Updated Ecosystem Mapping for the South Okanagan Valley

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1 Introduction

In 1991-1994 the south Okanagan and lower Similkameen Valleys were mapped using a biophysical habitat mapping approach on 1:15,000 aerial photographs taken in the mid 1980's (Lea et al. 1991; Harper et al. 1996). Since that time, a provincial ecosystem mapping standard has been adopted and the classification of ecosystems has been updated and revised.

This report documents the methods and results from updating of the habitat status of the biophysical mapping in the South Okanagan and upgrading the entire map product to current Terrestrial Ecosystem Mapping (TEM) standards (Resources Inventory Committee 1998).

The updated mapping provides a consistent Okanagan-wide mapping base. It provides the opportunity to link the mapping with Okanagan Falls (TFL15), Anarchist, Central Okanagan, Bella Vista – Goose Lake Range, Lake Country, and Commonage TEMapping. All projects except Anarchist now have the same ecosystem units (Anarchist mapped a combination of old and draft new ecosystem units).

We have updated to the current Biogeoclimatic Ecosystem Classification (BEC) site series classification, which is soon to be revised. The new site series classification, including site series numbers and codes, has not been finalized.

We have updated the biogeoclimatic zone and subzone boundaries, ecosection boundaries, and ecosystem units, including where recent burns and new developments have occurred.

In 2006, unmapped gaps between the South Okanagan TEM and TFL15 TEM were mapped and added to the South Okanagan TEM.

In 2006, the portion of the mapping in the Naramata OCP area was upgraded to delineate riparian and wetlands as distinct polygons wherever possible.

2 Methods

2.1 *Ecosystem Classification*

The site series classification for each subzone in the study area was correlated to the ecosystem classification used for the biophysical mapping. There were three situations:

1. Some site series clearly directly correlated to biophysical habitat map units. In this situation we used an algorithm to convert from the biophysical habitat mapping code to the corresponding TEM map unit code (Resources Inventory Committee 2000a).
2. A few map units did not correlate to a site series or TEM map unit. In this situation we retained the biophysical habitat map units. It some cases, the two-letter code was changed to avoid conflicts with another existing TEM code.
3. Some map units could not be directly correlated to a site series or could be one of two different site series. We marked polygons that had biophysical map units in them that did not directly correlate to a site series or TEM map unit. These polygons were verified using the original biophysical habitat mapping aerial photographs[3].

[3] The following biophysical habitat units were checked: BGxh1 – RO; PPxh1 - AS, PS, RO, SP, YS; IDFxh1 - DW, PS, RO, SP, WS; IDFdk1 - DY, RO. Additionally, any polygons with antelope-brush in them were verified as part of the antelope-brush mapping project (Iverson et al. 2005).

Polygons where map labels were generated using an algorithm or where just a single component was verified on aerial photographs have 'A' for algorithm in the 'Source' column of the database[4]. Polygons that were fully verified on aerial photographs have a 'P' for photo in the 'Source' column. Polygons that had visual inspections as part of the upgraded Antelope-brush mapping have a 'V' for visual in the 'Source' column.

2.2 *Subzone Boundaries*

The most recent biogeoclimatic boundary mapping (dated September 2004) was obtained from Dennis Lloyd. Where subzone boundaries had changed, polygons were re-assigned to new subzones and ecosystem mapping was adjusted accordingly. Polygons were only split where they were large and had large portions in two or more subzones. Otherwise, polygons were assigned to the subzone that the majority of the polygon was within.

2.3 *Development Updating*

We overlaid existing polygons onto 2003 orthophotos and digitized areas of recent development and overlaid them onto the existing polygons. Subdivided polygons were assigned new map labels based on aerial photograph interpretation (percentiles were reassessed for both portions).

Some areas had patchy or larger lot development such that the polygons could not be readily divided. For these polygons, the components and their deciles were re-evaluated.

Unfortunately, the orthophotos do not register well at the northern and southern ends of mapsheets and new line work will be less accurate in these areas.

2.4 *Fire Updating*

Fire boundaries were supplied by the Ministry of Water Land and Air Protection, Ministry of Forests, and the Canadian Forest Service. Fires dating from 1985 onwards (dating after the photos used for the original biophysical mapping) were included in updating the mapping.

Within the area of fires dating prior to 2003, structural stage mapping was updated using the fire boundary and orthophotos. For fires that occurred in 2003, structural stage for forested ecosystems was now assumed to be 'shrub' (3) even though it is likely some areas have retained live tree structure where the fire burned with low severity. However, for most areas no fire severity or current airphotos were available to determine areas that still have live forest structure.

For the Okanagan Mountain Park Fire (2003), post-fire high-resolution orthophotos and fire severity mapping supplied by Judy Millar was used to update the structural stage mapping. Thus, the fire updates for this fire are considered more accurate than for the other areas burned in 2003.

All polygons within a fire boundary had an 'F' added as a disturbance to all polygon components in the database. Non-vegetated components (rock, cliff, talus) did not have 'F' added as a disturbance.

2.5 *Mapping of Gaps between the South Okanagan and TFL15*

Bioterrain mapping for the gaps was completed by Polly Uunila, P.Geo. New lines are marked on the original SOK biophysical aerial photographs. This mapping is the only portion of the SOK TEM that has bioterrain data entered into the database. Ecosystem mapping was completed by Kristi Iverson, R.P.Bio. There was no field verification of the mapping.

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[4] If a polygon had only one component and that component was verified, then 'P' was recorded in the source field.

Subzone boundaries are not field verified and follow the nearest polygon boundary; very few polygons were split for polygon boundaries because the subzone boundaries have not been field verified and may need to be adjusted.

The mapping is substantially more detailed than the original SOK TEM with approximately 10 times more polygons in a given area. Wetlands, riparian, and sparsely vegetated ecosystems, and mature and old forest ecosystems are all delineated as separate polygons wherever possible.

New linework was digitally captured using TRIM as controls. The accuracy of the new lines is comparable to monorestitution. Because the mapping is more detailed and was captured using TRIM as control, it was not edge-matched to the existing SOK TEM. The mapping does directly abut the original SOK TEM and TFL15 TEM (there are no slivers or gaps between the projects).

2.6 *Upgrading of Wetland and Riparian Mapping in the Naramata OCP Area*

The existing SOK TEM was upgraded in 2006 to provide more detailed mapping of wetland and riparian ecosystems in the Naramata OCP area. Mapping was completed by Kristi Iverson, R.P.Bio. Wherever possible, wetland and riparian ecosystem were delineated as polygons, rather than having them as components of larger polygons. Ecosystem attributes were updated for all new or modified polygons. Bioterrain attributes were not entered into the database. The new mapping was not field verified.

New polygon boundaries were marked in red on the original SOK biophysical mapping aerial photographs. The new lines were digitally captured using the existing lines as controls. The lines could not be captured using monorestitution as this process was not used for the original SOK biophysical mapping. Thus, the polygon boundaries were not as accurately captured as in newer TEM projects. New polygons arising from the division of existing polygons are numbered 12000 and higher.

2.7 *Sensitive Ecosystem Inventory*

All TEM units have been assigned to Sensitive Ecosystem Inventory (SEI) categories. The SEI ratings table SEI_4484_rt01.cxv shows the relationship between each TEM unit and the SEI class and subclass. Table 1 below lists the SEI class and class description, and subclass and subclass description.

2.8 *Data Verification*

All coding was reviewed to ensure it is correct in the database. This was done using the DC Tools application which verifies the data is to current TEM standards (Resources Inventory Committee 2000b). We used Arcview to verify that polygons had been correctly assigned to subzones and ecosections.

Table 1. SEI units, codes and descriptions.

SEI Code (Class)	SEI Class	SEI Class Description	SEI Code (Class:subclass)	SEI Subclass
AS	Antelope Brush Steppe	Shrub-steppe ecosystems dominated by antelope-brush.	AS:as	Antelope Brush Steppe
			AS:ds	Disturbed Antelope Brush Steppe
BW	Broadleaf Woodlands	Ecosystems dominated by trembling aspen occurring in depressions and moist areas in grasslands; old Broadleaf Woodlands are part of the Old Forest category.	BW:ac	Aspen copse
FS	Seasonally Flooded Fields	Agricultural areas that are often flooded during spring run-off.	FS	Seasonally Flooded Fields
GR	Grasslands	Ecosystems dominated by bunchgrasses.	GR:gr	Grasslands
			GR:st	Steep Grasslands
			GR:ss	Steep, Shallow-soiled Grasslands
			GR:dg	Disturbed Grasslands
MF	Mature Forest	Forests dominated by mature coniferous trees; excludes mature coniferous and broadleaf woodlands	MF:co	Mature Forest
NA	Not Sensitive		NA	Not Sensitive
OF	Old Forest	Forest ecosystems dominated by large, old trees; includes old Coniferous Woodlands and Broadleaf Woodlands.	OF:co	Old Forest
RI	Riparian	Treed or shrubby ecosystems associated with pond and lake shorelines (fringe), swamps, floodplains, or gullies with intermittent or permanent creeks.	RI:ff	Fluvial Fringe
			RI:sh	Shrub
			RI:fp	Floodplain
			RI:gu	Gully
			RI:ri	River
			RI:be	Beach
SS	Sagebrush Steppe	Shrub-steppe ecosystems dominated by big sagebrush.	SS:ss	Sagebrush Steppe
			SS:st	Steep Sagebrush Steppe
			SS:sh	Steep, Shallow-soiled Sagebrush Steppe
			SS:ds	Disturbed Sagebrush Steppe
SV	Sparsely Vegetated	Ecosystems with little vegetation occurring on bedrock or colluvial features.	SV:cl	Cliff
			SV:ro	Rock Outcrop
			SV:sh	Shrubby Rock Outcrop
			SV:ta	Talus Slope
WD	Coniferous Woodlands	Open stands of Douglas-fir or ponderosa pine, often on shallow soils, with typically grassy understories; old Coniferous Woodlands are part of the Old Forest category.	WD:co	Coniferous Woodlands
WN	Wetlands	Ecosystems where the water table is at or near the surface.	WN:ms	Marsh
			WN:sp	Swamp
			WN:sw	Shallow Open Water
			WN:wm	Wet Meadow

3 Results

Appendix I has a map legend with the current classification, biophysical classification and a brief description of the map unit.

Databases are structured according to TEM standards. All databases can be linked by the ECP tag.

The following file names are used informally to track periodic updates to any products. As of the writing of this report, the following names are in use:

tecp_sok_24May2006.csv contains the ecosystem database

tusr_sok_24May2006.csv contains the definitions of user-defined attributes

tuda_sok_24May2006.csv contains the user-defined attributes for each polygon (antelope-brush cover for each component, condition of each component of polygons with antelope-brush ecosystems, highest antelope-brush cover and average antelope-brush cover, BHP_RANGE (range condition from original biophysical mapping))

project_sok_24May2006.csv contains the project information

Non-standard databases:

sok_sei-tem-bph_24May2006.csv and sok_sei-tem-bph-all info_24May2006.csv contain the tem database information, SEI codes and the original biophysical mapping attributes.

As further updates are done, the date in the name should reflect the date of the most recent update.

Official file names in the TEM warehouse are as follows:

TEM_4484_ecp.e00 contains the spatial data for the polygon coverage

TEM_4484_mta.csv contains the project meta-data

TEM_4484_ecp.csv contains the ecosystem database

TEM_4484_usr.csv contains the definitions of user-defined attributes

TEM_4484_uda.csv contains the ECP tag and user-defined attributes for each polygon

4 Limitations

1. New linework from the 2005 updates may not be as accurate as the original linework. The orthophotos do not register well with the biophysical mapping, especially near the north – south edges of mapsheets. However, the accuracy of the original linework is also unknown as the digital capture of linework did not follow TEM standards.
2. Fire updates from 2003 fires (except Okanagan Mountain Park fire) assume that all trees were burned and all forests are structural stage 3 (shrub). There are likely areas that have retained significant forest structure.
3. The original mapping was generalized. Only a small portion of the polygons were re-mapped and any weaknesses present in the original mapping are still present in the updated mapping. Many polygons are very large and have more than three ecosystem components although only the largest three components were mapped.

5 Recommendations

1. Update structural stage in 2003 burns (except Okanagan Mountain Park fire) when post-fire imagery becomes available.
2. Field verify mapping and subzone boundaries and adjust as needed.
3. Consider refining mapping for important conservation features. The mapping is presently much broader than mapping in the central and north Okanagan Valley and has very large polygons. Some important features, particularly pocket wetlands are not well represented in the mapping (except for the upgraded Naramata area). Many polygons are so large that they contain more than three ecosystem components and only the largest three ecosystems are represented in the database. If this work is done, the new polygon boundaries should be captured using monorestitution as the orthophotos do not register well with the mapping in some places.
4. Evaluate the Anarchist mapping and correlate to other mapping.
5. Map the gaps in TEM coverage (private lots) in the TFL15 mapping.

6 References

Harper, W.L., E.C. Lea and R.E. Maxwell. 1996. Biophysical habitat mapping of the South Okanagan. Resource Inventory Branch, BC Environment, Victoria, B.C.

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Resources Inventory Committee (RIC). 2000b. Standard for Terrestrial Ecosystem Mapping (TEM) – Digital Data Capture in British Columbia, Version 3.0. Victoria, B.C.

Resources Inventory Committee (RIC). 1998. Standard for Terrestrial Ecosystem Mapping in British Columbia. Ecosystems Working Group, Terrestrial Ecosystem Task Force, Resources Inventory Committee. http://srmwww.gov.bc.ca/ecology/tem/manuals.html

7 Appendix I: Map Legend

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
Non-vegetated, Sparsely Vegetated, and Anthropogenic Units common to all subzones			
AK	OWa	Alkaline pond	A body of fresh water with a pH greater than 7 and less than 2m deep. Usually indicated by a white colour in the draw-down zone.
BE	BE	Beach	Beaches on large lakeshores.
CB CBw	BA (in part)	Cutbank	Cutbanks of large roads or other sites.
CF CFx CFy	CF PD PM	Cultivated field	Cultivated areas or irrigated fields. The modifier 'x' is used to distinguish sites formerly mapped as dry pastures (PD); the modifier 'y' is used to distinguish sites formerly mapped as moist pastures (PM).
CL CLbq CLbz CLq CLz	CLc and CLw, CMc and CMw	Cliff	Large steep, vertical or overhanging rock faces. The modifier 'b' is a non-standard modifier added to differentiate large cliffs (formerly mapped as CL) from moderate cliffs (formerly mapped as CM).
CN	CA	Canal	An artificial watercourse including canals and channelized rivers.
CO	CO	Cultivated Orchard	An agricultural area with fruit trees.
CV	CV	Cultivated vineyard	An agricultural area with grape vines.

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
ES ESk ESw	BA	Exposed soil	Areas of exposed soil with no vegetation. May be caused by natural erosion or human causes. Can occur on cool (ESk) or warm (ESw) aspects.
GB	GB	Gravel bar	Gravel bars along rivers.
GC	GC	Golf Course	Golf courses
GP	GP	Gravel pit	Gravel pit – areas exposed through the removal of sand and gravel.
LA	LA	Lake	Lakes – water bodies greater than 5ha in size and greater than 2m deep.
MI	MI	Mine	An area of exposed rock where minerals or other materials are extracted.
OW	OW	Shallow open water	Permanent shallow open water less than 2m deep with less than 10% cover of emergent plants.
PD	PD	Pond	Small body of water less than 5ha in size and more than 2m deep.
RE	SL	Reservoir	Man-made water bodies, including sewage lagoons.
RI	ST	River	An intermittent or permanent water-course formed when water flows between two continuous, definable banks.
RO ROk ROq ROr ROw ROz	RO & ROc &ROw (in part)	Rock outcrop	A bedrock escarpment or outcropping with little soil development and sparse vegetation cover. Many sites originally mapped as RO are now mapped as SA. Very short steep rock outcrops are mapped as ROq (cool aspect) and ROz (warm aspect) rather than cliffs.
RW	UR (in part)	Rural	An area where residences are scattered and intermingled with native vegetation or agricultural areas. Most areas mapped as rural were only mapped based on the remaining native vegetation in the biophysical mapping.

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
RZ /00	TC	Road surface	An area cleared and compacted for the purposes of vehicular travel. Secondary roads are now included as a component of the polygon where they cover more than 10% and there are not already three ecosystem components in the polygon.
TAk /00 TAw	TA	Talus	Accumulated angular rock fragments at the base of rock outcrops or cliffs.
UR /00	UR	Urban	Areas where residences or other human developments cover nearly all of the landscape.
		BGxh1	
AN /02 ANk ANn ANnw ANs ANsw ANw	AN, ANc, ANf, ANw, AE	Antelope-brush – Needle and thread grass	Occurs on level and gently undulating coarse-textured (sandy, and sandy gravely) glaciofluvial sites. This unit was not mapped on morainal or colluvial materials. Some areas with glaciofluvial materials have medium textured soils (sandy loam) or an aeolian cap (sandy loam); the soils on these sites allows for different vegetation development (mapped as SW). Can occur on cool aspects (ANk), fans (ANn, ANnw), warm aspects (ANnw, ANsw, ANw) and occasionally on shallow soils (ANsw). (Sometimes WA, WB, SW, WS biophysical map units were interpreted as AN in photo interpretation of antelope-brush units). Assumed modifiers: c, d, j
ASa ASg	ASg, ASp	At – common snowberry	Moist gullies (ASg) and floodplains (ASa) with trembling aspen and a shrubby understory. Occurs on morainal materials. Non-standard unit retained from biophysical mapping. Similar to AS unit described for IDFxh1. Assumed modifiers: d, j, m
BD	BD	Water birch – red-osier dogwood swamp	Swamps adjacent to streams or other wetlands. Non-standard unit retained from biophysical mapping. Assumed modifiers: d, j, m

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
BR	SB	Silverweed – Bulrush marsh	Marshes and wet meadows on lacustrine sites. Non-standard unit retained from biophysical mapping; code changed from SB to BR to avoid conflicts. Assumed modifiers: d, j, m
CD /07	CD	Cottonwood – Water birch	Active floodplain, coarse-textured fluvial soils. Cottonwood overstory with a shrubby understory. Assumed modifiers: a, c, d, j
CM	CB	Summer-cypress – bentgrass meadow	Pond edges with high water tables for much of the year; lacustrine soils. Non-standard unit retained from biophysical mapping; code changed from CB to CM to avoid conflicts. Variable vegetation sometimes dominated by non-native species. Assumed modifiers: d, j, m
CT	CT	Cattail Marsh	Marshes on lacustrine soils, typically dominated by cattails and bulrushes. Non-standard unit retained from biophysical habitat mapping. Assumed modifiers: d, j, m
DS DSg DSs	SP	Douglas-fir / Ponderosa pine – Snowberry – Spirea	Moisture receiving sites with Douglas-fir overstories and mixed snowberry and birch-leaved spirea understories. Terrain is generally morainal. Unit from the PPxh1. Assumed modifiers: d, j, m
HA	HA	Black Hawthorn Copse	Moist copses dominated by black hawthorn with other shrubs. Non-standard unit retained from biophysical habitat mapping. Assumed modifiers: d, j, m
OS	OS	Oregon grape – Saskatoon Gully	Moist shrubby gullies. Non-standard unit retained from biophysical habitat mapping. Assumed modifiers: d, j, m

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
PA /04 PAk PAkn PAks PAn PAs PAw	PA, PAf	Py – Antelope-brush – Red three-awn	Forested level and gently sloping sites with coarse glaciofluvial soils (sandy or sandy gravely). Open ponderosa pine overstories with mixed bunchgrass and antelope-brush understory. Most sites were historically AN with occasional trees; these sites are now dominated by encroached trees. Can occur on cool aspects (PAk, PAkn, PAks); they are particularly susceptible to encroachment. Can also occur on fans (PAkn, PAn), shallow soils (PAks, PAs), and warm aspects (PAw). Shallow soil sites likely always had trees historically. (Sometimes AN, PW, and YS biophysical map units were re-interpreted as PA in the photo interpretation for antelope-brush mapping.) Assumed modifiers: c, d, j
PR /06 PRg PRn	BS	Py – Nootka rose – Poison ivy	Moist ponderosa pine forests on morainal materials with some aspen or cottonwood and variable shrubby understories. Can occur in gullies (PRg) and on moist fans (PRn). Assumed modifiers: c, d, j
PS /05 PSn	YS	Py – Sumac	Slightly moister ponderosa pine forests on fans with sumac and scattered shrubs (PSn). Assumed modifiers: c, d, j
PT PTjs PTjv PTks PTkv PTm PTs	PF, PS	Ponderosa pine – Red three-awn	Dry forests on warm slopes. Open ponderosa pine overstory with bluebunch wheatgrass and selaginella dominated understory. Unit from the PPxh1. Assumed modifiers: c, d, w

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
PW PWc PWk PWks PWkv PWn PWs PWv PWw	PW, PWc, PWf	Py – Bluebunch wheatgrass	Forested sites on gently to moderately sloping medium-textured morainal materials. Open ponderosa pine forests with bunchgrasses and often with big sagebrush. Non-standard unit from biophysical mapping. Assumed modifiers: d, j, m
SAkv SArv SAv SAvw SAvz	RO, ROc, ROw (in part)	Antelope-brush – Selaginella	Rocky areas with scattered shrubs and bunchgrasses. Terrain is mapped as rock. Rock is generally fractured and stepped with vegetation growing in cracks and in shallow soils on ledges. Shrubs (saskatoon, mock orange, antelope-brush, choke cherry, big sagebrush) together with bunchgrasses and lichens dominate the pockets of vegetation. Non-standard unit from the IDFxh1. Antelope-brush is limited to its core range in this unit; the unit itself is widely distributed. Occurs on both aspects and on gently sloping sites. Assumed modifiers: j, m, s
SB SBk SBw	SS, RO, ROc, ROw (in part)	Selaginella – Bluebunch wheatgrass rock outcrop	Very shallow colluvial or weathered bedrock materials over bedrock. Bedrock is usually exposed in places but is low relief and lacking large fractures. Vegetation is dominated by selaginella with bluebunch wheatgrass and other bunchgrasses, mosses, and lichens, with scattered saskatoon. Some sites have moderate to high covers of big sagebrush or antelope-brush (structural stage 3). This is a non-standard unit from the PPxh1 and IDFxh1. (AN and WS biophysical units were sometimes reinterpreted as SB in the antelope-brush mapping.) Assumed modifiers: j, v

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
SN SNn SNt	SN	Big sagebrush – Needle-and-thread grass	Coarse glaciofluvial sites with sandy soils. Limited primarily to the Similkameen Valley where there is no antelope-brush. Similar site features to the AN unit. Grasses dominated by needle-and-thread grass with varying amounts of big sagebrush. Assumed modifiers: c, d, j
SOk SOw	SOc, SOw	Saskatoon – Mock orange talus	Colluvial talus slopes with more than 10% vegetation cover. Cover is usually dominated by shrubs such as mock orange, saskatoon, and choke cherry. Scattered ponderosa pine trees may occur. Some cliff ferns and bunchgrasses may occur in pockets. This is a non-standard unit from the PPxh1 and IDFxh1. Assumed modifiers: c, d
SW /01 SWc SWcn SWcw SWf SWk SWks SWs SWsw SWw	SWl, SWm, WBc, WBw	Big sagebrush – Bluebunch wheatgrass	Zonal and near zonal sites. Materials are typically morainal or medium-textured glacioufluvial (sandy loam) and often have an aeolian cap on them. Vegetation is a mixture of bunchgrasses with forbs and with big sagebrush (structural stage 3) or without big sagebrush (structural stage 2). Sites with coarse-textured soils tend to have less overall sand content than AN sites or sands are much finer; on such sites some 'AN' biophysical map units were re-interpreted as 'SW'. Assumed modifiers: d, j, m
WS /03 WSc WSck WScn WScw WSk WSn WSw	WSc, WSw	Bluebunch wheatgrass – Selaginella	Submesic areas usually with shallow sandy loam soils, mixed big sagebrush and antelopebrush and bunchgrasses (dominated by bluebunch wheatgrass) with selaginella. Soils are morainal, colluvial, or glaciofluvial. Due to site history (fire or other disturbance), some sites have few or no shrubs (structural stage 2). Soils tend to be shallower than in SWs and have some selaginella, which SWs is generally lacking. Assumed modifiers: j, m, s

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
		ESSFxc	
BS /09	SE	Bluejoint - Sedge	Sedge wetlands; usually on organic matierials. Assumed modifiers: d, j, p
FF /07	SG	Bl - Gooseberry - Foamflower	Moist receiving sites with medium-textured morainal soils. Assumed modifiers: d, j, m
FG /01 FGk FGs	FG, FGc	Bl - Grouseberry - Valerian	Mesic and near-mesic sites with medium-textured morainal soils. Assumed modifiers: d, j, m
LJ /02	n/a	Pl - Juniper - Lupine	Forested dry, warm slopes with shallow soils. Assumed modifiers: m, s, w
SP /04 $vk SPj SPk	VK, VKc, VKw	Big sagebrush – Pinegrass	Warm aspect grasslands dominated by the Vasey's subspecies of big sagebrush. Assumed modifiers: d, m, w
WP /03	WS	Bluebunch wheatgrass - Pasqueflower	Warm aspect grasslands on dry shallow soils Assumed modifiers: m, s, w
		IDFdk1	
AS /94	AS	At - Snowberry - Kentucky bluegrass	Moist basins with trembling aspen and a shrubby understory. Occurs on morainal materials, most often in grassland dominated areas. Assumed modifiers: d, j, m
CT	CT	Cattail marsh	Marshes on lacustrine soils, typically dominated by cattails or bulrushes. Non-standard unit retained from biophysical mapping. Assumed modifiers: d, j, m

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
DJ /03 DJkv DJv	IDFxh1 DW, PSc & MSxk DAs (where subzone has changed)	Fd - Juniper - Pinegrass	Dry, moderately open Douglas-fir forests with an understory dominated by pinegrass and kinnikinnick. Assumed modifiers: j, r, s
DW /02 DWjv DWkv DWs DWv	DYs (in part)	Fd - Snowberry - Bluebunch wheatgrass	Dry, open Douglas-fir forests with an understory dominated by bluebunch wheatgrass and common snowberry at climax. Assumed modifiers: d, m, w
DY /04 DYks DYs	DY	Fd - Pinegrass - Yarrow	Slightly drier than mesic Douglas-fir forests with a pinegrass understory. Generally occurs on morainal materials. Assumed modifiers: d, j, m
FW /91 FWk FWks	VK, VKc	Fescue - Bluebunch wheatgrass (Idaho fescue) ($vk Big sagebrush – Kentucky bluegrass seral association)	Grasslands dominated by a mixture of rough fescue and bluebunch wheatgrass at climax. Often mapped as a shrubby seral stage ($vk Big sagebrush – Kentucky bluegrass, structural stage 3) dominated by the *vaseyana* variety of big sagebrush with a seral understory dominated by Kentucky bluegrass. Assumed modifiers: d, j, m
LP /01 LPk LPks LPs	LP, LPc, LPs (in part), DT	FdPl - Pinegrass - Feathermoss	Mesic and near mesic forests on morainal materials. Dominated by Douglas-fir with some lodgepole pine at climax. The understory is dominated by pinegrass with feathermosses. Assumed modifiers: d, j, m
SG /05 SGg	SP	SxwFd - Gooseberry - Feathermoss	Moist forests with a mixed Douglas-fir – hybrid white spruce overstory, with scattered shrubs, pinegrass and forbs in the understory. Assumed modifiers: d, j, m

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
SH /06	n/a	Sxw – Horsetail	Spruce forests with a permanently high water table and an understory characterized by abundant horsetail. Not mapped in the biophysical mapping but appears to occur adjacent to some organic wetlands. Assumed modifier: d, j, m
SOk SOw	SOc, SOw	Saskatoon – Mock orange talus	Colluvial talus slopes with more than 10% vegetation cover. Cover is usually dominated by shrubs such as mock orange, saskatoon, and choke cherry. Scattered Douglas-fir trees may occur. Some cliff ferns and bunchgrasses may occur in pockets. This is a non-standard unit retained from the biophysical habitat mapping. Assumed modifiers: c, d
WJsw WJw	WSw, WAw, VKw	Bluebunch wheatgrass – Junegrass ($vk Big sagebrush – Kentucky bluegrass seral association)	Submesic grasslands on warm aspects. Dominated by bluebunch wheatgrass at climax (structural stage 2). Some seral sites are dominated by big sagebrush and Kentucky bluegrass ($vk; structural stage 3). Assumed modifiers: d, j, m
WS /07	SE	Willow – Sedge	Sedge (structural stage 2) dominated wetlands. Usually occurs on organic materials. Assumed modifiers: d, j, m
		IDFdm1	
CT	CT	Cattail marsh	Marshes on lacustrine soils, typically dominated by cattails or bulrushes. Non-standard unit retained from biophysical mapping. Assumed modifiers: d, j, m
DP /04 DPks DPkv DPs DPw	DTs	Fd - Pinegrass - Kinnikinnick	Dry Douglas-fir forests with a mixed pinegrass and kinnikinnick understory. Assumed modifiers: d, j, m

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
DT /01 DTk DTks DTs	DT, DTc	FdPl - Pinegrass - Twinflower	Mesic and near mesic sites. Climax forests are dominated by Douglas-fir with some lodgepole pine and have pinegrass dominated understories with kinnikinnick and twinflower. Assumed modifiers: d, j, m
DW /03 DWjv DWkv DWs DWv	PPd, PPs	Fd/Py – Bluebunch wheatgrass - Pinegrass	Open Douglas-fir – ponderosa pine forests on moderate to steep warm aspects with deep, medium-textured colluvial or morainal soils. Understories are typically dominated by bluebunch wheatgrass at climax. Assumed modifiers: d, m, w
SD /06 SDg	SD	SxwFd - Dogwood - Gooseberry	Moist forests with a hybrid white spruce overstory, and with red-osier dogwood and scattered shrubs and forbs in the understory. Assumed modifiers: d, j, m
SE	SE	Sedge wetland	Sedge wetlands on organic materials. Assumed modifiers: d, j, p
SH /07	SD (in part)	Sxw - Horsetail	Spruce forests with a permanently high water table and an understory characterized by red-osier dogwood and abundant horsetail. Not mapped in the biophysical mapping but appears to occur adjacent to some organic wetlands. Assumed modifiers: d, j, m
SOk SOw	SOc, SOw	Saskatoon – Mock orange talus	Colluvial talus slopes with more than 10% vegetation cover. Cover is usually dominated by shrubs such as mock orange, saskatoon, and choke cherry. Scattered Douglas-fir trees may occur. Some cliff ferns and bunchgrasses may occur in pockets. This is a non-standard unit retained from the biophysical habitat mapping. Assumed modifiers: c, d

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
SP /05	SD (in part)	FdLw - Spruce - Pinegrass	Slightly moister forests with a mixed Douglas-fir – hybrid white spruce – Western larch – lodgepole pine overstory, with scattered shrubs, abundant pinegrass, and scattered forbs in the understory. Assumed modifiers: d, j, m
WJ /02 WJk WJks WJs	SS, WSc, WSw	Bluebunch wheatgrass - Junegrass	Submesic grasslands on warm aspects. Dominated by bluebunch wheatgrass at climax. Some of these grasslands may be fescue dominated at climax on cool aspects and level sites – may need to be split and may be split in new classification. Assumed modifiers: d, m , w
		IDFxh1	
AS ASg	AS	At – Common snowberry – Kentucky bluegrass	Moist gullies (ASg) and basins (AS) with trembling aspen and a shrubby understory. Occurs on morainal materials and is most common in grassland dominated areas. Assumed modifiers: d, j, m
BD	BD	Water birch - red-osier dogwood swamp	Shrubby swamps dominated by water birch, red-osier dogwood, mountain alder and poison ivy. Occurs on active floodplains with imperfectly to poorly drained soils. Assumed modifiers: d, j, m
BM	SB	Bulrush Marsh	Bulrush dominated marshes associated with ponds and shallow open water. Old SB unit may be broader, this may actually include what is now BR and BM. Assumed modifiers: d, j, m
BN /96 BNc	n/a	Kentucky bluegrass – Stiff needlegrass	A moist grassland ecosystem found on deep, medium-textured soils, in small swales and depressions where moisture collects. Most sites are seral and are dominated by Kentucky bluegrass with a diverse mixture of forbs. Assumed modifiers: d, j, m
CD	CD	Act – Fd – Common Snowberry – Red-osier Dogwood Riparian	Black cottonwood ecosystem commonly associated with active floodplains and fluvial terraces with subsurface water flow. It has a shrub-dominated understory. Assumed modifiers: a, d, j, m

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
CT	CT	Cattail Marsh	Marshes on lacustrine soils, typically dominated by cattails or bulrushes. Non-standard unit retained from biophysical mapping. Assumed modifiers: d, j, m
DP /01 DPf DPk DPks DPn DPs	DP, DPc, DPf	Fd / Py – Pinegrass	Mesic and near-mesic sites on medium-textured morainal materials. Climax forests are dominated by a mixture of Douglas-fir and ponderosa pine with a pinegrass dominated understory. Assumed modifiers: d, j, m
DS /07 DSg DSk DSn DSs DSw	SP (in part)	Fd / Py – Snowberry – Spirea	Slightly moist forests on medium-textured morainal soils. Climax forests are dominated by Douglas-fir with a shrubby understory of common snowberry and birch-leaved spirea. Assumed modifiers: d, m, j
DW /03 DWc DWjs DWjv DWks DWkv DWrs DWs DWv	DW, PS, PSc, PSw (in part)	Fd / Py – Bluebunch wheatgrass - Pinegrass	Open Douglas-fir – ponderosa pine forests on moderate to steep warm aspects with deep, medium-textured colluvial or morainal soils. Understories are typically dominated by bluebunch wheatgrass with scattered forbs and shrubs at climax. Assumed modifiers: d, m, w

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
FW /91 FWc FWk FWks FWn FWs FWw	FW, VKc, WAc, WJ	Idaho fescue – Bluebunch wheatgrass ($vk Big sagebrush – Kentucky bluegrass seral association)	Level and cool aspect grasslands usually on materials with an aeolian cap. Dominated by Idaho fescue and a diverse community of forbs at climax. Most sites are seral and may be dominated by Bluebunch wheatgrass, junegrass, Sandberg's bluegrass, cheatgrass or other seral species. May be dominated by big sagebrush and Kentucky bluegrass ($vk). Assumed modifiers: d, j, m
PB /02 PBjv PBkv PBqv PBrv PBv	PS, PSw (in part)	Fd / Py – Bluebunch wheatgrass – Balsamroot	Open Douglas-fir – ponderosa pine forests on shallow or very shallow morainal or colluvial soils on steep warm aspects. Understories have scattered shrubs such as saskatoon and mock orange with bunchgrasses, selaginella, and lichens. Assumed modifiers: m, s, w
SAkv SArv SAv SAvw	RO, ROc, ROw (in part)	Antelope-brush – Selaginella	Rocky areas with scattered shrubs and bunchgrasses. Terrain is mapped as rock. Bedrock is generally fractured and stepped with vegetation growing in cracks and in shallow soils on ledges. Shrubs (saskatoon, mock orange, antelope-brush, choke cherry, big sagebrush) together with bunchgrasses and lichens dominate the pockets of vegetation. Antelope-brush is limited to its core range in this unit; the unit itself is widely distributed. Assumed modifiers: j, m, s
SB SBk SBr SBw	SS, RO, ROc, ROw (in part)	Selaginella – Bluebunch wheatgrass rock outcrop	Very shallow colluvial or weathered bedrock materials over bedrock. Bedrock is usually exposed in places. It is low relief and lacking large fractures. Vegetation is dominated by selaginella with bluebunch wheatgrass and other bunchgrasses, mosses, and lichens with scattered saskatoon. Assumed modifiers: j, v

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
SD /08 SDa SDg SDk	BS, SP (in part)	Sxw – Fd – Douglas maple – Dogwood	Moist forests often occurring in gullies, adjacent to streams and rivers, and around ponds and lakes. Has a mixed overstory that has Douglas-fir and may have hybrid white spruce, paper birch, and sometimes black cottonwood. The understory is shrubby and has red-osier dogwood, Douglas maple, snowberry and other species. Assumed modifiers: d, j, m
SM	SE	Sedge marsh	Marshes dominated by sedges such as beaked sedge and water sedge. Fluctuating water tables; generally inundated for part of the year. Assumed modifiers: d, j, m
SOk SOw	SOc, SOw	Saskatoon – Mock orange talus	Colluvial talus slopes with more than 10% vegetation cover. Cover is usually dominated by shrubs such as mock orange, saskatoon, and choke cherry. Scattered Douglas-fir or ponderosa pine trees may occur. Some cliff ferns and bunchgrasses may occur in pockets. Assumed modifiers: c, d
SP /04 SPk SPks SPkv SPn SPs SPw	PS and PSc (in part)	Douglas-fir / Ponderosa pine – Snowbrush - Pinegrass	Slightly drier than average Douglas-fir forests on slightly warm aspects or cool aspects with shallow soils. Sites usually have medium-textured morainal soils. Understories have a mixture of bunchgrasses and pinegrass. Assumed modifiers: d, j, m
WB /93 WBc WBcn WBks WBs	FWks, WAw, VKw, WSw	Bluebunch wheatgrass – Balsamroot	Grassland ecosystem commonly occurring on moderately steep to steep warm aspects with deep, medium-textured morainal or glaciofluvial soils with an aeolian cap. Dominated by bluebunch wheatgrass with balsamroot, other forbs, and lichens at climax. Assumed modifiers: d, m, w

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
YS YSn	YS	Ponderosa pine - saskatoon fan	Open ponderosa pine forest with saskatoon, bluebunch wheatgrass, compact selaginella and some sumach, squaw currant, Sandberg's bluegrass, and timber milk-vetch. Occurs on fans with dry surfaces and subsurface moisture. Assumed modifiers: c, n
		MSdm1	
PGsw /03 PGvw	PPs	Pl - Grouseberry - Cladonia	Dry forests, often on glaciofluvial soils. Lodgepole pine overstory with kinnikinnick and grouseberry and lichens in the understory. Assumed modifiers: d, j, m
PPs /04	DTs	Pl - Pinegrass - Kinnikinnick	Submesic sites, usually morainal. Lodgepole pine overstory with pinegrass, grouseberry, and twinflower in the understory. Assumed modifiers: d, j, m
SF /01 SFk SFs	DT, DTc	Sxw - Falsebox - Feathermoss	Mesic and near mesic sites, usually on morainal soils. Mixed lodgepole pine, subalpine fir, and hybrid white spruce overstory at climax. Understory with falsebox, scattered other shrubs, pinegrass, grouseberry, and abundant feathermosses. Assumed modifiers: d, j, m
SG /06 SGg	SD	Sxw - Gooseberry	Subhygric sites, usually on morainal soils. Mixed lodgepole pine, subalpine fir, and hybrid white spruce overstory at climax. Understory with black gooseberry and scattered forbs. Assumed modifiers: d, j, m
WS /09	SE	Willow - sedge	Sedge wetlands. Assumed modifiers: d, j, p
		MSxk	
DA /05 DAs	DAd	FdPl - Pinegrass - Arnica	Douglas-fir forests on warm aspect submesic sites. At climax have a Douglas-fir canopy with pinegrass and heart-leaved arnica dominated understory. Assumed modifiers: d, m, w

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
DJ /02	DAs	Fd - Juniper - Grouseberry	Dry forests on warm aspects with shallow soils. Often occurs on colluvial materials. At climax, have open Douglas-fir – lodgepole pine canopy with common juniper, pinegrass, kinnikinnick, and lichens in the understory. Assumed modifiers: m, s, w
LL /01 LLk LLs	LL, LLc, LLs	Pl - Pinegrass - Lupine	Mesic and near mesic forested sites. Dominated by lodgepole pine, pinegrass, grouseberry and feathermosses. Assumed modifiers: d, j, m
VPk /04 VPw	VK, VKw	Vasey's big sagebrush - Pinegrass	Submesic grasslands on warm aspects. Dominated by big sagebrush, fescues, pinegrass and forbs. Assumed modifiers: d, j, m
WJw /03	WSw	Bluebunch wheatgrass - Junegrass	Submesic grasslands on warm aspects. Dominated by bluebunch wheatgrass at climax. Assumed modifiers: d, j, m
		PPxh1	
AN /02 ANk ANks ANn ANs ANsw ANv ANw	AN, ANc, ANw	Antelope-brush – Needle and thread grass	Occurs on level and gently undulating coarse-textured (sandy, and sandy gravely) glaciofluvial sites at lower elevations of the PPxh1. This unit was not mapped on morainal or colluvial materials. Non-standard unit from the BGxh1. Assumed modifiers: c, d, j
AS ASa ASg	ASg, ASp	Trembling aspen – Common snowberry – Kentucky bluegrass	Moist gullies (ASg) and basins (AS) with trembling aspen overstory and a shrubby understory. Occurs on morainal materials. Non-standard unit retained from biophysical mapping. Assumed modifiers: d, j, m

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
BD	BD	Water birch – red-osier dogwood swamp	Swamps adjacent to streams, lake edges or other wetlands. Non-standard unit retained from biophysical mapping. Assumed modifiers: d, j, m
BR	SB	Silverweed – Bulrush marsh	Marshes and wet meadows on lacustrine materials. Non-standard unit retained from biophysical mapping; code changed from BR to SB to avoid conflicts. Assumed modifiers: d, f, j
CD /00 CDt	CD	Ponderosa pine - Black cottonwood – Snowberry riparian	Active floodplains, coarse-textured fluvial soils. Cottonwood overstory, sometimes with ponderosa pine, and with a shrubby understory. Code originally mapped as PA during upgrade; TEM codes changed Jan. 2006 to 'CD' for this unit.
CT	CT	Cattail Marsh	Marshes on lacustrine soils, typically dominated by cattails. Assumed modifiers: d, j, m
DM /08 DMa DMg DMk	BS, SP (in part)	Douglas-fir – Water birch – Douglas maple	Moist gullies (DMg) or riparian fringes (DM), often with permanent or intermittent streams, usually with mixed Douglas-fir and paper birch overstories and rich, shrubby understories. Materials are generally morainal or fluvial. Assumed modifiers: d, j, m
DS /07 DSg DSk DSks DSn DSs DSw	SP (in part), YS	Douglas-fir / Ponderosa pine – Snowberry – Spirea	Moisture receiving sites with Douglas-fir overstories and mixed snowberry and spirea understories. Terrain is generally morainal. The old YS code is equivalent to DSn. Assumed modifiers: d, j, m

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
FB FBc FBcn FBk FBkn FBks FBs	WAc, WF, WJ, WSc	Fescue – Bluebunch wheatgrass	Grasslands on gentle and cool aspects with medium-textured soils (and occasionally on sandy soils). Dominated by Idaho fescue and bluebunch wheatgrass at climax. Assumed modifiers: d, j, m
PA PAk PAks PAn PAs PAt PAw	PA, PAf	Ponderosa pine – Antelope-brush – Red three-awn	Mapped on level and gentle with coarse glaciofluvial soils (sandy or sandy gravely) at lower elevations of the PPxh1. Open ponderosa pine overstories with mixed bunchgrass and antelope-brush understory. Most sites were historically AN with occasional trees; these sites are now dominated by encroached trees. Can occur on cool aspects (PAk); they are particularly susceptible to encroachment. Can also occur on fans (PAn), and shallow soils (PAs). Non-standard unit from BGxh1; code originally mapped as AP during upgrade to avoid conflict; TEM codes changed Jan. 2006 to 'PA'.
PC /04 PCc PCk PCks PCkv PCn PCs PCsw PCw	PF, PS	Ponderosa pine – Bluebunch wheatgrass – Cheatgrass	Submesic sites, often on slightly warmer or drier sites. Sites are not as steep or shallow-soiled as PT /02. Terrain is generally morainal or colluvial. Open ponderosa pine overstory with bluebunch wheatgrass dominated understory (at climax). Assumed modifiers: d, j, m
PF /05 PFck PFk PFks PFn	PSc (in part), PWc	Ponderosa pine – Bluebunch wheatgrass – Rough fescue	Cool aspect ponderosa pine forests with mixed bluebunch wheatgrass and fescue understory (at climax). Terrain is generally morainal or colluvial. Assumed modifiers: d, j, m

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
PT /02 PTjv PTks PTkv PTrv PTqs PTrv PTs PTv	PS, PSc, (in part), PSw	Ponderosa pine – Red three-awn	Dry, open ponderosa pine forests on steep warm aspects. Frequently occurs on shallow (PTks, PTs) or very shallow colluvial or morainal materials (PTjv, PTkv, PTrv, PTv). Occasionally occurs on slightly cool aspects with shallow or very shallow soils (PTks, PTkv). Assumed modifiers: c, d, w
PW /01 PWc PWcn PWk PWn PWs	PW, PA (in part), PS (in part)	Ponderosa pine – Bluebunch wheatgrass – Idaho fescue	Mesic and near-mesic ponderosa pine forests on medium-textured soils and level or gently sloping sites. At climax, understories are dominated by a mixture of bluebunch wheatgrass and Idaho fescue. Terrain is generally morainal or glaciofluvial. Assumed modifiers: d, j, m
SA SAkv SAqv SArv SAv SAvw SAvz	RO, ROc, ROw (in part)	Antelope-brush – Selaginella	Rocky areas with scattered shrubs and bunchgrasses. Terrain is mapped as rock. Bedrock is generally fractured and stepped with vegetation growing in cracks and in shallow soils on ledges. Shrubs (saskatoon, mock orange, antelope-brush, choke cherry, big sagebrush) together with bunchgrasses and lichens dominate the pockets of vegetation. Non-standard unit from the IDFxh1. Antelope-brush is limited to its core range in this unit; the unit itself is widely distributed. Assumed modifiers: j, m, s
SB /00 SBk SBr SBw	SS (in part), RO, ROc, ROw (in part)	Selaginella – Bluebunch wheatgrass rock outcrop	Very shallow colluvial or weathered bedrock materials over bedrock. Bedrock is usually exposed in places. It is low relief and lacking large fractures. Vegetation is dominated by selaginella with bluebunch wheatgrass and other bunchgrasses, mosses, and lichens with scattered saskatoon. Some sites have moderate to high covers of big sagebrush or antelope-brush (structural stage 3). Assumed modifiers: j, v

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
SOk SOw	SOc, SOk	Saskatoon – Mock orange talus	Colluvial talus slopes with more than 10% vegetation cover. Cover is usually dominated by shrubs such as mock orange, saskatoon, and choke cherry. Scattered ponderosa pine trees may occur. Some cliff ferns and bunchgrasses may occur in pockets. Assumed modifiers: c, d
SP /06 SPc SPg SPk SPs SPsw SPt	SP (in part)	Douglas-fir / Ponderosa pine – Snowberry - Pinegrass	Slightly moister or sheltered sites with mixed Douglas-fir and ponderosa pine overstories and an understory with pinegrass and some shrubs including snowberry. Assumed modifiers: d, j, m
SW /03 SWc SWcn SWf SWk SWks SWs SWsw SWw	SN, SNf, SS (in part), SWl, SWm	Big sagebrush – Bluebunch wheatgrass	Drier submesic to subxeric sites. Terrain is typically morainal or medium-textured glaciofluvial (sandy loam) and often has an aeolian cap. Vegetation is a mixture of bunchgrasses with forbs and big sagebrush. May occur on slightly coarse-textured soils (SWc), cool aspects (SWk, SWks), shallow soils (generally 50-100cm deep; SWks, SWs, and SWsw), and warm aspects (SWsw and SWw). Assumed modifiers: d, j, m

Code /Site Series	Biophysical Map Unit	Name	Description & Mapping Notes
WB WBcj WBcn WBcs WBf WBj WBjn WBjs WBs	WAc, WAw, WF, WFf, WJ, WSc, WSw	Bluebunch wheatgrass – Balsamroot	Warm aspect grasslands. Generally morainal materials with aeolian caps. Climax sites dominated by bluebunch wheatgrass with balsamroot, other forbs, and various lichens. Also occurs on coarse textured soils (WBc, WBcn) which have less vegetation cover, and fewer forbs and lichens. Assumed modifiers: d, m, w