

## **APPENDIX H: Baseline Vegetation Inventory**

### **Summary Tables, Appendices, and Plates (Electronic Only)**

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**BASELINE VEGETATION INVENTORY**  
**BLACK BUTTE PROJECT**  
**MEAGHER COUNTY, MONTANA**

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September 2015

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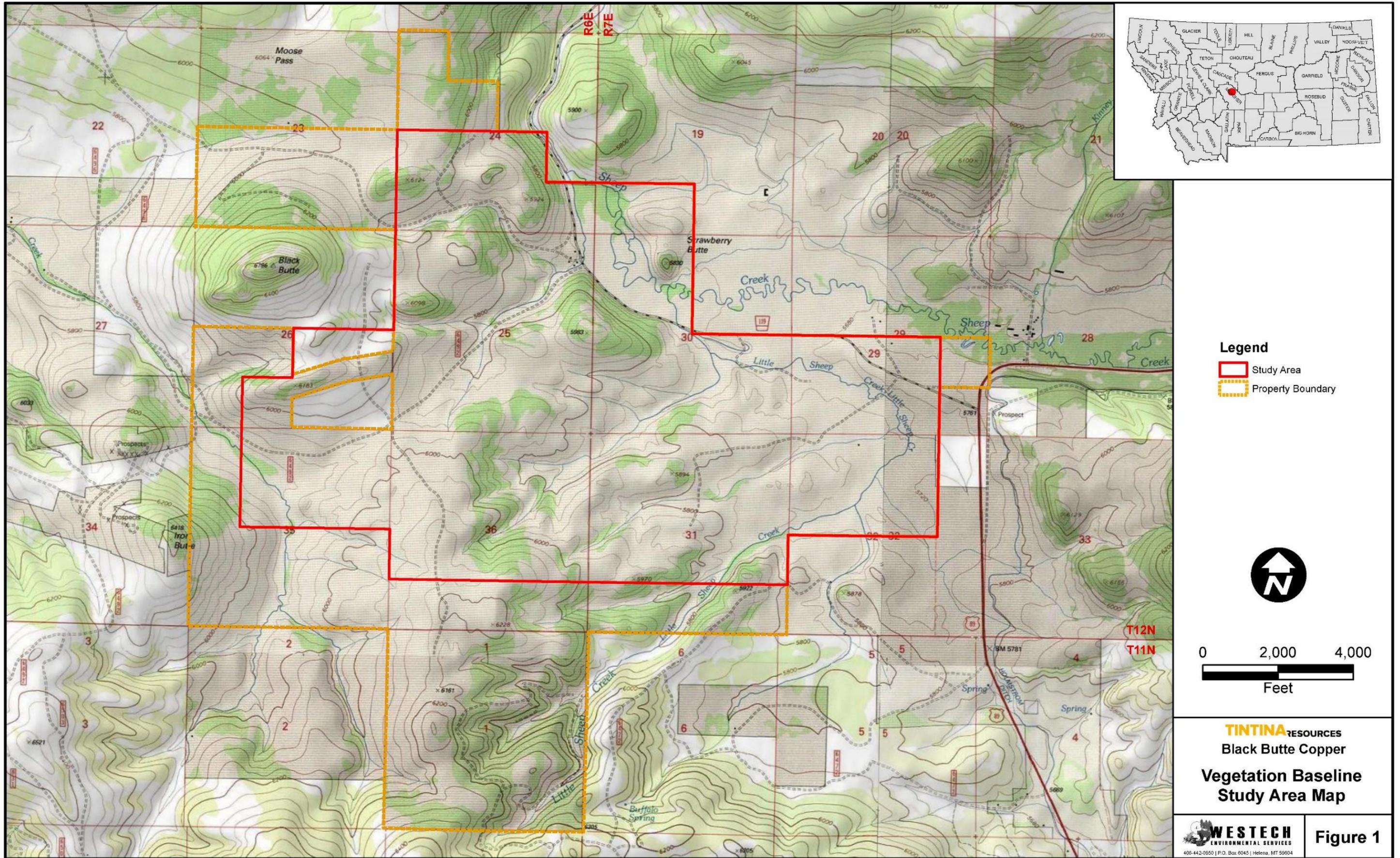
## 1.0 INTRODUCTION

Tintina Resources contracted WESTECH Environmental Services, Inc. (WESTECH) to conduct a baseline vegetation inventory of their Black Butte Copper Project area approximately 16 miles north of White Sulphur Springs, Montana in north-central Meagher County (Figure 1). The vegetation baseline was also designed to provide portions of a land use analysis of the study area, in particular to assess vegetation components of hay cropland and grazing lands. The study area (Figure 1) is located in all or portions of Sections 24-26, 35 and 36 in T12N, R6E and Sections 19 and 29-32 in T12N, R7E, comprising pertinent portions of Tintina's current surface and mineral leases. The vegetation baseline study area comprised 3367 acres (5.3 square miles). The vegetation baseline was designed to address current and potential environmental concerns related to vegetation resources of the project area. This inventory will be used to assist mine permitting and reclamation planning in accordance with the laws and regulations administered by MDEQ's Hard Rock Section.

The study area climate is continental, having cold winters and warm summers with a growing season extending from Mid-May to late-September in most years.

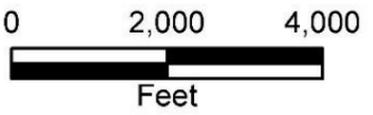
In 2015, quantitative sampling was conducted in or near areas potentially affected by proposed mining operations (Figure 1 and Plate 1). The 2015 field inventory was conducted May 27 and June 12 (spring flora), and July 13-20 (quantitative vegetation inventory). Vegetation data obtained during the 2014 baseline wetlands inventory were also selectively incorporated into this vegetation baseline report.

Field investigators for the baseline vegetation inventory were Ken Scow, Drake Barton, Steve Cooper, Ed Darfler and Joe Elliott. Field work for the baseline wetlands/waters of the U.S. inventory was led by John Beaver, with the hydrophytic vegetation data also collected by Ken Scow, Drake Barton, Steve Cooper, Lisa Larsen, Ed Darfler and Dean Culwell, and GPS data recorded by John Beaver, Dan Culwell and Dave Hagen. Vegetation data analysis and report preparation were conducted by Ken Scow and Nancy Horn, with computer graphics by Dan Culwell.



**Legend**

- Study Area
- Property Boundary



**TINTINA** RESOURCES  
 Black Butte Copper  
**Vegetation Baseline  
 Study Area Map**



**Figure 1**

## 2.0 METHODS

### 2.1 MAPPING/VEGETATION TYPE DELINEATION

Vegetation resources of the intensive study area were preliminarily office-mapped to the level of vegetation physiognomic type by interpretation of color ortho-photos (1 inch = 500 feet scale). Vegetation type designations were based on a combination of dominant plant species, topographic features and disturbance/management history. The preliminary mapping was checked in the field by pedestrian and vehicular surveys, later verified by analysis of quantitative data, and modified as necessary. Derivation of the vegetation classification for the study area is explained in Section 3.1 of this report.

### 2.2 SAMPLE LOCATION AND SAMPLE SIZE

The preliminary vegetation map indicated the general delineation and distribution of physiognomic types and subtypes in the study area. A 100-foot grid was overlaid on the study area map to select sample sites using a stratified random procedure based on projected sample size for each physiognomic type and subtype. To ensure an even (yet stratified random) distribution of sample plots throughout narrow portions of Drainage Bottom mapping units, plot sites were sometimes selected where grid lines intersect drainage bottoms because grid points often do not fall within these narrow units. Sample sites were located in the field using the aerial photo-map and a hand-held GPS unit. Sample sites are shown on Plate 1.

Sample size varied by physiognomic type according to the variability and relative areal extent of each type, with more extensive types receiving proportionately more plots. In addition, certain vegetation types received preferential sampling, particularly wetland and riparian types. Sample size and distribution were based on professional judgment, with the intent of the baseline study to quantitatively characterize vegetation ecology within the study area and show variability within the availability of sample sites.

Sampling intensity among vegetation types was adjusted following pedestrian surveys and mapping refinements to allow a more confident prediction of satisfactory sample sizes and plot distribution.

### 2.3 QUANTITATIVE INVENTORY

Sampling of vegetation physiognomic types was conducted as described below for each component. Quantitative data were collected for the vegetation baseline inventory during the 2015 growing season on July 13-20.

Plot dimensions at each sample site are listed below for each principal sample parameter:

- 1) estimation of canopy cover was made on a 0.01-acre circular plot centered on each randomly selected point;
- 2) shrub density was determined by recording all live individuals by species and health class in a 2 x 20-meter belt transect centered on each point;

- 3) tree density was estimated by recording all live individuals by species and diameter at breast height (dbh) class in a 0.1-acre circular plot centered on each point.

A color photograph (oblique) was taken at each sample site.

### **2.3.1 Canopy Cover**

On each sample field form, location was recorded along with date, personnel, percent slope, aspect, topography and slope configuration. Each non-forested upland plot was also identified as to its occurrence in either a grassland (less than approximately 10 to 15 percent shrub cover) or shrub/grassland stand. The 10 to 15 percent shrub cover threshold was determined for the overall mapping unit in which the cover plot was located and did not necessarily reflect the shrub cover value estimated for the plot itself. The reason for this distinction in the field is that, for example, a grassland site may contain widely scattered shrubs or small clumps of shrubs, and a randomly located sample plot may happen to fall in such a site; although substantial shrub cover may be recorded for the plot, it should be shown to occur in a grassland mapping unit, and the data should be tabulated accordingly. Conversely, a random plot may fall in a relatively small opening with sparse shrub density in a stand otherwise clearly dominated by shrubs; although the plot may show scant shrub cover, it should be mapped in a shrub/grassland mapping unit and the data treated accordingly. With sufficient sample size, the natural range in variation of canopy cover can be properly recorded and compared between the two physiognomic types. Similarly, each drainage bottom plot was identified as to its occurrence in a specific physiognomic type/subtype determined by the overall map unit setting in which it was located.

In each 0.01-acre cover plot (11.8-foot radius), an ocular estimate was made of percent cover for ground cover classes, including bare ground, rock, litter, lichens, moss and basal vegetation to total 100 percent. Nonstratified canopy cover was estimated to the nearest percent in each plot for total live vascular plant cover, for each morphological (or functional) class category (tree, shrub, perennial graminoid, annual graminoid, perennial forb and annual/biennial forb), and for each vascular plant species. Ocular estimates of tree cover were made by walking around the plot and estimating the extent of tree canopy extending within a vertical projection of the plot perimeter.

Cover data are tabulated in the report by plot (Appendix B), and summarized by both community type and physiognomic type (Section 5.0). Using these data, stratified cover values and relative cover values were generated in the office to evaluate composition and diversity.

### **2.3.2 Productivity**

Predicted average yield data for grazing lands and croplands in the study area were obtained from the *Meagher County Soil Survey* (USDA Natural Resources Conservation Service (NRCS) website), and other NRCS and USFS publications. Yield data were directly correlated with ecological site and soils information derived from these sources and the Black Butte baseline soils inventory.

### **2.3.3 Shrub Density**

Densities were determined for each shrub species by counting the number of live individuals rooted within a 2 x 20-meter belt transect centered on each sample point. Individuals were recorded as healthy (immature to mature) or decadent. Belt transects were aligned along the contour on slopes; on drainage bottoms, belt transects were aligned with the general direction of the drainage.

### **2.3.4 Tree Density**

Tree density was recorded in a 0.1-acre circular plot (37.2-foot radius) centered on each sample point. Live trees greater than 6 inches tall were counted in each plot by species for the following diameter-at-breast-height (dbh) classes: less than 1-inch dbh, 1 to 4-inch dbh, 4 to 8-inch dbh, 8 to 12-inch dbh, 12 to 16-inch dbh, *etc.* For trees forking less than 4.5 feet above the base (ground level), the dbh of each stem was measured at 3.5 feet above the first indication of the fork (Avery 1967). The 0.1-acre plot and belt transect perimeters were measured with a fiberglass tape and marked with pin-flags prior to inventory.

### **2.3.5 Species Composition and Diversity**

Species composition, origin, utility, seasonality and diversity parameters are inherently determined for each vegetation type using cover data. Species diversity was evaluated by determining the average number of vascular plant species per 0.01-acre plot in each community and physiognomic type. Species nomenclature and functional groups follow the recently published *Manual of Montana Vascular Plants* (Lesica 2012).

### **2.3.6 Species List/Sensitive Plants/Noxious Weeds**

All vascular plant species encountered in the study area were recorded and a comprehensive list was compiled. This involved seasonal investigations between August 14 and September 4, 2014 (wetlands field inventories), and between May 27 and July 20, 2015 (vegetation baseline field inventories), including quantitative sampling, and qualitative and mapping surveys. Particular attention was given to the search for sensitive plant species, including taxa currently listed as rare, threatened or endangered by the Montana Natural Heritage Program (MTNHP), new Montana records, and taxa which may represent significant extensions of distribution records.

Taxa not readily identified in the field were collected and identified in the laboratory using a stereozoom binocular scope and taxonomic references including (but not limited to) Lesica (2012), Flora of North America Editorial Committee (1993+), Hitchcock *et al.* (1955-1969), Hitchcock and Cronquist (1973), Dorn (1984), Great Plains Flora Association (1986), Cronquist *et al.* (1972-2012), Gleason and Cronquist (1991) and Holmgren (1998). Nomenclature of vascular plant species in this report follows Lesica (2012).

Noxious weeds listed by the Montana County Weed Control Act were qualitatively assessed for distribution and abundance, as well as quantitatively sampled on cover estimation plots.

### **2.3.7 Productivity and Utility Evaluation**

Ecological sites were identified and mapped (Plate 2) using baseline soils inventory data along with any available Natural Resource Conservation Service soil survey information for Meagher County. Predicted potential productivity and carrying capacity of grazing land were then determined using NRCS technical guides, based on computer-generated study area acreages.

### **2.3.8 Delineation of Hydrophytic Vegetation**

Sites within the study area supporting hydrophytic vegetation were sampled during the wetlands baseline inventory, and were subsequently delineated on the baseline vegetation map with minor modifications. These data were used to assist in completing (in conjunction with assessments of hydric soils and wetland hydrology) the baseline wetlands inventory and delineation for the study area, a more detailed examination and sub-meter (GPS) delineation of wetland vegetation community types. Wetlands mapping is presented in a separate baseline wetlands report for the Black Butte inventory area.

## 3.0 RESULTS

### 3.1 VEGETATION CLASSIFICATION

The Black Butte vegetation classification was based on published classifications of vegetation types that have been developed statewide for Montana, with modifications to reflect community types induced by sustained livestock grazing. Grassland and Shrubland habitat types were identified following Mueggler and Stewart (1980), Forest habitat types follow Pfister *et al.* (1977), and Wetland/ Riparian types follow Hansen *et al.* (1995), with minor modifications based on comparisons with various western Montana and regional baseline inventories conducted during the past 40+ years in the region. Many of the studies reviewed to develop the Black Butte classification were summarized and synthesized in Culwell *et al.* (1987); these and more recent studies pertinent to the Black Butte region are listed in Appendix G.

Table 1 (Section 5.0) lists habitat types and community types for each physiognomic type sampled in the Black Butte baseline study area in 2014-2015. Vegetation types were mapped (Plate 1) by physiognomic type or series according to dominant species identified in the dichotomous classifications listed above.

Habitat types and vegetation community types are normally named for dominant, codominant and occasionally subdominant plant species, the two classification systems distinguished by recognition of species perceived to be the ecologically successional climax for a site (habitat types), or the species currently dominating a site (community types). These species, the most conspicuous in the Black Butte study area, are discussed in the following narrative by scientific name (binomial) and are listed below with common names. A complete list of all vascular plant species recorded in the Black Butte baseline study area is given in Appendix A.

There were four native Grassland habitat types identified in two series including the *Festuca idahoensis* (Idaho fescue) and *Festuca campestris* (rough fescue) series (Table 1). An Upland Altered Grassland community type was also identified, dominated by non-native perennial grasses *Poa pratensis* (Kentucky bluegrass) and *Phleum pratense* (common timothy).

Six Upland Shrubland types were sampled, dominated by *Artemisia tridentata* (big sagebrush) or *Dasiphora fruticosa* (shrubby cinquefoil). Understories were dominated or distinguished variously by *Festuca idahoensis*, *Festuca campestris*, and *Poa pratensis*.

Of seven Conifer Forest and Woodland habitat types identified, six were in the *Pseudotsuga menziesii* (Douglas-fir) series, and one in the *Picea engelmannii* (Engelmann spruce) series. Understories were distinguished by *Festuca idahoensis*, *Festuca campestris*, *Juniperus communis* (common juniper), *Calamagrostis rubescens* (pinegrass), *Symphoricarpos albus* (common snowberry), and *Linnaea borealis* (twinflower).

A Lowland Altered Grassland or Hay Meadow type was sampled at 16 sites, primarily on the Sheep Creek floodplain.

## Dominant Plant Species in the Black Butte Baseline Study Area

BINOMIAL	COMMON NAME
<b>GRASSES and SEDGES</b>	
<i>Agropyron spicatum</i>	Bluebunch wheatgrass
<i>Agropyron trachycaulum</i>	Slender wheatgrass
<i>Agrostis stolonifera</i>	Redtop
<i>Alopecurus arundinaceus</i>	Creeping meadow foxtail
<i>Bromus carinatus</i>	Mountain brome
<i>Bromus inermis</i>	Smooth brome
<i>Calamagrostis canadensis</i>	Bluejoint reedgrass
<i>Calamagrostis rubescens</i>	Pinegrass
<i>Calamagrostis stricta</i>	Northern reedgrass
<i>Carex aquatilis</i>	Water sedge
<i>Carex filifolia</i>	Threadleaf sedge
<i>Carex geyeri</i>	Elk sedge
<i>Carex nebrascensis</i>	Nebraska sedge
<i>Carex pellita</i>	Woolly sedge
<i>Carex praegracilis</i>	Clustered field sedge
<i>Carex rossii</i>	Ross sedge
<i>Carex simulata</i>	Short-beaked sedge
<i>Carex utriculata</i>	Southern beaked sedge
<i>Danthonia intermedia</i>	Timber oatgrass
<i>Danthonia unispicata</i>	One-spike oatgrass
<i>Deschampsia cespitosa</i>	Tufted hairgrass
<i>Festuca campestris</i>	Rough fescue
<i>Festuca idahoensis</i>	Idaho fescue
<i>Festuca rubra</i>	Red fescue
<i>Glyceria striata</i>	Fowl mannagrass
<i>Juncus balticus</i>	Baltic rush
<i>Koeleria macrantha</i>	Prairie junegrass
<i>Phleum pratense</i>	Common timothy
<i>Poa palustris</i>	Fowl bluegrass
<i>Poa pratensis</i>	Kentucky bluegrass
<i>Schedonorus pratensis</i>	Meadow fescue
<i>Stipa nelsonii</i>	Columbia needlegrass
<i>Stipa richardsonii</i>	Richardson's needlegrass
<b>FORBS AND SUBSHRUBS</b>	
<i>Achillea millefolium</i>	Common yarrow
<i>Anemone multifida</i>	Ball anemone
<i>Antennaria parvifolia</i>	Small-leaf pussytoes
<i>Antennaria rosea</i>	Rosy pussytoes
<i>Arenaria congesta</i>	Ballhead sandwort
<i>Arnica cordifolia</i>	Heartleaf arnica
<i>Artemisia ludoviciana</i>	Cudweed sagewort
<i>Astragalus miser</i>	Weedy milkvetch
<i>Berberis repens</i>	Creeping Oregon-grape
<i>Campanula rotundifolia</i>	Roundleaf harebell
<i>Canadanthus modestus</i>	Few-flowered aster
<i>Carduus nutans</i>	Musk thistle
<i>Carum carvi</i>	Caraway
<i>Cerastium arvense</i>	Field chickweed
<i>Cirsium arvense</i>	Canada thistle
<i>Clematis hirsutissima</i>	Vaseflower clematis
<i>Cynoglossum officinale</i>	Common hound's-tongue

BINOMIAL	COMMON NAME
<b>FORBS AND SUBSHRUBS (cont.)</b>	
<i>Erigeron subtrinervis</i>	Three nerve fleabane
<i>Eriogonum umbellatum</i>	Sulfur buckwheat
<i>Eurybia conspicua</i>	Western showy aster
<i>Fragaria vesca</i>	Woods strawberry
<i>Fragaria virginiana</i>	Virginia strawberry
<i>Galium boreale</i>	Northern bedstraw
<i>Gentianella amarella</i>	Northern gentian
<i>Geranium richardsonii</i>	White geranium
<i>Geranium viscosissimum</i>	Sticky geranium
<i>Geum macrophyllum</i>	Large leaf avens
<i>Geum rivale</i>	Water avens
<i>Geum triflorum</i>	Prairiesmoke
<i>Linnaea borealis</i>	Western twinflower
<i>Lupinus leucophyllus</i>	Velvet lupine
<i>Lupinus sericeus</i>	Silky lupine
<i>Mentha arvensis</i>	Field mint
<i>Pedicularis groenlandica</i>	Elephanthead
<i>Perideridia montana</i>	Gairdner's yampa
<i>Petasites frigidus</i>	Arrowleaf coltsfoot
<i>Phlox hoodii</i>	Hood's phlox
<i>Potentilla gracilis</i>	Slender cinquefoil
<i>Rhinanthus crista-galli</i>	Yellow rattle
<i>Selaginella densa</i>	Compact clubmoss
<i>Senecio sphaerocephalus</i>	Mountain-marsh butterweed
<i>Solidago canadensis</i>	Canada goldenrod
<i>Solidago missouriensis</i>	Missouri goldenrod
<i>Stachys palustris</i>	Swamp hedge-nettle
<i>Symphotrichum campestre</i>	Meadow aster
<i>Symphotrichum subspicatum</i>	Douglas' aster
<i>Taraxacum officinale</i>	Common dandelion
<i>Thalictrum venulosum</i>	Veiny meadowrue
<i>Trifolium hybridum</i>	Alsike clover
<i>Trifolium pratense</i>	Red clover
<i>Trifolium repens</i>	White Dutch clover
<i>Valeriana dioica</i>	Northern valerian
<i>Viola nephrophylla</i>	Northern bog violet
<b>SHRUBS and TREES</b>	
<i>Arctostaphylos uva-ursi</i>	Kinnikinnick
<i>Artemisia tridentata</i>	Big sagebrush
<i>Betula glandulosa</i>	Bog birch
<i>Dasiphora fruticosa</i>	Shrubby cinquefoil
<i>Juniperus communis</i>	Common juniper
<i>Juniperus scopulorum</i>	Rocky Mountain juniper
<i>Picea engelmannii</i>	Engelmann spruce
<i>Pinus contorta</i>	Lodgepole pine
<i>Populus tremuloides</i>	Quaking aspen
<i>Pseudotsuga menziesii</i>	Douglas-fir
<i>Ribes inerme</i>	Whitestem gooseberry
<i>Ribes setosum</i>	Bristly gooseberry
<i>Rosa woodsii</i>	Wood's rose
<i>Salix bebbiana</i>	Bebb willow

BINOMIAL	COMMON NAME
<b>SHRUBS and TREES (cont.)</b>	
<i>Salix boothii</i>	Booth willow
<i>Salix geeyeriana</i>	Geyer willow
<i>Salix planifolia</i>	Planeleaf willow

BINOMIAL	COMMON NAME
<b>SHRUBS and TREES (cont.)</b>	
<i>Salix pseudomonticola</i>	Mountain willow
<i>Spiraea betulifolia</i>	White spirea
<i>Symphoricarpos albus</i>	Common snowberry

Scientific nomenclature follows Lesica (2012).

Three primary Riparian-Wetland (RW) types were classified according to physiognomic type, including Herbaceous, Shrub and Deciduous Tree. The Herbaceous RW type was sampled in three mesophytic/hydrophytic habitat types or community types dominated by various associations of *Juncus balticus* (Baltic rush), *Carex nebrascensis* (Nebraska sedge), and *Carex utriculata* (southern beaked sedge). The Shrub RW type includes three mesophytic or hydrophytic low shrub community types in the *Dasiphora fruticosa* series, and two hydrophytic tall shrub series dominated by *Salix bebbiana* (Bebb willow) or *Salix geeyeriana* (Geyer willow). The Deciduous Tree Riparian type was comprised of one community type and one habitat type in the *Populus tremuloides* (quaking aspen) series.

The diversity of community types in the inventory area is largely representative of other, lower to middle elevation study areas in central Montana, as listed in the literature review table in Appendix G. All vegetation types identified in this study have been documented in previous studies in the region under the same or similar type names, as reviewed and summarized from published literature and unpublished technical reports.

### 3.2 COMMUNITY TYPE DESCRIPTIONS

Following is a narrative description of habitat and community types identified for the Black Butte baseline study area. All summary tables are presented in Section 5.0 (see index page 5-i). Table 1 identifies plot numbers and sample size by vegetation type (see Plate 1 for plot locations). Summary data are presented for cover/constancy in Tables 2 through 7, shrub density (Tables 8 through 13), tree density (Tables 14 through 19), ecological site/soils correlations (Table 20), vegetation/soils correlations (Table 21), and vegetation/ecological site correlations (Table 22). Summaries of rangeland productivity and grazing capacity are given in Table 23, hay cropland productivity and yield (Table 24), plant species of concern (Table 25), species diversity (Table 26), noxious weeds (Table 27), and acreage of vegetation types (Table 28).

The summary tables listed above are derived from the 2015 quantitative data presented by sample site in the Appendix Section 6.0, including cover/constancy (Appendix B), shrub density (Appendix C), tree density (Appendix D), and ecological site/soils correlations (Appendix E). Appendix F presents a summary of site parameters by vegetation type, and Appendix G summarizes a review of current literature concerning regional plant communities, providing context for the Black Butte vegetation type classification. Representative photographs are presented for each vegetation type in Appendix H.

For most data parameters, a weighted mean is given for all habitat types and communities composited within each physiognomic type. The physiognomic type means are not meant to be viewed as an ecological presentation, but can be used to facilitate practical comparisons with any future revegetation efforts on-site (*i.e.*, reclamation planning and evaluation of reclamation success).

The following habitat and community type descriptions are arranged for each physiognomic type to generally follow a gradient of site parameters, particularly soil texture (apparent water-holding capacity), topographic position and aspect (slope exposure). Departures from this arrangement are intended to account for species dominance and considerations of relative susceptibility to various disturbances, particularly grazing history, logging history and agricultural practices.

### 3.2.1 Upland Grassland

Upland herbaceous communities or “grasslands” were identified according to two principal categories:

- Upland Native Grassland (607 acres, or 18 percent of the study area) that is dominated by native grass (and forb) species, with adventitious occurrences of introduced (exotic) species and relatively minor amounts of woody plants.
- Upland Altered Grassland (172 acres, or 5 percent of the study area) is land that has been invaded by or interseeded with introduced (exotic) species, primarily *Poa pratensis* and *Phleum pratense* in the study area.

There were four Upland Native Grassland habitat types in two series and one Upland Altered Grassland community type identified during the 2015 inventory, comprising 779 acres or 23 percent of total study area acreage. The two Native Grassland series were dominated or distinguished by *Festuca idahoensis*, or *Festuca campestris*.

Upland Grassland cover and constancy data are presented by sample site (plot) in Appendix Tables B1 through B3, and summarized by habitat and community type in Table 2. Shrub density data are given by plot in Appendix Tables C1 through C3, and summarized for Upland Grassland types in Table 8. Tree density data are presented by plot in Appendix Table D1, and summarized by Upland Grassland type in Table 14.

A correlation of soils mapping units, ecological sites and community types is listed by plot in Appendix E, and summarized by parameter in Tables 20 through 22. Rangeland productivity values and projected grazing capacity are shown in Table 23.

Plant species of concern listed by MTNHP (2015) for Meagher County are summarized in Table 25. A simple comparison of relative diversity among physiognomic types is presented in Table 26. The abundance of noxious weeds sampled in Upland Grassland types is given in Table 27. Appendix F provides a synopsis of important site parameters (topographical position, slope gradient and aspect) recorded for Black Butte Upland Grassland communities. A list of selected ecological literature pertinent to the Black Butte study area is synthesized in Appendix G. Acreage of vegetation physiognomic types is given in Table 28. All vegetation sample site locations are shown on the vegetation type map (Plate 1). Representative photographs are included in Appendix H.

In the following text, the Native Upland Grassland types are arranged approximately in order of xeric to mesic moisture regime, and lower to higher topographical position.

## Upland Altered Grassland community type

The Upland Altered Grassland community type is very common in the Black Butte baseline study area. A total of nine plots were sampled, primarily on toeslope to middle slope positions of gentle to moderate (1-10 percent) slope gradient. Aspect was variable, commonly easterly or westerly. The predominant ecological sites were loamy and loamy droughty, associated with the Houlihan sandy loams, Wineglass channery clay loams and Libeg clay loams soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

Upland Altered Grassland c.t. n=9					
GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	83	Perennial	50	Shrub	3
Annual	-	Annual/Biennial	<1	Tree	-
<i>Poa pratensis</i>	37	<i>Geranium viscosissimum</i>	11	<i>Artemisia tridentata</i>	1
<i>Phleum pratense</i>	29	<i>Potentilla gracilis</i>	7	<i>Rosa woodsii</i>	<1
<i>Bromus inermis</i>	4	<i>Knautia arvensis</i>	5		
<i>Festuca idahoensis</i>	3	<i>Taraxacum officinale</i>	4		
<i>Stipa nelsonii</i>	2	<i>Artemisia ludoviciana</i>	3		
<i>Danthonia intermedia</i>	2	<i>Erigeron subtrinervis</i>	2		
<i>Carex petasata</i>	1	<i>Antennaria rosea</i>	2		
<i>Danthonia californica</i>	1	<i>Lupinus leucophyllus</i>	2		
<i>Bromus carinatus</i>	1	<i>Geum triflorum</i>	2		
<i>Festuca campestris</i>	<1	<i>Solidago missouriensis</i>	2		
		<i>Galium boreale</i>	2		
		<i>Cerastium arvense</i>	2		
		<i>Achillea millefolium</i>	1		
		<i>Symphyotrichum campestre</i>	1		
		<i>Lupinus sericeus</i>	<1		

Shrub density averaged 596 live stems per acre, of which 49 percent was *Artemisia tridentata*, 45 percent was *Rosa woodsii* and 6 percent was *Dasiphora fruticosa*. No trees were recorded in the Upland Altered Grassland community type.

***Festuca idahoensis/Agropyron spicatum* habitat type**

The *Festuca idahoensis/Agropyron spicatum* habitat type is relatively uncommon in the Black Butte baseline study area. Three plots were sampled on ridge and lower slope positions of moderate (6-11 percent) slope gradient. Aspect was commonly southerly and southeasterly. The *Festuca idahoensis/Agropyron spicatum* habitat type was sampled on the shallow droughty and loamy droughty ecological sites associated with three upland soils mapping units, including the Cheadle channery loams and Libeg clay loams soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Festuca idahoensis/Agropyron spicatum* h.t.  
n=3**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	64	Perennial	42	Shrub	-
Annual	-	Annual/Biennial	2	Tree	-
<i>Festuca idahoensis</i>	26	<i>Antennaria rosea</i>	10		
<i>Danthonia unispicata</i>	22	<i>Phlox hoodii</i>	4		
<i>Agropyron spicatum</i>	6	<i>Selaginella densa</i>	3		
<i>Koeleria macrantha</i>	3	<i>Eriogonum umbellatum</i>	3		
<i>Danthonia intermedia</i>	3	<i>Achillea millefolium</i>	2		
<i>Carex filifolia</i>	1	<i>Lupinus sericeus</i>	2		
		<i>Artemisia ludoviciana</i>	2		
		<i>Eriogonum caespitosum</i>	2		
		<i>Geum triflorum</i>	2		
		<i>Cerastium arvense</i>	1		
		<i>Alyssum alyssoides</i>	1		
		<i>Arenaria congesta</i>	1		
		<i>Solidago missouriensis</i>	1		
		<i>Zigadenus venenosus</i>	1		
		<i>Galium boreale</i>	1		

Shrub density averaged only 34 live stems per acre, entirely *Artemisia tridentata*. No trees were recorded in the *Festuca idahoensis/Agropyron spicatum* habitat type.

***Festuca idahoensis/Stipa richardsonii* habitat type**

The *Festuca idahoensis/Stipa richardsonii* habitat type is infrequent in the Black Butte baseline study area. Two plots were sampled on a bench and middle slope position of gentle (2-6 percent) slope gradient and northerly aspect. The ecological sites were droughty and shallow droughty, associated with the Farlin clay loams and Cheadle channery loams soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Festuca idahoensis/Stipa richardsonii* h.t.**  
**n=2**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	73	Perennial	53	Shrub	6
Annual	-	Annual/Biennial	2	Tree	-
<i>Poa pratensis</i>	17	<i>Antennaria rosea</i>	13	<i>Rosa woodsii</i>	3
<i>Stipa richardsonii</i>	13	<i>Geum triflorum</i>	9	<i>Artemisia tridentata</i>	3
<i>Festuca idahoensis</i>	13	<i>Geranium viscosissimum</i>	5		
<i>Danthonia unispicata</i>	12	<i>Solidago missouriensis</i>	5		
<i>Danthonia intermedia</i>	6	<i>Lupinus sericeus</i>	5		
<i>Stipa nelsonii</i>	3	<i>Eriogonum umbellatum</i>	3		
<i>Carex filifolia</i>	3	<i>Potentilla gracilis</i>	3		
<i>Agropyron trachycaulum</i>	2	<i>Clematis hirsutissima</i>	3		
<i>Agropyron smithii</i>	2	<i>Achillea millefolium</i>	2		
<i>Carex eleocharis</i>	1	<i>Artemisia ludoviciana</i>	2		
<i>Koeleria macrantha</i>	1	<i>Anemone multifida</i>	2		
		<i>Orthocarpus luteus</i>	2		
		<i>Pyrrocoma integrifolia</i>	1		

Shrub density averaged 2934 live stems per acre, of which 64 percent was *Rosa woodsii* and 36 percent was *Artemisia tridentata*. No trees were recorded in the *Festuca idahoensis/Stipa richardsonii* habitat type.

***Festuca campestris/Agropyron spicatum* habitat type**

The *Festuca campestris/Agropyron spicatum* habitat type is uncommon in the Black Butte baseline study area. One plot was sampled on a middle slope position of moderate (20 percent) slope gradient and southerly aspect. The ecological site was loamy droughty, associated with the Libeg clay loams soils. Plant species dominance is shown below, based on percent canopy cover rounded to the nearest percent.

***Festuca campestris /Agropyron spicatum* h.t.**  
**n=1**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	56	Perennial	47	Shrub	4
Annual	-	Annual/Biennial	<1	Tree	-
<i>Danthonia unispicata</i>	22	<i>Artemisia ludoviciana</i>	10	<i>Juniperus communis</i>	4
<i>Festuca idahoensis</i>	12	<i>Eriogonum caespitosum</i>	5		
<i>Festuca campestris</i>	8	<i>Solidago missouriensis</i>	5		
<i>Agropyron spicatum</i>	5	<i>Antennaria rosea</i>	3		
<i>Koeleria macrantha</i>	4	<i>Astragalus tenellus</i>	3		
<i>Carex filifolia</i>	3	<i>Heterotheca villosa</i>	3		
<i>Agropyron smithii</i>	2	<i>Lupinus sericeus</i>	3		
		<i>Phlox hoodii</i>	3		
		<i>Symphyotrichum falcatum</i>	3		
		<i>Antennaria parvifolia</i>	2		
		<i>Cerastium arvense</i>	2		
		<i>Astragalus drummondii</i>	1		
		<i>Eriogonum umbellatum</i>	1		
		<i>Lithospermum ruderales</i>	1		

Shrub density averaged about 100 live stems per acre, comprised entirely of *Juniperus communis*. No trees were recorded in the *Festuca campestris/Agropyron spicatum* habitat type.

***Festuca campestris/Festuca idahoensis* habitat type**

The *Festuca campestris/Festuca idahoensis* habitat type is the most common Upland Grassland type in the Black Butte baseline study area. A total of thirteen plots were sampled, primarily on middle and upper slope positions of mostly moderate (6-15 percent) slope gradient. Aspects were primarily northwesterly through northeasterly. The predominant ecological sites were, in order, droughty, shallow droughty and loamy droughty, associated primarily with the Woodhall skeletal loams, Cheadle channery loams and Libeg clay loams soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Festuca campestris/Festuca idahoensis* h.t.  
n=13**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	80	Perennial	47	Shrub	2
Annual	-	Annual/Biennial	<1	Tree	-
<i>Festuca campestris</i>	28	<i>Geum triflorum</i>	14	<i>Artemisia tridentata</i>	1
<i>Stipa richardsonii</i>	20	<i>Geranium viscosissimum</i>	5		
<i>Festuca idahoensis</i>	10	<i>Solidago missouriensis</i>	5		
<i>Danthonia intermedia</i>	7	<i>Antennaria rosea</i>	3		
<i>Poa pratensis</i>	7	<i>Selaginella densa</i>	2		
<i>Carex rossii</i>	2	<i>Potentilla gracilis</i>	2		
<i>Agropyron trachycaulum</i>	1	<i>Cerastium arvense</i>	2		
<i>Carex filifolia</i>	1	<i>Sedum lanceolatum</i>	2		
<i>Koeleria macrantha</i>	1	<i>Phlox hoodii</i>	1		
<i>Agropyron spicatum</i>	1	<i>Eriogonum umbellatum</i>	1		
<i>Stipa nelsonii</i>	<1	<i>Lupinus sericeus</i>	1		
		<i>Artemisia ludoviciana</i>	1		
		<i>Clematis hirsutissima</i>	<1		

Shrub density averaged about 553 live stems per acre, of which 63 percent was *Artemisia tridentata* and 37 percent was *Dasiphora fruticosa*. Tree density was negligible in the *Festuca campestris/Festuca idahoensis* habitat type.

### 3.2.2 Upland Shrubland

There were six Upland Shrubland habitat types and communities identified in three series during the 2015 inventory, comprising 1,372 acres or 41 percent of total study area acreage. The three types in the *Artemisia tridentata* series were dominated or distinguished in the understory by *Poa pratensis*, *Festuca idahoensis*, or *Festuca campestris*. A second series was codominated by *Artemisia tridentata* and *Dasiphora fruticosa*, with the more-altered sites (historical grazing) dominated in the understory by *Poa pratensis*, and the less-altered sites by *Festuca campestris*. A third “series” was identified according to topo-edaphic features, the mixed shrub-shale outcrop community type, a vegetation type of limited occurrence in the study area.

Upland Shrubland cover and constancy data are presented by sample site (plot) in Appendix Tables B4 through B7, and summarized by habitat and community type in Table 3. Shrub density data are given by plot in Appendix Tables C4 through C7, and summarized for Upland Shrubland types in Table 9. Tree density data are presented by plot in Appendix Tables D2 through D5, and summarized by Upland Shrubland type in Table 15.

A correlation of soils mapping units, ecological sites and community types is listed by plot in Appendix E, and summarized by parameter in Tables 20 through 22. Rangeland productivity values and projected grazing capacity are shown in Table 23.

Plant species of concern listed by MTNHP (2015) for Meagher County are summarized in Table 25. A simple comparison of relative diversity among physiognomic types is presented in Table 26. The abundance of noxious weeds sampled in Upland Shrubland types is given in Table 27. Appendix F provides a synopsis of important site parameters (topographical position, slope gradient and aspect) recorded for Black Butte Upland Shrubland communities. A list of selected ecological literature pertinent to the Black Butte study area is synthesized in Appendix G. Acreage of vegetation physiognomic types is given in Table 28. All vegetation sample site locations are shown on the vegetation type map (Plate 1). Representative photographs are included in Appendix H.

In the following text, Upland Shrubland series are arranged approximately in order of lower to higher topographical positions.

***Artemisia tridentata/Poa pratensis* community type**

The *Artemisia tridentata/Poa pratensis* community type is very common in the Black Butte baseline study area. Thirteen plots were sampled on swales and middle to upper slope positions of gentle to moderate (1-14 percent) slope gradient. Aspects were primarily northerly through easterly to southeasterly. The ecological sites were shallow droughty, droughty, and loamy, associated with the Cheadle channery loams, Redchief silty loams and Wineglass channery clay loams soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Artemisia tridentata/Poa pratensis* c.t.  
n=13**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	82	Perennial	27	Shrub	40
Annual	<1	Annual/Biennial	<1	Tree	<1
<i>Poa pratensis</i>	64	<i>Cerastium arvense</i>	6	<i>Artemisia tridentata</i>	39
<i>Phleum pratense</i>	5	<i>Geum triflorum</i>	3		
<i>Festuca idahoensis</i>	3	<i>Solidago missouriensis</i>	2		
<i>Danthonia intermedia</i>	3	<i>Artemisia ludoviciana</i>	2		
<i>Festuca campestris</i>	2	<i>Erigeron subtrinervis</i>	1		
<i>Stipa richardsonii</i>	2	<i>Potentilla gracilis</i>	1		
<i>Agropyron trachycaulum</i>	<1	<i>Geranium viscosissimum</i>	1		
<i>Stipa nelsonii</i>	<1	<i>Lupinus leucophyllus</i>	1		
		<i>Lupinus sericeus</i>	1		
		<i>Antennaria parvifolia</i>	1		
		<i>Lithospermum ruderae</i>	<1		

Shrub density averaged 5985 live stems per acre, of which 98 percent was *Artemisia tridentata* and 2 percent was *Dasiphora fruticosa*. Tree density was negligible in the *Artemisia tridentata/Poa pratensis* community type.

***Artemisia tridentata/Festuca idahoensis* habitat type**

The *Artemisia tridentata/Festuca idahoensis* habitat type is infrequent in the Black Butte baseline study area. Three plots were sampled on lower slopes and a bench of gentle (2-5 percent) slope gradient. Aspect was northeasterly to southeasterly. The ecological site was shallow droughty, associated with the Cheadle channery loams soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Artemisia tridentata/Festuca idahoensis* h.t.**

*n=3*

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	34	Perennial	26	Shrub	27
Annual	-	Annual/Biennial	<1	Tree	-
<i>Festuca idahoensis</i>	12	<i>Antennaria rosea</i>	8	<i>Artemisia tridentata</i>	26
<i>Danthonia unispicata</i>	9	<i>Phlox hoodii</i>	4		
<i>Poa pratensis</i>	4	<i>Cerastium arvense</i>	4		
<i>Agropyron spicatum</i>	3	<i>Selaginella densa</i>	2		
<i>Danthonia intermedia</i>	3	<i>Lupinus sericeus</i>	2		
<i>Koeleria macrantha</i>	1	<i>Galium boreale</i>	1		
<i>Agropyron trachycaulum</i>	<1	<i>Paronychia sessiliflora</i>	1		
<i>Poa secunda</i>	<1	<i>Arenaria congesta</i>	1		

Shrub density averaged 5362 live stems per acre, comprised of 99 percent *Artemisia tridentata* and 1 percent *Juniperus communis*. No trees were recorded in the *Artemisia tridentata/Festuca idahoensis* habitat type.

**Artemisia tridentata/Festuca campestris habitat type**

The *Artemisia tridentata/Festuca campestris* habitat type is the most common Upland Shrubland type in the Black Butte baseline study area. A total of seventeen plots were sampled on mostly middle and upper slope positions and benches of primarily gentle to moderate (2-17 percent) slope gradient and essentially all aspects. The predominant ecological site (16 of 17 samples) was shallow droughty, associated with the Cheadle channery loams and Poin skeletal sandy loams soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

**Artemisia tridentata/Festuca campestris h.t.**  
n=17

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	63	Perennial	34	Shrub	41
Annual	-	Annual/Biennial	<1	Tree	<1
<i>Festuca campestris</i>	20	<i>Cerastium arvense</i>	4	<i>Artemisia tridentata</i>	40
<i>Festuca idahoensis</i>	14	<i>Geum triflorum</i>	4	<i>Juniperus communis</i>	<1
<i>Danthonia intermedia</i>	9	<i>Selaginella densa</i>	4		
<i>Poa pratensis</i>	8	<i>Antennaria parvifolia</i>	3		
<i>Stipa richardsonii</i>	4	<i>Lupinus sericeus</i>	3		
<i>Carex fillifolia</i>	3	<i>Antennaria rosea</i>	2		
<i>Danthonia unispicata</i>	2	<i>Phlox hoodii</i>	1		
<i>Carex eleocharis</i>	1	<i>Potentilla gracilis</i>	1		
		<i>Solidago missouriensis</i>	1		
		<i>Eriogonum umbellatum</i>	1		
		<i>Arenaria congesta</i>	<1		
		<i>Artemisia ludoviciana</i>	<1		

Shrub density averaged 5452 live stems per acre, of which 98 percent was *Artemisia tridentata* and 2 percent *Rosa woodsii*. Density of trees less than four inches dbh (diameter at breast height) averaged 1 *Pseudotsuga menziesii* per acre.

***Artemisia tridentata-Dasiphora fruticosa/Poa pratensis* community type**

The *Artemisia tridentata-Dasiphora fruticosa/Poa pratensis* community type is relatively common in the Black Butte baseline study area, mostly occupying transitional areas between drainage bottom types and upland types. Six plots were sampled on swales, toeslopes and other low topographical positions of gentle (0-9 percent) slope gradient and mostly westerly aspect. The primary ecological sites were loamy and loamy argillic, associated with five soils including the Duckcreek clay loams soil. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Artemisia tridentata-Dasiphora fruticosa/Poa pratensis* c.t.**  
n=6

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	75	Perennial	45	Shrub	43
Annual	-	Annual/Biennial	1	Tree	-
<i>Poa pratensis</i>	49	<i>Taraxacum officinale</i>	4	<i>Artemisia tridentata</i>	23
<i>Danthonia intermedia</i>	7	<i>Potentilla gracilis</i>	4	<i>Dasiphora fruticosa</i>	19
<i>Festuca campestris</i>	3	<i>Cerastium arvense</i>	4	<i>Rosa woodsii</i>	<1
<i>Agropyron smithii</i>	2	<i>Artemisia ludoviciana</i>	3		
<i>Festuca idahoensis</i>	2	<i>Antennaria rosea</i>	3		
<i>Stipa richardsonii</i>	2	<i>Solidago missouriensis</i>	3		
<i>Agropyron trachycaulum</i>	2	<i>Geum triflorum</i>	2		
<i>Stipa nelsonii</i>	2	<i>Lupinus sericeus</i>	2		
<i>Carex petasata</i>	1	<i>Lupinus leucophyllus</i>	2		
<i>Muhlenbergia richardsonis</i>	1	<i>Galium boreale</i>	2		
<i>Phleum pratense</i>	1	<i>Antennaria parvifolia</i>	2		
<i>Juncus confusus</i>	<1	<i>Phlox hoodii</i>	1		
		<i>Fragaria virginiana</i>	1		
		<i>Campanula rotundifolia</i>	1		
		<i>Penstemon procerus</i>	<1		
		<i>Fragaria vesca</i>	<1		

Shrub density averaged about 5400 live stems per acre, of which 74 percent was *Artemisia tridentata*, 25 percent *Dasiphora fruticosa* and 1 percent was *Rosa woodsii*. No trees were recorded in the *Artemisia tridentata-Dasiphora fruticosa/Poa pratensis* community type.

***Dasiphora fruticosa-Artemisia tridentata/Festuca campestris* community type**

The *Dasiphora fruticosa-Artemisia tridentata/Festuca campestris* community type is relatively uncommon in the Black Butte baseline study area. Three plots were sampled on terrace to middle slope positions of gentle to moderate (1-20 percent) slope gradient. Aspect was northwesterly and northerly. The ecological sites were loamy argillic and shallow droughty, associated with the Duckcreek clay loams and Cheadle channery loams soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Dasiphora fruticosa-Artemisia tridentata/Festuca campestris* c.t.  
n=3**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	79	Perennial	37	Shrub	33
Annual	-	Annual/Biennial	<1	Tree	-
<i>Danthonia intermedia</i>	25	<i>Geum triflorum</i>	12	<i>Dasiphora fruticosa</i>	20
<i>Festuca campestris</i>	22	<i>Lupinus sericeus</i>	6	<i>Artemisia tridentata</i>	13
<i>Poa pratensis</i>	12	<i>Antennaria parvifolia</i>	2		
<i>Festuca idahoensis</i>	7	<i>Astragalus adsurgens</i>	2		
<i>Stipa richardsonii</i>	3	<i>Clematis hirsutissima</i>	2		
<i>Carex filifolia</i>	2	<i>Cerastium arvense</i>	2		
<i>Agropyron trachycaulum</i>	1	<i>Pyrrocoma integrifolia</i>	2		
<i>Carex eleocharis</i>	1	<i>Solidago missouriensis</i>	2		
<i>Carex obtusata</i>	1	<i>Symphotrichum campestre</i>	1		
<i>Juncus balticus</i>	1	<i>Campanula rotundifolia</i>	1		
		<i>Galium boreale</i>	1		
		<i>Anemone multifida</i>	<1		

Shrub density averaged 2833 live stems per acre, of which 79 percent was *Dasiphora fruticosa* and 21 percent was *Artemisia tridentata*. No trees were recorded in the *Dasiphora fruticosa-Artemisia tridentata/Festuca campestris* community type.

### Mixed Shrub-Shale Outcrop community type

The Mixed Shrub-Shale Outcrop community type is infrequent in the Black Butte baseline study area. Two plots were sampled on middle slope and ridge positions of moderately steep (17-30 percent) slope gradient and southerly to westerly aspect. The ecological site was shallow droughty, associated with the Cheadle channery loams soil. Plant species dominance is shown below, based on percent canopy cover rounded to the nearest percent.

Mixed Shrub-Shale Outcrop c.t. n=2					
GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	Percent <u>Cover</u>	<u>Class/Species</u>	Percent <u>Cover</u>	<u>Class/Species</u>	Percent <u>Cover</u>
Perennial	9	Perennial	20	Shrub	9
Annual	-	Annual/Biennial	4	Tree	2
<i>Agropyron spicatum</i>	3	<i>Phlox hoodii</i>	4	<i>Juniperus horizontalis</i>	4
<i>Festuca idahoensis</i>	2	<i>Stenotus acaulis</i>	4	<i>Dasiphora fruticosa</i>	3
<i>Koeleria macrantha</i>	1	<i>Medicago lupulina</i>	2	<i>Pseudotsuga menziesii</i>	2
<i>Agropyron dasystachyum</i>	1	<i>Comandra umbellata</i>	2	<i>Artemisia tridentata</i>	2
<i>Agropyron trachycaulum</i>	1	<i>Alyssum alyssoides</i>	2		
<i>Oryzopsis hymenoides</i>	1	<i>Erigeron caespitosum</i>	2		
		<i>Cerastium arvense</i>	1		
		<i>Eriogonum ovalifolium</i>	1		

Shrub density averaged 1518 live stems per acre, of which 40 percent was *Artemisia tridentata*, 40 percent was *Rosa woodsii*, 17 percent was *Dasiphora fruticosa* and 3 percent was *Juniperus horizontalis*. Density of trees less than four inches dbh (diameter at breast height) averaged about 3 *Pseudotsuga menziesii* per acre.

### 3.2.3 Conifer Forest And Woodland

Seven Conifer Forest and Woodland habitat types were identified in two series during the 2015 inventory, comprising 737 acres or 22 percent of total study area acreage. The two Conifer series were dominated or distinguished by *Pseudotsuga menziesii* or *Picea engelmannii*. Each habitat type was named for the characteristic understory union, *i.e.*, *Festuca idahoensis*, *Festuca campestris*, *Juniperus communis*, *Calamagrostis rubescens*, *Symphoricarpos albus*, or *Linnaea borealis* (two series). Mature conifer stands totaled 502 acres or 15 percent of study area acreage, while immature stands totaled 235 acres (7 percent). Immature stands were comprised of seedling, sapling, and/or pole-sized trees reflecting two different ecologies:

1. Logged areas undergoing conifer recruitment (regeneration)
2. Areas where conifers are encroaching into upland grassland or shrubland, generally adjoining the downhill perimeter of mature conifer stands.

Conifer cover and constancy data are presented by sample site (plot) in Appendix Tables B8 through B11, and summarized by habitat type in Table 4. Shrub density data are given by plot in Appendix Tables C8 through C11, and summarized for Conifer types in Table 10. Tree density data are presented by plot in Appendix Tables D6 through D9, and summarized by Conifer type in Table 16.

A correlation of soils mapping units, ecological sites and community types is listed by plot in Appendix E, and summarized by parameter in Tables 20 through 22. Grazeable understory productivity values and projected grazing capacity are shown in Table 23.

Plant species of concern listed by MTNHP (2015) for Meagher County are summarized in Table 25. A simple comparison of relative diversity among physiognomic types is presented in Table 26. The abundance of noxious weeds sampled in Conifer types is given in Table 27. Appendix F provides a synopsis of important site parameters (topographical position, slope gradient and aspect) recorded for Black Butte Conifer habitat types. A list of selected ecological literature pertinent to the Black Butte study area is synthesized in Appendix G. Acreage of vegetation physiognomic types is given in Table 28. All vegetation sample site locations are shown on the vegetation type map (Plate 1). Representative photographs are included in Appendix H.

In the following text, Conifer Forest and Woodland habitat types are arranged roughly in order of postulated successional status (using Pfister *et al.* 1977) as well as moisture regime (xeric to mesic). Site parameters and understory species composition were also taken into account.

***Pseudotsuga menziesii/Festuca idahoensis* habitat type**

The *Pseudotsuga menziesii/Festuca idahoensis* habitat type is very infrequent in the Black Butte baseline study area. One plot was sampled on an upper slope position of moderate (12 percent) slope gradient and southeasterly aspect. The ecological site was Douglas-fir/rough fescue, associated with the Casepeak skeletal loams soil. Plant species dominance is shown below, based on percent canopy cover rounded to the nearest percent.

***Pseudotsuga menziesii/Festuca idahoensis* h.t.  
n=1**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	32	Perennial	43	Shrub	25
Annual	-	Annual/Biennial	<1	Tree	40
<i>Stipa nelsonii</i>	12	<i>Artemisia ludoviciana</i>	20	<i>Pseudotsuga menziesii</i>	40
<i>Poa pratensis</i>	6	<i>Antennaria parvifolia</i>	5	<i>Artemisia tridentata</i>	25
<i>Danthonia intermedia</i>	4	<i>Cerastium arvense</i>	5		
<i>Stipa richardsonii</i>	4	<i>Arenaria congesta</i>	1		
<i>Carex petasata</i>	3	<i>Arnica sororia</i>	1		
<i>Festuca idahoensis</i>	2	<i>Eriogonum umbellatum</i>	1		
<i>Agropyron trachycaulum</i>	1	<i>Gaillardia aristata</i>	1		
		<i>Geum triflorum</i>	1		
		<i>Helianthella uniflora</i>	1		
		<i>Solidago missouriensis</i>	1		
		<i>Symphotrichum falcatum</i>	1		

Shrub density averaged 2226 live stems per acre, comprised entirely of *Artemisia tridentata*.

Density of trees greater than four inches dbh (diameter at breast height) was 11 *Pseudotsuga menziesii* per acre; density of trees less than four inches dbh was 59 *Pseudotsuga menziesii* per acre.

***Pseudotsuga menziesii/Festuca campestris* habitat type**

The *Pseudotsuga menziesii/Festuca campestris* habitat type is one of the two most common Conifer types in the Black Butte baseline study area. Twelve plots were sampled on middle and upper slope positions and ridges of gentle to steep (4-45 percent) slope gradient. Aspect was variable, commonly southerly, but also northwesterly and northeasterly. The ecological site was Douglas-fir/rough fescue, associated with the Caseypeak skeletal loams, Kimpton skeletal loams, Poin skeletal sandy loams and Woodhall skeletal loams soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Pseudotsuga menziesii/Festuca campestris* h.t.  
n=12**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	Percent <u>Cover</u>	<u>Class/Species</u>	Percent <u>Cover</u>	<u>Class/Species</u>	Percent <u>Cover</u>
Perennial	33	Perennial	24	Shrub	8
Annual	-	Annual/Biennial	<1	Tree	45
<i>Festuca idahoensis</i>	12	<i>Antennaria parvifolia</i>	2	<i>Pseudotsuga menziesii</i>	39
<i>Agropyron spicatum</i>	5	<i>Cerastium arvense</i>	2	<i>Juniperus scopulorum</i>	5
<i>Festuca campestris</i>	4	<i>Antennaria rosea</i>	2	<i>Artemisia tridentata</i>	3
<i>Poa pratensis</i>	2	<i>Balsamorhiza sagittata</i>	1	<i>Juniperus communis</i>	2
<i>Stipa nelsonii</i>	2	<i>Solidago missouriensis</i>	1	<i>Pinus contorta</i>	<1
<i>Danthonia intermedia</i>	1	<i>Fragaria virginiana</i>	1		
<i>Danthonia unispicata</i>	1	<i>Phlox hoodii</i>	1		
<i>Phleum pratense</i>	1	<i>Potentilla gracilis</i>	1		
<i>Stipa richardsonii</i>	<1	<i>Astragalus adsurgens</i>	<1		
<i>Poa interior</i>	<1	<i>Astragalus miser</i>	<1		
		<i>Selaginella densa</i>	<1		

Shrub density averaged 5422 live stems per acre, of which 25 percent was *Spiraea betulifolia*, 23 percent *Symphoricarpos albus*, 19 percent *Arctostaphylos uva-ursi*, 18 percent *Rosa woodsii*, and 11 percent *Artemisia tridentata*.

Density of trees greater than four inches dbh (diameter at breast height) averaged 17 *Pseudotsuga menziesii* per acre; trees less than four inches dbh averaged 28 *Pseudotsuga menziesii* per acre, and 7 *Juniperus scopulorum* per acre.

***Pseudotsuga menziesii/Juniperus communis* habitat type**

The *Pseudotsuga menziesii/Juniperus communis* habitat type is common in the Black Butte baseline study area. Eight plots were sampled on lower to upper slope positions of moderate to very steep (10-60 percent) slope gradient. Aspect was commonly northerly, occasionally southerly. The ecological site was Douglas-fir/common juniper, associated most often with the Kimpton skeletal loams and Poin skeletal sandy loams soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Pseudotsuga menziesii/Juniperus communis* h.t.**  
n=8

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	12	Perennial	16	Shrub	40
Annual	-	Annual/Biennial	<1	Tree	48
<i>Poa pratensis</i>	4	<i>Antennaria parvifolia</i>	2	<i>Pseudotsuga menziesii</i>	38
<i>Agropyron spicatum</i>	1	<i>Antennaria neglecta</i>	2	<i>Juniperus communis</i>	25
<i>Festuca idahoensis</i>	1	<i>Arnica cordifolia</i>	1	<i>Pinus contorta</i>	9
<i>Calamagrostis rubescens</i>	1	<i>Valeriana dioica</i>	1	<i>Arctostaphylos uva-ursi</i>	7
<i>Danthonia intermedia</i>	1	<i>Fragaria virginiana</i>	1	<i>Spiraea betulifolia</i>	2
<i>Festuca campestris</i>	<1	<i>Astragalus miser</i>	1	<i>Symphoricarpos albus</i>	1
		<i>Fragaria vesca</i>	1	<i>Rosa woodsii</i>	<1
		<i>Antennaria rosea</i>	<1		

Shrub density averaged about 15,300 live stems per acre, of which 43 percent was *Spiraea betulifolia*, 22 percent *Arctostaphylos uva-ursi*, 14 percent *Symphoricarpos albus*, 13 percent *Rosa woodsii*, and 6 percent *Juniperus communis*.

Density of trees greater than four inches dbh (diameter at breast height) averaged 16 *Pseudotsuga menziesii* per acre and 5 *Pinus contorta* per acre; trees less than four inches dbh averaged 76 *Pseudotsuga menziesii* per acre, 23 *Pinus contorta* per acre, 2 *Pinus flexilis* per acre, and 1 *Juniperus scopulorum* per acre.

***Pseudotsuga menziesii/Calamagrostis rubescens* habitat type**

The *Pseudotsuga menziesii/Calamagrostis rubescens* habitat type is infrequent in the Black Butte baseline study area. Two plots were sampled on a toeslope and a middle slope position of generally steep (40-50 percent) slope gradient. Aspects of the sample sites were northerly and northwesterly. The ecological site assigned was Douglas-fir/snowberry, associated with the Kimpton skeletal loams soil. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Pseudotsuga menziesii/Calamagrostis rubescens* h.t.**  
n=2

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	3	Perennial	5	Shrub	-
Annual	-	Annual/Biennial	2	Tree	55
<i>Poa pratensis</i>	2	<i>Heuchera parvifolia</i>	2	<i>Pseudotsuga menziesii</i>	55
		<i>Antennaria parvifolia</i>	<1		
		<i>Galium boreale</i>	<1		

No shrubs were recorded in the two belt transects sampled in the *Pseudotsuga menziesii/Calamagrostis rubescens* habitat type.

Density of trees greater than four inches dbh (diameter at breast height) averaged 33 *Pseudotsuga menziesii* per acre; density of trees less than four inches dbh averaged 8 *Pseudotsuga menziesii* per acre.

***Pseudotsuga menziesii/Symphoricarpos albus* habitat type**

The *Pseudotsuga menziesii/Symphoricarpos albus* habitat type is very common in the Black Butte baseline study area. Eleven plots were sampled, primarily on toeslope to upper slope positions of variable (5-55 percent) slope gradient. Aspects of the sample sites were northerly and easterly. The ecological site was Douglas-fir/snowberry, associated with the Kimpton skeletal loams and Woodhall skeletal loams, among other soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Pseudotsuga menziesii/Symphoricarpos albus* h.t.  
n=11**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	30	Perennial	23	Shrub	31
Annual	<1	Annual/Biennial	1	Tree	35
<i>Poa pratensis</i>	12	<i>Fragaria virginiana</i>	2	<i>Pseudotsuga menziesii</i>	35
<i>Calamagrostis rubescens</i>	4	<i>Fragaria vesca</i>	2	<i>Arctostaphylos uva-ursi</i>	11
<i>Phleum pratense</i>	3	<i>Arnica cordifolia</i>	2	<i>Symphoricarpos albus</i>	10
<i>Carex geyeri</i>	3	<i>Valeriana dioica</i>	2	<i>Spiraea betulifolia</i>	5
<i>Carex rossii</i>	2	<i>Potentilla gracilis</i>	1	<i>Juniperus communis</i>	2
<i>Stipa nelsonii</i>	1	<i>Antennaria parvifolia</i>	1	<i>Rosa woodsii</i>	1
<i>Festuca campestris</i>	1	<i>Eurybia conspicua</i>	1	<i>Ribes setosum</i>	1
<i>Festuca idahoensis</i>	<1	<i>Astragalus miser</i>	1		
		<i>Galium boreale</i>	1		
		<i>Berberis repens</i>	<1		

Shrub density averaged about 24,800 live stems per acre, of which 51 percent was *Symphoricarpos albus*, 27 percent *Spiraea betulifolia*, 14 percent *Arctostaphylos uva-ursi*, 4 percent *Rosa woodsii*, and 1 percent *Rubus idaeus*.

Density of trees greater than four inches dbh (diameter at breast height) averaged 16 *Pseudotsuga menziesii* per acre; trees less than four inches dbh averaged 42 *Pseudotsuga menziesii* per acre and 1 *Pinus contorta* per acre.

***Pseudotsuga menziesii/Linnaea borealis* habitat type**

The *Pseudotsuga menziesii/Linnaea borealis* habitat type is not particularly common in the Black Butte baseline study area. Four plots were sampled, primarily on middle slopes, also on a lower slope position; slope gradients were moderately steep to very steep (30-80 percent) on northerly aspects. The ecological site was Douglas-fir/twinflower, associated with the Kimpton skeletal loams soil. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Pseudotsuga menziesii/Linnaea borealis* h.t.**

*n=4*

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	Percent <u>Cover</u>	<u>Class/Species</u>	Percent <u>Cover</u>	<u>Class/Species</u>	Percent <u>Cover</u>
Perennial	15	Perennial	32	Shrub	55
Annual	-	Annual/Biennial	<1	Tree	28
<i>Calamagrostis rubescens</i>	7	<i>Linnaea borealis</i>	11	<i>Juniperus communis</i>	34
<i>Carex geyeri</i>	3	<i>Eurybia conspicua</i>	5	<i>Pseudotsuga menziesii</i>	27
<i>Poa pratensis</i>	2	<i>Arnica cordifolia</i>	2	<i>Arctostaphylos uva-ursi</i>	10
<i>Phleum pratense</i>	1	<i>Berberis repens</i>	2	<i>Symphoricarpos albus</i>	5
		<i>Antennaria racemosa</i>	2	<i>Spiraea betulifolia</i>	2
		<i>Fragaria vesca</i>	2	<i>Rosa woodsii</i>	1
		<i>Fragaria virginiana</i>	1	<i>Pinus contorta</i>	1
		<i>Thalictrum venulosum</i>	1	<i>Shepherdia canadensis</i>	1
		<i>Astragalus miser</i>	<1		

Shrub density averaged about 21,700 live stems per acre, of which 36 percent was *Symphoricarpos albus*, 18 percent *Rubus idaeus*, 17 percent *Arctostaphylos uva-ursi*, 11 percent *Rosa woodsii*, 8 percent *Juniperus communis*, and 8 percent *Spiraea betulifolia*.

Density of trees greater than four inches dbh (diameter at breast height) averaged 18 *Pseudotsuga menziesii* per acre, and 3 *Pinus contorta* per acre; trees less than four inches dbh averaged 40 *Pseudotsuga menziesii* per acre, 2 *Pinus contorta* per acre, and 1 *Juniperus scopulorum* per acre.

***Picea engelmannii/Linnaea borealis* habitat type**

The *Picea engelmannii/Linnaea borealis* habitat type is an infrequent Conifer Forest-Woodland type in the Black Butte baseline study area. Two plots were sampled on a middle slope position of steep (38 percent) slope gradient, and on an upland drainage bottom of gentle (5-8 percent) slope gradient. Aspect was northerly for both sample sites. The ecological site was spruce/twinflower, associated with the Kimpton skeletal loams soil. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Picea engelmannii/Linnaea borealis* h.t.**  
**n=2**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	58	Perennial	47	Shrub	18
Annual	-	Annual/Biennial	<1	Tree	49
<i>Carex disperma</i>	27	<i>Eurybia conspicua</i>	20	<i>Picea engelmannii</i>	40
<i>Calamagrostis rubescens</i>	9	<i>Linnaea borealis</i>	4	<i>Pseudotsuga menziesii</i>	8
<i>Carex geyeri</i>	6	<i>Geranium richardsonii</i>	3	<i>Symphoricarpos albus</i>	5
<i>Phleum pratense</i>	6	<i>Stellaria crispa</i>	3	<i>Ribes setosum</i>	4
<i>Poa pratensis</i>	5	<i>Fragaria virginiana</i>	2	<i>Rubus idaeus</i>	2
<i>Glyceria striata</i>	2	<i>Actaea rubra</i>	2	<i>Spiraea betulifolia</i>	2
<i>Agrostis exarata</i>	1	<i>Thalictrum venulosum</i>	2	<i>Clematis occidentalis</i>	2
<i>Bromus carinatus</i>	1	<i>Galium boreale</i>	2	<i>Rosa woodsii</i>	2
		<i>Chamerion angustifolium</i>	1	<i>Salix bebbiana</i>	2
		<i>Smilacina racemosa</i>	1	<i>Juniperus communis</i>	1
		<i>Geum macrophyllum</i>	1	<i>Pinus contorta</i>	1
		<i>Osmorhiza occidentalis</i>	1		

Shrub density averaged about 11,600 live stems per acre, of which 46 percent was *Symphoricarpos albus*, 15 percent *Spiraea betulifolia*, 9 percent *Rosa acicularis*, 9 percent *Ribes setosum*, 7 percent *Rosa woodsii*, and 6 percent *Rubus idaeus*.

Density of trees greater than four inches dbh (diameter at breast height) averaged 11 *Picea engelmannii* per acre, and 10 *Pseudotsuga menziesii* per acre; trees less than four inches dbh averaged 20 *Picea engelmannii* per acre, 19 *Pseudotsuga menziesii* per acre, and 7 *Pinus contorta* per acre.

### 3.2.4 Lowland Altered Grassland

The Lowland Altered Grassland physiognomic type consists of two herbaceous communities occurring in low-lying, open areas. The first is of limited extent on lower Little Sheep Creek, dominated by musk thistle and Kentucky bluegrass; it is associated with an area of gravel-cobble tailings in a disturbed setting, and is discussed as the Noxious Weed Tailings community type. The second type, Lowland Altered Grassland, includes Hay Meadow, and is based on considerations of land use (management-related activities), referring to land that has been seeded, interseeded or invaded by introduced forage species of relatively limited diversity that provides special or seasonal use for livestock, often on a more intensively managed basis than that which would occur if the land were native grazing land.

In the Black Butte study area, Hay Meadow areas on the Sheep Creek floodplain are regularly mowed and baled for hay production for livestock feed. These lowland meadows are predominantly various mixtures of introduced species, particularly *Phleum pratense*, *Poa pratensis* and clovers, with lesser amounts of native sedges, grasses and forbs. Upland Grassland in the study area currently dominated by introduced grasses is discussed earlier in Section 3.2.1 as the Upland Altered Grassland community type. In the Black Butte study area, Noxious Weed Tailings occurred on 7 acres (0.2 percent of the study area), while Lowland Altered Grassland occupied 118 acres or 4 percent of the study area, including the Hay Meadow community type at 69 acres (2 percent).

Lowland Altered Grassland cover and constancy data are presented by sample site in Appendix Tables B12 and B13, and summarized in Table 5. Shrub density data are given by plot in Appendix Table C12, and summarized for Hay Meadow in Table 11.

A correlation of soils mapping units, ecological sites and community types is listed by plot in Appendix E, and summarized by parameter in Tables 20 through 22. Predicted cropland yields (NRCS 2015) are given in Table 24.

Hay Meadow species diversity is given by functional class, and compared with relative diversity among physiognomic types in Table 26. The abundance of noxious weeds sampled in the Hay Meadow type is presented in Table 27. Appendix F provides a synopsis of important site parameters (topographical position, slope gradient and aspect) recorded for the Hay Meadow type in the study area. Acreage of vegetation types is given in Table 28. All vegetation sample site locations are shown on the vegetation type map (Plate 1). Representative photographs are included in Appendix H.

**Noxious Weed Tailings community type**

The Noxious Weed Tailings community type occupies only 7 acres (0.2 percent) of the Black Butte Baseline study area. One dense population of *Carduus nutans* (musk thistle) was sampled during the 2014 baseline wetlands inventory (plot 162, Plate 1). The site was treated with herbicide (very effectively) in the interim, prior to the 2015 baseline vegetation inventory, when it was again sampled. A comparison of the two years of vegetation cover data is presented below.

**Noxious Weed Tailings c.t. (2014/2015)**  
*n=1*

GRAMINOIDS			FORBS			WOODY PLANTS		
<u>Class/Species</u>	<u>Percent Cover</u>		<u>Class/Species</u>	<u>Percent Cover</u>		<u>Class/Species</u>	<u>Percent Cover</u>	
	<u>2014</u>	<u>2015</u>		<u>2014</u>	<u>2015</u>		<u>2014</u>	<u>2015</u>
Perennial	86	95	Perennial	9	-	Shrub	4	-
Annual	-	-	Annual/Biennial	85	-	Tree	-	-
<i>Poa pratensis</i>	86	95	<i>Carduus nutans</i>	84	0	<i>Artemisia tridentata</i>	4	0
			<i>Cirsium arvense</i>	8	0			
			<i>Cynoglossum officinale</i>	1	0			
			<i>Silene latifolia</i>	1	0			

## Lowland Altered Grassland (Hay Meadow) community type

The Lowland Altered Grassland (Hay Meadow) community type occurs on floodplains and terraces, in the study area primarily those associated with Sheep Creek, however a few sites sampled along Little Sheep Creek and Black Butte Creek floodplains showed similar plant composition and are included here. A total of 16 plots were sampled, all on low terraces of very gentle (0-3 percent) slope gradient. Aspect was not relevant. The primary ecological sites were subirrigated and wet meadow, associated mostly with the Redfish-occasionally flooded and Medicinelodge-frequently flooded soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

Lowland Altered Grassland (Hay Meadow) c.t.  
n=16

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	112	Perennial	55	Shrub	-
Annual	-	Annual/Biennial	13	Tree	-
<i>Phleum pratense</i>	37	<i>Trifolium pratense</i>	19		
<i>Poa pratensis</i>	28	<i>Taraxacum officinale</i>	14		
<i>Alopecurus arundinaceus</i>	11	<i>Trifolium hybridum</i>	7		
<i>Carex praegracilis</i>	9	<i>Carum carvi</i>	7		
<i>Juncus balticus</i>	8	<i>Rhinanthus crista-galli</i>	6		
<i>Bromus inermis</i>	7	<i>Potentilla gracilis</i>	3		
<i>Poa palustris</i>	4	<i>Trifolium repens</i>	2		
<i>Schedonorus pratensis</i>	4	<i>Geum rivale</i>	1		
<i>Deschampsia cespitosa</i>	2	<i>Potentilla anserina</i>	1		
<i>Agrostis stolonifera</i>	2				

No shrubs were encountered in the 16 belt transects sampled in the Hay Meadow community type. No trees were recorded in the 16 0.1-acre tree density plots sampled in this type.

### 3.2.5 Riparian and Wetland (RW) Vegetation Types

Three primary Riparian and Wetland (RW) vegetation types were identified in the Black Butte baseline study area, and classified according to physiognomic type, including Herbaceous RW, Shrub RW, and Deciduous Forest RW. Riparian and Wetland types collectively comprised 303 acres (9 percent) of the study area. These communities are restricted to major drainage floodplains (Sheep Creek, Little Sheep Creek and Black Butte Creek), tributary drainage bottoms and adjacent toeslopes, sidehill springs and seeps, *i.e.*, sites which receive supplemental water from perennial streams, overflow, subirrigation or springs-seepage. The following type descriptions are arranged with regard to the stratification of plant physiognomy.

The Herbaceous RW type was comprised of three hydrophytic habitat types and community types dominated by various associations of *Juncus balticus*, *Carex nebrascensis*, and *Carex utriculata*. Due to the mosaic distribution of these often small-scale communities, they are mapped according to physiognomic type. Herbaceous RW types totaled 75 acres, or 25 percent of total Riparian and Wetland vegetation type acreage, and 2 percent of the baseline study area.

Shrub-dominated RW types totaled 216 acres, or 71 percent of total Riparian and Wetland vegetation type acreage, and 6 percent of the baseline study area. The Shrub RW type included three mesophytic/hydrophytic low shrub community types in the *Dasiphora fruticosa* series (120 acres), and two hydrophytic tall shrub willow series dominated by *Salix bebbiana* or *Salix geyeriana* (96 acres). The Deciduous Forest RW type was comprised of the mesophytic *Populus tremuloides* series, including the *Populus tremuloides/Osmorhiza occidentalis* habitat type and *Populus tremuloides/Poa pratensis* community type. *Populus tremuloides* stands comprised approximately 13 acres, or 4 percent of total Riparian and Wetland vegetation type acreage, and 0.4 percent of the baseline study area.

Riparian and Wetland cover and constancy data are presented by sample site (plot) in Appendix Tables B14 and B15 (Herbaceous RW types), Appendix Tables B16 through B18 (Shrub RW types), and Appendix Table B19 (Deciduous Forest RW types), summarized by habitat and community type in Tables 5 through 7, respectively. Shrub density data are given by plot in Appendix Tables C13 through C18, and summarized for Riparian and Wetland types in Tables 11 through 13. Tree density data are presented by plot in Appendix Tables D10 through D13, and summarized by Riparian and Wetland type in Tables 17 through 19.

A correlation of soils mapping units, ecological sites and community types is listed by plot in Appendix E, and summarized by parameter in Tables 20 through 22. Rangeland productivity values and projected grazing capacity are shown in Table 23.

Plant species of concern listed by MTNHP (2015) for Meagher County are summarized in Table 25. A simple comparison of relative diversity among physiognomic types is presented in Table 26. The abundance of noxious weeds sampled in Riparian and Wetland types is given in Table 27. Appendix F provides a synopsis of important site parameters (topographical position, slope gradient and aspect) recorded for Black Butte Riparian and Wetland communities. A list of selected ecological literature

pertinent to the Black Butte study area is synthesized in Appendix G. Acreage of vegetation physiognomic types is given in Table 28. All vegetation sample site locations are shown on the vegetation type map (Plate 1). Representative photographs are included in Appendix H.

In the following text, Riparian and Wetland vegetation types are arranged first by physiognomic subtype (lower to taller vegetation stratum) and secondly, within the herbaceous and shrub subtypes, a moisture gradient from mesophytic to clearly hydrophytic.

### 3.2.5.1 Herbaceous Riparian And Wetland Types

#### *Juncus balticus* community type

The *Juncus balticus* community type is a common Riparian/Wetland type in the Black Butte baseline study area. Five plots were sampled on drainage bottoms and terraces of gentle (0-6 percent) slope gradient. Aspect was generally not relevant. The ecological sites were wet meadow and subirrigated, chiefly associated with the Medicinelodge-occasionally flooded soil. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

*Juncus balticus* c.t.  
n=5

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	105	Perennial	42	Shrub	2
Annual	-	Annual/Biennial	<1	Tree	-
<i>Juncus balticus</i>	38	<i>Cirsium arvense</i>	13	<i>Salix brachycarpa</i>	1
<i>Carex praegracilis</i>	16	<i>Symphyotrichum subspicatum</i>	7		
<i>Phleum pratense</i>	10	<i>Potentilla gracilis</i>	4		
<i>Poa pratensis</i>	9	<i>Senecio sphaerocephalus</i>	3		
<i>Festuca rubra</i>	6	<i>Geum rivale</i>	3		
<i>Poa palustris</i>	5	<i>Viola nephrophylla</i>	2		
<i>Deschampsia cespitosa</i>	4	<i>Polygonum amphibium</i>	2		
<i>Calamagrostis stricta</i>	4	<i>Geum aleppicum</i>	1		
<i>Carex pellita</i>	3	<i>Pedicularis groenlandica</i>	1		
<i>Hordeum jubatum</i>	3	<i>Taraxacum officinale</i>	1		
<i>Carex aquatilis</i>	2	<i>Sonchus arvensis</i>	1		
<i>Alopecurus arundinaceus</i>	1	<i>Mentha arvensis</i>	1		
<i>Anthoxanthum hirtum</i>	1				
<i>Carex nebrascensis</i>	1				

Shrub density averaged 911 live stems per acre, of which 73 percent was *Dasiphora fruticosa*, 11 percent *Salix planifolia*, 9 percent *Salix brachycarpa*, 4 percent *Salix bebbiana*, and 2 percent *Salix boothii*.

No trees were recorded in the five 0.1-acre density plots sampled in the *Juncus balticus* community type.

**Carex nebrascensis community type**

The *Carex nebrascensis* community type is a rather uncommon wetland type in the Black Butte baseline study area. Two plots were sampled on mucky drainage bottoms of gentle (0-3 percent) slope gradient. Aspect was westerly. The ecological site was wet meadow, associated with the MedicineLodge-frequently flooded soil. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

**Carex nebrascensis c.t.  
n=2**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	101	Perennial	40	Shrub	5
Annual	-	Annual/Biennial	<1	Tree	-
<i>Carex nebrascensis</i>	41	<i>Stachys palustris</i>	19	<i>Salix geyeriana</i>	2
<i>Juncus balticus</i>	15	<i>Mentha arvensis</i>	14	<i>Dasiphora fruticosa</i>	1
<i>Carex praegracilis</i>	11	<i>Viola nephrophylla</i>	2	<i>Salix boothii</i>	1
<i>Calamagrostis stricta</i>	8	<i>Potentilla anserina</i>	2	<i>Salix planifolia</i>	1
<i>Deschampsia cespitosa</i>	6	<i>Potentilla gracilis</i>	2		
<i>Carex aquatilis</i>	4	<i>Polygonum amphibium</i>	1		
<i>Poa palustris</i>	4				
<i>Poa pratensis</i>	4				
<i>Eleocharis palustris</i>	3				
<i>Festuca rubra</i>	2				
<i>Glyceria striata</i>	1				
<i>Hordeum brachyantherum</i>	1				
<i>Muhlenbergia richardsonis</i>	1				

Shrub density averaged 2428 live stems per acre, of which 63 percent was *Salix bebbiana* (stunted), 33 percent *Dasiphora fruticosa*, and 4 percent *Salix boothii*.

No trees were recorded in the two 0.1-acre density plots sampled in the *Carex nebrascensis* community type.

**Carex utriculata habitat type**

The *Carex utriculata habitat* type is the most abundant Herbaceous Wetland type in the Black Butte baseline study area. Eight plots were sampled on mucky drainage bottoms and terraces of gentle (0-5 percent) slope gradient. Aspect was northerly and westerly. The sole ecological site was wet meadow, associated with the Medicinelandge-frequently flooded soil. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

**Carex utriculata h.t.**  
**n=8**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	116	Perennial	12	Shrub	3
Annual	-	Annual/Biennial	<1	Tree	-
<i>Carex utriculata</i>	69	<i>Potentilla anserina</i>	2	<i>Dasiphora fruticosa</i>	3
<i>Carex nebrascensis</i>	10	<i>Mentha arvensis</i>	2		
<i>Alopecurus arundinaceus</i>	9	<i>Senecio sphaerocephalus</i>	2		
<i>Carex aquatilis</i>	8	<i>Stachys palustris</i>	2		
<i>Juncus balticus</i>	4	<i>Rumex occidentalis</i>	1		
<i>Carex simulata</i>	4	<i>Symphotrichum lanceolatum</i>	1		
<i>Carex praegracilis</i>	3				
<i>Alopecurus pratensis</i>	2				
<i>Poa pratensis</i>	2				
<i>Festuca rubra</i>	1				
<i>Deschampsia cespitosa</i>	1				
<i>Phleum pratense</i>	1				

Shrub density averaged 1100 live stems per acre, of which 91 percent was *Dasiphora fruticosa*, 6 percent *Salix bebbiana*, and 3 percent *Salix planifolia*.

No trees were recorded in the eight 0.1-acre density plots sampled in the *Carex utriculata* habitat type.

### 3.2.5.2 Shrub Riparian And Wetland Types

#### *Dasiphora fruticosa/Poa pratensis* community type

The *Dasiphora fruticosa/Poa pratensis* community type is relatively common on mesic, transitional sites between xeric communities upslope and hydrophytic communities on bottoms downslope. It appears to represent a grazing-induced phase of the less altered *Dasiphora fruticosa/Deschampsia cespitosa* community type. Six plots were sampled on bottoms and terraces of gentle (0-4 percent) slope gradient, and northerly or westerly aspects. The primary ecological site was subirrigated, associated with the Medicin lodge-occasionally flooded soil. Plant species dominance is shown below, based on percent canopy cover rounded to the nearest percent.

*Dasiphora fruticosa/Poa pratensis* c.t.  
n=6

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	95	Perennial	64	Shrub	44
Annual	-	Annual/Biennial	<1	Tree	-
<i>Poa pratensis</i>	37	<i>Potentilla gracilis</i>	10	<i>Dasiphora fruticosa</i>	43
<i>Phleum pratense</i>	30	<i>Taraxacum officinale</i>	7	<i>Salix bebbiana</i>	1
<i>Juncus balticus</i>	7	<i>Symphyotrichum subspicatum</i>	7		
<i>Carex praegracilis</i>	6	<i>Fragaria virginiana</i>	6		
<i>Agrostis stolonifera</i>	5	<i>Cirsium arvense</i>	3		
<i>Festuca rubra</i>	3	<i>Trifolium pratense</i>	3		
<i>Danthonia californica</i>	2	<i>Antennaria rosea</i>	3		
<i>Carex praticola</i>	1	<i>Viola nephrophylla</i>	3		
<i>Danthonia intermedia</i>	1	<i>Galium boreale</i>	2		
<i>Deschampsia cespitosa</i>	1	<i>Solidago canadensis</i>	2		
		<i>Antennaria microphylla</i>	2		
		<i>Geum rivale</i>	2		
		<i>Achillea millefolium</i>	1		
		<i>Iris missouriensis</i>	1		
		<i>Symphyotrichum ascendens</i>	1		
		<i>Astragalus agrestis</i>	1		
		<i>Trifolium hybridum</i>	1		
		<i>Geum macrophyllum</i>	1		

Shrub density averaged 3980 live stems per acre, of which 90 percent was *Dasiphora fruticosa*, 6 percent *Salix bebbiana*, 2 percent *Salix planifolia*, 1 percent *Salix pseudomonticola*, and 1 percent *Rosa woodsii*.

No trees were recorded in the six 0.1-acre density plots sampled in the *Dasiphora fruticosa/Poa pratensis* community type.

***Dasiphora fruticosa/Deschampsia cespitosa* community type**

The *Dasiphora fruticosa/Deschampsia cespitosa* community type is a relatively common shrub riparian type in the Black Butte baseline study area. Four plots were sampled on bottoms, terraces, and a lower slope position of gentle (1-4 percent) slope gradient and northerly aspect. The ecological site was subirrigated, associated with the Medicin lodge-occasionally flooded soil. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Dasiphora fruticosa/Deschampsia cespitosa* c.t.**  
**n=4**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	88	Perennial	48	Shrub	63
Annual	-	Annual/Biennial	<1	Tree	-
<i>Poa pratensis</i>	23	<i>Symphotrichum subspicatum</i>	13	<i>Dasiphora fruticosa</i>	63
<i>Festuca rubra</i>	14	<i>Potentilla gracilis</i>	6		
<i>Deschampsia cespitosa</i>	13	<i>Taraxacum officinale</i>	5		
<i>Juncus balticus</i>	12	<i>Viola nephrophylla</i>	4		
<i>Carex praegracilis</i>	10	<i>Trifolium repens</i>	4		
<i>Carex pellita</i>	5	<i>Fragaria virginiana</i>	3		
<i>Agrostis stolonifera</i>	4	<i>Valeriana edulis</i>	2		
<i>Agropyron trachycaulum</i>	2	<i>Geum rivale</i>	2		
<i>Phleum pratense</i>	2	<i>Achillea millefolium</i>	1		
<i>Calamagrostis stricta</i>	1	<i>Galium boreale</i>	1		
<i>Muhlenbergia richardsonis</i>	1	<i>Allium schoenoprasum</i>	1		
		<i>Trifolium longipes</i>	1		

Shrub density averaged 5110 live stems per acre, of which 95 percent was *Dasiphora fruticosa*, 2 percent *Ribes setosum*, 1 percent *Salix geyeriana*, and 1 percent *Salix bebbiana*.

No trees were recorded in the four 0.1-acre density plots sampled in the *Dasiphora fruticosa/Deschampsia cespitosa* community type.

***Dasiphora fruticosa/Carex utriculata* community type**

The *Dasiphora fruticosa/Carex utriculata* community type is an uncommon shrub RW type in the Black Butte baseline study area. Two plots were sampled on bottoms of gentle (3-5 percent) slope gradient and northerly aspect. The ecological site was wet meadow, associated with the MedicineLodge-frequently flooded soil. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

***Dasiphora fruticosa/Carex utriculata* c.t.**  
**n=2**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	120	Perennial	11	Shrub	21
Annual	-	Annual/Biennial	-	Tree	-
<i>Carex utriculata</i>	50	<i>Symphyotrichum subspicatum</i>	5	<i>Dasiphora fruticosa</i>	21
<i>Carex nebrascensis</i>	19	<i>Viola nephrophylla</i>	2		
<i>Deschampsia cespitosa</i>	16	<i>Geum macrophyllum</i>	1		
<i>Agrostis stolonifera</i>	9	<i>Taraxacum officinale</i>	1		
<i>Carex praegracilis</i>	6				
<i>Poa pratensis</i>	6				
<i>Juncus balticus</i>	6				
<i>Festuca rubra</i>	2				
<i>Calamagrostis stricta</i>	2				
<i>Carex pellita</i>	2				
<i>Phleum pratense</i>	2				

Shrub density averaged 3642 live stems per acre, comprised entirely of *Dasiphora fruticosa*.

No trees were recorded in the two 0.1-acre density plots sampled in the *Dasiphora fruticosa/Carex utriculata* community type.

**Salix bebbiana series**

The *Salix bebbiana* series is a common tall shrub RW type in the Black Butte baseline study area. Thirteen plots were sampled on the primary floodplain terraces as well as tributary upland drainages. Slope gradients were mostly gentle (1-8 percent) and aspects northerly and easterly depending on the direction of drainage. The sole ecological site was wet meadow, associated with the Medicinelodge-frequently flooded and Medicinelodge-occasionally flooded soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

**Salix bebbiana series  
n=13**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	110	Perennial	35	Shrub	61
Annual	-	Annual/Biennial	<1	Tree	<1
<i>Carex utriculata</i>	38	<i>Geum rivale</i>	7	<i>Salix bebbiana</i>	27
<i>Juncus balticus</i>	14	<i>Symphytotrichum subspicatum</i>	6	<i>Dasiphora fruticosa</i>	16
<i>Poa pratensis</i>	12	<i>Viola nephrophylla</i>	3	<i>Salix planifolia</i>	7
<i>Carex nebrascensis</i>	9	<i>Fragaria virginiana</i>	2	<i>Salix pseudomonticola</i>	4
<i>Carex pellita</i>	8	<i>Solidago canadensis</i>	2	<i>Betula glandulosa</i>	2
<i>Phleum pratense</i>	5	<i>Taraxacum officinale</i>	1	<i>Juniperus communis</i>	1
<i>Agrostis stolonifera</i>	3	<i>Trifolium hybridum</i>	1	<i>Salix brachycarpa</i>	1
<i>Festuca rubra</i>	3	<i>Mentha arvensis</i>	1		
<i>Deschampsia cespitosa</i>	3	<i>Heracleum lanatum</i>	1		
<i>Carex aquatilis</i>	2				
<i>Carex simulata</i>	2				
<i>Carex praegracilis</i>	2				
<i>Poa palustris</i>	2				
<i>Bromus inermis</i>	2				
<i>Glyceria striata</i>	1				
<i>Juncus longistylis</i>	1				

Shrub density averaged 9157 live stems per acre, of which 33 percent was *Salix bebbiana*, 31 percent *Dasiphora fruticosa*, 13 percent was *Salix planifolia*, 6 percent *Salix pseudomonticola*, 4 percent *Salix brachycarpa*, and 2 percent each for *Betula glandulosa*, *Rosa woodsii*, *Rosa acicularis*, *Ribes setosum* and *Salix geyeriana*.

Tree density was negligible in the *Salix bebbiana* series at one *Juniperus scopulorum* per acre in the 1 to 4-inch dbh class.

**Salix geyeriana series**

The *Salix geyeriana* series is a common tall shrub RW type in the Black Butte baseline study area. Twelve plots were sampled, particularly on the Sheep Creek floodplain terrace where it is the dominant willow series in that portion of the study area. It was occasionally sampled on tributary upland drainages. It occurs on very gentle (0-4 percent) slope gradients; aspects were variable and not relevant. The ecological sites were wet meadow (9 samples) and subirrigated (3 samples), associated with the Medicinelodge-frequently flooded and Medicinelodge-occasionally flooded soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

<i>Salix geyeriana</i> series n=12					
GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	67	Perennial	37	Shrub	100
Annual	-	Annual/Biennial	1	Tree	-
<i>Carex utriculata</i>	27	<i>Petasites frigidus</i>	7	<i>Salix boothii</i>	34
<i>Juncus balticus</i>	7	<i>Geum rivale</i>	6	<i>Salix geyeriana</i>	29
<i>Poa palustris</i>	6	<i>Symphyotrichum subspicatum</i>	4	<i>Salix bebbiana</i>	11
<i>Phleum pratense</i>	5	<i>Canadanthus modestus</i>	3	<i>Salix planifolia</i>	10
<i>Poa pratensis</i>	4	<i>Geum macrophyllum</i>	3	<i>Dasiphora fruticosa</i>	7
<i>Carex pellita</i>	3	<i>Viola nephrophylla</i>	2	<i>Ribes inerme</i>	2
<i>Carex nebrascensis</i>	3	<i>Mentha arvensis</i>	2	<i>Salix drummondiana</i>	2
<i>Calamagrostis canadensis</i>	2	<i>Taraxacum officinale</i>	1	<i>Betula glandulosa</i>	2
<i>Carex praegracilis</i>	2	<i>Cirsium arvense</i>	<1	<i>Salix melanopsis</i>	1
<i>Festuca rubra</i>	2				
<i>Agrostis stolonifera</i>	1				
<i>Bromus inermis</i>	1				
<i>Scirpus microcarpus</i>	1				

Shrub density averaged 4309 live stems per acre, of which 20 percent was *Salix boothii*, 20 percent *Dasiphora fruticosa*, 18 percent was *Ribes inerme*, 13 percent *Salix geyeriana*, 11 percent *Salix bebbiana*, 8 percent *Salix planifolia*, 4 percent was *Salix drummondiana*, 2 percent *Betula glandulosa*, and 1 percent each for *Salix melanopsis*, *Rosa woodsii* and *Ribes setosum*.

No trees were recorded in the twelve 0.1-acre density plots sampled in the *Salix geyeriana* series.

### 3.2.5.3 Deciduous Forest Riparian And Wetland Types

#### *Populus tremuloides/Osmorhiza occidentalis* habitat type

The *Populus tremuloides/Osmorhiza occidentalis* habitat type is infrequent in the Black Butte baseline study area. One plot was sampled on a midslope position of moderate (18 percent) slope gradient and northerly aspect. The ecological site was aspen/Kentucky bluegrass, associated with the Redchief silty loams soil. Plant species dominance is shown below, based on percent canopy cover rounded to the nearest percent.

*Populus tremuloides/Osmorhiza occidentalis* h.t.  
n=1

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	85	Perennial	56	Shrub	6
Annual	-	Annual/Biennial	2	Tree	52
<i>Phleum pratense</i>	32	<i>Geranium richardsonii</i>	25	<i>Populus tremuloides</i>	52
<i>Calamagrostis rubescens</i>	30	<i>Osmorhiza occidentalis</i>	13	<i>Rosa woodsii</i>	3
<i>Poa pratensis</i>	18	<i>Actaea rubra</i>	7	<i>Symphoricarpos albus</i>	3
<i>Agropyron trachycaulum</i>	3	<i>Fragaria virginiana</i>	3		
<i>Bromus carinatus</i>	2	<i>Geum macrophyllum</i>	2		
		<i>Cynoglossum officinale</i>	2		
		<i>Achillea millefolium</i>	1		
		<i>Galium boreale</i>	1		
		<i>Ranunculus uncinatus</i>	1		
		<i>Thalictrum venulosum</i>	1		
		<i>Taraxacum officinale</i>	1		

Shrub density averaged 8400 live stems per acre, of which 63 percent was *Symphoricarpos albus*, and 37 percent was *Rosa woodsii*.

Density of trees greater than four inches dbh (diameter at breast height) averaged 29 *Populus tremuloides* per acre; trees less than four inches dbh averaged 83 *Populus tremuloides* per acre, 1 *Picea engelmannii* per acre, and 1 *Pinus flexilis* per acre.

**Populus tremuloides/Poa pratensis community type**

The *Populus tremuloides/Poa pratensis* community type is relatively uncommon in the Black Butte baseline study area. Three plots were sampled on variable terrain including a bottom, midslope and ridge saddle. The sites were on gentle (3-8 percent) slope gradients of easterly aspect. The ecological sites were loamy droughty and aspen/bluegrass, associated with the Libeg clay loams, Medicinelodge-occasionally flooded and Redchief silty loams soils. Plant species dominance is shown below, based on mean percent canopy cover rounded to the nearest percent.

**Populus tremuloides/Poa pratensis c.t.  
n=3**

GRAMINOIDS		FORBS		WOODY PLANTS	
<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>	<u>Class/Species</u>	<u>Percent Cover</u>
Perennial	81	Perennial	61	Shrub	25
Annual	-	Annual/Biennial	2	Tree	53
<i>Poa pratensis</i>	54	<i>Taraxacum officinale</i>	21	<i>Populus tremuloides</i>	52
<i>Phleum pratense</i>	22	<i>Geranium viscosissimum</i>	10	<i>Rosa woodsii</i>	23
<i>Calamagrostis rubescens</i>	1	<i>Eurybia integrifolia</i>	7	<i>Symphoricarpos albus</i>	1
<i>Bromus carinatus</i>	<1	<i>Potentilla gracilis</i>	4		
		<i>Fragaria virginiana</i>	4		
		<i>Achillea millefolium</i>	3		
		<i>Galium boreale</i>	2		
		<i>Symphyotrichum subspicatum</i>	2		
		<i>Arnica cordifolia</i>	1		
		<i>Perideridia montana</i>	1		
		<i>Cynoglossum officinale</i>	1		
		<i>Lupinus leucophyllus</i>	1		

Shrub density averaged 11,400 live stems per acre, of which 92 percent was *Rosa woodsii*, 3 percent *Symphoricarpos albus*, 2 percent *Dasiphora fruticosa*, 1 percent *Ribes setosum*, and 1 percent *Symphoricarpos occidentalis*.

Density of trees greater than four inches dbh (diameter at breast height) averaged 9 *Populus tremuloides* per acre; trees less than four inches dbh averaged 83 *Populus tremuloides* per acre.

### 3.3 PRODUCTIVITY AND UTILITY

The primary land uses in the Black Butte study area are livestock grazing (rangeland) and hay production (lowland altered grassland or hay meadow). The Natural Resources Conservation Service (2015) presents long-term productivity data for some of the applicable soils and ecological sites in Meagher County, relative to good-excellent condition in the perceived “Historic Climax Plant Community” (HCPC). Additionally, NRCS (2015) gives long-term irrigated and nonirrigated hay yields by soils mapping unit that can be expected under a high level of management. Information pertinent to the Black Butte study area is summarized below.

#### 3.3.1 Rangeland

Appendix E identifies the soil mapping unit and ecological site for each vegetation plot sampled in the study area in 2015. Soil types are correlated with ecological sites in Table 20. Vegetation habitat types and community types are correlated with soil types in Table 21, and with ecological sites in Table 22.

The NRCS uses long-term data to predict productivity for each “Historic Climax Plant Community (HCPC)” to represent range in excellent condition, and indicates productivity for years of normal precipitation and temperature patterns. Annual production was determined for each soil mapping unit in the inventory area using the long-term data (NRCS 2015) (when available) developed for ecological sites in Major Land Resource Area 43B (MLRA 43B-Central Rocky Mountains) in the 15 to 19-inch and 20+-inch mean annual precipitation zones. Production data derived from NRCS (2015) are presented in Tables 20 and 23.

Productivity varies considerably among vegetation types in the study area, depending on current condition and the ecological sites involved. Potential rangeland productivity listed in Table 23 is projected for estimated grazing capacity in the baseline study area. Hypothetical grazing capacity calculated for HCPC (not current condition) rangeland was estimated at 4350 animal unit months (annually) for the baseline study area as a whole.

#### 3.3.2 Cropland

Hay is the only crop grown in the study area. In the Black Butte baseline study area, hay meadow areas on the Sheep Creek floodplain are regularly mowed and baled for hay production for livestock feed. These lowland pastures are dominated by various mixtures of *Phleum pratense*, *Poa pratensis*, *Alopecurus arundinaceus*, *Bromus inermis*, *Poa palustris* and *Schedonorus pratensis*, in combination with lesser composition of the native species *Carex praegracilis*, *Juncus balticus* and *Deschampsia cespitosa*. In the Black Butte baseline study area, the Hay Meadow type occurred on 69 acres (2 percent of the study area).

Based on compilation of long-term annual production data, the NRCS (2015) has determined representative values for non-irrigated and irrigated hay production for pertinent soils in the Black Butte baseline study area (Table 24). Hay cropland in the study area can be expected to produce approximately 3 to 5 AUM’s per acre, depending on the soil. The predicted yield of grass hay in the study area is expected

to average 1.5 to 2.0 tons per acre in non-irrigated pastures (Table 24). Grass-legume hay in the study area can be expected to yield 1.8 to 2.3 non-irrigated tons per acre, and 3.0 to 4.0 irrigated tons per acre based on NRCS (2015) productivity guidelines. In recent practice, grass hay and grass-legume hay on the Sheep Creek floodplain is harvested once a year within the study area, producing approximately 3 tons per acre annually on average (ranch manager, personal communication, 2015).

### 3.4 SPECIES LIST/MTNHP-LISTED SPECIES

Appendix A is a list of vascular plant taxa identified during the 2014-2015 quantitative and mapping inventory of the Black Butte vegetation (and wetland) baseline study area. A total of 398 vascular plant taxa were identified, with forbs (278 species) comprising the majority (70 percent). Forbs included 235 perennial taxa (213 native, 16 introduced and 6 fern allies), and 43 annual/biennial taxa (31 native and 12 introduced). Of 82 grasses and grass-like plants identified (21 percent of the total), there were 78 perennial taxa (66 native and 12 introduced), and 4 annual taxa (2 native and 2 introduced). The 38 woody plant taxa (9 percent of the total) recorded in the study area included 31 shrubs and vines, and 7 tree species, all native. Species numbers are listed by class below.

CLASS	NUMBER OF SPECIES	
	Black Butte Study Area (2014-2015) 5.3 square miles	Percent
Native Perennial Graminoid	66	16.6
Introduced Perennial Grass	12	3.0
Native Annual Graminoid	2	0.5
Introduced Annual Grass	2	0.5
Native Perennial Forb and Subshrub	213	53.5
Introduced Perennial Forb	16	4.0
Ferns and Allies	6	1.5
Native Annual/Biennial Forb	31	7.8
Introduced Annual/Biennial Forb	12	3.0
Native Shrub and Vine	31	7.8
Native Tree	7	1.8
<b>TOTAL</b>	<b>398</b>	<b>100</b>

No federally listed or proposed endangered or threatened plant species are known to occur in the vicinity of the Black Butte study area, and none were recorded during the 2014-2015 baseline vegetation inventory. A search of the Montana Natural Heritage Program (2015) website for “plant species of concern or SOC” in Meagher County (Table 25) found one plant species of concern that was identified in the study area, *Cirsium longistylum* (long-styled thistle).

*Cirsium longistylum*, endemic to central Montana, is a short-lived perennial (biennial?) species inhabiting montane to subalpine meadows. It is listed as G2G3 (global rank) and S2S3 (state rank). These rankings

indicate a range of uncertainty whether the species is at risk (S2) or potentially at risk (S3) in the state (and globally). MTNHP (2015) gives the state rank reason as: “population estimates of approximately 30,000 plants, including seven high quality populations over four mountain ranges... in generally high quality habitat with few if any problem weeds... and (for the largest populations) promising habitat protection on both public and private lands”.

In the Black Butte baseline study area, *Cirsium longistylum* was noted qualitatively by pedestrian survey, and recorded quantitatively during the vegetation inventory using the randomly located sample sites. It was usually associated with the vegetation types most altered by historical grazing, including Upland Altered Grassland (plot #67), *Festuca campestris*/*Festuca idahoensis* (plot #108), *Artemisia tridentata*/*Poa pratensis* (plots #51 and 97), *Artemisia tridentata*-*Dasiphora fruticosa*/*Poa pratensis* (plots #110 and 116), and *Dasiphora fruticosa*/*Poa pratensis* (plot #82). Plot locations are shown on the vegetation type map (Plate 1).

Many *Cirsium longistylum* specimens in the Black Butte study area indicated hybridization with other native thistle species, apparently *Cirsium scariosum* and/or *Cirsium hookerianum*.

### 3.5 PLANT SPECIES DIVERSITY

The diversity of vascular plant species was evaluated by determining the average number of species per plot in each general vegetation physiognomic type (Table 26). These data are summarized from the cover data presented by community type in Appendix B. Although these tallies are dependent on sample size, Table 26 provides a generalized assessment of the relative diversity of species by functional class among physiognomic types, particularly for those with similar sample sizes.

### 3.6 WEEDS

State-listed noxious weeds are given on the “Montana Noxious Weed List, Effective December, 2013” (Montana Department of Agriculture 2015). Four state-listed weed species (all Priority 2B), and one Priority 3 regulated plant species were encountered on the study area during the 2015 Black Butte baseline inventory.

**Priority 2B** noxious weeds are abundant in Montana and widespread in many counties of the state. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts. These weeds are capable of rapid spread and render land unfit or greatly limit beneficial uses. The four species recorded in the study area included:

- Canada thistle (*Cirsium arvense*)
- Spotted knapweed (*Centaurea maculosa*)
- Oxeye daisy (*Leucanthemum vulgare*)
- Houndstongue (*Cynoglossum officinale*)

**Priority 3** species are “regulated plants” (not Montana-listed noxious weeds). These regulated plants have the potential to have significant negative impacts. The plant may not be intentionally spread or sold other than as a contaminant in agricultural products. One Priority 3 species was recorded on the Black Butte study area:

- Cheatgrass brome (*Bromus tectorum*)

The distribution of 185 sample plots throughout vegetation communities in the study area provides a fair assessment of the relative abundance of vascular plant species among community types, including state-listed noxious weed species. Vascular plant canopy cover and constancy data are summarized in Tables 2 through 7, and an excerpt of noxious weed data is presented by species and vegetation type in Table 27.

Presently, 32 Priority 1 and 2 species are listed for Montana statewide. Of the four state-listed noxious weed species found in the study area, three of them were recorded during the quantitative inventory of randomly distributed cover plots. The remaining species, *Leucanthemum vulgare*, was recorded during qualitative surveys of the study area. In addition to noxious weeds listed for Montana state-wide, many counties have independently listed various other troublesome weed species targeted for control. Of 56 Montana counties, 21 have not designated such additional target weed species, including Meagher County (Montana Department of Agriculture 2013). Caraway (*Carum carvi*) is on two county lists; it and yellow rattle (*Rhinanthus crista-galli*) can often be problematic in high-mesic meadows, and in the Black Butte baseline study area they had relatively high canopy cover values (about 6 percent each) in the Lowland Altered Grassland (Hay Meadow) community type. Two counties have listed field scabious (*Knautia arvensis*) as a problem; a dense population was recorded in a lower tributary just north of Little Sheep Creek in the vicinity of plot #85 (Plate 1). Fourteen Montana counties have listed musk thistle (*Carduus nutans*) as a problematic weed. All four species were recorded in the Black Butte study area, and are added below to the list of weed abundance and distribution summarized from Table 27.

**Noxious Weed Abundance and Distribution (Percent Cover/Constancy) by Physiognomic Type,  
Black Butte Baseline Study Area, 2015.**

	Upland Grassland n=28	Upland Shrubland n=44	Conifer Forest and Woodland n=40	Hay Meadow and Roadsides n=16	Riparian and Wetland (RW)		
					Herbaceous RW n=15	Shrub RW n=37	Deciduous Tree RW n=4
<b>NOXIOUS WEEDS</b>							
<i>Centaurea maculosa</i>		0.2/2					
<i>Cirsium arvense</i>			<0.1/5	0.3/19	4.3/20	1.0/30	0.1/25
<i>Cynoglossum officinale</i>		0.1/5	0.2/15			0.2/14	1.3/75
<i>Leucanthemum vulgare</i>				X			
<b>PROBLEMATIC WEEDS</b>							
<i>Carduus nutans</i>	<0.1/4	<0.1/2	0.1/5	<0.1/6		<0.1/3	
<i>Carum carvi</i>				6.6/63			
<i>Knautia arvensis</i>	1.5/4					<0.1/5	
<i>Rhinanthus crista-galli</i>				6.3/50	0.3/13		

n = number of quantitative sample sites    X = present in the type, not recorded at a sample site

The two most common noxious weeds in the Black Butte study area, particularly in lowlands, were *Cirsium arvense* (Canada thistle) and *Cynoglossum officinale* (common houndstongue). *Centaurea maculosa* (spotted knapweed) was recorded with minor cover values at limited sites in upland shrubland community types. *Leucanthemum vulgare* was noted only as scattered plants in hay meadow and disturbed roadside locations.

Of the four potentially problematic weed species recorded, *Carduus nutans* (musk thistle) was by far the most common. In fact, musk thistle was generally more conspicuous than the listed noxious weed species, occurring in almost every vegetation physiognomic type present in the study area, occasionally in dense patches. One dense population was sampled during the 2014 baseline wetlands inventory (plot 162, Plate 1). The site was treated with herbicide (very effectively) in the interim, prior to the 2015 baseline vegetation inventory, when it was again sampled. A comparison of the two years of vegetation cover data is presented in section 3.2.4 as the “noxious weed tailings” community type.

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