

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

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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 Mixedgrass interpretation guide applies to the following GVI Study Areas.

Year	Area	Townships	Ranges W4
2004	Eagle Butte	7	Portions of 3 and 4
2006	Milk River Ridge	1 to 4	Eastern areas of 17 to 25
2006	County of Lethbridge and Environs	7	19 to 24
		8	18 to 24
		9 to 12	19 to 24
		13	19 to 21

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 Oldman River at Paradise Canyon, Lethbridge.

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** ($\geq 65\%$): 70% BdL and 30% TB on the northern edge of the Lower Little Bow valley wall in N-29 and S-32-12-19-W4.
- **Co-Dominant** (two or three site types each cover 30 to 60%): 35% BdL with 55% TB and 10% Li in 21-12-19-W4.

- **Significant** (one to three sites types, each of 10 to 30%): 10% BdL with co-dominant TB (55%) and Li (35%) in 19-13-20-W4.

Example(s) of non-typical occurrence: Hard sandstone walls and hoodoos of the Blood Reserve Formation near Jensen Reservoir south of Magrath.

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: Lower Little Bow valley between the steep sides and the floodplain.

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

Common association with other GVI site types: Lo, BIO, 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 greater 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 IUI and IUh landscape models.

Native vegetation: Variable herbaceous cover and often occurs with some shrub cover.

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%): Valley fans of the Lower Little Bow river. Eg., E5-13-20-W4, with significant Li.
- **Co-Dominant** (two or more ERS cover 30 to 60%): NW 29-12-19-W4: Ov (40%), BIO (30%), Li (30%), TB (10%).
- **Significant** (10 to 30%): N 22-11-21-W4: Dominant SL (65%) with 20% Ov and 15% Lentic.

Example(s) of non-typical occurrence: Wide, broad, low-gradient flats below highlands (Milk River Ridge or Cypress Hills) that have Overflow in association with Saline Lowland, Limy, Loamy and Blowouts.

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 Lethbridge (Oldman River).

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** ($\geq 65\%$): 70% TB with 20% Li and 10% Lotics in the Lower Little Bow valley wall in 4-13-20-W4.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Co-dominant TB (55%) and Li (35%) with 10% BdL in 19-13-20-W4.
- **Significant** (one to three sites types, each covering 10 to 30%): 70% BdL and 30% TB on the northern edge of the Lower Little Bow valley wall in N-29 and S-32-12-19-W4.

Example(s) of non-typical occurrences: Site-specific level to depressional locations with exposed softrock and a greater coarse fragment content. (Depressions are due to soil removal by wind erosion). Examples occur in the Lost Creek valley of the southwestern portion of the Pinhorn Grazing Reserve.

Site Types Defined Mainly by Soil Features

Blowouts/Solonetzic Order (BIO)

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

Representative example: Near Standard on inclined plains south of the Wintering Hills.

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% BIO. BIO usually occur with Lo, with Lo occupying areas 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 and some bare ground. Highly mottled appearance, as BIO 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** ($\geq 65\%$): 65% BIO with 25% Lo and 10% Li in NE 36-2-18-W4.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): 30% BIO with 40% Ov, 30% Li and 10% TB in NW 29-12-19-W4.
- **Significant** (one to three sites types, each covering 10 to 30%): 25% BIO with 65% Lo and 10% Li in W 31-2-17-W4.

Example(s) of non-typical occurrences: SL occurs with BIO in native areas with Solonetzic order soils subjected to salinization through an elevated water table. This higher water table may be due to local irrigation or to cropping practices.

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., Lower Little Bow River valley downstream of Turin, and the Bow River valley near Bassano.

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 Dark Brown Chernozemic soil, while Li is an immature Rego or Calcareous Dark Brown Chernozemic. TB may be developed on similar soils as Li, but TB is characterized by shallow bedrock, and vegetative cover is generally sparser.

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 patchy shrub cover.

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

Examples in pilot areas:

- **Dominant** ($\geq 65\%$): 70% Li with 30% TB in the east valley wall of the Lower Little Bow in 22-11-19-W4.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): 35% Li with 55% TB and 10% BdL in 19-13-20-W4
- **Significant** (one to three sites types, each covering 10 to 30%): 20% Li with 70% TB and 10% Lotics in the Lower Little Bow valley wall in 4-13-20-W4.

Example(s) of non-typical occurrences: 1) Locations with occasional groundwater discharge, where the groundwater is carbonated, rather than saline and 2) Extensive areas of the Blackfoot Plain near Gleichen, where Li occurs in association with Sy and Lo site types, and occasionally TB.

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: Dune field on the Blackfoot Reserve (Siksika Nation) in Twp 21, R 22 W4 between the CP Railway (south of Highway #1) and the Bow River.

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** ($\geq 65\%$): 65% Sb with 20% Sy, 10% SL and 5% LtcH in NW 12-2-18-W4.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): 35% Sb with 50% Sy, 10% LenT and 5% TB in LSD 2-19-2-16-W4.
- **Significant** (one to three sites types, each covering 10 to 30%): 20% Sb with 80% Sy on the south side upper terrace above the Milk River in LSD 12-26-2-17-W4.

Saline Lowland (SL)

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

Representative example: Areas below the north slope of the Milk River Ridge, such as west of Warner and south of Raymond.

Usual landscape position: lower slopes; can be broad concave settings.

Common association with other GVI site types: B1O, 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** ($\geq 65\%$): 80% SL with 10% LenA and 10% Li in LSD 2-11-2-18-W4.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): 35% SL with 55% Lo and 10% Li in LSD 5-29-3-17-W4.
- **Significant** (one to three sites types, each covering 10 to 30%): 10% SL with 65% Sb, 20% Sy and 5% LtcH in NW 12-2-18-W4.

Example(s) of non-typical occurrences: Areas adjacent and below reservoirs such as McVinnie Reservoir in Twp. 13 R 21 W4.

Site Types Defined as Wetlands

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: Oldman 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 Mixedgrass Natural Subregion.

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 the River Valley Park in Fort MacLeod.

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, *Populus angustifolia* (Narrow-leaf Cottonwood).

Native vegetation: Mainly Narrow-leaf Cottonwood plant communities.

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

Examples in pilot areas:

- **Dominant** ($\geq 65\%$): Milk River Valley at the AB Tourism office in the Town of Milk River, with significant LtcS.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Southwest edge of Pavan Park adjacent to the Oldman River, with a mix of POPUDEL/CORNSTO (*Populus deltoides/Cornus stolonifera*) and SHEPARG (*Shepardia argentia*) plant communities.
- **Significant** (one to three sites types, each covering 10 to 30%): North central area of Alexander Wilderness Park in Lethbridge, LtcD is significant in association with areas dominated by LtcS.

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: Willow and other shrub plant communities of Devil’s Coulee west of Warner.

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** ($\geq 65\%$): North central area of Alexander Wilderness Park in Lethbridge, with significant LtcD.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Southwest edge of Pavan Park adjacent to the Oldman River, with a mix of POPUDEL/CORNSTO (*Populus deltoides/Cornus stolonifera*) and SHEPARG (*Shepardia argentia*) plant communities.
- **Significant** (one to three sites types, each covering 10 to 30%): Significant LtcS in the Milk River Valley at the AB Tourism office in the Town of Milk River, with dominant LtcD.

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: Grass and sedge plant communities along Willow Creek between Claresholm and Fort MacLeod.

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** ($\geq 65\%$): CAREROS (*Carex rostrata*) plant community surrounding the oxbow backwater in the river valley park at Fort MacLeod.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Locations with an association of LtcH and LtcS too narrow or small to map as individual site types.
- **Significant** (one to three sites types, each covering 10 to 30%): Areas dominated by LtcS with isolated LtcH including the Milk River valley in LSD 15-15-2-16-W4.

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: Many shallow depressions in the hummocky till of the Sundial Butte area (Twp 13, R 20 and 21, W4M) north of Lethbridge.

Usual landscape position: Depressional.

Common association with other GVI site types: Other Lentic 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 surrounding upland.

Examples in pilot areas:

- **Dominant** ($\geq 65\%$): Many small wetlands in hummocky glacial till. Eg., 16-1-18-W4.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Small wetland with an outer ring of LenT surrounding LenS. Eg., LSD 13-24-1-18-W4.
- **Significant** (one to three sites types, each covering 10 to 30%): None observed.

Example(s) of non-typical occurrences: Blowout pits in Solonchic 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: Many of the wetlands on the Milk River Ridge (e.g. Twp 3 R 18 W4M).

Usual landscape position: Depressional

Common association with other GVI site types: Other Lentic.

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** ($\geq 65\%$): Many small wetlands in hummocky glacial till. Eg., LSD 4-24-1-18-W4.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Small wetland with an outer ring of LenT surrounding LenS. Eg., LSD 13-24-1-18-W4.
- **Significant** (one to three sites types, each covering 10 to 30%): None observed.

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: Marsh areas and shoreline habitats of Stirling Lake, in the southwest corner of Twp. 7 R 19 W4M.

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** ($\geq 65\%$): Deep marsh habitats in Long's Lake, in W11-1-17-W4.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Locations where marsh habitat and open water are intermixed. Eg., wetlands in LSD 11-17-1-17-W4.
- **Significant** (one to three sites types, each covering 10 to 30%): LenSP ring around a LenW wetland.

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: Strongly saline wetland depressions in the New Dayton area, Twp. 5, Rg 18, W4.

Usual landscape position: Depressional flats with apparent salts.

Common association with other GVI site types: SL, Li, and other Lentic.

Differentiation from the most similar site type(s): Saline Lowland does not have a defined basinal edge and is characterized by imperfectly drained soils (usually Saline Regosols). LenA is in a definite basin and is usually represented by poorly drained Saline Gleysolic soils.

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** ($\geq 65\%$): Basin in NE 27-5-18-W4 between New Dayton and Tyrell Lake.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): LenA is co-dominant with SL in an un-named basin immediately north of New Dayton, in LSD 6-33-5-18-W4.
- **Significant** (one to three sites types, each covering 10 to 30%): Any LenA basin dominated by water (LenW) at the time of imagery. LenA would then be significant.

Example(s) of non-typical occurrences: Alkaline fens with deep Organic (peat) soils due to permanent groundwater discharge. Organic soils are considered rare in the Mixedgrass Natural Subregion, and when they occur, they are typically alkaline fens (LenA).

Lentic Open Water (LenW)

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

Representative example: Park Lake north of Lethbridge.

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** ($\geq 65\%$): Any natural or artificial depression holding water. Eg., Milk River Ridge Reservoir.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Locations where open water and marsh habitat are intermixed. Eg., wetlands in LSD 11-17-1-17-W4.
- **Significant** (one to three sites types, each covering 10 to 30%): Wetlands that are dominated by LenSP, with LenW < 1 ha.

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: Standard and Chancellor areas.

Usual landscape position: Level to gently undulating plains.

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

Differentiation from the most similar site type(s): Many clay-dominated areas are actually Li and typified by Rego or Calcareous Dark 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.

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

Examples in pilot areas:

- **Dominant** ($\geq 65\%$): Cy could occur in the Coaldale glacial lake basin if there are any remnants of native prairie > 5 ha, but this is not expected.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): Not expected to occur.
- **Significant** (one to three sites types, each covering 10 to 30%): Not expected to occur.

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 Lomond and Vulcan areas.

Usual landscape position: Undulating to hummocky plains

Common association with other GVI site types: Li, Sy, B1O, Ov, or 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 subsoil and 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.

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

Examples in pilot areas:

- **Dominant** ($\geq 65\%$): 85% Lo with 10% Li and 5% LenT in soils polygon 107 (RDWN1/U1h) in W19-13-20-W4 on the Lower Little Bow and Battersea soil survey.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): 35% Lo with 45% Sy and 20% Li in polygon 41 (KSWN4/H11) in Sec 5 Twp 14, Rge 20, W4M on Lower Little Bow and Battersea soil survey.
- **Significant** (one to three sites types, each covering 10 to 30%): 20% Lo with 70% Ov and 10% Li in polygon 120 (BUT1/I31). Occurs in SE5, Twp 13, Rge 20, W4M on Lower Little Bow and Battersea soil survey.

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: Gleichen south 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.

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

Examples in pilot areas:

- **Dominant** ($\geq 65\%$): 70% Sy with 15% SwG and 15% Sa in polygon 208 (KSR6/U1h) in SW 29, Twp 12, Rge 19, W4M on the Lower Little Bow and Battersea soil survey.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): 45% Sy with 35% Lo and 20% Li in soils polygon 41 (KSWN4/H11) Sec 5 Twp 14, Rge 20, W4M on Lower Little Bow and Battersea soil survey.
- **Significant** (one to three sites types, each covering 10 to 30%): 20% Sy with 70% Ov and 10% Li in soils polygon 218 (BUTaa6/I31) in NW 22 Twp 12 Rge 20 W4M on the Lower Little Bow and Battersea soil survey.

Example(s) of non-typical occurrences: Sandy soils with some gravels, where gravels are <20% by volume.

Sands (Sa)

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

Representative example: Area south of Turin and west of the Little Bow 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.

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

Examples in pilot areas:

- **Dominant** ($\geq 65\%$): 80% Sa with 15% CS and 5% Sy in SE 19-2-17-W4, (HRK1/3-4 polygon on the Soil Survey for the County of Warner).
- **Co-Dominant** (two or three site types each cover between 30 and 60%): 55% Sa with 35% CS and 10% CS-Ac in polygon 631 (HRaaKS4/u1h) in NE 8, Twp 11, Rge 19 on Lower Little Bow and Battersea soil survey.
- **Significant** (one to three sites types, each covering 10 to 30%): 70% Sy with 15% SwG and 15% Sa in soils polygon 208 (KSR6/U1h) in SW 29, Twp 12, Rge 19, W4M on Lower Little Bow and Battersea soil survey.

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).

Representative example: Dunes on Blackfoot Reserve (Siksika Nation) between Gleichen and Cluny and south of the CP Railway.

Usual landscape position: Sand plains with low to high relief dunes; 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 D11, 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** ($\geq 65\%$): Soils polygon 635 (HRaaKS4/U1h) in NW4 Twp 11 Rge 19 W4M on the Lower Little Bow and Battersea soil survey, or to the south of this polygon and above the Oldman river breaks may be a GVI polygon dominated by CS.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): 35% CS with 55% Sa and 10% CSAc in polygon 631 (HRaaKS4/u1h) in NE 8, Twp 11, Rge 19 on the Lower Little Bow and Battersea soil survey.
- **Significant** (one to three sites types, each covering 10 to 30%): 15% CS with 80% Sa and 5% Sy in SE 19-2-17-W4, (HRK1/3-4 polygon) on the Soil Survey for the County of Warner.

Example(s) of non-typical occurrences: Dunes on the leeward sides of ridges (often north-south ridges), where sand textures may accumulate over time.

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: Glaciofluvial terraces above the Little Bow River in Twp. 13 Rg. 20 W4M, and in the Little Bow valley in Twp 12 Rg. 20 W4M.

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 shrub 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:

- **Dominant** ($\geq 65\%$): Portions of the Oldman River Valley downstream (north) of Lethbridge.

- **Co-Dominant** (two or three site types each cover between 30 and 60%): 50% Gr and 50% SwG in soils polygon 487 (CFNE1/H11) in SW 26, Twp 11, Rge 20 W4M on the Lower Little Bow and Battersea Soil Survey.
- **Significant** (one to three sites types, each covering 10 to 30%): 15% Gr with 70% SwG and 15% Li in soils polygon 377 (CFT4/U1h) in SE 3, Twp 12 Rge 20 W4M on Lower Little Bow and Battersea Soil Survey.

Example(s) of non-typical occurrences: Upland gravel surfaces such as the Buffalo Hills south of Arrowood (Mixedgrass and Foothills Fescue Natural Subregions), and the upland north of Cluny (Mixedgrass Natural Subregion).

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 Bullshead Coulee west of the Cypress Hills in Twp. 8 Rg. 4 W4M.

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 some shrub.

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

Examples in pilot areas:

- **Dominant** ($\geq 65\%$): 70% SwG with 15% Gr and 15% Li in soils polygon 377 (CFT4/U1h) in SE 3, Twp 12, Rge 20, W4M on the Lower Little Bow and Battersea soil survey.
- **Co-Dominant** (two or three site types each cover between 30 and 60%): 50% SwG and 50% Gr in soils polygon 487 (CFNE1/H11) in SW 26, Twp 11, Rge 20 W4M on the Lower Little Bow and Battersea Soil Survey.
- **Significant** (one to three sites types, each covering 10 to 30%): 15% SwG with 70% Sy and 15% Sa in soils polygon 208 (KSR6/U1h) in SW 29, Twp 12, Rge 19, W4M on Lower Little Bow and Battersea Soil Survey.

Example(s) of non-typical occurrences: Upland SwG surfaces such as the Milk River Ridge (Mixedgrass and Foothills Fescue Natural Subregions) and the Buffalo Hills south of Arrowood (Mixedgrass and Foothills Fescue Natural Subregions).

Examples of Other GVI Site Types

Crop Irrigated (CI)

Representative Example: Common irrigation methods in the Lethbridge area for annual crops.

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

Crop Non-Irrigated (CN)

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

Example(s) of non-typical occurrences: Scattered crop production on the Milk River Ridge.

Tame Pasture or Hay - Irrigated (PI)

Representative Example: Centre-pivot irrigation on the Blood Reserve (Kainai Nation) for export timothy production.

Example(s) of non-typical occurrences: 1) Occasional irrigation for hay production in valley settings of the Milk River Ridge (e.g. Mackie Creek) and 2) Pasture flood irrigation with a series of contoured ditches (e.g. NE 23, Twp 22 Rge 23 W4M near Gleichen).

Tame Pasture or Hay - Non-Irrigated (PN)

Representative Example: Crested Wheatgrass pastures. (Eg., Numerous in Retlaw area (west of Vauxhall).

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: None.

Pit Sand: Some locations. Eg., south of Turin.

Pit Gravel: Many locations. Eg., Oldman valley at Fort MacLeod.

Pit Clay: Cypress Hills Medalta Potteries source in Twp 8 Rg 5 W4M.

Pit Quarries: Inactive sandstone quarry near the confluence of Rocky Coulee and the Oldman river in Twp 10 Rg 24 W4M.

Developed Site Type and Examples of Modifiers

Developed Confined Feeding Operations: Eg., Many in Picture Butte area.

Developed Transportation: Highway #3 Fort Macleod to Chin Coulee and Highway #4 Lethbridge to Coutts.

Developed Agricultural Research or Processing: Lethbridge Research Centre or the Animal Disease Research Centre.

Developed Industrial Processing: Cement plants.

Developed Lagoons: East side of Vulcan.

Developed Oil or Gas Facilities: Any gas plant larger than 5 ha.

Developed Mining Facilities: Not expected in the Mixedgrass.

Urban Site Type

Representative Examples: Lethbridge, Raymond, and Milo.

Rural Site Type

Representative Examples: Farmsteads; small hamlets, Eg., Welling, Kirkaldy.

Literature Resources Applicable to this Guide

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- 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.

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Bitterroot Restoration Inc. Prepared for the Alberta Riparian Habitat Management Program – Cows and Fish. Cows and Fish Report No. 018. 416 pp.