Preliminary Classification of
Silver Sagebrush (*Artemisia cana*) Community Types

Prepared for

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INTRODUCTION

Silver sagebrush (*Artemisia cana* spp. *cana*) community types are essentially restricted to the western Great Plains. In Alberta, they occur in the Mixedgrass and Dry Mixedgrass Natural Subregions, extending north along riparian areas into the Central Parkland Subregion of Alberta. They occur in relatively small areas and have been identified as priority types due to the restricted habitat they tend to occupy. In addition, there may be vertebrate species of concern that are dependent on them, such as the sage grouse and sage thrasher.

There are limited data on the extent and diversity of silver sage communities in Alberta, although numerous types have been identified in North America (see Existing Classifications below). A preliminary classification of community types is required by the Alberta Natural Heritage Information Centre (ANHIC). The purpose is:

- to review existing literature and data, such as those stored in the Ecological Site Inventory System (ESIS),
- to develop a preliminary classification according to the system adopted by The Nature Conservancy based on the information collected and discussions with knowledgeable individuals, and
- to then compare the preliminary classification to other similar community types identified elsewhere, to place the Alberta types in the North American context where possible.

This preliminary classification will focus on native shrubland and "shrub herbaceous" community types where silver sagebrush is a prominent component, with a minimum of 5% cover.

The Nature Conservancy has developed a standardised hierarchical system to facilitate the identification and classification of vegetated terrestrial communities (Schneider *et al*. 1997; NatureServe 2000). The upper hierarchical levels (class and subclass) are based on vegetation structure, height and leaf form; the middle levels (group and formation) are based on climate, hydrology and leaf form; the lowest levels (alliance and association) are based on floristic composition of the uppermost strata (alliance) and total floristic composition (association). An important aspect to the classification is that the community elements are related to a set of environmental factors rather than to a particular site, allowing the classification to have ecological meaning over a broad geographical range. The lowest level of the hierarchy (the plant association) has a definite floristic composition and uniform physiography, and represents uniform habitat conditions. Habitat refers to the combination of environmental conditions and ecological processes influencing the community. The classification which is applicable to this project is taken from "The Status of Biodiversity in the Great Plains: Great Plains Vegetation

Classification" (Schneider *et al*. 1997) and NatureServe (2000), and is presented below:

V HERBACEOUS. Herbs (graminoids, forbs and ferns) dominate (generally forming at least 25% cover). Trees, shrubs and dwarf shrubs generally with less than 25% cover.

V.A.7 **Temperate or subpolar grassland with a sparse shrub layer**

V.A.7.e **Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer**

V.A.7.e *ARTEMISIA CANA* SHRUB HERBACEOUS ALLIANCE
Artemisia cana/Carex inops ssp. *heliophila* Shrub Herbaceous Alliance
Silver Sagebrush/Sedge Shrub Prairie
Artemisia cana/Festuca idahoensis Shrub Herbaceous Alliance
Silver Sagebrush/Idaho Fescue Shrub Prairie
Artemisia cana/Stipa comata Shrub Herbaceous Alliance
Silver Sagebrush/Needle-and-thread Shrub Prairie
Artemisia cana ssp. *cana/Calamovilfa longifolia* Shrub Herbaceous Alliance
Silver Sagebrush/Prairie Sandreed Shrub Prairie
Artemisia cana ssp. *cana/Pascopyrum smithii* Shrub Herbaceous Alliance
Silver Sagebrush/Western Wheatgrass Shrub Prairie

V.A.7.j **Short temperate or subpolar grassland with a sparse microphyllous evergreen shrub layer**

V.A.7.j *ARTEMISIA CANA* SHRUB SHORT HERBACEOUS ALLIANCE
Artemisia cana ssp. *cana/Bouteloua gracilis* Shrub Herbaceous Vegetation
Silver sagebrush/Blue grama Shrub Prairie
Artemisia cana/*Muhlenbergia richardsonis* Shrub Herbaceous Vegetation
Silver Sagebrush/Mat Muhly Shrub Herbaceous Vegetation

III SHRUBLAND (SCRUB). Shrubs generally greater than 0.5 m tall with individuals or clumps not touching to interlocking (generally forming >25% canopy cover, tree cover generally <25%).

III.A.4 **Microphyllous evergreen shrubland**

III.A.4.a **Microphyllous evergreen shrubland**

III.A.4.a *ARTEMISIA CANA* ssp. *CANA* SHRUBLAND ALLIANCE
Artemisia cana ssp. *cana-Sarcobatus vermiculatus*-(*Chrysothamnus nauseosus*) Shrubland
Silver Sagebrush-Greasewood-(Rabbit Brush) Shrubland

III.A.4.c **Temporarily flooded microphyllous evergreen shrubland**

III.A.4.c *ARTEMISIA CANA* TEMPORARILY FLOODED SHRUBLAND ALLIANCE
Artemisia cana/*Pascopyrum smithii* Shrubland
Silver Sagebrush/Western Wheatgrass Shrubland
Artemisia cana/*Poa secunda* Shrubland

Silver Sagebrush/Curly Bluegrass Shrubland
Artemisia cana/Pascopyrum smithii Shrub Herbaceous Vegetation
Silver sagebrush/Western Wheatgrass Shrub Prairie

METHODS

A literature review of publications on silver sagebrush communities was conducted. This included publications from the library of Lorna Allen of ANHIC, those in our own library and those provided by experts in the field whom we contacted. Some experts were able to provide comments or refer us to publications on silver sagebrush classification, while others referred us to other individuals or indicated that they were unable to provide any information on the subject.

The records in the ESIS database having silver sagebrush at a cover of 5% or greater were subjected to an indicator species analysis (TWINSPAN) (Hill 1979) and ordination (DECORANA, a detrended correspondence analysis) (Gauch 1982) using PC-ORD. The results were subjectively assessed and the records were grouped according to dominant species and vegetation structure.

EXISTING CLASSIFICATIONS

The following is a summary of the community types applicable to the silver sagebrush community types of Alberta. The term used to describe the type matches that used by the author (e.g., vegetation type, habitat type, association). The species composition and/or canopy cover for each of the community types described, if available, is presented in Appendix I.

Current grassland classification work primarily in the Grassland Natural Region (but including grasslands in the aspen parkland and montane regions) began by linking generic range site types with soil types (McNeil and Sawyer 1998). The next step was to correlate vegetation communities with these types. Taking the soil description into consideration when classifying vegetation communities can be extremely valuable in distinguishing between communities that have developed based on the soils versus disturbances such as grazing (B. Adams, pers. comm.). The classification of riparian vegetation communities is close to being finalised (Thompson and Hansen 2001), and classification of upland communities has begun recently (Adams and Ehlert 2001). This draft report will be further refined and expanded to include all of the Grassland Natural Region and grasslands of the aspen parkland (B. Adams, pers. comm.).

Ron McNeil of LandWise Inc. (pers. comm.) is working on an assessment of the soils that relate to sagebrush communities, particularly those that have more than 5% cover. His general synopsis of the typical soil landscapes on which sagebrush is associated include:

- fans, aprons and swales which are characterised by any of Wardlow (WDW), Orion (ORN) and Bunton (BUT) soils. These soils range from Solonetzic through Regosolic through Chernozemic associations. Sagebrush tends to be associated with sodic conditions, which are more predominant with each of the Solonetzic and Regosolic soils.

- sandy and gravelly sites, specifically in valleys or swales. However, sagebrush is at a lower percentage cover and often may be less than 5% on these sites.

The silver sagebrush/western wheat grass (*Artemisia cana/Agropyron smithii*) habitat type is a riparian type that has been described in southern Alberta and for the Great Plains portion of Montana (Hansen *et al.* 1995; Thompson and Hansen 2001). It is found on nearly level, older alluvial terraces on both broad and narrow flood plains and coalescing alluvial fans in valleys. It represents one of the driest of the community types found in the riparian or wetland zone. Sites are located in deep, loamy, alluvial soils or where overland water flow (from spring run-off or storms) or soil conditions (fine textured), or a combination of both, allow a higher moisture regime than normal. In some situations, fine textured soils have resulted in a perched water table. Soils are clay loam to loam textured and slightly acid to moderately alkaline pH (6.0-8.0), although some sites sampled had weakly saline soils. Redox concentrations (mottles) were common, indicating a fluctuating water table. Available water was estimated as moderate (Hansen *et al.* 1995; Thompson and Hansen 2001).

Along with silver sagebrush and western wheat grass, green needle grass (*Stipa viridula*) is important on undisturbed sites. Other common species include slender wheat grass (*Agropyron trachycaulum*), June grass (*Koeleria macrantha*), needle-and-thread (*Stipa comata*), blue grama (*Bouteloua gracilis*), common yarrow (*Achillea millefolium*), pasture sagewort (*Artemisia frigida*) and wild vetch (*Vicia americana*) (Hansen *et al.* 1995; Thompson and Hansen 2001).

Widely spaced, old or dying plains cottonwoods (*Populus deltoides*) may be present in mid- to late seral primary successional stands, occasionally with buckbrush (*Symphoricarpos occidentalis*). The silver sagebrush/western wheat grass habitat type develops when an old alluvial terrace that once supported the cottonwood community becomes drier due to flood plain build-up, or channel down-cutting or migration away from the site (Hansen *et al.* 1995; Thompson and Hansen 2001).

A silver sagebrush/western wheat grass habitat type was described by Hansen *et al.* (1984) in western North Dakota. These sagebrush flats occurred on large areas of flood plains and river terraces. Silver sagebrush dominated with a mean cover of 33.6%. Buckbrush occurred in less than half of the stands sampled but had a mean cover of 47%. There was high graminoid cover at

84.8%. Western wheat grass and thread-leaved sedge (*Carex filifolia*) dominated between the widely spaced silver sagebrush shrubs. Other common species included green needle grass, bearded wheat grass (*Agropyron caninum*) and pasture sagewort. This habitat type forms an edaphic climax in the region.

Silver Sagebrush-Western Wheat Grass Shrubland was described by Heidel *et al.* (2000) in Sheridan County, Montana and in NatureServe (2000) for the northwestern Great Plains and Rocky Mountains of the western United States, ranging from Montana and North Dakota, south to Nebraska. This shrubland is found mainly in the western Great Plains on flat alluvial deposits on flood plains, terraces or benches, and alluvial fans. The soils are moderately deep to deep and either silt loam, clay loam or sandy loam. Flooding may occur periodically and this tends to retard soil development. This community is dominated by a combination of shrubs and graminoids, and the total vegetation cover is moderate. The shrub layer is the tallest and most conspicuous stratum. It is usually 0.6-1.2 m high and dominated by silver sagebrush, sometimes accompanied by buckbrush. Grass cover is dominated by western wheat grass, which is often accompanied by green needle grass and occasionally June grass, Kentucky bluegrass, needle-and-thread and blue grama. Typical forbs of this community are pasture sagewort, broomweed (*Gutierrezia sarothrae*), common yarrow, scarlet butterflyweed (*Gaura coccinea*), scarlet mallow (*Sphaeralcea coccinea*) and common blue lettuce (*Lactuca pulchella*). While this plant association is not restricted to riparian settings, those observed fit the wetland characterisation of Hansen *et al.* (1995). In Sheridan County, the canopy cover of silver sagebrush was usually less than 25%, and therefore was more appropriately referred to as shrub herbaceous vegetation. The bottomlands where this vegetation association occurs are heavily used by cattle. Often the western wheat grass is heavily grazed, and povertyweed (*Iva axillaris*) and Pursh's plantain (*Plantago patagonica*) are the likely increaser species (Cooper *et al.* 2001).

Silver Sagebrush/Western Wheat Grass Shrubland is found in northeastern Montana on level to gently sloping, narrow to extremely broad alluvial (flood plain) terraces and coalescing alluvial fans (DeVelice *et al.* 1995; Cooper *et al.* 1999). It may occur up-slope in swales and gentle depressions. These sites are moister than contiguous up-slope vegetation and in some cases may constitute wetland sites. Substrates are generally moderately fine to fine textured, being derived from sediments deposited in low energy environments (or in the case of basins and swales from slope wash). They have a high water holding capacity and are well to imperfectly drained. Perched or high water tables may influence the rooting zone for a portion of the year. A silver sagebrush canopy cover of at least 5% is diagnostic of this type, but its cover usually exceeds 30%. Pasture sagewort was consistently present in low amounts (greater than 10% where cattle grazing was intensive) and other shrub species were only sporadic. Graminoids dominated the herbaceous layer with western wheat grass usually dominant, but green needle grass, needle-and-thread and blue grama were all dominant or co-dominant in at least one stand. This variability is speculated to reflect differing grazing pressure. The forb component was insignificant.

Hanson and Whitman (1938) described a sagebrush type on flats along streams and in valleys in western North Dakota. Silver sagebrush grew in dense or open stands, from 0.9 to 1.2 m (3 to 4 feet) high. Western wheat grass was the most abundant grass. Blue grama and green needle grass were also dominant. Forbs were not usually abundant, but included wild vetch, western bluebur (*Lappula occidentalis*), leafy musineon (*Musineon divaricatum*), Pursh's plantain, narrow-leaved goosefoot (*Chenopodium leptophyllum*), yellow flax (*Linum rigidum*) and common pepper-grass (*Lepidium densiflorum*). This type is subject to flooding, erosion and deposition. Where flooding is more frequent, blue grama and green needle grass were less abundant. Soil texture was variable in each horizon. Clay loam and clay were found more often than sandy loam, loam or silt loam. Soils were alkaline, ranging in pH from 7.3 to 8.2.

Silver sagebrush/western wheatgrass shrub prairie in Wyoming is described in NatureServe (2000). They suggest that this community may be very closely related to silver sagebrush/western wheatgrass shrubland (NatureServe 2000) which is found in Montana, western North Dakota and western South Dakota. The most apparent difference is the cover of shrubs. Short shrubs, especially silver sagebrush and sometimes buckbrush, have 10-25% cover. Silver sagebrush/ western wheatgrass shrub prairie is dominated by moderately dense to dense graminoids less than 1 m tall. Western wheat grass is usually the most abundant among these, while Kentucky bluegrass, blue grama and green needle grass are also common. Sand grass (*Calamovilfa longifolia*), needle-and-thread and Indian rice grass (*Oryzopsis hymenoides*) are sometimes present. Forbs and non-vascular species are generally rare. Further comparison may result in the combination of the shrubland and shrub prairie types (NatureServe 2000).

A silver sagebrush/western wheat grass habitat type has also been described in upland areas of the Dry Mixedgrass Subregion of southern Alberta (Adams and Ehlert 2001). It generally occurs on well drained, level to very gently sloping terrain and variable aspects. This late seral to potential natural community (PNC) is associated with solonetzic soils, which normally range from brown solonetz and orthic regosols to brown solods and are developed on glacial fluvial and glacial lacustrine parent materials with sodium enrichment. Textures are generally silt loams and silt clay loams. The range site categories are Limy, Overflow, Saline Lowland, Blowout and Thin Breaks. Silver sagebrush has an average per cent composition by weight of 7.5 (range 5-11%). The community is classified as a native grassland, with shrub cover of less than 10%, tree cover of less than 10%, and grasses and forbs dominating the well drained upland sites. Western wheat grass and Sandberg bluegrass (*Poa sandbergii*) dominate the graminoids. Other prominent species include June grass, blue grama, needle-and-thread and pasture sagewort. This type is generally found higher in the landscape than the riparian silver sagebrush/western wheat grass type described by Thompson and Hansen (2001) and slightly lower than the silver sagebrush/northern wheat grass (*Agropyron dasystachyum*) type described below. The riparian

type has a higher canopy cover of silver sagebrush, averaging 39%, and a higher average canopy height.

The silver sagebrush/western wheat grass/prickly-pear (*Opuntia polyacantha*) vegetation type was described in Grasslands National Park, Saskatchewan in the Valley Grassland Vegetation Landscape Unit (Michalsky and Ellis 1994). This unit is undisturbed, generally has slopes of less than 3°, elevations below 900 m and is typified by salt tolerant grasses, forbs and shrubs. The silver sagebrush/western wheat grass/prickly-pear vegetation type occurs on primarily moderately well drained sites, but drainage ranges from well to imperfect. The ecological moisture regime is most commonly subxeric, but may range from xeric to subhygric depending on the proximity of the site to water. Slopes range up to 6° with no dominant aspect, but are most commonly between 0 and 1°. Bare ground cover averages between 25 and 30%, but ranges between 0 and 80%. Soil types consist primarily of Solonetzic soils with varying degrees of salinity. Plant species presence and dominance appears to vary depending on the degree of moisture available or perhaps soil salinity. On the driest or most saline sites, dominant species include western wheatgrass, Sandberg bluegrass and silver sagebrush. On moist or moderately saline sites, dominant species include western wheat grass, blue grama, June grass, pasture sagewort, prickly-pear, silver sagebrush, prairie selaginella (*Selaginella densa*) and lichen (primarily *Xanthoparmelia* sp.). The least saline or moister sites are dominated by silver sagebrush, pasture sagewort, common yarrow, June grass, and green needle grass or needle-and-thread.

The silver sagebrush/western wheat grass community type has been described in the southeast corner of Alberta within the Dry Mixedgrass Subregion (Adams *et al.* 2002). This community occurred on saline Overflow range sites. The Solonetzic soils were silt loam textured. Silver sagebrush cover was 17.6%, and western wheat grass dominated at 30.7% cover. Also prominent were green needle grass and northern wheat grass. Bare ground cover was relatively high at 48.25%. There was abundant sage grouse use, which was concentrated on the overflow area.

The silver sagebrush/northern wheat grass-needle-and-thread community type has also been described in the southeast corner of Alberta within the Dry Mixedgrass Subregion (Adams *et al.* 2002). This community occurred on rapidly to well drained Blowout range sites. The Orthic Brunisolic and Solonetzic soils tended to be loam to clay loam textured. Silver sagebrush cover was 8%. Also prominent were northern wheat grass at 7.9% cover, along with blue grama, sedge and Nuttall's atriplex (*Atriplex nuttallii*). The numerous sage grouse droppings indicated the importance of this habitat to sage grouse.

The silver sagebrush/northern wheat grass habitat type has been described in upland areas of the Dry Mixedgrass and Mixedgrass subregions of southern Alberta (Adams and Ehlert 2001). It generally occurs on moderately well drained, level to moderately sloping terrain and variable

aspects. This late seral to PNC community type occurs on Blowout range sites. Soils are Brown Solidized Solonetzics, Brown Solods and Orthic Regosols with loamy and clay loam textures. The solonetzic soils have more solodic tendencies with better developed internal drainage, allowing the shift to northern wheat grass. The habitat type falls within the open shrubland category as an upland site with woody perennials of less than 3 m high and shrub cover between 10 and 50%. The silver sagebrush averages 12.3% composition by weight (range 7-27%) and northern wheat grass clearly dominates the herb layer. Other prominent species include June grass, Sandberg bluegrass, blue grama and pasture sagewort.

Silver Sagebrush/Needle-and-Thread Shrub Herbaceous Vegetation was described by Comer *et al.* (1999). It generally occurs in small patches (<1 ha) in the northwestern Great Plains. In Montana, it is found on benches to gently inclined slopes (maximum 17° recorded) in the vicinity of breaklands. It occurs in similar habitats in Alberta, including old river terraces, badlands, ravine side slopes and valley walls. It is found on various parent materials, but mostly well drained, often sandy, glacial drift and sandy alluvium. Silver sagebrush is clearly the dominant shrub, with average cover values in the order of 25% and up to 50%. Needle-and-thread has high cover values (average 38%) and is present at all sites. Blue grama, thread-leaved sedge, June grass and Sandberg bluegrass also occur frequently. Forb species cover is very low. Those that occurred most frequently included scarlet mallow, silverleaf psoralea (*Psoralea argophylla*), scarlet butterflyweed and pasture sagewort. This association is hypothesised to represent the driest environment capable of supporting silver sagebrush. It occupies a higher landscape position that the silver sagebrush/western wheat grass and silver sagebrush/green needle grass-western wheat grass associations, which occur in more mesic areas of flood plain terraces.

The silver sagebrush/needle-and-thread-blue grama habitat type has been described in the Dry Mixedgrass Subregion of southern Alberta (Adams and Ehlert 2001). It generally occurs on well to rapidly drained, very gentle to nearly level slopes and variable aspects. This late seral to PNC community type occurs on Loamy and Sandy range sites. Soils are mostly Orthic Brown Chernozems that are rapidly drained, loam, sand and sandy loam textured. This type is found on coarse sand verging on choppy sandhill topography. It is categorised as a native grassland, with silver sagebrush averaging 8.8% composition by weight (range 5-33%). Needle-and-thread tends to dominate over blue grama. Other prominent species include June grass, sedge and pasture sagewort. Grazing pressure will reduce the canopy of silver sagebrush and blue grama.

The silver sagebrush/needle-and-thread-sand grass habitat type has been described in the Dry Mixedgrass Subregion of southern Alberta (Adams and Ehlert 2001). It occurs on rapidly drained, very gentle to strong slopes and variable aspects. This late seral to PNC community type is associated with Sands, Sandy and Choppy Sandhill range sites. Soils are developed on fluvial and eolian parent material. The community is categorised as an open shrubland, with silver

sagebrush averaging 10.75% composition by weight (range 6-21%). Needle-and-thread generally dominates over sand grass. Other prominent species include blue grama, prickly-pear and scurf pea (*Psoralea lanceolata*). This community type is related to the silver sagebrush/needle-and-thread-blue grama habitat type, but the latter occurs on heavier textured soils, which are considered Loamy range sites, and generally more gentle slopes. Silver sagebrush/sand grass shrub prairie is identified as a community type in NatureServe (2000) in Wyoming basins and northern Great Plains steppe, and may be related to the silver sagebrush/needle-and-thread-sand grass habitat type.

The silver sagebrush/northern wheat grass/Nuttall's atriplex habitat type has been described in the Dry Mixedgrass Subregion of southern Alberta associated with saline lowlands in the dry mixed prairie and soil correlation area 1 (Adams and Ehlert 2001). It occurs on imperfectly to poorly drained, level plains and depressional areas with periodic ponding of water and high sodicity. This late seral to PNC community type is associated with Saline Lowland and Blowout range sites. Soils are poorly developed saline Regosols or alkaline Solonetz, developed on fluvial and glacial fluvial parent materials. Textures range from silt loam to silt clay. This community is classified as a native grassland, with shrub cover of less than 10%, tree cover of less than 10%, and grasses and forbs dominating the well drained upland sites. The silver sagebrush in this shrub prairie averages 6.9% composition by weight (range 1.2-10.0%). Northern wheat grass and Nuttall's atriplex dominate the herb layer. Other prominent species include blue grama, sedge, needle-and-thread, June grass, Sandberg bluegrass and pasture sagewort. This community is very important for sage grouse dancing grounds (leks) due to the low plant stature and high cover of bare ground (B. Adams, pers. comm.).

The silver sagebrush/Sandberg bluegrass-sedge community type described by Adams *et al.* (2002) had Nuttall's atriplex as a co-dominant species with silver sagebrush. This shrub prairie was found in the southeast corner of Alberta, within the Dry Mixedgrass Subregion, on imperfectly drained Saline Lowland range sites. The alkaline solonetzic soils were silty loam textured. Silver sagebrush cover was 5.5%, with Nuttall's atriplex at 5.8%. Sandberg bluegrass and sedge dominated the grass layer, at 2.9% and 1.3% cover respectively. Also present were northern wheat grass and needle-and-thread. There was a high cover of bare ground (72.25%), and an active sage grouse lek site was found within this community.

The silver sagebrush/western porcupine grass-sedge community type has been described in the southeast corner of Alberta within the Dry Mixedgrass Subregion on north-facing slopes (Adams *et al.* 2002). This shrub prairie occurred on well to moderately well drained, non-saline Overflow range sites in the Brown soil zone. The Orthic Brunisolic soils tend to be clay loam textured, or occasionally loam to silt loam textured. Silver sagebrush cover was 4.3%. Western porcupine grass (*Stipa curtiseta*) dominated at 21% cover. Also prominent were sedge, needle-and-thread,

western wheat grass and northern wheat grass.

The Silver Sagebrush/Idaho Fescue (*Festuca idahoensis*) Habitat Type was described by Hansen *et al.* (1995) at mid- to high elevations in the mountains and foothills of central and southwestern Montana, on alluvial outwash fans and terraces. Site elevations ranged from 2,196 to 2,376 m. Silver sagebrush dominated the shrub layer with an average cover of 23% (range 1-40%), while Kentucky bluegrass and Idaho fescue dominated the herb layer. Lesser amounts of common dandelion, graceful cinquefoil (*Potentilla gracilis*) and common yarrow were also present. Soils are Borolls formed in alluvium. Soil texture varies little from silt loam to sandy loam, and coarse fragments are common. Redox concentrations (mottles) are common, indicating a fluctuating water table. Available soil moisture is estimated as moderate. Soils are slightly acid to moderately alkaline (pH 6.0-8.0). This habitat type represents the driest extreme of the riparian or wetland zone in central and southwestern Montana.

The Silver Sagebrush/Idaho Fescue Shrub Herbaceous Vegetation was described by Mueggler and Stewart (1980) in southwestern Montana (Yellowstone Park vicinity) in small areas (<2 ha) on deep, loamy, alluvial soils along mountain streams above 1,830 m (6,000 feet) elevation. It occurs as a very minor landscape component in the Red Rock Lakes National Wildlife Refuge associated with virtually identical environmental parameters as described by Mueggler and Stewart (1980) (Cooper *et al.* 1999). Vegetation composition corresponds to that of the more moist portions of the big sagebrush (*Artemisia tridentata* ssp. *vaseyana*)/Idaho fescue habitat type (Mueggler and Stewart 1980), with high cover (30-40%) of Idaho fescue, and variable cover of other mesic graminoids including keeled brome (*Bromus carinatus*), nodding brome (*Bromus anomalus*), Columbia needle grass (*Stipa occidentalis = columbiana*) and bearded wheat grass (Cooper *et al.* 1999). The shrub component, which generally does not exceed 15-20 % canopy cover, is dominated by silver sagebrush with scattered big sagebrush. The forb component is rich with sticky purple geranium (*Geranium viscosissimum*), graceful cinquefoil, three-flowered avens (*Geum triflorum*) and yellow false dandelion (*Agoseris glauca*) contributing the greatest cover. The moistest sites support appreciable amounts of western bistort (*Polygonum bistortoides*) and pasture sedge (*Carex petasata*). Common dandelion, common yarrow and clovers (*Trifolium* spp.) have high cover where grazing has altered communities (Cooper *et al.* 1999).

The Silver Sagebrush/Kentucky Bluegrass Shrub Herbaceous Vegetation is a grazing induced disclimax of any one of a number of plant associations including silver sagebrush/Idaho fescue, silver sagebrush/bearded wheat grass or, most probably, silver sagebrush/western wheat grass (Cooper *et al.* 1999). Within greater southwestern Montana, silver sagebrush/western wheat grass is the most abundant association dominated by silver sagebrush. Usually occurring as stringers on the first (or second) terrace up from small mountain streams, these communities occupy mesic to

wet sites, with deep alluvial soils. In the more severe cases of this community, the scattered shrub canopy (combined cover of <20%) of silver sagebrush and occasionally big sagebrush coexists with Kentucky bluegrass and clovers. In less affected stands, graminoid remnants of past vegetation, such as pasture sedge, western wheat grass, thick-spike wheat grass (*Elymus lanceolatus*), fringed brome (*Bromus ciliatus*) or Columbia needle grass will be present. Cover of common yarrow, clovers, graceful cinquefoil and yellow false dandelion appears to increase under these conditions. Where disturbance has been severe, common dandelion can form a virtually continuous carpet (often with clovers).

A number of silver sagebrush communities have been described in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). Three comprise shrubland communities and one is a shrub/herbaceous community type. The Sagebrush Association was dominated by silver sagebrush at 25% cover, with a high cover of bare ground (70%). Other characteristic species included common wild rose (*Rosa woodsii*), western wheat grass, sand grass and gumweed (*Grindelia squarrosa*). This community occurred on level sites on old river terraces and stabilised badlands. Silver sagebrush cover was approximately 45% in the Spear Grass-Sagebrush Association. The spear grass referred to was needle-and-thread which dominated over blue grama. Other prominent species included sand grass, western wheat grass, prickly-pear and winter-fat (*Eurotia lanata*). This community occurred on level sites on river terraces and colluvium. The Salt Sage-Sagebrush Association had an approximately 15% cover of silver sagebrush and 5% cover of salt sage (synonym for Nuttall's atriplex). This was a species-poor community with 50% bare soil and 25% rock (gravel and cobble), occurring on steep north-facing slopes (24°) of eroding and stabilised badlands. Other common species included yellow umbrella-plant (*Eriogonum flavum*), western wheat grass and broomweed. The Spear Grass-Greasewood Association was a shrub/herbaceous community type with silver sagebrush and greasewood (*Sarcobatus vermiculatus*) in the shrub layer, each with a cover of approximately 6%. The spear grass referred to was again needle-and-thread, at approximately 10% cover. This community also occurred on steep (26°), north-facing slopes of eroding badlands but with less bare soil and rock (each 15% cover). Other prominent species included June grass, wheat grass, blue grama, moss phlox (*Phlox hoodii*) and prairie crocus (*Anemone patens*).

Dry, eroding slopes in Writing-on-stone Provincial Park harbour a community that includes silver sagebrush as one of the prime components (Wershler 1980). Also common were Nuttall's atriplex, greasewood, sand-lily (*Mentzelia decapetala*), prickly-pear, rabbitbrush (*Chrysothamnus nauseosus*), winter-fat and povertyweed. Silver sagebrush was dominant in local areas on the upper benches of the river flat. In general, the river flat was dominated by western wheat grass and slender wheat grass, the former occurring on drier sites and the latter occurring on moister sites. Other species included prairie onion (*Allium textile*), cushion cactus

(*Coryphantha vivipara*), prickly-pear, Pursh's plantain, gumweed and skeletonweed (*Lygodesmia juncea*).

Wallis (1976) described sagebrush flats, dominated by silver sagebrush, in the Milk River canyon between the eroded slopes and the flood plains of streams. The substrate consisted of materials that had been washed off the slopes and deposited on the more level sites. Most of the sites had been greatly modified by grazing. Understorey vegetation was generally sparse, with reticulated, cracked bare clay exposed throughout. Commonly occurring plant species were tansy mustard (*Descurainia* spp.), prairie onion, gumweed, sunflowers (*Helianthus* spp.), bluebur (*Lappula* spp.) and Pursh's plantain. Ungrazed communities differed greatly, with a dense cover of needle-and-thread and wheat grasses.

Wallis (1977) describes several silver sagebrush communities in the Red Deer River area from Red Deer to Empress. Silver sagebrush flats occupied the second driest portion of river terraces, with grasslands occupying the driest sites. The sagebrush flats seemed to occur on the interface between veneered and alluvial terraces, and the older parts of the alluvial terraces. Silver sagebrush seemed to be most abundant on alluvial fan portions of the veneered terraces and on the alluvial river terraces. Dense silver sagebrush flats were found on alluvial terraces and the modern flood plain from the Drumheller area south. They were best developed on the broad flood plains and where minor stream valleys enter the major valleys. There were considerable differences in the understorey of the sagebrush communities, which probably relates to the coarseness of the underlying materials and the rate of deposition of alluvium and colluvium. Less than rapid deposition would favour dense carpets of needle-and-thread, green needle grass, June grass, northern, slender and western wheat grasses, salt grass (*Distichlis stricta*) and blue grama. The presence of slender and western wheat grasses, and salt grass seemed to relate to seasonal ponding and accumulation of salts, while dense mats of blue grama, prickly-pear and prairie selaginella was expected to be attributable to heavy grazing. Other characteristic species of the sagebrush flats included cushion cactus, winter-fat, hairy fleabane (*Erigeron pumilus*), broomweed, Pursh's plantain, prairie onion, pasture sagewort, Nuttall's atriplex and gumweed. A variety of the drier bedrock slopes in the badlands, along with west- and south-facing bedrock slopes in coulees harboured a sparse plant cover dominated by silver sagebrush, long-leaved sagewort (*Artemisia longifolia*) and Nuttall's atriplex. Other characteristic species included hoary aster (*Machaeranthera canescens*), winter-fat, broomweed, povertyweed, dragonwort (*Artemisia dracunculus*), smooth blue beardtongue (*Penstemon nitidus*), prickly-pear and gumweed.

In the Middle Sand Hills area, Cottonwood Consultants Ltd. (1987) found silver sagebrush flats in narrow bands at the driest portion (perimeter) of riverine habitats along the South Saskatchewan River. This is also the highest area of the valley floor. The veneered terrace consisted of eroded badland materials overlying former flood plain deposits. In addition to

sagebrush flats, it harboured western wheat grass communities. Silver sagebrush was also dominant with broomweed on eroding morainal material of badlands along the steep slopes of coulees and the South Saskatchewan River valley. Other characteristic species included white prairie-clover (*Petalostemon candidum*), plains wormwood (*Artemisia campestris*), smooth blue beardtongue and yellow umbrella-plant.

A number of silver sagebrush communities were identified in the Canadian Forces Base (CFB) Suffield National Wildlife Area, which includes the Middle Sand Hills (Adams *et al.* 1997). Shrub species, such as silver sagebrush, were often significant components of certain grassland community types. Rather than classify these as separate community types, they were considered to be phases of the grassland community when the shrub species cover was greater than 10%. The reasons for the prominent occurrence of certain shrub species was not known, but was speculated to be due to variations in moisture availability, wild-fire frequency or grazing. If so, they may have been different successional stages. These shrub herbaceous community types are listed below:

Silver sagebrush/needle-and-thread
Silver sagebrush/needle-and-thread-June grass
Silver sagebrush/needle-and-thread-blue grama
Silver sagebrush/needle-and-thread-western wheat grass
Silver sagebrush/needle-and-thread-low sedge
Silver sagebrush/northern wheat grass
Silver sagebrush/green needle grass-western wheat grass
Silver sagebrush/sand grass-needle-and-thread
Silver sagebrush/sand grass-needle-and-thread-June grass
Silver sagebrush/sand grass-needle-and-thread-blue grama
Silver sagebrush/sand grass-blue grama-needle-and-thread
Silver sagebrush/sand grass-needle-and-thread-low sedge

Apart from the shrub herbaceous communities, two shrubland vegetation types were identified in CFB Suffield National Wildlife Area (Adams *et al.* 1997): the silver sagebrush/northern wheat grass community type and the silver sagebrush-creeping Juniper (*Juniperus horizontalis*)/western wheat grass community type.

A silver sagebrush shrubland community was described near the Matador Research Station in southern Saskatchewan (Lawrence and Romo 1994). It occurred primarily on slopes of the draws. The majority were on southerly slopes, but also on north- and east-facing slopes. Along with the open shrub canopy of silver sagebrush (41.2% cover), there was significant cover of graminoids (52%). Green needle grass and pasture sagewort had the highest cover of the graminoids and

forbs. Blue grama and western wheat grass were also prominent.

There were 21 records in the ESIS database having silver sagebrush at a cover of 5% or greater. All were from southeastern Alberta, south or southwest of Medicine Hat (Dry Mixedgrass and Mixedgrass subregions). The ordination and indicator species analysis suggested that nine native community types were represented along with two modified non-native/native community types. Two of the native community types were shrublands not dominated by silver sagebrush (Saskatoon-silver sagebrush-buckbrush/fowl bluegrass-slender wheat grass; Saskatoon-silver sagebrush/Kentucky bluegrass/low goldenrod), and therefore did not qualify as silver sagebrush communities. The remaining native community types were:

- Silver sagebrush-buckbrush/June grass-sedge shrub prairie (n=2)
- Silver sagebrush/rough fescue-western porcupine grass shrub prairie (n=1)
- Silver sagebrush/green needle grass-western wheat grass-northern wheat grass shrub prairie/shrubland (n=3)
- Silver sagebrush/needle-and-thread-blue grama shrub prairie (n=6)
- Silver sagebrush/needle-and-thread-sand dropseed-blue grama shrub prairie (n=1)
- Silver sagebrush/needle-and-thread-sand grass shrubland (n=1)
- Silver sagebrush/western wheat grass-sand grass/pasture sagewort shrub prairie (n=1)

PROPOSED PRELIMINARY CLASSIFICATION

The proposed classification of the silver sagebrush community types in Alberta has been developed from the plant communities described above and follows the format of Schneider *et al*. (1997) and NatureServe (2000). The community type is either herb-dominated (graminoids, forbs and ferns), or shrub-dominated. At herb-dominated sites, herbs generally form at least 25% ground cover, and trees, shrubs and dwarf shrubs generally are at less than 25% cover. The shrubs at shrub-dominated sites are generally greater than 0.5 m tall with individuals or clumps not touching to interlocking, and generally forming greater than 25% canopy cover. Tree cover is generally less than 25%.

SILVER SAGEBRUSH (*Artemisia cana*) SHRUB HERBACEOUS ALLIANCE
Silver sagebrush/western wheat grass (upland)
Silver sagebrush/northern wheat grass
Silver sagebrush/needle-and-thread

Silver sagebrush/needle-and-thread-sand grass
Silver sagebrush/western porcupine grass-sedge
Silver sagebrush/Idaho fescue
Silver sagebrush/rough fescue-western porcupine grass
Silver sagebrush-greasewood/needle-and-thread
Silver sagebrush/Nuttall's atriplex

SILVER SAGEBRUSH (*Artemisia cana*) SHRUBLAND ALLIANCE
Silver sagebrush/western wheat grass (riparian)
Silver sagebrush/green needle grass-western wheat grass
Silver sagebrush/Nuttall's atriplex

Preliminary Community Characterisation Abstracts for each community are found in Appendix II. Descriptions of these community types are summarised below:

SILVER SAGEBRUSH (*Artemisia cana*) SHRUB HERBACEOUS ALLIANCE

Silver Sagebrush/Western Wheat Grass Upland Shrub Prairie
The silver sagebrush/western wheat grass (*Artemisia cana/Agropyron smithii*) shrub prairie has been described in upland areas of the Dry Mixedgrass Subregion of southern Alberta (Adams and Ehlert 2001), in southern Saskatchewan (Michalsky and Ellis 1994) and in Wyoming (NatureServe 2000). It generally occurs on moderately to well drained, level to very gently sloping terrain and variable aspects. The ecological moisture regime is most commonly subxeric, but may range from xeric to subhygric depending on the proximity of the site to water. This late seral to potential natural community (PNC) is associated with solonetzic soils with varying degrees of salinity, normally ranging from brown solonetz and orthic regosols to brown solods, and are developed on glacial fluvial and glacial lacustrine parent materials. Textures are generally silt loams and silt clay loams. The range site categories are Limy, Overflow, Saline Lowland, Blowout and Thin Breaks. The silver sagebrush has an average per cent composition by weight of 7.5 (range 5-11%) (Adams and Ehlert 2001). Western wheat grass and Sandberg bluegrass dominate the graminoids. Other prominent species include June grass, blue grama, needle-and-thread and pasture sagewort. Also common were prickly-pear, winter-fat, Nuttall's atriplex, moss phlox and prairie selaginella. This type is generally found higher in the landscape than the riparian silver sagebrush/western wheat grass type described by Thompson and Hansen (2001) and slightly lower than the silver sagebrush/northern wheat grass type described below. The riparian silver sagebrush/western wheat grass type has a higher canopy cover of silver sagebrush, averaging 39%, and a higher average canopy height.

The silver sagebrush-creeping Juniper/western wheat grass (*Artemisia cana-Juniperus horizontalis*/*Agropyron smithii*) shrubland has been identified in the CFB Suffield National

Wildlife Area (Adams *et al.* 1997), and may be a variant of the silver sagebrush/western wheat grass upland shrub prairie.

Silver Sagebrush/Northern Wheat Grass Shrub Prairie

The silver sagebrush/northern wheat grass (*Artemisia cana*/*Agropyron dasystachyum*) shrub prairie has been identified in the CFB Suffield National Wildlife Area (Adams *et al.* 1997), and has been described in upland areas of the Dry Mixedgrass and Mixedgrass subregions of southern Alberta (Adams and Ehlert 2001) and the southeast corner of Alberta (Adams *et al.* 2002). It generally occurs on rapidly to well drained, level to moderately sloping terrain and variable aspects. This late seral to PNC community type occurs on Blowout range sites. Soils are Brown Solidized Solonetzics, Brown Solods, Orthic Regosols and Orthic Brunisols with loamy and clay loam textures. The solonetzic soils have more solodic tendencies with better developed internal drainage, allowing the shift to northern wheat grass. The silver sagebrush averages 12.3% composition by weight (range 7-27%) and approximately 8% cover. Northern wheat grass clearly dominates the herb layer. Other prominent species include June grass, Sandberg bluegrass, blue grama, sedge, Nuttall's atriplex and pasture sagewort. The numerous sage grouse droppings indicated the importance of this habitat to sage grouse.

Silver sagebrush/northern wheat grass (*Artemisia cana*/*Agropyron dasystachyum*) shrubland also has been identified in the CFB Suffield National Wildlife Area (Adams *et al.* 1997).

Silver Sagebrush/Needle-and-Thread Shrub Prairie

Silver sagebrush/needle-and-thread (*Artemisia cana*/*Stipa comata*) shrub prairie has been identified in CFB Suffield National Wildlife Area (Adams *et al.* 1997), was identified in six records in the ESIS database north of Grassy Lake and Purple Springs, was described by Comer *et al.* (1999), and was described by Adams and Ehlert (2001) in the Dry Mixedgrass Subregion of southern Alberta. It generally covers small areas (<1 ha) in the northwestern Great Plains. In Montana, it is found on benches to gently inclined slopes (maximum 17° recorded) in the vicinity of breaklands. It occurs in similar habitats in Alberta, including old river terraces, badlands, ravine side slopes and valley walls, on slopes of 1-11° and variable aspects. It is found on various parent materials, but mostly well to rapidly drained, medium-textured, often sandy, glacial drift and sandy alluvium. This late seral to PNC community type occurs on Loamy and Sandy range sites. Soils are mostly Orthic Brown Chernozems that are loam, sand and sandy loam textured.

Silver sagebrush is clearly the dominant shrub, with average cover values of 5 to 25%. Needle-and-thread has high cover values (average approximately 30%) and is present at all sites. Blue grama is sometimes co-dominant (Adams *et al.* 1997; Adams and Ehlert 2001; ESIS database). June grass, western wheat grass and sedge tend to occur frequently. Other common grasses

include sand grass and Sandberg bluegrass. Forb species cover tends to be low. Those that occurred most frequently included pasture sagewort, prickly-pear, golden aster (*Heterotheca villosa*), scarlet mallow, silverleaf psoralea and scarlet butterflyweed. This association is hypothesised to represent the driest environment capable of supporting silver sagebrush. It occupies a higher landscape position that the silver sagebrush/western wheat grass and silver sagebrush/green needle grass-western wheat grass associations, which occur in more mesic areas of flood plain terraces. Grazing pressure will reduce the canopy of silver sagebrush and blue grama.

Silver Sagebrush/Needle-and-Thread-Sand Grass Shrub Prairie

The silver sagebrush/needle-and-thread-sand grass (*Artemisia cana*/*Stipa comata*-*Calamovilfa longifolia*) shrub prairie was identified in one record in the ESIS database north of Grassy Lake, has been described by Adams and Ehlert (2001) in the Dry Mixedgrass Subregion of southern Alberta, has been identified in the CFB Suffield National Wildlife Area (Adams *et al.* 1997), and is identified in NatureServe (2000) in Wyoming basins and northern Great Plains steppe. It occurs on rapidly drained, very gentle to strong slopes and variable aspects. This late seral to PNC community type is associated with Sands, Sandy and Choppy Sandhill range sites. Soils are developed on fluvial and eolian parent material. Silver sagebrush averages 10.75% composition by weight (range 6-21%) or 30% cover (ESIS record). Needle-and-thread generally dominates over sand grass, but occasionally is common but not a co-dominant species. Other prominent species include blue grama, June grass, low sedge (*Carex stenophylla*), prickly-pear, scurf pea, golden aster, pasture sagewort, common yarrow and common wild rose. This community type is related to the silver sagebrush/needle-and-thread-blue grama habitat type, but the latter occurs on heavier textured soils, which are considered Loamy range sites, and generally more gentle slopes.

Silver Sagebrush/Western Porcupine Grass-Sedge Shrub Prairie

The silver sagebrush/western porcupine grass-sedge shrub prairie has been described in the southeast corner of Alberta within the Dry Mixedgrass Subregion on north-facing slopes (Adams *et al.* 2002). This shrub prairie occurred on well to moderately well drained, non-saline Overflow range sites in the Brown soil zone. The Orthic Brunisolic soils tend to be clay loam textured, or occasionally loam to silt loam textured. Silver sagebrush cover was 4.3%. Western porcupine grass dominated at 21%. Also prominent were sedge, needle-and-thread, western wheat grass and northern wheat grass.

Silver Sagebrush/Idaho Fescue Shrub Prairie

The silver sagebrush/Idaho fescue (*Artemisia cana*/*Festuca idahoensis*) shrub prairie has been described by Mueggler and Stewart (1980) and Cooper *et al.* (1999) in southwestern Montana, and by Hansen *et al.* (1995) at mid- to high elevations in the mountains and foothills of central

and southwestern Montana, on alluvial outwash fans and terraces. It may occur in Alberta where the ranges of silver sagebrush and Idaho fescue overlap, in the Cypress Hills area and in southwestern Alberta (Moss 1983). In Montana, this community occurs in small areas (<2 ha) on deep, loamy, alluvial soils. Mueggler and Stewart (1980) report it along mountain streams above 1,830 m elevation, whereas Hansen *et al.* (1995) report it at elevations of 2,196 to 2,376 m. Soil texture varies little from silt loam to sandy loam, and coarse fragments are common. Redox concentrations (mottles) are common, indicating a fluctuating water table. Available soil moisture is estimated as moderate. Soils are slightly acid to moderately alkaline (pH 6.0-8.0) (Hansen *et al.* 1995). Vegetation composition corresponds to that of the more moist portions of the big sagebrush/Idaho fescue habitat type (Mueggler and Stewart 1980), with high cover (30-40%) of Idaho fescue, along with Kentucky bluegrass in some areas. There is variable cover of other mesic graminoids including keeled brome, nodding brome, Columbia needle grass and bearded wheat grass. The shrub component, which generally does not exceed 15-23 % canopy cover (range 1-40%), is dominated by silver sagebrush with scattered big sagebrush. The forb component is rich, with sticky purple geranium, graceful cinquefoil, three-flowered avens and yellow false dandelion contributing the greatest cover. The moistest sites support appreciable amounts of western bistort and pasture sedge. Common dandelion, common yarrow and clovers have high cover where grazing has altered communities (Hansen *et al.* 1995; Cooper *et al.* 1999). This habitat type represents the driest extreme of the riparian or wetland zone in central and southwestern Montana (Hansen *et al.* 1995).

Silver Sagebrush/Rough Fescue-Western Porcupine Grass Shrub Prairie

Silver sagebrush/rough fescue-western porcupine grass (*Artemisia cana*/*Festuca scabrella-Stipa curtiseta*) shrub prairie was identified in one record in the ESIS database. The record was from the Cypress Hills of Alberta, southwest of Elkwater, on a 17°, west-facing slope. Rough fescue and western porcupine grass clearly dominated the community, each with 17% cover. Silver sagebrush was at 5% cover. The dominant forb was prairie selaginella at 8% cover. Other common species included June grass, prairie sagewort, small-leaved everlasting and golden bean.

Silver Sagebrush-Greasewood/Needle-and-Thread Shrub Prairie

The silver sagebrush-greasewood/needle-and-thread (*Artemisia cana-Sarcobatus vermiculatus*/ *Stipa comata*) shrub prairie has been described in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). Silver sagebrush and greasewood each have a cover of approximately 6%. Needle-and-thread cover is approximately 10%. This community occurred on steep (26°), north-facing slopes of eroding badlands but with less bare soil and rock (each 15% cover) than silver sagebrush/Nuttall's atriplex shrubland (see below). Other prominent species included June grass, wheat grass, blue grama, moss phlox and prairie crocus. Silver sagebrush-greasewood-(rabbitbrush) shrubland is suggested as a community type in NatureServe

(2000), and may be related to the silver sagebrush-greasewood/needle-and-thread shrub prairie.

Silver Sagebrush/Nuttall's Atriplex Shrub Prairie
Silver sagebrush/Nuttall's atriplex (*Artemisia cana*/*Atriplex nuttallii*) shrub prairie has been described in the Dry Mixedgrass Subregion of southern Alberta associated with saline lowlands in the dry mixed prairie and soil correlation area 1 (Adams and Ehlert 2001; Adams *et al.* 2002). It occurs on imperfectly to poorly drained, level plains and depressional areas with periodic ponding of water and high sodicity. This late seral to PNC community type is associated with Saline Lowland and Blowout range sites. Soils are poorly developed saline Regosols or alkaline Solonetz, developed on fluvial and glacial fluvial parent materials. Textures range from silt loam to silt clay. The silver sagebrush in this shrub prairie averages 6.9% composition by weight (range 1.2-10.0%) and approximately 5.5% cover. Nuttall's atriplex, sometimes with northern wheat grass, dominates the herb layer. Other prominent species include blue grama, sedge, Sandberg bluegrass, needle-and-thread, June grass and pasture sagewort. this community being very important as sage grouse dancing grounds (leks) The low plant stature and high cover of bare ground (72.25%) result in (Adams *et al.* 2002; B. Adams, pers. comm.).

SILVER SAGEBRUSH (*Artemisia cana*) SHRUBLAND ALLIANCE

Silver Sagebrush/Western Wheat Grass Riparian Shrubland
Silver sagebrush/western wheat grass (*Artemisia cana*/*Agropyron smithii*) riparian shrubland has been described in southern Alberta (Wallis 1976; Wallis 1977; Wershler 1980; Cottonwood Consultants Ltd. 1987; Thompson and Hansen 2001; Adams *et al.* 2002) and for the Great Plains and Rocky Mountains portion of Montana, western North and South Dakota and eastern Wyoming, south to Nebraska (Hanson and Whitman 1938; Hansen *et al.* 1984; DeVelice *et al.* 1995; Hansen *et al.* 1995; Cooper *et al.* 1999; Heidel *et al.* 2000; NatureServe 2000). It occurs on level to gently sloping, older alluvial terraces on both broad and narrow flood plains and coalescing alluvial fans in valleys. It may occur up-slope in swales and gentle depressions. These sites are moister than contiguous up-slope vegetation and in some cases may constitute wetland sites. This shrubland represents one of the driest of the community types found in the riparian or wetland zone. It is a PNC community. Silver sagebrush is not tolerant of grazing, but rather decreases with grazing (B. Adams, pers. comm.).

Substrates are generally moderately fine to fine textured, being derived from sediments deposited in low energy environments (or in the case of basins and swales from slope wash). They have a high water holding capacity and are well to imperfectly drained. Perched or high water tables may influence the rooting zone for a portion of the year. The Regosolic to Solonetzic soils (R. McNeil, pers. comm.) are moderately deep to deep and either loam, silt loam, clay loam or sandy

loam. Flooding may occur periodically and this tends to retard soil development. Soils are slightly acid to moderately alkaline pH (6.0-8.2), although some sites sampled had weakly saline soils (Hanson and Whitman 1938; Hansen *et al.* 1995; Thompson and Hansen 2001). Redox concentrations (mottles) were common, indicating a fluctuating water table. Available water was estimated as moderate (Hansen *et al.* 1995; Thompson and Hansen 2001).

The riparian type has a higher canopy cover of silver sagebrush than the upland type, averaging 39%, and a higher average canopy height. Total vegetation cover is moderate. The shrub layer is the tallest and most conspicuous stratum and is usually 0.6-1.2 m high and dominated by silver sagebrush. A silver sagebrush canopy cover of at least 5% is diagnostic of this type, but its cover usually exceeds 30%. Other shrub species are only sporadic. Buckbrush is frequently present. Graminoids dominate the herbaceous layer with western wheat grass usually dominant and green needle grass important on undisturbed sites. Needle-and-thread and/or blue grama may be dominant or co-dominant. Other grass and forb species reported differed considerably, possibly due to differences in moisture, the coarseness of the underlying materials, the rate of deposition of alluvium and colluvium, and grazing pressure. Other reported grasses include June grass, northern and slender wheat grasses, and salt grass. The forb component is often insignificant. Commonly reported species included pasture sagewort, gumweed, prickly-pear, cushion cactus, Nuttall's atriplex, prairie onion, common yarrow, Pursh's plantain, scarlet mallow, winter-fat, broomweed, scarlet butterflyweed and common blue lettuce.

Widely spaced, decadent or dying plains cottonwoods may be present in mid-late seral primary successional stands, occasionally with buckbrush. The silver sagebrush/western wheat grass habitat type develops when an old alluvial terrace that once supported the cottonwood community becomes drier due to flood plain build-up, or channel down-cutting or migration away from the site (Hansen *et al.* 1995; Thompson and Hansen 2001).

Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland

Silver sagebrush/green needle grass-western wheat grass (*Artemisia cana*/*Stipa viridula-Agropyron smithii*) shrubland was identified in three records in the ESIS database, south of Manyberries and north of Grassy Lake, in CFB Suffield National Wildlife Area (Adams *et al.* 1997), and near the Matador Research Station in southern Saskatchewan (Lawrence and Romo 1994). The ESIS records were from a site between Taber and Bow Island, on a steep (17°), east-northeast-facing slope, and from two sites near Manyberries. In southern Saskatchewan, the majority of sites were on southerly slopes of draws, but also on north- and east-facing slopes. The average cover of silver sagebrush was 41.2% (Lawrence and Romo 1994) and 20% (although two of the sites had covers of 25%) (ESIS records). Green needle grass was the dominant grass, with an average cover of 28% in ESIS records. Western wheat grass averaged 17% cover, and northern wheat grass dominated over western wheat grass at one site, with a cover of 30% versus

7%. Buckbrush was another prominent shrub, with an average cover of 6% (range 1-15%). Other common species included blue grama, needle-and-thread, sand grass, pasture sagewort, common yarrow, small-leaved everlasting, broomweed and tufted white prairie aster (*Aster ericoides*).

Silver Sagebrush/Nuttall's Atriplex Shrubland

The silver sagebrush/Nuttall's atriplex (*Artemisia cana*/*Atriplex nuttallii*) shrubland has been described in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date), Red Deer River valley (Wallis 1977), in Writing-on-stone Provincial Park (Wershler 1980), and possibly in the Middle Sand Hills area (Cottonwood Consultants Ltd. 1987) and CFB Suffield National Wildlife Area (Adams *et al.* 1997). Although the cover of silver sagebrush in the Dinosaur Provincial Park shrubland is only reported to be approximately 15%, it dominates the community as the cover of bare soil is approximately 50% and rock (gravel and cobble) cover is approximately 25%. Nuttall's atriplex is also prominent at 5% cover. This is a species-poor community, occurring on steep north-facing slopes (24°) of eroding and stabilised badlands. Other common species include yellow umbrella-plant, western wheat grass and broomweed. Wallis (1977) described this community on a variety of the drier bedrock slopes in the Red Deer River badlands, along with west- and south-facing bedrock slopes in coulees. The sparse plant cover was dominated by silver sagebrush, long-leaved sagewort and Nuttall's atriplex. Other characteristic species included hoary aster, winter-fat, broomweed, povertyweed, dragonwort, smooth blue beardtongue, prickly-pear and gumweed. In Writing-on-stone Provincial Park, (Wershler 1980) described a similar community on dry, eroding slopes. Species include silver sagebrush, Nuttall's atriplex, greasewood, sand-lily, prickly-pear, rabbitbrush, winter-fat and povertyweed. In the Middle Sand Hills area, Cottonwood Consultants Ltd. (1987) found silver sagebrush to be dominant with broomweed on eroding morainal material of badlands along the steep slopes of coulees and the South Saskatchewan River valley. Other characteristic species included white prairie-clover, plains wormwood, smooth blue beardtongue and yellow umbrella-plant. The sagebrush-greasewood/barren community in CFB Suffield National Wildlife Area appears to fit within this association. It was a dominant plant community in major ravines with extensive erosion, occurring on steep slopes of over 24°. The well drained, sandy-textured soils were Orthic Regosols (Adams *et al.* 1997).

Other Potential Community Types

Silver sagebrush/western wheat grass-sand grass/pasture sagewort (*Artemisia cana*/*Agropyron smithii*-*Calamovilfa longifolia*/*Artemisia frigida*) shrub prairie was identified in a record in the ESIS database. The record was from a site south of Manyberries, near the southern border of Alberta, on a 2°, east-facing slope. Western wheat grass dominated the site (28% cover), with sand grass and pasture sagewort as sub-dominants (16% cover). Silver sagebrush was at 14% cover. The site was species poor. Other common species included thread-leaved sedge, June

grass, golden aster and common blue lettuce. Needle-and-thread was present. As this was the only record encountered of this plant community in the literature and ESIS database, and it displays some similarities to previously described types (silver sagebrush/western wheat grass shrub prairie, silver sagebrush/needle-and-thread-sand grass shrub prairie), there should be further verification prior to confirming it as a silver sagebrush community type.

Silver sagebrush/needle-and-thread-sand dropseed-blue grama (*Artemisia cana*/*Stipa comata-Sporobolus cryptandrus-Bouteloua gracilis*) shrub prairie was identified in a record in the ESIS database. The record was from a site north of Purple Springs, on a shallow (2°), west-southwest-facing slope. Needle-and-thread dominated the site at 40% cover. Sand dropseed cover was 25% and blue grama cover was 15%. Silver sagebrush cover was 10%. Other common species included sand grass, pasture sagewort, prickly-pear, golden aster and common wild rose. As this was the only record encountered of this plant community in the literature and ESIS database, and it displays some similarities to previously described types (silver sagebrush/needle-and-thread-sand grass shrub prairie, silver sagebrush/needle-and-thread shrub prairie), there should be further verification prior to confirming it as a silver sagebrush community type.

Silver sagebrush-buckbrush/June grass-sedge (*Artemisia cana-Symphoricarpos occidentalis*/ *Koeleria macrantha-Carex* spp.) shrub prairie was identified in two records in the ESIS database. The records were from the Cypress Hills of Alberta, south and southwest of Elkwater in the Mixedgrass and Montane Subregions. The sites were on south and southwest-facing slopes of 12.5-18°. Silver sagebrush averaged 5.5% and buckbrush averaged 7.5% cover. June grass cover averaged 7%. Several sedge species were present. Blunt sedge (*Carex obtusata*) was the only species recorded at both sites. Other sedges included sun-loving sedge (*C. pensylvanica*), low sedge and thread-leaved sedge. Other common plant species included green needle grass, pasture sagewort, field mouse-ear chickweed (*Cerastium arvense*), small-leaved everlasting (*Antennaria parvifolia*) and golden bean (*Thermopsis rhombifolia*). Alkali bluegrass (*Poa juncifolia*), mat muhly (*Muhlenbergia richardsonis*), slender wheat grass, creeping white prairie aster (*Aster falcatus*), hairy rock cress (*Arabis hirsuta*), Douglas knotweed (*Polygonum douglasii*), northern bedstraw (*Galium boreale*), golden aster and creeping juniper were present at both sites but at low cover (1%). As these two sites were the only records encountered of this plant community in the literature and ESIS database, and it displays some similarities to previously described types (silver sagebrush/green needle grass-western wheat grass shrubland), there should be further verification prior to confirming it as a silver sagebrush community type. Grazing may have resulted in the dominance of June grass and sedges over the more common climax species.

The silver sagebrush/needle-and-thread-sand grass (*Artemisia cana*/*Stipa comata-Calamovilfa longifolia*) shrubland was identified in one record in the ESIS database north of Grassy Lake,

where silver sagebrush was reported to have a cover of 30%. Such a cover value would place this community in the shrubland category. At this time, this record was combined with the more commonly reported silver sagebrush/needle-and-thread-sand grass shrub prairie. There should be further verification prior to confirming this community as a shrubland type.

Silver sagebrush/needle-and-thread (*Artemisia cana*/*Stipa comata*) shrubland has been described in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). Silver sagebrush cover was approximately 45%. Needle-and-thread dominated over blue grama. Other prominent species included sand grass, western wheat grass, prickly-pear and winter-fat. This community occurred on level sites on river terraces and colluvium. It is not clear whether the silver sagebrush/needle-and-thread community normally exists as a shrubland in Alberta. Comer *et al.* (1999) include sites with silver sagebrush cover of higher than 25% in the silver sagebrush/needle-and-thread shrub prairie. Barry Adams (pers. comm.) has found that silver sagebrush cover in silver sagebrush/needle-and-thread communities is generally from 1-5% in Alberta.

Silver sagebrush/barren (*Artemisia cana*/barren) shrubland has been described in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). It is dominated by silver sagebrush at 25% cover, with a high cover of bare ground (70%). Other characteristic species included common wild rose, western wheat grass, sand grass and gumweed. This community occurred on level sites on old river terraces and stabilised badlands. As this was the only record encountered of this plant community in the literature and ESIS database, and it displays some similarities to previously described types (silver sagebrush/Nuttall's atriplex), there should be further verification prior to confirming it as a silver sagebrush community type.

The silver sagebrush/northern wheat grass (*Artemisia cana*/*Agropyron dasystachyum*) shrubland and the silver sagebrush-creeping juniper/western wheat grass (*Artemisia cana-Juniperus horizontalis*/*Agropyron smithii*) shrubland have been identified in the CFB Suffield National Wildlife Area (Adams *et al.* 1997). However, there is insufficient information on and descriptions of these communities to confirm whether they qualify as silver sagebrush community types.

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APPENDIX I

SILVER SAGEBRUSH (*Artemisia cana*) FLORISTIC COMMUNITY TYPES

Note: Descriptions are given from those publications where percent cover or composition was given for the plant species. The figures presented for each plant species vary with each publication from which the information was taken (see end of table). Those species that are recorded as being present but for which no figures are given are indicated by a _.

PLANT SPECIES	SHRUB PRAIRIE COMMUNITY TYPES*																
	Silver Sagebrush/Western Wheat Grass Upland [1] (n=10)	Silver Sagebrush/Western Wheat Grass Upland [2] (n=85)	Silver Sagebrush/Western Wheat Grass Upland [3]	Silver Sagebrush/Northern Wheat Grass [1] (n=9)	Silver Sagebrush/Northern Wheat Grass [4] (n=1)	Silver Sagebrush/Needle-and-Thread-Blue Grama [5] (n=6)	Silver Sagebrush/Needle-and-Thread-Blue Grama [1] (n=57)	Silver Sagebrush/Needle-and-Thread [6]	Silver Sagebrush/Needle-and-Thread-Sand Grass [1] (n=18)	Silver Sagebrush/Needle-and-Thread-Sand Grass [5] (n=1)	Silver sagebrush/western porcupine grass-sedge [4] (n=1)	Silver sagebrush/rough fescue-western porcupine grass [5] (n=1)	Silver sagebrush/Idaho fescue [7] (n=6)	Silver sagebrush/Idaho fescue [8]	Silver sagebrush-greasewood/needle-and-thread [9]	Silver sagebrush/Nuttall's atriplex [1] (n=6)	Silver sagebrush/Nuttall's atriplex/Sandberg bluegrass [4] (n=1)
GRAMINOIDS																	
Agropyron albicans	0.6			0.01													
Agropyron caninum													8				
Agropyron dasystachyum	0.2			24.9	7.9		1.3		0.8	1	1.8	1				5.4	0.4
Agropyron pectiniforme	0.3					0.2	0.03										
Agropyron smithii	21.3	9	_	3.8	0.05	1.8	2.6		1.6		3.75					0.1	
Agropyron trachycaulum												1					
Agropyron sp.							0.2								5		
Agrostis scabra				0.2													
Bouteloua gracilis	7.0	9	_	4.8	4.4	20.0	13.6	_	6.3		0.7				3	2.1	
Bromus anomalus														_			
Bromus carinatus														_			
Calamagrostis montanensis	0.4			1.5			0.5		0.1		0.4						
Calamovilfa longifolia			_			3.3	1.9	_	18.9	20							
Carex filifolia							0.1	_							2		
Carex obtusata												1					
Carex petasata														_			
Carex stenophylla				0.5			0.1		1.3								
Carex sp.	1.2			1.6	2.5		5.3		2.2		7.9					1.5	1.3
Danthonia intermedia													1				
Distichlis stricta	0.3			0.04													
Festuca idahoensis													14	30-40			
Festuca ovina							0.01										
Festuca scabrella												17					
Koeleria macrantha	11.8	2		7.1	1.0		11.3	_	3.9	5	0.9	4			5	1.1	
Muhlenbergia cuspidata	0.6							_									

PLANT SPECIES	SHRUB PRAIRIE COMMUNITY TYPES*																
	Silver Sagebrush/Western Wheat Grass Upland [1] (n=10)	Silver Sagebrush/Western Wheat Grass Upland [2] (n=85)	Silver Sagebrush/Western Wheat Grass Upland [3]	Silver Sagebrush/Northern Wheat Grass [1] (n=9)	Silver Sagebrush/Northern Wheat Grass [4] (n=1)	Silver Sagebrush/Needle-and-Thread-Blue Grama [5] (n=6)	Silver Sagebrush/Needle-and-Thread-Blue Grama [1] (n=57)	Silver Sagebrush/Needle-and-Thread [6]	Silver Sagebrush/Needle-and-Thread-Sand Grass [1] (n=18)	Silver Sagebrush/Needle-and-Thread-Sand Grass [5] (n=1)	Silver sagebrush/western porcupine grass-sedge [4] (n=1)	Silver sagebrush/rough fescue-western porcupine grass [5] (n=1)	Silver sagebrush/Idaho fescue [7] (n=6)	Silver sagebrush/Idaho fescue [8]	Silver sagebrush-greasewood/needle-and-thread [9]	Silver sagebrush/Nuttall's atriplex [1] (n=6)	Silver sagebrush/Nuttall's atriplex/Sandberg bluegrass [4] (n=1)
Muhlenbergia richardsonis				0.1													
Oryzopsis hymenoides			_			0.2											
Poa compressa							0.03										
Poa juncifolia				0.6			0.04										
Poa pratensis			_										16				
Poa sandbergii	18.5	1		4.8	0.2		0.7	_	0.1		0.3				1	1.1	2.9
Poa sp.	0.4										0.05						
Puccinellia nuttalliana				0.5													
Sporobolus cryptandrus				0.1		3.7				2							
Stipa columbiana						0.2								_			
Stipa comata	6.6	<1	_	2.7	0.75	22.5	35.3	38	27.2	25	5.2				10	1.1	0.2
Stipa curtiseta											21.0	17				0.2	
Stipa viridula	0.5	_	_	1.1		1.0			0.1							0.1	
FORBS																	
Achillea millefolium	0.1	<1		2.6			0.1			5	0.1	1	1	_			
Agoseris glauca														_			
Allium textile	0.1			0.02			0.01								2		
Androsace septentrionalis							0.02		0.01								
Anemone patens															4		
Antennaria aprica				0.1													
Antennaria parvifolia				1.4			0.1					2			2		
Antennaria sp.	0.6						0.1									<0.1	
Arabis sp.															1		
Arenaria congesta				0.1								1					
Arnica fulgens											0.5						
Artemisia frigida	7.0	4		5.4	1.2	3.5	6.2	≤3	3.4	5	0.5	1			2	1.0	

PLANT SPECIES	SHRUB PRAIRIE COMMUNITY TYPES*																
	Silver Sagebrush/Western Wheat Grass Upland [1] (n=10)	Silver Sagebrush/Western Wheat Grass Upland [2] (n=85)	Silver Sagebrush/Western Wheat Grass Upland [3]	Silver Sagebrush/Northern Wheat Grass [1] (n=9)	Silver Sagebrush/Northern Wheat Grass [4] (n=1)	Silver Sagebrush/Needle-and-Thread-Blue Grama [5] (n=6)	Silver Sagebrush/Needle-and-Thread-Blue Grama [1] (n=57)	Silver Sagebrush/Needle-and-Thread [6]	Silver Sagebrush/Needle-and-Thread-Sand Grass [1] (n=18)	Silver Sagebrush/Needle-and-Thread-Sand Grass [5] (n=1)	Silver sagebrush/western porcupine grass-sedge [4] (n=1)	Silver sagebrush/rough fescue-western porcupine grass [5] (n=1)	Silver sagebrush/Idaho fescue [7] (n=6)	Silver sagebrush/Idaho fescue [8]	Silver sagebrush-greasewood/needle-and-thread [9]	Silver sagebrush/Nuttall's atriplex [1] (n=6)	Silver sagebrush/Nuttall's atriplex/Sandberg bluegrass [4] (n=1)
Artemisia ludoviciana				0.2			0.03				0.2	3				0.1	
Aster ericoides	0.4					0.2											
Aster falcatus												1					
Aster sp.				0.03													
Astragalus miser							0.02										
Astragalus pectinatus							0.1										
Astragalus sp.											0.2						
Atriplex nuttallii	1.7	<1		1.0	3.6		0.1									2.9	5.8
Besseya wyomingensis						0.3											
Campanula rotundifolia							0.01										
Cerastiun arvense							0.02		0.2			1					
Cerastium sp.											0.15						
Chenopodium album				0.01													
Chenopodium fremontii										3							
Chenopodium pratericola						0.3			0.5								
Chenopodium sp.							0.04										
Cirsium arvense									1.4								
Cirsium flodmanii							0.04										
Collomia linearis				0.03													
Comandra umbellata	0.03					0.2	0.02		0.02								
Coryphantha vivipara						0.3	0.1		0.01								
Cryptantha fendleri									0.1								
Descurainia sophia									0.3	1							
Erigeron caespitosus	0.5						0.1					1			3		
Erigeron canadensis									0.01								
Eriogonum flavum															2		

PLANT SPECIES	SHRUB PRAIRIE COMMUNITY TYPES*																
	Silver Sagebrush/Western Wheat Grass Upland [1] (n=10)	Silver Sagebrush/Western Wheat Grass Upland [2] (n=85)	Silver Sagebrush/Western Wheat Grass Upland [3]	Silver Sagebrush/Northern Wheat Grass [1] (n=9)	Silver Sagebrush/Northern Wheat Grass [4] (n=1)	Silver Sagebrush/Needle-and-Thread-Blue Grama [5] (n=6)	Silver Sagebrush/Needle-and-Thread-Blue Grama [1] (n=57)	Silver Sagebrush/Needle-and-Thread [6]	Silver Sagebrush/Needle-and-Thread-Sand Grass [1] (n=18)	Silver Sagebrush/Needle-and-Thread-Sand Grass [5] (n=1)	Silver sagebrush/western porcupine grass-sedge [4] (n=1)	Silver sagebrush/rough fescue-western porcupine grass [5] (n=1)	Silver sagebrush/Idaho fescue [7] (n=6)	Silver sagebrush/Idaho fescue [8]	Silver sagebrush-greasewood/needle-and-thread [9]	Silver sagebrush/Nuttall's atriplex [1] (n=6)	Silver sagebrush/Nuttall's atriplex/Sandberg bluegrass [4] (n=1)
Erysimum asperum							0.02		0.2								
Euphorbia glyptosperma						0.2											
Eurotia lanata	2.0			0.7			0.1								2		
Gaura coccinea						0.2	0.2	_									
Gentianella amarella												1					
Geranium viscosissimum														_			
Geum triflorum												1	8	_	2		
Glaux maritima	0.1																
Gutierrezia sarothrae	0.8	<1				0.3	0.04					1				0.1	
Haplopappus spinulosus						0.2											
Helianthus couplandii									0.03								
Heterotheca villosa	0.5					4.3	0.8		2.0	7							
Hymenoxys richardsonii	0.3														2		
Lappula occidentalis									0.2								
Lathyrus sp.															1		
Lepidium densiflorum				0.1			0.02		0.02								
Lepidium sp.							0.02		1.2								
Liatris punctata						0.2	0.02		0.2	1							
Lithospermum incisum									0.1								
Lomatium sp.	0.03																
Lygodesmia juncea						0.2	0.1		0.6								
Oenothera nuttallii									0.1								
Opuntia fragilis						0.3											
Opuntia polyacantha	2.4	<1		1.0		5.7	1.3		6.5	2					1	0.5	
Oxytropis sericea						0.2									1		
Paronychia sessiliflora							0.01										

PLANT SPECIES	SHRUB PRAIRIE COMMUNITY TYPES*																
	Silver Sagebrush/Western Wheat Grass Upland [1] (n=10)	Silver Sagebrush/Western Wheat Grass Upland [2] (n=85)	Silver Sagebrush/Western Wheat Grass Upland [3]	Silver Sagebrush/Northern Wheat Grass [1] (n=9)	Silver Sagebrush/Northern Wheat Grass [4] (n=1)	Silver Sagebrush/Needle-and-Thread-Blue Grama [5] (n=6)	Silver Sagebrush/Needle-and-Thread-Blue Grama [1] (n=57)	Silver Sagebrush/Needle-and-Thread [6]	Silver Sagebrush/Needle-and-Thread-Sand Grass [1] (n=18)	Silver Sagebrush/Needle-and-Thread-Sand Grass [5] (n=1)	Silver sagebrush/western porcupine grass-sedge [4] (n=1)	Silver sagebrush/rough fescue-western porcupine grass [5] (n=1)	Silver sagebrush/Idaho fescue [7] (n=6)	Silver sagebrush/Idaho fescue [8]	Silver sagebrush-greasewood/needle-and-thread [9]	Silver sagebrush/Nuttall's atriplex [1] (n=6)	Silver sagebrush/Nuttall's atriplex/Sandberg bluegrass [4] (n=1)
Petalostemon candidum						0.2											
Petalostemon purpureum						0.5				1							
Phlox hoodii	1.5	<1		0.3	0.1		0.9								7	0.1	
Plantago patagonica	0.1			0.7			0.1		0.8								
Polygonum arenastrum				0.2													
Polygonum bistortoides														_			
Polygonum sp.	0.01			0.04												0.2	
Potentilla gracilis													2	_			
Potentilla hippiana	0.1			1.4													
Potentilla paradoxa							0.02										
Potentilla pensylvanica							0.01										
Psoralea argophylla								_									
Psoralea lanceolata							0.4		6.1								
Salsola kali									0.04								
Sedum lanceolatum																<0.1	
Selaginella densa		16				6.7	0.1					8			2		
Solidago missouriensis				2.4		0.3	0.01			1		1					
Sphaeralcea coccinea	0.2	<1		0.2	0.1	0.5	1.2	_	0.02						1	0.2	
Taraxacum officinale				0.04			0.1		0.03				12	_			
Thermopsis rhombifolia				0.1			0.4					2					
Tragopogon dubius	0.1			0.02		0.3	0.1		0.01								
Trifolium spp.														_			
Vicia americana	0.01			0.3		0.3	0.2		0.2			1					
SHRUBS																	
Artemisia cana	7.5	5	10-25	12.3	8.0	13.2	8.8	27	10.8	30	4.3	5	23	15-20	6	6.9	5.5
Artemisia tridentata														_			

PLANT SPECIES	SHRUB PRAIRIE COMMUNITY TYPES*																
	Silver Sagebrush/Western Wheat Grass Upland [1] (n=10)	Silver Sagebrush/Western Wheat Grass Upland [2] (n=85)	Silver Sagebrush/Western Wheat Grass Upland [3]	Silver Sagebrush/Northern Wheat Grass [1] (n=9)	Silver Sagebrush/Northern Wheat Grass [4] (n=1)	Silver Sagebrush/Needle-and-Thread-Blue Grama [5] (n=6)	Silver Sagebrush/Needle-and-Thread-Blue Grama [1] (n=57)	Silver Sagebrush/Needle-and-Thread [6]	Silver Sagebrush/Needle-and-Thread-Sand Grass [1] (n=18)	Silver Sagebrush/Needle-and-Thread-Sand Grass [5] (n=1)	Silver sagebrush/western porcupine grass-sedge [4] (n=1)	Silver sagebrush/rough fescue-western porcupine grass [5] (n=1)	Silver sagebrush/Idaho fescue [7] (n=6)	Silver sagebrush/Idaho fescue [8]	Silver sagebrush-greasewood/needle-and-thread [9]	Silver sagebrush/Nuttall's atriplex [1] (n=6)	Silver sagebrush/Nuttall's atriplex/Sandberg bluegrass [4] (n=1)
Chrysothamnus nauseosus 1.2			0.4														
Rosa arkansana							0.1		1.9								
Rosa woodsii						0.8			1.0	7							
Sarcobatus vermiculatus			0.6												6		
Symphoricarpos occidentalis		10-25				0.3			0.2	3							

PLANT SPECIES	SHRUBLAND COMMUNITY TYPES*														
	Silver Sagebrush/Western Wheat Grass [10] (n=9)	Silver Sagebrush/Western Wheat Grass [11] (n=12)	Silver Sagebrush Flats [12] (n=3)	Silver Sagebrush/Western Wheat Grass [7] (n=43)	Silver Sagebrush/Western Wheat Grass [4] (n=1)	Silver Sagebrush/Western Wheat Grass [6]	Silver Sagebrush/Western Wheat Grass [13]	Silver Sagebrush Flats [14]	Silver Sagebrush Flats [15]	Silver Sagebrush/Western Wheat Grass [3]	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [5] (n=3)	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [16] (n=11)	Salt Sage-Sagebrush Association (Silver Sagebrush/Nuttall's Atriplex) [9]	Silver sagebrush/Long-leaved Sagewort-Nuttall's atriplex [14]	Silver Sagebrush/Nuttall's Atriplex [15]
GRAMINOIDS															
Agropyron caninum				3											
Agropyron dasystachyum					5.0			–			10				
Agropyron pectiniforme	1														

PLANT SPECIES	SHRUBLAND COMMUNITY TYPES*														
	Silver Sagebrush/Western Wheat Grass [10] (n=9)	Silver Sagebrush/Western Wheat Grass [11] (n=12)	Silver Sagebrush Flats [12] (n=3)	Silver Sagebrush/Western Wheat Grass [7] (n=43)	Silver Sagebrush/Western Wheat Grass [4] (n=1)	Silver Sagebrush/Western Wheat Grass [6]	Silver Sagebrush/Western Wheat Grass [13]	Silver Sagebrush Flats [14]	Silver Sagebrush Flats [15]	Silver Sagebrush/Western Wheat Grass [3]	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [5] (n=3)	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [16] (n=11)	Salt Sage-Sagebrush Association (Silver Sagebrush/Nuttall's Atriplex) [9]	Silver sagebrush/Long-leaved Sagewort-Nuttall's atriplex [14]	Silver Sagebrush/Nuttall's Atriplex [15]
Agropyron repens	1														
Agropyron smithii	68	70.9	88.3	85	30.7	_	_	_	_	_	17	13.6	2		
Agropyron trachycaulum	2							_	_				_	_	
Bouteloua gracilis	2	T	41.0	1		_		_		_	2	14.7			
Bromus inermis		0.1													
Bromus japonicus	10			10											
Calamagrostis inexpansa		0.1													
Calamagrostis montanensis	10		T		0.05										
Calamagrostis stricta	1			1											
Calamovilfa longifolia		0.6									1	7.1			
Carex filifolia		T										1.0			
Distichlis stricta	1	0.4		1				_			1				
Elymus canadensis													<1		
Koeleria macrantha	10			1	1.3			_		_	1				
Muhlenbergia cuspidata		0.4										0.8			
Muhlenbergia racemosa		T													
Poa arida		0.6									3				
Poa interior		1.1													
Poa juncifolia	1														
Poa palustris		0.5													
Poa pratensis		1.3								_	1				
Stipa comata	20	0.1	1.7	1		_		_		_	3	3.8			
Stipa spartea												0.8			
Stipa viridula	30	2.4	34.0	9	8.2	_		_		_	28	47.7			
FORBS															

PLANT SPECIES	SHRUBLAND COMMUNITY TYPES*														
	Silver Sagebrush/Western Wheat Grass [10] (n=9)	Silver Sagebrush/Western Wheat Grass [11] (n=12)	Silver Sagebrush Flats [12] (n=3)	Silver Sagebrush/Western Wheat Grass [7] (n=43)	Silver Sagebrush/Western Wheat Grass [4] (n=1)	Silver Sagebrush/Western Wheat Grass [6]	Silver Sagebrush/Western Wheat Grass [13]	Silver Sagebrush Flats [14]	Silver Sagebrush Flats [15]	Silver Sagebrush/Western Wheat Grass [3]	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [5] (n=3)	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [16] (n=11)	Salt Sage-Sagebrush Association (Silver Sagebrush/Nuttall's Atriplex) [9]	Silver sagebrush/Long-leaved Sagewort-Nuttall's atriplex [14]	Silver Sagebrush/Nuttall's Atriplex [15]
Achillea millefolium	2	1.5		1	0.2		_			_	4				
Allium textile			_					_	_						
Antennaria parvifolia											2				
Artemisia campestris													_		
Artemisia dracunculus		T											_	_	
Artemisia frigida	1	0.6		1		_		_		_	4	14.7			
Artemisia longifolia													_	_	
Artemisia ludoviciana		0.7									1	0.5			
Aster ericoides	10										1				
Aster sp.											T				
Astragalus dasyglottis		0.1													
Astragalus gilviflorus													_	_	
Atriplex nuttallii	1							_					5	_	_
Cerastiun arvense											T				
Chenopodium album	1	T													
Chenopodium leptophyllum			_												
Comandra umbellata								_			T	1.0			
Convolvulus sepium		T													
Coryphantha vivipara								_	_						
Draba nemorosa			0.7												
Erigeron annuus	1	T		1											
Erigeron caespitosus											T		_	_	
Erigeron canadensis	1	0.3		1											
Erigeron pumilus								_					_	_	

PLANT SPECIES	SHRUBLAND COMMUNITY TYPES*														
	Silver Sagebrush/Western Wheat Grass [10] (n=9)	Silver Sagebrush/Western Wheat Grass [11] (n=12)	Silver Sagebrush Flats [12] (n=3)	Silver Sagebrush/Western Wheat Grass [7] (n=43)	Silver Sagebrush/Western Wheat Grass [4] (n=1)	Silver Sagebrush/Western Wheat Grass [6]	Silver Sagebrush/Western Wheat Grass [13]	Silver Sagebrush Flats [14]	Silver Sagebrush Flats [15]	Silver Sagebrush/Western Wheat Grass [3]	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [5] (n=3)	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [16] (n=11)	Salt Sage-Sagebrush Association (Silver Sagebrush/Nuttall's Atriplex) [9]	Silver sagebrush/Long-leaved Sagewort-Nuttall's atriplex [14]	Silver Sagebrush/Nuttall's Atriplex [15]
Eriogonum flavum													3		
Eurotia lanata	1	0.6		1				_		_			_	_	_
Galium aparine		0.1													
Galium boreale												0.2			
Gaura coccinea		0.3					_			_					
Glycyrrhiza lepidota								_			1				
Grindelia squarrosa	1	T		1				_	_		1		_	_	
Gutierrezia sarothrae	1	T		1				_		_	3		1-2	_	
Hedeoma hispidum		T													
Helianthus annuus													1		
Helianthus subrhomboideus		T													
Iva axillaris													_	_	_
Lactuca pulchella	1			1			_			_					
Lappula occidentalis			_										<1		
Lepidium densiflorum			_												
Linum lewisii		0.2									T				
Linum rigidum			_												
Lygodesmia juncea									_						
Machaeranthera canescens													_	_	
Melilotus officinalis	1	0.3		1											
Mentzelia decapetala													_		_
Monarda fistulosa		T													
Musineon divaricatum			_												
Oenothera caespitosa													_	_	
Opuntia fragilis		T						_							

PLANT SPECIES	SHRUBLAND COMMUNITY TYPES*														
	Silver Sagebrush/Western Wheat Grass [10] (n=9)	Silver Sagebrush/Western Wheat Grass [11] (n=12)	Silver Sagebrush Flats [12] (n=3)	Silver Sagebrush/Western Wheat Grass [7] (n=43)	Silver Sagebrush/Western Wheat Grass [4] (n=1)	Silver Sagebrush/Western Wheat Grass [6]	Silver Sagebrush/Western Wheat Grass [13]	Silver Sagebrush Flats [14]	Silver Sagebrush Flats [15]	Silver Sagebrush/Western Wheat Grass [3]	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [5] (n=3)	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [16] (n=11)	Salt Sage-Sagebrush Association (Silver Sagebrush/Nuttall's Atriplex) [9]	Silver sagebrush/Long-leaved Sagewort-Nuttall's atriplex [14]	Silver Sagebrush/Nuttall's Atriplex [15]
Opuntia polyacantha	1	1						_	_		1	3.6	_	_	_
Parietaria pensylvanica	1	1.8		1											
Penstemon nitidus													_	_	
Petalostemon candidum													_		
Phlox hoodii											T				
Plantago patagonica		T	0.7					_	_						
Psoralea argophylla												0.1			
Psoralea esculenta		0.5													
Ratibida columnifera	1	0.1		1											
Selaginella densa								_							
Sisymbrium altissimum	1			1											
Solidago canadensis	1														
Solidago missouriensis		0.2									T				
Solidago rigida		0.1													
Sphaeralcea coccinea	1	0.1	_	1			_			_					
Taraxacum officinale	1	T		1							1				
Thalictrum dasycarpum		0.1													
Thermopsis rhombifolia												2.2			
Tragopogon dubius	1	T		1							T				
Vicia americana	2	0.4	_	1							1				
SHRUBS															
Artemisia cana	39	33.6	47.7	38	17.6	>30		_	_	_	20	41.2	15	_	_
Chrysothamnus nauseosus													_		_
Juniperus horizontalis	1										T	1.7			

PLANT SPECIES	SHRUBLAND COMMUNITY TYPES*														
	Silver Sagebrush/Western Wheat Grass [10] (n=9)	Silver Sagebrush/Western Wheat Grass [11] (n=12)	Silver Sagebrush Flats [12] (n=3)	Silver Sagebrush/Western Wheat Grass [7] (n=43)	Silver Sagebrush/Western Wheat Grass [4] (n=1)	Silver Sagebrush/Western Wheat Grass [6]	Silver Sagebrush/Western Wheat Grass [13]	Silver Sagebrush Flats [14]	Silver Sagebrush Flats [15]	Silver Sagebrush/Western Wheat Grass [3]	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [5] (n=3)	Silver Sagebrush/Green Needle Grass-Western Wheat Grass [16] (n=11)	Salt Sage-Sagebrush Association (Silver Sagebrush/Nuttall's Atriplex) [9]	Silver sagebrush/Long-leaved Sagewort-Nuttall's atriplex [14]	Silver Sagebrush/Nuttall's Atriplex [15]
Ribes oxyacanthoides	1											0.1			
Rosa woodsii		0.1								_	3				
Rosa spp.	3											1.3			
Sarcobatus vermiculatus											T		<1	_	_
Symphoricarpos occidentalis	2	19.3								_	6	7.3			

Plant community type names described by:

1 Adams and Ehlert (2001)
2 Michalsky and Ellis (1994)
3 NatureServe (2000)
4 Adams *et al.* (2002)
5 ESIS database
6 Comer *et. al.* (1999)
7 Hansen *et al.* (1995)
8 Cooper *et al.* (1999)
9 Envirocon Ltd. and Hough, Stansbury and Assoc. Limited (no date)
10 Thompson and Hansen (2001)
11 Hansen *et al.* (1984)
12 Hanson and Whitman (1938)
13 Heidel *et al.* (2000)
14 Wallis (1977)
15 Wershler (1980)
16 Lawrence and Romo (1994)

* Figures presented above:

composition by weight (%)
canopy cover (%)
canopy cover (%)
canopy cover (%)
canopy cover (%)
canopy cover (%)
canopy cover (%)
canopy cover (%)
canopy cover (%)
canopy cover (%)
canopy cover (%)
frequency x abundance
canopy cover (%)
presence
presence
canopy cover (%)

APPENDIX II

SILVER SAGEBRUSH (*Artemisia cana*)

COMMUNITY CHARACTERISATION ABSTRACTS

TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
The **Silver Sagebrush/Western Wheat Grass (*Artemisia cana/Agropyron smithii*) Shrub Prairie** has been described in upland areas of the Dry Mixedgrass Subregion of southern Alberta (Adams and Ehlert 2001), in southern Saskatchewan (Michalsky and Ellis 1994) and in Wyoming (NatureServe 2000). It generally occurs on moderately to well drained, level to very gently sloping terrain and variable aspects. The ecological moisture regime is most commonly subxeric. This community is associated with solonetzic soils with varying degrees of salinity, normally ranging from brown solonetz and orthic regosols to brown solods, and are developed on glacial fluvial and glacial lacustrine parent materials. Textures are generally silt loams and silt clay loams. *Artemisia cana* has an average per cent composition by weight of 7.5 (range 5-11%). *Agropyron smithii* and *Poa sandbergii* dominate the graminoids. Other prominent species include *Koeleria macrantha*, *Bouteloua gracilis*, *Stipa comata* and *Artemisia frigida*.

ET SNAME
Artemisia cana/Agropyron smithii Shrub Herbaceous Vegetation

ET SCOMNAME
Silver Sagebrush/Western Wheat Grass Shrub Prairie

2. CLASSIFICATION

ET SYSTEM	Terrestrial
ET CLASS	V - Herbaceous Vegetation
ET SUBCLASS	V.A - Perennial graminoid vegetation
ET GROUP	V.A.7 - Temperate or subpolar grassland with a sparse shrub layer
ET FORMATION	V.A.7.N.e - Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer
ET ALLIANCE	V.A.7.N.e.11 - *ARTEMISIA CANA* SHRUB HERBACEOUS ALLIANCE

SIMILAR COMMUNITIES
Artemisia cana/Agropyron smithii Shrubland is closely related. The most apparent difference is the greater *Artemisia cana* cover (25% or more) and higher stature in the shrubland type.

3. RELATED NOMENCLATURE

SOTHER.NAMES
Artemisia cana/*Pascopyrum smithii* Vegetation Type
Silver sagebrush/western wheat grass/prickly-pear (*Artemisia cana*/*Pascopyrum smithii*/*Opuntia polyacantha*) vegetation type
Artemisia cana/*Poa pratensis* Shrub Herbaceous Vegetation

SOTHER.NAMES.RELATION
= | = | -

SOTHER.NAMES.RELATION.NOTE
Pascopyrum smithii is a synonym for *Agropyron smithii*.

Silver sagebrush/western wheat grass/prickly-pear (*Artemisia cana*/*Pascopyrum smithii*/*Opuntia polyacantha*) vegetation type is the name given to this element by Michalsky and Ellis (1994).

Artemisia cana/*Poa pratensis* Shrub Herbaceous Vegetation is a grazing induced disclimax most probably of silver sagebrush/western wheat grass (Cooper *et al.* 1999).

SNAMES.COM
Pascopyrum smithii is a synonym for *Agropyron smithii*.

Silver sagebrush/western wheat grass/prickly-pear (*Artemisia cana*/*Pascopyrum smithii*/*Opuntia polyacantha*) vegetation type is the name given to this element by Michalsky and Ellis (1994).

Artemisia cana/*Poa pratensis* Shrub Herbaceous Vegetation is a grazing induced disclimax most probably of silver sagebrush/western wheat grass (Cooper *et al.* 1999).

4. DISTRIBUTION

ESR SRANGE
The Silver Sagebrush/Western Wheat Grass Shrub Prairie has been described in the Dry Mixedgrass Subregion of southern Alberta (Adams and Ehlert 2001), in southern Saskatchewan (Grassland National Park) (Michalsky and Ellis 1994) and in Wyoming (NatureServe 2000).

ESR SRANGECOM
The Silver Sagebrush/Western Wheat Grass Shrub Prairie has been described in the Dry Mixedgrass Subregion of southern Alberta (Adams and Ehlert 2001). It probably occurs in the Mixedgrass Subregion of southern Alberta and grassland regions of Saskatchewan and southwestern Manitoba.

SDISTRIBUTION.COM
The element is expected to occur in the Dry Mixedgrass Subregion and Mixedgrass Subregion of southern Alberta.

5. ENVIRONMENTAL FACTORS

SMINELEV SMAXELEV	900 m
SLANDFORM	Valleys
STOPO.POSITION	Lower slopes
SSLOPE	Level to 6° (mostly 0-1°)
SASPECT	Variable
SGEOLOGY.COM	Glacial fluvial and glacial lacustrine parent material
SSOIL.TYPE	Primarily Solonetzic soils normally ranging from brown solonetz and orthic regosols to brown solods (Orthic Regosol, Brown Solodized Solonetzic, Brown Solod, Dark Brown Solonetzic, Solonetzic Brown Chernozem); Soil series: Wardlow, miscellaneous un. mineral (CAESA), Halliday, Hughenden, Neutral, Bunton, Ronalaine, Steveville, Orion, Kitsim; Soil correlation areas 1 and 4.
SSOIL.MOISTURE	Xeric to subhygric (normally subxeric)

SSOIL.COM
Soils have varying degrees of salinity. Textures are generally silt loams and silt clay loams.

SHYDRO.INFLUENCE Well to imperfectly drained (primarily well drained)

SSEASONAL.VAR

SKEY.ENVIRO.FACTORS
The element is associated primarily with Solonetzic soils with varying degrees of salinity.

SENVIRO.COM
The Silver Sagebrush/Western Wheat Grass Shrub Prairie generally occurs on moderately to well drained, level to very gently sloping terrain and variable aspects (Michalsky and Ellis 1994; Adams and Ehlert 2001). The ecological moisture regime is most commonly subxeric, but may range from xeric to subhygric depending on the proximity of the site to water (Michalsky and Ellis 1994). This late seral to potential natural community (PNC) is associated with solonetzic soils with varying degrees of salinity, normally ranging from brown solonetz and orthic regosols to brown solods, and are developed on glacial fluvial and glacial lacustrine parent materials. Textures are generally silt loams and silt clay loams. The range site categories are Limy, Overflow, Saline Lowland, Blowout and Thin Breaks (Adams and Ehlert 2001).

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM	Shrub, herb

SPCT.COVER
Shrub: <10%
Herb: ≥90%

SHEIGHT

SMOST.ABUND.SPP
Shrub layer: *Artemisia cana*
Herb layer: *Agropyron smithii*, *Poa sandbergii*

SSUNVEGETATED.SURFACE	Little to high unvegetated surface
SSUNVEGETATED.SURFACE.COVER	0 to 80% (average 25 to 30%)
SCONSTANT.SPP	*Artemisia cana, Agropyron smithii, Koeleria macrantha, Artmisia frigida*
SCHARACTERISTIC.SPP	None

SVEGETATION.COM
The Silver Sagebrush/Western Wheat Grass Shrub Prairie consists of two vegetation strata: the herb and shrub layers. *Artemisia cana* has an average per cent composition by weight of 7.5 (range 5-11%). *Agropyron smithii* and *Poa sandbergii* dominate the graminoids. Other prominent species include *Koeleria macrantha*, *Bouteloua gracilis*, *Stipa comata* and *Artemisia frigida*. Also common were *Opuntia polyacantha*, *Eurotia lanata*, *Atriplex nuttallii*, *Phlox hoodii* and *Selaginella densa*.

The community is classified as a native grassland, with shrub cover of less than 10%, tree cover of less than 10%, and grasses and forbs dominating the well drained upland sites (Adams and Ehlert 2001). *Artemisia cana*, *Agropyron smithii* and *Poa sandbergii* are the most abundant species in the Silver Sagebrush/Western Wheat Grass Shrub Prairie. *Artemisia cana*, *Agropyron smithii*, *Koeleria macrantha* and *Artemisia frigida* are found consistently within this community type. All occur in other community types as well.

6b. OTHER SPECIES

SHIGH.RANK.SPP	Potential species: swift fox (S1 G3), American badger (S4W G5), Richardson's ground squirrel (S5W G5), western harvest mouse (S1 G5), northern grasshopper mouse (S2 G5), sagebrush vole (S3 G5), sage grouse leks (S2 G5), sharp-tailed grouse (S4W G4), sage

thrasher (S1 G5), Sprague's pipit (S4W G4), short-horned lizard (S2 G5), western terrestrial garter snake hibernacula (S3S4 G5), western rattlesnake hibernacula (S3 G5)

SFAUNA.COM
Coyote, red fox, swift fox, white-tailed deer, mule deer, pronghorn, Nuttall's cottontail, white-tailed jack rabbit, American badger, striped skunk, least weasel, long-tailed weasel, prairie shrew, Richardson's ground squirrel, northern pocket gopher, western harvest mouse, deer mouse, northern grasshopper mouse, meadow vole, sagebrush vole, northern harrier, Swainson's hawk, prairie falcon, sage grouse, sharp-tailed grouse, mourning dove, Say's phoebe, eastern kingbird, horned lark, black-billed magpie, sage thrasher, Sprague's pipit, clay-coloured sparrow, Brewer's sparrow, lark sparrow, lark bunting, western meadowlark, Brewer's blackbird, short-horned lizard, bull snake, western terrestrial garter snake, western rattlesnake.

SOTHER.SPP.COM
No high ranking plant or animal species have been reported from the Silver Sagebrush/Western Wheat Grass Shrub Prairie, although several are potential species. Several animal species are associated with sagebrush communities, including northern grasshopper mouse, sagebrush vole, sage grouse, sage thrasher, Brewer's sparrow, lark bunting and short-horned lizard.

6c. VARIABILITY

SSPP.COMP.VAR
Artemisia cana, *Agropyron smithii*, *Koeleria macrantha* and *Artemisia frigida* are found consistently in the Silver Sagebrush/Western Wheat Grass Shrub Prairie. *Artemisia cana*, *Agropyron smithii* and *Poa sandbergii* are the most abundant species. Other prominent species include *Koeleria macrantha*, *Bouteloua gracilis*, *Stipa comata* and *Artemisia frigida*. Also common were *Carex* spp., *Calamagrostis montanensis*, *Opuntia polyacantha*, *Eurotia lanata*, *Atriplex nuttallii*, *Phlox hoodii*, *Selaginella densa*, *Gutierrezia sarothrae*, *Plantago patagonica* and *Sphaeralcea coccinea*. The unvegetated surface varies from 0 to 80% cover (average 25 to 30%).

Michalsky and Ellis (1994) found plant species presence and dominance to vary depending on the degree of moisture available or perhaps soil salinity. On the driest or most saline sites, dominant species include *Artemisia cana*, *Agropyron smithii* and *Poa sandbergii*. On moist or moderately saline sites, dominant species include *Artemisia cana*, *Agropyron smithii*, *Bouteloua gracilis*, *Koeleria macrantha*, *Artemisia frigida*, *Opuntia polyacantha*, *Selaginella densa* and lichen (primarily *Xanthoparmelia* sp.). The least saline or moister sites are dominated by *Artemisia cana*, *Artemisia frigida*, *Achillea millefolium*, *Koeleria macrantha*, and *Stipa viridula* or *Stipa comata*.

In the more severely grazed *Artemisia cana*/*Agropyron smithii* communities, the scattered shrub canopy of silver sagebrush coexists with *Poa pratensis* and *Trifolium* spp.. In less affected stands, graminoid remnants of past vegetation will be present. Cover of *Achillea millefolium*, *Trifolium* spp., *Potentilla gracilis* and *Agoseris glauca* appears to increase under these conditions. Where disturbance has been severe, *Taraxacum officinale* can form a virtually

continuous carpet (often with *Trifolium* spp.) (Cooper *et al.* 1999).

SPHYSIOG.VAR
There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM
While *Artemisia cana*, *Agropyron smithii*, *Koeleria macrantha* and *Artemisia frigida* are always present, other graminoid, forb and shrub species may be present. The unvegetated surface varies from 0 to 80% cover (average 25 to 30%).

7. DYNAMIC PROCESSES

SNAT.DISTURBANCE
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling et al. 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS Late seral, edaphic climax

SSUCCESS.DYNAM.COM
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush/Western Wheat Grass Shrub Prairie can be a late seral to edaphic climax.

8. SPATIAL RELATIONS

SSIZE Relatively small in area.

SSPATIAL DISTRIBUTION Patchy

SADJACENT.COMMUNITIES
The primary community types adjacent to the Silver Sagebrush/Western Wheat Grass Shrub Prairie include the riparian Silver Sagebrush/Western Wheat Grass Shrubland which is generally lower in the landscape, and the Silver Sagebrush/Northern Wheat Grass Shrub Prairie which is slightly higher.

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush/Western Wheat Grass Shrub Prairie is relatively small in area and patchy in distribution.
The primary community types adjacent to the Silver Sagebrush/Western Wheat Grass Shrub Prairie include the riparian Silver Sagebrush/Western Wheat Grass Shrubland which is generally lower in the landscape, and the Silver Sagebrush/Northern Wheat Grass Shrub Prairie which is slightly higher.

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO Not yet available.

SEXEMP.EO.SITENAME Not yet available.

SSTATCOM
The conservation status of the element is assumed to be favourable since it is unlikely to be cultivated. Heavy grazing could alter the species composition. This and other disturbances could encourage the establishment of non-native weedy species.

10. MANAGEMENT

SECONCOM
Livestock grazing; recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.

SMANAGE.COM
Silver Sagebrush/Western Wheat Grass Shrub Prairie is a range resource, however grazing intensities beyond light grazing result in a shift towards other community types.

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested community types on air photos and Landsat imagery. As a rule, it can be distinguished from shrub community types on large scale air photos (1:30,000 or larger), as well as cultivated land and seeded pastures. It cannot be distinguished from similar native shrub prairie or prairie communities. The preferred scale of aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, shrub prairie can easily be distinguished from forested community types. Shrub prairie can further be distinguished from shrub as well as cultivated land and seeded pasture community types on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar native shrub prairie and prairie communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT

SANALYSIS.COM
In the Dry Mixedgrass Subregion of Alberta, percent composition by weight of each plant species was estimated within microplots (Adams and Ehlert 2001). Vegetation data were analysed using PC-ORD version 4, including a detrended correspondence analysis (DCA ordination) to group the communities, as well as a cluster analysis (Wards Method). Results were viewed graphically (scatter plots and dendrograms). The resultant groupings of sites were then reassessed and adjusted to more closely reflect the vegetation associations as they were found in the field. Vegetation communities were also correlated with soil types.

In Grassland National Park of southern Saskatchewan, percent cover estimates were made of herbs, dwarf shrubs, lichens and mosses in two 1 x 1 m plots located randomly within a 5 x 5 m plot (Michalsky and Ellis 1994). The 5 x 5 m plot was used to estimate tree and shrub cover. Vegetation data were stratified into each of the seven distinct vegetation - landscape units. To determine the vegetation types present within each landscape type, the vegetation data were analysed using TWINSPAN (Hill 1979). Each division created in the analysis was assessed to determine if it constituted a vegetation type that was recognizable in the field. If adjacent divisions were very similar to each other, and if they could not be easily distinguished in the field, they were combined.

SANALYSIS.DATA.MANAGE.COM
In the Dry Mixedgrass Subregion of Alberta, vegetation data (percent composition by weight) were analysed using a detrended correspondence analysis (DCA ordination) and a cluster analysis (Wards Method), followed by a subjective reassessment and correlation with soil types to create the final groupings. The data are housed with Barry Adams of Public Lands Division, Alberta Agriculture, Food and Rural Development, Lethbridge.

In Grassland National Park of southern Saskatchewan, vegetation data (percent cover) were analysed using TWINSPAN (Hill 1979), followed by a subjective reassessment to create the final groupings. The data are housed in Grassland National Park.

13. GENERAL COMMENTS

SCOMMUNITY.COM

15. REFERENCES

SA CITATION

Adams, B.W. and R. Ehlert. 2001. Draft - *Artemisia cana* plant communities in the Dry Mixedgrass prairie subregion and soil correlation area 1. Unpublished. Alberta Rangeland Health Assessment Project, Public Lands Division, Alberta Agriculture, Food and Rural Development, Lethbridge.

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TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
The **Silver Sagebrush/Northern Wheat Grass (*Artemisia cana*/*Agropyron dasystachyum*) Shrub Prairie** has been identified in the CFB Suffield National Wildlife Area (Adams *et al.* 1997), and has been described in upland areas of the Dry Mixedgrass and Mixedgrass subregions of southern Alberta (Adams and Ehlert 2001) and the southeast corner of Alberta (Adams *et al.* 2002). It generally occurs on rapidly to well drained, level to moderately sloping terrain and variable aspects. This late seral to climax community type occurs on Blowout and Thin Breaks range sites. Soils are Brown Solidized Solonetzics, Brown Solods, Orthic Regosols and Orthic Brunisols with loamy and clay loam textures. The solonetzic soils have more solodic tendencies with better developed internal drainage, allowing the shift to *Agropyron dasystachyum*. *Artemisia cana* averages 12.3% composition by weight (range 7-27%) and approximately 8% cover. *Agropyron dasystachyum* clearly dominates the herb layer. Other prominent species include *Koeleria macrantha*, *Poa sandbergii*, *Bouteloua gracilis*, *Carex* sp., *Atriplex nuttallii* and *Artemisia frigida*. The numerous sage grouse droppings indicated the importance of this habitat to sage grouse.

ET SNAME
Artemisia cana/*Agropyron dasystachyum* Shrub Herbaceous Vegetation

ET SCOMNAME
Silver Sagebrush/Northern Wheat Grass Shrub Prairie

2. CLASSIFICATION

ET SYSTEM	Terrestrial
ET CLASS	V - Herbaceous Vegetation
ET SUBCLASS	V.A - Perennial graminoid vegetation
ET GROUP	V.A.7 - Temperate or subpolar grassland with a sparse shrub layer
ET FORMATION	V.A.7.N.e - Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer
ET ALLIANCE	V.A.7.N.e.11 - *ARTEMISIA CANA* SHRUB HERBACEOUS ALLIANCE

SIMILAR COMMUNITIES
Silver sagebrush/northern wheat grass (*Artemisia cana*/*Agropyron dasystachyum*) shrubland also has been identified in the CFB Suffield National Wildlife Area (Adams *et al.* 1997). No description is given, however the shrubland will have greater *Artemisia cana* cover (probably >30%).

3. RELATED NOMENCLATURE

SOTHER.NAMES

SOTHER.NAMES.RELATION

SOTHER.NAMES.RELATION.NOTE

SNAMES.COM

4. DISTRIBUTION

ESR SRANGE
The Silver Sagebrush/Northern Wheat Grass Shrub Prairie has been identified in the CFB Suffield National Wildlife Area (Adams *et al.* 1997) and described in upland areas of the Dry Mixedgrass and Mixedgrass subregions of southern Alberta (Adams and Ehlert 2001; Adams *et al.* 2002).

ESR SRANGECOM
The Silver Sagebrush/Northern Wheat Grass (*Artemisia cana*/*Agropyron dasystachyum*) Shrub Prairie has been identified in the CFB Suffield National Wildlife Area (Adams *et al.* 1997) and described in upland areas of the Dry Mixedgrass and Mixedgrass subregions of southern Alberta (Adams and Ehlert 2001; Adams *et al.* 2002). It probably occurs in the grassland regions of Saskatchewan and southwestern Manitoba.

SDISTRIBUTION.COM
The element occurs in the Dry Mixedgrass Subregion and Mixedgrass Subregion of southern Alberta.

5. ENVIRONMENTAL FACTORS

SMINELEV

SMAXELEV

SLANDFORM	Upland flats and slopes
STOPO.POSITION	Slopes
SSLOPE	Level to moderately sloping

SASPECT Variable

SGEOLOGY.COM

SSOIL.TYPE Brown Solidized Solonetzics, Brown Solods, Orthic Regosols and Orthic Brunisols; Soil series: Steveville, Halliday, Tothill and Maher; Soil correlation areas 1 and 2.

SSOIL.MOISTURE

SSOIL.COM
Soils have loamy and clay loam textures. The solonetzic soils have more solodic tendencies with better developed internal drainage.

SHYDRO.INFLUENCE Rapidly to well drained

SSEASONAL.VAR

SKEY.ENVIRO.FACTORS

SENVIRO.COM
The Silver Sagebrush/Northern Wheat Grass Shrub Prairie generally occurs on rapidly to well drained, level to moderately sloping terrain and variable aspects. The soils of this late seral to potential natural community (PNC) are Brown Solidized Solonetzics, Brown Solods, Orthic Regosols and Orthic Brunisols with loamy and clay loam textures. The solonetzic soils have more solodic tendencies with better developed internal drainage. The range site categories are Blowout and Thin Breaks.

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM Shrub, herb

SPCT.COVER
Shrub: <25%
Herb: ≥75%

SHEIGHT

SMOST.ABUND.SPP
Shrub layer: *Artemisia cana*
Herb layer: *Agropyron dasystachyum*

SSUNVEGETATED.SURFACE

SSUNVEGETATED.SURFACE.COVER 20.75%

SCONSTANT.SPP *Artemisia cana, Agropyron dasystachyum, Koeleria macrantha*, *Poa sandbergii, Artmisia frigida*

SCHARACTERISTIC.SPP None

SVEGETATION.COM
The Silver Sagebrush/Western Wheat Grass Shrub Prairie consists of two vegetation strata: the herb and shrub layers. *Artemisia cana* averages 12.3% composition by weight (range 7-27%) and approximately 8% cover. *Agropyron dasystachyum* clearly dominates the herb layer. Other prominent species include *Koeleria macrantha*, *Poa sandbergii*, *Bouteloua gracilis*, *Carex* sp., *Atriplex nuttallii* and *Artemisia frigida*. *Stipa comata* and *Achillea millefolium* frequently occur but at lower composition by weight and cover. Other common species include *Agropyron smithii*, *Calamagrostis montanensis*, *Stipa viridula*, *Solidago missouriensis*, *Plantago patagonica*, *Antennaria parvifolia*, *Eurotia lanata* and *Sphaeralcea coccinea*.

The community falls within the open shrubland category as an upland site with woody perennials of less than 6 m high and shrub cover between 10 and 50% (Adams and Ehlert 2001). *Artemisia cana* and *Agropyron dasystachyum* are the most abundant species. *Artemisia cana, Agropyron dasystachyum, Koeleria macrantha*, *Poa sandbergii* and *Artmisia frigida* are found consistently within this community type. All occur in other community types as well.

6b. OTHER SPECIES

SHIGH.RANK.SPP Potential species: swift fox (S1 G3), American badger (S4W G5), Richardson's ground squirrel (S5W G5), western harvest mouse (S1 G5), northern grasshopper mouse (S2 G5), sagebrush vole (S3 G5), sage grouse leks (S2 G5), sharp-tailed grouse (S4W G4), sage thrasher (S1 G5), Sprague's pipit (S4W G4), short-horned lizard (S2 G5), western terrestrial garter snake hibernacula (S3S4 G5), western rattlesnake hibernacula (S3 G5)

SFAUNA.COM
Coyote, red fox, swift fox, white-tailed deer, mule deer, pronghorn, Nuttall's cottontail, white-tailed jack rabbit, American badger, striped skunk, least weasel, long-tailed weasel, prairie shrew, Richardson's ground squirrel, northern pocket gopher, western harvest mouse, deer mouse, northern grasshopper mouse, meadow vole, sagebrush vole, northern harrier, Swainson's hawk, prairie falcon, sage grouse, sharp-tailed grouse, mourning dove, Say's phoebe, western kingbird, eastern kingbird, horned lark, black-billed magpie, sage thrasher, Sprague's pipit, clay-coloured sparrow, Brewer's sparrow, lark sparrow, lark bunting, western meadowlark, Brewer's blackbird, short-horned lizard, bull snake, western terrestrial garter snake, western rattlesnake.

SOTHER.SPP.COM
Numerous sage grouse droppings have been observed in the Silver Sagebrush/Northern Wheat

Grass Shrub Prairie, but no other high ranking plant or animal species have been reported, although several are potential species. Several animal species are associated with sagebrush communities, including northern grasshopper mouse, sagebrush vole, sage grouse, sage thrasher, Brewer's sparrow, lark bunting and short-horned lizard.

6c. VARIABILITY

SSPP.COMP.VAR
Artemisia cana, Agropyron dasystachyum, Koeleria macrantha, *Poa sandbergii* and *Artemisia frigida* are found consistently in the Silver Sagebrush/Northern Wheat Grass Shrub Prairie. *Bouteloua gracilis*, *Carex* sp. and *Atriplex nuttallii* are also prominent species. *Stipa comata* and *Achillea millefolium* frequently occur but at lower composition by weight and cover. Other common species include *Agropyron smithii*, *Calamagrostis montanensis*, *Stipa viridula*, *Solidago missouriensis*, *Plantago patagonica*, *Atriplex nuttallii*, *Antennaria parvifolia*, *Eurotia lanata* and *Sphaeralcea coccinea*.

SPHYSIOG.VAR
There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM
While *Artemisia cana, Agropyron dasystachyum, Koeleria macrantha*, *Poa sandbergii* and *Artemisia frigida* are always present, other graminoid, forb and shrub species may be present.

7. DYNAMIC PROCESSES

SNAT.DISTURBANCE
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling et al. 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS Late seral, edaphic climax

SSUCCESS.DYNAM.COM
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush/Northern Wheat Grass Shrub Prairie can be a late seral to edaphic climax.

8. SPATIAL RELATIONS

SSIZE Relatively small in area.

SSPATIAL DISTRIBUTION Patchy

SADJACENT.COMMUNITIES
A community type that is adjacent to the Silver Sagebrush/Northern Wheat Grass Shrub Prairie is the upland Silver Sagebrush/Western Wheat Grass Shrub Prairie which is slightly lower in the landscape.

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush/Northern Wheat Grass Shrub Prairie is relatively small in area and patchy in distribution.

A community type that is often adjacent to the Silver Sagebrush/Northern Wheat Grass Shrub Prairie is the upland Silver Sagebrush/Western Wheat Grass Shrub Prairie which is slightly lower in the landscape.

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO Not yet available.

SEXEMP.EO.SITENAME Not yet available.

SSTATCOM
Heavy grazing could alter the species composition. This and other disturbances could encourage the establishment of non-native weedy species.

10. MANAGEMENT

SECONCOM
Livestock grazing; recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.

SMANAGE.COM
Silver Sagebrush/Northern Wheat Grass Shrub Prairie is a range resource, however grazing intensities beyond light grazing result in a shift towards other community types.

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested community types on air photos and Landsat imagery. As a rule, it can be distinguished from shrub community types on large scale air photos (1:30,000 or larger), as well as cultivated land and seeded pastures. It cannot be distinguished from similar native shrub prairie or prairie communities. The preferred scale of aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, shrub prairie can easily be distinguished from forested community types. Shrub prairie can further be distinguished from shrub as well as cultivated land and seeded pasture community types on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar native shrub prairie and prairie communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT

SANALYSIS.COM
In the Mixedgrass and Dry Mixedgrass Subregions of Alberta, percent composition by weight of each plant species was estimated within microplots (Adams and Ehlert 2001). Vegetation data were analysed using PC-ORD version 4, including a detrended correspondence analysis (DCA ordination) to group the communities, as well as a cluster analysis (Wards Method). Results were viewed graphically (scatter plots and dendrograms). The resultant groupings of sites were then reassessed and adjusted to more closely reflect the vegetation associations as they were found in the field. Vegetation communities were also correlated with soil types.

In CFB Suffield National Wildlife Area, percent canopy cover of each plant species was estimated within microplots along a transect (Adams *et al.* 1997). Shrub cover was estimated within a 25 m^2 circular plot centred on each end of the transect and 5.6 m to the left and right of the middle of the transect line. Vegetation data were analysed initially using cluster analysis, followed by combinations of dissimilarity/similarity measures and grouping methods. The Euclidean distance as a measure of (dis)similarity between relevés and minimum variance of Ward's Method as a grouping technique produced the most easily interpreted groupings or clusters. Two-Way Species Indicator Analysis (TWINSPAN) (Hill 1979) was also used. The final classification was based on the manual grouping of sites.

SANALYSIS.DATA.MANAGE.COM
In the Mixedgrass and Dry Mixedgrass Subregions of Alberta, vegetation data (percent composition by weight) were analysed using a detrended correspondence analysis (DCA ordination) and a cluster analysis (Wards Method), followed by a subjective reassessment and correlation with soil types to create the final groupings. The data are housed with Barry Adams of Public Lands Division, Alberta Agriculture, Food and Rural Development, Lethbridge.

In CFB Suffield National Wildlife Area, vegetation data (percent canopy cover) were analysed initially using cluster analysis, followed by combinations of dissimilarity/similarity measures and grouping methods. The Euclidean distance as a measure of (dis)similarity between relevés and minimum variance of Ward's Method as a grouping technique produced the most easily interpreted groupings or clusters. Two-Way Species Indicator Analysis (TWINSPAN) (Hill 1979) was also used. The final classification was based on the manual grouping of sites (Adams *et al.* 1997). The data are housed with the Garry Trottier of the Canadian Wildlife Service, Edmonton, and have been shared with Barry Adams of Public Lands Division, Alberta Agriculture, Food and Rural Development, Lethbridge, and the Alberta Natural Heritage Information Centre, Edmonton.

13. GENERAL COMMENTS

SCOMMUNITY.COM

15. REFERENCES

SA CITATION

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Bailey, A.W. and R.A. Wroe. 1974. Aspen invasion in a portion of the Alberta Parklands. J. Range Mange. 28:263-266.

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the parklands of central Alberta. Can. J. Bot. 73:937-942.

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TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
The **Silver Sagebrush/Needle-and-thread (*Artemisia cana*/*Stipa comata*) Shrub Prairie** has been identified in CFB Suffield National Wildlife Area (Adams *et al.* 1997), was identified in six records in the Ecological Site Inventory System (ESIS) database north of Grassy Lake and Purple Springs, was described by Comer *et al.* (1999), and was described by Adams and Ehlert (2001) in the Dry Mixedgrass Subregion of southern Alberta. It generally covers small areas (<1 ha) in the northwestern Great Plains. In Montana, it is found on benches to gently inclined slopes (maximum 17° recorded) in the vicinity of breaklands. It occurs in similar habitats in Alberta, including old river terraces, badlands, ravine side slopes and valley walls, on slopes of 1-11° and variable aspects. It is found on various parent materials, but mostly well drained, medium textured, often sandy, glacial drift and sandy alluvium. *Artemisia cana* is clearly the dominant shrub, with average cover values of 5 to 25%. *Stipa comata* has high cover values (average approximately 30%) and is present at all sites. *Bouteloua gracilis* is sometimes co-dominant. *Koeleria macrantha*, *Agropyron smithii* and *Carex* spp. tend to occur frequently. Other common grasses include *Calamovilfa longifolia* and *Poa sandbergii*. Forb species cover tends to be low. Those that occurred most frequently included *Artemisia frigida*, *Opuntia polyacantha*, *Heterotheca villosa*, *Sphaeralcea coccinea*, *Psoralea argophylla* and *Gaura coccinea*. This association is hypothesised to represent the driest environment capable of supporting silver sagebrush.

ET SNAME
Artemisia cana/*Stipa comata* Shrub Herbaceous Vegetation

ET SCOMNAME
Silver Sagebrush/Needle-and-thread Shrub Prairie

2. CLASSIFICATION

ET SYSTEM	Terrestrial
ET CLASS	V - Herbaceous Vegetation
ET SUBCLASS	V.A - Perennial graminoid vegetation
ET GROUP	V.A.7 - Temperate or subpolar grassland with a sparse shrub layer
ET FORMATION	V.A.7.N.e - Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer

ET ALLIANCE V.A.7.N.e.11 - *ARTEMISIA CANA* SHRUB HERBACEOUS ALLIANCE

SIMILAR COMMUNITIES
The Silver Sagebrush/Needle-and-thread (*Artemisia cana*/*Stipa comata*) Shrubland is closely related. The most apparent difference is the greater *Artemisia cana* cover (25% or more) in the shrubland type on relatively undisturbed sites.

The Silver Sagebrush/Needle-and-Thread Shrub Prairie is related to the Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie, but the former occurs on heavier textured soils, which are considered Loamy range sites, and generally more gentle slopes. Sand grass may be present in the Silver Sagebrush/Needle-and-Thread Shrub Prairie but is never dominant.

3. RELATED NOMENCLATURE

SOTHER.NAMES
Silver sagebrush/needle-and-thread-blue grama (*Artemisia cana*/*Stipa comata-Bouteloua gracilis*) shrub prairie

SOTHER.NAMES.RELATION
=

SOTHER.NAMES.RELATION.NOTE
When *Bouteloua gracilis* is a co-dominant grass, this element is called the *Artemisia cana*/*Stipa comata-Bouteloua gracilis* community by Adams *et al.* (1997) and Adams and Ehlert (2001).

SNAMES.COM
When *Bouteloua gracilis* is a co-dominant grass, this element is called the *Artemisia cana*/*Stipa comata-Bouteloua gracilis* community by Adams *et al.* (1997) and Adams and Ehlert (2001).

4. DISTRIBUTION

ESR SRANGE
The Silver Sagebrush/Needle-and-thread Shrub Prairie has been identified in CFB Suffield National Wildlife Area (Adams *et al.* 1997), north of Grassy Lake and Purple Springs (ESIS database), was described by Comer *et al.* (1999) in the northwestern Great Plains of Montana and in southern Alberta, and was described by Adams and Ehlert (2001) in the Dry Mixedgrass Subregion of southern Alberta.

ESR SRANGECOM
The Silver Sagebrush/Needle-and-thread Shrub Prairie has been described in southern Alberta and in the northwestern Great Plains of Montana (Adams *et al.* 1997; Comer *et al.* 1999; Adams and Ehlert 2001; ESIS database). The same or a similar type occurs in Wyoming. It probably occurs in the grassland regions of Saskatchewan and northwestern North Dakota (Comer *et al.* 1999).

SDISTRIBUTION.COM
The element is expected to occur in the Dry Mixedgrass Subregion and Mixedgrass Subregion of southern Alberta.

5. ENVIRONMENTAL FACTORS
SMINELEV

SMAXELEV

SLANDFORM	Benches, old river terraces, breaklands, badlands, ravine side slopes, valley walls
STOPO.POSITION	Slopes
SSLOPE	Level to gently inclined (1 to 17° recorded)
SASPECT	Variable
SGEOLOGY.COM	Glacial drift and sandy alluvium
SSOIL.TYPE	Mostly Orthic Brown Chernozems
SSOIL.MOISTURE	
SSOIL.COM	Soils are loam, sand and sandy loam textured.
SHYDRO.INFLUENCE	Well to rapidly drained
SSEASONAL.VAR	
SKEY.ENVIRO.FACTORS	

SENVIRO.COM
The Silver Sagebrush/Needle-and-thread Shrub Prairie generally occurs on well to rapidly drained, level to gently sloping terrain (1 to 17° recorded) and variable aspects. In Montana, it is found on benches to gently inclined slopes in the vicinity of breaklands. It occurs in similar habitats in Alberta, including old river terraces, badlands, ravine side slopes and valley walls. It is found on various parent materials, but mostly medium textured, often sandy, glacial drift and sandy alluvium. Soils are mostly Orthic Brown Chernozems that are loam, sand and sandy loam textured. This association is hypothesised to represent the driest environment capable of supporting silver sagebrush.

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM	Shrub, herb

SPCT.COVER
Shrub: <25%
Herb: ≥75%

SHEIGHT

SMOST.ABUND.SPP
Shrub layer: *Artemisia cana*
Herb layer: *Stipa comata*

SSUNVEGETATED.SURFACE

SSUNVEGETATED.SURFACE.COVER

SCONSTANT.SPP	*Artemisia cana, Stipa comata*

SCHARACTERISTIC.SPP	None

SVEGETATION.COM
The Silver Sagebrush/Needle-and-thread Shrub Prairie consists of two vegetation strata: the herb and shrub layers. *Artemisia cana* is clearly the dominant shrub, with average cover values of 5 to 25%. *Stipa comata* has high cover values (average approximately 30%) and is present at all sites. *Bouteloua gracilis* is sometimes co-dominant. *Koeleria macrantha*, *Agropyron smithii* and *Carex* spp. tend to occur frequently. Other common grasses include *Calamovilfa longifolia* and *Poa sandbergii*. Forb species cover tends to be low. Those that occurred most frequently included *Artemisia frigida*, *Opuntia polyacantha*, *Heterotheca villosa*, *Sphaeralcea coccinea*, *Psoralea argophylla* and *Gaura coccinea*.

Artemisia cana and *Stipa comata* are the most abundant species in the Silver Sagebrush/Needle-and-thread Shrub Prairie and are found consistently within this community type. Both occur in other community types as well.

6b. OTHER SPECIES

SHIGH.RANK.SPP	Potential species: swift fox (S1 G3), American badger (S4W G5), Richardson's ground squirrel (S5W G5), western harvest mouse (S1 G5), northern grasshopper mouse (S2 G5), sagebrush vole (S3 G5), sage grouse leks (S2 G5), sharp-tailed grouse (S4W G4), burrowing owl (S3 G4), sage thrasher (S1 G5), Sprague's pipit (S4W G4), short-horned lizard (S2 G5), western terrestrial garter

snake hibernacula (S3S4 G5), western rattlesnake hibernacula (S3 G5)

SFAUNA.COM
Coyote, red fox, swift fox, white-tailed deer, mule deer, pronghorn, Nuttall's cottontail, white-tailed jack rabbit, American badger, striped skunk, least weasel, long-tailed weasel, prairie shrew, Richardson's ground squirrel, northern pocket gopher, western harvest mouse, deer mouse, northern grasshopper mouse, meadow vole, sagebrush vole, northern harrier, Swainson's hawk, prairie falcon, sage grouse, sharp-tailed grouse, mourning dove, burrowing owl, Say's phoebe, western kingbird, eastern kingbird, horned lark, black-billed magpie, sage thrasher, Sprague's pipit, clay-coloured sparrow, Brewer's sparrow, lark sparrow, lark bunting, western meadowlark, chestnut-collared longspur, Brewer's blackbird, short-horned lizard, bull snake, western terrestrial garter snake, western rattlesnake.

SOTHER.SPP.COM
No high ranking plant or animal species have been reported from the Silver Sagebrush/Needle-and-thread Shrub Prairie, although several are potential species. Several animal species are associated with sagebrush communities, including northern grasshopper mouse, sagebrush vole, sage grouse, sage thrasher, Brewer's sparrow, lark bunting and short-horned lizard. Several animal species are associated with badland communities, including prairie falcon, Say's phoebe, lark sparrow and short-horned lizard.

6c. VARIABILITY

SSPP.COMP.VAR
Artemisia cana and *Stipa comata* are found consistently in the Silver Sagebrush/Needle-and-thread Shrub Prairie, and are the most abundant species. *Artemisia cana* is clearly the dominant shrub, with average cover values of 5 to 25%. *Stipa comata* has high cover values (average approximately 30%). *Bouteloua gracilis* is sometimes co-dominant. *Koeleria macrantha*, *Agropyron smithii* and *Carex* spp. tend to occur frequently. Other common grasses include *Calamovilfa longifolia* and *Poa sandbergii*. Forb species cover tends to be low. Those that occurred most frequently included *Artemisia frigida*, *Opuntia polyacantha*, *Heterotheca villosa*, *Sphaeralcea coccinea*, *Psoralea argophylla* and *Gaura coccinea*. *Muhlenbergia cuspidata*, *Calamovilfa longifolia*, *Sporobolus cryptandrus* and *Selaginella densa* had high cover on some sites.

SPHYSIOG.VAR
There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM
While *Artemisia cana* and *Stipa comata* are always present, other graminoid, forb and shrub species may be present.

7. DYNAMIC PROCESSES

SNAT.DISTURBANCE
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling *et al.* 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS Late seral, edaphic climax
SSUCCESS.DYNAM.COM
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush/Needle-and-thread Shrub Prairie can be a late seral to edaphic climax.

8. SPATIAL RELATIONS

SSIZE Relatively small in area (<1 ha).

SSPATIAL DISTRIBUTION Patchy

SADJACENT.COMMUNITIES
The primary community types adjacent to the Silver Sagebrush/Needle-and-thread Shrub Prairie include the silver sagebrush/western wheat grass and silver sagebrush/green needle grass-western wheat grass associations, which occur lower in the landscape in more mesic areas of flood plain terraces.

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush/Needle-and-thread Shrub Prairie is relatively small in area and patchy in distribution.

The primary community types adjacent to the Silver Sagebrush/Needle-and-thread Shrub Prairie include the silver sagebrush/western wheat grass and silver sagebrush/green needle grass-western wheat grass associations, which occur lower in the landscape in more mesic areas of flood plain terraces.

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO Not yet available.

SEXEMP.EO.SITENAME Not yet available.

SSTATCOM
Heavy grazing could alter the species composition. This and other disturbances could encourage the establishment of non-native weedy species.

10. MANAGEMENT

SECONCOM
Livestock grazing; recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.

SMANAGE.COM0
Silver Sagebrush/Needle-and-thread Shrub Prairie is a range resource, however grazing intensities beyond light grazing result in a shift towards other community types.

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested community types on air photos and Landsat imagery. As a rule, it can be distinguished from shrub community types on large scale air photos (1:30,000 or larger), as well as cultivated land and seeded pastures. It cannot be distinguished from similar native shrub prairie or prairie communities. The preferred scale of aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, shrub prairie can easily be distinguished from forested community types. Shrub prairie can further be distinguished from shrub as well as cultivated land and seeded pasture community types on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar native shrub prairie and prairie communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT

SANALYSIS.COM

Vegetation data in the ESIS database (percent canopy cover) were subjected to an indicator species analysis (TWINSPAN) (Hill 1979) and ordination (DECORANA, a detrended correspondence analysis) (Gauch 1982) using PC-ORD. The results were subjectively assessed and the records were grouped according to dominant species and vegetation structure.

SANALYSIS.DATA.MANAGE.COM
Vegetation data in the ESIS database (percent canopy cover) were subjected to an indicator species analysis (TWINSPAN) (Hill 1979) and ordination (DECORANA, a detrended correspondence analysis) (Gauch 1982) using PC-ORD. The results were subjectively assessed and the records were grouped according to dominant species and vegetation structure. The data are housed in the ESIS database of Alberta Environment, Edmonton.

13. GENERAL COMMENTS

SCOMMUNITY.COM

15. REFERENCES

SA CITATION

Adams, B.W. and R. Ehlert. 2001. Draft - *Artemisia cana* plant communities in the Dry Mixedgrass prairie subregion and soil correlation area 1. Unpublished. Alberta Rangeland Health Assessment Project, Public Lands Division, Alberta Agriculture, Food and Rural Development, Lethbridge.

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Anderson, H.G. and A.W. Bailey. 1980. Effects of annual burning on grassland in the aspen parkland of east-central Alberta. Can. J. Bot. 58:985-996.

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Bird, R.D. 1961. Ecology of the Aspen Parkland of western Canada in relation to land use. Canada Department of Agriculture, Ottawa. Publ. No. 1006. 176 pp.

Comer, P., L. Allen, S. Cooper, D. Faber-Langendoen and G. Jones. 1999. Selected shrubland and grassland communities of the northern Great Plains. A report to the Nebraska National Forest. The Nature Conservancy.

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Gerling, H.S., A.W. Bailey and W.D. Willms. 1995. The effects of burning on Festuca hallii in the parklands of central Alberta. Can. J. Bot. 73:937-942.

Hill, M.O. 1979. TWINSPAN: A FORTRAN program for arranging multivariate data into an ordered two-way table. Section of Ecology and Systematics, Cornell University. Ithaca, New York.

Moss, E.H. and J.A. Campbell. 1947. The fescue grassland of Alberta. Can. Jour. Res. 25: 209-227.

Nelson, J.G. and R.E. England. 1971. Some comments on the causes and effects of fire in the northern grasslands area of Canada and the nearby United States, ca. 1750-1900. Can Geog. 15:295-306.

TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
The **Silver Sagebrush/Needle-and-thread-Sand Grass (*Artemisia cana*/*Stipa comata-Calamovilfa longifolia*) Shrub Prairie** was identified in one record in the ESIS database north of Grassy Lake, has been described by Adams and Ehlert (2001) in the Dry Mixedgrass Subregion of southern Alberta, has been identified in the CFB Suffield National Wildlife Area (Adams *et al.* 1997), and is identified in NatureServe (2000) in Wyoming basins and northern Great Plains steppe. It occurs on rapidly drained, very gentle to strong slopes and variable aspects. Soils are developed on fluvial and eolian parent material. The community is categorised as an open shrubland, with *Artemisia cana* averaging 10.75% composition by weight (range 6-21%) or 30% cover (ESIS record). *Stipa comata* generally dominates over *Calamovilfa longifolia*, but occasionally is common but not a co-dominant species. Other prominent species include *Bouteloua gracilis*, *Koeleria macrantha*, *Carex stenophylla*, *Opuntia polyacantha*, *Psoralea lanceolata*, *Heterotheca villosa*, *Artemisia frigida*, *Achillea millefolium* and *Rosa woodsii*.

ET SNAME
Artemisia cana/*Stipa comata-Calamovilfa longifolia* Shrub Herbaceous Vegetation

ET SCOMNAME
Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie

2. CLASSIFICATION

ET SYSTEM	Terrestrial
ET CLASS	V - Herbaceous Vegetation
ET SUBCLASS	V.A - Perennial graminoid vegetation
ET GROUP	V.A.7 - Temperate or subpolar grassland with a sparse shrub layer
ET FORMATION	V.A.7.N.e - Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer
ET ALLIANCE	V.A.7.N.e.11 - ARTEMISIA CANA SHRUB HERBACEOUS ALLIANCE

SIMILAR COMMUNITIES
The Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie is related to the Silver Sagebrush/Needle-and-Thread Shrub Prairie, but the latter occurs on heavier textured soils, which are considered Loamy range sites, and generally more gentle slopes. Sand grass may be present in the Silver Sagebrush/Needle-and-Thread Shrub Prairie but is never dominant.

3. RELATED NOMENCLATURE

SOTHER.NAMES
Silver sagebrush/sand grass-needle-and-thread (*Artemisia cana*/*Calamovilfa longifolia*-*Stipa comata*) vegetation type
Silver sagebrush/sand grass (*Artemisia cana*/*Calamovilfa longifolia*) shrub prairie

SOTHER.NAMES.RELATION
= | =

SOTHER.NAMES.RELATION.NOTE
This element is called the *Artemisia cana*/*Calamovilfa longifolia*-*Stipa comata* vegetation type or the *Artemisia cana*/*Calamovilfa longifolia* vegetation type in CFB Suffield National Wildlife Area (Adams *et al.* 1997). This element is called the *Artemisia cana*/*Calamovilfa longifolia* shrub prairie in Wyoming basins and northern Great Plains steppe (NatureServe 2000).

SNAMES.COM
This element is called the *Artemisia cana*/*Calamovilfa longifolia*-*Stipa comata* vegetation type or the *Artemisia cana*/*Calamovilfa longifolia* vegetation type in CFB Suffield National Wildlife Area (Adams *et al.* 1997). This element is called the *Artemisia cana*/*Calamovilfa longifolia* shrub prairie in Wyoming basins and northern Great Plains steppe (NatureServe 2000).

4. DISTRIBUTION

ESR SRANGE
The Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie was identified in one record in the ESIS database north of Grassy Lake, has been described by Adams and Ehlert (2001) in the Dry Mixedgrass Subregion of southern Alberta, has been identified in the CFB Suffield National Wildlife Area (Adams *et al.* 1997), and is identified in NatureServe (2000) in Wyoming basins and northern Great Plains steppe.

ESR SRANGECOM
The Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie has been described in southern Alberta and in Wyoming basins and northern Great Plains steppe (Adams *et al.* 1997; NatureServe 2000; Adams and Ehlert 2001; ESIS database). It probably occurs in the Mixedgrass Subregion of southern Alberta and grassland regions of Saskatchewan and southwestern Manitoba.

SDISTRIBUTION.COM
The element is expected to occur in the Dry Mixedgrass Subregion and Mixedgrass Subregion of

southern Alberta.
5. ENVIRONMENTAL FACTORS

SMINELEV

SMAXELEV
SLANDFORM

STOPO.POSITION Slopes

SSLOPE Very gentle to strong slopes

SASPECT Variable

SGEOLOGY.COM Fluvial and eolian parent material

SSOIL.TYPE

SSOIL.MOISTURE

SSOIL.COM

SHYDRO.INFLUENCE Rapidly drained

SSEASONAL.VAR

SKEY.ENVIRO.FACTORS

SENVIRO.COM
The Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie occurs on rapidly drained, very gentle to strong slopes and variable aspects. Soils are developed on fluvial and eolian parent material.

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM Shrub, herb

SPCT.COVER
Shrub: <25%
Herb: ≥75%

SHEIGHT

SMOST.ABUND.SPP
Shrub layer: *Artemisia cana*
Herb layer: *Stipa comata*, *Calamovilfa longifolia*

SSUNVEGETATED.SURFACE

SSUNVEGETATED.SURFACE.COVER

SCONSTANT.SPP *Artemisia cana, Stipa comata*

SCHARACTERISTIC.SPP None

SVEGETATION.COM
The Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie consists of two vegetation strata: the herb and shrub layers. *Artemisia cana* is clearly the dominant shrub, averaging 10.75% composition by weight (range 6-21%) or 30% cover (ESIS record). *Stipa comata* generally dominates over *Calamovilfa longifolia*, but occasionally is common but not a co-dominant species. Other prominent species include *Bouteloua gracilis*, *Koeleria macrantha*, *Carex stenophylla*, *Opuntia polyacantha*, *Psoralea lanceolata*, *Heterotheca villosa*, *Artemisia frigida*, *Achillea millefolium* and *Rosa woodsii*.

Artemisia cana, *Stipa comata* and *Calamovilfa longifolia* are the most abundant species in the Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie, and *Artemisia cana* and *Stipa comata* are found consistently within this community type. All three occur in other community types as well.

6b. OTHER SPECIES
SHIGH.RANK.SPP Potential species: swift fox (S1 G3), American badger (S4W G5), Richardson's ground squirrel (S5W G5), olive-backed pocket mouse (S2 G5), western harvest mouse (S1 G5), northern grasshopper mouse (S2 G5), sagebrush vole (S3 G5), sage grouse leks (S2 G5), sharp-tailed grouse (S4W G4), burrowing owl (S3 G4), sage thrasher (S1 G5), Sprague's pipit (S4W G4), short-horned lizard (S2 G5), western terrestrial garter snake hibernacula (S3S4 G5), western rattlesnake hibernacula (S3 G5)

SFAUNA.COM
Coyote, red fox, swift fox, white-tailed deer, mule deer, pronghorn, Nuttall's cottontail, white-tailed jack rabbit, American badger, striped skunk, least weasel, long-tailed weasel, prairie shrew, Richardson's ground squirrel, northern pocket gopher, olive-backed pocket mouse, western harvest mouse, deer mouse, northern grasshopper mouse, meadow vole, sagebrush vole, northern harrier, Swainson's hawk, prairie falcon, sage grouse, sharp-tailed grouse, mourning dove, burrowing owl, Say's phoebe, western kingbird, eastern kingbird, horned lark, black-billed magpie, sage thrasher, Sprague's pipit, clay-coloured sparrow, Brewer's sparrow, lark sparrow, lark bunting, grasshopper sparrow, western meadowlark, chestnut-collared longspur, McCown's longspur, Brewer's blackbird, bull snake, western terrestrial garter snake, western rattlesnake.

SOTHER.SPP.COM
No high ranking plant or animal species have been reported from the Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie, although several are potential species. Several animal species are associated with sagebrush communities, including northern grasshopper mouse, sagebrush vole, sage grouse, sage thrasher, Brewer's sparrow, lark bunting and short-horned lizard.

6c. VARIABILITY

SSPP.COMP.VAR
Artemisia cana, *Stipa comata* and *Calamovilfa longifolia* are the most abundant species in the Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie, and *Artemisia cana* and *Stipa comata* are found consistently within this community type. *Artemisia cana* is clearly the dominant shrub, averaging 10.75% composition by weight (range 6-21%) or 30% cover (ESIS record). *Stipa comata* generally dominates over *Calamovilfa longifolia*, but occasionally is common but not a co-dominant species. Other prominent species include *Bouteloua gracilis*, *Koeleria macrantha*, *Carex stenophylla*, *Opuntia polyacantha*, *Psoralea lanceolata*, *Heterotheca villosa*, *Artemisia frigida*, *Achillea millefolium* and *Rosa woodsii*.

SPHYSIOG.VAR
There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM
While *Artemisia cana* and *Stipa comata* are always present, and *Calamovilfa longifolia* is usually present, other graminoid, forb and shrub species may be present.

7. DYNAMIC PROCESSES

SNAT.DISTURBANCE
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling *et al.* 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS Late seral, edaphic climax

SSUCCESS.DYNAM.COM
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie can be a late seral to edaphic climax.

8. SPATIAL RELATIONS

SSIZE Relatively small in area.

SSPATIAL DISTRIBUTION Patchy

SADJACENT.COMMUNITIES

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie is relatively small in area and patchy in distribution.

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO Not yet available.

SEXEMP.EO.SITENAME Not yet available.

SSTATCOM
Heavy grazing could alter the species composition. This and other disturbances could encourage the establishment of non-native weedy species.

10. MANAGEMENT

SECONCOM
Livestock grazing; recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.

SMANAGE.COM
Silver Sagebrush/Needle-and-thread-Sand Grass Shrub Prairie is a range resource, however grazing intensities beyond light grazing result in a shift towards other community types.

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested community types on air photos and Landsat imagery. As a rule, it can be distinguished from shrub community types on large scale air photos (1:30,000 or larger), as well as cultivated land and seeded pastures. It cannot be distinguished from similar native shrub prairie or prairie communities. The preferred scale of aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, shrub prairie can easily be distinguished from forested community types. Shrub prairie can further be distinguished from shrub as well as cultivated land and seeded pasture community types on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar native shrub prairie and prairie communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT

SANALYSIS.COM
Vegetation data in the ESIS database (percent canopy cover) were subjected to an indicator species analysis (TWINSPAN) (Hill 1979) and ordination (DECORANA, a detrended correspondence analysis) (Gauch 1982) using PC-ORD. The results were subjectively assessed and the records were grouped according to dominant species and vegetation structure.

SANALYSIS.DATA.MANAGE.COM
Vegetation data in the ESIS database (percent canopy cover) were subjected to an indicator species analysis (TWINSPAN) (Hill 1979) and ordination (DECORANA, a detrended correspondence analysis) (Gauch 1982) using PC-ORD. The results were subjectively assessed and the records were grouped according to dominant species and vegetation structure. The data are housed in the ESIS database of Alberta Environment, Edmonton.

13. GENERAL COMMENTS

SCOMMUNITY.COM

15. REFERENCES

SA CITATION

Adams, B.W. and R. Ehlert. 2001. Draft - *Artemisia cana* plant communities in the Dry Mixedgrass prairie subregion and soil correlation area 1. Unpublished. Alberta Rangeland Health Assessment Project, Public Lands Division, Alberta Agriculture, Food and Rural Development, Lethbridge.

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Bird, R.D. 1961. Ecology of the Aspen Parkland of western Canada in relation to land use. Canada Department of Agriculture, Ottawa. Publ. No. 1006. 176 pp.

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NatureServe: An online encyclopedia of life [web application]. 2000. Version 1.2. Arlington, Virginia, U.S.A.: Association for Biodiversity Information. Available: http://www.natureserve.org/. (Accessed: February 20, 2001).

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TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
Silver Sagebrush/Western Porcupine Grass-Sedge (*Artemisia cana*/*Stipa curtiseta-Carex* spp.) Shrub Prairie has been described in the southeast corner of Alberta within the Dry Mixedgrass Subregion on north-facing slopes (Adams *et al.* 2002). This community occurs on well to moderately well drained, non-saline Overflow range sites in the Brown soil zone. The Orthic Brunisolic soils tend to be clay loam textured, or occasionally loam to silty loam textured. *Artemisia cana* cover was 4.3%. *Stipa curtiseta* dominated at 21%. Also prominent were *Carex* spp., *Stipa comata*, *Agropyron smithii* and *Agropyron dasystachyum*.

ET SNAME
Artemisia cana/*Stipa curtiseta*-*Carex* spp. Shrub Herbaceous Vegetation

ET SCOMNAME
Silver Sagebrush/Western Porcupine Grass-Sedge Shrub Prairie

2. CLASSIFICATION

ET SYSTEM	Terrestrial
ET CLASS	V - Herbaceous Vegetation
ET SUBCLASS	V.A - Perennial graminoid vegetation
ET GROUP	V.A.7 - Temperate or subpolar grassland with a sparse shrub layer
ET FORMATION	V.A.7.N.e - Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer
ET ALLIANCE	V.A.7.N.e.11 - *ARTEMISIA CANA* SHRUB HERBACEOUS ALLIANCE

SIMILAR COMMUNITIES

3. RELATED NOMENCLATURE

SOTHER.NAMES

SOTHER.NAMES.RELATION

SOTHER.NAMES.RELATION.NOTE

SNAMES.COM

4. DISTRIBUTION

ESR SRANGE
Silver Sagebrush/Western Porcupine Grass-Sedge Shrub Prairie has been described in the southeast corner of Alberta within the Dry Mixedgrass Subregion.

ESR SRANGECOM
Silver Sagebrush/Western Porcupine Grass-Sedge Shrub Prairie has been described in the southeast corner of Alberta within the Dry Mixedgrass Subregion. It may also occur in the southwest corner of Saskatchewan.

SDISTRIBUTION.COM
The element is expected to occur in the Dry Mixedgrass Subregion of southern Alberta and the southwest corner of Saskatchewan.

5. ENVIRONMENTAL FACTORS

SMINELEV

SMAXELEV

SLANDFORM

STOPO.POSITION Slopes

SSLOPE

SASPECT North-facing

SGEOLOGY.COM

SSOIL.TYPE Orthic Brunisols

SSOIL.MOISTURE

SSOIL.COM Soils tend to be clay loam textured, or occasionally loam to silty loam textured. Sites are non-saline.

SHYDRO.INFLUENCE Well to moderately well drained

SSEASONAL.VAR

SKEY.ENVIRO.FACTORS

SENVIRO.COM
This element occurs on well to moderately well drained, non-saline sites on north-facing slopes. The Orthic Brunisolic soils tend to be clay loam textured, or occasionally loam to silty loam textured.

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM	Shrub, herb

SPCT.COVER
Shrub: <25%
Herb: ≥75%

SHEIGHT

SMOST.ABUND.SPP
Shrub layer: *Artemisia cana*
Herb layer: *Stipa curtiseta*, *Carex* spp.

SSUNVEGETATED.SURFACE

SSUNVEGETATED.SURFACE.COVER	0.25% cover
SCONSTANT.SPP	*Artemisia cana*, *Stipa curtiseta*, *Carex* spp.
SCHARACTERISTIC.SPP	None

SVEGETATION.COM
Artemisia cana cover was 4.3%. *Stipa curtiseta* dominated at 21%.

The Silver Sagebrush/Western Porcupine Grass-Sedge Shrub Prairie consists of two vegetation strata: the herb and shrub layers. *Stipa curtiseta* clearly dominated the community, at 21% cover. *Artemisia cana* was at 4.3% cover and *Carex* spp. were at 7.9%. Also prominent were *Stipa comata*, *Agropyron smithii* and *Agropyron dasystachyum*. *Arnica fulgens* and *Artemisia frigida* were the most common forbs.

Artemisia cana, *Stipa curtiseta* and *Carex* spp. are the most abundant species in the Silver Sagebrush/Western Porcupine Grass-Sedge Shrub Prairie and are found consistently within this community type. All occur in other community types as well.

6b. OTHER SPECIES

SHIGH.RANK.SPP	Potential species: swift fox (S1 G3), American badger (S4W G5), Richardson's ground squirrel (S5W G5), olive-backed pocket mouse (S2 G5), western harvest mouse (S1 G5), northern grasshopper mouse (S2 G5), sagebrush vole (S3 G5), sage grouse leks (S2 G5), sharp-tailed grouse (S4W G4), burrowing owl (S3 G4), sage thrasher (S1 G5), Sprague's pipit (S4W G4), short-horned lizard (S2 G5), western terrestrial garter snake hibernacula (S3S4 G5), western rattlesnake hibernacula (S3 G5)

SFAUNA.COM

Coyote, red fox, swift fox, white-tailed deer, mule deer, pronghorn, Nuttall's cottontail, white-tailed jack rabbit, American badger, striped skunk, least weasel, long-tailed weasel, prairie shrew, Richardson's ground squirrel, northern pocket gopher, olive-backed pocket mouse, western harvest mouse, deer mouse, northern grasshopper mouse, meadow vole, sagebrush vole, northern harrier, Swainson's hawk, prairie falcon, sage grouse, sharp-tailed grouse, mourning dove, burrowing owl, Say's phoebe, western kingbird, eastern kingbird, horned lark, black-billed magpie, sage thrasher, Sprague's pipit, clay-coloured sparrow, Brewer's sparrow, lark sparrow, lark bunting, grasshopper sparrow, western meadowlark, chestnut-collared longspur, McCown's longspur, Brewer's blackbird, bull snake, western terrestrial garter snake, western rattlesnake.

SOTHER.SPP.COM

Sage grouse droppings have been observed in the Silver Sagebrush/Western Porcupine Grass-Sedge Shrub Prairie, but no other high ranking plant or animal species have been reported, although several are potential species. Several animal species are associated with sagebrush communities, including northern grasshopper mouse and sagebrush vole, sage grouse, sage thrasher, Brewer's sparrow and lark bunting.

6c. VARIABILITY

SSPP.COMP.VAR

Artemisia cana, *Stipa curtiseta* and *Carex* spp. are found consistently in the Silver Sagebrush/Western Porcupine Grass-Sedge Shrub Prairie, and are the most abundant species. *Stipa curtiseta* clearly dominated the community, at 21% cover. *Artemisia cana* was at 4.3% cover and *Carex* spp. were at 7.9%. Also prominent were *Stipa comata*, *Agropyron smithii* and *Agropyron dasystachyum*. *Arnica fulgens* and *Artemisia frigida* were the most common forbs.

SPHYSIOG.VAR

There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM

While *Artemisia cana*, *Stipa curtiseta* and *Carex* spp. are always present, other graminoid, forb and shrub species may be present.

7. DYNAMIC PROCESSES

SNAT.DISTURBANCE
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling et al. 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS Late seral, edaphic climax

SSUCCESS.DYNAM.COM
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush/Western Porcupine Grass-Sedge Shrub Prairie may be a late seral to edaphic climax.

8. SPATIAL RELATIONS

SSIZE Relatively small in area.

SSPATIAL DISTRIBUTION Patchy

SADJACENT.COMMUNITIES

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush/Western Porcupine Grass-Sedge Shrub Prairie is relatively small in area and patchy in distribution.

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO Not yet available.

SEXEMP.EO.SITENAME Not yet available.

SSTATCOM
Heavy grazing could alter the species composition. This and other disturbances could encourage the establishment of non-native weedy species.

10. MANAGEMENT

SECONCOM
Livestock grazing; recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.

SMANAGE.COM
Silver Sagebrush/Western Porcupine Grass-Sedge Shrub Prairie is a range resource, however grazing intensities beyond light grazing result in a shift towards other community types.

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested community types on air photos and Landsat imagery. As a rule, it can be distinguished from shrub community types on large scale air photos (1:30,000 or larger), as well as cultivated land and seeded pastures. It cannot be distinguished from similar native shrub prairie or prairie communities. The preferred scale of aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, shrub prairie can easily be distinguished from forested community types. Shrub prairie can further be distinguished from shrub as well as cultivated land and seeded pasture community types on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar native shrub prairie and prairie communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT

SANALYSIS.COM

SANALYSIS.DATA.MANAGE.COM

13. GENERAL COMMENTS

SCOMMUNITY.COM

15. REFERENCES

SA CITATION

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TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
The **Silver Sagebrush/Idaho Fescue (*Artemisia cana*/*Festuca idahoensis*) Shrub Prairie** has been described by Mueggler and Stewart (1980) and Cooper *et al.* (1999) along mountain streams in southwestern Montana, and by Hansen *et al.* (1995) at mid- to high elevations in the mountains and foothills of central and southwestern Montana, on alluvial outwash fans and terraces. It may occur in Alberta where the ranges of silver sagebrush and Idaho fescue overlap, in the Cypress Hills area and in southwestern Alberta (Moss 1983). In Montana, this community occurs in small areas (<2 ha) on deep, loamy, alluvial soils above 1,830 m elevation. Soil texture varies little from silt loam to sandy loam, and coarse fragments are common. The shrub component, which generally does not exceed 15-23 % canopy cover, is dominated by *Artemisia cana*, with scattered *Artemisia tridentata* in Montana. There is high cover (30-40%) of *Festuca idahoensis*, , along with *Poa pratensis* in some areas. There is variable cover of other mesic graminoids including *Bromus carinatus*, *Bromus anomalus*, *Stipa columbiana* and, in Montana, *Agropyron caninum*. The forb component is rich with *Geranium viscosissimum*, *Potentilla gracilis*, *Geum triflorum* and *Agoseris glauca* contributing the greatest cover. This habitat type represents the driest extreme of the riparian or wetland zone in central and southwestern Montana.

ET SNAME
Artemisia cana/*Festuca idahoensis* Shrub Herbaceous Vegetation

ET SCOMNAME
Silver Sagebrush/Idaho Fescue Shrub Prairie

2. CLASSIFICATION

ET SYSTEM	Terrestrial
ET CLASS	V - Herbaceous Vegetation
ET SUBCLASS	V.A - Perennial graminoid vegetation
ET GROUP	V.A.7 - Temperate or subpolar grassland with a sparse shrub layer
ET FORMATION	V.A.7.N.e - Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer
ET ALLIANCE	V.A.7.N.e.11 - *ARTEMISIA CANA* SHRUB HERBACEOUS ALLIANCE

SIMILAR COMMUNITIES
The grass-forb understorey is similar to that found in the more moist portions of the Big Sagebrush/Idaho Fescue (*Artemisia tridentata*/*Festuca idahoensis*) Habitat Type described by Mueggler and Stewart (1980).

3. RELATED NOMENCLATURE

SOTHER.NAMES
Artemisia cana/*Poa pratensis* Shrub Herbaceous Vegetation

SOTHER.NAMES.RELATION
-

SOTHER.NAMES.RELATION.NOTE
Artemisia cana/*Poa pratensis* Shrub Herbaceous Vegetation is a grazing induced disclimax possibly of silver sagebrush/Idaho fescue (Cooper *et al.* 1999).

SNAMES.COM
Artemisia cana/*Poa pratensis* Shrub Herbaceous Vegetation is a grazing induced disclimax possibly of silver sagebrush/Idaho fescue (Cooper *et al.* 1999).

4. DISTRIBUTION

ESR SRANGE
The Silver Sagebrush/Idaho Fescue Shrub Prairie has been described by Mueggler and Stewart (1980) and Cooper *et al.* (1999) in southwestern Montana, and by Hansen *et al.* (1995) at mid- to high elevations in the mountains and foothills of central and southwestern Montana. It may occur in Alberta where the ranges of silver sagebrush and Idaho fescue overlap, in the Cypress Hills area and in southwestern Alberta (Moss 1983).

ESR SRANGECOM
The Silver Sagebrush/Idaho Fescue Shrub Prairie has been described by Mueggler and Stewart (1980) and Cooper *et al.* (1999) in southwestern Montana, and by Hansen *et al.* (1995) at mid- to high elevations in the mountains and foothills of central and southwestern Montana. It may occur in Alberta where the ranges of silver sagebrush and Idaho fescue overlap, in the Cypress Hills area and in southwestern Alberta (Moss 1983) and in the Cypress Hills of Saskatchewan.

SDISTRIBUTION.COM
The element is expected to occur in the Foothills Fescue Subregion and the Mixedgrass Subregion of southern Alberta and the grassland of southwestern Saskatchewan.

5. ENVIRONMENTAL FACTORS

SMINELEV 1,830 m

SMAXELEV 2,376 m

SLANDFORM Mountains and foothills, alluvial outwash fans and terraces

STOPO.POSITION Slopes

SSLOPE

SASPECT

SGEOLOGY.COM Alluvium

SSOIL.TYPE Borolls

SSOIL.MOISTURE Moderate

SSOIL.COM
Soils are deep and texture varies little from silt loam to sandy loam. Coarse fragments are common. Available soil moisture is estimated as moderate. Soils are slightly acid to moderately alkaline (pH 6.0-8.0).

SHYDRO.INFLUENCE
Redox concentrations (mottles) are common, indicating a fluctuating water table.

SSEASONAL.VAR

SKEY.ENVIRO.FACTORS
Sites have a fluctuating water table. Soils are slightly acid to moderately alkaline (pH 6.0-8.0).

SENVIRO.COM
In Montana, the Silver Sagebrush/Idaho Fescue Shrub Prairie occurs at mid- to high elevations (1,830 m to 2,376 m) in the mountains and foothills on alluvial outwash fans and terraces. Soils are deep and texture varies little from silt loam to sandy loam. Coarse fragments are common. Redox concentrations (mottles) are common, indicating a fluctuating water table. Available soil moisture is estimated as moderate. Soils are slightly acid to moderately alkaline (pH 6.0-8.0).

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM Shrub, herb

SPCT.COVER
Shrub: <25%
Herb: ≥75%

SHEIGHT

SMOST.ABUND.SPP
Shrub layer: *Artemisia cana*
Herb layer: *Festuca idahoensis*
SSUNVEGETATED.SURFACE

SSUNVEGETATED.SURFACE.COVER

SCONSTANT.SPP *Artemisia cana, Festuca idahoensis*

SCHARACTERISTIC.SPP None

SVEGETATION.COM
The Silver Sagebrush/Idaho Fescue Shrub Prairie consists of two vegetation strata: the herb and shrub layers. The shrub component, which generally does not exceed 15-23 % (range 1-40%) canopy cover, is dominated by *Artemisia cana*, with scattered *Artemisia tridentata* in Montana. There is high cover (30-40%) of *Festuca idahoensis*, along with *Poa pratensis* in some areas. There is variable cover of other mesic graminoids including *Bromus carinatus*, *Bromus anomalus*, *Stipa columbiana* and, in Montana, *Agropyron caninum*. The forb component is rich, with *Geranium viscosissimum*, *Potentilla gracilis*, *Geum triflorum* and *Agoseris glauca* contributing the greatest cover. The moistest sites support appreciable amounts of *Polygonum bistortoides* and *Carex petasata*. *Taraxacum officinale*, *Achillea millefolium* and *Trifolium* spp. have high cover where grazing has altered communities.

Artemisia cana and *Festuca idahoensis* are the most abundant species in the Silver Sagebrush/ Idaho Fescue Shrub Prairie and are found consistently within this community type. Both occur in other community types as well.

6b. OTHER SPECIES
SHIGH.RANK.SPP Potential species: American badger (S4W G5), Richardson's ground squirrel (S5W G5), western harvest mouse (S1 G5), northern grasshopper mouse (S2 G5), sagebrush vole (S3 G5), sharp-tailed grouse (S4W G4), Sprague's pipit (S4W G4), Baird's sparrow (S3W G4), western terrestrial garter snake hibernacula (S3S4 G5)

SFAUNA.COM
Coyote, red fox, white-tailed deer, mule deer, pronghorn, Nuttall's cottontail, white-tailed jack rabbit, American badger, striped skunk, least weasel, long-tailed weasel, prairie shrew, Richardson's ground squirrel, northern pocket gopher, western harvest mouse, deer mouse, northern grasshopper mouse, meadow vole, sagebrush vole, northern harrier, Swainson's hawk, prairie falcon, sharp-tailed grouse, mourning dove, western kingbird, eastern kingbird, horned lark, black-billed magpie, mountain bluebird, Sprague's pipit, clay-coloured sparrow, savannah sparrow, Baird's sparrow, western meadowlark, Brewer's blackbird, western terrestrial garter snake.

SOTHER.SPP.COM
No high ranking plant or animal species have been reported from the Silver Sagebrush/Idaho Fescue Shrub Prairie, although several are potential species. Several animal species are associated with sagebrush communities, including northern grasshopper mouse and sagebrush vole.

6c. VARIABILITY

SSPP.COMP.VAR
Artemisia cana and *Festuca idahoensis* are found consistently in the Silver Sagebrush/Idaho Fescue Shrub Prairie, and are the most abundant species. The shrub component, which generally does not exceed 15-23 % (range 1-40%) canopy cover, is dominated by *Artemisia cana*, with scattered *Artemisia tridentata* in Montana. There is high cover (30-40%) of *Festuca idahoensis*, along with *Poa pratensis* in some areas. There is variable cover of other mesic graminoids including *Bromus carinatus*, *Bromus anomalus*, *Stipa columbiana* and, in Montana, *Agropyron caninum*. The forb component is rich, with *Geranium viscosissimum*, *Potentilla gracilis*, *Geum triflorum* and *Agoseris glauca* contributing the greatest cover. The moistest sites support appreciable amounts of *Polygonum bistortoides* and *Carex petasata*. *Taraxacum officinale*, *Achillea millefolium* and *Trifolium* spp. have high cover where grazing has altered communities.

SPHYSIOG.VAR
There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM
While *Artemisia cana* and *Festuca idahoensis* are always present, other graminoid, forb and shrub species may be present.

7. DYNAMIC PROCESSES

SNAT.DISTURBANCE
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling et al. 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS Late seral, edaphic climax, grazing climax

SSUCCESS.DYNAM.COM
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush/Idaho Fescue Shrub Prairie may be a late seral to edaphic climax, or a grazing climax where the site potential has changed due to prolonged heavy grazing.

8. SPATIAL RELATIONS

SSIZE Relatively small in area (<2 ha).

SSPATIAL DISTRIBUTION Patchy

SADJACENT.COMMUNITIES
The Silver Sagebrush/Idaho Fescue Shrub Prairie often intergrades with wetter sites supporting the *Salix wolfii*/*Deschampsia cespitosa* and *Potentilla fruticosa*/*Deschampsia cespitosa* habitat types. In Montana, drier sites are typically uplands dominated by *Artemisia tridentata* and *Festuca idahoensis*.

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush/Idaho Fescue Shrub Prairie is relatively small in area (<2 ha) and patchy in distribution.

The Silver Sagebrush/Idaho Fescue Shrub Prairie often intergrades with wetter sites supporting the *Salix wolfii*/*Deschampsia cespitosa* and *Potentilla fruticosa*/*Deschampsia cespitosa* habitat types. In Montana, drier sites are typically uplands dominated by *Artemisia tridentata* and *Festuca idahoensis*.

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO Not yet available.

SEXEMP.EO.SITENAME Not yet available.

SSTATCOM
Heavy grazing could alter the species composition. This and other disturbances could encourage

the establishment of non-native weedy species.

10. MANAGEMENT

SECONCOM
Livestock grazing; recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.

SMANAGE.COM
Silver Sagebrush/Idaho Fescue Shrub Prairie is a range resource, however grazing intensities beyond light grazing result in a shift towards other community types.

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested community types on air photos and Landsat imagery. As a rule, it can be distinguished from shrub community types on large scale air photos (1:30,000 or larger), as well as cultivated land and seeded pastures. It cannot be distinguished from similar native shrub prairie or prairie communities. The preferred scale of aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, shrub prairie can easily be distinguished from forested community types. Shrub prairie can further be distinguished from shrub as well as cultivated land and seeded pasture community types on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar native shrub prairie and prairie communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT

SANALYSIS.COM
In southwestern Montana, percent cover estimates of each plant species were made within forty 2 x 5 dm microplots placed in a 20 x 20 m macroplot (Mueggler and Stewart 1980). Synthesis or association tables were used to obtain groupings. Factors considered in selecting species upon which to base groupings included species dominance, suspected affinity to specific environmental conditions, and constancy within the proposed groups. Separation of habitat types was based on dominant and co-dominant species, reasonable consistency of the secondary species, and the likelihood of similar anticipated response to management.

In the northern and central Rocky Mountain zone, percent cover estimates of each plant species were made within 5 x 10 m plots (Hansen *et al.* 1995). For long stringer communities, the plot width was reduced and length was increased to maintain a constant plot size of 50 m^2. Each plot was located within a stand at least twice the area of the plot to avoid sampling ecotones between communities. Data were entered into FUZPHY, a computer data analysis system developed by

Dave Roberts of Utah State University, capable of summarising large quantities of vegetation and environmental data. A stepwise procedure of successive approximations was used to develop the classification (Pfister and Arno 1980). Preliminary association tables were created using plot species and canopy cover values. Stands were then rearranged several times to group stands into sets with the greatest vegetation similarities. Plot-to-plot similarity relations, plot-to-set similarity relations, and set-to-set similarity relations were analysed using a modified Sorensenís Index (the program SIMRELin FUZPHY). The final placement of each sample plot in a set was based on both floristic and environmental relationships (Hansen *et al.* 1995).

SANALYSIS.DATA.MANAGE.COM
In southwestern Montana, vegetation data (percent cover) were summarised for macroplots and analysed using synthesis or association tables (Mueggler and Stewart 1980). Factors considered in selecting species upon which to base groupings included species dominance, suspected affinity to specific environmental conditions, and constancy within the proposed groups. Separation of habitat types was based on dominant and co-dominant species, reasonable consistency of the secondary species, and the likelihood of similar anticipated response to management.

In the northern and central Rocky Mountain zone, percent cover estimates of each plant species were made within 5 x 10 m plots (Hansen *et al.* 1995). For long stringer communities, the plot width was reduced and length was increased to maintain a constant plot size of 50 m^2. Each plot was located within a stand at least twice the area of the plot to avoid sampling ecotones between communities. Data were entered into FUZPHY, a computer data analysis system developed by Dave Roberts of Utah State University, capable of summarising large quantities of vegetation and environmental data. A stepwise procedure of successive approximations was used to develop the classification (Pfister and Arno 1980). Preliminary association tables were created using plot species and canopy cover values. Stands were then rearranged several times to group stands into sets with the greatest vegetation similarities. Plot-to-plot similarity relations, plot-to-set similarity relations, and set-to-set similarity relations were analysed using a modified Sorensenís Index (the program SIMRELin FUZPHY). The final placement of each sample plot in a set was based on both floristic and environmental relationships (Hansen *et al.* 1995). The data are housed at the School of Forestry, University of Montana, and available on the web site: www.rwrp.umt.edu.

13. GENERAL COMMENTS

SCOMMUNITY.COM

15. REFERENCES

SA CITATION

Anderson, H.G. and A.W. Bailey. 1980. Effects of annual burning on grassland in the aspen parkland of east-central Alberta. Can. J. Bot. 58:985-996.

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Mueggler, W.F. and W.L. Stewart. 1980. Grassland and shrubland habitat types of western Montana. USDA For. Serv. Gen. Tech. Rep. INT-66. Intermountain Forest and Range Experiment Station, Ogden, Utah. 154 pp.

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Pfister, R.D. and S.F. Arno. 1980. Classifying forest habitat types based on potential climax vegetation. Forest Science 26:52-70.

TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
Silver Sagebrush/Rough Fescue-Western Porcupine Grass (*Artemisia cana*/*Festuca scabrella-Stipa curtiseta*) Shrub Prairie was identified in a record in the Ecological Site Inventory System (ESIS) database. The record was from the Cypress Hills of Alberta, southwest of Elkwater, on a 17°, west-facing slope. *Festuca scabrella* and *Stipa curtiseta* clearly dominated the community, each with 17% cover. Silver sagebrush was at 5% cover. The dominant forb was *Selaginella densa* at 8% cover. Other common species included *Koeleria macrantha*, *Artemisia ludoviciana*, *Antennaria parvifolia* and *Thermopsis rhombifolia*.

ET SNAME
Artemisia cana/*Festuca scabrella*-*Stipa curtiseta* Shrub Herbaceous Vegetation

ET SCOMNAME
Silver Sagebrush/Rough Fescue-Western Porcupine Grass Shrub Prairie

2. CLASSIFICATION

ET SYSTEM	Terrestrial
ET CLASS	V - Herbaceous Vegetation
ET SUBCLASS	V.A - Perennial graminoid vegetation
ET GROUP	V.A.7 - Temperate or subpolar grassland with a sparse shrub layer
ET FORMATION	V.A.7.N.e - Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer
ET ALLIANCE	V.A.7.N.e.11 - *ARTEMISIA CANA* SHRUB HERBACEOUS ALLIANCE

SIMILAR COMMUNITIES

3. RELATED NOMENCLATURE

SOTHER.NAMES

SOTHER.NAMES.RELATION

SOTHER.NAMES.RELATION.NOTE

SNAMES.COM

4. DISTRIBUTION

ESR SRANGE
Silver Sagebrush/Rough Fescue-Western Porcupine Grass Shrub Prairie has been identified in the Cypress Hills of Alberta.

ESR SRANGECOM
Silver Sagebrush/Rough Fescue-Western Porcupine Grass Shrub Prairie has been identified in the Cypress Hills of Alberta. It may also occur in the Cypress Hills of Saskatchewan.

SDISTRIBUTION.COM
The element is expected to occur in the Mixedgrass Subregion of southern Alberta and the grassland of southwestern Saskatchewan.

5. ENVIRONMENTAL FACTORS

SMINELEV

SMAXELEV

SLANDFORM

STOPO.POSITION	Slopes
SSLOPE	17°
SASPECT	west-facing

SGEOLOGY.COM

SSOIL.TYPE

SSOIL.MOISTURE

SSOIL.COM

SHYDRO.INFLUENCE

SSEASONAL.VAR

SKEY.ENVIRO.FACTORS

SENVIRO.COM
The record of this element was on a 17°, west-facing slope.

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM Shrub, herb

SPCT.COVER
Shrub: <25%
Herb: ≥75%

SHEIGHT

SMOST.ABUND.SPP
Shrub layer: *Artemisia cana*
Herb layer: *Festuca scabrella*, *Stipa curtiseta*

SSUNVEGETATED.SURFACE

SSUNVEGETATED.SURFACE.COVER

SCONSTANT.SPP *Artemisia cana*, *Festuca scabrella*, *Stipa curtiseta*

SCHARACTERISTIC.SPP None

SVEGETATION.COM
The Silver Sagebrush/Rough Fescue-Western Porcupine Grass Shrub Prairie consists of two vegetation strata: the herb and shrub layers. *Festuca scabrella* and *Stipa curtiseta* clearly dominated the community, each with 17% cover. *Artemisia cana* was at 5% cover. The dominant forb was *Selaginella densa* at 8% cover. Other common species included *Koeleria macrantha*, *Artemisia ludoviciana*, *Antennaria parvifolia* and *Thermopsis rhombifolia*.

Artemisia cana, *Festuca scabrella* and *Stipa curtiseta* are the most abundant species in the Silver Sagebrush/Rough Fescue-Western Porcupine Grass Shrub Prairie and are found consistently within this community type. All occur in other community types as well.

6b. OTHER SPECIES
SHIGH.RANK.SPP Potential species: American badger (S4W G5), Richardson's ground squirrel (S5W G5), western harvest mouse (S1 G5), northern grasshopper mouse (S2 G5), sagebrush vole (S3 G5), sharp-tailed grouse (S4W G4), Sprague's pipit (S4W G4), Baird's sparrow (S3W G4), western terrestrial garter snake hibernacula (S3S4 G5)

SFAUNA.COM
Coyote, red fox, white-tailed deer, mule deer, Nuttall's cottontail, white-tailed jack rabbit, American badger, striped skunk, least weasel, long-tailed weasel, prairie shrew, Richardson's ground squirrel, northern pocket gopher, western harvest mouse, deer mouse, northern grasshopper mouse, meadow vole, sagebrush vole, northern harrier, Swainson's hawk, prairie falcon, sharp-tailed grouse, mourning dove, western kingbird, eastern kingbird, horned lark, black-billed magpie, mountain bluebird, Sprague's pipit, clay-coloured sparrow, savannah sparrow, Baird's sparrow, western meadowlark, Brewer's blackbird, western terrestrial garter snake.

SOTHER.SPP.COM
No high ranking plant or animal species have been reported from the Silver Sagebrush/Rough Fescue-Western Porcupine Grass Shrub Prairie, although several are potential species. Several animal species are associated with sagebrush communities, including northern grasshopper mouse and sagebrush vole.

6c. VARIABILITY

SSPP.COMP.VAR
Artemisia cana, *Festuca scabrella* and *Stipa curtiseta* are found consistently in the Silver Sagebrush/Rough Fescue-Western Porcupine Grass Shrub Prairie, and are the most abundant species. *Festuca scabrella* and *Stipa curtiseta* clearly dominated the community, each with 17% cover. Silver sagebrush was at 5% cover. The dominant forb was *Selaginella densa* at 8% cover. Other common species included *Koeleria macrantha*, *Artemisia ludoviciana*, *Antennaria parvifolia* and *Thermopsis rhombifolia*. Other species, such as *Agropyron trachycaulum*, *Agropyron dasystachyum*, *Carex obtusata*, *Artemisia frigida*, *Geum triflorum*, *Gentianella amarella*, *Erigeron caespitosus*, *Aster falcatus*, *Cerastium arvense and Solidago missouriensis* occurred at low cover (1%).

SPHYSIOG.VAR
There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM
While *Artemisia cana*, *Festuca scabrella* and *Stipa curtiseta* are always present, other graminoid, forb and shrub species may be present.

7. DYNAMIC PROCESSES

SNAT.DISTURBANCE
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the

Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling et al. 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS Late seral, edaphic climax, grazing climax

SSUCCESS.DYNAM.COM
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush/Rough Fescue-Western Porcupine Grass Shrub Prairie may be a late seral to edaphic climax, or a grazing climax where the site potential has changed due to prolonged heavy grazing.

8. SPATIAL RELATIONS

SSIZE Relatively small in area.

SSPATIAL DISTRIBUTION Patchy

SADJACENT.COMMUNITIES

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush/Rough Fescue-Western Porcupine Grass Shrub Prairie is relatively small in area and patchy in distribution.

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO Not yet available.

SEXEMP.EO.SITENAME Not yet available.

SSTATCOM
Heavy grazing could alter the species composition. This and other disturbances could encourage

the establishment of non-native weedy species.

10. MANAGEMENT

SECONCOM
Livestock grazing; recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.
SMANAGE.COM
Silver Sagebrush/Rough Fescue-Western Porcupine Grass Shrub Prairie is a range resource, however grazing intensities beyond light grazing result in a shift towards other community types.

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested community types on air photos and Landsat imagery. As a rule, it can be distinguished from shrub community types on large scale air photos (1:30,000 or larger), as well as cultivated land and seeded pastures. It cannot be distinguished from similar native shrub prairie or prairie communities. The preferred scale of aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, shrub prairie can easily be distinguished from forested community types. Shrub prairie can further be distinguished from shrub as well as cultivated land and seeded pasture community types on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar native shrub prairie and prairie communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT

SANALYSIS.COM
Vegetation data (percent canopy cover) were subjected to an indicator species analysis (TWINSPAN) (Hill 1979) and ordination (DECORANA, a detrended correspondence analysis) (Gauch 1982) using PC-ORD. The results were subjectively assessed and the records were grouped according to dominant species and vegetation structure.

SANALYSIS.DATA.MANAGE.COM
Vegetation data (percent canopy cover) were subjected to an indicator species analysis (TWINSPAN) (Hill 1979) and ordination (DECORANA, a detrended correspondence analysis) (Gauch 1982) using PC-ORD. The results were subjectively assessed and the records were grouped according to dominant species and vegetation structure. The data are housed in the Ecological Site Inventory System (ESIS) database of Alberta Environment, Edmonton.

13. GENERAL COMMENTS

SCOMMUNITY.COM

15. REFERENCES

SA CITATION

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TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
The **Silver Sagebrush-Greasewood/Needle-and-thread (*Artemisia cana-Sarcobatus vermiculatus*/*Stipa comata*) Shrub Prairie** has been described in Alberta in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). *Artemisia cana* and *Sarcobatus vermiculatus* each have a cover of approximately 6%. *Stipa comata* cover is approximately 10%. This community occurs on steep (26°), north-facing slopes of eroding badlands but with less bare soil and rock (each 15% cover) than Silver Sagebrush/Nuttall's Atriplex Shrubland. Other prominent species include *Koeleria macrantha*, *Agropyron sp.*, *Bouteloua gracilis*, *Phlox hoodii* and *Anemone patens*.

ET SNAME
Artemisia cana-Sarcobatus vermiculatus/*Stipa comata* Shrub Herbaceous Vegetation

ET SCOMNAME
Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie

2. CLASSIFICATION

ET SYSTEM	Terrestrial
ET CLASS	V - Herbaceous Vegetation
ET SUBCLASS	V.A - Perennial graminoid vegetation
ET GROUP	V.A.7 - Temperate or subpolar grassland with a sparse shrub layer
ET FORMATION	V.A.7.N.e - Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer
ET ALLIANCE	V.A.7.N.e.11 - *ARTEMISIA CANA* SHRUB HERBACEOUS ALLIANCE

SIMILAR COMMUNITIES
The Silver Sagebrush/Nuttall's Atriplex Shrubland is similar but has more bare soil and rock (50% and 25%, respectively). The Sagebrush-Greasewood/Barren Community identified in CFB Suffield National Wildlife Area may also be similar (Adams *et al.* 1997).

3. RELATED NOMENCLATURE

SOTHER.NAMES

Spear Grass-Greasewood Association
Silver sagebrush-greasewood-(rabbitbrush) shrubland

SOTHER.NAMES.RELATION
= | ?

SOTHER.NAMES.RELATION.NOTE
Spear Grass-Greasewood Association is the name used for this community in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). Silver sagebrush-greasewood-(rabbitbrush) shrubland is suggested as a community type in NatureServe (2000), and may be related to the Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie.

SNAMES.COM
Spear Grass-Greasewood Association is the name used for this community in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). Silver sagebrush-greasewood-(rabbitbrush) shrubland is suggested as a community type in NatureServe (2000), and may be related to the Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie.

4. DISTRIBUTION

ESR SRANGE
The Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie has been described in Alberta in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date).

ESR SRANGECOM
The Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie has been described in Alberta in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date).
It probably occurs in the grassland regions of Saskatchewan.

SDISTRIBUTION.COM
The element is expected to occur in the Dry Mixedgrass Subregion of southern Alberta.

5. ENVIRONMENTAL FACTORS

SMINELEV

SMAXELEV

SLANDFORM Eroding badlands

STOPO.POSITION Slopes

SSLOPE Steep slopes (26°)

SASPECT North-facing

SGEOLOGY.COM Badlands
SSOIL.TYPE

SSOIL.MOISTURE

SSOIL.COM

SHYDRO.INFLUENCE

SSEASONAL.VAR

SKEY.ENVIRO.FACTORS
The element is prone to erosion.

SENVIRO.COM
The Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie occurs on steep (26°), north-facing eroding badlands (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date).

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM Shrub, herb

SPCT.COVER
Shrub: <25%
Herb: ≥75%

SHEIGHT

SMOST.ABUND.SPP
Shrub layer: *Artemisia cana*, *Sarcobatus vermiculatus*
Herb layer: *Stipa comata*

SSUNVEGETATED.SURFACE Bare soil and rock of eroding badlands

SSUNVEGETATED.SURFACE.COVER Bare soil covers approximately 15% and rock cover

	is approximately 15%
SCONSTANT.SPP	*Artemisia cana*, *Sarcobatus vermiculatus*, *Stipa comata*
SCHARACTERISTIC.SPP	None

SVEGETATION.COM
The Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie consists of two vegetation strata: the herb and shrub layers. *Artemisia cana* and *Sarcobatus vermiculatus* each have a cover of approximately 6%. *Stipa comata* cover is approximately 10%. Bare soil and rock each cover 15%. Other prominent species included *Koeleria macrantha*, *Agropyron sp.*, *Bouteloua gracilis*, *Phlox hoodii* and *Anemone patens*. Moss and lichen cover were high at 40% and 15%, respectively. The lichens were dominated by *Cladonia* sp., at 10% cover.

Artemisia cana, *Sarcobatus vermiculatus* and *Stipa comata* are the most abundant species in the Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie and are found consistently within this community type. All occur in other community types as well.

6b. OTHER SPECIES

SHIGH.RANK.SPP	Potential species: short-horned lizard (S2 G5), western rattlesnake (S3 G5)

SFAUNA.COM
Coyote, red fox, mule deer, striped skunk, Nuttall's cottontail, least weasel, deer mouse, Swainson's hawk, golden eagle, prairie falcon, mourning dove, Say's phoebe, black-billed magpie, rock wren, lark sparrow, short-horned lizard, bull snake, western rattlesnake.

SOTHER.SPP.COM
No high ranking plant or animal species have been reported from the Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie, although several are potential species. Several animal species are associated with badland communities, including prairie falcon, Say's phoebe, lark sparrow and short-horned lizard.

6c. VARIABILITY

SSPP.COMP.VAR
Artemisia cana, *Sarcobatus vermiculatus* and *Stipa comata* are the most abundant species in the Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie and are found consistently within this community type. *Artemisia cana* and *Sarcobatus vermiculatus* each have a cover of approximately 6%. *Stipa comata* cover is approximately 10%. Bare soil and rock each cover 15%. Other prominent species included *Koeleria macrantha*, *Agropyron sp.*, *Bouteloua gracilis*, *Phlox hoodii* and *Anemone patens*. Those with lower cover include *Carex filifolia*, *Poa sandbergii*, *Erigeron caespitosus*, *Eurotia lanata*, *Artemisia frigida*, *Geum triflorum*, *Eriogonum flavum*, *Selaginella densa*, *Antennaria parvifolia*, *Hymenoxys richardsonii*, *Allium textile* and *Opuntia polyacantha*. Moss and lichen cover were high at 40% and 15%, respectively. The

lichens were dominated by *Cladonia* sp., at 10% cover.

SPHYSIOG.VAR
There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM
While *Artemisia cana*, *Sarcobatus vermiculatus* and *Stipa comata* are always present, other graminoid, forb and shrub species may be present.

7. DYNAMIC PROCESSES
SNAT.DISTURBANCE
The element is prone to erosion.

The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling et al. 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS Late seral, edaphic climax

SSUCCESS.DYNAM.COM
The element is prone to erosion. The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie may be a late seral or edaphic climax community.

8. SPATIAL RELATIONS

SSIZE Relatively small in area.

SSPATIAL DISTRIBUTION Patchy

SADJACENT.COMMUNITIES
A community type that is generally lower in the landscape than the Silver Sagebrush-Greasewood/
Needle-and-thread Shrub Prairie is the Silver Sagebrush/Western Wheat Grass Shrubland. Those that are generally higher include variable grasslands that are usually dominated by *Koeleria macrantha*, *Gutierrezia sarothrae* and *Phlox hoodii* (Cottonwood Consultants Ltd. 1987), or the

Opuntia polyacantha Association*, Opuntia polyacantha-Bouteloua gracilis* Association, *Selaginella densa-Stipa comata* Association, *Selaginella densa-Koeleria macrantha* Association, *Stipa comata-Bouteloua gracilis* Association or *Plantago* sp.-*Bouteloua gracilis* Association (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date).

Adjacent eroding badlands may harbour the *Sarcobatus vermiculatus* Association or *Artemisia cana*/*Atriplex nuttallii* Association (=Silver Sagebrush/Nuttall's Atriplex Shrubland) (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). On adjacent bedrock (consolidated shales and sandstones) there are very open *Sarcobatus vermiculatus* stands. Darker and looser shales are characterised by *Atriplex suckleyi*, *Sarcobatus vermiculatus*, *Descurainia* sp., *Polygonum* sp., *Monolepis nuttalliana* and *Helianthus annuus*. The softer Bearspaw shale is characterised by *Iva axillaris*, *Atriplex nuttallii*, *Atriplex* spp. and *Artemisia longifolia* (Cottonwood Consultants Ltd. 1987). Adjacent stable slopes are grassier, with *Muhlenbergia cuspidata*, *Stipa viridula*, *Koeleria macrantha* and *Agropyron smithii* common (Cottonwood Consultants Ltd. 1987), or harbour the *Hymenoxys richardsonii-Phlox hoodii* Association, *Selaginella densa-Stipa comata* Association, *Eurotia lanata*/*Stipa comata-Bouteloua gracilis* Association, *Koeleria macrantha-Juniperus* sp. Association or *Phlox hoodii-Juniperus* sp. Association (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). On moist north-facing and sheltered coulee sites, *Koeleria macrantha*, *Muhlenbergia cuspidata* and *Juniperus horizontalis* dominate in a forb-rich community (Cottonwood Consultants Ltd. 1987).

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie is relatively small in area and patchy in distribution.

A community type that is generally lower in the landscape than the Silver Sagebrush-Greasewood/
Needle-and-thread Shrub Prairie is the Silver Sagebrush/Western Wheat Grass Shrubland. Those that are generally higher include variable grasslands that are usually dominated by *Koeleria macrantha*, *Gutierrezia sarothrae* and *Phlox hoodii* (Cottonwood Consultants Ltd. 1987), or the *Opuntia polyacantha* Association*, Opuntia polyacantha-Bouteloua gracilis* Association, *Selaginella densa-Stipa comata* Association, *Selaginella densa-Koeleria macrantha* Association, *Stipa comata-Bouteloua gracilis* Association or *Plantago* sp.-*Bouteloua gracilis* Association (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date).

Adjacent eroding badlands may harbour the *Sarcobatus vermiculatus* Association or *Artemisia cana*/*Atriplex nuttallii* Association (=Silver Sagebrush/Nuttall's Atriplex Shrubland) (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). On adjacent bedrock (consolidated shales and sandstones) there are very open *Sarcobatus vermiculatus* stands. Darker and looser shales are characterised by *Atriplex suckleyi*, *Sarcobatus vermiculatus*, *Descurainia* sp., *Polygonum* sp., *Monolepis nuttalliana* and *Helianthus annuus*. The softer Bearspaw shale is characterised by *Iva axillaris*, *Atriplex nuttallii*, *Atriplex* spp. and *Artemisia longifolia*

(Cottonwood Consultants Ltd. 1987). Adjacent stable slopes are grassier, with *Muhlenbergia cuspidata*, *Stipa viridula*, *Koeleria macrantha* and *Agropyron smithii* common (Cottonwood Consultants Ltd. 1987), or harbour the *Hymenoxys richardsonii-Phlox hoodii* Association, *Selaginella densa-Stipa comata* Association, *Eurotia lanata*/*Stipa comata-Bouteloua gracilis* Association, *Koeleria macrantha-Juniperus* sp. Association or *Phlox hoodii-Juniperus* sp. Association (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). On moist north-facing and sheltered coulee sites, *Koeleria macrantha*, *Muhlenbergia cuspidata* and *Juniperus horizontalis* dominate in a forb-rich community (Cottonwood Consultants Ltd. 1987).

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO	Not yet available.
SEXEMP.EO.SITENAME	Not yet available.

SSTATCOM
The conservation status of the element is assumed to be favourable since it is unlikely to be cultivated. Disturbances could encourage the establishment of non-native weedy species.

10. MANAGEMENT

SECONCOM
Recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.

SMANAGE.COM

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested and prairie community types, cultivated land and seeded pastures on air photos and Landsat imagery. As a rule, it can be distinguished from other shrubland types in non-badland situations on large scale air photos (1:30,000 or larger). It cannot be distinguished from similar badland communities. The preferred scale of aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, the element can easily be distinguished from forested and prairie community types, cultivated land and seeded pastures. As a rule, it can be distinguished from other shrubland types in non-badland situations on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar badland communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT

SANALYSIS.COM
Percent cover estimates were made of plant species and bare ground.

SANALYSIS.DATA.MANAGE.COM
Percent cover estimates were made of plant species and bare ground.

13. GENERAL COMMENTS

SCOMMUNITY.COM

15. REFERENCES

SA CITATION

Adams, G.D., G.C. Trottier, W.L. Strong, I.D. MacDonald, S. Barry, P.G. Gregoire, G.W. Babish and G. Weiss. 1997. Vegetation component report, Canadian Forces Base Suffield National Wildlife Area wildlife inventory. Canadian Wildlife Service, Environment Canada, Prairie and Northern Region, Edmonton. 96 pp.

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TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
Silver Sagebrush/Nuttall's Atriplex (*Artemisia cana*/*Atriplex nuttallii*) Shrub Prairie has been described in the Dry Mixedgrass Subregion of southern Alberta associated with saline lowlands in the dry mixed prairie and soil correlation area 1 (Adams and Ehlert 2001; Adams *et al.* 2002). It occurs on imperfectly to poorly drained, level plains and depressional areas with periodic ponding of water and high sodicity. This late seral to PNC community type is associated with Saline Lowland and Blowout range sites. Soils are poorly developed saline Regosols or alkaline Solonetz, developed on fluvial and glacial fluvial parent materials. Textures range from silt loam to silt clay. The *Artemisia cana* in this shrub prairie averages 6.9% composition by weight (range 1.2-10.0%) and approximately 5.5% cover. *Atriplex nuttallii*, sometimes with *Agropyron dasystachyum*, dominates the herb layer. Other prominent species include *Bouteloua gracilis*, *Carex* spp., *Poa sandbergii*, *Stipa comata*, *Koeleria macrantha* and *Artemisia frigida*. This community is very important for sage grouse dancing grounds (leks) due to the low plant stature and high cover of bare ground (72.25%) (Adams *et al.* 2002; B. Adams, pers. comm.).

ET SNAME
Artemisia cana/*Atriplex nuttallii* Shrub Herbaceous Vegetation

ET SCOMNAME
Silver Sagebrush/Nuttall's Atriplex Shrub Prairie

2. CLASSIFICATION

ET SYSTEM	Terrestrial
ET CLASS	V - Herbaceous Vegetation
ET SUBCLASS	V.A - Perennial graminoid vegetation
ET GROUP	V.A.7 - Temperate or subpolar grassland with a sparse shrub layer
ET FORMATION	V.A.7.N.e - Medium-tall temperate or subpolar grassland with a sparse needle-leaved or microphyllous evergreen shrub layer
ET ALLIANCE	V.A.7.N.e.11 - *ARTEMISIA CANA* SHRUB HERBACEOUS ALLIANCE

SIMILAR COMMUNITIES

3. RELATED NOMENCLATURE

SOTHER.NAMES

SOTHER.NAMES.RELATION

SOTHER.NAMES.RELATION.NOTE

SNAMES.COM

4. DISTRIBUTION

ESR SRANGE
Silver Sagebrush/Nuttall's Atriplex Shrub Prairie has been described in the Dry Mixedgrass Subregion of Alberta.

ESR SRANGECOM
Silver Sagebrush/Nuttall's Atriplex Shrub Prairie has been described in the Dry Mixedgrass Subregion of Alberta. It may also occur in the grassland region of Saskatchewan.

SDISTRIBUTION.COM
The element is expected to occur in the Dry Mixedgrass Subregion of southern Alberta and the grassland region of Saskatchewan.

5. ENVIRONMENTAL FACTORS

SMINELEV

SMAXELEV

SLANDFORM	Saline lowlands
STOPO.POSITION	Level plains and depressional areas
SSLOPE	Level
SASPECT	
SGEOLOGY.COM	Fluvial and glacial fluvial parent materials
SSOIL.TYPE	Poorly developed saline Regosols or alkaline Solonetz
SSOIL.MOISTURE	
SSOIL.COM	Soils are poorly developed saline Regosols or alkaline Solonetz. Textures range from silt loam to silt clay.

SHYDRO.INFLUENCE Imperfectly to poorly drained areas with periodic ponding of water and high sodicity

SSEASONAL.VAR

SKEY.ENVIRO.FACTORS

SENVIRO.COM
This element occurs on imperfectly to poorly drained, level plains and depressional areas with periodic ponding of water and high sodicity. Soils are poorly developed saline Regosols or alkaline Solonetz, developed on fluvial and glacial fluvial parent materials. Textures range from silt loam to silt clay.

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM Shrub, herb

SPCT.COVER
Shrub: <25%
Herb: ≥75%

SHEIGHT Low stature

SMOST.ABUND.SPP
Shrub layer: *Artemisia cana*
Herb layer: *Atriplex nuttallii*

SSUNVEGETATED.SURFACE

SSUNVEGETATED.SURFACE.COVER 72.25% cover

SCONSTANT.SPP *Artemisia cana*, *Atriplex nuttallii*, *Agropyron dasystachyum*, *Poa sandbergii*

SCHARACTERISTIC.SPP None

SVEGETATION.COM
Artemisia cana averages 6.9% composition by weight (range 1.2-10.0%) and approximately 5.5% cover. *Atriplex nuttallii* averages 2.9% composition by weight (range 1.0-5.8%) and approximately 5.8% cover.

The Silver Sagebrush/Nuttall's Atriplex Shrub Prairie consists of two vegetation strata: the herb and shrub layers. *Artemisia cana* in this shrub prairie averages 6.9% composition by weight

(range 1.2-10.0%) and approximately 5.5% cover. *Atriplex nuttallii*, sometimes with *Agropyron dasystachyum*, dominates the herb layer. Other prominent species include *Bouteloua gracilis*, *Carex* spp., *Poa sandbergii*, *Stipa comata*, *Koeleria macrantha* and *Artemisia frigida*.

Artemisia cana and *Atriplex nuttallii*, and sometimes *Agropyron dasystachyum,* are the most abundant species in the Silver Sagebrush/Nuttall's Atriplex Shrub Prairie. *Artemisia cana*, *Atriplex nuttallii*, *Agropyron dasystachyum* and *Poa sandbergii* are found consistently within this community type. All occur in other community types as well.

6b. OTHER SPECIES

SHIGH.RANK.SPP Observed: sage grouse leks (S2 G5)

Potential species: swift fox (S1 G3), American badger (S4W G5), Richardson's ground squirrel (S5W G5), western harvest mouse (S1 G5), northern grasshopper mouse (S2 G5), sagebrush vole (S3 G5), sharp-tailed grouse (S4W G4), sage thrasher (S1 G5), Sprague's pipit (S4W G4), short-horned lizard (S2 G5), western terrestrial garter snake hibernacula (S3S4 G5), western rattlesnake hibernacula (S3 G5)

SFAUNA.COM

Coyote, red fox, swift fox, white-tailed deer, mule deer, pronghorn, Nuttall's cottontail, white-tailed jack rabbit, American badger, striped skunk, least weasel, long-tailed weasel, Richardson's ground squirrel, deer mouse, northern grasshopper mouse, sagebrush vole, northern harrier, Swainson's hawk, prairie falcon, sage grouse, sharp-tailed grouse, mourning dove, Say's phoebe, western kingbird, eastern kingbird, black-billed magpie, sage thrasher, Sprague's pipit, Brewer's sparrow, lark sparrow, Brewer's blackbird, short-horned lizard, bull snake, western terrestrial garter snake, western rattlesnake.

SOTHER.SPP.COM

Sage grouse leks have been observed in the Silver Sagebrush/Nuttall's Atriplex Shrub Prairie, but no other high ranking plant or animal species have been reported, although several are potential species. Several animal species are associated with sagebrush communities, including northern grasshopper mouse and sagebrush vole, sage grouse, sage thrasher, Brewer's sparrow and lark bunting.

6c. VARIABILITY

SSPP.COMP.VAR

Artemisia cana, *Atriplex nuttallii*, *Agropyron dasystachyum* and *Poa sandbergii* are found consistently in the Silver Sagebrush/Nuttall's Atriplex Shrub Prairie. *Artemisia cana* and *Atriplex nuttallii*, and sometimes *Agropyron dasystachyum*, are the most abundant species. *Artemisia cana* in this shrub prairie averages 6.9% composition by weight (range 1.2-10.0%) and approximately 5.5% cover. *Atriplex nuttallii*, sometimes with *Agropyron dasystachyum*, dominates the herb layer. Other prominent species include *Bouteloua gracilis*, *Carex* spp., *Poa sandbergii*, *Stipa comata*, *Koeleria macrantha* and *Artemisia frigida*.

SPHYSIOG.VAR
There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM
While *Artemisia cana*, *Atriplex nuttallii*, *Agropyron dasystachyum* and *Poa sandbergii* are always present, other graminoid, forb and shrub species may be present.

7. DYNAMIC PROCESSES

SNAT.DISTURBANCE
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling et al. 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS Late seral, edaphic climax

SSUCCESS.DYNAM.COM
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush/Nuttall's Atriplex Shrub Prairie may be late seral to edaphic climax.

8. SPATIAL RELATIONS

SSIZE Relatively small in area.

SSPATIAL DISTRIBUTION Patchy

SADJACENT.COMMUNITIES

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush/Nuttall's Atriplex Shrub Prairie is relatively small in area and patchy in

distribution.

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO	Not yet available.
SEXEMP.EO.SITENAME	Not yet available.

SSTATCOM
Heavy grazing could alter the species composition. This and other disturbances could encourage the establishment of non-native weedy species.

10. MANAGEMENT

SECONCOM
Livestock grazing; recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.

SMANAGE.COM
Silver Sagebrush/Nuttall's Atriplex Shrub Prairie is a range resource, however grazing intensities beyond light grazing result in a shift towards other community types.

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested community types on air photos and Landsat imagery. As a rule, it can be distinguished from shrub community types on large scale air photos (1:30,000 or larger), as well as cultivated land and seeded pastures. It cannot be distinguished from similar native shrub prairie or prairie communities. The preferred scale of aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, shrub prairie can easily be distinguished from forested community types. Shrub prairie can further be distinguished from shrub as well as cultivated land and seeded pasture community types on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar native shrub prairie and prairie communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT

SANALYSIS.COM

SANALYSIS.DATA.MANAGE.COM

13. GENERAL COMMENTS

SCOMMUNITY.COM

15. REFERENCES
SA CITATION

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PERSONAL COMMUNICATIONS

Adams, Barry. Range Management Specialist, Public Lands, Alberta Sustainable Resource

Development, Lethbridge, Alberta.

TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
Silver Sagebrush/Western Wheat Grass (*Artemisia cana*/*Agropyron smithii*) Shrubland has been described in southern Alberta (Wallis 1976; Wallis 1977; Wershler 1980; Cottonwood Consultants Ltd. 1987; Thompson and Hansen 2001; Adams *et al.* 2002) and for the Great Plains and Rocky Mountains portion of Montana, western North and South Dakota and eastern Wyoming, south to Nebraska (Hanson and Whitman 1938; Hansen *et al.* 1984; DeVelice *et al.* 1995; Hansen *et al.* 1995; Cooper *et al.* 1999; Heidel *et al.* 2000; NatureServe 2000). It occurs on level to gently sloping, older alluvial terraces on both broad and narrow flood plains and coalescing alluvial fans in valleys. It may occur up-slope in swales and gentle depressions. These sites are moister than contiguous up-slope vegetation and in some cases may constitute wetland sites. It represents one of the driest of the community types found in the riparian or wetland zone. Substrates are generally moderately fine to fine textured, being derived from sediments deposited in low energy environments (or in the case of basins and swales from slope wash). They have a high water holding capacity and are well to imperfectly drained. Perched or high water tables may influence the rooting zone for a portion of the year. The Regosolic to Solonetzic soils (R. McNeil, pers. comm.) are moderately deep to deep and either loam, silt loam, clay loam or sandy loam. Flooding may occur periodically and this tends to retard soil development. Soils are slightly acid to moderately alkaline pH (6.0-8.2), although some sites sampled had weakly saline soils (Hanson and Whitman 1938; Hansen *et al.* 1995; Thompson and Hansen 2001). Redox concentrations (mottles) were common, indicating a fluctuating water table. Available water was estimated as moderate (Hansen *et al.* 1995; Thompson and Hansen 2001).

ET SNAME
Artemisia cana/Agropyron smithii Shrubland

ET SCOMNAME
Silver Sagebrush/Western Wheat Grass Shrubland

2. CLASSIFICATION

ET SYSTEM Terrestrial

ET CLASS III - Shrubland

ET SUBCLASS III.A - Evergreen shrubland

ET GROUP III.A.4 - Microphyllous evergreen shrubland

ET FORMATION III.A.4.N.c - Temporarily flooded microphyllous shrubland

ET ALLIANCE III.A.4.N.c.2 - *ARTEMISIA CANA* TEMPORARILY FLOODED SHRUBLAND ALLIANCE

SIMILAR COMMUNITIES
Artemisia cana/Agropyron smithii Shrub Prairie is closely related. The most apparent difference is the greater *Artemisia cana* cover (25% or more) and higher stature in the shrubland type.

3. RELATED NOMENCLATURE

SOTHER.NAMES
Artemisia cana/Pascopyrum smithii Vegetation Type

SOTHER.NAMES.RELATION
=

SOTHER.NAMES.RELATION.NOTE
Pascopyrum smithii is a synonym for *Agropyron smithii*.

SNAMES.COM

4. DISTRIBUTION

ESR SRANGE
Silver Sagebrush/Western Wheat Grass (*Artemisia cana*/*Agropyron smithii*) Shrubland has been described in southern Alberta (Wallis 1976; Wallis 1977; Wershler 1980; Cottonwood Consultants Ltd. 1987; Thompson and Hansen 2001; Adams *et al.* 2002) and for the Great Plains and Rocky Mountains portion of Montana, western North and South Dakota and eastern Wyoming, south to Nebraska (Hanson and Whitman 1938; Hansen *et al.* 1984; DeVelice *et al.* 1995; Hansen *et al.* 1995; Cooper *et al.* 1999; Heidel *et al.* 2000; NatureServe 2000).

ESR SRANGECOM
Silver Sagebrush/Western Wheat Grass (*Artemisia cana*/*Agropyron smithii*) Shrubland has been described in southern Alberta (Wallis 1976; Wallis 1977; Wershler 1980; Cottonwood Consultants Ltd. 1987; Thompson and Hansen 2001; Adams *et al.* 2002). It probably occurs in the grassland regions of Saskatchewan and southwestern Manitoba.

SDISTRIBUTION.COM
The element is expected to occur in the Dry Mixedgrass Subregion and Mixedgrass Subregion of southern Alberta.

5. ENVIRONMENTAL FACTORS

SMINELEV

SMAXELEV

SLANDFORM	Older alluvial terraces on both broad and narrow flood plains and coalescing alluvial fans in valleys
STOPO.POSITION	Valley bottom, upland depressions
SSLOPE	Level to gently sloping
SASPECT	Variable
SGEOLOGY.COM	Sediments deposited in low energy environments (or in the case of basins and swales from slope wash)
SSOIL.TYPE	Regosolic to Solonetzic soils
SSOIL.MOISTURE	Moderate

SSOIL.COM
Substrates are generally moderately fine to fine textured. They have a high water holding capacity. The Regosolic to Solonetzic soils are moderately deep to deep and either loam, silt loam, clay loam or sandy loam. Flooding may occur periodically and this tends to retard soil development. Soils are slightly acid to moderately alkaline pH (6.0-8.2), although some sites sampled had weakly saline soils (Hanson and Whitman 1938; Hansen *et al.* 1995; Thompson and Hansen 2001). Available water was estimated as moderate (Hansen *et al.* 1995; Thompson and Hansen 2001).

SHYDRO.INFLUENCE Well to imperfectly drained. Redox concentrations (mottles) were common, indicating a fluctuating water table.

SSEASONAL.VAR
The element is prone to spring flooding and/or slope wash from major precipitation events.

SKEY.ENVIRO.FACTORS
The element is prone to flooding and/or slope wash. Sites have a fluctuating water table. Soils tend to be slightly acid to moderately alkaline pH (6.0-8.2).

SENVIRO.COM
The Silver Sagebrush/Western Wheat Grass Shrubland generally occurs on well to imperfectly drained, level to gently sloping terrain and variable aspects on older alluvial terraces on both broad and narrow flood plains and coalescing alluvial fans in valleys. Substrates are generally moderately fine to fine textured. They have a high water holding capacity. The Regosolic to Solonetzic soils are moderately deep to deep and either loam, silt loam, clay loam or sandy loam. Flooding may occur periodically and this tends to retard soil development. In the case of basins and upland depressions, sediments may be deposited from slope wash. Soils are slightly acid to moderately alkaline pH (6.0-8.2), although some sites sampled had weakly saline soils (Hanson and Whitman 1938; Hansen *et al.* 1995; Thompson and Hansen 2001). Redox concentrations (mottles) were common, indicating a fluctuating water table. Available water was estimated as

moderate (Hansen *et al.* 1995; Thompson and Hansen 2001).

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM	Shrub, herb
SPCT.COVER Shrub: ≥25% Herb: <75%	
SHEIGHT	0.6-1.2 m
SMOST.ABUND.SPP Shrub layer: *Artemisia cana* Herb layer: *Agropyron smithii*	
SSUNVEGETATED.SURFACE	Most sites have no unvegetated surface; some sites have low to moderate amount.
SSUNVEGETATED.SURFACE.COVER	Average 2.5% (range 0-20%) (Thompson and Hansen 2001); 48.25% (Adams *et al.* 2002)
SCONSTANT.SPP	*Artemisia cana, Agropyron smithi*
SCHARACTERISTIC.SPP	None

SVEGETATION.COM
The Silver Sagebrush/Western Wheat Grass Shrubland consists of two vegetation strata: the herb and shrub layers. A silver sagebrush canopy cover of at least 5% is diagnostic of this type, but its cover usually exceeds 30%. It has an average canopy cover of 39% and dominates the shrub layer. Total vegetation cover is moderate. Other shrub species are only sporadic. *Symphoricarpos occidentalis* is frequently present. Graminoids dominate the herbaceous layer with *Agropyron smithii* usually dominant and *Stipa viridula* important on undisturbed sites. *Stipa comata* and/or *Bouteloua gracilis* may be dominant or co-dominant. Other grass and forb species reported differed considerably, possibly due to differences in moisture, the coarseness of the underlying materials, the rate of deposition of alluvium and colluvium, and grazing pressure. Other reported grasses include *Koeleria macrantha*, *Agropyron dasystachyum*, *Agropyron trachycaulum* and *Distichlis stricta*. The forb component is often insignificant. Commonly reported species included *Artemisia frigida*, *Grindelia squarrosa*, *Opuntia polyacantha*, *Coryphantha vivipara*, *Atriplex nuttallii*, *Allium textile*, *Achillea millefolium*, *Plantago purshii*, *Sphaeralcea coccinea*, *Eurotia lanata*, *Gutierrezia sarothrae*, *Gaura coccinea* and *Lactuca pulchella*.

Artemisia cana and *Agropyron smithii* are the most abundant species in the Silver Sagebrush/

Western Wheat Grass Shrubland, and are found consistently within this community type. Both occur in other community types as well.

6b. OTHER SPECIES

SHIGH.RANK.SPP	Potential species: American badger (S4W G5), Richardson's ground squirrel (S5W G5), northern grasshopper mouse (S2 G5), sagebrush vole (S3 G5), sage grouse leks (S2 G5), sharp-tailed grouse (S4W G4), sage thrasher (S1 G5), Sprague's pipit (S4W G4), short-horned lizard (S2 G5), plains hog-nosed snake (S2 G5T5), western terrestrial garter snake hibernacula (S3S4 G5), western rattlesnake hibernacula (S3 G5)

SFAUNA.COM

Coyote, red fox, white-tailed deer, mule deer, Nuttall's cottontail, white-tailed jack rabbit, American badger, least weasel, long-tailed weasel, prairie shrew, Richardson's ground squirrel, northern pocket gopher, deer mouse, northern grasshopper mouse, meadow vole, sagebrush vole, northern harrier, Swainson's hawk, prairie falcon, sage grouse, sharp-tailed grouse, mourning dove, Say's phoebe, eastern kingbird, horned lark, black-billed magpie, sage thrasher, Sprague's pipit, clay-coloured sparrow, Brewer's sparrow, lark sparrow, lark bunting, western meadowlark, Brewer's blackbird, short-horned lizard, plains hog-nosed snake, bull snake, western terrestrial garter snake, western rattlesnake.

SOTHER.SPP.COM

Abundant sage grouse use has been observed in the Silver Sagebrush/Western Wheat Grass Shrubland, but no other high ranking plant or animal species have been reported, although several are potential species. Several animal species are associated with sagebrush communities, including northern grasshopper mouse, sagebrush vole, sage grouse, sage thrasher, Brewer's sparrow, lark bunting and short-horned lizard.

6c. VARIABILITY

SSPP.COMP.VAR

Artemisia cana and *Agropyron smithii* are found consistently in the Silver Sagebrush/Western Wheat Grass Shrubland, and are the most abundant species. Other shrub species are only sporadic. *Symphoricarpos occidentalis* is frequently present. Graminoids dominate the herbaceous layer with *Agropyron smithii* usually dominant and *Stipa viridula* important on undisturbed sites. *Stipa comata* and/or *Bouteloua gracilis* may be dominant or co-dominant. Other grass and forb species reported differed considerably, possibly due to differences in moisture, the coarseness of the underlying materials, the rate of deposition of alluvium and colluvium, and grazing pressure. Other reported grasses include *Koeleria macrantha*, *Agropyron dasystachyum*, *Agropyron trachycaulum* and *Distichlis stricta*. The forb component is often insignificant. *Artemisia frigida* frequently occurs at some sites. Other commonly reported species included *Grindelia squarrosa*, *Opuntia polyacantha*, *Coryphantha vivipara*, *Atriplex nuttallii*, *Allium textile*, *Achillea millefolium*, *Plantago purshii*, *Sphaeralcea coccinea*, *Eurotia lanata*, *Gutierrezia sarothrae*, *Gaura coccinea* and *Lactuca pulchella*. Many sites have no unvegetated surface, however some sites have low to moderate bare ground cover. Average bare ground cover

is reported to be 2.5% (range 0-20%) in Alberta's Grassland Natural Region (Thompson and Hansen 2001), and 48.25% in southeastern Alberta (Adams *et al.* 2002).

Widely spaced, old or dying *Populus deltoides* may be present in mid-late seral primary successional stands, occasionally with *Symphoricarpos occidentalis*. The Silver Sagebrush/ Western Wheat Grass Shrubland develops when an old alluvial terrace that once supported the cottonwood community becomes drier due to flood plain build-up, or channel down-cutting or migration away from the site (Hansen *et al.* 1995; Thompson and Hansen 2001).

SPHYSIOG.VAR
There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM
While *Artemisia cana* and *Agropyron smithii* are always present, other graminoid, forb and shrub species may be present. Most sites have no unvegetated surface, however some sites have low to moderate bare ground cover. Many sites have no unvegetated surface, however some sites have low to moderate bare ground cover. Average bare ground cover is reported to be 2.5% (range 0-20%) in Alberta's Grassland Natural Region (Thompson and Hansen 2001), and 48.25% in southeastern Alberta (Adams *et al.* 2002). *Populus deltoides* may be present in an open canopy.

7. DYNAMIC PROCESSES

SNAT.DISTURBANCE
The element is prone to periodic flooding and/or slope wash from major precipitation events.

The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling et al. 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS PNC community, edaphic climax

SSUCCESS.DYNAM.COM
The element is prone to periodic flooding and/or slope wash from major precipitation events. The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush/Western Wheat Grass Shrubland is an edaphic climax (PNC community).

8. SPATIAL RELATIONS

SSIZE Relatively small in area.

SSPATIAL DISTRIBUTION Patchy or linear

SADJACENT.COMMUNITIES
The primary community types that are generally higher in the landscape than the Silver Sagebrush/
Western Wheat Grass Shrubland include the upland Silver Sagebrush/Western Wheat Grass Shrub Prairie, Needle-and-thread-Blue grama (*Stipa comata-Bouteloua gracilis*) Prairie, Western wheat grass-needle-and-thread (*Agropyron smithii-Stipa comata*) Prairie or other upland shrub and grassland communities. Those that are slightly lower in the landscape include Manitoba maple/choke cherry (*Acer negundo*/*Prunus virginiana*), Western Wheat Grass (*Agropyron smithii*), the Buckbrush (*Symphoricarpos occidentalis*) and Common Wild Rose (*Rosa woodsii*) dominated associations, or Greasewood (*Sarcobatus vermiculatus*) dominated communities when the setting is in highly erosive to badlands topography. Wetter sites may be dominated by cottonwoods or willows.

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush/Western Wheat Grass Shrubland is relatively small in area and patchy or linear in distribution.

The primary community types that are generally higher in the landscape than the Silver Sagebrush/
Western Wheat Grass Shrubland include the upland Silver Sagebrush/Western Wheat Grass Shrub Prairie, Needle-and-thread-Blue grama (*Stipa comata-Bouteloua gracilis*) Prairie, Western wheat grass-needle-and-thread (*Agropyron smithii-Stipa comata*) Prairie or other upland shrub and grassland communities. Those that are slightly lower in the landscape include Manitoba maple/choke cherry (*Acer negundo*/*Prunus virginiana*), Western Wheat Grass (*Agropyron smithii*), the Buckbrush (*Symphoricarpos occidentalis*) and Common Wild Rose (*Rosa woodsii*) dominated associations, or Greasewood (*Sarcobatus vermiculatus*) dominated communities when the setting is in highly erosive to badlands topography. Wetter sites may be dominated by cottonwoods or willows.

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO Not yet available.

SEXEMP.EO.SITENAME Not yet available.

SSTATCOM
The conservation status of the element is assumed to be favourable since it is unlikely to be cultivated. Heavy grazing could alter the species composition. This and other disturbances could encourage the establishment of non-native weedy species. Upstream dugouts or dams may disrupt the periodic flooding events that may be important to the maintenance of this community.

10. MANAGEMENT

SECONCOM
Livestock grazing; recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.

SMANAGE.COM
Silver Sagebrush/Western Wheat Grass Shrubland is a range resource, however grazing intensities beyond light grazing result in a shift towards other community types. Exotics such as *Bromus japonicus* and *Taraxacum officinale* increase with grazing pressure.

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested community types on air photos and Landsat imagery. As a rule, it can be distinguished from prairie community types on large scale air photos (1:30,000 or larger), as well as cultivated land and seeded pastures. It cannot be distinguished from similar native shrubland communities. The preferred scale of aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, shrubland can easily be distinguished from forested community types. Shrubland can further be distinguished from prairie as well as cultivated land and seeded pasture community types on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar native shrubland communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT

SANALYSIS.COM
In North Dakota, percent cover estimates of each plant species were made within fifty 2 x 5 dm microplots placed systematically along the sides of a central 15 x 25 m macroplot (Hansen *et al.* 1984). These macroplots were established in areas that were homogeneous, as little disturbed as possible and nearly mature, representing habitat types that had been tentatively previously identified. Habitat types were described by reporting on the constancy and mean coverage of each plant species.

In western North Dakota, the frequency, abundance and canopy cover of species were determined using the frequency-abundance method in 30 m^2 sample areas and the point method using 300 points per test area (Hanson and Whitman 1938). On the basis primarily of vegetation and topography, the test areas were classified into types and named according to the chief species in each.

In the northern and central Rocky Mountain zone, percent cover estimates of each plant species were made within 5 x 10 m plots (Hansen *et al.* 1995). For long stringer communities, the plot width was reduced and length was increased to maintain a constant plot size of 50 m^2. Each plot was located within a stand at least twice the area of the plot to avoid sampling ecotones between communities. Data were entered into FUZPHY, a computer data analysis system developed by Dave Roberts of Utah State University, capable of summarising large quantities of vegetation and environmental data. A stepwise procedure of successive approximations was used to develop the classification (Pfister and Arno 1980). Preliminary association tables were created using plot species and canopy cover values. Stands were then rearranged several times to group stands into sets with the greatest vegetation similarities. Plot-to-plot similarity relations, plot-to-set similarity relations, and set-to-set similarity relations were analysed using a modified Sorensenís Index (the program SIMRELin FUZPHY). The final placement of each sample plot in a set was based on both floristic and environmental relationships (Hansen *et al.* 1995).

SANALYSIS.DATA.MANAGE.COM
In North Dakota, vegetation data (percent cover) were summarised for macroplots within habitat types that had been tentatively previously identified. In western North Dakota, vegetation data (frequency, abundance, percent cover) were assessed subjectively, and test areas were classified into types based primarily on vegetation and topography.

In western North Dakota, the frequency, abundance and canopy cover of species were determined using the frequency-abundance method in 30 m^2 sample areas and the point method using 300 points per test area (Hanson and Whitman 1938). On the basis primarily of vegetation and topography, the test areas were classified into types and named according to the chief species in each.

In the northern and central Rocky Mountain zone, percent cover estimates of each plant species were made within 5 x 10 m plots (Hansen *et al.* 1995). For long stringer communities, the plot width was reduced and length was increased to maintain a constant plot size of 50 m^2. Each plot was located within a stand at least twice the area of the plot to avoid sampling ecotones between communities. Data were entered into FUZPHY, a computer data analysis system developed by Dave Roberts of Utah State University, capable of summarising large quantities of vegetation and environmental data. A stepwise procedure of successive approximations was used to develop the classification (Pfister and Arno 1980). Preliminary association tables were created using plot species and canopy cover values. Stands were then rearranged several times to group stands into sets with the greatest vegetation similarities. Plot-to-plot similarity relations, plot-to-set similarity relations, and set-to-set similarity relations were analysed using a modified Sorensenís Index (the program SIMRELin FUZPHY). The final placement of each sample plot in a set was based on both floristic and environmental relationships (Hansen *et al.* 1995). The data are housed at the School of Forestry, University of Montana, and available on the web site: www.rwrp.umt.edu.

13. GENERAL COMMENTS

SCOMMUNITY.COM

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PERSONAL COMMUNICATIONS

McNeil, Ron. President. LandWise Inc., Lethbridge, Alberta.

TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
Silver Sagebrush/Green Needle Grass-Western Wheat Grass (*Artemisia cana*/*Stipa viridula-Agropyron smithii*) Shrubland has been identified in Alberta south of Manyberries, north of Grassy Lake (ESIS database) and in CFB Suffield National Wildlife Area (Adams *et al.* 1997), and in southern Saskatchewan near the Matador Research Station (Lawrence and Romo 1994). The ESIS record of a site between Taber and Bow Island was on a steep (17°), east-northeast-facing slope. In southern Saskatchewan, the majority of sites were on southerly slopes of draws, but also on north- and east-facing slopes. The average cover of *Artemisia cana* was 41.2% (Lawrence and Romo 1994) and 20% (although two of the sites had covers of 25%) (ESIS database). *Stipa viridula* is the dominant grass, with an average cover of 28% in ESIS records. In ESIS records, *Agropyron smithii* averages 17% cover, and *Agropyron dasystachyum* dominate over *Agropyron smithii* at one site, with a cover of 30% versus 7%. *Symphoricarpos occidentalis* is another prominent shrub, with an average cover of 6% (range 1-15%). Other common species include *Bouteloua gracilis*, *Stipa comata*, *Calamovilfa longifolia*, *Artemisia frigida*, *Achillea millefolium*, *Antennaria parvifolia*, *Gutierrezia sarothrae*, *Opuntia polyacantha*, *Thermopsis rhombifolia* and *Aster ericoides*.

ET SNAME
Artemisia cana/*Stipa viridula-Agropyron smithii* Shrubland

ET SCOMNAME
Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland

2. CLASSIFICATION

ET SYSTEM Terrestrial

ET CLASS III - Shrubland

ET SUBCLASS III.A - Evergreen shrubland

ET GROUP III.A.4 - Microphyllous evergreen shrubland

ET FORMATION III.A.4.a - Microphyllous evergreen shrubland

ET ALLIANCE III.A.4.N.a.15 *ARTEMISIA CANA* SHRUBLAND ALLIANCE

SIMILAR COMMUNITIES

3. RELATED NOMENCLATURE
SOTHER.NAMES
Artemisia cana Community

SOTHER.NAMES.RELATION
=

SOTHER.NAMES.RELATION.NOTE
This element is called the *Artemisia cana* Community by Lawrence and Romo (1994).

SNAMES.COM
This element is called the *Artemisia cana* Community by Lawrence and Romo (1994).

4. DISTRIBUTION

ESR SRANGE
Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland has been identified in Alberta from a site between Taber and Bow Island, from two sites near Manyberries (ESIS database) and in CFB Suffield National Wildlife Area (Adams *et al.* 1997), and in southern Saskatchewan near the Matador Research Station (Lawrence and Romo 1994).

ESR SRANGECOM
Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland has been identified in Alberta from a site between Taber and Bow Island, from two sites near Manyberries (ESIS database) and in CFB Suffield National Wildlife Area (Adams *et al.* 1997), and in southern Saskatchewan near the Matador Research Station (Lawrence and Romo 1994).

SDISTRIBUTION.COM
The element is expected to occur in the Dry Mixedgrass Subregion and possibly in the Mixedgrass Subregion of southern Alberta, and the grassland region of southern Saskatchewan.

5. ENVIRONMENTAL FACTORS

SMINELEV

SMAXELEV

SLANDFORM	Slopes of draws
STOPO.POSITION	Slopes
SSLOPE	Steep (17° recorded)
SASPECT	Variable (majority on southerly slopes, also north and east-facing)

SGEOLOGY.COM

SSOIL.TYPE
SSOIL.MOISTURE

SSOIL.COM

SHYDRO.INFLUENCE

SSEASONAL.VAR

SKEY.ENVIRO.FACTORS

SENVIRO.COM
Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland occurs primarily on southerly slopes of draws, but also on north- and east-facing slopes. One site was on a steep (17°), east-northeast-facing slope.

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM Shrub, herb

SPCT.COVER
Shrub: ≥25%
Herb: <75%

SHEIGHT

SMOST.ABUND.SPP
Shrub layer: *Artemisia cana*
Herb layer: *Stipa viridula*

SSUNVEGETATED.SURFACE

SSUNVEGETATED.SURFACE.COVER

SCONSTANT.SPP *Artemisia cana*, *Stipa viridula, Agropyron smithii*

SCHARACTERISTIC.SPP None

SVEGETATION.COM
The Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland consists of two

vegetation strata: the herb and shrub layers. The average cover of *Artemisia cana* was 41.2% (Lawrence and Romo 1994) and 20% (although two of the sites had covers of 25%) (ESIS records). *Stipa viridula* was the dominant grass, with an average cover of 28% in ESIS records. *Agropyron smithii* averaged 17% cover, and *Agropyron dasystachyum* dominated over *Agropyron smithii* at one site, with a cover of 30% versus 7%. *Symphoricarpos occidentalis* was another prominent shrub, with an average cover of 6% (range 1-15%). Other common species included *Bouteloua gracilis*, *Stipa comata*, *Calamovilfa longifolia*, *Artemisia frigida*, *Achillea millefolium*, *Antennaria parvifolia*, *Gutierrezia sarothrae* and *Aster ericoides*.

Artemisia cana and *Stipa viridula* are the most abundant species in the Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland and, along with *Agropyron smithii*, are found consistently within this community type. All occur in other community types as well.

6b. OTHER SPECIES

SHIGH.RANK.SPP	Potential species: American badger (S4W G5), Richardson's ground squirrel (S5W G5), northern grasshopper mouse (S2 G5), sagebrush vole (S3 G5), sage grouse leks (S2 G5), sharp-tailed grouse (S4W G4), sage thrasher (S1 G5), Sprague's pipit (S4W G4), short-horned lizard (S2 G5), western terrestrial garter snake hibernacula (S3S4 G5), western rattlesnake hibernacula (S3 G5)

SFAUNA.COM

Coyote, red fox, white-tailed deer, mule deer, Nuttall's cottontail, white-tailed jack rabbit, American badger, striped skunk, least weasel, long-tailed weasel, prairie shrew, Richardson's ground squirrel, northern pocket gopher, deer mouse, northern grasshopper mouse, meadow vole, sagebrush vole, northern harrier, Swainson's hawk, prairie falcon, sage grouse, sharp-tailed grouse, mourning dove, Say's phoebe, eastern kingbird, horned lark, black-billed magpie, sage thrasher, Sprague's pipit, clay-coloured sparrow, Brewer's sparrow, lark sparrow, lark bunting, western meadowlark, Brewer's blackbird, short-horned lizard, bull snake, western terrestrial garter snake, western rattlesnake.

SOTHER.SPP.COM

No high ranking plant or animal species have been reported from the Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland, although several are potential species. Several animal species are associated with sagebrush communities, including northern grasshopper mouse, sagebrush vole, sage grouse, sage thrasher, Brewer's sparrow, lark bunting and short-horned lizard.

6c. VARIABILITY

SSPP.COMP.VAR

Artemisia cana and *Stipa viridula* are the most abundant species in the Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland and, along with *Agropyron smithii*, are found consistently within this community type. The average cover of *Artemisia cana* was 41.2% (Lawrence and Romo 1994) and 20% (although two of the sites had covers of 25%) (ESIS records). *Stipa viridula* was the dominant grass, with an average cover of 28% in ESIS records.

Agropyron smithii generally had higher cover than *Agropyron dasystachyum*. In ESIS records, *Agropyron smithii* averaged 17% cover, and *Agropyron dasystachyum* dominated over *Agropyron smithii* at one site, with a cover of 30% versus 7%. *Symphoricarpos occidentalis* was another prominent shrub, with an average cover of 6% (range 1-15%). Other common species included *Bouteloua gracilis*, *Stipa comata*, *Calamovilfa longifolia*, *Artemisia frigida*, *Achillea millefolium*, *Antennaria parvifolia*, *Gutierrezia sarothrae*, *Opuntia polyacantha*, *Thermopsis rhombifolia* and *Aster ericoides*. *Rosa woodsii* and *Poa arida* were prominent at one site, each at 10% cover.

SPHYSIOG.VAR
There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM
While *Artemisia cana*, *Stipa viridula* and *Agropyron smithii* are always present, other graminoid, forb and shrub species may be present.

7. DYNAMIC PROCESSES

SNAT.DISTURBANCE
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling et al. 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS Late seral, edaphic climax

SSUCCESS.DYNAM.COM
The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland may be a late seral to edaphic climax.

8. SPATIAL RELATIONS

SSIZE Relatively small in area.

SSPATIAL DISTRIBUTION Patchy

SADJACENT.COMMUNITIES

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland is relatively small in area and patchy in distribution.

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO Not yet available.

SEXEMP.EO.SITENAME Not yet available.

SSTATCOM
The conservation status of the element is assumed to be favourable since it is unlikely to be cultivated. Heavy grazing could alter the species composition. This and other disturbances could encourage the establishment of non-native weedy species.

10. MANAGEMENT

SECONCOM
Livestock grazing; recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.

SMANAGE.COM
Silver Sagebrush/Green Needle Grass-Western Wheat Grass Shrubland is a range resource, however grazing intensities beyond light grazing result in a shift towards other community types.

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested community types on air photos and Landsat imagery. As a rule, it can be distinguished from prairie community types on large scale air photos (1:30,000 or larger), as well as cultivated land and seeded pastures. It cannot be distinguished from similar native shrubland communities. The preferred scale of aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, shrubland can easily be distinguished from forested community types. Shrubland can further be distinguished from prairie as well as cultivated land and seeded pasture community types on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar native shrubland communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT
SANALYSIS.COM
Vegetation data in the ESIS database (percent canopy cover) were subjected to an indicator species analysis (TWINSPAN) (Hill 1979) and ordination (DECORANA, a detrended correspondence analysis) (Gauch 1982) using PC-ORD. The results were subjectively assessed and the records were grouped according to dominant species and vegetation structure.

In southern Saskatchewan, percent canopy cover of plant species, and cover and density of shrubs were estimated and counted in 0.25 m^2 quadrats along 10 m transects (Lawrence and Romo 1994). Simpson's diversity index, and Sorensen and Morisita's similarity indices were derived from formulas in Brower and Zar (1977). The similarity indices for frequency and total canopy cover were subjected to polar ordination (Barbour *et al.* 1980) to obtain community groupings.

SANALYSIS.DATA.MANAGE.COM
Vegetation data in the ESIS database (percent canopy cover) were subjected to an indicator species analysis (TWINSPAN) (Hill 1979) and ordination (DECORANA, a detrended correspondence analysis) (Gauch 1982) using PC-ORD. The results were subjectively assessed and the records were grouped according to dominant species and vegetation structure. The data are housed in the ESIS database of Alberta Environment, Edmonton.

In southern Saskatchewan (Lawrence and Romo 1994), vegetation data (percent canopy cover of plant species, and cover and density of shrubs) were analysed using Simpson's diversity index, and Sorensen and Morisita's similarity indices, which were derived from formulas in Brower and Zar (1977). The similarity indices for frequency and total canopy cover were subjected to polar ordination (Barbour *et al.* 1980) to obtain community groupings.

13. GENERAL COMMENTS

SCOMMUNITY.COM

15. REFERENCES

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TERRESTRIAL COMMUNITY CLASSIFICATION ABSTRACT SUB-NATIONAL

FIELD NAME

1. IDENTIFIERS

SEL.SUMMARY
The **Silver Sagebrush/Nuttall's Atriplex (*Artemisia cana*/*Atriplex nuttallii*) Shrubland** has been described in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date), Red Deer River valley (Wallis 1977), in the Middle Sand Hills area (Cottonwood Consultants Ltd. 1987), and possibly in Writing-on-stone Provincial Park (Wershler 1980) and CFB Suffield National Wildlife Area (Adams *et al.* 1997). It occurs on well drained, steep (≥24°), eroding and stabilised badlands and bedrock slopes in major valleys, coulees and ravines (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date; Wallis 1977; Cottonwood Consultants Ltd. 1987; Wershler 1980; Adams *et al.* 1997). The sandy-textured soils are Orthic Regosols (Adams *et al.* 1997). This is a species-poor community and vegetation cover is relatively sparse. Although the cover of *Artemisia cana* in the Dinosaur Provincial Park shrubland is only reported to be approximately 15%, it dominates the community as the cover of bare soil is approximately 50% and rock (gravel and cobble) cover is approximately 25%. *Atriplex nuttallii* is also prominent at 5% cover (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date).

ET SNAME
Artemisia cana/*Atriplex nuttallii* Shrubland

ET SCOMNAME
Silver Sagebrush/Nuttall's Atriplex Shrubland

2. CLASSIFICATION

ET SYSTEM Terrestrial

ET CLASS III - Shrubland

ET SUBCLASS III.A - Evergreen shrubland

ET GROUP III.A.4 - Microphyllous evergreen shrubland

ET FORMATION III.A.4.a - Microphyllous evergreen shrubland

ET ALLIANCE III.A.4.N.a.15 *ARTEMISIA CANA* SHRUBLAND ALLIANCE

SIMILAR COMMUNITIES
The Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie is similar but has less bare soil and rock (each 15% cover). The Sagebrush-Greasewood/Barren Community identified in

CFB Suffield National Wildlife Area may also be similar.

3. RELATED NOMENCLATURE
SOTHER.NAMES
Salt Sage-Sagebrush Association

SOTHER.NAMES.RELATION
=

SOTHER.NAMES.RELATION.NOTE
The Salt Sage-Sagebrush Association is the name used for this community in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date).

SNAMES.COM
The Salt Sage-Sagebrush Association is the name used for this community in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date).

4. DISTRIBUTION

ESR SRANGE
The Silver Sagebrush/Nuttall's Atriplex (*Artemisia cana*/*Atriplex nuttallii*) Shrubland has been described in Alberta in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date), Red Deer River valley (Wallis 1977), in the Middle Sand Hills area (Cottonwood Consultants Ltd. 1987), and possibly in Writing-on-stone Provincial Park (Wershler 1980) and CFB Suffield National Wildlife Area (Adams *et al.* 1997).

ESR SRANGECOM
The Silver Sagebrush/Nuttall's Atriplex (*Artemisia cana*/*Atriplex nuttallii*) Shrubland has been described in Alberta in Dinosaur Provincial Park (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date), Red Deer River valley (Wallis 1977), in the Middle Sand Hills area (Cottonwood Consultants Ltd. 1987), and possibly in Writing-on-stone Provincial Park (Wershler 1980) and CFB Suffield National Wildlife Area (Adams *et al.* 1997). It probably occurs in the grassland regions of Saskatchewan.

SDISTRIBUTION.COM
The element is expected to occur in the Dry Mixedgrass Subregion and possibly the Northern Fescue Subregion of southern Alberta.

5. ENVIRONMENTAL FACTORS

SMINELEV

SMAXELEV

SLANDFORM Eroding and stabilised badlands and bedrock slopes in major valleys, coulees and ravines

STOPO.POSITION Slopes

SSLOPE Steep slopes (≥24°)
SASPECT Variable (reported on north-, west- and south-facing slopes)

SGEOLOGY.COM Morainal, badlands

SSOIL.TYPE Orthic Regosols

SSOIL.MOISTURE

SSOIL.COM
The sandy-textured soils are Orthic Regosols (Adams *et al.* 1997).

SHYDRO.INFLUENCE Well drained

SSEASONAL.VAR

SKEY.ENVIRO.FACTORS
The element is often prone to erosion.

SENVIRO.COM
The Silver Sagebrush/Nuttall's Atriplex Shrubland occurs on well drained, steep (≥24°), eroding and stabilised badlands and bedrock slopes in major valleys, coulees and ravines (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date; Wallis 1977; Cottonwood Consultants Ltd. 1987; Wershler 1980; Adams *et al.* 1997). The sandy-textured soils are Orthic Regosols (Adams *et al.* 1997).

6. BIOLOGICAL AND STRUCTURAL DESCRIPTION

6a. VEGETATION

SSTRATA.LIFEFORM Shrub, herb

SPCT.COVER
Shrub: ≥15%
Herb: <75%

SHEIGHT

SMOST.ABUND.SPP
Shrub layer: *Artemisia cana*
Herb layer: *Atriplex nuttallii*

SSUNVEGETATED.SURFACE	Eroding and stabilised badlands and bedrock slopes

SSUNVEGETATED.SURFACE.COVER	Bare soil covers approximately 50% and rock (gravel and cobble) cover is approximately 25%
SCONSTANT.SPP	*Artemisia cana, Atriplex nuttallii*, *Gutierrezia sarothrae*
SCHARACTERISTIC.SPP	None

SVEGETATION.COM
The Silver Sagebrush/Nuttall's Atriplex Shrubland consists of two vegetation strata: the herb and shrub layers. This is a species-poor community and vegetation cover is relatively sparse. Although the cover of *Artemisia cana* in the Dinosaur Provincial Park shrubland is only reported to be approximately 15%, it dominates the community as the cover of bare soil is approximately 50% and rock (gravel and cobble) cover is approximately 25%. *Atriplex nuttallii* is also prominent at 5% cover (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). Other commonly reported species in the Silver Sagebrush/Nuttall's Atriplex Shrubland include *Agropyron smithii*, *Gutierrezia sarothrae*, *Eriogonum flavum*, *Penstemon nitidus*, *Eurotia lanata*, *Iva axillaris*, *Opuntia polyacantha* and *Sarcobatus vermiculatus*.

Artemisia cana and *Atriplex nuttallii* are the most abundant species in the Silver Sagebrush/ Nuttall's Atriplex Shrubland and, along with *Gutierrezia sarothrae*, are found consistently within this community type. All occur in other community types as well.

6b. OTHER SPECIES

SHIGH.RANK.SPP	Potential species: short-horned lizard (S2 G5), western rattlesnake (S3 G5)

SFAUNA.COM
Coyote, red fox, mule deer, striped skunk, Nuttall's cottontail, least weasel, deer mouse, Swainson's hawk, golden eagle, prairie falcon, mourning dove, Say's phoebe, black-billed magpie, rock wren, lark sparrow, short-horned lizard, bull snake, western rattlesnake.

SOTHER.SPP.COM
No high ranking plant or animal species have been reported from the Silver Sagebrush/Nuttall's Atriplex Shrubland, although several are potential species. Several animal species are associated with badland communities, including prairie falcon, Say's phoebe, lark sparrow and short-horned lizard.

6c. VARIABILITY

SSPP.COMP.VAR
Artemisia cana and *Atriplex nuttallii* are the most abundant species in the Silver Sagebrush/ Nuttall's Atriplex Shrubland and, along with *Gutierrezia sarothrae*, are found consistently within this community type. This is a species-poor community and vegetation cover is relatively sparse. Although the cover of *Artemisia cana* in the Dinosaur Provincial Park shrubland is only reported to be approximately 15%, it dominates the community as the cover of bare soil is approximately

50% and rock (gravel and cobble) cover is approximately 25%. *Atriplex nuttallii* is also prominent at 5% cover (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). Other commonly reported species in the Silver Sagebrush/Nuttall's Atriplex Shrubland include *Agropyron smithii*, *Gutierrezia sarothrae*, *Eriogonum flavum*, *Penstemon nitidus*, *Eurotia lanata*, *Iva axillaris*, *Opuntia polyacantha* and *Sarcobatus vermiculatus*. Occasionally reported species include *Grindelia squarrosa*, *Artemesia longifolia*, *Artemisia dracunculus*, *Artemisia campestris*, *Chrysothamnus nauseosus*, *Petalostemon candidum*, *Machaeranthera canescens* and *Mentzelia decapetala*.

SPHYSIOG.VAR
There is always a shrub layer along with the herb layer.

SSUBTYPES

SVARIABILITY.COM
While *Artemisia cana*, *Atriplex nuttallii* and *Gutierrezia sarothrae* are always present, other graminoid, forb and shrub species may be present.

7. DYNAMIC PROCESSES

SNAT.DISTURBANCE
The element is prone to erosion.

The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. In the past, this type may not have attained such high shrub densities. Fire was essential for maintaining the grassland openings in the parklands of the Northern Great Plains before settlement by the Europeans in the late 1800s (Nelson and England 1971). With fire suppression, succession towards shrublands and forest is occurring (Moss and Campbell 1947; Bird 1961; Nelson and England 1971; Bailey and Wroe 1974; Bailey and Anderson 1978; Anderson and Bailey 1980; Gerling et al. 1995). Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

SSUCCESS.STATUS Edaphic climax

SSUCCESS.DYNAM.COM
The element is prone to erosion. The relatively high cover of *Artemisia cana* may be the result of an altered fire regime. Fire can be a large or small scale natural disturbance, and was more common in the past. Small scale disturbances include soil disturbance by burrowing animals, grazing by ungulates and rodents, and soil compaction along game trails.

The Silver Sagebrush/Nuttall's Atriplex Shrubland is an edaphic climax.

8. SPATIAL RELATIONS

SSIZE Relatively small in area.

SSPATIAL DISTRIBUTION Patchy

SADJACENT.COMMUNITIES
A community type that is generally lower in the landscape than the Silver Sagebrush/Nuttall's Atriplex Shrubland is the Silver Sagebrush/Western Wheat Grass Shrubland. Those that are generally higher include variable grasslands that are usually dominated by *Koeleria macrantha*, *Gutierrezia sarothrae* and *Phlox hoodii* (Cottonwood Consultants Ltd. 1987), or the *Opuntia polyacantha* Association*, Opuntia polyacantha-Bouteloua gracilis* Association, *Selaginella densa-Stipa comata* Association, *Selaginella densa-Koeleria macrantha* Association, *Stipa comata-Bouteloua gracilis* Association or *Plantago* sp.-*Bouteloua gracilis* Association (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date).

Adjacent eroding badlands may harbour the *Sarcobatus vermiculatus* Association or *Stipa comata-Sarcobatus vermiculatus* Association (=Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie) (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). On adjacent bedrock (consolidated shales and sandstones) there are very open *Sarcobatus vermiculatus* stands. Darker and looser shales are characterised by *Atriplex suckleyi*, *Sarcobatus vermiculatus*, *Descurainia* sp., *Polygonum* sp., *Monolepis nuttalliana* and *Helianthus annuus*. The softer Bearspaw shale is characterised by *Iva axillaris*, *Atriplex nuttallii*, *Atriplex* spp. and *Artemisia longifolia* (Cottonwood Consultants Ltd. 1987). Adjacent stable slopes are grassier, with *Muhlenbergia cuspidata*, *Stipa viridula*, *Koeleria macrantha* and *Agropyron smithii* common (Cottonwood Consultants Ltd. 1987), or harbour the *Hymenoxys richardsonii-Phlox hoodii* Association, *Selaginella densa-Stipa comata* Association, *Eurotia lanata*/*Stipa comata-Bouteloua gracilis* Association, *Koeleria macrantha-Juniperus* sp. Association or *Phlox hoodii-Juniperus* sp. Association (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). On moist north-facing and sheltered coulee sites, *Koeleria macrantha*, *Muhlenbergia cuspidata* and *Juniperus horizontalis* dominate in a forb-rich community (Cottonwood Consultants Ltd. 1987).

SINCLUSION.COMMUNITIES

SMOSAIC.COM

SSPATIAL.COM
The Silver Sagebrush/Nuttall's Atriplex Shrubland is relatively small in area and patchy in distribution.

A community type that is generally lower in the landscape than the Silver Sagebrush/Nuttall's Atriplex Shrubland is the Silver Sagebrush/Western Wheat Grass Shrubland. Those that are generally higher include variable grasslands that are usually dominated by *Koeleria macrantha*, *Gutierrezia sarothrae* and *Phlox hoodii* (Cottonwood Consultants Ltd. 1987), or the *Opuntia polyacantha* Association*, Opuntia polyacantha-Bouteloua gracilis* Association, *Selaginella densa-Stipa comata* Association, *Selaginella densa-Koeleria macrantha* Association, *Stipa comata-Bouteloua gracilis* Association or *Plantago* sp.-*Bouteloua gracilis* Association (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date).

Adjacent eroding badlands may harbour the *Sarcobatus vermiculatus* Association or *Stipa comata-Sarcobatus vermiculatus* Association (=Silver Sagebrush-Greasewood/Needle-and-thread Shrub Prairie) (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). On adjacent bedrock (consolidated shales and sandstones) there are very open *Sarcobatus vermiculatus* stands. Darker and looser shales are characterised by *Atriplex suckleyi*, *Sarcobatus vermiculatus*, *Descurainia* sp., *Polygonum* sp., *Monolepis nuttalliana* and *Helianthus annuus*. The softer Bearspaw shale is characterised by *Iva axillaris*, *Atriplex nuttallii*, *Atriplex* spp. and *Artemisia longifolia* (Cottonwood Consultants Ltd. 1987). Adjacent stable slopes are grassier, with *Muhlenbergia cuspidata*, *Stipa viridula*, *Koeleria macrantha* and *Agropyron smithii* common (Cottonwood Consultants Ltd. 1987), or harbour the *Hymenoxys richardsonii-Phlox hoodii* Association, *Selaginella densa-Stipa comata* Association, *Eurotia lanata*/*Stipa comata-Bouteloua gracilis* Association, *Koeleria macrantha-Juniperus* sp. Association or *Phlox hoodii-Juniperus* sp. Association (Envirocon Ltd. and Hough, Stansbury and Assoc. Limited, no date). On moist north-facing and sheltered coulee sites, *Koeleria macrantha*, *Muhlenbergia cuspidata* and *Juniperus horizontalis* dominate in a forb-rich community (Cottonwood Consultants Ltd. 1987).

9. STATUS

ESR SRANK

ESR SREASONS

SEXEMPLARY.EO Not yet available.

SEXEMP.EO.SITENAME Not yet available.

SSTATCOM
The conservation status of the element is assumed to be favourable since it is unlikely to be cultivated. Disturbances could encourage the establishment of non-native weedy species.

10. MANAGEMENT

SECONCOM
Recreation (e.g., photography, bird-watching); maintenance of soil and groundwater level.

SMANAGE.COM

11. INVENTORY AND SAMPLING PROCEDURES

SIMAGERY.COM
The element can easily be distinguished from forested and prairie community types, cultivated land and seeded pastures on air photos and Landsat imagery. As a rule, it can be distinguished from other shrubland types in non-badland situations on large scale air photos (1:30,000 or larger). It cannot be distinguished from similar badland communities. The preferred scale of

aerial photography is 1:20,000 or larger, either colour or black and white infrared.

SSAMPLE.STRATEGY

SINVENTORY.COM
Using either air photos or Landsat imagery, the element can easily be distinguished from forested and prairie community types, cultivated land and seeded pastures. As a rule, it can be distinguished from other shrubland types in non-badland situations on large scale air photos (1:30,000 or larger). However, ground truthing is required to distinguish it from similar badland communities.

12. ANALYSIS PROCEDURES AND DATA MANAGEMENT

SANALYSIS.COM
Percent cover estimates were made of plant species and bare ground.

SANALYSIS.DATA.MANAGE.COM
Percent cover estimates were made of plant species and bare ground.

13. GENERAL COMMENTS

SCOMMUNITY.COM

15. REFERENCES

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