

Major Land Resource Area 034A

Cool Central Desertic Basins and Plateaus

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Ecological site keys

Key to the Keys

- I. In MLRA 34A, outside of the State of Wyoming.
 - A. Within the State of Utah. ... Key 2 – 34A Utah
 - B. Within the State of Colorado. ... Key 3 – 34A Colorado
- II. In 34A, within the State of Wyoming.
 - A. MLRA based keys.
 - 1 MLRA-wide key encompassing all LRUs. ... Key 4 – MLRA 34A Rangeland Ecological Site Key
 - 2 LRU specific keys.
 - i. LRUs west of the Continental divide within Wyoming.
 - a. Situated in the northern portion of the west Divide, in the Pinedale area on the Pinedale Plateau and surrounding landforms. ... Key 6 – Pinedale Plateau Ecological Site Key 34A
 - b. Situated on the southern portion of the MLRA west of the Divide in the Green River and Great Divide Basins. ... Key 5 – Green River Basin Ecological Site Key 34A
 - ii. LRUs east of the continental divide in Wyoming.
 - a. LRU positioned along the Beaver Rim breaks and south along the Sweetwater river valley. ... Key 7 – Beaver Rim Divide
 - b. South of Sweetwater, and east along the valley and surrounding area of the Platte River Valley. ... Key 8 – Platte Valley
 - B. Historic Wyoming Precipitation Zone based keys.
 - 1 Within the 10 to 14 inch precipitation zone.
 - i. In the Northern portion of the west divide in the Basin and Foothills. ... Key 9 – Foothills and Basins West
 - ii. In the Southeastern portion of the State, in the high plains region. ... Key 10 – High Plains Southeast
 - 2 Within the 7 to 9 precipitation zone in the Southwest portion of Wyoming. ... Key 11 – Green River and Great Divide Basins Archived

34A Utah

- I. Site in a lowland position (bottom) that receives significant additional moisture from runoff of adjacent slopes or intermittent/perennial streams or a water table (HIGH productivity potential)
 - A. Site moderately to strongly saline (>8mmhos/cm) within 20" (50cm) and dominated by salt tolerant species
 - 1 Site adjacent to perennial or intermittent streams, receiving some overland flow from adjacent slopes, with moderately good drainage, but water table within 36" (within rooting depth of woody plants, but not herbaceous plants) during most of the growing season ... R034AA201UT – Semi-desert Saline Well-Drained Terraces (Indian ricegrass/ Greasewood)
 - 2 Site may receive periodic overflow from adjacent slopes, located in lowland position but water is typically

channeled into gullies so that plants are not receiving a lot of benefit from additional moisture ...

R034AA203UT – Semi-desert Saline Terraces (Gardner's saltbush/ Bluebunch wheatgrass)

B. Site not saline

1 Site with a water table present and visible for at least part of the growing season above 40 inches.

i. Site has a water table within rooting depth of herbaceous species (12-24" (30-60cm)) during most of the growing season ... R034AA013UT – Semi-Wet Fresh Meadow

ii. Site has fluctuating water table above surface part of growing season (redox features in top 12" (30cm))

a. Without the prominent riparian gravels ... R034AA012UT – Riparian Complex Perennial II/E4 (Nebraska Sedge/Baltic Rush)

b. With the prominent riparian gravels

1) Water table fluctuates low enough to encourage woody riparian species. ... R034AA010UT – Riparian Complex Perennial Gravelly VIII/E4 (Geyers Willow/Northwest Territory Sedge)

2) Water table fluctuates and remains high enough to restrict the woody species. ...

R034AA011UT – Riparian Complex Perennial Gravelly VIII/E4 (Northwest Territory Sedge)

2 Surface textures range from sandy loam to light silty clay loam (if redox features are present they are below 40" (100cm)) ... R034AA237UT – Semi-desert Loamy Run-on (Basin big sagebrush/ Mixed bunchgrass)

II. Site is in an upland position and does not receive additional effective moisture from runoff of adjacent slopes and there is no water table.

A. Soil depth very shallow (<10" (25cm)), shallow (10-20" (25-50cm)) OR moderately deep to deep (>20" (>50cm)), skeletal (>35% coarse fragments by volume in top 20" (50cm)) soils on south and west aspects and/or with a root restricting layer which react like shallow soils (LOW productivity potential)

1 Site with a highly calcareous subsoil with highly calcareous (violent effervescence (>15% CCE)) subsoil at <10" (25cm), often gravelly or skeletal and on 15 to 35% slopes, Moderately deep to deep soil (>20" (50cm)) , (compare with II. B. 2. i. a) ... R034AA205UT – Semi-desert Stony Loam (Black sagebrush)

2 Site without highly calcareous subsoil or bedrock, OR if lime horizon present, accompanied by high volume of coarse fragments at soil surface, slopes variable

i. Soil is skeletal with coarse fragments common on surface and throughout profile (>35% by volume in top 20" (50cm))

a. Site occurs along terrace breaks, steep slopes, or terraces with coarse fragments up to 10" diameter covering 50-75% of surface and making up 40-50% volume in top 20" (50cm), may have lime horizon below 12", often westerly aspect and windswept ridges, soils are excessively well drained loamy sands, sandy loams and fine sandy loams ... R034AA228UT – Semi-desert Gravel (Bluebunch wheatgrass/ Wyoming big sagebrush)

b. Fractured sedimentary bedrock at 10-20" (25-50cm) with cobble, stone, and angular fragments on the surface and throughout soil profile, inclusions of very shallow to deep pockets of soil, loamy well drained soils commonly on south & west facing slopes (productivity potential higher than Very Shallow (VS) site) ... R034AA240UT – Semi-desert Shallowbreaks (Bluebunch wheatgrass/ Utah juniper)

ii. Soils without high amount of coarse fragments at soil surface, but still may be skeletal, have root restricting layer, shallow to bedrock

a. Root restricting (7-15" 18-30cm) clay loam to clay subsoil layer (>40% clay) with sharply contrasting loam to clay loam surface textures, soil may develop large cracks when dry ... R034AA210UT – Semi-desert Shallow Clay (Early sagebrush)

b. Well-drained soils with 35% or less clay in the mineral soil surface and are over sedimentary bedrock or loams with root restricting layer (i.e. rock layer and/or similar layer)

1) Soil textures are fine sandy loam to loams ... R034AA235UT – Semi-desert Shallow Loam (Wyoming big sagebrush)

2) Soil textures are silt loam to loams ... R034AA207UT – Semi-desert Shallow Loam (Black

sagebrush)

B. Soil depth moderately deep to deep (>20" (50cm)) without root restricting layer and is NOT skeletal and/or south or west facing that inhibits the productivity potential; Sites are not affected by soil chemistry

1 Sandy clay loam, silty clay loam and clay loam surface, soil cracking common during dry summer months, though not severe (>36% clay in subsurface)

i. Heavy clay soils (>40%) at surface with severe soil cracking in dry conditions may occur, very sticky when wet, (slick spot) ... R034AA215UT – Semi-desert Dense Clay (Low and/ or Early sagebrush/ Rhizomatous wheatgrass)

ii. Silty clay loam and clay loams soil cracking common during dry summer months, though not severe (>36% clay in subsurface) ... R034AA239UT – Semi-desert Silt (Basin big sagebrush/ Bluebunch wheatgrass)

2 Site not as above

i. Excessively drained soils that are very coarse (loamy sand to sand), on nearly level to rolling uplands or dunes, dark or light colored ... R034AA248UT – Semi-desert Sand (Indian ricegrass/ Needle and thread)

ii. Soil not as above, Clay content is not greater than 35% by is greater than 15% in the mineral soil surface layer (1-2")

a. Soil textures range from silty loamy to silty clay loam ... R034AA223UT – Semi-desert Silt Loam (Wyoming big sagebrush/ Bluebunch wheatgrass)

b. Soil textures range from loamy fine sand to clay loam ... R034AA220UT – Semi-desert Loam (Wyoming big sagebrush/ Bluebunch wheatgrass)

34A Colorado

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

A. Water table is present or signs of a water table during some portion of the year may be present.

1 Site adjacent to perennial or intermittent streams, with moderate to excessive drainage, and fluctuating 24-60", within 36" (rooting depth of woody plants, but not herbaceous plants) during some of the growing season ... R034AY236CO – Riverbottom

2 Surface textures range from sandy loam to light silty clay loam (if redox features are present they are below 40" (100cm)) ... R034AY421CO – Cold Desert Overflow

B. No indications of a water table, low depressional areas or swales.

1 In foothills at higher precipitation ... R034AY285CO – Foothill Swale

2 Silt loams to silty clay soil textures, lower precipitation. ... R034AY433CO – Silty Swale

II. Upland position, or sites receiving no additional moisture.

A. Soil depth very shallow (<10" (25cm)), shallow (10-20" (25-50cm)) OR moderately deep to deep (>20" (>50cm))

1 Shallow due to sedimentary bedrock or a root restricting layer. Not fractured bedrock.

i. Bedrock is soft or hard clay shale bedrock that may be saline, occurs in upland position on moderately to steeply sloping land (5-25% slope) ... R034AY430CO – Shale

ii. Well-drained fine sandy loam to silty loams over sedimentary bedrock or loams with root restricting layer (i.e. rock layer and/or similar layer) ... R034AY431CO – Shallow Loamy 10-14 PZ

2 Fractured sedimentary bedrock at 10-20" (25-50cm) with gravel, cobble, stone, and angular fragments on the surface and throughout soil profile, inclusions of very shallow to deep pockets of soil, with Loamy well drained soils.

i. Commonly on south & west facing slopes, lower precipitation, in the Cold Desert LRU. ...

R034AY420CO – Cold Desert Breaks

ii. Higher precipitation, foothills. ... R034AY300CO – Loamy Breaks

B. Soil depth moderately deep to deep (>20" (50cm)) without root restricting layer that inhibits the productivity potential

1 Site affected by soil chemistry (salinity, sodicity, and/or calcium carbonates) within the rooting depth of herbaceous plants

i. Surface textures range from sandy loam to clay loam, moderately saline or greater (>8mmhos/cm), or sodic (SAR >13, EC <4mmhos) ... R034AY418CO – Alkali Upland

ii. Soils very fine sandy loams to sandy clay loams, violent effervescence (>15%CCE) at the soil surface, in the Cold Desert LRU. ... R034AY423CO – Limy Cold Desert

2 Sites are not affected by soil chemistry

i. Precipitation less than 10" (includes the 9-11" breaks)

a. Soils are fine sandy loam or coarser in texture (less than 18% clay)

1) Excessively drained soils that are very coarse (loamy sand to sand), on nearly level to rolling uplands or dunes, dark or light colored ... R034AY434CO – Dry Sandy

2) Soils loamy fine sand to fine sandy loam, in the Cold Desert LRU. ... R034AY428CO – Sandy Cold Desert

b. Soils are well-drained site with <6" (15cm) sandy loam surface layer over sandy clay loam or clay loam is included)

1) Temperature is lower and productivity slightly less, in the Cold Desert LRU. ... R034AY426CO – Loamy Cold Desert

2) Productivity potential is high ... R034AY424CO – Loamy 7-10 PZ

ii. Precipitation greater than 10"

a. Silty clay loam and clay loams soil cracking common during dry summer months, though not severe (>36% clay in subsurface) ... R034AY246CO – Clayey Slopes

b. Soils less than 36% clay in the subsurface.

1) Soils with Loamy sand to fine sandy loam textures

a) Excessively drained soils that are very coarse (loamy sand to sand), on nearly level to rolling uplands or dunes ... R034AY293CO – Sandhills

b) Soils loamy fine sand to fine sandy loam

(1) Slope greater than 30% ... R034AY331CO – Sandy Slopes

(2) Slope less than 30% ... R034AY330CO – Sandy Land

2). Productivity potential is high, well-drained site, sandy loam surface layer over sandy clay loam or clay loam

a) Slopes greater than 30% ... R034AY303CO – Loamy Slopes

b) Slopes less than 30% ... R034AY298CO – Rolling Loam

MLRA 34A Rangeland Ecological Site Key

I. Site in a low lying position (drainageway, flood plain, adjacent alluvial fan or concave position) with simple¹ and nearly level (0-3%) slopes that receives additional moisture from runoff of adjacent slopes or intermittent/perennial streams or a water table (HIGH productivity potential, >1,200 lb/ac)

A. Soils moderately to strongly saline (EC >8mmhos/cm), sodic (SAR >13, EC <4mmhos/cm), or saline-sodic (SAR >13, EC >4mmhos/cm) within 15" (38cm) and dominated by salt tolerant species species (i.e. greasewood, Nutall's alkaligrass, inland saltgrass, alkali sacaton)

1 Site typically in drainageway or floodplain and has a water table within rooting depth of herbaceous

species, 12-36" (30-90cm), during most of the growing season; grasses such as alkali sacaton, basin wildrye, Nutall's alkaligrass common (typically few shrubs present) SALINE SUBIRRIGATED

- i. If in Green River and Great Divide Basin ... R034AY142WY – Saline Subirrigated Green River and Great Divide Basins (SS)
- ii. If in Foothills and Basins West ... R034AY242WY – Saline Subirrigated Foothills and Basins West (SS)
- iii. If in High Plains Southeast ... R034AY342WY – Saline Subirrigated High Plains Southeast (SS)

2 Soils not like 1. above

i. Site typically in or adjacent to perennial or intermittent stream or ephemeral drainage, receives overland flow from adjacent slopes; moderately well-drained; water table within 48" (122cm) during some of the growing season; greasewood, inland saltgrass, alkali sacaton, basin wildrye, and western wheatgrass common SALINE LOWLAND

- a. If in Green River and Great Divide Basin ... R034AY138WY – Saline Lowland Green River and Great Divide Basins (SL)
- b. If in Foothills and Basins West ... R034AY238WY – Saline Lowland Foothills and Basins West (SL)
- c. If in High Plains Southeast ... R034AY338WY – Saline Lowland High Plains Southeast (SL)

ii. Site in or adjacent to perennial or intermittent stream or ephemeral drainage, receives periodic overflow from adjacent slopes; well-drained; water table >60" (150cm); gullies present; shallow-rooted plants not receiving benefit from additional moisture; greasewood and Gardner's saltbush common, big sagebrush may be present SALINE LOWLAND, DRAINED

- a. If in Green River and Great Divide Basin ... R034AY140WY – Saline Lowland Drained Green River and Great Divide Basins (SLDr)
- b. If in Foothills and Basins West ... R034AY240WY – Saline Lowland Drained Foothills and Basins West (SLDr)

B. Soils not like A above

1 Site typically in drainageway or floodplain and has a high water table for most of the growing season and redox features in upper 12" (30cm); frequent flooding; Nebraska sedge, northern reedgrass, tufted hairgrass common, occasionally willows WETLAND

- i. If in Green River and Great Divide Basin ... R034AY178WY – Wetland Green River and Great Divide Basins (WL)
- ii. If in Foothills and Basins West ... R034AY278WY – Wetland Foothills and Basins West (WL)
- iii. If in High Plains Southeast ... R034AY378WY – Wetland High Plains Southeast (WL)

2 Soils not like 1 above

i. Site adjacent to perennial stream and a water table within 12-24" (30-60cm) during most of the growing season with occasional to frequent flooding during runoff events; basin wildrye, tufted hairgrass, slender wheatgrass, shrubby cinquefoil, sedges, rushes, and willows common SUBIRRIGATED

- a. If in Green River and Great Divide Basin ... R034AY174WY – Subirrigated Green River and Great Divide Basins (Sb)
- b. If in Foothills and Basins West ... R034AY274WY – Subirrigated Foothills and Basins West (Sb)
- c. If in High Plains Southeast ... R034AY374WY – Subirrigated High Plains Southeast (Sb)

ii. Soils not like i. above

a. Site adjacent to perennial stream, well drained to excessively well-drained and fluctuating water table, 24-60" (60- 150cm), but within 36" (90cm) during some of the growing season, rooting depth of woody plants, but not herbaceous plants; cottonwood or remnants may be present; gravelly with gravel bars often present; basin wildrye, needleandthread, western wheatgrass, woods rose and other woody species common LOWLAND

- 1) If in Green River and Great Divide Basin ... R034AY128WY – Lowland Green River and Great Divide Basins (LL)
- 2) If in Foothills and Basins West ... R034AY228WY – Lowland Foothills and Basins West (LL)
- 3) If in High Plains Southeast ... R034AY328WY – Lowland High Plains Southeast (LL)

b. Soils not like a. above

1) Site drier than perennial stream site, more likely on intermittent or ephemeral drainage or floodplain terrace, without gravel bars and high water table during growing season

a) Clay loam, silty clay loam, or silty clay surface textures (>32% clay) at least 5" (13cm) thick; if redox features are present they, are below 40" (100cm); heavy presence of western wheatgrass, slender wheatgrass, basin wildrye, basin big sagebrush or silver sagebrush
CLAYEY OVERFLOW

(1) If in Foothills and Basins West ... R034AY206WY – Clayey Overflow Foothills and Basins West (CyO)

(2) If in High Plains Southeast ... R034AY306WY – Clayey Overflow High Plains Southeast (CyO)

b) Surface textures range from sandy loam to light silty clay loam (<32% clay); if redox features are present, they are below 40" (100cm); basin big sagebrush, silver sagebrush, slender wheatgrass, and/or Canby's bluegrass common (Loamy Overflow only occurs east of Continental Divide) OVERFLOW/LOAMY OVERFLOW

(1) If in Foothills and Basins West ... R034AY230WY – Overflow Foothills and Basins West (Ov)

(2) If in High Plains Southeast ... R034AY326WY – Loamy Overflow High Plains Southeast (LyO)

II. Upland site that does not receive additional moisture

A. Soil depth very shallow, <10" (25cm); shallow, 10-20" (25-50cm); OR moderately deep to deep, >20" (>50cm) and skeletal, >35% coarse fragments by volume in upper 20" (50cm), OR with low Available Water-holding Capacity (AWC) OR a root limiting layer which reacts like shallow soils (VERY LOW to MODERATE productivity potential, 150-1,200 lb/ac)

1 Soils moderately to strongly saline (EC >8mmhos/cm), sodic (SAR >13, EC <4mmhos/cm), or saline-sodic (SAR >13, EC >4mmhos/cm) within 15" (38cm) and dominated by salt tolerant species (i.e. Gardner's saltbush)

i. Soils very shallow; clay loam surface texture, bedrock soft or hard shale bedrock that is typically saline, sodic, or saline- sodic, occurs in upland position on moderate to steep sloping land (5-25% slope); Gardner's saltbush and western wheatgrass common, with VERY LOW productivity potential (<350 lb/ac)
SHALE

a. If in Green River & Great Divide Basin ... R034AY154WY – Shale Green River and Great Divide Basins (Sh)

b. If in Foothills & Basins West ... R034AY254WY – Shale Foothills and Basins West (Sh)

c. If in High Plains Southeast ... R034AY354WY – Shale High Plains Southeast (Sh)

ii. Soils moderately deep or deep and skeletal; surface textures variable; chemistry occurs above or within same horizon as rock fragments; site nearly level and gently sloping. Go to Saline Upland

2 Soils not like 1 above

i. Soils very shallow, <10" (25cm), often on steep (30-60%) slopes with LOW productivity potential (<500 lb/ac)

a. Cobbly, stony, or bouldery loamy sand or sandy loam surface textures over igneous bedrock; black sagebrush, bluebunch wheatgrass common IGNEOUS

1) If in Foothills & Basins West ... R034AY216WY – Igneous Foothills and Basins West (Ig)

b. Variable surface textures; commonly interbedded sandstone, shale, or siltstone, on ridges and simple, steep, slopes (>35%) productivity low (if productivity not low, go to 9b); bluebunch wheatgrass common, a variety of shrub species may be present, commonly with scattered juniper
VERY SHALLOW

1) If in Green River & Great Divide Basins ... R034AY176WY – Very Shallow Green River and Great Divide Basins (VS)

2) If in Foothills & Basins West ... R034AY276WY – Very Shallow Foothills and Basins West (VS)

3) If in High Plains Southeast ... R034AY376WY – Very Shallow High Plains Southeast (VS)

- ii. Soils shallow, 10-20" (25-50cm), but may include soils moderately deep to deep, 20-60" (50-150cm) and skeletal within upper 20" (50cm)
 - a. Soils highly calcareous (violently effervescent, CCE >15%, or secondary carbonates covering rock fragments on all sides) within 6-15" (15-38cm), typically skeletal OR shallow to lithic contact, parent material consisting of soft, calcareous material
 - 1) Shallow and skeletal OR moderately deep to deep and skeletal, highly calcareous (violent effervescence, 15%CCE, or secondary carbonates covering rock fragments on all sides) soils within 6-15" (15- 38cm); typically high amounts of gravels and skeletal at or near the soil surface; black sagebrush dominant shrub SHALLOW LOAMY, CALCAREOUS
 - a) If in Foothills & Basins West ... R034AY263WY – Shallow Loamy Calcareous Foothills and Basins West (SwLyCa)
 - 2) Shallow sandy or loamy soils, 10-20" (25-50cm) to lithic contact, often cobbly or channery with steep, simple slopes >35%, underlain by soft calcareous parent material with outcrops of calcareous sedimentary parent material; true mountain mahogany, bluebunch wheatgrass, Indian ricegrass common ROCKY HILLS
 - a) If in Foothills & Basins West ... R034AY234WY – Rocky Hills Foothills and Basins West (RH)
 - b) If in High Plains Southeast ... R034AY334WY – Rocky Hills High Plains Southeast (RH)
 - b. Soils not like a above
 - 1) Soil is typically skeletal within upper 10" (25%) with high amounts of gravels and/or cobbles up to 10" (25cm) diameter covering 50-75% of the soil surface with gravelly sandy loamy or loam surface textures; strong effervescence may occur below 10" (25cm); occurring on summit and shoulder landform positions with simple, moderately steep to steep slopes 10-45%; bluebunch wheatgrass and winterfat common, Wyoming big sagebrush on leeward slopes GRAVEL
 - a) If in Green River & Great Divide Basins ... R034AY112WY – Gravelly Green River and Great Divide Basins (Gr)
 - b) If in Foothills & Basins West ... R034AY212WY – Gravelly Foothills and Basins West (Gr)
 - c) If in High Plains Southeast ... R034AY312WY – Gravelly High Plains Southeast (Gr)
 - 2) Soils not like 1 above
 - a) Fractured sedimentary bedrock at 10-20" (25-50cm) with outcropping sandstone bedrock and rock fragments on the surface and throughout soil profile; slopes complex1 with very shallow to deep pockets of soil, loamy well- drained soils, commonly on south & west facing slopes (productivity potential higher than Very Shallow site); juniper common with Wyoming big sagebrush and bluebunch wheatgrass SHALLOW BREAKS
 - (1) If in Green River & Great Divide Basin ... R034AY156WY – Shallow Breaks Green River and Great Divide Basins (SwBr)
 - (2) If in Foothills & Basins West ... R034AY256WY – Shallow Breaks Foothills and Basins West (SwBr)
 - (3) If in High Plains Southeast ... R034AY356WY – Shallow Breaks High Plains Southeast (SwBr)
 - b) Soils without high amounts of rock fragments on the soil surface, but may have occasional outcropping bedrock and are shallow to lithic contact or skeletal within 10-20" (25-50cm)
 - (1) Gravelly, cobbly, or very cobbly sandy loam to loam soil surface textures over igneous parent material, typically granite or schist; antelope bitterbrush dominant with black sagebrush and bluebunch wheatgrass common SHALLOW IGNEOUS
 - (a) If in Foothills & Basins West ... R034AY260WY – Shallow Igneous Foothills and Basins West (Swlg)
 - (2) Soils not like 1 above
 - (a) Loamy sand or sandy loam surface textures, at least 5" (13cm) thick, over sandstone that restricts rooting depth; carbonates (strong effervescence) may be present; Indian ricegrass, needleandthread common, Wyoming big sagebrush usually present SHALLOW SANDY

(1) If in Green River & Great Divide Basin ... R034AY166WY – Shallow Sandy Green River and Great Divide Basins (SwSy)

(2) If in Foothills & Basins West ... R034AY266WY – Shallow Sandy Foothills and Basins West (SwSy)

(3) If in High Plains Southeast ... R034AY366WY – Shallow Sandy High Plains Southeast (SwSy)

(b) Soils not like a above

(1) Sandy clay loam, clay loam, or silty clay loam surface textures (>32% clay), at least 5" (13cm) thick, over fractured shale bedrock, winterfat and Wy big sage common east of Continental Divide; OR fine sandy loam, loam, sandy clay loam, or clay loam surface (<32% clay) over a root limiting heavy argillic horizon (35-50% clay) with slow to very slow permeability within upper 20" (50cm), early sagebrush dominant west of Continental Divide SHALLOW CLAYEY

(a) If in Green River & Great Divide Basin ... R034AY158WY – Shallow Clayey Green River and Great Divide Basins (SwCy)

(b) If in Foothills & Basins West ... R034AY258WY – Shallow Clayey Foothills and Basins West (SwCy)

(c) If in High Plains Southeast ... R034AY358WY – Shallow Clayey High Plains Southeast (SwCy)

(2) Fine sandy loam, loam, silt loam, sandy clay loam or light clay loam surface textures (<32% clay) over sedimentary bedrock or skeletal; Wyoming big sagebrush dominant shrub SHALLOW LOAMY

(a) If in Green River & Great Divide Basin ... R034AY162WY – Shallow Loamy Green River and Great Divide Basins (SwLy)

(b) If in Foothills & Basins West ... R034AY262WY – Shallow Loamy Foothills and Basins West (SwLy)

(c) If in High Plains Southeast ... R034AY362WY – Shallow Loamy High Plains Southeast (SwLy)

B. Soil depth moderately deep to deep, 20-60" (50-150cm) with moderate to high AWC and without root limiting layers that inhibit the productivity potential (productivity potential variable)

1 Site affected by significant soil chemistry (strongly alkaline with pH >8.5) within 15" (38cm); typically moderately to strongly saline (EC >8mmhos/cm), sodic (SAR >13, EC <4mmhos/cm), saline-sodic (SAR >13, EC >4mmhos/cm), OR high in calcium carbonates, violently effervescent with CCE >15%; Note: loamy sand and sandy loam surface textures at least 5" (13cm) thick must have SAR >13 within 10" (25cm)

i. Soil saline, sodic, or saline-sodic; may or may not have 5-15%, by weight, gypsum (CaSO₄•2H₂O); may or may not be highly calcareous

a. Clay loam, silty clay, or clay surface textures (>35% clay), sometimes with thin sandy loam cap up to 3" (8cm), that are slightly saline (4-8mmhos/cm), but strongly alkaline (pH >8.5) with 0-15% gypsum, very slow permeability; birdfoot sagebrush dominates (found in Great Divide Basin and 10-14E Foothills and Basins East) IMPERVIOUS CLAY

1) If in Green River and Great Divide Basin ... R034AY118WY – Impervious Clay Green River and Great Divide Basins (IC)

2) If in High Plains Southeast ... R034AY318WY – Impervious Clay High Plains Southeast (IC)

b. Soils not like a. above

1) Surface textures include fine sandy loam, loam, silt loam, and sandy clay loam (<32% clay); sodic or saline-sodic within 10-20" (25-50cm) of the soil surface, could be calcareous throughout, but slightly effervescent at surface and increasing with depth, permeability moderately slow to slow due to excess sodium (Laramie Basin LRU only) SALINE LOAMY

a) If in Laramie Basin ... R034AY336WY – Saline Loamy High Plains Southeast (SnLy)

2) Surface textures include sandy loam, loam, silt loam, sandy clay loam, and clay loam, moderately saline or greater (>8mmhos/cm), or sodic (SAR >13, EC <4mmhos), with 0-15% gypsum; gently sloping (1-10%); Gardner's saltbush, winterfat, bud sagebrush, Indian ricegrass, a

n d bottlebrush squirreltail common; SALINE UPLAND Note: if root limiting layer present, moderate to steep sloping, or productivity potential very low, go to SHALE

a) If in Green River and Great Divide Basin ... R034AY144WY – Saline Upland Green River and Great Divide Basins (SU)

b) If in Foothills and Basins West ... R034AY244WY – Saline Upland Foothills and Basins West (SU)

c) If in High Plains Southeast ... R034AY344WY – Saline Upland High Plains Southeast (SU)

ii. Soil highly calcareous, violently effervescent (>15% CCE) within upper 15" (38cm), but not saline, sodic, saline-sodic or gypsic

a. Soils very fine sandy loams to sandy clay loams with violent effervescence (>15%CCE) within 6-15" (15-38cm) of the soil surface; Wyoming big sagebrush dominant shrub LOAMY CALCAREOUS Note: if conditions found outside GRB or PP LRU, go to Shallow Loamy, Calcareous

1) If in Green River Basin ... DX034A01X126 – Loamy Calcareous Green River Basin (LyCa GRB)

2) If in Pinedale Plateau ... DX034A02X126 – Loamy Calcareous Pinedale Plateau (LyCa PP)

b. Soils very fine sandy loams to sandy clay loams with violent effervescence (>15%CCE) at the soil surface; winterfat dominant shrub with Indian ricegrass and bottlebrush squirreltail common; Note: if conditions found outside PP LRU, make note "site not developed" LIMY

1) If in Pinedale Plateau ... DX034A02X120 – Limy Pinedale Plateau (Li PP)

2 Soils not like 1. above

i. Site with rock fragments on soil surface, >50% cover gravels and cobbles on summit or shoulder landform positions OR stony or bouldery surfaces in glacial till, slopes simple or complex and variable

a. Soil is typically skeletal within upper 10" (25cm) with high amounts of gravels and/or cobbles up to 10" (25cm) diameter covering 50-75% of the soil surface with gravelly sandy loamy or loam surface textures; strong effervescence may occur below 10" (25cm); occurring on summit and shoulder landform positions with simple1, moderately steep to steep slopes, 10-45%; bluebunch wheatgrass and winterfat common, Wy big sage on leeward slope, go to SHALE

b. Sandy loam or loam surface textures with stony or bouldery surface associated with glacial till with complex1, strongly sloping to very steep slopes COARSE UPLAND

1) If in Foothills and Basins West ... R034AY208WY – Coarse Upland Foothills and Basins West (CU)

2) If in High Plains Southeast ... R034AY308WY – Coarse Upland High Plains Southeast (CU)

ii. Site without significant rock fragments on soil surface

a. Soil surface or subsurface textures have high clay content (>32% clay) at least 5" (13cm), slight to severe soil cracking in dry conditions may occur and vertic properties are common

1) Surface texture with high clay content (>40% clay), at least 5" (13cm) thick; severe soil cracking in dry conditions may occur, very sticky when wet; low sage dominant; Note: site not common and typically does not occur with less than 15" (380mm) ppt; for eroded early (alkali) sagebrush dominated sites missing surface layer, see Loamy Argillic. DENSE CLAY

a) If in Foothills and Basins West ... R034AY210WY – Dense Clay Foothills and Basins West (DC)

2) Soil surface not as above

a) Loamy surface textures (<32% clay) over a root limiting argillic subsurface horizon (35-50% clay) starting within 2-15" (5-30cm) depth; strongly contrasting surface and subsurface textures (e.g. sandy loam over heavy clay loam or clay loam over clay); early (alkali) sage dominant. LOAMY ARGILLIC Note: if found outside PP LRU, go to Shallow Clayey

(1) If in Pinedale Plateau ... R034AY124WY – Loamy Calcareous Green River and Great Divide Basins (LyCa)

b) Clay loam surface textures (32-40% clay), at least 5" (13cm) thick; cracking common during dry summer months, though not severe (<40% clay in subsurface); Wyoming big sagebrush dominant with western wheatgrass (green needlegrass east of the Cont. Divide)

CLAYEY

- (1) If in Green River and Great Divide Basin ... R034AY104WY – Clayey Green River and Great Divide Basins (Cy)
- (2) If in Foothills and Basins West ... R034AY204WY – Clayey Foothills and Basins West (Cy)
- (3) If in High Plains Southeast ... R034AY304WY – Clayey High Plains Southeast (Cy)
- (4) If in Pinedale Plateau ... DX034A02X104 – Clayey Pinedale Plateau (Cy PP)

b. Soil surface texture <32% clay at least 5" (13cm) thick, but without strongly contrasting surface and subsurface textures

1) Sand to loamy sand surface texture, at least 5" (13cm) thick, on nearly level to rolling (0-16% slope) uplands or dunes, dark or light colored; basin big sagebrush dominant with needle and thread, Indian ricegrass, and thickspike wheatgrass; spiny hopsage common in 7-9GR zone
SANDS

- a) If in Green River and Great Divide Basin ... R034AY146WY – Sands Green River and Great Divide Basins (Sa)
- b) If in Foothills and Basins West ... R034AY246WY – Sands Foothills and Basins West (Sa)
- c) If in High Plains Southeast ... R034AY346WY – Sands High Plains Southeast (Sa)

2) Soil surface texture not as above

a) Loamy fine sand to fine sandy loam surface texture, at least 5" (13cm) thick, predominantly sandy loam; Wyoming big sagebrush, needle and thread & Indian ricegrass dominant
SANDY

- (1) If in Green River and Great Divide Basin ... R034AY150WY – Sandy Green River and Great Divide Basins (Sy)
- (2) If in Foothills and Basins West ... R034AY250WY – Sandy Foothills and Basins West (Sy)
- (3) If in High Plains Southeast ... R034AY350WY – Sandy High Plains Southeast (Sy)

b) Very fine sandy loam, loam, silt loam, sandy clay loam, or light clay loam surface texture, at least 5" (13cm) thick, predominantly loam or sandy clay loam

(1) Slopes >15% (east of Continental Divide only, if west go to 13b); Wyoming big sagebrush dominant shrub
STEEP LOAMY

(a) If in High Plains Southeast ... R034AY368WY – Steep Loamy High Plains Southeast (SLy)

(2) Slopes <15%; Wy big sagebrush dominant; (Note: if loam surface overlays a heavy argillic layer (>35% clay) within 2-15" (5-30cm) with early (alkali) sagebrush dominant, go to Loamy Argillic)
LOAMY

(a) If in Green River Basin ... DX034A01X122 – Loamy Green River Basin (Ly GRB)

(b) If in Pinedale Plateau ... DX034A02X122 – Loamy Pinedale Plateau (Ly PP)

(c) If in Beaver Rim ... DX034A05X122 – Loamy Beaver Rim (Ly BR)

(d) If in Platte Valley ... DX034A07X122 – Loamy Platte Valley (Ly PV)

(e) If in Green River and Great Divide Basin ... R034AY122WY – Loamy Green River and Great Divide Basins (Ly)

(f) If in Foothills and Basins West ... R034AY222WY – Loamy Foothills and Basins West (Ly)

(g) If in High Plains Southeast ... R034AY322WY – Loamy High Plains Southeast (Ly)

Green River Basin Ecological Site Key 34A

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

- A. Site moderately to strongly saline (>8mmhos/cm) within 20" (50cm) and dominated by salt tolerant species
- 1 Site has a water table within rooting depth of herbaceous species (20-40" (50-100cm)) during most of the growing season ... R034AY142WY – Saline Subirrigated Green River and Great Divide Basins (SS)
 - 2 Site not as above
 - i. Site adjacent to perennial or intermittent streams, receiving some overland flow from adjacent slopes, with moderately good drainage, but water table within 36" (within rooting depth of woody plants, but not herbaceous plants) during most of the growing season ... R034AY138WY – Saline Lowland Green River and Great Divide Basins (SL)
 - ii. Site may receive periodic overflow from adjacent slopes, located in lowland position but water is typically channeled into gullies so that plants are not receiving a lot of benefit from additional moisture ... R034AY140WY – Saline Lowland Drained Green River and Great Divide Basins (SLDr)

B. Site not saline

- 1 Site has fluctuating water table above surface part of growing season (redox features in top 12" (30cm)) ... R034AY178WY – Wetland Green River and Great Divide Basins (WL)
- 2 Site not as above
 - i. Site has a water table within rooting depth of herbaceous species (12-24" (30-60cm)) during most of the growing season ... R034AY174WY – Subirrigated Green River and Great Divide Basins (Sb)
 - ii. Site adjacent to perennial or intermittent streams, with moderate to excessive drainage, and fluctuating water table 24-60" (60-152cm), within 36" (90cm) (rooting depth of woody plants, but not herbaceous plants) during some of the growing season, cottonwood or remnants may be present, (soil texture varies on gravel bars and pockets of bare gravel often present) ... R034AY128WY – Lowland Green River and Great Divide Basins (LL)

II. Soil depth very shallow (<10" (25cm)), shallow (10-20" (25-50cm)) OR moderately deep to deep (>20" (>50cm)), skeletal (>35% coarse fragments by volume in top 20" (50cm)) soils on south and west aspects and/or with a root restricting layer which react like shallow soils (LOW productivity potential)

A. Soils very shallow (<10" (25cm)), but may include areas of exposed bedrock and pockets of deep soil, often on steep (up to 55%) south and west facing slopes with VERY LOW productivity potential

- 1 Bedrock is soft or hard clay shale bedrock that may be saline, occurs in upland position on moderately to steeply sloping land (5-25% slope) ... R034AY154WY – Shale Green River and Great Divide Basins (Sh)
- 2 Bedrock commonly fractured sandstone, shale, or siltstone, commonly on windswept ridges (within 8" (20cm), productivity very low (if productivity is higher and coarse fragments are present, go to II. B. 2. ii) ... R034AY176WY – Very Shallow Green River and Great Divide Basins (VS)

B. Soils shallow (10-20" (25-50cm)), but may include moderately deep to deep (>20" (>50cm)) skeletal soils on south and west aspects, >15% slopes, productivity potential is LOW

- 1 Site without highly calcareous subsoil or bedrock, OR if lime horizon present, accompanied by high volume of coarse fragments at soil surface, slopes variable
 - i. Site occurs along terrace breaks, steep slopes, or terraces with coarse fragments up to 10" diameter covering 50-75% of surface and making up 40-50% volume in top 20" (50cm), may have lime horizon below 12", often westerly aspect and windswept ridges, soils are excessively well drained loamy sands, sandy loams and fine sandy loams ... R034AY112WY – Gravelly Green River and Great Divide Basins (Gr)
 - ii. Fractured sedimentary bedrock at 10-20" (25-50cm) with gravel, cobble, stone, and angular fragments on the surface and throughout soil profile, inclusions of very shallow to deep pockets of soil, loamy well drained soils commonly on south & west facing slopes (productivity potential higher than Very Shallow (VS) site) ... R034AY156WY – Shallow Breaks Green River and Great Divide Basins (SwBr)
- 2 Soils without high amount of coarse fragments at soil surface, but still may be skeletal, have root restricting layer, shallow to bedrock
 - i. Clay loam, or silty clay loam over fractured shale bedrock ... R034AY158WY – Shallow Clayey Green River and Great Divide Basins (SwCy)

- ii. Well drained loamy sand, sandy loams, or fine sandy loams over sedimentary bedrock or calcium carbonate or similar layer that restricts rooting depth ... R034AY166WY – Shallow Sandy Green River and Great Divide Basins (SwSy)
- iii. Well-drained fine sandy loam to silty loams over sedimentary bedrock or loams with root restricting layer (i.e. rock layer and/or similar layer) ... R034AY162WY – Shallow Loamy Green River and Great Divide Basins (SwLy)

III. Soil depth moderately deep to deep (>20" (50cm)) without root restricting layer and is NOT skeletal and/or south or west facing that inhibits the productivity potential

A. Site affected by soil chemistry (salinity, sodicity, and/or calcium carbonates) within the rooting depth of herbaceous plants (Top 20" (50cm))

1 Soils slightly saline to moderately saline or greater (>4mmhos/cm), calcareous or not.

- i. Silty clay and clay surface textures that are only slightly saline (<8mmhos/cm), but strongly alkaline (pH >8.5), permeability very low ... R034AY118WY – Impervious Clay Green River and Great Divide Basins (IC)
- ii. Surface textures range from sandy loam to clay loam, moderately saline or greater (>8mmhos/cm), or sodic (SAR >13, EC <4mmhos) (if root restrictive layer present and productivity very low consider Shale site – Group II) ... R034AY144WY – Saline Upland Green River and Great Divide Basins (SU)

2 Soils highly calcareous (>15% CCE within top 20" (50cm)), but not saline (<4mmhos/cm)

- i. Soils very fine sandy loams to sandy clay loams, with violent effervescence (>15%CCE) between 10" (25cm) and 20" (50cm) of the soil surface ... DX034A01X126 – Loamy Calcareous Green River Basin (LyCa GRB)
- ii. Soils very fine sandy loams to sandy clay loams, violent effervescence (>15%CCE) at the soil surface ... DX034A02X120 – Limy Pinedale Plateau (Li PP)

B. Sites are not affected by soil chemistry

1 Sites with a high volume of coarse fragments in top 20" (>35% by volume). Site occurs along terrace breaks, steep slopes, or terraces with coarse fragments up to 10" diameter covering 50-75% of surface and making up 40-50% volume in top 20" (50cm), may have lime horizon below 12", often westerly aspect and windswept ridges, soils are excessively well drained loamy sands, sandy loams and fine sandy loams (See II. B. 2. i. a)

2 Sites without high volume of coarse fragments

- i. Sandy clay loam, silty clay loam and clay loam surface, soil cracking common during dry summer months, though not severe (>36% clay in subsurface) ... R034AY104WY – Clayey Green River and Great Divide Basins (Cy)
- ii. Site has less 35% or less clay within the upper portion of the profile.
 - a. Soils that are coarse (sand, loamy fine sand to fine sandy loam)
 - 1) Excessively drained soils that are very coarse (loamy sand to sand), on nearly level to rolling uplands or dunes, dark or light colored ... R034AY146WY – Sands Green River and Great Divide Basins (Sa)
 - 2) Soils loamy fine sand to fine sandy loam, (Note: Soils with <6" (15cm) sandy loam surface layer over sandy clay loam or clay loams are excluded, go to III.B.2.ii.c) ... R034AY150WY – Sandy Green River and Great Divide Basins (Sy)
 - b. Soils that are in the Sandy Loam to clay loam range, Slopes >30% productivity potential is high, well-drained site (Note: soils with <6" (15cm) sandy loam surface layer over sandy clay loam or clay loam is included) ... R034AY122WY – Loamy Green River and Great Divide Basins (Ly)

¹ I.B.2.ii.a. Not sure what is fluctuating 24-60"? I suppose its rooting depth of woody plants? You were also consistent with using cm for other measurements, best use that here as well.

² I.B.2.ii.b. Surface texture is used as criteria for b, but not for a. Its hard to get a read on differentiating criteria between the lowland and overflow sites.

address notes above.. Have addressed all comments above and added to the keys to reflect.

³ II. Just a comment on the "and/or" following "south and west aspects". It would be more exact if it just said "and". But if you are saying that sites that are moderately deep to deep, that are present on this warmer aspect, will fall into category II, then maybe that should also be mentioned in the description of III.

Pinedale Plateau Ecological Site Key 34A

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

A. Site moderately to strongly saline (>8mmhos/cm) within 20" (50cm) and dominated by salt tolerant species

1 Site has a water table within rooting depth of herbaceous species (20-40" (50-100cm)) during most of the growing season ... R034AY242WY – Saline Subirrigated Foothills and Basins West (SS)

2 Site not as above

i. Site adjacent to perennial or intermittent streams, receiving some overland flow from adjacent slopes, with moderately good drainage, but water table within 36" (within rooting depth of woody plants, but not herbaceous plants) during most of the growing season ... R034AY238WY – Saline Lowland Foothills and Basins West (SL)

ii. Site may receive periodic overflow from adjacent slopes, located in lowland position but water is typically channeled into gullies so that plants are not receiving a lot of benefit from additional moisture ... R034AY240WY – Saline Lowland Drained Foothills and Basins West (SLDr)

B. Site not saline

1 Site has fluctuating water table above surface part of growing season (redox features in top 12" (30cm)) ... R034AY278WY – Wetland Foothills and Basins West (WL)

2 Site not as above

i. Site has a water table within rooting depth of herbaceous species (12-24" (30-60cm)) during most of the growing season ... R034AY274WY – Subirrigated Foothills and Basins West (Sb)

ii. Site not as above

a. Site adjacent to perennial or intermittent streams, with moderate to excessive drainage, and fluctuating water table 24-60"(60-152cm), within 36"(90cm) (rooting depth of woody plants, but not herbaceous plants) during some of the growing season, cottonwood or remnants may be present, (soil texture varies on gravel bars and pockets of bare gravel often present) ... R034AY228WY – Lowland Foothills and Basins West (LL)

b. Site drier than above, more likely on intermittent drainage without gravel bars and high water table during growing season

1) Surface textures range from sandy loam to light silty clay loam (if redox features are present they are below 40" (100cm)) ... R034AY230WY – Overflow Foothills and Basins West (Ov)

2) Site similar to above with heavier textured soils (clay loam, silty clay loam, and silty clay) (if redox features are present they are below 40" (100cm)) ... R034AY206WY – Clayey Overflow Foothills and Basins West (CyO)

II. Soil depth very shallow (<10" (25cm)), shallow (10-20" (25-50cm)) OR moderately deep to deep (>20" (>50cm), skeletal (>35% coarse fragments by volume in top 20" (50cm")) soils on south and west aspects and/or with a root restricting layer which react like shallow soils (LOW productivity potential)

A. Soils very shallow(<10" (25cm)), but may include areas of exposed bedrock and pockets of deep soil, often on steep (up to 55%) south and west facing slopes with VERY LOW productivity potential

1 Bedrock is soft or hard clay shale bedrock that may be saline, occurs in upland position on moderately to steeply sloping land (5-25% slope) ... R034AY254WY – Shale Foothills and Basins West (Sh)

2 Bedrock commonly fractured sandstone, shale, or siltstone, commonly on windswept ridges (within 8" (20cm), productivity very low (if productivity is higher and coarse fragments are present, go to II. B. 2. ii) ... R034AY276WY – Very Shallow Foothills and Basins West (VS)

B. Soils shallow (10-20" (25-50cm)), but may include moderately deep to deep (>20" (>50cm)) skeletal soils on south and west aspects, >15% slopes, productivity potential is LOW

1 Site with a highly calcareous subsoil (<10" (25cm)), often gravelly or skeletal subsoil OR underlain by soft calcareous materials and slopes >15%

- i. Shallow sandy and loamy soils (10-20" (25-50cm)), often cobbly or channery with slopes >35%, underlain by soft calcareous materials with many outcrops of sedimentary rock (often associated with Limestone parent material) ... R034AY234WY – Rocky Hills Foothills and Basins West (RH)
- ii. Moderately deep to deep soil (>20" (50cm)) with highly calcareous (violent effervescence (>15%CCE)) subsoil at <10" (25cm), often gravelly or skeletal and on 15 to 35% slopes, (compare with II. B. 2. i. a) ... R034AY263WY – Shallow Loamy Calcareous Foothills and Basins West (SwLyCa)

2 Site without highly calcareous subsoil or bedrock, OR if lime horizon present, accompanied by high volume of coarse fragments at soil surface, slopes variable

- i. Soil is skeletal with coarse fragments common on surface and throughout profile (>35% by volume in top 20" (50cm))
 - a. Site occurs along terrace breaks, steep slopes, or terraces with coarse fragments up to 10" diameter covering 50-75% of surface and making up 40-50% volume in top 20" (50cm), may have lime horizon below 12", often westerly aspect and windswept ridges, soils are excessively well drained loamy sands, sandy loams and fine sandy loams ... R034AY212WY – Gravelly Foothills and Basins West (Gr)
 - b. Fractured sedimentary bedrock at 10-20" (25-50cm) with cobble, stone, and angular fragments on the surface and throughout soil profile, inclusions of very shallow to deep pockets of soil, loamy well drained soils commonly on south & west facing slopes (productivity potential higher than Very Shallow (VS) site) ... R034AY256WY – Shallow Breaks Foothills and Basins West (SwBr)
- ii. Soils without high amount of coarse fragments at soil surface, but still may be skeletal, have root restricting layer, shallow to bedrock
 - a. Root restricting (7-15" 18-30cm) clay loam to clay subsoil layer (>40% clay) with sharply contrasting loam to clay loam surface textures, soil may develop large cracks when dry ... DX034A02X124 – Loamy Argillic Pinedale Plateau (LyA PP)
 - b. Well drained loamy sand, sandy loams, or fine sandy loams over sedimentary bedrock or calcium carbonate or similar layer that restricts rooting depth ... R034AY266WY – Shallow Sandy Foothills and Basins West (SwSy)
 - c. Well-drained fine sandy loam to silty loams over sedimentary bedrock or loams with root restricting layer (i.e. rock layer and/or similar layer) ... R034AY262WY – Shallow Loamy Foothills and Basins West (SwLy)

III. Soil depth moderately deep to deep (>20" (50cm)) without root restricting layer and is NOT skeletal and/or south or west facing that inhibits the productivity potential

A. Site affected by soil chemistry (salinity, sodicity, and/or calcium carbonates) within the rooting depth of herbaceous plants (Top 20" (50cm))

1 Soils slightly saline to moderately saline or greater (>4mmhos/cm), calcareous or not. Surface textures range from sandy loam to clay loam, moderately saline or greater (>8mmhos/cm), or sodic (SAR >13, EC <4mmhos) (if root restrictive layer present and productivity very low consider Shale site – Group II) ... R034AY244WY – Saline Upland Foothills and Basins West (SU)

2 Soils highly calcareous (>15% CCE within top 20" (50cm)), but not saline (<4mmhos/cm)

- i. Soils very fine sandy loams to sandy clay loams, with violent effervescence (>15%CCE) between 10" (25cm) and 20" (50cm) of the soil surface ... DX034A02X126 – Loamy Calcareous Pinedale Plateau (LyCa PP)
- ii. Soils very fine sandy loams to sandy clay loams, violent effervescence (>15%CCE) at the soil surface ... DX034A02X120 – Limy Pinedale Plateau (Li PP)

B. Sites are not affected by soil chemistry

1 Sites with a high volume of coarse fragments in top 20" (>35% by volume). Site occurs along terrace

breaks, steep slopes, or terraces with coarse fragments up to 10" diameter covering 50-75% of surface and making up 40-50% volume in top 20" (50cm), may have lime horizon below 12", often westerly aspect and windswept ridges, soils are excessively well drained loamy sands, sandy loams and fine sandy loams (See II. B. 2. i. a) ... DX034A02X112 – Gravelly Pinedale Plateau (Gr PP)

2 Sites without high volume of coarse fragments

i. Sandy clay loam, silty clay loam and clay loam surface, soil cracking common during dry summer months, though not severe (>36% clay in subsurface) ... DX034A02X104 – Clayey Pinedale Plateau (Cy PP)

ii. Sites not as above

a. Excessively drained soils that are very coarse (loamy sand to sand), on nearly level to rolling uplands or dunes, dark or light colored ... R034AY246WY – Sands Foothills and Basins West (Sa)

b. Soil textures range from loamy fine sand to clay loam

1) Soils loamy fine sand to fine sandy loam, (Note: Soils with <6" (15cm) sandy loam surface layer over sandy clay loam or clay loams are excluded, go to III.B.2.ii.b.2) ... DX034A02X150 – Sandy Pinedale Plateau (Sy PP)

2) Slopes <30%, productivity potential is high, well-drained site (Note: soils with <6" (15cm) sandy loam surface layer over sandy clay loam or clay loam is included) ... DX034A02X122 – Loamy Pinedale Plateau (Ly PP)

Beaver Rim Divide

I. Precipitation is 10-14 inches; site has no water table or receives run-in moisture; family particle size is fine-loamy; surface texture is loam, clay loam, sandy clay loam or gravelly loam ... DX034A05X122 – Loamy Beaver Rim (Ly BR)

II. Site not as above ... Key 9 – Foothills and Basins West

Platte Valley

I. Precipitation is 10-14 inches; site has no water table or receives run-in moisture; family particle size is fine-loamy; surface texture is loam, clay loam, sandy clay loam or gravelly loam ... DX034A07X122 – Loamy Platte Valley (Ly PV)

II. Site not as above ... Key 9 – Foothills and Basins West

Foothills and Basins West

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, Gardner's saltbush, alkali sacaton, alkali muhly)

1 Water table within rooting depth of herbaceous species (20-40") during some or most of the growing season, dominated by grasses such as saltgrass, wiregrass, alkali sacaton, alkali muhly, sandberg bluegrass, Nuttall's alkaligrass (typically no shrubs present) ... R034AY242WY – Saline Subirrigated Foothills and Basins West (SS)

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 greasewood, inland saltgrass, Nuttall's alkaligrass, basin wildrye, western wheatgrass ... R034AY238WY – Saline Lowland Foothills and Basins West (SL)

ii. Site may receive periodic overflow from adjacent slopes, may be in a lowland position but water is typically channeled into gullies or alkali flats so that plants are not receiving a lot of benefit from additional moisture, greasewood, Gardner's saltbush, alkali sacaton, squirreltail, Indian ricegrass and sandberg bluegrass ... R034AY240WY – Saline Lowland Drained Foothills and Basins West (SLDr)

B. Sites that are not saline and/or alkaline

1 Site poorly drained with water table above surface part of growing season, Nebraska sedge, water sedge, northern reedgrass, tufted hairgrass, and willows, common species ... R034AY278WY – Wetland Foothills and Basins West (WL)

2 Site not as above

i. Water table within rooting depth of herbaceous species (typically above 20") during part of the growing season, tufted hairgrass, shrubby cinquefoil, inland sedge, Nebraska sedge, western wheatgrass, rushes, and willows ... R034AY274WY – Subirrigated Foothills and Basins West (Sb)

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; gravel bars and pockets of bare gravel often present,) cottonwoods or remnants thereof may be present, silver buffaloberry, slender wheatgrass, woods rose and other woody species common ... R034AY228WY – Lowland Foothills and Basins West (LL)

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, basin wildrye, western wheatgrass and/or Sandberg Bluegrass common ... R034AY230WY – Overflow Foothills and Basins West (Ov)

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 western wheatgrass and other plants basin wildrye, sandberg bluegrass and muttongrass ... R034AY206WY – Clayey Overflow Foothills and Basins West (CyO)

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

A. Soil depth very shallow (<10"), shallow (10-20") OR moderately deep to deep (>20") reacting like shallow soils due to root restrictive layer or on south and west facing slopes (LOW productivity potential)

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

i. Bedrock igneous or volcanic, black sage, bluebunch wheatgrass, sandberg bluegrass, squirreltail are common plants ... R034AY216WY – Igneous Foothills and Basins West (Ig)

ii. Bedrock not igneous or volcanic

a. Soils are saline and/alkaline; bedrock is soft or hard clay shale bedrock that may be saline and/or alkaline in various degrees, Gardner's saltbush, winterfat, sandberg bluegrass, squirreltail, Indian ricegrass and western wheatgrass are common species, productivity very low ... R034AY254WY – Shale Foothills and Basins West (Sh)

b. Site not as above, commonly on windswept ridges, fractured bedrock of various types, common plants are bluebunch wheatgrass, Indian ricegrass, squirreltail and occasionally Utah Juniper productivity very low (if productivity is high and coarse fragments are present, go to #7) ... R034AY276WY – Very Shallow Foothills and Basins West (VS)

2 Soils shallow (10-20"), but may include moderately deep to deep gravelly or cobbly soils, soils with a root restrictive layer, and/or south and west facing slopes that react like shallow soils (see Group III (II. B. for acting shallow soils)

i. Soils are saline and/alkaline; bedrock is soft or hard clay shale bedrock that may be saline and/or alkaline in various degrees, Gardner's saltbush, winterfat, sandberg bluegrass, squirreltail, Indian ricegrass and western wheatgrass are common species, productivity very low ... R034AY254WY – Shale Foothills and Basins West (Sh)

ii. Soil not as above

a. Site with a highly calcareous subsoil OR underlain by soft calcareous materials

1) Soil <20" in depth to limestone, dolomite or calcareous sandstone; common plants are black sagebrush, and bluebunch wheatgrass and Junegrass ... R034AY263WY – Shallow Loamy Calcareous Foothills and Basins West (SwLyCa)

2) Shallow soil (10-20") usually bedrock is soft sandstones (ESD) but mapped on dolomite (Sublette) with many rock outcrops, Mountain Mahogany, Indian ricegrass, and bluebunch wheatgrass are common ... R034AY234WY – Rocky Hills Foothills and Basins West (RH)

b. High volume (>35%) of rock fragments & possible a calcic horizon

1) Rock fragments common on surface and throughout profile (>35% by volume in top 20")

a) Site occurs along terrace breaks, steep slopes, or stream terraces with coarse fragments up to 10" diameter covering 50-75% of surface and making up 40-50% volume in top 20", may have calcic horizon below 10" bluebunch wheatgrass and variety of woody plants (fringed sagebrush and if calcic – black sagebrush) may be present ... R034AY208WY – Coarse Upland Foothills and Basins West (CU)

b) Fractured sedimentary bedrock at 10-20" with gravel, cobble, stone, and angular fragments on the surface and throughout soil profile, inclusions of very shallow to deep pockets of soil, commonly on south and west facing slopes, Utah juniper, Indian ricegrass, Limber pine replaces Utah juniper in Sublette county ... R034AY256WY – Shallow Breaks Foothills and Basins West (SwBr)

2) Soils without high amount (<35%) of rock fragments

a) Medium to fine textured soils over igneous or volcanic bedrock, black sage or maybe bitterbrush common shrubs, bluebunch wheatgrass, Indian ricegrass, and letterman's needlegrass ... R034AY260WY – Shallow Igneous Foothills and Basins West (Swlg)

b) Soils not as above

(1) Coarse-loamy or fine sandy loams soils over sandstone or sandy shale

(a) Coarse textured soils over sandstone; , inclusions of very shallow to deep pockets of soil, commonly on south and west facing slopes, Utah juniper, Indian ricegrass, Limber pine replaces Utah juniper in Sublette county ... R034AY256WY – Shallow Breaks Foothills and Basins West (SwBr)

(b) Fine sandy loams or coarser textured soils over sandstone or sandy shale, Wyoming big Sage, Indian ricegrass, and needleandthread ... R034AY266WY – Shallow Sandy Foothills and Basins West (SwSy)

(2) Soils not as above

(a) Silty clays or heavier textured soils; soil may develop large cracks when dry, early sage, winterfat, and bluebunch wheatgrass, muttongrass, and western wheatgrass ... R034AY258WY – Shallow Clayey Foothills and Basins West (SwCy)

(b) Very fine sandy loams to clay loam textured soils over various bedrock types (commonly limestone, siltstone, or shale), Wyoming big sage intermixed with early/low sage, bluebunch wheatgrass, Indian ricegrass and squirreltail ... R034AY262WY – Shallow Loamy Foothills and Basins West (SwLy)

B. Soil depth moderately deep to deep (>20") without root restricting layer that inhibits the productivity potential

1 Sites that are saline and/or alkaline

i. Gardner's saltbush, winterfat, Indian ricegrass, and squirreltail common (if root restrictive layer <20" depth is present and productivity very low consider Shale site) ... R034AY244WY – Saline Upland

Foothills and Basins West (SU)

ii. Alluvial flats and alluvial drains that may receive periodic overflow from adjacent slopes, but water table is deeper than 6'; greasewood, Gardner's saltbush, squirreltail and Indian ricegrass ...

R034AY240WY – Saline Lowland Drained Foothills and Basins West (SLDr)

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, steep slopes or along stream terraces with rock 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 ...

R034AY212WY – Gravelly Foothills and Basins West (Gr)

b. Site occurs in a variety of upland positions, boulders found in abundance on surface, at least 35% volume of coarse fragments in top 20", generally increasing with depth, (loamy-skeletal soils from glacial till) bluebunch wheatgrass, bitterbrush, and Wyoming big sage common, productivity high ...

R034AY208WY – Coarse Upland Foothills and Basins West (CU)

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, Wyoming big sagebrush common, but sparse, with a lot of western wheatgrass ... R034AY204WY – Clayey Foothills and Basins West (Cy)

2) Heavy clay soils (silty clays or clays), low or early sage common

a) Root restricting clay subsoil layer (silty clays or heavier textured soils) with coarse to fine textures above, soil may develop large cracks when dry, early sage, Indian ricegrass, western wheatgrass, muttongrass, and if in Sublette county letterman's needlegress ...

R034AY258WY – Shallow Clayey Foothills and Basins West (SwCy)

b) Heavy clay soils with severe soil cracking in dry conditions, very sticky when wet, (slick spot), low sage squirreltail and muttongrass ... R034AY210WY – Dense Clay Foothills and Basins West (DC)

b. Soil textures not as above

1) Soil textures are very coarse (loamy sand to sand), sometimes as dunes, dark or light colored, needleandthread, Indian ricegrass, thickspike wheatgrass and basin big sagebrush ...

R034AY246WY – Sands Foothills and Basins West (Sa)

2) Soil textures range from very fine sandy loam to clay loam

a) Soils fine sandy loams to loamy sands, needleandthread and Indian ricegrass are dominant species

(1) Productivity potential is low and restrictive feature (calcic, rock layer or both) within 20" of surface of the soil or sandy-skeletal; and common plant species Indian ricegrass, Wyoming big sagebrush and needleandthread ... R034AY266WY – Shallow Sandy Foothills and Basins West (SwSy)

(2) Productivity potential is high; common plant species are: Wyoming big sagebrush, needleandthread and Indian ricegrass are dominant species ... R034AY250WY – Sandy Foothills and Basins West (Sy)

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

(1) Moderately deep to deep soil (>20") with calcic layer with high calcareous content – white color (violent effervescence) subsoil <20" in depth, maybe skeletal - black sage, Indian ricegrass, squirreltail and bluebunch wheatgrass are common plants species ... R034AY263WY – Shallow Loamy Calcareous Foothills and Basins West (SwLyCa)

(2) Soils not as above

(a) Root restricting clay subsoil layer with coarse to fine textures above, soil may

develop large cracks when dry, early sage, Indian ricegrass, sandberg bluegrass and in Sublette – letterman's needlegrass ... R034AY258WY – Shallow Clayey Foothills and Basins West (SwCy)

(b) Soil not as above

(1) Productivity is low, acting shallow soil with restrictive features (rock layer, calcic or both with 20" of surface) or loamy-skeletal has Wyoming Big Sage intermixed with early/low sagebrush, Indian ricegrass, sandberg bluegrass and mock goldenweed ... R034AY262WY – Shallow Loamy Foothills and Basins West (SwLy)

(2) Productivity potential is high when have a sandy loam surface and fine-loamy soil; common plants; Wyoming big sage, Indian ricegrass, needleandthread, and Sandberg bluegrass. Common plants without sandy loam surface and lower productivity than sandy surface version– Wyoming big sagebrush, Junegrass, sulphur buckwheat, Indian ricegrass, sandberg bluegrass, and thickspike wheatgrass ... R034AY222WY – Loamy Foothills and Basins West (Ly)

High Plains Southeast

I. Site in a lowland position (bottom) that receives significant additional moisture from runoff of adjacent slopes or 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)

1 Site is somewhat poorly drained with moderately saline and/or alkaline water table within rooting depth of herbaceous species (20-40") during most of the growing season, dominated by grasses such as alkali sacaton, basin wildrye, alkali/sandberg bluegrass, (typically no shrubs present) ... R034AY342WY – Saline Subirrigated High Plains Southeast (SS)

2 Site not as above

i. Site is usually on gently sloping land along perennial or intermittent streams with moderately good drainage and moderately saline and/or alkaline water table >3' (within rooting depth of woody plants, but not within rooting depth of herbaceous plants), dominated by alkali sacaton, basin wildrye, western wheatgrass, greasewood, inland saltgrass, (no big sage on this site) ... R034AY338WY – Saline Lowland High Plains Southeast (SL)

ii. Site may receive periodic overflow from adjacent slopes, may be in a lowland position but water is 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 sage (Basin and/or Wyoming) may be present ... R034AY336WY – Saline Loamy High Plains Southeast (SnLy)

B. Sites that are not saline and/or alkaline

1 Site poorly drained with fluctuating water table above surface part of growing season, Nebraska sedge, northern reedgrass, tufted hairgrass, and willows ... R034AY378WY – Wetland High Plains Southeast (WL)

2 Site not as above

i. Site is somewhat poorly drained with water tables within rooting depth of herbaceous species (2-3 feet) during most of the growing season, basin wildrye, tufted hairgrass, western wheatgrass, slender wheatgrass, shrubby cinquefoil, some sedges, rushes, and willows may be present ... R034AY374WY – Subirrigated High Plains Southeast (Sb)

ii. Site not as above

a. Site is usually on gently sloping land along perennial or intermittent streams. Site is moderately good drainage water table within rooting depth of woody plants (>3 feet), but not within rooting depth of herbaceous plants during most of the growing season, cottonwoods or remnants thereof may be present, (gravel bars and pockets of bare gravel often present, basin wildrye, needleandthread,

western wheatgrass, woods rose and other woody species ... R034AY328WY – Lowland High Plains Southeast (LL)

b. Site not as above

1) Surface textures range from sandy loam to light silty clay loam. Site receives more than normal moisture from overflow of intermittent streams running from adjacent slopes, but without a water table within rooting depth of woody plants, basin big sagebrush, silver sage, slender wheatgrass, western wheatgrass, and/or canby/sandberg bluegrass common ... R034AY326WY – Loamy Overflow High Plains Southeast (LyO)

2) Site similar to above with heavy textured soils (well-drained clay loams, silty clay loams and silty clays), Site occurs on gently sloping lands along intermittent streams and draws. Heavy presence of western wheatgrass, slender wheatgrass, basin wildrye ... R034AY306WY – Clayey Overflow High Plains Southeast (CyO)

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

A. Soil depth very shallow (<10”), shallow (10-20”) OR moderately deep to deep (>20”) reacting like shallow soils due to root restrictive layer (ex. heavy calcic (~30%+), heavy argillic, and/or rocks) or on south and west facing slopes (LOW productivity potential)

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

i. Bedrock igneous or volcanic, black sage may be present (Igneous not currently in 10-14 SE ESD Legend)

ii. Bedrock not igneous or volcanic

a. Bedrock is soft or hard clay shale bedrock that may be saline and/or alkaline in various degrees, occurs in upland position on moderately to steeply sloping land. Gardner’s saltbush, western cheatgrass, is common, productivity very low ... R034AY354WY – Shale High Plains Southeast (Sh)

b. Site not as above, commonly on windswept ridges, fractured bedrock of various types, and Juniper occasionally found on at higher elevations, common plants bluebunch wheatgrass, squirreltail, western wheatgrass, may have shrubs present (black sage, big sage) productivity very low (if productivity is high and coarse fragments are present, go to Gravelly) ... R034AY376WY – Very Shallow High Plains Southeast (VS)

2 Soils shallow (10-20”), but may include moderately deep to deep gravelly or cobbly soils, soils with a root restrictive layer, and/or south and west facing slopes that react like shallow soils, productivity potential is LOW

i. Site with a highly calcareous subsoil OR underlain by soft calcareous materials

a. Moderately deep to deep soil (>20”) with highly calcareous (violent effervescence) subsoil at 10 to 20”, black sagebrush common shrub species. (Shallow Loamy, Calcareous not currently in 10-14 SE ESD Legend)

b. Shallow sandy and loamy soils (10-20”) underlain by soft calcareous materials with many outcrops of sedimentary rock, mountain mahogany, bluebunch wheatgrass needleandthread, and western wheatgrass common ... R034AY334WY – Rocky Hills High Plains Southeast (RH)

ii. Site without calcareous subsoil or bedrock, OR if lime horizon present, accompanied by high volume of coarse fragments

a. Coarse fragments common on surface and throughout profile (>35% by volume in top 20”)

1) Site occurs along terrace breaks, steep slopes, or stream terraces 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”, soils are excessively well drained loamy sands, sandy loams and fine sandy loams, common plants are bluebunch wheatgrass, Indian ricegrass, needleandthread with a variety of woody plants may be present, productivity potential VERY LOW ... R034AY312WY – Gravelly High Plains Southeast (Gr)

2) Fractured sedimentary bedrock at 10-20” with gravel, cobble, stone, and angular fragments on the surface and throughout soil profile, inclusions of very shallow to deep pockets of soil, loamy well drained soils commonly on south & west facing slopes, juniper common with bluebunch

wheatgrass, needleandthread, squirreltail (productivity potential higher than Very Shallow (VS) site) ... R034AY356WY – Shallow Breaks High Plains Southeast (SwBr)

b. Soils without high amount of coarse fragments

1) Medium to fine textured soils over igneous or volcanic bedrock, bitterbrush common (Shallow Igneous not currently in 10-14 SE ESD Legend)

2) Soils not as above

a) Well drained sandy clay loams, clay loams or silty clay loams or heavier textured soils OR root restricting clay subsoil layer with coarse to fine textures above, soil may develop large cracks when dry, winterfat dominant with western wheatgrass, Bluebunch wheatgrass and squirreltail ... R034AY358WY – Shallow Clayey High Plains Southeast (SwCy)

b) Soils not as above

(1) Well drained loamy sand, sandy loams, or fine sandy loams over sedimentary bedrock or calcium carbonate or similar layer that restricts rooting depth; common plant Indian ricegrass, threadleaf sedge, & needleandthread with fringed sagebrush, stemless mock goldenweed and/or Wyoming big sage ... R034AY366WY – Shallow Sandy High Plains Southeast (SwSy)

(2) Well-drained fine sandy loam and silty loams over sedimentary bedrock or loams with root restricting layer (calcium carbonate, rock layer and/or similar layer); with Wyoming big sagebrush or possibly Wyoming big sage intermixed with low sage/early sagebrush, dominant grasses are bluebunch wheatgrass, western wheatgrass, and sandberg bluegrass; a good mixed of different grass species ... R034AY362WY – Shallow Loamy High Plains Southeast (SwLy)

B. Soil depth moderately deep to deep (>20") without root restricting layer that inhibits the productivity potential

1 Sites that are saline and/or alkaline

i. Permeability is moderately slow to slow due to excess sodium in the substratum. Depth to horizons with excessive amounts of sodium and strongly alkaline reactions ranges from 10 to 20" . These horizons restrict deep root penetration by all but alkali-tolerant species. These soils are typically calcareous throughout and have salts which, although low at the surface and upper subsoil, increase with depth. Common grasses are western wheatgrass, bluebunch ... R034AY336WY – Saline Loamy High Plains Southeast (SnLy)

ii. Gardner's saltbush, winterfat, bud sage common with western wheatgrass, Indian ricegrass, squirreltail common grass species(if root restrictive layer present and productivity very low consider Shale site ... R034AY344WY – Saline Upland High Plains Southeast (SU)

iii. Site may receive periodic overflow from adjacent slopes, may be in a lowland position but water is 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 sage (Basin and/or Wyoming) may be present (Saline Lowland Drained not currently in 10-14 SE ESD Legend)

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, steep slopes, or stream terraces 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", soils are excessively well drained loamy sands, sandy loams and fine sandy loams, common plants are bluebunch wheatgrass, Indian ricegrass, needleandthread with a variety of woody plants may be present, productivity potential VERY LOW ... R034AY312WY – Gravelly High Plains Southeast (Gr)

b. Site occurs in a variety of upland positions, soils are well drained very sandy loam, loam, silt loam, and clay loam with 35% or more coarse fragments (gravel, cobble, stone, and flagstone) within 8" of the surface and generally increasing with depth, bluebunch wheatgrass, little bluestem, bitterbrush, and black sagebrush, productivity high ... R034AY308WY – Coarse Upland High Plains Southeast (CU)

ii. Sites without high volume of coarse fragments

- a. Soil textures are heavy, slight to severe soil cracking in dry conditions
- 1) Well drained sandy clay loam, silty clay loam and clay loams soil cracking common during dry summer months, though not severe, birdfoot sagebrush common, but sparse, with a lot of western wheatgrass, green needlegrass ... R034AY304WY – Clayey High Plains Southeast (Cy)
 - 2) Heavy clay soils (silty clays or clays), low or early sage common
 - a) Well drained sandy clay loams, clay loams or silty clay loams or heavier textured soils OR root restricting clay subsoil layer with coarse to fine textures above, soil may develop large cracks when dry, winterfat dominant with western wheatgrass, bluebunch wheatgrass and squirreltail ... R034AY358WY – Shallow Clayey High Plains Southeast (SwCy)
 - b) Heavy clay soils with severe soil cracking in dry conditions, very sticky when wet, (slick spot), western wheatgrass, squirreltail, low sagebrush ... R034AY310WY – Dense Clay High Plains Southeast (DC)
 - c) These clay soils have a high alkaline reaction from the surface down. Some salinity may be present. Permeability is very low. Common grasses are western wheatgrass, squirreltail, Indian ricegrass with shrubs being birdfoot sagebrush and gardener's saltbush ... R034AY318WY – Impervious Clay High Plains Southeast (IC)
- b. Soil textures not as above
- 1) Excessively drained soils that are very coarse (loamy sand to sand), on nearly level to rolling uplands or dunes, dark or light colored, needleandthread Indian ricegrass, and thickspike wheatgrass are dominant species, basin big sagebrush/Wyoming big sagebrush may occur ... R034AY346WY – Sands High Plains Southeast (Sa)
 - 2) Soil textures range from very fine sandy loam to clay loam
 - a) Soils fine sandy loam, sandy loam, and loamy sand, needleandthread & Indian ricegrass are dominant
 - (1) Productivity potential is low; well drained loamy sand, sandy loams, or fine sandy loams with root restricting layer (calcium carbonate, rock layer and/or similar layer); common plants are Indian ricegrass, threadleaf sedge, needleandthread, with fringed sagebrush, stemless mock goldenweed and/or Wyoming big sagebrush ... R034AY366WY – Shallow Sandy High Plains Southeast (SwSy)
 - (2) Productivity potential is high; well drained loamy fine sand, sandy loam, or fine sandy loam. Soils with fine sandy loam surface (<6") thick with loam or clay loam subsoils are excluded (if excluded subsoils are present consider Loamy site, Group III, 12). needleandthread, Indian ricegrass, threadleaf sedge, and thickspike wheatgrass, with Wyoming big sagebrush and spineless horsebrush are dominant ... R034AY350WY – Sandy High Plains Southeast (Sy)
 - b) Soils very fine sandy loams to clay loams, a good variety and even mix of grass species
 - (1) Productivity potential is low; well-drained fine sandy loam & silty loams with root restricting layer (calcium carbonate, rock layer and/or similar layer);with Wyoming big sage or possibly Wyoming big sage intermixed with low sage/early sage, dominant grasses bluebunch wheatgrass, western wheatgrass, and sandberg bluegrass; a good mixed of different grass species ... R034AY362WY – Shallow Loamy High Plains Southeast (SwLy)
 - (2) Productivity potential is high, well-drained with very fine sandy loam, loam or silt loam surfaces. Soils with fine sandy loam surface layers, (<6" thick), and loam or clay loam subsoils are included. Wyoming big sagebrush is dominant with western wheatgrass, sandberg bluegrass, Junegrass, Bluebunch wheatgrass, and needleandthread ... R034AY322WY – Loamy High Plains Southeast (Ly)
 - (3) Well-drained soil with very fine sandy loam, loam, and silt loam with >15% slopes; common grasses are western wheatgrass, bluebunch wheatgrass, needleandthread, sandberg bluegrass, and shrubs Wyoming big sagebrush, and/or black sagebrush ... R034AY368WY – Steep Loamy High Plains Southeast (SLy)

Green River and Great Divide Basins Archived

- 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 (20-40") during some or most of the growing season, dominated by grasses such as alkali sacaton, alkali muhly, alkali bluegrass, saltgrass, wiregrass (typically no shrubs present) ... R034AY142WY – Saline Subirrigated Green River and Great Divide Basins (SS)
 - 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 greasewood, inland saltgrass, basin wildrye (no big sage on this site) ... R034AY138WY – Saline Lowland Green River and Great Divide Basins (SL)
 - ii. Site may receive periodic overflow from adjacent slopes, may be in a lowland position but water is typically channeled into gullies so that plants are not receiving a lot of benefit from additional moisture, greasewood and Gardner's saltbush common species, grey molly, seepweed ... R034AY140WY – Saline Lowland Drained Green River and Great Divide Basins (SLDr)
- B. Sites that are not saline and/or alkaline
- 1 Site poorly drained with water table above surface part of growing season, Nebraska sedge, tufted hairgrass, water sedge, and willows common species ... R034AY178WY – Wetland Green River and Great Divide Basins (WL)
 - 2 Site not as above
 - i. Sites with a water table
 - a. Water table within rooting depth of herbaceous species (typically above 20") during part of the growing season, tufted hairgrass, some sedges, rushes, and willows may be present ... R034AY174WY – Subirrigated Green River and Great Divide Basins (Sb)
 - b. 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, Cottonwoods, rhizomatous wheatgrass, and other woody species ... R034AY128WY – Lowland Green River and Great Divide Basins (LL)
 - ii. Sites without a water table within rooting depth of woody plants receives extra intermittent water from periodic overflow from adjacent slopes; common plants basin big sagebrush, rubber rabbitbrush, Basin Wildrye, and sandberg bluegrass ... R034AY230WY – Overflow Foothills and Basins West (Ov)
- II. Upland site that does not receive additional moisture as above
- A. Soil depth very shallow (<10"), shallow (10-20") OR moderately deep to deep (>20") reacting like shallow soils due to root restrictive layer or on south and west facing slopes (LOW productivity potential)
- 1 Soils very shallow (<10"), but may include areas of exposed bedrock and pockets of deep soil, often on steep (up to 55%) south and west facing slopes with VERY LOW productivity potential
 - i. Soils are very fine textured and have a high concentration of exchangeable sodium throughout the profile, birdfoot sage and sandberg bluegrass ... R034AY118WY – Impervious Clay Green River and Great Divide Basins (IC)
 - ii. Site not as above
 - a. Site found in uplands, slopes typically 5-25%, with outcrops of clay shale bedrock that may be saline and/or alkaline in various degrees, gardeners saltbush, squirreltail, Indian ricegrass ... R034AY154WY – Shale Green River and Great Divide Basins (Sh)
 - b. Site not as above, upland with steep slopes (25-50%), commonly on windswept ridges, fractured bedrock of various types, soil depth <10" in depth; bluebunch wheatgrass, Indian ricegrass and

variety of woody shrubs (if rock fragments are present, gravelly) ... R034AY176WY – Very Shallow Green River and Great Divide Basins (VS)

2 Soils shallow (10-20”), but may include moderately deep to deep gravelly or cobbly soils, soils with a root restrictive layer, and/or south and west facing slopes that react like shallow soils, productivity potential is LOW

i. Soils are very fine textured and have a high concentration of exchangeable sodium throughout the profile, birdfoot sage and sandberg bluegrass ... R034AY118WY – Impervious Clay Green River and Great Divide Basins (IC)

ii. Site not as above

a. Coarse fragments common on surface and throughout profile (>35% by volume in top 20”)

1) Site occurs along terrace breaks, steep slopes or stream terraces with coarse fragments up to 10” diameter covering 50-75% of surface and making up 40-50% volume in top 20”, may have calcic horizon below 12 inches, bluebunch wheatgrass and variety of woody plants may be present ... R034AY112WY – Gravelly Green River and Great Divide Basins (Gr)

2) Site with fractured sedimentary bedrock at less than 20” with gravel, cobble, stone, and angular fragments on the surface and throughout soil profile, inclusions of very shallow to deep pockets of soil, Utah Juniper ... R034AY156WY – Shallow Breaks Green River and Great Divide Basins (SwBr)

b. Sites without a lot of coarse fragments

1) Silty clays or heavier textured soils, soil may develop large cracks when dry, early sage dominant shrub ... R034AY158WY – Shallow Clayey Green River and Great Divide Basins (SwCy)

2) Soils not as above

a) Fine sandy loams or coarser textured soils over sandstone or sandy shale, Indian ricegrass and needleandthread dominant grass species on site ... R034AY166WY – Shallow Sandy Green River and Great Divide Basins (SwSy)

b) Soil <20” in depth to limestone, dolomite or calcareous sandstone; common plants are Black sagebrush, and bluebunch wheatgrass ... R034AY163WY – Shallow Loamy, Calcareous Green River and Great Divide Basins (SwLyCa)

c) Sandy loams to clay loam textured soils over various bedrock types usually shale or siltstone; common plants are Wyoming big sage, sandberg bluegrass, thickspike wheatgrass bluebunch wheatgrass ... R034AY162WY – Shallow Loamy Green River and Great Divide Basins (SwLy)

B. Soil depth moderately deep to deep (>20”) without root restricting layer that inhibits the productivity potential

1 Sites that are saline and/or alkaline

i. Alluvial flats and alluvial drains that may receive periodic overflow from adjacent slopes, but water table is deeper than 6’; greasewood, Gardner’s saltbush, squirreltail and Indian ricegrass ... R034AY140WY – Saline Lowland Drained Green River and Great Divide Basins (SLDr)

ii. Site not as above

a. Soils are very fine textured and have a high concentration of exchangeable sodium throughout the profile, birdfoot sage common woody species ... R034AY118WY – Impervious Clay Green River and Great Divide Basins (IC)

b. Gardner’s saltbush (heavy clay soils and natric) and/or winterfat (calcic) and/ shadscale (coarser soils) (if root restrictive layer present and productivity very low consider Shale site) ... R034AY144WY – Saline Upland Green River and Great Divide Basins (SU)

2 Sites not saline and/or alkaline

i. Site occurs along terrace breaks, steep slopes or stream terraces with coarse fragments up to 10” diameter covering 50-75% of surface and making up 40-50% volume in top 20”, may have calcic horizon below 12 inches, bluebunch wheatgrass and variety of woody plants may be present ... R034AY112WY

– Gravelly Green River and Great Divide Basins (Gr)

ii. Soils without high volume of coarse fragments

a. Soils textures are heavy and range from silty clay to heavy clay, 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, soils can be lighter in texture when clay size carbonates are present - Wyoming big sagebrush, Gardner's saltbush and winterfat ... R034AY104WY – Clayey Green River and Great Divide Basins (Cy)

2) Heavy clay soils (silty clays or clays) at the surface or in a subsurface layer, low or early sage common

a) Silty clays or heavier textured soils; with root restricting clay subsoil layer with coarse to fine textures above within 20" from surface, soil may develop large cracks when dry, early sage, sandberg bluegrass and squirreltail ... R034AY158WY – Shallow Clayey Green River and Great Divide Basins (SwCy)

b) Heavy clay soils with severe soil cracking in dry conditions, very sticky when wet, (slick spot), low sage common ... R034AY110WY – Dense Clay Green River and Great Divide Basins (DC)

b. Soil textures not as above

1) Soil textures are very coarse (loamy sand to sand), sometimes as dunes (psamments), dark or light colored, spiny hopsage, Basin Big Sage, needleandthread and Indian ricegrass are dominant species ... R034AY146WY – Sands Green River and Great Divide Basins (Sa)

2) Soil textures range from very fine sandy loam to clay loam

a) Soils fine sandy loams to loamy sands, needleandthread and Indian ricegrass are abundant species

(1) Productivity potential is low and restrictive feature (calcic, rock layer or both) within 20" of surface of the soil or sandy-skeletal; and common plant species Indian ricegrass, Wyoming big sagebrush and needleandthread ... R034AY166WY – Shallow Sandy Green River and Great Divide Basins (SwSy)

(2) Productivity potential is high; common plant species are: Wyoming big sagebrush, spiny hopsage, needleandthread and Indian ricegrass are dominant species ... R034AY150WY – Sandy Green River and Great Divide Basins (Sy)

b) Soils sandy loams to clay loams, a good variety and even mix of grass species

(1) Heavy white calcic and may have a rock fragments within 20" of surface or be a skeletal soil; common plants are black sage, Indian ricegrass and sandberg bluegrass ... R034AY163WY – Shallow Loamy, Calcareous Green River and Great Divide Basins (SwLyCa)

(2) Not as above

(a) Productivity is low, acting shallow soil with restrictive features (rock layer, calcic or both with 20" of surface) or loamy-skeletal has Wyoming Big Sage intermixed with early/low sagebrush, Indian ricegrass, sandberg bluegrass, and mock goldenweed ... R034AY162WY – Shallow Loamy Green River and Great Divide Basins (SwLy)

(b) Productivity potential is high when have a sandy loam surface and fine-loamy soil; common plants; Wyoming big sage, Indian ricegrass, needleandthread, and Sandberg bluegrass. Common plants without sandy loam surface and lower productivity than sandy surface version– Wyoming big sagebrush, Indian ricegrass, sandberg bluegrass, and thickspike wheatgrass ... R034AY122WY – Loamy Green River and Great Divide Basins (Ly)

ARCHIVED - MLRA 34A Rangeland Ecological Site Key

- I. Site in a lowland position (bottom) that receives significant additional moisture from runoff of adjacent slopes or intermittent/perennial streams or a water table (HIGH productivity potential)
- A. Site moderately to strongly saline (>8mmhos/cm) within 20" (50cm) and dominated by salt tolerant species
- 1 Site has a water table within rooting depth of herbaceous species (20-40" (50-100cm)) during most of the growing season ... R034AY142WY – Saline Subirrigated Green River and Great Divide Basins (SS)
 - 2 Site not as above
 - i. Site adjacent to perennial or intermittent streams, receiving some overland flow from adjacent slopes, with moderately good drainage, but water table within 36" (within rooting depth of woody plants, but not herbaceous plants) during most of the growing season ... R034AY138WY – Saline Lowland Green River and Great Divide Basins (SL)
 - ii. Site may receive periodic overflow from adjacent slopes, located in lowland position but water is typically channeled into gullies so that plants are not receiving a lot of benefit from additional moisture ... R034AY140WY – Saline Lowland Drained Green River and Great Divide Basins (SLDr)
- B. Site not saline
- 1 Site has fluctuating water table above surface part of growing season (redox features in top 12" (30cm)) ... R034AY178WY – Wetland Green River and Great Divide Basins (WL)
 - 2 Site not as above
 - i. Site has a water table within rooting depth of herbaceous species (12-24" (30-60cm)) during most of the growing season ... R034AY174WY – Subirrigated Green River and Great Divide Basins (Sb)
 - ii. Site not as above
 - a. Site adjacent to perennial or intermittent streams, with moderate to excessive drainage, and fluctuating 24-60", within 36" (rooting depth of woody plants, but not herbaceous plants) during some of the growing season, cottonwood or remnants may be present, (gravel bars and pockets of bare gravel often present)
 - b. Site drier than above, more likely on intermittent drainage without gravel bars and high water table during growing season
 - 1) Surface textures range from sandy loam to light silty clay loam (if redox features are present they are below 40" (100cm))
 - 2) Site similar to above with heavier textured soils (clay loam, silty clay loam, and silty clay) (if redox features are present they are below 40" (100cm)) ... R034AY206WY – Clayey Overflow Foothills and Basins West (CyO)
- II. Soil depth very shallow (<10" (25cm)), shallow (10-20" (25-50cm)) OR moderately deep to deep (>20" (>50cm)), skeletal (>35% coarse fragments by volume in top 20" (50cm")) soils on south and west aspects and/or with a root restricting layer which react like shallow soils (LOW productivity potential)
- A. Soil depth very shallow (<10" (25cm)), shallow (10-20" (25-50cm)) OR moderately deep to deep (>20" (>50cm)), skeletal (>35% coarse fragments by volume in top 20" (50cm")) soils on south and west aspects and/or with a root restricting layer which react like shallow soils (LOW productivity potential)
- 1 Soils very shallow (<10" (25cm)), but may include areas of exposed bedrock and pockets of deep soil, often on steep (up to 55%) south and west facing slopes with VERY LOW productivity potential
 - i. Bedrock is soft or hard clay shale bedrock that may be saline, occurs in upland position on moderately to steeply sloping land (5-25% slope) ... R034AY154WY – Shale Green River and Great Divide Basins (Sh)
 - ii. Bedrock commonly fractured sandstone, shale, or siltstone, commonly on windswept ridges (within 8" (20cm), productivity very low (if productivity is higher and coarse fragments are present, go to II. B. 2. ii) ... R034AY176WY – Very Shallow Green River and Great Divide Basins (VS)
- B. Soils shallow (10-20" (25-50cm)), but may include moderately deep to deep (>20" (>50cm)) skeletal soils on south and west aspects, >15% slopes, productivity potential is LOW

1 Site with a highly calcareous subsoil (<10" (25cm)), often gravelly or skeletal subsoil OR underlain by soft calcareous materials and slopes >15%

- i. Shallow sandy and loamy soils (10-20" (25-50cm)), often cobbly or channery with slopes >35%, underlain by soft calcareous materials with many outcrops of sedimentary rock (often associated with Lime Stone parent material) ... R034AY234WY – Rocky Hills Foothills and Basins West (RH)
- ii. Moderately deep to deep soil (>20" (50cm)) with highly calcareous (violent effervescence (>15%CCE)) subsoil at <10" (25cm), often gravelly or skeletal and on 15 to 35% slopes, (compare with II. B. 2. i. a) ... R034AY263WY – Shallow Loamy Calcareous Foothills and Basins West (SwLyCa)

2 Site without highly calcareous subsoil or bedrock, OR if lime horizon present, accompanied by high volume of coarse fragments at soil surface, slopes variable

- i. Soil is skeletal with coarse fragments common on surface and throughout profile (>35% by volume in top 20" (50cm))
 - a. Site occurs along terrace breaks, steep slopes, or terraces with coarse fragments up to 10" diameter covering 50-75% of surface and making up 40-50% volume in top 20" (50cm), may have lime horizon below 12", often westerly aspect and windswept ridges, soils are excessively well drained loamy sands, sandy loams and fine sandy loams ... R034AY212WY – Gravelly Foothills and Basins West (Gr)
 - b. Fractured sedimentary bedrock at 10-20" (25-50cm) with gravel, cobble, stone, and angular fragments on the surface and throughout soil profile, inclusions of very shallow to deep pockets of soil, loamy well drained soils commonly on south & west facing slopes (productivity potential higher than Very Shallow (VS) site) ... R034AY156WY – Shallow Breaks Green River and Great Divide Basins (SwBr)
- ii. Soils without high amount of coarse fragments at soil surface, but still may be skeletal, have root restricting layer, shallow to bedrock
 - a. Clay loam, silty clay loam, or clay over fractured shale bedrock or loam over root restricting clay layer
 - 1) Clay loam, or silty clay loam over fractured shale bedrock ... R034AY258WY – Shallow Clayey Foothills and Basins West (SwCy)
 - 2) Root restricting (7-15" 18-30cm) clay loam to clay subsoil layer (>40% clay) with sharply contrasting loam to clay loam surface textures, soil may develop large cracks when dry ... DX034A02X124 – Loamy Argillic Pinedale Plateau (LyA PP)
 - b. Well drained loamy sand, sandy loams, or fine sandy loams over sedimentary bedrock or calcium carbonate or similar layer that restricts rooting depth ... R034AY266WY – Shallow Sandy Foothills and Basins West (SwSy)
 - c. Well-drained fine sandy loam to silty loams over sedimentary bedrock or loams with root restricting layer (i.e. rock layer and/or similar layer) ... R034AY262WY – Shallow Loamy Foothills and Basins West (SwLy)

III. Soil depth moderately deep to deep (>20" (50cm)) without root restricting layer that inhibits the productivity potential

A. Site affected by soil chemistry (salinity, sodicity, and/or calcium carbonates) within the rooting depth of herbaceous plants (Top 20" (50cm))

- 1 Soils slightly saline to moderately saline or greater (>4mmhos/cm), calcareous or not.
 - i. Silty clay and clay surface textures that are only slightly saline (<8mmhos/cm), but strongly alkaline (pH >8.5), permeability very low ... R034AY118WY – Impervious Clay Green River and Great Divide Basins (IC)
 - ii. Surface textures range from sandy loam to clay loam, moderately saline or greater (>8mmhos/cm), or sodic (SAR >13, EC <4mmhos) (if root restrictive layer present and productivity very low consider Shale site – Group II) ... R034AY144WY – Saline Upland Green River and Great Divide Basins (SU)
 - iii. Loamy surface textures (fine sandy loam to sandy clay loam), sodic (SAR >13, EC <4mmhos/cm) or saline-sodic (SAR >13, EC >4mmhos/cm) within 10" (25cm) to 20" (50cm) of soil surface, calcareous

throughout but slight at surface and increasing with depth, permeability moderately slow to slow due to excess sodium in the substratum.....(only in Laramie Basin LRU) ... R034AY336WY – Saline Loamy High Plains Southeast (SnLy)

2 Soils highly calcareous (>15% CCE within top 20" (50cm)), but not saline (<4mmhos/cm)

i. Soils very fine sandy loams to sandy clay loams, with violent effervescence (>15%CCE) between 10" (25cm) and 20" (50cm) of the soil surface ... DX034A01X126 – Loamy Calcareous Green River Basin (LyCa GRB)

ii. Soils very fine sandy loams to sandy clay loams, violent effervescence (>15%CCE) at the soil surface ... DX034A02X120 – Limy Pinedale Plateau (Li PP)

B. Sites are not affected by soil chemistry

1 Sites with a high volume of coarse fragments in top 20" (>35% by volume). Site occurs along terrace breaks, steep slopes, or terraces with coarse fragments up to 10" diameter covering 50-75% of surface and making up 40-50% volume in top 20" (50cm), may have lime horizon below 12", often westerly aspect and windswept ridges, soils are excessively well drained loamy sands, sandy loams and fine sandy loams (See II. B. 2. i. a)

2 Sites without high volume of coarse fragments

i. Surface soil textures are heavy, slight to severe soil cracking in dry conditions may occur

a. Sandy clay loam, silty clay loam and clay loams soil cracking common during dry summer months, though not severe (>36% clay in subsurface) ... R034AY104WY – Clayey Green River and Great Divide Basins (Cy)

b. Heavy clay soils (>40%) at surface with severe soil cracking in dry conditions may occur, very sticky when wet, (slick spot) ... R034AY110WY – Dense Clay Green River and Great Divide Basins (DC)

ii. Sites not as above

a. Excessively drained soils that are very coarse (loamy sand to sand), on nearly level to rolling uplands or dunes, dark or light colored ... R034AY146WY – Sands Green River and Great Divide Basins (Sa)

b. Soil textures range from loamy fine sand to clay loam

1) Soils loamy fine sand to fine sandy loam, (Note: Soils with <6" (15cm) sandy loam surface layer over sandy clay loam or clay loams are excluded, go to 11b) ... R034AY150WY – Sandy Green River and Great Divide Basins (Sy)

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

a) Slopes >30% productivity potential is high, well-drained site (Note: soils with <6" (15cm) sandy loam surface layer over sandy clay loam or clay loam is included) ... R034AY368WY – Steep Loamy High Plains Southeast (SLy)

b) Slopes <30%, productivity potential is high, well-drained site (Note: soils with <6" (15cm) sandy loam surface layer over sandy clay loam or clay loam is included) ... DX034A01X122 – Loamy Green River Basin (Ly GRB)