present use II.B.2i.a.1) Gravelly (Gr) ... R032XD176WY – Very Shallow (VS) 10-14" Mesic Wind River Basin

ii. Soil is shallow to bedrock

a. Soil has ≥ 35% clay starting within 4” (10 cm) of the mineral soil surface ... R032XD158WY – Shallow Clayey (Swcy) 10-14" Mesic Wind River Basin

b. Soil has < 18% clay starting within 4” (10 cm) of the mineral soil surface ... R032XD166WY – Shallow Sandy (Swsy) 10-14" Mesic Wind River Basin

c. Soil has ≥ 18% but < 35% clay starting within 4” (10 cm) of the mineral soil surface ... DX032X02B162 – Shallow Loamy (SwLy) Wind River Basin Rim

2 Soil is moderately deep to very deep (≥ 20” (50 cm) to bedrock (lithic or paralithic contact)

i. Soil is skeletal (≥ 35% rock fragments[7]) in the upper 20” (50 cm) of mineral

soil surface

a. Soil is skeletal throughout the upper 20” (50 cm) of mineral soil surface

1) Soil has < 18% clay; surface fragments and fragments in the soil profile are dominantly < 3” (76mm) in diameter, but may range in size ... R032XD112WY – Gravelly (Gr) 10-14" Mesic Wind River Basin

2) Soil has ≥ 18% but < 60% clay; surface fragments and fragments in the soil profile are dominantly ≥ 3” (76mm) in diameter but < 10” (250 mm), but may range in size

a) Violent[3] effervescence starting within 4” (10 cm) of the mineral soil surface, calcium carbonate increases with depth ... DX032X02B121 – Limy Skeletal (LiSk) Wind River Basin Rim

b) None to strong[3] effervescence in the upper 4” (10 cm) of mineral soil surface ... DX032X02B175 – Skeletal (Sk) Wind River Basin Rim

b. Soil is skeletal starting within 8-20” (20-50 cm) of the mineral soil surface

1) Soil has ≥ 18% but < 60% clay in the upper 10” (25 cm) of mineral soil, decreasing to < 18% clay within 10-20” (25-50 cm) of the mineral soil surface

a) Violent[3] effervescence starting within 4” (10 cm) of the mineral soil surface, calcium carbonate increases with depth ... DX032X02B169 – Shallow To Gravel Limy (SwGrLi) Wind River Basin Rim

b) None to strong[3] effervescence in the upper 4” (10 cm) of the mineral soil surface ... DX032X02B167 – Shallow To Gravel (SwGr) Wind River Basin Rim

2) Soil has ≥ 18% but < 60% clay throughout the upper 20” (50 cm) of the mineral soil surface

a) Fragments typically consisting of stones and boulders (fragments > 10” (250 mm) in diameter), surface fragments (5-15%) are dominantly stones and boulders

b) Fragments typically consisting of cobbles (fragments are dominantly > 3” (76 mm) but < 10” (250 mm) in diameter); few stones and boulders (0-5%) are present ... DX032X02B109 – Cobbly Upland (CoU) Wind River Basin Rim

ii. Soil is not skeletal in the upper 20” (50 cm) of the mineral soil surface

a. Soil has ≥ 35% clay throughout the upper 20” (50 cm) of the mineral soil – may have a lighter textured cap or may decrease lower in the profile

1) Abrupt clay increase[6] to > 40% clay present within 4-8” (10-20 cm) of the mineral soil surface, severe surface cracking during dry conditions;

plant dominated by birdfoot sagebrush ... DX032X02B110 – Dense Clay (DC) Wind River Basin Rim

2) Soil has ≥ 35% clay starting within the upper 4” (10 cm) and continues throughout the upper 20” (50 cm) of mineral soil surface ... R032XD104WY – Clayey (Cy) 10-14" Mesic Wind River Basin

b. Soil has < 35% clay throughout the upper 20” (50 cm) of the mineral soil – may see individual horizons that are above 35% clay, but on average, the soil profile is less than 35% clays

1) Soil has < 18% clay throughout the upper 20” (50 cm) of mineral soil surface; clay may increase below 8" (20 cm) of mineral soil surface

a) Soil has < 15% clay starting within the upper 4” (10 cm) from the mineral soil surface and lacks structure; soil textures include coarse sands to loamy fine sands ... R032XD146WY – Sands (Sa) 10-14” Mesic Wind River Basin

b) Soil has < 18% clay starting within the upper 4” (10 cm) from the mineral soil surface; soil textures include loamy very fine sands to loams ... DX032X02B150 – Sandy (Sy) Wind River Basin Rim

c) Site intermixed with a distinct band of sandstone with Desert Wyethia present, and a distinct band of shales running below supporting minimal vegetation. ... R032XD148WY – Sandstone Breaks (Sab) 10-14” Mesic Wind River Basin

2) Soil has ≥ 18% but < 35% clay starting within the upper 8” (20 cm) of mineral soil surface

a) Soil is calcareous (violent effervescence[3]) within 20” (50 cm) of the mineral soil surface

(1) Soil is calcareous within the upper 8” (20 cm) of mineral soil, calcium carbonate increases with depth ... DX032X02B120 – Limy Upland (LiU) Wind River Basin Rim

(2) Soil is calcareous starting within the upper 8-20” (20 to 50 cm) of the mineral soil surface ... DX032X02B123 – Loamy Calcareous (LyCa) Wind River Basin Rim

b) Soil is non-calcareous within 20” (50 cm) of the mineral soil surface ... DX032X02B122 – Loamy (Ly) Wind River Basin Rim

[4] 4. Ecological site does not fit within one LRU, written to encompass Subset A and B (was LRU C and D), labeled 032X02B or 032XD for the WRB.

[1] 1. For areas that receive additional moisture through snow trapping, consider adjusting to a wetter LRU or Subset consistent with the vegetation observed for the site keyed. It is anticipated that most snow-trap sites will not have a water table.

[2] 2. Specific plant species listed in the key are not to be used as the only determining factor. Management or disturbance may have removed or altered the plant composition that could reflect the wrong ecological site.

[3] 3. Soils derived from Dolomite or similar geology may not react as “violently” as other calcareous parent materials; dolomite site may be limy or loamy calcareous with only a strong effervescence. Soils with <18% clays only need a CCE of 5% to be calcic or calcareous, while soils with >18% clays need a CCE of 15%.

[5] 5. Saline, saline sodic, and sodic soils have a pH of 7.9 to 9.0 and an EC (electrical conductivity) > 4 dS/m [dS/m = mmhos/cm]. Salts, including gypsum will lower the pH without affecting the EC, but may still fit into the salt effected sites. Soils that are sodic generally have a SAR of ≥ 13 typically have a pH of 8.8 or higher.

[6] 6. The Dense Clay ecological site will have a lighter textured cap or “A” horizon with an abrupt clay increase, commonly the clay percent will then decrease as move lower in the profile. The abrupt increase in the upper portion of the profile with significant cracking is the key for this site. The Clayey ecological site may have a lighter textured cap but typically maintains or increases in clay as move through the profile. The presence of birdfoot sagebrush and lack of Wyoming sagebrush is a plant indicator for the Dense Clay ecological site.

[7] 7. When calculating percent rock fragments in the profile to determine if a site is skeletal, pararock fragments (parachanners) are not considered, however, channers are. The difference between a parachanner and a channer is how “hard” the rock is. Soft flat fragments (ruptured by hand) are parachanners, while harder flat fragments are channers.

Historic Key MLRA 32X Zone 5: 5-9 BH

I. Soil depth very shallow (<8-10”), possibly with areas of exposed bedrock and pockets of deep soil OR deep heavy clay soils with a high concentration of exchangeable sodium throughout the profile

A. Soils are very fine textured and have a high concentration of exchangeable sodium throughout the profile, birdfoot sagebrush common woody species ... R032XY118WY – Impervious Clay (IC) 5-9” Big Horn Basin Precipitation Zone

B. Site not as above

1 Site found in uplands, slopes typically 5-25%, WITH many outcrops of clay shale bedrock that may be saline and/or alkaline in various degrees, Gardner's saltbush common woody species ... R032XY154WY – Shale (Sh) 5-9” Big Horn Basin Precipitation Zone

2 Site not as above, upland with steep slopes (25-50%), commonly on windswept ridges, fractured bedrock of various types, and juniper occasionally found at higher elevations ... R032XY176WY – Very Shallow (VS) 5-9” Big Horn Basin Precipitation Zone

II. Soil depth >8"

A. Soil depth shallow (8-15”) OR may be deep (>15”), gravelly and/or cobbly soils on south and west facing slopes which react like shallow soils

1 Silty clays or heavier textured soils over clay shale bedrock, soil may develop large cracks when dry, bud sagebrush, birdfoot sagebrush and Gardner’s saltbush common woody species ... R032XY158WY – Shallow Clayey (SwCy) 5-9” Big Horn Basin Precipitation Zone

2 Soils not as above, including gravelly and/or cobbly soils on south and west facing slopes which react like shallow soils

i. Fine sandy loams or coarser textured soils over sandstone or sandy shale, needle and thread and Indian ricegrass common grass species on site ... R032XY166WY – Shallow Sandy (SwSy) 5-9” Big Horn Basin Precipitation Zone

ii. Very fine sandy loams to clay loam textured soils over various bedrock types (commonly limestone, siltstone, or shale) ... R032XY162WY – Shallow Loamy (SwLy) 5-9” Big Horn Basin Precipitation Zone

B. Soils depth deep (>15”)

1 Site that receives significant additional moisture from runoff of adjacent slopes or from intermittent/perennial streams or a water table

i. Sites that are saline and/or alkaline

a. Water table within rooting depth of herbaceous species (typically 20-40”) during some or most of the growing season, salt crusts can be found on ridges and mounds during dry periods, alkali sacaton & Nuttalls alkaligrass common species ... R032XY142WY – Saline Subirrigated (SS) 5-9” Big Horn Basin Precipitation Zone

b. Site adjacent to intermittent/perennial stream, occasionally receiving overflow water, and water table usually >3 feet (within rooting depth of woody plants, but not within rooting depth of herbaceous plants), greasewood and alkali sacaton common species ... R032XY138WY – Saline Lowland (SL) 5-9” Big Horn Basin Precipitation Zone

ii. Sites that are not saline and/or alkaline

a. Site poorly drained with water table above surface part of growing season, Nebraska sedge and willows common species ... R032XY178WY – Wetland (WL) 5-9” Big Horn Basin Precipitation Zone

b. Site adjacent to intermittent/perennial stream and water table usually >3 feet (within rooting depth of woody plants, but not within rooting depth of herbaceous plants), cottonwoods or remnants thereof may be present ... R032XY128WY – Lowland (LL) 5-9” Big Horn Basin Precipitation Zone

2 Upland site that does not receive significant additional moisture as above

i. Sites that are saline and/or alkaline, Gardner's saltbush and/or winterfat common species ... R032XY144WY – Saline Upland (SU) 5-9” Big Horn Basin Precipitation Zone

ii. Sites that are not saline and/or alkaline

a. Sites with a high volume of coarse fragments in top 20” (>35% by volume)

1) Site occurs along terrace breaks or steep slopes with the majority of

coarse fragments from 2 mm to 3” in diameter covering 50-75% of surface and making up 40-50% volume in top 20”, may have lime horizon below 12 inches, bluebunch wheatgrass and variety of woody plants may be present, productivity low ... R032XY112WY – Gravelly (Gr) 5-9” Big Horn Basin Precipitation Zone

2) Site occurs in a variety of upland positions, majority of coarse fragments greater than 3” in diameter found in abundance on surface, at least 35% volume of coarse fragments in top 20”, generally increasing with depth, bluebunch wheatgrass common ... R032XY108WY – Coarse Upland (CU) 5-9” Big Horn Basin Precipitation Zone

b. Sites without high volume of coarse fragments

1) Soils textures are heavy and range from silty clay to heavy clay, slight to severe soil cracking in dry conditions. Textures range from silty clay through finer silty and sandy clay loams, soil cracking common during dry summer months, though not severe, big sagebrush more common woody species ... R032XY104WY – Clayey (Cy) 5-9” Big Horn Basin Precipitation Zone

2) Soils not as above

a) Soil textures are coarse and range from fine sandy loam to sand

(1) Soils coarse, loamy sand to sand textures, sometimes as dunes, dark or light colored, needle and thread and prairie sandreed are abundant species ... R032XY146WY – Sands (Sa) 5-9” Big Horn Basin Precipitation Zone

(2) Soils fine sandy loams, sandy loams, or loamy sands in texture, light or dark colored, needle and thread and Indian ricegrass are abundant species ... R032XY150WY – Sandy (Sy) 5-9” Big Horn Basin Precipitation Zone,

b) Soils not as above - sandy loams to clay loams, moderate textures ... R032XY122WY – Loamy (Ly) 5-9” Big Horn Basin Precipitation Zone

Historic Key MLRA 32X Zone 8 - 5-9 WR

I. Soil depth very shallow (<8-10”), possibly with areas of exposed bedrock and pockets of deep soil OR deep heavy clay soils with a high concentration of exchangeable sodium throughout the profile

A. Soils are very fine textured and have a high concentration of exchangeable sodium throughout the profile, birdfoot sagebrush common woody species ... R032XY218WY

– Impervious Clay (IC) 5-9” Wind River Basin Precipitation Zone

B. Site not as above

1 Site found in uplands, slopes typically 5-25%, WITH many outcrops of clay shale bedrock that may be saline and/or alkaline in various degrees, Gardner's Saltbush common woody species ... R032XY254WY – Shale (Sh) 5-9” Wind River Basin Precipitation Zone

2 Site not as above, upland with steep slopes (25-50%), commonly on windswept ridges, fractured bedrock of various types, and Juniper occasionally found on at higher elevations ... R032XY276WY – Very Shallow (VS) 5-9” Wind River Basin Precipitation Zone

II. Soil depth >8"

A. Soil depth shallow (8-15”) OR may be deep (>15”), gravelly and/or cobbly soils on south and west facing slopes which react like shallow soils

1 Silty clays or heavier textured soils over clay shale bedrock, soil may develop large cracks when dry, bud sagebrush, birdfoot sagebrush and Gardner’s saltbush common woody species ... R032XY258WY – Shallow Clayey (SwCy) 5-9” Wind River Basin Precipitation Zone

2 Soils not as above, including gravelly and/or cobbly soils on south and west facing slopes which react like shallow soils

i. Fine sandy loams or coarser textured soils

a. Soils shallow (less than 20” to bedrock) intermingled with areas of Sands, Shallow Sandy and Sandy ecological sites. Bedrock is sandstone over soft shale bedrock, Desert wyethia is common on site ... R032XY248WY – Sandstone Breaks (SaB) 5-9” Wind River Basin Precipitation Zone

b. Fine sandy loams or coarser textured soils over sandstone or sandy shale, needle and thread and Indian ricegrass common grass species on site ... R032XY266WY – Shallow Sandy (SwSy) 5-9” Wind River Basin Precipitation Zone

ii. Very fine sandy loams to clay loam textured soils over various bedrock types (commonly limestone, siltstone, or shale) ... R032XY262WY – Shallow Loamy (SwLy) 5-9” Wind River Basin Precipitation Zone

B. Soils depth deep (>15”)

1 Site that receives significant additional moisture from runoff of adjacent slopes or from intermittent/perennial streams or a water table

i. Sites that are saline and/or alkaline

a. Water table within rooting depth of herbaceous species (typically 20-40”) during some or most of the growing season, salt crusts can be found on ridges and mounds during dry periods, alkali sacaton & Nuttalls alkaligrass

common species ... R032XY242WY – Saline Subirrigated (SS) 5-9” Wind River Basin Precipitation Zone

b. Site not as above

1) Site adjacent to intermittent/perennial stream, occasionally receiving overflow water, and water table usually >3 feet (within rooting depth of woody plants, but not within rooting depth of herbaceous plants), greasewood and alkali sacaton common species ... R032XY238WY – Saline Lowland (SL) 5-9” Wind River Basin Precipitation Zone

2) Site receives periodic overflow from adjacent slopes, but it is typically channeled into gullies so that plants are not receiving benefit from additional moisture, greasewood and Gardner's saltbush common species, big sagebrush sometimes present ... R032XY240WY – Saline Lowland Drained (SLDr) 5-9” Wind River Basin Precipitation Zone

ii. Sites that are not saline and/or alkaline

a. Site poorly drained with water table above surface part of growing season, Nebraska sedge and willows common species ... R032XY278WY – Wetland (WL) 5-9” Wind River Basin Precipitation Zone

b. Site adjacent to intermittent/perennial stream and water table usually >3 feet (within rooting depth of woody plants, but not within rooting depth of herbaceous plants), cottonwoods or remnants thereof may be present ... R032XY228WY – Lowland (LL) 5-9” Wind River Basin Precipitation Zone

2 Upland site that does not receive significant additional moisture as above

i. Sites that are saline and/or alkaline, Gardner's saltbush and winterfat common species ... R032XY244WY – Saline Upland (SU) 5-9” Wind River Basin Precipitation Zone

ii. Sites that are not saline and/or alkaline

a. Sites with a high volume of coarse fragments in top 20” (>35% by volume)

1) Site occurs along terrace breaks or steep slopes with the majority of coarse fragments from 2 mm to 3” in diameter covering 50-75% of surface and making up 40-50% volume in top 20”, may have lime horizon below 12 inches, bluebunch wheatgrass and variety of woody plants may be present, productivity low ... R032XY212WY – Gravelly (Gr) 5-9” Wind River Basin Precipitation Zone

2) Site occurs in a variety of upland positions, majority of coarse fragments greater than 3” in diameter found in abundance on surface, at least 35% volume of coarse fragments in top 20”, generally increasing with depth, bluebunch wheatgrass common ... R032XY208WY – Coarse Upland (CU) 5-9” Wind River Basin Precipitation Zone

b. Sites without high volume of coarse fragments

1) Soils textures are heavy and range from silty clay to heavy clay, slight to severe soil cracking in dry conditions. Textures range from silty clay through finer silty and sandy clay loams, soil cracking common during dry summer months, though not severe, big sagebrush more common woody species ... R032XY204WY – Clayey (Cy) 5-9” Wind River Basin Precipitation Zone

2) Soils not as above

a) Soil textures are coarse and range from fine sandy loam to sand

(1) Soils coarse, loamy sand to sand textures, sometimes as dunes, dark or light colored, needle and thread and prairie sandreed are abundant species ... R032XY246WY – Sands (Sa) 5-9” Wind River Basin Precipitation Zone

(2) Soils fine sandy loams, sandy loams, or loamy sands in texture, light or dark colored, needle and thread and Indian Ricegrass are abundant species ... R032XY250WY – Sandy (Sy) 5-9” Wind River Basin Precipitation Zone

b) Soils not as above - sandy loams to clay loams, moderate textures ... R032XY222WY – Loamy (Ly) 5-9” Wind River Basin Precipitation Zone

Historic Key MLRA 32X Zone 7: 10-14 E

I. Site in a lowland position that receives significant additional moisture from runoff of adjacent slopes or from intermittent/perennial streams or a water table (HIGH Productivity Potential)

A. Sites that are saline and/or alkaline, dominated by salt tolerant species (greasewood, inland saltgrass, alkali sacaton, alkali muhly)

1 Water table within rooting depth of herbaceous species (typically 20-40”) during some or most of the growing season, dominated by grasses such as alkali sacaton, Nuttall’s alkaligrass, alkali bluegrass, alkali cordgrass, basin wildrye (typically no shrubs present) ... R032XY342WY – Saline Subirrigated (SS) 10-14" East Precipitation Zone

2 Site not as above

i. Site in a lowland position and water table usually >3 feet (within rooting depth of woody plants, but not within rooting depth of herbaceous plants), dominated by alkali sacaton, greasewood, inland saltgrass, basin wildrye (no big

sagebrush on this site) ... R032XY338WY – Saline Lowland (SL) 10-14" East Precipitation Zone

ii. Site receives periodic overflow from adjacent slopes, but it is typically channeled into gullies so that plants are not receiving benefit from additional moisture, greasewood and Gardner's saltbush common species, big sagebrush sometimes present ... R032XY340WY – Saline Lowland Drained (SLDr) 10-14" East Precipitation Zone

B. Sites that are not saline and/or alkaline

1 Site poorly drained with water table above surface part of growing season, Nebraska sedge and willows common species ... R032XY378WY – Wetland (WL) 10-14" East Precipitation Zone

2 Site not as above

i. Water table within rooting depth of herbaceous species (typically above 20”) during part of the growing season, basin wildrye, shrubby cinquefoil, and willows may be present ... R032XY374WY – Subirrigated (Sb) 10-14" East Precipitation Zone

ii. Site not as above

a. Site in a lowland position, adjacent to intermittent/perennial stream and water table usually >3 feet (within rooting depth of woody plants, but not within rooting depth of herbaceous plants), cottonwoods or remnants thereof may be present, gravel bars and pockets of bare gravel often present, woods rose and other woody species common ... R032XY328WY – Lowland (LL) 10-14" East Precipitation Zone

b. Site not as above

1) Site receives periodic overflow from adjacent slopes, but without a water table within rooting depth of woody plants, basin big sagebrush, silver sagebrush, slender wheatgrass and/or canby bluegrass common ... R032XY330WY – Overflow (Ov) 10-14" East Precipitation Zone

2) Site similar to above with heavy textured soils (finer portions of silty clay loams to sandy clay loams and clay loams), heavy presence of rhizomatous wheatgrasses ... R032XY306WY – Clayey Overflow (CyO) 10-14" East Precipitation Zone

II. Upland site that does not receive additional moisture as above

A. Soil depth very shallow (<10”), shallow (10-20”) OR deep (>20”) on south and west facing slopes which react like shallow soils (LOW productivity potential)

1 Soils very shallow (<10”), but include areas of exposed bedrock and pockets of deep soil, often on steep (up to 55%) south and west facing slopes with LOW productivity potential

i. Bedrock is soft or hard clay shale bedrock that may be saline and/or alkaline

in various degrees, Gardner’s saltbush common species, productivity very low ... R032XY354WY – Shale (Sh) 10-14" East Precipitation Zone

ii. Site not as above, commonly on windswept ridges, fractured bedrock of various types, and juniper occasionally found on at higher elevations, productivity very low, bluebunch wheatgrass (if productivity is high and coarse fragments are present, go to Gravelly or Shallow*) ... R032XY376WY – Very Shallow (VS) 10-14" East Precipitation Zone

2 Soils shallow (10-20”) OR deep, gravelly and/or cobbly soils on south and west facing slopes that react like shallow soils

i. Coarse fragments common on surface and throughout profile (>35% by volume).Site occurs along terrace breaks or steep slopes with coarse fragments up to 10” diameter covering 50-75% of surface and making up 40-50% volume in top 20”, may have lime horizon below 12 inches, bluebunch wheatgrass and a variety of woody plants may be present, productivity very low ... R032XY312WY – Gravelly (Gr) 10-14" East Precipitation Zone

ii. Site not as above

a. Silty clays or heavier textured soils over clay shale bedrock, birdfoot sagebrush, winterfat & Gardner’s saltbush ... R032XY358WY – Shallow Clayey (SwCy) 10-14" East Precipitation Zone

b. Site not as above

1) Fine sandy loams or coarser textured soils over sandstone or sandy shale, needle and thread, Indian ricegrass & bluebunch wheatgrass dominant grass species on site ... R032XY366WY – Shallow Sandy (SwSy) 10-14" East Precipitation Zone

2) Very fine sandy loams to clay loam textured soils over various bedrock types (commonly limestone, siltstone, or shale) ... R032XY362WY – Shallow Loamy (SwLy) 10-14" East Precipitation Zone

B. Upland Sites that are moderately deep to deep (>20”)

1 Sites that are saline and/or alkaline

i. Gardner's saltbush, winterfat common (if root restrictive layer present and production very low consider Shale site—Group II, 2) ... R032XY344WY – Saline Upland (SU) 10-14" East Precipitation Zone

ii. Site receives periodic overflow from adjacent slopes, but water typically channeled into gullies so that plants are not receiving a lot of benefit from additional moisture, greasewood and Gardner's saltbush common species, big sagebrush sometimes present ... R032XY340WY – Saline Lowland Drained (SLDr) 10-14" East Precipitation Zone

2 Sites that are not saline and/or alkaline

i. Sites with a high volume of coarse fragments in top 20” (>35% by volume)

a. Site occurs along terrace breaks or steep slopes with coarse fragments up to 10” diameter covering 50-75% of surface and making up 40-50% volume in top 20”, may have lime horizon below 12 inches, bluebunch wheatgrass and variety of woody plants may be present, productivity low ... R032XY312WY – Gravelly (Gr) 10-14" East Precipitation Zone

b. Site occurs in a variety of upland positions, coarse fragments found in abundance on surface, at least 35% volume of coarse fragments in top 20”, generally increasing with depth, bluebunch wheatgrass, bitterbrush, and a variety of other shrubs, production higher ... R032XY308WY – Coarse Upland (CU) 10-14" East Precipitation Zone

ii. Sites without high volume of coarse fragments

a. Soil textures are heavy, slight to severe soil cracking in dry conditions

1) Soil textures range from silty clay through finer silty and sandy clay loams, soil cracking common during dry summer months, though not severe, big sagebrush more common, but sparse, with a lot of western wheatgrass ... R032XY304WY – Clayey (Cy) 10-14" East Precipitation Zone

2) Heavy clay soils (silty clays or clays), silty clays or heavier textured soils over clay shale bedrock, birdfoot sagebrush, winterfat & Gardner’s saltbush ... R032XY358WY – Shallow Clayey (SwCy) 10-14" East Precipitation Zone

b. Soil textures not as above

1) Soils fine sandy loams to loamy sands, light or dark colored, needle and thread and Indian ricegrass are abundant species

a) Productivity is low ... R032XY366WY – Shallow Sandy (SwSy) 10-14" East Precipitation Zone

b) Productivity is high ... R032XY350WY – Sandy (Sy) 10-14" East Precipitation Zone

2) Soils very fine sandy loams to clay loams, good variety and even mix of grass species

a) Productivity is low, low or early sage intermixed with big sagebrush

... R032XY362WY – Shallow Loamy (SwLy) 10-14" East Precipitation Zone

b) Productivity is high ... R032XY322WY – Loamy (Ly) 10-14" East Precipitation Zone