Interpretation Guide Linking Soil and Natural Resource Information to GVI Site Types in the Dry Mixedgrass Natural Subregion

Prepared by Ron McNeil, LandWise Inc.,
for GVI Interpreters and Auditors
February 2007

The Grassland Vegetation Inventory uses a system with 32 site types classified into three Primary Classes: 22 site types in the Native/Natural Primary Class, two site types in the Water Primary Class, and eight site types in the Anthropogenic Primary Class.

A unique interpretation guide has been developed for each Natural Subregion in the Grassland Natural Region. Each interpretation guide identifies key properties and distinguishing features for the 22 Native-Natural and two water-related site types. Representative examples are also provided for the eight Anthropogenic site types.

For each Natural Subregion, the 24 site types in the Native/Natural and Water Primary Classes are divided into four groups based on their main defining features of landscape, soil features, type of wetland, soil textural groupings. Each guide contains the following information for each of the 24 site types:

- Definition
- Representative example
- Usual landscape position
- Common association with other GVI site types
- Differentiation from the most similar site type(s)
- Correlation with Soil Landscape Models
- Native vegetation
- Expression on colour infrared photography
- Examples in pilot areas, for Dominant, Co-dominant and Significant occurrences, based on available colour infrared aerial photography
- Example(s) of non-typical occurrence.

This Dry Mixedgrass interpretation guide applies to the following GVI Pilot Areas.

Southeast Corner of AB (2005):	Townships 1 to 3; Ranges 1-8 W4
Wildhorse (2004):	Township 1, Range 2, W4
Milk River Canyon (2004):	Township 1, Range 5, W4

Site Types Defined Mainly by Landscape

Badlands/Bedrock (BdL)

Definition: Nearly barren or barren lands with exposures of softrock, hardrock or surficial geologic materials. Includes steep valley walls.

Representative example: Banks of the South Saskatchewan River at Sandy Point on Highway 41 north of Medicine Hat.

Usual landscape position: Moderate to steep coulee or valley sides; also eroded bedrock plains.

Common association with other GVI site types: TB, Li and Ov.

Differentiation from the most similar site type(s): TB is characterized by fewer softrock exposures and less bare soil and hence has more vegetative cover.

Correlation with Soil Landscape Models: Applies to all inclined to steeply sloping landscapes with greater than 10% bedrock exposures of softrock or hardrock. Slopes generally range from 30% to 60% (in isolated cases 15% to 100%). Includes I4h and I5 landscape models from AGRASID 3.0.

Native vegetation: Very limited cover due to high proportion of bare soil.

Expression on colour infrared photography: highly reflective, with most geologic formations appearing white or very light grey. Linear bands may also occur due to the continuity of exposed strata over distances.

Examples in pilot areas:

- **Dominant** (≥65%): Milk River – Comrey area, air photo AS3070-091, 100% of some polygons.
- **Co-Dominant** (two or three site types each cover 30 to 60%): Sage Creek; west side of valley at Secondary #501. Air photo AS5350F-188 with BdL and TB each at approximately 50%.
- **Significant** (one to three sites types, each of 10 to 30%): Milk River – Comrey area, air photo AS3078-033, 20% BdL in polygons dominated by Thin Breaks.

Example(s) of non-typical occurrences: 1) Manyberries Badlands are dominated by Bearpaw Shale. They are gently sloping badlands with patchy cover of Horizontal Juniper, and subjected to wind deflation. (Active areas are described as BdL-Ac). **2)** Hard sandstone walls and hoodoos of the Milk River Formation at Writing-On-Stone Provincial Park.

Overflow (Ov)

Definition: Areas that receive additional moisture from overland flow or increased snow catch. Typically occurs in valleys on gentle inclines, or on terraces subject to infrequent flooding.

Representative example: Valley between Irvine and Walsh AB visible on traveling Highway #1.

Usual landscape position: Occurs mainly in coulees or valley settings as fan or apron deposits.

Common association with other GVI site types: Lo, BlO, SL, TB, BdL, and Lotic types

Differentiation from the most similar site types: Loamy (Lo) does not receive additional moisture inputs; Lotic types occur on slightly lower to lower slope positions and have grater available soil moisture.

Correlation with Soil Landscape Models: Applies to non-saline Chernozemic (soils with A, B and C horizons) and/or Regosolic soils (soils that lack a B horizon >5 cm thick, and may lack an A horizon) on landscapes that are low-relief inclines in valley or basinal settings. Overflow sites are usually fan or apron deposits, where upslope streams enter lowland areas and experience a marked decrease in gradient. Slopes generally range from 2% to 9% (in isolated cases from 0.5% to 15%). Overflow occurs only on lower slope positions or adjacent to stream(s), and the percentage of eligible overflow ranges from 10% to 50% per SLM. Overflow includes I3l and I4l landscape models from AGRASID 3.0 and may occur with IUl and IUh landscape models.

Native vegetation: Variable herbaceous cover and often occurs with Silver Sagebrush, occasionally with Greasewood.

Expression on colour infrared photography: Generally a uniform dull pinkish green to olive tone if dominant and the soils are relatively mature. If the soils are immature then a mottled appearance is common.

Examples in pilot areas:

- **Dominant** (>60%): Milk River Canyon – Comrey area, air photo AS3070-091.
- **Co-Dominant** (two or more ERS cover 30 to 60%): Sage Creek valley about 2 km north of Secondary # 501, on AS5350F-188. Apron setting and associated with BlO and SL.
- **Significant** (10 to 30%): Milk River Canyon – Comrey area, air photo AS 3078-033 in polygons dominated by TB or BdL, or both. Occurring with TB and BlO.

Example(s) of non-typical occurrences: Wide and broad, low gradient flats leading to Pakowki Lake such as Irrigation and Canal Creeks.

Thin Breaks (TB)

Definition: Areas with soft or hard bedrock at or near the soil surface; partially vegetated; thin, eroded, and immature soils on gentle to steep landscapes, including slumped or failed slopes.

Representative examples: Most river valley slopes at the Grand Forks (junction of the Oldman and Bow Rivers). Banks of Oldman River Valley at Highway #36 south of Vauxhall.

Usual landscape position: moderate to steep coulee or valley sides; or plains with thin surficial sediments overlying bedrock.

Common association with other GVI site types: BdL, Li, Ov.

Differentiation from the most similar site type(s): Both Li and TB usually exhibit immature soils (ie. Rego or Calcareous) but TB is usually distinguished by bedrock within 1 m. TB can be considered a transition between Limy and Badlands. Badlands have negligible vegetation, while TB has moderate vegetation cover.

Correlation with Soil Landscape Models: Applies to: **1**) all steeply-sloping landscapes with less than 10% bedrock exposures; **2**) largely vegetated areas with bedrock at or near (within 5 m) the surface; **3)** AGRASID 3.0 landscape models I3m, I3h or I4m.

Native Vegetation: Usually graminoid with some bare soil; less vegetation on south or west facing slopes.

Expression on Colour Infrared Photography: Light greenish gray to white tones.

Examples in Pilot Areas:

- **Dominant** (≥65%): North face (south exposure) of Canal Creek Coulee at Secondary #501 on AS5350F-166. TB represents approximately 70% of this upper slope and BdL represents about 30%.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): West side of Sage Creek Valley (east aspect) located on AS5350F-176, approximately 4 to 5 km south of Secondary #501. BdL represents 60% of the unit and TB represents 40%.
- **Significant** (one to three sites types, each covering 10 to 30%): Air photo AS5350F-176, Sec. #501 crossing of Sage Creek Valley, east side aspect is dominated by Li (80%) with significant TB (20%).

Example(s) of non-typical occurrences: Site-specific level to depressional (latter due to soil removal by wind erosion) locations with exposed softrock and a greater coarse fragment content. Pictoral examples provided in the GVI Dry Mixedgrass Powerpoint files.

Site Types Defined Mainly by Soil Features

Blowouts/Solonetzic Order (BlO)

Definition: Areas dominated by Solonetzic Order (hardpan) soils, which may or may not have the presence of eroded surface pits. Sometimes termed as burnouts.

Representative example: Along Highway 1 southeast of Tilley, in areas dominated by the Solonetzic Order.

Usual landscape position: Often in swales or at slope inflections within plains; can be valley bottoms and inclined surfaces. Often associated with Bearpaw Shale <5 m from surface, or in areas of former groundwater discharge.

Common association with other GVI site types: Lo, Ov, TB; to a lesser extent SL, Sy

Differentiation from the most similar site type(s): There are seldom areas of 100% BlO. BlO usually occur with Lo, with Lo occupying some of the area between pits.

Correlation with Soil Landscape Models: Applies to all SLMs where soils from the Solonetzic order are dominant (>50%) or co-dominant (30 to 50%). Solonetzic soils have an impervious hardpan layer (Bnt horizon) in the subsoil that is caused by excess sodium (Na^+). The land surface is usually characterized by rough microtopography.

Native vegetation: Usually with wheatgrasses, silver sagebrush and prickly pear cactus. Highly mottled appearance, as BlO exhibits microtopography on a 1 to 5 m range laterally, and 20 to 50 cm vertically.

Expression on colour infrared photography: Highly speckled or mottled.

Examples in Pilot Areas:

- **Dominant** (≥65%): Milk River – Comrey area: air photo AS3078-033, 50% of polygons 3, 7, 10 and 11. Wildhorse area: air photo AS3078-046, 50% of polygons 3,7, 8, 12 and 19. Significant site types are Ov or SL.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Milk River – Comrey area: air photo AS3078-033, 40% of polygon 6. Wildhorse area: air photo AS3078-046, 40% of polygons 17, 18, and 20. Other co-dominants are usually SL, Ov, Lo, or TB.
- **Significant** (one to three sites types, each covering 10 to 30%): Milk River – Comrey area: air photo AS3070-091, 20% of polygons 4 and 5. Wildhorse area: air photo AS3078-046, 20% of polygons 5 and 6.

Example(s) of non-typical occurrences: Solonetz in Sand and Sandy plains, where the Bnt or hardpan occurs at depths greater than 50 cm. These occur in the Gem, Rolling Hills, Sunnynook, and Pakowki Lake areas.

Limy (Li)

Definition: Eroded or immature soils with free lime ($CaCO_3$) at the soil surface. The soil pH is generally >7.5.

Representative Example: Coulee side slopes with negligible or no bedrock exposures. Eg. Chin, Forty Mile, and Etzikom coulees, and Bow River between Bow City and Ronalaine Bridge.

Usual landscape position: Eroded side slopes, upper and crest positions, moderate to steep coulee or valley sides, but not including areas with bedrock exposures (BdL and TB).

Common association with other GVI site types: TB, Lo, Cy.

Differentiation from the most similar site type(s): Lo represents a normally developed Orthic Brown Chernozemic soil, while Li is an immature Rego or Calcareous Brown Chernozemic. TB may be developed on similar soils as Li, but TB is characterized by shallow bedrock, and vegetative cover is generally sparser than with Li.

Correlation with Soil Landscape Models: Applies to all immature or eroded soils with free lime (calcium carbonates) at the soil surface or in the B horizon. Free lime is detected by effervescence when soil is treated with 10% hydrochloric acid (HCl). Li soils include Rego or Calcareous Chernozemics, eroded phases, and subgroups from the Regosolic order if they are calcareous.

Native vegetation: Graminoid with silver sagebrush.

Expression on colour infrared photography: Smooth gray to green tone.

Examples in pilot areas:

- **Dominant** (≥65%): Sage Creek at Sec. #501: air photo AS5350F-188, east side of vallay wall is dominated by Li.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Philp Coulee valley sidewalls, AS5350F-32, in association with TB.
- **Significant** (one to three sites types, each covering 10 to 30%): Glacial till upland dominated by Lo northwest of Pinhorn Ranch in centre-left portion of AS5350F-99.

Example(s) of non-typical occurrences: Locations with occasional groundwater discharge, where the groundwater is carbonated, and not saline.

Sub-irrigated (Sb)

Definition: Water table is close to surface during growing season, but rarely above. The water table is relatively stable, and is not subject to strong seasonal fluctuations.

Representative Example: North Hilda dune field at Highway 41 in Twp. 19, R1 W4.

Usual landscape position: Almost always occurs in concave settings (swales). Ranchers often locate dugouts within lowland portions of Sa or CS areas, due to reliable shallow water table conditions.

Common association with other GVI site types: Sa, Sy, CS, Lentic wetlands, and to a lesser extent, Lo.

Differentiation from the most similar site type(s): LenT and Sb both typically represent gleyed subgroups. The water table is near the surface in the Sb site type, but water seldom ponds on the soil surface. In contrast, LenT has standing water for a short duration (typically less than a season), after which the water table may or may not be out of range for plant roots. LenT commonly occurs with medium and fine soil textures, whereas Sb commonly occurs with coarse and very coarse textures, and occasionally with medium textures.

Correlation with Soil Landscape Models: Sb best represents areas with the water table near the surface causing gleyed soils. Sb includes Gleyed, non-saline, very coarse to medium textured soils. Gleyed subgroups have faint to distinct mottles within 50 cm, or prominent mottles between 50 and 100 cm.

Native vegetation: Often a higher density of shrubs (eg. Thorny Buffaloberry, willow) and wild licorice can be an indicator.

Expression on colour infrared photography: Dark gray speckled appearance, with the darker areas receiving groundwater enrichment from a near-surface water table.

Examples in Pilot Areas: can occur as an entire polygon, but more commonly occurs as a significant component. Examples:

- **Dominant** (≥65%)**:** Orion area, air photo AS4551-35, 70% of polygon 3 is Sb.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Hilda area, 1:60,000-scale air photo AS 2485-161, Sb is 50% of polygons 1 and 2, and 30% of polygon 7.
- **Significant** (one to three sites types, each covering 10 to 30%): Pakowki – Orion area, 1:10,000-scale photo AS4551-35, Sb is 10% of polygon 14.

Saline Lowland (SL)

Definition: Native areas with negligible or limited vegetation due to electrical conductivity (salts) and/or sodium adsorption ratio limitations.

Representative example: Valley bottom on Cassils Road west of Brooks, between Brooks and Cassils, along the railway siding.

Usual landscape position: depressional; can be broad concave settings.

Common association with other GVI site types: BlO, Ov, Lo, LenA

Differentiation from the most similar site type(s): Distinguished from Lentic Alkali by the lack of a defined basin.

Correlation with Soil Landscape Models: Applies to salt-enriched soils, including Saline phase Chernozemic, Saline phase Regosolic, and occasionally Saline phase Gleysolic soils. Saline phase soils generally have an electrical conductivity greater than 4.0 dS/m, which retards most plant growth.

Native vegetation: Wheatgrass, Saltgrass, Foxtail Barley, Red Samphire

Expression on colour infrared photography: White when dry; can be red when lush growth of salophytes is present.

Examples in pilot areas:

- **Dominant** (≥65%): Canal Creek valley 1.5 to 2 km west of Sec. 501, on AS5350F-165.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Canal Creek valley between 0.5 and 1.5 km east of Sec. 501, in association with BlO and Ov.
- **Significant** (one to three sites types, each covering 10 to 30%): Bare Creek valley about 4 km east of Hwy 41, in co-dominant association with Ov and BlO, on AS5350F-179.

Example(s) of non-typical occurrences: "Black alkali" flats (dark shales) east of Wildhorse are BdL, while the areas with Silver Sagebrush and other colonizing vegetation are typically SL.

Lotic Undifferentiated - *Note: This is Not a Site Type*

Definition: *Any riparian habitat associated with a flowing stream, and represents the active floodplain. True riparian areas only include the valley floor portions that are prone to occasional flooding (Eg., 1 in 10 years). Lotics do not include fans, aprons, or mid to high elevation terraces in valley or coulee settings. A wide range of vegetation types occur, depending on moisture, and nutrient regime, soil chemistry (salinity and sodicity), texture, parent material, etc.*

Correlation with Soil Landscape Models: *AGRASID and soil surveys have a correlation to Lotic Undifferentiated.* ***The GVI interpreters are required to identify the appropriate Lotic site type.*** *Valley systems on AGRASID are often identified as undifferentiated Soil Landscape Models. The AGRASID 3.0 correlation includes FP1, FP2, FP3, SC1-l, SC1-h, SC2, SC3 and SC4 landscape models from AGRASID 3.0.*

Lotic River (LtcR)

Definition: Any river that is generally wider than 20 m, and conforms to the double-line base-features hydrography, representing water edge to water edge.

Associated with other ecological range sites: Any other Lotics; also Ov. Occasionally where a river borders a steep bank the bank may be BdL or TB. Islands in LtcR that are larger than 0.16 ha in size and are either partially or totally vegetated will be mapped and described as other Lotic polygons.

Landscape Position: Wide stream or river.

Representative Example: Milk River.

Non-typical Example(s): Artificial channel.

Native Vegetation: None, due to permanent water.

Expression on Colour Infrared Photography: Blue.

Lotic Coniferous (LtcC)

Lotic Coniferous does not occur in the Dry Mixedgrass.

Lotic Deciduous (LtcD)

Definition: "Riparian wetlands" that border flowing water systems and where deciduous trees have a combined canopy cover of >25% OR more than 25 trees per ha.

Representative example: Portions of Police Point Park in Medicine Hat

Usual landscape position: Terraces immediately above rivers or creeks.

Common association with other GVI site types: Mainly LtcS, but may be adjacent to LtcH or LtcR. In occasional cases it may border Ov, SL, Li, TB, or BdL.

Differentiation from the most similar site type(s): LtcS with tall shrubs may present some difficulty in interpretation. However, shrubs have a high degree of canopy cover, and are shorter than the main tree species including *Populus deltoides* (Plains Cottonwood), *Salix amygdaloides* (Peach-leaf willow) and *Betula occidentali*s (Water Birch).

Native vegetation: Mainly Plains Cottonwood plant communities.

Expression on colour infrared photography: Very bright red colours, often as ribbons near rivers or streams.

Examples in pilot areas:

- **Dominant** (≥65%): Milk River Canyon. Eg., AS5350F-70 in numerous polygons.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): In Milk River Canyon. Eg., AS5350F-70 in some polygons in association with LtcS.
- **Significant** (one to three sites types, each covering 10 to 30%): No example, but may occasionally occur in association with Ov and other Lotics.

Lotic Shrub (Ltc S)

Definition: "Riparian wetlands" that border flowing water systems and have a combined canopy cover of greater than 10% shrub species.

Representative example: Thorny Buffaloberry plant communities of Writing-On-Stone Provincial Park.

Usual landscape position: Terraces immediately above rivers or creeks.

Common association with other GVI site types: Mainly LtcD and LtcH, and may be adjacent to LtcR. In occasional cases it may border Ov, SL, Li, TB, or BdL.

Differentiation from the most similar site type(s): LtcS has varying shrub heights, of which the tall ones may be similar to short trees. However, Lotic Shrub usually has denser canopy and has a different appearance compared to LtcD. Ltc S may also be confused with LtcH in locations where the shrub cover is near 10%. If the shrub cover is interpreted as less than 10%, then LtcH is correct.

Native vegetation: A wide range of shrub species, from roses to willow to birch.

Expression on colour infrared photography: Bright red to pinkish red colours; may flank bright red rings or linear features that are LtcD.

Examples in pilot areas:

- **Dominant** (≥65%): Ltc S dominated channel of Bare Creek, 3.5 to 4 km east of Highway 41, on AS5350F-179.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): LtcD and LtcS east of the Pinhorn Ranch headquarters in the Milk River Canyon, on AS5350F-69.
- **Significant** (one to three sites types, each covering 10 to 30%): Polygons dominated by Overflow, where Lotics are smaller than the 1 ha minimum size, so LtcS can be included in significant or minor proportions. Eg., AS5350F-68 in Milk River Canyon, 1 km west of Pinhorn Ranch headquarters.

Lotic Herbaceous (Ltc H)

Definition: "Riparian wetlands" that border flowing water systems and are usually dominated by emergent herbaceous plants (Eg. sedges), but also can be dominated by bare ground indicative of recent features (Eg. gravel bars).

Representative example: Reed canarygrass plant communities along rivers including the Bow River at the Old Ronalaine bridge in NE 33-12-12-W4.

Usual landscape position: Point bars, meander scrolls and low level terraces.

Common association with other GVI site types: Mainly adjacent to LtcS, LtcD and LtcR in major rivers. In occasional cases it may border Ov, SL, Li, TB, or BdL.

Differentiation from the most similar site type(s): LtcS has >10% shrub cover and LtcH has <10%

Native vegetation: Emergent herbaceous plants including reed canarygrass, wild licorice, wheatgrasses, sedges, rushes, horsetail, etc.

Expression on colour infrared photography: More uniform reddish or pinkish tones than with LtcS and LtcD. Lotic Shrub and Lotic Deciduous polygons have texture that indicate some height.

Examples in pilot areas:

- **Dominant** (≥65%): Narrow channels with grass or sedge-like vegetation such as on east side of AS5350F-100.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Approximately 500 m east of Pinhorn Ranch headquarters in Milk River Canyon on west and north side of river; Codominant with LtcS.
- **Significant** (one to three sites types, each covering 10 to 30%): Lotic Shrub 80% and Lotic Herbaceous 20% in unnamed incised gullies on AS5350F-101.

Example(s) of non-typical occurrences: Recently formed islands that have pioneer species, such as horsetail, beginning to colonize.

Lentic Undifferentiated –Note: This is Not a Site Type

Definition: *Typically low-lying or depressional positions subject to occupation by water ranging from temporary to permanent in duration. Also known as the lentic zone. AGRASID and soil surveys have a correlation to Lentic Undifferentiated.* ***The GVI interpreters are required to identify the appropriate Lentic site type.***

Correlation with Soil Landscape Models: *Applies to all non-saline or weakly-saline soils of the Gleysolic and Organic orders. Gleysolic soils occur in seasonal to semi-permanent wetlands. They are typified by dull colours or prominent mottles within 50 cm, due to prolonged periods of intermittent or continuous saturation and the lack of oxygen in the soil. Organic soils are dominated by the accumulation of decomposing peat material derived mainly from sedges and reeds.*

Lentic Temporary (LenT)

Definition: Still-water wetland depression with a defined edge that only holds water for brief periods, usually in the spring.

Representative example: Upper end of Whitla Coulee between Bow Island and Seven Persons, on north side of Highway 3. Depressions in this coulee bottom only hold surface water for a short time period each year.

Usual landscape position: Depressional.

Common association with other GVI site types: Other Lentics or other Native/Natural Site Types; edges may be Sb.

Differentiation from the most similar site type(s): LenS holds water seasonally rather than for a few days to weeks.

Native vegetation: Low prairie or wet meadow vegetation zones as described by Stewart and Kantrud (1971).

Expression on colour infrared photography: Usually a dull colour such as olive to slightly pink, and a contrasting tone compared to the neighbouring or surrounding upland.

Examples in pilot areas:

- **Dominant** (≥65%): Approximately a 5 ha depression in LSD 10-20-3-7-W4 on AS5350F-161.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): LenT 60% and LenA 40%, on AS5350F-179 immediately south of Junction of Highways 41 and 501 on west side of #41.

- **Significant** (one to three sites types, each covering 10 to 30%): Significant LenT (about 20%) as an outer ring of a 6 ha wetland dominated by LenS near centre right of AS5350F-108.

Example(s) of non-typical occurrences: Blowout pits in Solonetzic areas that contain surface water at the time of imagery acquisition will be called LenT.

Lentic Seasonal (LenS)

Definition: Still-water wetland that usually holds water for a few months, usually in the spring.

Representative example: Agatha paleovalley in NE 21-13-11-W4, located 1 km north of Secondary Hwy #524 between Hays and Redcliff.

Usual landscape position: Depressional

Common association with other GVI site types: Other Lentics.

Differentiation from the most similar site type(s): LenT only holds water for a few days to a few weeks; LenSP holds water for most to all of most years.

Correlation with Soil Landscape Models: Applies to non-saline or weakly saline Gleysolic Order soils in depressions with shallow marsh vegetation. Usually applies to Gleysol soil series and ZGW soils. Usually L1 or L2 landscape models, but may occasionally be W1 or W2.

Native vegetation: Characterized by shallow marsh vegetation in the deepest part, and wet meadow and low prairie vegetation at the edges.

Expression on colour infrared photography: Pink tones.

Examples in pilot areas:

- **Dominant** (≥65%): Depressions in east central portion of AS5350F-176.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): LSD 14-22-2-6-W4, with approximately 40% each of LenS and LenA, and 20% LenT on the southeastern edge.
- **Significant** (one to three sites types, each covering 10 to 30%): West side of Highway #41, about 2 km north of Sec. #501. Dominantly LenA (75%) with about 25% LenS.

Example(s) of non-typical occurrences: Depressions in oxbows of riverine systems.

Lentic Semi to Permanent (LenSP)

Definition: Still-water wetland that usually holds water for several months, usually to late summer, and is usually wet in the majority of years.

Representative example: Kinbrook Marsh on the east side of Lake Newell.

Usual landscape position: Depressions.

Common association with other GVI site types: LenW where the water is deeper and permanent, and LenS where the water is shallower.

Differentiation from the most similar site type(s): LenW where the water is deeper and permanent; LenS where the water is shallower and typically occurs for only a few months of the year.

Correlation with Soil Landscape Models: Applies to non-saline or weakly saline Gleysolic Order soils in depressions with deep marsh vegetation. Usually applies to Gleysol soil series, ZGW soils, or occasionally ZWA soils. Usually W1, W2 or W3 landscape models.

Native vegetation: Deep marsh vegetation (reeds, cattails) with shallow marsh edges. May have open water in deeper areas.

Expression on colour infrared photography: Usually bright red or reddish pink tones.

Examples in pilot areas:

- **Dominant** (≥65%): Areas surrounding the Onefour South Reservoir (AS5350F-80). Reservoir is LenW, and surrounding areas are LenSP (80%) and LenS (20%).
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Grassy Lake, AS5350F-25, about 3 km northeast of the Wildhorse border crossing, in a co-dominant association of LenSP and LenA.
- **Significant** (one to three sites types, each covering 10 to 30%): Edges of Ketchum Creek Reservoir on AS5350F-172. Reservoir and edges should be included in the same polygon; LenW (80%), LenSP (15%), LenS (5%)

Example(s) of non-typical occurrences: Depressions in oxbows of riverine systems.

Lentic Alkaline (LenA)

Definition: Still water wetland that holds water for variable time periods ranging from a few weeks to several months, and has a salt (saline) fringe. Vegetation types are variable to none.

Representative example: Verdigris Lake, in Twps. 2 and 3, Rg 14 and 15, W4.

Usual landscape position: Depressions.

Common association with other GVI site types: LenSP, LenS, and SL.

Differentiation from the most similar site type(s): SL is not a definite basin, and the internal soil drainage is typically imperfectly drained, compared to poorly drained for LenA.

Correlation with Soil Landscape Models: Applies to saline soils of the Gleysolic, Organic and Regosolic (if Gleyed) Orders.

Native vegetation: Dominated by bare ground, and salts if dry.

Expression on colour infrared photography: Usually white or grayish-white.

Examples in pilot areas:

- **Dominant** (≥65%): Immediately west of Bare Creek Reservoir, on air photo AS5350F-178, there are numerous polygons that are dominated by LenA.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): LSD 15 Sec 36-2-8-W4, on air photo AS5350F-98, LenS (60%) and LenA (40%).
- **Significant** (one to three sites types, each covering 10 to 30%): 23-2-5-W4, on AS5350F-108, in about three polygons dominated by LenS, lenA ranges from 15 to 30%.

Example(s) of non-typical occurrences: i) South shore of Dishpan Lake in CFB Suffield, in 6-19-4-W4, with deep Organic (peat) soils due to permanent groundwater discharge. Organic soils are extremely rare in the Dry Mixedgrass Natural Subregion, and when they occur, they are typically alkaline fens (LenA). ii) Wetlands in the "black alkali" muds near Wildhorse.

Lentic Open Water (LenW)

Definition: Water bodies, either artificial or natural, that are typically characterized by standing water.

Representative example: Lake Newell.

Usual landscape position: Water bodies.

Common association with and differentiation from other GVI site types: LenSP where the water is shallower and not as permanent.

Correlation with Soil Landscape Models: Applies to ZWA soils and the W3 landscape model, but may occur less commonly with W1, W2, L2 and L3 landscape models.

Native vegetation: Dominated by open water, but may have some occurrences of deep marsh vegetation (reeds, cattails).

Expression on colour infrared photography: Usually blue or bluish-green tones.

Examples in pilot areas:

- **Dominant** (≥65%): Bare Creek Reservoir, on AS5350F-178.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): None observed.
- **Significant** (one to three sites types, each covering 10 to 30%): None observed, but can be associated with any Lentic depression that has a constructed dugout, and for which the constructed dugout comprises more than 10% of the total Lentic area.

Ecological/Range Sites Defined Mainly by Textural Groupings

Clayey (Cy)

Definition: Clayey-textured soils including silty clay, sandy clay, clay, and heavy clay. Generally >40% clay.

Representative example: Acadia Valley area.

Usual landscape position: Level to gently undulating plains.

Common association with other GVI site types: Lo, Li, BlO, SL.

Differentiation from the most similar site type(s): Many clay-dominated areas are actually Li and typified by Rego or Calcareous Brown Subgroups, due to the shallow depth of leaching in clay soils**.** Therefore, many clay-rich soils are calcareous to the surface.

Correlation with Soil Landscape Models: Applies to all non-saline and non-gleyed Vertisolic soils; **OR** to fine or very fine Chernozemic soils (soils with A, B and C horizons), and **fine or very fine** non-saline and non-gleyed Regosolic soils (soils that lack a B horizon >5 cm, and may lack an A horizon) (E.g., clay and silty clay textural subgroups, >40% clay).

Native vegetation: Wheatgrasses and Prickly Pear Cactus.

Expression on colour infrared photography: Uniform green or can even be a dark green to purple colour.

Examples in pilot areas:

- Dominant (≥65%): West-central basin on AS5350F-26 was described by author and GVI auditors as Cy (95%) and LtcH (5%).
- Co-Dominant (two or three site types each cover between 30 and 60%): Wildhorse area: air photo AS3078-046, 40% of polygon 14.
- Significant (one to three sites types, each covering 10 to 30%): Expected in Wildhorse area, possibly Cy as a significant with either SL, BlO or both as co-dominant.

Example(s) of non-typical occurrences: Coulee Valley bottoms where former shallow lakes (locations where clay may have been deposited) have improved drainage, and are now represented by Regosolic, Chernozemic or Vertisolic soil orders.

.

Loamy (Lo)

Definition: Includes loam, silt loam, silt, clay loam, sandy clay loam, and silty clay loam soil textures.

Representative Example: Native/Natural site types in the Foremost area

Usual landscape position: Undulating to hummocky plains

Common association with other GVI site types: Li, Sy, BlO, Ov, Cy.

Differentiation from the most similar site type(s): Soil texture is intermediate between Cy and Sy. Li has surface carbonates; Lo has carbonates in the parent material. Ov occurs in settings that receive additional moisture from run-on, and Lo does not.

Correlation with Soil Landscape Models: Applies to all non-saline and non-gleyed Chernozemic soils (soils with A, B and C horizons), and non-saline and non-gleyed Regosolic soils (soils that lack a B horizon >5 cm, and may lack an A horizon) with soil textures in the **medium and moderately fine** textural subgroups (E.g., loam and clay loam).

Native vegetation: Dominated by grasses, mainly Needle and Thread and Blue Grama Grass.

Expression on colour infrared photography: Smooth pale green to brownish-green tone.

Examples in pilot areas:

- **Dominant** (≥65%): NE 22-3-7-W4 on AS5350F-162. Loamy approximates 75%, BlO about 15%, and Li 10%.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Air photo AS5350F-176 east of Sage Creek and south of Sec. #501, near centre of image. Co-dominant Lo and BlO (each 40 to 45%) and LenT and Li at about 10 and 5% respectively.
- **Significant** (one to three sites types, each covering 10 to 30%): AS5350F-176 in east central portion of image. Dominant BlO (65%), Significant Lo (25%) and LenT (10%).

Example(s) of non-typical occurrences: Loamy textured landscapes that were formerly cultivated, and native landscapes that have returned gradually. GVI interpreters will be assessing whether the native species now predominate (i.e. >50% native).

Sandy (Sy)

Definition: Sandy-loam-textured soils.

Representative example: Grassy Lake area

Usual landscape position: Undulating plains

Common association with other GVI site types: Lo, Sa.

Differentiation from the most similar site type(s): Sa are more drought prone than Sy; Lo is more drought tolerant.

Correlation with Soil Landscape Models: Applies to all non-saline and non-gleyed Chernozemic soils (soils with A, B and C horizons), and non-saline and non-gleyed Regosolic soils (soils that lack a B horizon >5 cm, and may lack an A horizon) with soil textures in the **moderately coarse** (sandy loam) textural subgroup.

Native vegetation: Grass-dominated. May include Western Porcupine Grass, Western Wheat Grass, and Sand Grass.

Expression on colour infrared photography: generally smooth pinkish-green tone.

Examples in Pilot Areas:

- **Dominant** (≥65%): Wildhorse east area, on photo AS5350F-26. East-central area may be 10% Sy.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Pakowki – Orion area: air photo AS 4551-035, 40% of polygon 12, 50% of polygon 18. Hilda area: air photo AS2485-161, 40% of polygon 14.
- **Significant** (one to three sites types, each covering 10 to 30%): Pakowki – Orion area: air photo AS 4551-035, 20% of polygon 16, 30% of polygon 19. Wildhorse east area, central portion of photo AS5350F-27, with 20% Sy and 80% Sa. Blotchy appearance on photo due to patchy Sand Grass pattern.

Example(s) of non-typical occurrences: Sandy soils with some gravels but gravels <20% by volume. Eg., soil series include Kangaroo (KGO) which is relatively common at CFB Suffield.

Sands (Sa)

Definition: Loamy sand and sand soils, and not with a duned surface.

Representative example: Purple Springs area north to the Oldman River.

Usual landscape position: Undulating to ridged plains.

Common association with other GVI site types: Sy, CS, Sb.

Differentiation from the most similar site type(s):

- CS has open dunes, bare soil, and more shrubs, with shrubs particularly on north or east-facing slopes.
- Sy is more drought tolerant than Sa.
- Sb has a shallow water table, is located in swales, and usually a high proportion of shrubs, and sometimes occasional trees.

Correlation with Soil Landscape Models: Applies to all non-saline and non-gleyed Chernozemic soils (soils with A, B and C horizons), and non-saline and non-gleyed Regosolic soils (soils that lack a B horizon >5 cm, and may lack an A horizon) with soil textures in the **very coarse** (loamy sand) textural subgroup. Sa does not apply to duned landscapes.

Native Vegetation: Graminoids and small shrubs, including Wild Rose and Silver Sagebrush.

Expression on Colour Infrared Photography: generally smooth to blotchy pinkish-green, grading to pinkish- brown (more shrubs).

Examples in Pilot Areas:

- **Dominant** (≥65%): Wildhorse east area, in the central portion of photo AS5350F27, with 80% Sa and 20% Sy. Pakowki – Orion area: air photo AS 4551-035, 70% of polygon 8, 80% of polygon 2, 100% of polygon 22. Hilda area: air photo AS2485-161, 60% of polygon 13, 80% of polygon 16.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): two or more ERS cover 30 to 50%): Pakowki – Orion area: air photo AS 4551-035, 50% of polygons 18 and 23, 40% of polygon 12. Hilda area: air photo AS2485-161, 50% of polygons 1 and 2.
- **Significant** (one to three sites types, each covering 10 to 30%): Pakowki – Orion area: air photo AS 4551-035, 30% of polygons 10 and 13, 20% of polygon 14. Wildhorse area: air photo AS3078-046, 30% of polygons 5 and 6.

Choppy Sandhills (CS)

Definition: Loamy sand and sand soils with a rough surface caused by wind, resulting in a duned landscape. Dunes may be longitudinal or parabolic (U-shaped). Stable dunes are described as CS, and active dunes are described as CS-Ac.

Representative example: Pakowki dunes and Middle Sand Hills north of Hilda.

Usual landscape position: Sand plains with low to high relief dunes, of which some are active.

Common association with other GVI site types: Sa, Sb.

Differentiation from the most similar site type(s):

- Sa does not include irregular moderate and high-relief dunes.
- Sb has a shallow water table.

Correlation with Soil Landscape Models: Applies to all non-saline and non-gleyed Chernozemic soils (soils with A, B and C horizons), and non-saline and non-gleyed Regosolic soils (soils that lack a B horizon >5 cm, and may lack an A horizon) with soil textures in the **very coarse** (loamy sand) textural subgroup. CS applies to soils that occur on duned landscapes, including Dl1, D1m, D1h, D2l, D2m and D2h in AGRASID 3.0. Applies to **other Sands range sites on duned landscapes**.

Native vegetation: Graminoid with shrubs including Rose, Chokecherry, and Buffaloberry.

Expression on colour infrared photography: Blotchy irregular pattern with pinkish-brown to pink colouration. Dunes may appear as blemishes and may be oriented in the direction of the prevailing wind (longitudinal) or U-shaped (parabolic).

Examples in Pilot Areas:

- **Dominant** (≥65%): Pakowki – Orion area: air photo AS 4551-035, 100% of polygon 1, 70% of polygons 10, 13 and 14. Hilda area: air photo AS2485-161, 100% of polygons 5 and 6.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Pakowki – Orion area: air photo AS 4551-035, 50% of polygon 23. Hilda area: air photo AS2485-161, 40% of polygons 3, 8 and 15.
- **Significant** (one to three sites types, each covering 10 to 30%): i) Approximately 10% on AS5350F-27 in lower right centre of photo. Dominated by Sa (70%) with Significant sy (20%) and Significant CS (10%). ii) Pakowki – Orion area: air photo AS 4551-035, 30% of polygons 8 and 9. Hilda area: air photo AS2485-161, 20% of polygons 7 and 16.

Example(s) of non-typical occurrences: Dunes on the leeward sides of ridges (often north-south ridges), as sand textures may accumulate over time in such a setting. An example in CFB Suffield is on Southern Hogsback Ridge in the National Wildlife Area southeast of Dugway Trail.

Gravel (Gr)

Definition: Dominated by gravels or cobbles (>50% coarse fragments). May be covered by a mantle with few gravels, up to 20 cm thick.

Representative example: Pakowki Lake delta on the northwest side of the Lake.

Usual landscape position: Often on terraces and in valley bottoms**.**

Common association with other GVI site types: SwG, Sy, Lo.

Differentiation from the most similar site type(s):

- SwG: gravels not at surface but between 20 and 100 cm in depth.

- Sy: Gravels occur only occasionally, and textures are moderately coarse (sandy loam). Gravels are <20% in Sy.
- Lo: 0 to 20% gravels by volume, and textures are medium (loam, silt loam).

Correlation with Soil Landscape Models: Applies to any soil with less than 20 cm of a surface mantle of any textural class over gravelly to very gravelly or cobbly to very cobbly (>20% gravel or cobbles) material.

Native vegetation: Graminoids and Silver Sagebrush with some bare soil.

Expression on colour infrared photography: Light green and light grayish to white tones. The lightest tones correlate to the locations with gravel at the surface.

Examples in pilot areas: Co-dominant occurrence (30 to 60%) on air photo AS5350F-115 in the Sage Creek Valley. Gravel resources have been extracted from a small terrace in the Sage Creek Valley. Small native/natural polygons may still occur. May occur with SwG.

Example(s) of non-typical occurrences: None.

Shallow to Gravel (SwG)

Definition: Soil with 20 to 50 cm of a sandy or loamy surface overlying a gravel or cobble- rich substrate.

Representative Example: Terraces along Chin Coulee northeast of Skiff

Usual landscape position: Often on terraces and in valley bottoms

Common association with other GVI site types: Sy, Lo, Gr.

Differentiation from the most similar site type(s):

- Gr has gravels at the surface.
- Lo has only a few gravels between 20 and 100 cm from the surface.

Correlation with Soil Landscape Models: Applies to any soil with 20 to 50 cm of a surface mantle of any textural class overlying gravelly or very gravelly or cobbly to very cobbly (>20% gravel or cobbles) material.

Native vegetation: Graminoid with Silver Sagebrush.

Expression on colour infrared photography: Generally a smooth green tone.

Examples in pilot areas: Co-dominant occurrence (30 to 60%) on air photo AS5350F-115 in the Sage Creek Valley. Gravel resources have been extracted from a small terrace in the Sage Creek Valley. Small native/natural polygons may still occur. May occur with Gravel (Gr).

Example(s) of non-typical occurrences: None.

Examples of Other GVI Site Types

Crop Irrigated (CI)

Representative Example: Common irrigation methods in the Taber and Bow Island areas for annual crops.

Example(s) of non-typical occurrences: Irrigation and Canal Creeks on the east side of Pakowki Lake, mainly irrigated by flood irrigation using a border dyke system. Occasional annual crops occur in this area. (Eg., lower left portion of AS5350F-164) but most production is now forage (hay and pasture production).

Crop Non-Irrigated (CN)

Representative Example: Dryland (or rainfed) crop production in the Foremost area.

Example(s) of non-typical occurrences: Scattered crop production in the Comrey area, Twp. 2 Rg. 6-W4).

Tame Pasture or Hay - Irrigated (PI)

Representative Example: Common irrigation methods in the Taber and Bow Island areas for annual crops.

Example(s) of non-typical occurrences: Irrigation and Canal Creeks on the east side of Pakowki Lake, mainly irrigated by flood irrigation using a border dyke system. Occasional annual crops occur in this area. (Eg., lower left portion of AS5350F-164) but most production is now forage (hay and pasture production).

Tame Pasture or Hay - Non-Irrigated (PN)

Representative Example: Crested Wheatgrass pastures. (Eg., Numerous in Etzikom north area, and in the southeastern portion of CFB Suffield).

Example(s) of non-typical occurrences: Introduced pastures that have reverted to native pastures over time. GVI interpreters will be viewing and assessing the relative percentage of native species. (PN applies if <50% native species and non-irrigated).

Pits Site Type and Examples of Modifiers

Pit Coal: Eg., Sheerness Mine in eastern areas.

Pit Sand: Eg., Numerous locations. Eg., north of Purple Springs.

Pit Gravel: Many locations. Eg., northwest edge of Pakowki Lake.

Pit Clay: Not expected in the Dry Mixedgrass Natural Subregion.

Pit Quarries: Not expected in the Dry Mixedgrass Natural Subregion.

Developed Site Type and Examples of Modifiers

Developed Confined Feeding Operations: Eg., Lakeside Feeders, Brooks

Developed Transportation: Highway #1.

Developed Agricultural Research or Processing: Lamb Wesson Potato Plant, Fincastle.

Developed Industrial Processing: Refineries at Redcliff.

Developed Lagoons: Rogers Sugar, Taber.

Developed Oil or Gas Facilities: EnCana Compressor Station on Sec. Highway #884, 12 miles south of Jenner.

Developed Mining Facilities: Not expected in the Dry Mixedgrass.

Urban Site Type

Representative Examples: Medicine Hat, Youngstown, Brooks, Tilley.

Rural Site Type

Representative Examples: Farmsteads; small hamlets, Whitla, Richdale.

Literature Resources Applicable to this Guide

Adams, B.W., L. Poulin-Klein, D. Moisey and R.L. McNeil. 2004. Rangeland Plant Communities and Range Health Assessment Guidelines for the Dry Mixedgrass Natural Subregion of Alberta. Rangeland Management Branch, Public Lands Division, Alberta Sustainable Resource Development, Lethbridge, Pub. No. T/040. 85 pp.

Alberta Sustainable Resource Development (ASRD). 2004. Draft Natural Subregions map and legend. Edmonton, Alberta.

ASIC (Alberta Soil Information Centre) 2001. AGRASID 3.0: Agricultural region of Alberta Soil Inventory Database (Version 3.0). Edited by J.A. Brierley, T.C. Martin and D.J. Spiess. Agriculture and Agri-Food Canada, Research Branch; Alberta Agriculture, Food and Rural Development, Conservation and Development Branch. Available: http://www.agric.gov.ab.ca/asic

GVI Committee and R.L. McNeil. Grassland Vegetation Inventory (GVI) Final Specifications Report. Alberta Sustainable Resource Development and LandWise Inc. Lethbridge, Alberta. 53 pages.

Kjearsgaard, A., J. Tajek, W.W. Pettapiece, and R.L. McNeil. 1986. Soil survey of the County of Warner, Alberta. Report #46, Alberta Soil Survey. Research Branch, Agriculture Canada. Ottawa, Ont. 108 pp. + maps.

McNeil, R.L., R.W. Howitt, I.R.Whitson, and A.G. Chartier. 1994. Soil survey of the County of Forty Mile No. 8, Alberta. Report No. 54, Alberta Research Council, Environmental Research and Engineering Department, 82 pp.

Penniket and Associates Ltd. 2002. Sagebrush inventory in southeastern Alberta. Prepared for the Alberta Conservation Association. Lethbridge, Alberta.

Soil Classification Working Group (SCWG). 1998. The Canadian system of soil classification. 3rd Edition. Research Branch, Agriculture and Agri-Food Canada. NRC Research Press, Ottawa. 187 pp.

Stewart, R.E. and H. A. Kantrud. 1971. Classification of Natural Ponds and Lakes in the Glaciated Prairie Region. Resource Publication 92. Bureau of Sport Fisheries and Wildlife, U.S. Fish and Wildlife Service, Washington, D.C.

Stewart, R.E. and H. A. Kantrud. 1972. Vegetation of prairie potholes, North Dakota, in relation to quality of water and other environmental factors. Hydrology of prairie potholes in North Dakota. Geological Survey Professional Paper 585-D. Prepared by U.S. Bureau of Sport Fisheries and Wildlife, in collaboration with the U.S. Geological Survey. Washington, D.C. Posted April 15, 2004. Accessed April 25, 2005. http://www.lib.ndsu.nodak.edu/govdocs/text/potholes/585d.html

Thompson, W.H., and P.L. Hansen. 2002. Classification and management of riparian and wetlands sites in Alberta's Grassland Natural Region and adjacent subregions. Bitterroot Restoration Inc. Prepared for the Alberta Riparian Habitat Management Program – Cows and Fish. Cows and Fish Report No. 018. 416 pp.