

# **Plant and Animal Resources and Ecological Condition of the Hanging Woman Basin in Big Horn County, Montana and Sheridan County Wyoming**

Prepared for:

Padlock Ranch  
and  
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By:

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## EXECUTIVE SUMMARY

The biological resources of southeastern Montana are not well documented. Recent proposals to develop large portions of this landscape for the production of coal-bed methane have focused attention on the potential effects of such development on the region's wildlife, vegetation, and ecosystems. This report provides an initial overview of biological resources within the Hanging Woman Creek Basin of southeastern Montana and, in general, the middle portion of the Tongue River Basin in Montana and Wyoming.

This overview focused on animal and plant Species of Concern and plant communities, but also included other animal species observed or expected in the Basin. We conducted three brief field surveys, focused on the Forks Ranch Unit of the Padlock, and assembled previously collected data from the Montana Natural Heritage Program and the Wyoming Natural Diversity Database, as well as data from other sources. Though examples of all habitats were included in the survey, an exhaustive search of appropriate habitat for particular sensitive species was not conducted.

The most important animal species present within the Hanging Woman Basin from a conservation perspective are the Black-tailed Prairie Dog and the Greater Sage Grouse. Other animal Species of Concern documented in or near the basin include Northern Grasshopper Mouse (*Onychomys leucogaster*), Merriam's shrew (*Sorex merriami*), Burrowing Owls, Greater Short-horned Lizards (*Phrynosoma hernandesi*), Northern Leopard Frog (*Rana pipiens*), Great Plains Toad (*Bufo cognatus*) and Plains Spadefoot (*Spea bombifrons*). Extensive sage habitats in the Hanging Woman Basin potentially provide habitat for a number of sage obligate bird species, including Sage Thrasher (*Oreoscoptes montanus*), Sage Sparrow (*Amphispiza belli*), Ferruginous Hawk (*Buteo regalis*), Brewer's Sparrow (*Spizella breweri*), Lark Bunting (*Calamospiza melanocorys*), and Loggerhead Shrike (*Lanius ludovicianus*). The Milk Snake (*Lampropeltis triangulum*), a species of concern for both Montana and Wyoming, potentially occurs along sandstone outcrops, ridges and escarpments associated with Ponderosa pine communities.

We documented 13 plant associations on the ranch, though approximately 73 community types are known to occur in this ecoregional Section. Greater community diversity almost certainly exists in the basin, particularly in wetland or riparian areas and badlands, which could not be adequately inventoried in this brief assessment. Three plant taxa of global significance have been documented in this basin or the Upper Tongue River drainage. Barr's milkvetch (*Astragalus barrii*) and Woolly twinpod (*Physaria didymocarpa* var. *lanata*) tend to occupy high knobs and outcrops, while Nuttall's desert-parsley (*Lomatium nuttallii*) grows on mid- to lower-slopes, especially along drainages.

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## INTRODUCTION

The biological resources of southeastern Montana are not well documented. Recent proposals to develop large portions of this landscape for the production of coal-bed methane (CBM) have focused attention on the potential effects of CBM development on the region's wildlife, vegetation, and ecosystems. The first step in answering these questions is to assemble information on the biological resources that currently exist in this landscape.

This report provides an initial overview of biological resources within the Hanging Woman Creek Basin of southeastern Montana and, in general, the middle portion of the Tongue River Basin in Montana and Wyoming. This area was selected at the request of, and with financial support from, the Padlock Ranch, Forks Unit to assist Ranch managers in working with industry to minimize impacts of energy development on wildlife and vegetation. The Bureau of Land Management also supported the work, to help build a stronger information base of biological resources in this poorly documented area of the state.

Although much of the report is focused on animal and plant species of concern, we also documented plant communities and other animal species observed and expected to occur in the Basin. We conducted three brief field surveys on the Ranch, and assembled previously collected data from the Montana Natural Heritage Program and the Wyoming Natural Diversity Database, as well as data from other sources, to produce this overview. Based on this information, we also provide a preliminary assessment of the current status of the plants, plant communities and animals within this landscape, and some observations about management of those resources.

## GENERAL SETTING

The Hanging Woman Basin is situated in predominantly gently rolling prairie located about 50 and 18 air miles respectively from Sheridan, Wyoming and Decker, Montana. Though the occasional hillock, minor escarpment and butte are present and some areas are highly dissected by dendritic drainages, the overall impression is of a gently undulating tableland with shallowly entrenched tributaries to the main drainage, Hanging Woman Creek. The major drainages of this basin include the West, Middle and North Prongs of Hanging Woman Creek, Trail, Deep, Waddle and Seventysix Creeks. Elevations range from just over 3,500 feet along the northern portion of Hanging Woman Creek to slightly less than 4,100 feet on the apex of several of the buttes (Figure 1). Hanging Woman Creek joins the Tongue River near the town of Birney, Montana.

Bedrock and surficial geology accords with that of much of southcentral Montana and northcentral Wyoming. With the exception of Quaternary alluvium deposited along the lower reaches of Hanging Woman Creek, parent material is predominantly sedimentary rock, mudstones and clay shales of the Cretaceous age Fort Union Formation and sandstones of the Wasatch Formation. Sandy soils generally occur in the uppermost positions in the local landscape associated with a more weathering resistant caprock; also occurring to a minor extent in elevated positions are thermally altered shales and mudstones (forming clinker and scoria). Soils of mid to lower slopes are characteristically loams (mostly silt loams), whereas those of the toeslopes, terraces and bottoms are silty, often with a high percentage of clay.

The area's climate is continental with hot summers, cold winters and the bulk of precipitation in the late spring and early summer. The Otter 9SSW Station (MT) at 4,060 feet elevation (closest to and representing the highest portions of the Fork Ranch Unit) receives an average of 18.9 in. of precipitation and has mean January and July temperatures of 21.5° and 72.2° respectively (based on 1961-1990 period of record). The Otter Station, for the period of April - June, receives on average more than 8 inches of precipitation, or 42% of the annual amount. To the west of the Forks Ranch at the Decker 1 E Station (3,500 feet and representing a modal elevation for the ranch), precipitation for April - June is just over 5.5 inches, or 46% of the annual average of 12.15 inches. Precipitation appears to increase rapidly with elevation in this part of the Powder River Basin, based on an expected 12 to 14 inches annually for the lower portions of the Fork Ranch Unit (down to 3,500 feet) compared with more than 18 inches (USDA-NRCS 1999) expected for the upper elevations (only 500 feet higher).

Climate drives community composition and patterning, however weather of the recent past (last several years to present) determines community productivity and may cause compositional shifts or failure of some species to flower or even appear. For at least two years (2000, 2001) prior to our sampling, a drought has plagued this portion of Montana/Wyoming and continued well into the summer of 2002. For the critical precipitation period of April-June (especially critical to cool-season grasses), the last three years were 2.17, 3.66, and 3.42 inches below normal, an average decrease of 55%. This ongoing and deep drought has severely reduced forage production and made inventory of plant populations and communities more difficult. The combination of drought-stressed communities and livestock grazing has also resulted in extensively depleted range and made it difficult to evaluate the ecological status of communities.

Due to the relatively restricted climatic gradient, and the narrow range and consistency of topographic relief and parent materials, the vegetation on the Ranch is characterized by extensive areas of relatively common community types. It is conceivable that, in the absence of disturbance/treatments, the entire Forks Ranch would be covered by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*)-dominated shrubland or shrub herbaceous plant associations. Exceptions would be riparian hardwood stringers, alluvial bottomlands with or without the influence of alkaline soils, sandstone outcrops with xeric ponderosa pine (*Pinus ponderosa*) woodlands, and scoria exposures with a sparse, depauperate vegetative cover. Where Wyoming big sagebrush has been disturbed (burned or converted by other means), mesic grasslands persist until the sagebrush can reestablish dominance. Black-tailed prairie dog (*Cynomys ludovicianus*) colonies also constitute a significant disturbance, creating grass-dominated areas that represent an earlier successional stage in the progression to *A. tridentata* ssp. *wyomingensis* dominance.

Animal distributions in the Basin would be expected to follow vegetation conditions in the absence of disturbances, as noted above. Sage obligate and sage associated species would be expected throughout the sagebrush habitat type, and a number of species associated with prairie dog towns would be present. The populations of these prairie dog associated species would depend on the size and extent of the prairie dog colonies, which may have been extensive prior to control efforts. Much of the animal diversity would have been centered along the riparian hardwood stringers where the increased structural complexity provides habitat for a wider range of species.

## METHODS

Field procedures were designed to inventory for both plant communities and sensitive plant and animal species; given that only four field days were available for the plant surveys as well as the animal surveys, a balance was struck between intensive survey for particular species and a broad-brush assessment of the animal and plant communities. Sampling was focused on the Forks Ranch Unit, and was conducted as an informal gradsect approach (Austin and Heyligers 1989), with travel routes chosen to include the full range of abiotic parameters; these same routes were also used for sensitive plant and animal species inventories. Though examples of all habitats were included in the survey, an exhaustive search of appropriate habitat for particular sensitive species was not conducted. Plant and plant community surveys were conducted by Stephan V. Cooper between June 12 and 14, 2002. Animal surveys were conducted by John C. Carlson from July 15 to July 17, 2002. Additional small mammal trapping was conducted on the Padlock Ranch from August 21 to August 23, 2002 by John C. Carlson as part of a larger statewide effort funded by Montana Fish, Wildlife, and Parks.

Prior to conducting fieldwork, we prepared a search list of plant (Appendix 3) and animal (Appendix 2) species and their habitats to use in planning and conducting field surveys. It included Montana and Wyoming plant and animal species of concern that had been previously documented from Big Horn County, MT or Sheridan County, WY or from adjoining counties, consistent with current species of concern lists for Montana (Heidel 1999, Carlson 2001) and Wyoming (Wyoming Natural Diversity Database 2002). We documented all locations of species of concern encountered during our surveys.

We also selected 33 plant associations that could occur in the Forks Ranch Unit (Appendix 4) as search targets from a list of plant communities compiled during a rapid ecological assessment in the Powder River Basin Section of the Great Plains-Palouse Dry Steppe Province (331G of Bailey 1995, Martin et al. 1998). When we encountered plant associations ranked G3 or S3 and higher, we recorded species composition and cover, at least for the first occurrence noted.

For common communities, ranked G4 and lower, we noted their occurrence and made some observations on their position in the landscape and areal extent. It should be noted that no definitive plant association classification has been published for this local and thus the communities inventoried in this study were compared to those described in EcoArt (NatureServe 2002) or the classifications of greatest geographic and ecologic propinquity (DeVelice et al. 1995; DeVelice and Lesica 1993; Vanderhorst et al. 1998). Sampling sites for communities are depicted in Figure 1.

Small mammal surveys consisted of four trap lines with ten trap stations each. At each station one snap trap and one Sherman live trap were deployed. Snap traps were baited with peanut butter and Sherman traps were baited with an oatmeal/commercial birdseed mixture. In addition two pit trap arrays were deployed near two of the trap lines. Each array consisted of four plastic cup pits traps at the center and at each end of three masonite fences radiating from a central point.

## RESULTS

### *Plant Communities*

#### **SHRUBLANDS:**

By far the greatest portion of the Fork Ranch Unit is potentially dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) (Figure 6); only restricted habitats such as riparian bottoms, ridgeline outcrops and sandy or extremely eroded outcrops are not likely to be Wyoming big sagebrush dominated. The extensive grasslands found over slopes and flats is attributable to past burning of the range, either as a sagebrush control measure or as wildfire. Anecdotal evidence is beginning to accumulate to show that response to disturbance varies significantly among subspecies of big sagebrush and that Wyoming big sagebrush is very slow to revegetate disturbed areas, regardless of treatment type. This response has significant implications for managing not only for livestock but also for a healthy and diverse ecosystem.

The only other shrub of any consequence is black greasewood (*Sarcobatus vermiculatus*), which is restricted to alkaline or salt-affected bottomlands (Figure 9), and also rarely occurs on sideslopes where appropriate soil conditions exist. Also associated with bottomlands is silver sage (*Artemisia cana* ssp. *cana*) but, it favors substrates that are not salt-affected or alkaline. Very small patches of Gardner's saltbush (*Atriplex gardneri*) were found on highly erosive clay outcrops; associated species were few and inconsistently present from patch to patch, thus no particular plant association could be identified for these sites. Fragrant sumac / bluebunch wheatgrass (*Rhus trilobata* / *Pseudoroegneria spicata*) was also noted as fragmentary occurrences on eroding slope shoulders of sandy knolls and escarpments. Prairie junegrass (*Koeleria macrantha*) canopy cover is higher than would be expected and has probably increased as a result of intensive grazing pressure placed on preferred species.

#### **Plant Association Descriptions**

##### ***Artemisia cana* ssp. *cana* / *Pascopyrum smithii* (formerly *Elymus smithii*) Shrub Herbaceous Plant Association:**

The first terrace up from streams and coalesced fans support this community. The cover of *A. cana* ssp. *cana* is generally low, between 5 and 20%, not technically enough to qualify sites as true shrublands (according to NVCS); the only other shrub occurring here is *Sarcobatus vermiculatus*. The undergrowth is almost exclusively comprised of graminoids, among which *P. smithii* and the exotic *Poa pratensis* are usually dominant (cover between 30 and 70%), and *Koeleria macrantha*, *Poa secunda*, and *Nassella viridula* (formerly *Stipa viridula*) are consistently represented. Though seldom present with greater than 5-10% cover under favorable conditions, the fact that *Nassella viridula* is present in mere trace amounts may be indicative of past intensive grazing.

##### ***Artemisia cana* ssp. *cana* / *Carex inops* ssp. *heliophila* Shrub Herbaceous Plant Association:**

The lone occurrence of this association on the Forks Unit comprises a small recently burned patch and thus represents a relatively early successional stage in a burned community (ostensibly of the same name, though its composition might have been somewhat different). *A. cana* ssp. *cana* is well known to stump-sprout and is not confined to alluvial positions as this association evidences by its hillslope position on fine sands. In this stand *A. cana* ssp. *cana* has stump sprouted and approaches 20% cover. Other

herbs, whose presence is generally tied to sandy substrates, include *Pediomelum argophyllum* (formerly *Psoralea argophylla*), *Calamovilfa longifolia*, and *Oryzopsis hymenoides*. *Poa secunda* and *Festuca idahoensis* exhibit covers in excess of 10 %. To date this community has been reported only for Montana, but this occurrence would indicate appropriate habitats in Wyoming also support it.

***Artemisia tridentata* ssp. *wyomingensis* / *Pseudoroegneria spicata* (formerly *Agropyron spicatum* or *Elymus spicata*) Shrub Herbaceous Plant Association:**

Generally steep slopes with moderately coarse-textured soils (e.g. sandy loams) support sparse stands (canopy cover 10-20%) of *A. tridentata* ssp. *wyomingensis* with an undergrowth dominated by low coverages of *P. spicata* and *Koeleria macrantha* and *Carex filifolia*; areas transitional to finer-textured soils support significant amounts of *Pascopyrum smithii* (where the cover of *P. smithii* becomes sufficient to indicate a type with that name has not been formally established). The only exotic of note, *Bromus tectorum*, is present here in low to moderate cover, generally less than 20%.

Associated shrubs reflecting the coarse soils include *Rhus trilobata*, *Yucca glauca*, *Artemisia frigida*, *Gutierrezia sarothrae*, and *Ericameria nauseosa* (formerly *Chrysothamnus nauseosus*). The forb component is both species depauperate and low in aggregate canopy cover; common species include *Phlox hoodii*, *Lomatium cous*, *Erigeron pumilus*, and *Allium textile*. [In the National Vegetation Classification Standard the designation 'Shrub Herbaceous' is used to denote vegetation types wherein the shrub component has less than 25 % cover, which is clearly the case with this relatively xeric big sagebrush type]

***Artemisia tridentata* ssp. *wyomingensis* / *Pascopyrum smithii* (formerly *Agropyron smithii* or *Elymus smithii*) Shrub Herbaceous Plant Association:**

Most of the Fork Ranch would support various permutations of this association had not various disturbances, predominantly burning, occurred in the past. As the most common plant association on the Fork Ranch, this association is capable of dominating from just above the riparian zone (and is found on the first terrace up from streams often considered part of the riparian) to the top, or sometimes only the shoulder, of ridges and hills. It is associated with medium-to fine-textured soils (loams to silt and clay loams) derived from the sedimentary Fort Union Formation. *A. tridentata* ssp. *wyomingensis* cover is generally greater here than in the *A. tridentata* ssp. *wyomingensis* / *P. spicata* P. A., ranging from about 10 to 30%. Besides the diagnostic *P. smithii* (whose cover ranged from 20 to 60 % and would be higher in a non-drought year), other native graminoids consistently present include *Poa secunda*, *Nassella viridula* (= *Stipa viridula*), and *Koeleria macrantha*. The fact that *Nassella* is present in such low cover, even on the sites most favorable to its development (toeslopes, swales) may be explained by past intensive grazing (it is highly palatable) or the ongoing drought or a combination of these two factors. *Poa pratensis* is a major increaser species on the more mesic portion of this association. *Bromus tectorum* has also responded to disturbance but does not seem to pose a threat to native populations except where disturbance is intensive and ongoing. Forb cover seldom exceeds 5% and commonly includes *Sphaeralcea coccinea*, *Comandra umbellata*, *Crepis* spp. and *Astragalus agrestis*.

***Sarcobatus vermiculatus* / *Pascopyrum smithii* (formerly *Elymus* or *Agropyron smithii*) Shrub Herbaceous Plant Association:**

This community is associated with alluvial terrace deposits derived from shale or other fine-grained sedimentary material and are mostly small to large patch in extent. All the examples of this type

examined on the ranch had extremely fine textured, high in clay soils with gap distance of the shrink swell cracks approaching 1.5 inches. We speculate that for a portion of the year soils, due to the water-perching potential of the heavy-textured soils, are saturated to a depth tapped by *S. vermiculatus*. Of the sites examined on the Fork Ranch none possessed hydric soils, though several sites showed traces of salt efflorescence indicating alkaline conditions. The cover of *Sarcobatus*, the only shrub noted on these sites, ranges from 5 to 20 % and the undergrowth is very depauperate. We noted a considerable variation in the cover of *Pascopyrum*, from less than 5% to more than 70%. These sites are easily accessible to livestock and presumably some of this variation in graminoid cover is explained by differing grazing pressures, yet some may be due to the alkalinity of the soil. Other grasses consistently present are *Distichlis spicata* and *Poa juncifolia* (now termed *P. secunda* but, we cite the older synonymy, *P juncifolia*, because this taxa is associated with bottomland habitats and *P. secunda*, as currently and broadly defined, is generally not).

### **FORESTS AND WOODLANDS:**

The Hanging Woman Basin receives insufficient rainfall to support more than a woodland condition on the uplands, where ponderosa pine (*Pinus ponderosa*) and Rocky Mountain juniper (*Juniperus scopulorum*) are the only trees present (Figure 10). Canopy cover of the tree layer seldom exceeds 50% and generally ranges from 10 to 35 %, which would place many of these communities below the cutoff for woodland (25%) and in the savanna structure category. Hardwood forests are extremely limited on the Ranch, with narrow riparian stringers dominated by box elder (*Acer negundo*); wooded riparian areas were incompletely inventoried and may support stands wherein plains cottonwood (*Populus deltoides*) is a component or even dominant.

### **Plant Association Descriptions**

#### ***Pinus ponderosa* / *Pseudoroegneria spicata* (formerly *Agropyron spicatum* or *Elymus spicatus*) Woodland Plant Association:**

This community is found as small, open stands on sandstone outcrops or where sandstone colluvium has mixed with finer textured parent material. Usually stands are associated with warmer exposures of west to south-facing slopes; they also occur on flat to undulating benchlands at the crest of ridges and escarpments. Mature canopy height of *P. ponderosa* does not much exceed 40 feet and *Juniperus scopulorum* is more of a multistemmed shrub less than 10-12 ft. in height. The undergrowth may have very scattered *Yucca glauca* and *Rhus trilobata*, two shrubs often associated with sandy soils. We observed burned areas that had experienced a high degree of *P. ponderosa* mortality to regenerate to *Artemisia tridentata* ssp. *wyomingensis* before the tree component is reestablished. However, seldom was *A. tridentata* a component of older, or even younger, *P. ponderosa* stands. These observations may point to the protracted nature of succession on these xeric sites (Figure 7). *Pinus ponderosa* has been observed to establish preferentially on sites with nurse shrubs (e.g. *A. tridentata*) however, a rate-limiting step in this process is the establishment of *A. tridentata*, which may require 20 to 30 years to generate significant numbers of individuals with mature crowns (affording protection). *Pseudoroegneria spicata* is the diagnostic and dominant herbaceous species (canopy cover seldom exceeding 20%) with *Carex filifolia* and *Oryzopsis hymenoides* consistently present with low cover values. Some commonly occurring forbs include *Astragalus agrestis*, *Pediomelum argophyllum* (formerly *Psoralea argophylla*), *Crepis acuminata*, *Cirsium* spp., *Linum lewisii* and *Antennaria parvifolia*. Most of the

stands of the visited stands of this association were in good condition with relatively few exotics in the undergrowth (low coverages of *Bromus tectorum*).

***Pinus ponderosa* / *Festuca idahoensis* Woodland Plant Association:**

This association is represented by small stands, often constituting a mere downslope fringe to *P. ponderosa* / *P. spicatum* stands; it is associated with more mesic positions than *P. ponderosa* / *P. spicata*, such as north or east-facing slopes but holds in common with the more prevalent forest association an affinity for sandy substrates (which occur near the crest of ridge systems). Scattered shrubs of *Rhus trilobata* and *Artemisia frigida* occur in the undergrowth. The graminoid component is like that of *P. ponderosa* / *P. spicata* but with *Festuca idahoensis* having at least 5% canopy cover; *Carex inops* ssp. *heliophila* may be present in low coverages. We took this approach to recognizing the type because often the cover of *P. spicata* was appreciable or at least approaching, or even exceeding, that of *F. idahoensis*, a condition apparently not encountered by Hansen and Hoffman (1988) and not well accommodated by their key. The forb component is like that of *P. ponderosa* / *P. spicata* but, has in addition, some more mesic species e.g. *Geum triflorum*, *Potentilla arguta*, and *Potentilla gracilis*.

***Pinus ponderosa* / *Carex inops* ssp. *heliophila* Woodland:**

This association was **not found** but is strongly suspected to occur in a very fragmentary way; this prediction is based on observing this community in adjacent landscapes immediately north and east of the study area.

***Acer negundo* / *Prunus virginiana* Forest Plant Association:**

Only one small and poor quality stand of this association was examined, though other hardwood stands were spotted with binoculars and appeared to be in the same landscape position (as the one examined), secondary stream corridors and cool toeslopes near or at the heads of drainages. The inventoried site had been severely hummocked by early season cattle use. A highly variable canopy cover of *Acer negundo* approximately 30 feet tall straddled an intermittent stream course. The non-palatable shrub component of *Symphoricarpos occidentalis* and *Rosa woodsii* was abundant whereas the more palatable shrubs *Prunus virginiana* and *Salix* spp. were severely browsed and had less cover. The native forbs and graminoids have been negatively impacted by domestic stock to the extent that composition could not be determined (remnant of *Maianthemum stellatum* was noted) and the exotics and native increasers such as *Poa pratensis*, *Arctium* spp., *Galium aparine*, *Taraxacum officinalis*, and *Achillea millifolium*. It appeared (scanning with binoculars) that none of the riparian areas had been fenced to control cattle or wild ungulate browsing pressure and consequently it can be expected that degradation of these areas will be the norm.

**GRASSLANDS AND SPARSE VEGETATION TYPES:**

We speculate that in the absence of disturbance nearly the whole of the Forks Ranch would be supporting shrubland communities wherein the major shrub component is Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Because disturbance is both a natural (principally via wildfire) and man-imposed process of this landscape and because there are some azonal soils embedded in the landscape there are also flourishing grassland types (Figure 8).

## **Plant Association Descriptions**

### ***Calamovilfa longifolia* ñ *Carex inops* ssp. *heliophila* Herbaceous Vegetation Plant Association:**

This association occurs as small patches or linear extensions on north or east-facing slopes having fine sandy soils. Warmer slopes with comparably sandy soils would have a dominant component of *Pseudoroegneria spicata*. There are indications that, in part, this community is seral to *Pinus ponderosa*, but the rate of succession is very slow in this dry environment. A variable mix of *Calamovilfa longifolia* and *Carex inops* dominate these sites with *Schizachyrium scoparium* having appreciable cover on unstable or recently stabilized sites. Other graminoids consistently present include *Koeleria macrantha*, *Festuca idahoensis*, *Hesperostipa comata* (formerly *Stipa comata*) and *Poa secunda*. On at least one north-slope site *F. idahoensis* had cover in excess of 5 %, indicative of relatively mesic conditions, but we classified the site to this type based on the fact that soils were sandy and *Calamovilfa* was dominant or an important component. *Artemisia cana*, *A. frigida*, and *Rosa woodsii* are consistently present, but their aggregate cover does not 5 %; *A. tridentata* ssp. *wyomingensis* is conspicuously absent from these sites. Forbs regularly present included *Antennaria parviflora*, *Pediemelum argophyllum* (formerly *Psoralea argophylla*), *Cerastium arvense* and *Opuntia polyacantha*.

### ***Distichlis spicata* Herbaceous Vegetation Plant Association:**

This is a minor wetland type occurring as small patches, usually linear in form, in saline or alkali-affected drainage margins, basins or swales. It usually gives way to *Pascopyrum smithii*-dominated sites having better drainage and/or which are less salt-affected.

### ***Pascopyrum smithii* (formerly *Elymus smithii* or *Agropyron smithii*) ñ *Poa secunda* (formerly *P. sandbergii*) Herbaceous Vegetation Plant Association:**

This community, the most common grassland community on the Forks Ranch, is quite extensive as a seral community due in large part to the control of Wyoming big sagebrush; it also in part occupies sites where big sagebrush might not be expected (mesic sites in drainage bottoms). It occurs on fine-textured soils of stream terraces, with soils so heavy that drying cracks are more than an inch wide; it also is found on all but the most xeric of upland sites (such as south facing slopes shoulders, and even here it may occur as a depauperate community). It is dominated by *P. smithii*, though in some cases where grazing has been intensive (or perhaps just its intrinsic expression under drought conditions) *Poa secunda* has nearly equivalent cover values. In other expressions of the type *Koeleria macrantha* has greater cover than *P. secunda* and only under exceptionally heavy grazing does *Koeleria* become dominant over *P. smithii* (*K. macrantha* is generally not used as an indicator species of natural conditions because it is the most ubiquitous of cespitose grasses and relatively unpalatable to domestic stock or wild ungulates and thus an increaser under grazing). Shrubs and subshrubs were present in only trace amounts and fringed sage (*Artemisia frigida*) was the only species occurring with greater than 50% constancy. The relatively depauperate forb component may be explained by many of the sites examined having experienced fire in the recent to distant past (presuming forbs to be negatively impacted by the fires) and the stress of an ongoing drought. The most common forbs were exotics, *Taraxacum officinalis* and *Tragopogon dubius*. Another explanation of forb scarcity could be historic sheep grazing but not knowing ranch history this reason is purely speculative. The interaction of all three factors to produce an exacerbated condition is not unlikely.

### ***Pseudoroegneria spicata* / Cushion Plant Sparse Vegetation:**

Ostensibly this is a relatively rare community type (G3) that has been described only from the Tendoy Mountains of western Montana and Big Horn and Custer Counties of eastern Montana (DeVelice and Lesica 1993) and possibly extending into Wyoming's portion of the Bighorn Canyon NRA (as windswept plateau grassland Knight et al. 1987). It is found as small patches on badlands terrain characterized by thin and eroding soils; site severity is often exacerbated by the impact of southwesterly winds on what are the most projecting landforms in local landscapes. On the Forks Ranch, this type of terrain is restricted to the very tops and shoulders of ridges and mini-buttles. The vegetation is very sparse, usually with less than 15% cover and plants often are pedicelled due to the natural erosivity of the substrates; in some cases the substrate appeared to be clinker and in other cases a sedimentary deposit was indicated. *Pseudoroegneria spicata* is the most abundant species but its cover does not exceed 10%. Very dwarfed forms (not exceeding 2 dm) of *Artemisia tridentata* ssp. *wyomingensis* and *Ericameria nauseosus* (formerly *Chrysothamnus nauseosus*) occur as scattered individuals. The forb component is depauperate in cover and composition, characterized by the cushion forming *Eriogonum brevicaulis* and other cushion formers such as *Muscineon divaricatum*, *Lomatium* spp., *Hymenoxys acaulis*, and *Phlox hoodii*. This community is very close in composition, structure and site parameters to the *Pseudoroegneria spicata* / Cushion Plant community described from the Pryor Mountain area (DeVelice and Lesica 1993).

### ***Pseudoroegneria spicata* (formerly *Agropyron spicatum* or *Elymus spicatus*) ñ *Pascopyrum smithii* (formerly *Elymus smithii*) Herbaceous Vegetation Plant Association:**

This is a common grassland community across the Northern Great Plains and foothills of the U.S. portion of the Rocky Mountains. On the Forks Ranch it has a limited distribution, usually occurring on loamy soils on the upper third of slopes with warm aspects and was always associated with sagebrush sites that has burned in the recent past. *Pseudoroegneria spicatum* has responded well post-fire but *Pascopyrum smithii* has not regained the cover it ostensibly had prior to being burned (compared to *P. smithii* cover in adjacent *A. tridentata* ssp. *wyomingensis*-dominated stands). *Hesperostipa comata* (formerly *Stipa comata*) and *Koeleria macrantha* (formerly *K. cristata*) are consistently present in low cover, unless grazing has been intensive, in which case both are increasers. Annual bromes (*Bromus tectorum*, *B. japonicus*) also are a presence here following fire but, their cover is low and they do not appear to be a serious threat (such as in the Great Basin where they can attain a virtual monoculture status).

## ***Plant Species of Concern***

Three plant species (one a variety) of global significance have been documented from the Upper Tongue River and Hanging Woman drainages of eastern Big Horn and southwestern Rosebud Counties, Montana. They are Barr's milkvetch (*Astragalus barrii*), Woolly twinpod (*Physaria didymocarpa* var. *lanata*), and Nuttall's desert-parsley (*Lomatium nuttallii*). All are regional endemics, and the latter two ñ woolly twinpod and Nuttall's desert-parsley ñ are restricted in Montana to the upper Tongue River drainage. All are Montana species of concern; Barr's milkvetch and Woolly twinpod are also Wyoming species of concern.

Montana Natural Heritage Program botanists conducted surveys for these plants for the Bureau of Land Management (BLM) during the summers of 2001 and 2002, discovering a total of nine new populations

(Barton & Crispin, 2003). While only Woolly twinpod has been documented in the Hanging Woman basin, the habitat for these species is not uncommon in the area, and most likely exists in the basin; thus, there is a good chance that they could occur there.

Table 1 summarizes the status, distribution and habitat characteristics of the globally significant species noted above, as well as five other taxa that have been documented from this general area of Wyoming. Habitat information for the Wyoming taxa is from Dorn (2001). Figure 2 shows their distribution in the region.

Also documented in this general area are a number of plant taxa that are common through a broader range (G5), but rare (S1 or S2) in either Montana and/or Wyoming (Appendix 3).

Table 1. Globally Significant Plant species in the Tongue-Hanging Woman Drainages

<b>Scientific Name</b>	<b>Common Name</b>	<b>Heritage Ranks</b>	<b>Habitat</b>
<i>Astragalus barrii</i>	Barr's milkvetch	G3 MT: S2S3 WY: S3	heavy clay (igumboi) knobs, badlands, buttes and barren hilltops, in sparse cover of sagebrush and/or pine and juniper; 3140-4160 ft.
<i>Lomatium nuttallii</i>	Nuttall's desert -parsley	G3 MT: S1 WY: S3	open, rocky sparsely-vegetated slopes of sandstone, siltstone or clayey shale, in open pine woodlands; 2400-7200 ft.
<i>Physaria didymocarpa</i> var. <i>lanata</i>	Woolly twinpod	G5T2 MT: S1 WY: S2	slopes on sandstone outcrops, redbed clay (clinker or scoria)-shale, calcareous substrates, and road cuts in open skunkbush sumac & sagebrush, occasionally with pine and juniper; 3300-4100 ft.
<i>Musineon vaginatum</i>	Sheathed musineon	G3G4 S2	rocky hills, woods and slopes
<i>Symphyotrichum mollis</i>	Soft aster	G3 S3	mountain parks and slopes
<i>Nothocalais troximoides</i>	False agoseris	G5 S1	plains, hills and slopes
<i>Sullivantia hapemanii</i> var. <i>hapemanii</i>	Hapeman's sullivantia	G3T3 S3	wet limestone
<i>Pedicularis contorta</i> var. <i>ctenophora</i>	Coil-beaked lousewort	G3T3 S2	Park Reservoir

## *Animals*

### **Mammals**

The most prominent mammal species of concern present and observed on the Ranch was the Black-tailed Prairie Dog (*Cynomys ludovicianus*). There are a number of colonies scattered throughout the Hanging Woman Drainage with most of the colonies occupying upslope terraces along the major drainages. The colonies were all fairly small but appeared vigorous with no sign that plague had recently affected the colonies. Control efforts have probably limited these colonies to their current size. The perimeters of a number of these towns were documented by the RMBO (Hanni and Mehlman 2003). Further surveys to document the location, size, and associated species of these Prairie Dog towns should be conducted throughout the region.

Mammal species encountered during a small mammal trapping session on the Forks Ranch included many Deer Mouse (*Peromyscus maniculatus*), a Northern Grasshopper Mouse (*Onychomys leucogaster*), and one Merriam's Shrew (*Sorex merriami*). This effort was confined to sagebrush habitat types and a number other small mammal species of concern such as the Meadow Jumping Mouse (*Zapus hudsonius*), Preble's Shrew (*Sorex preblei*), Dwarf Shrew (*Sorex nanus*) and Hayden's Shrew (*Sorex haydeni*) may be present in this or other habitat types within the Hanging Woman Basin. The Merriam's Shrew is a Montana species of concern, primarily because so few specimens (9) have been collected in the state (Foresman 2001). This species is one of the most xeric adapted shrews in North America and has been found primarily in sage habitats throughout eastern Montana. The type specimen was collected from near Fort Custer on the Little Bighorn River in Bighorn County in 1884 by C.E. Bendire (Foresman 2001). Additional small mammal surveys in sage habitats in Montana may prove this species to be more common. The Northern Grasshopper Mouse was the first specimen known to be collected from Bighorn County.

Other mammal species of concern that may be present on the ranch include a number of bat species such as the Hoary Bat (*Lasiurus cinereus*), Pallid Bat (*Antrozous pallidus*), and Long-eared Myotis (*Myotis evotis*). One unidentified species of bat was observed foraging in the early evening of August 22, 2002 by John Carlson. The composition and distribution of bat fauna in the area is not well known, but species that may be present are noted in Appendix 2.

Additional species of concern that may occur within the basin are the Least Weasel (*Mustela nivalis*), Swift Fox (*Vulpes velox*) and Western Spotted Skunk (*Spilogale gracilis*). Least weasels have been documented in Sheridan Co. Wyoming but not in this area of Montana, although they probably occur here. Swift Fox probably ranged throughout the area in the past, but are now rarely seen here, though populations are thought to be increasing throughout the state.

The distribution of the Spotted Skunks in Montana and Wyoming is poorly known, and there are two species that could occur in the Hanging Woman Basin ñ the Eastern and Western Spotted Skunks. The Western Spotted Skunk has been documented in south central Montana and north central Wyoming in habitats similar to those found on the Forks Unit, and this species may occur in the area. The Eastern Spotted Skunk is not known from Montana but occurs in South Dakota and Wyoming and may also

occur in this area. Further small mammal and bat surveys would improve our knowledge of the distribution and relative abundance of these species. Mammal occurrences are depicted in Figure 4.

The Hanging Woman Basin and the surround landscape also provide essential winter range for both Antelope or Pronghorn (*Antilocapra Americana*) and Elk (*Cervus elaphus*) (Figure 5).

## Birds

Extensive sage habitats in the Hanging Woman Basin potentially provide habitat for a number of sage obligate bird species of concern, Potential Concern, or Under Review in Montana and Wyoming. These include the Greater Sage Grouse (*Centrocercus urophasianus*), Sage Thrasher (*Oreoscoptes montanus*), Sage Sparrow (*Amphispiza belli*), Ferruginous Hawk (*Buteo regalis*), Brewer's Sparrow (*Spizella breweri*), Lark Bunting (*Calamospiza melanocorys*), and Loggerhead Shrike (*Lanius ludovicianus*). None of these species were observed during our visit, however the timing of our surveys was not optimal for these species. Brewer's Sparrows, Lark Buntings and Loggerhead Shrikes were observed by Rocky Mountain Bird Observatory (RMBO) personnel during bird surveys conducted earlier in the summer (Hanni and Mehlman 2003). Sage grouse occur throughout the area, and there are a number of leks noted in the and around the Basin. The status of the sage grouse population in the areas is unknown. Some sage grouse scat was noted during small mammal trapping surveys in August. Although sagebrush habitats are extensive on the Forks Unit and throughout the region, few sage associated species were noted on either the RMBO surveys (Hanni and Mehlman 2003) or during our surveys. This is probably due to the timing of the MTNHP surveys and the number and distribution of the RMBO surveys. Additional surveys throughout sagebrush habitats in the Hanging Woman Basin would better document the occurrence and status of these species.

Species of concern associated with prairie dogs include Burrowing Owls (*Athene cunicularia*) and Mountain Plovers (*Charadrius montanus*). Burrowing Owls were noted in a number of prairie dog towns within the drainage by both John Carlson and RMBO personnel. Burrowing Owls are thought to be declining throughout their range in North America and better documentation of their occurrence within the Hanging Woman Basin and throughout Montana is needed. No Mountain Plovers were observed, and there is limited habitat for them in the Basin. Bird occurrences are depicted in Figure 3.

## Reptiles

One Western Rattlesnake (*Crotalus viridus*) and one Eastern Racer (*Coluber constrictor*) were observed during small mammal surveys in sagebrush habitats. Other reptiles potentially found in this habitat type on the Forks Ranch include the Gopher or Bull Snake (*Pituophis catenifer*), Western Hognose Snake (*Heterodon nasicus*), and the Common Sagebrush Lizard (*Sceloporus graciosus*). Both the Western Hognose Snake and the Sagebrush Lizard are species of concern in Montana and could potentially exist in a number of habitats on the ranch. The Milk Snake (*Lampropeltis triangulum*), a species of concern for both Montana and Wyoming, potentially occurs along sandstone outcrops, ridges and escarpments associated with Ponderosa pine communities. These snakes are highly nocturnal and are rarely found even in the appropriate habitat. Surveys for these snakes should be conducted in early June when they are most easily found. Greater Short-horned Lizards (*Phrynosoma*

*hernandesi*), a Montana species of concern, have been found in the basin (Maxell et al. 2003) and probably occur in areas of sparse vegetation throughout.

The Spiny Softshell Turtle (*Apalone spiniferus*) and the Snapping Turtle are known from the Tongue River. They may occur in Hanging Woman Creek near its mouth and upstream as far as there is year-round water. They probably do not occur as far upstream as the Forks Unit Ranch. Reptile occurrences are depicted in Figure 4.

## **Amphibians**

No targeted surveys for amphibians were conducted during our brief visit to the area, and no amphibian species of concern were observed. However the Northern Leopard Frog (*Rana pipiens*), a Montana species of concern, has been observed within the basin (Maxell et al. 2003) and is strongly suspected to occur throughout the basin in appropriate wetland habitat.

The Great Plains Toad (*Bufo cognatus*) and Plains Spadefoot (*Spea bombifrons*), both Montana species of concern, have been recorded nearby (Maxell et al. 2003) and probably occur within the Hanging Woman Basin and on the Forks Unit Ranch. Great Plains Toads are found in deserts, grasslands, semidesert shrublands, open floodplains, and agricultural areas, often in stream valleys where soils are softer (Hammerson 1999). When inactive, it is found in burrows, and under rocks or wood. During the active season, it occupies burrows that are quite shallow during the day. This species enters water only to breed, utilizing rain pools, flooded areas, and ponds and reservoirs that fluctuate in size. It appears to prefer stock tanks and roadside ponds rather than floodplains (Baxter and Stone 1985). Eggs and larvae develop in shallow water, usually clear or slightly turbid but not muddy. Plains Spadefoot toads are found in grasslands of plains, hills, floodplains and deserts; sagebrush and semidesert shrublands, usually in areas with friable soils. They burrow underground or occupy rodent burrows when inactive. Eggs and larvae develop in flooded areas and temporary pools formed by heavy rains. Amphibian occurrences are depicted in Figure 4.

## **Fish**

Although no fish surveys were conducted during our site visit, a number of fish species are known to occur in Hanging Woman Creek (Appendix 1). The only fish species of concern for Montana found in the creek is the Sauger (*Stizostedion canadense*). This fish probably occurs in the lower reaches of the creek where there is permanent water. The Brassy Minnow (*Hybognathus hankinsoni*) has also been found in the creek and is a species under review in Montana. Western Silvery Minnow (*Hybognathus argyritis*), Sturgeon Chub (*Hybopsis gelida*) and Shovelnose Sturgeon (*Scaphirhynchus platorynchus*) have been recorded in the Powder River drainage in Wyoming. Fish occurrences are depicted in Figure 3.

## DISCUSSION AND CONCLUSIONS

### *Plant Communities*

The topography and landforms on the Forks Ranch appear highly representative of the non-glaciated, sedimentary rock-derived landscape of eastern Montana and Wyoming (known technically as the Powder River Basin / Breaks / Scoria Hills Subsection of the Powder River Basin Section). As would be expected from its relatively low relief and limited geologic variability in the area we surveyed, the plant communities are not highly diverse. We documented only 13 plant associations on the ranch, compared with a total of approximately 73 community types known to occur in the Powder River Basin Section. Greater community diversity almost certainly does exist on the ranch, particularly in wetland or riparian areas and badlands, which could not be adequately inventoried in this brief assessment. Characterizations of these communities would benefit from more focused assessment in future survey efforts.

### *Fauna*

Animal surveys were similarly limited by timing and duration, and many species expected in the area were not detected. However, because the Hanging Woman Basin is representative of the surrounding landscape, we were able to develop a list of expected animal species, based on the documented distribution of species in the general area. Additional and more specific surveys conducted on the Forks Ranch would detect many of these species.

The most important animal species present within the Hanging Woman Basin from a conservation perspective are the Black-tailed Prairie Dog and the Greater Sage Grouse. Black-tailed Prairie Dog towns provide habitat not only for the prairie dogs living there but also for a large number of native animal species, including many species of concern (Campbell and Clark 1981, Appendix 2). Similarly, population trends and the distribution of Greater Sage Grouse are assumed to be indicative of the health of sagebrush ecosystems throughout Montana and the west (Sage Grouse Working Group 2002). Management of prairie dogs and sage grouse is controversial because of their intimate ties with management of lands for livestock production. Recently published management plans for both species provide further information regarding their management on public and private land in Montana and Wyoming.

### *Plant Species of Concern*

Though none of the globally significant plant species found in this general landscape were documented on the ranch property surveyed, there is a good likelihood that all occur in the Hanging Woman Basin and may be found with further survey effort. Neither Barr's milkvetch nor Woolly twinpod appear to be negatively impacted by grazing. Both also tend to occupy high knobs and outcrops that are not readily accessible and are poor sites for development. However they may still be vulnerable to secondary impacts that could result from extensive disruption of native vegetation, including the introduction and spread of aggressive invasive weeds that compete with native plant species and reduce habitat quality. Nuttall's desert-parsley grows on mid- to lower-slopes, especially along drainages, and its habitat could be more vulnerable to surface developments.

### ***Range Quality***

It is difficult to evaluate range condition during severe drought stress and with limited field time. However, in general, we noted no signs of degraded range such as pedicelling and slopewash erosion. Our short inspection did not reveal any severely overgrazed pastures, though utilization was quite high on a number of areas; this is no doubt a consequence of the ongoing drought and reduced forage yields (assessing stocking rates was beyond the scope of this project). The relative lack of weeds and increaser species also attests to long-term management having been consistent with ecological potential.

### ***Weed Issues***

We noted that hay meadows composed of naturalized pasture grasses have replaced whatever unique communities may have existed in this setting of broad, subirrigated riparian areas (which were noted in passing, not inventoried). These highly manipulated, artificial communities now serve as habitat for an aggressive noxious weed, *Euphorbia esula* (leafy spurge). Given the mobility of leafy spurge (bird disseminated) it would take very little for it to expand to comparably moist to wet areas, such as native riparian, woody draws and upland swales. We observed *Cirsium arvense* (Canada thistle) at one riparian location, and a short stretch of the access road to the north had a small population of *Hyoscyamus niger* (black henbane). We also noted that the herbaceous component of at least one woodland riparian area has been almost completely converted to non-native increasers and the shrub layer compositionally altered as well; it is likely that all such habitat on the ranch where cattle have full access has been degraded to various degrees.

Though not ranked as a noxious weed, *Bromus tectorum* (cheatgrass) is a pest to livestock operations. It is broadly distributed across the ranch's uplands. Cheatgrass was not noted to be prolific in burned areas or showing potential to become so; this contrasts with *B. tectorum*'s response to burning in Great Basin habitats where it has become a permanent community dominant. With continuing drought this species may gain a competitive advantage over the native grasses, and should be monitored.

While obviously not weed-free, there appears to be remarkably good opportunity to extirpate existing weed populations or, in the case of leafy spurge, simply keep it at low levels in the hay meadows. The ranch has staff permanently dedicated to noxious weed control (spraying in the case of leafy spurge) and though their efforts are dispersed across three units, this should be adequate to control the weeds at current levels.

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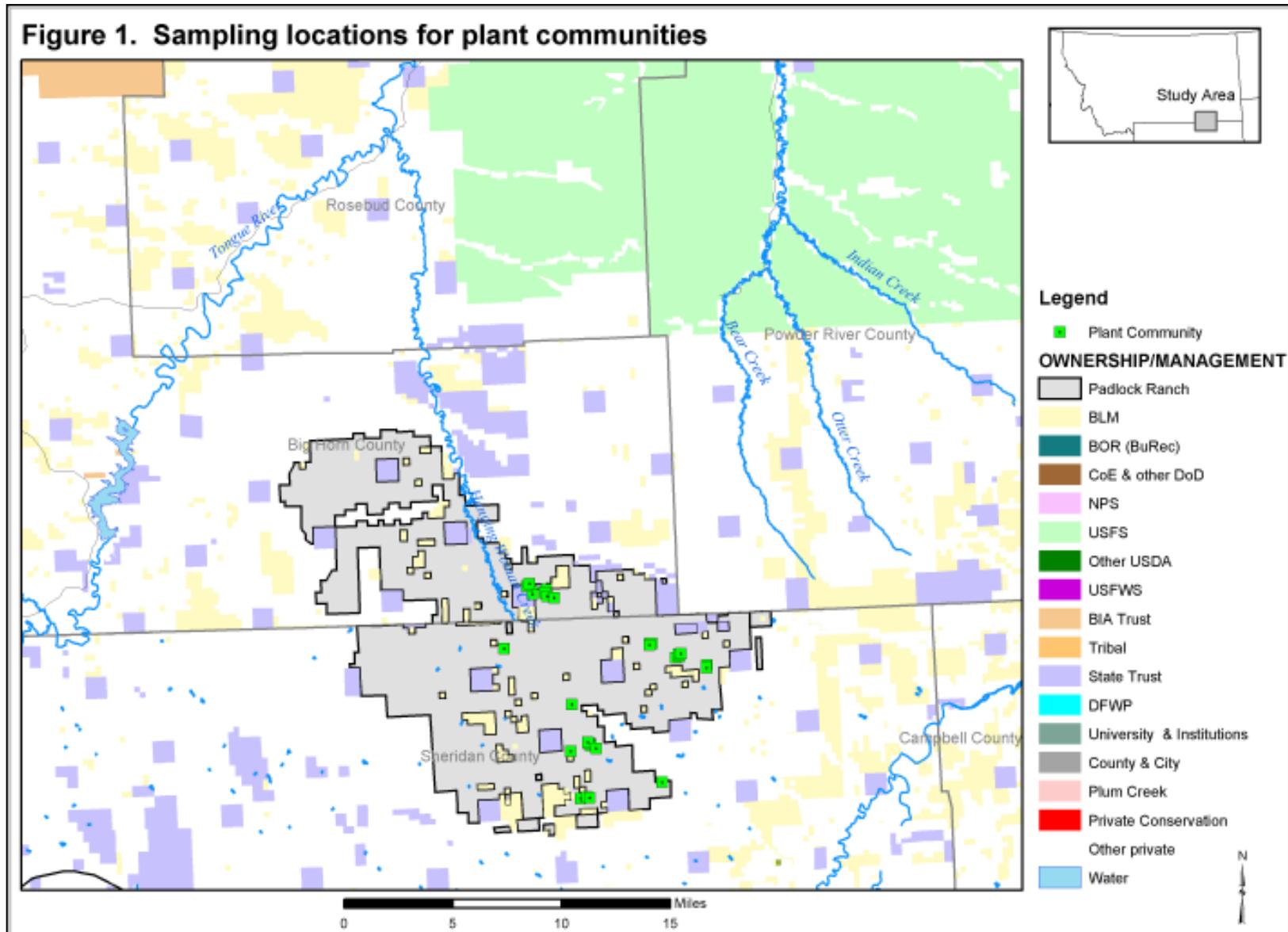
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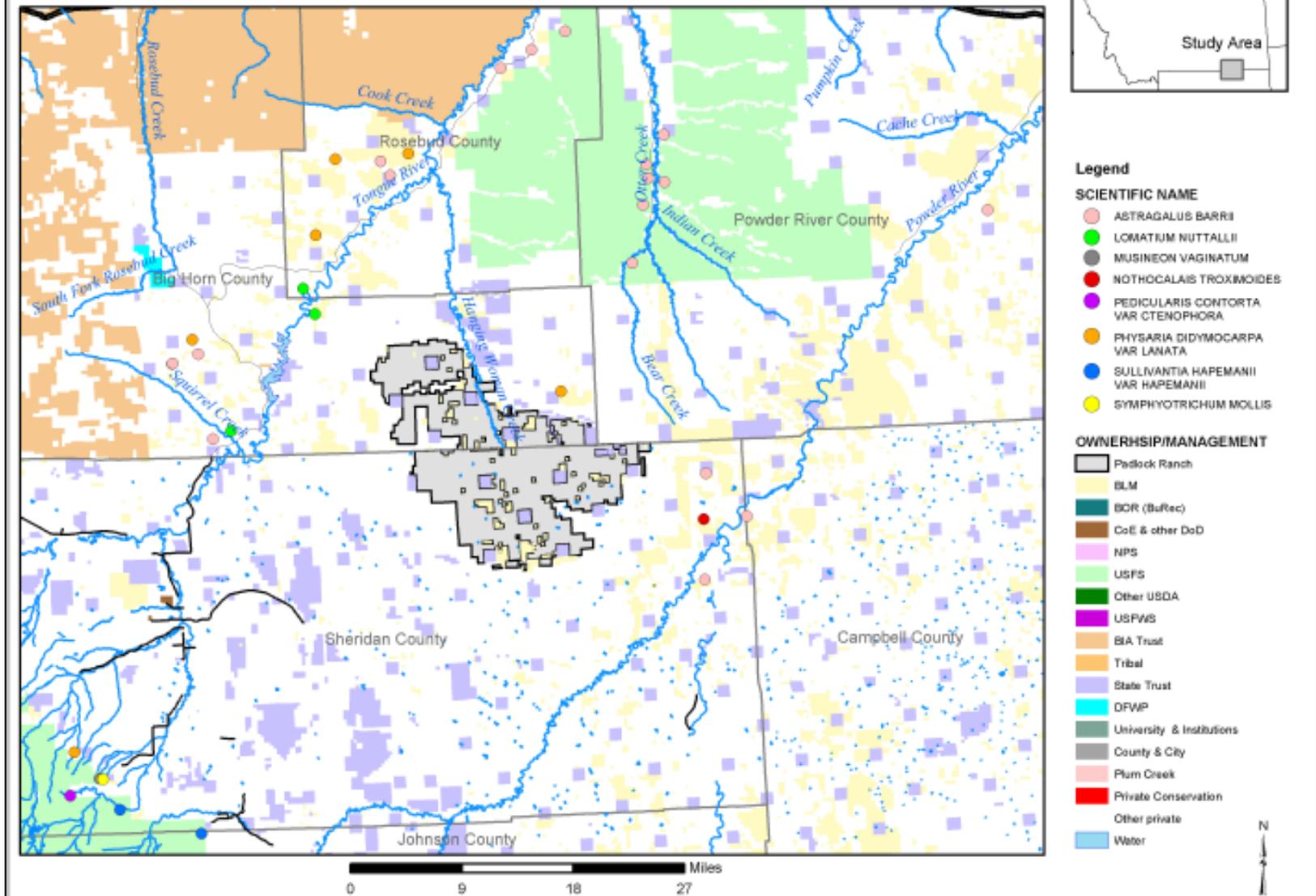
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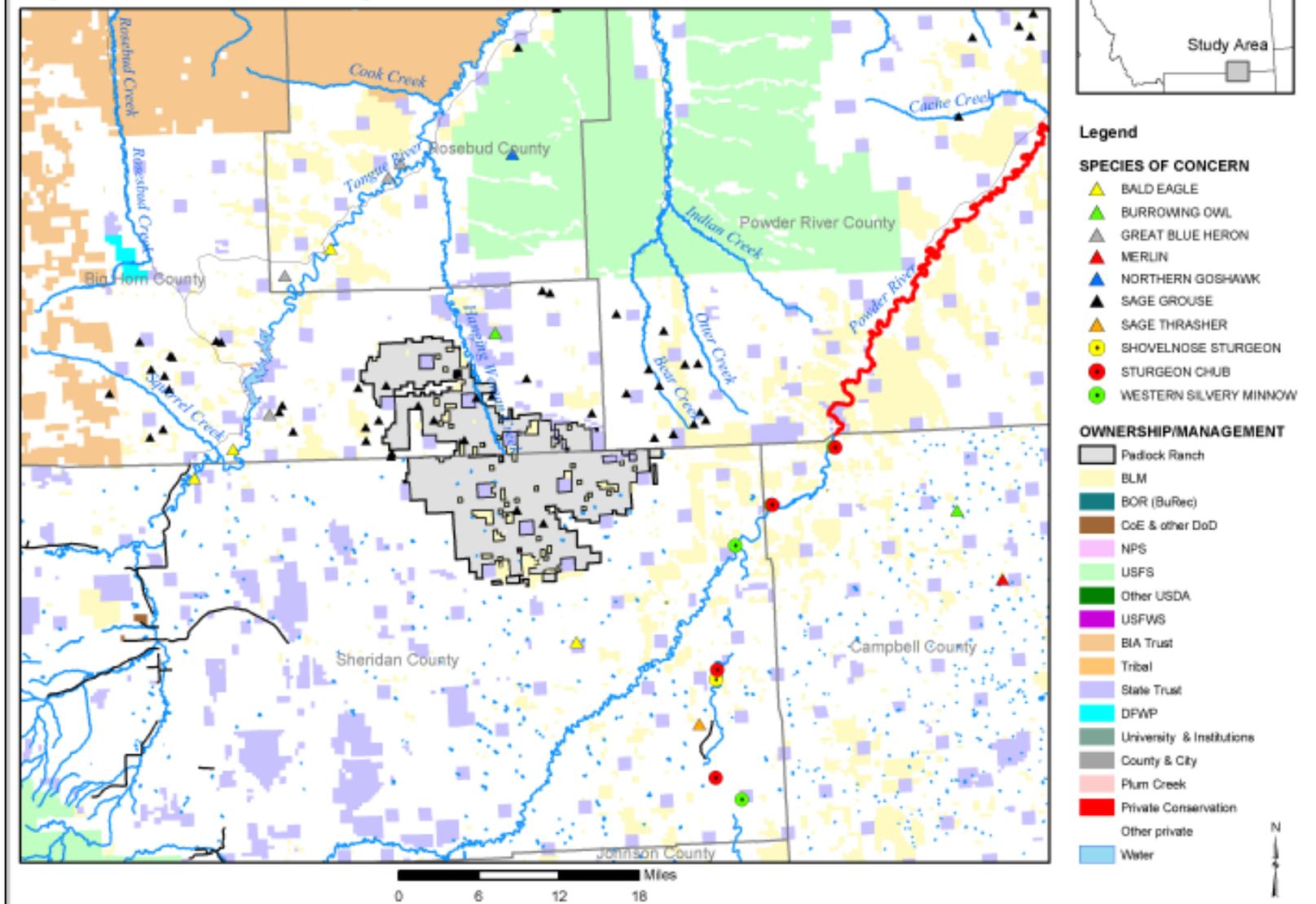
## List of Figures



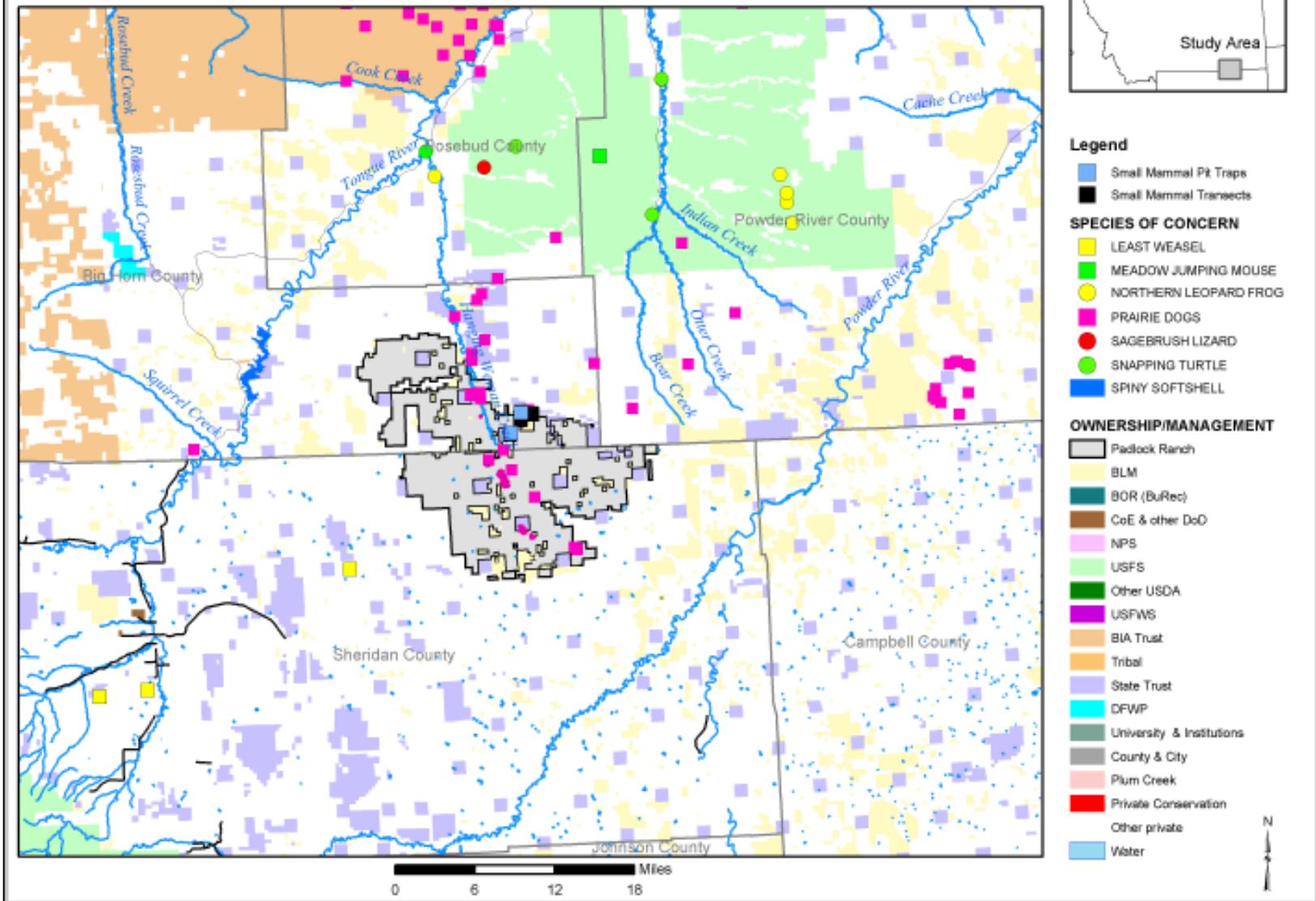
**Figure 2. Locations of globally significant plant species**



**Figure 3. Locations of significant bird and fish species**



**Figure 4. Locations and sampling sites of significant mammal and herpetofauna species**



**Figure 5. Ungulate Winter Range**

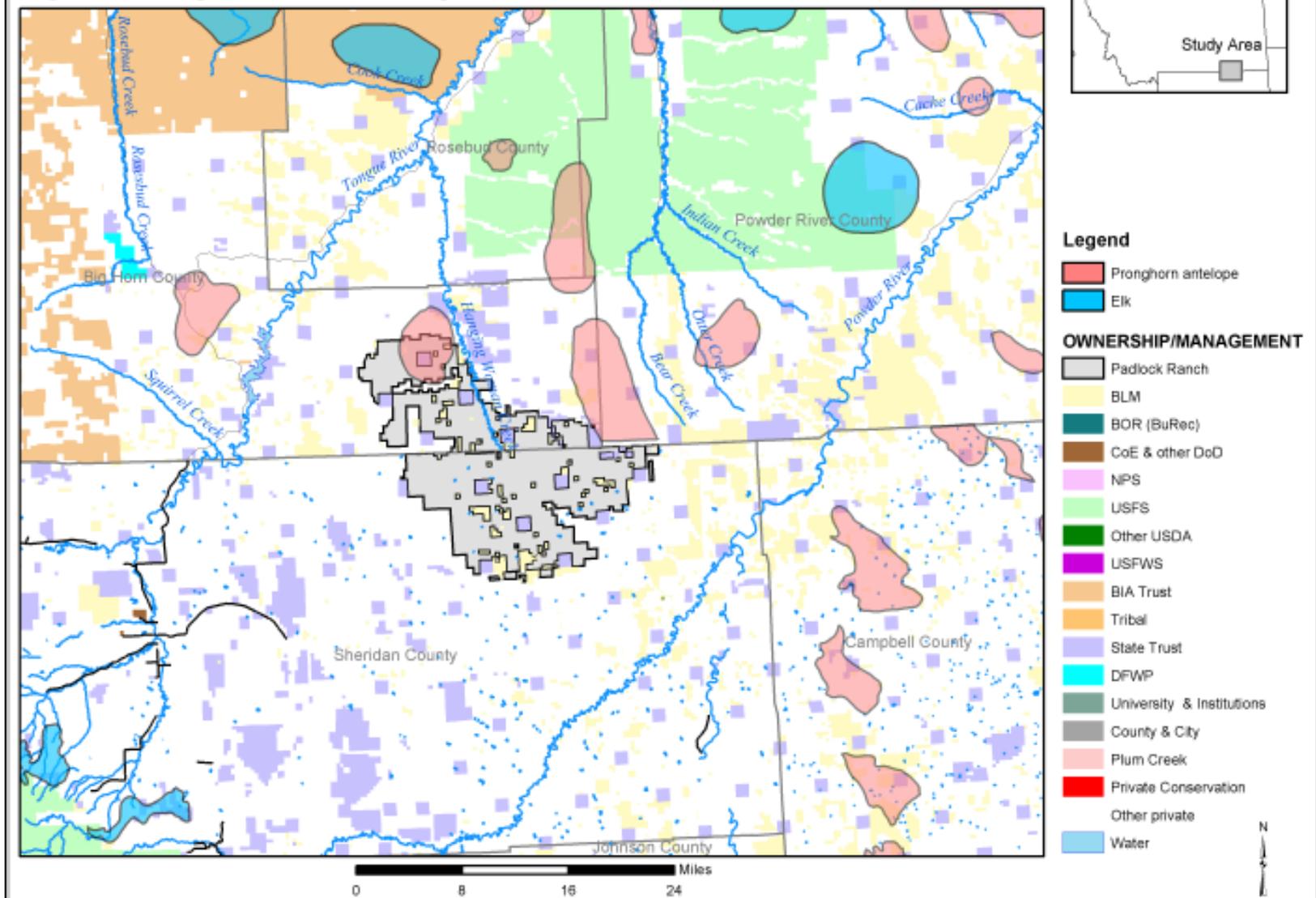




Figure 6: Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), occurring on both gently rolling terrain with fine-textured soils and steeper-slope uplands, is by far the most expansive type on the Forks Ranch Unit.



Figure 7: Fire has been an important, mostly natural disturbance across a range of vegetation types on the ranch. Owing to a lack of fuel, fire is generally not stand replacing in woodlands yet recovery to pre-burn structure and composition may take hundreds of years.



Figure 8: Depending on salt concentration any number of graminoid-dominated communities may develop in bottomlands, such as this sward of *Poa juncifolia* (big bluegrass, now known as *Poa secunda*)



Figure 9: Relatively undisturbed bottomlands are most commonly dominated by black greasewood (*Sarcobatus vermiculatus*)-dominated communities.

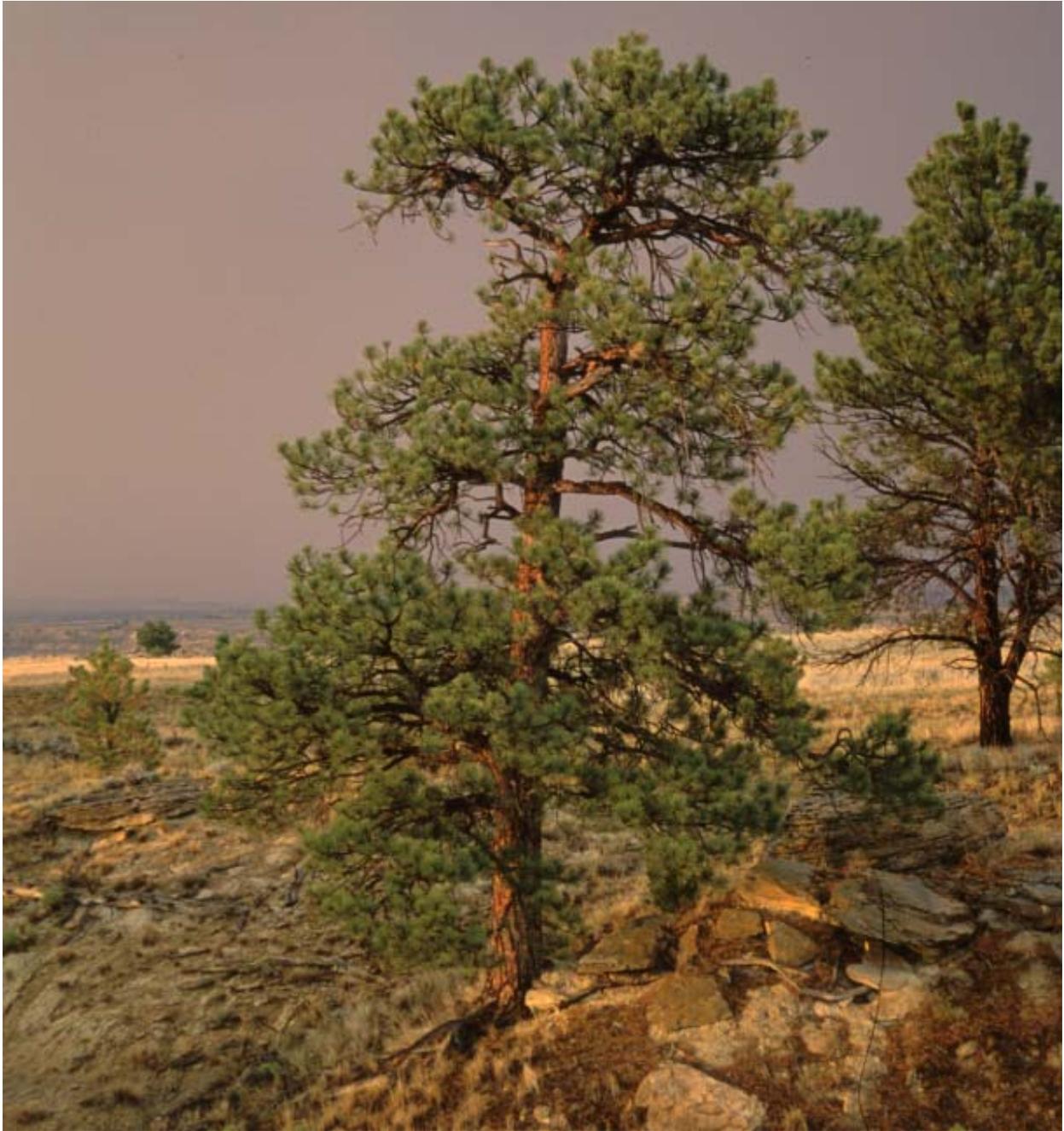


Figure 10: *Pinus ponderosa*, both woodlands and scattered individuals, populate the sandstone caprock formations.

## **Appendix 1. Global/State Rank Definitions**

## **HERITAGE PROGRAM RANKS**

The international network of Natural Heritage Programs employs a standardized ranking system to denote global (range-wide) and state status (NatureServe 2002). Species are assigned numeric ranks ranging from 1 (critically imperiled) to 5 (demonstrably secure), reflecting the relative degree to which they are at-risk. Rank definitions are given below. A number of factors are considered in assigning ranks – the number, size and distribution of known occurrences or populations, population trends (if known), habitat sensitivity, and threat. Factors in a species' life history that make it especially vulnerable are also considered (e.g., dependence on a specific pollinator).

## **RANK DEFINITIONS**

G1 S1	Critically imperiled because of extreme rarity and/or other factors making it highly vulnerable to extinction.
G2 S2	Imperiled because of rarity and/or other factors making it vulnerable to extinction.
G3 S3	Vulnerable because of rarity or restricted range and/or other factors, even though it may be abundant at some of its locations.
G4 S4	Apparently secure, though it may be quite rare in parts of its range, especially at the periphery.
G5 S5	Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.
GU SU	Possibly imperiled, but status uncertain; more information needed.
GA SA	Native in nearby states, but in Montana believed to be accidentally introduced, deliberately planted, or escaped from plantings.
GH SH	Historical, known only from records over 50 year ago; may be rediscovered.
GX SX	Believed to be extinct; historical records only.

## **COMBINATION RANKS**

G#G# or S#S# Indicates a range of uncertainty about the rarity of the species.

## **SUBRANKS**

T#	Rank of a subspecies or variety; appended to the species' global rank of the full species, e.g. G4T3.
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## **QUALIFIERS**

Q	Taxonomic questions or problems exist, more information needed; appended to the global rank, e.g. G3Q.
?	Denotes uncertainty or for numeric ranks, inexactness.

**Appendix 2. Animal Species in the Hanging Woman Basin.**



Common Name	Scientific Name	MT Status	WY status	BLM STATUS	FS STATUS	USES A	Confirmed	Probable	Possible
<b>Short-eared Owl</b>	<b><i>Asio flammeus</i></b>		Species of Special Concern						x
Common Nighthawk	<i>Chordeiles minor</i>						x		
<b>Common Poorwill</b>	<b><i>Phalaenoptilus nuttallii</i></b>	On Review					x		
White-throated Swift	<i>Aeronautes saxatalis</i>						x		
Ruby-throated Hummingbird	<i>Archilochus colubris</i>								x
Belted Kingfisher	<i>Ceryle alcyon</i>							x	
<b>Lewis' Woodpecker</b>	<b><i>Melanerpes lewis</i></b>	Species of Concern	Species of Special Concern						x
<b>Red-headed Woodpecker</b>	<b><i>Melanerpes erythrocephalus</i></b>	Species of Concern					x		
Downy Woodpecker	<i>Picoides pubescens</i>							x	
Hairy Woodpecker	<i>Picoides villosus</i>			Sensitive			x		
<b>Three-toed Woodpecker</b>	<b><i>Picoides tridactylus</i></b>	On Review		Sensitive				x	
<b>Black-backed Woodpecker</b>	<b><i>Picoides arcticus</i></b>	Species of Concern	Species of Special Concern	Sensitive	Sensitive		x		
Northern Flicker	<i>Colaptes auratus</i>						x		
Western Wood-pewee	<i>Contopus sordidulus</i>						x		
Least Flycatcher	<i>Empidonax minimus</i>						x		
Dusky Flycatcher	<i>Empidonax oberholseri</i>						x		
Say's Phoebe	<i>Sayornis saya</i>						x		
<b>Cassin's Kingbird</b>	<b><i>Tyrannus vociferans</i></b>	Species of Concern	Species of Special Concern				x		
Western Kingbird	<i>Tyrannus verticalis</i>						x		
Eastern Kingbird	<i>Tyrannus tyrannus</i>						x		
Horned Lark	<i>Eremophila alpestris</i>						x		
Tree Swallow	<i>Tachycineta bicolor</i>							x	
Violet-green Swallow	<i>Tachycineta thalassina</i>						x		
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>							x	
Bank Swallow	<i>Riparia riparia</i>						x		
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>						x		
Barn Swallow	<i>Hirundo rustica</i>						x		
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>						x		
Clark's Nutcracker	<i>Nucifraga columbiana</i>								x
Black-billed Magpie	<i>Pica pica</i>						x		
American Crow	<i>Corvus brachyrhynchos</i>						x		
Common Raven	<i>Corvus corax</i>								x
Black-capped Chickadee	<i>Poecile atricapillus</i>						x		
Mountain Chickadee	<i>Poecile gambeli</i>								x
Red-breasted Nuthatch	<i>Sitta canadensis</i>						x		
White-breasted Nuthatch	<i>Sitta carolinensis</i>						x		
<b>Pygmy Nuthatch</b>	<b><i>Sitta pygmaea</i></b>		Species of Special Concern						x
Brown Creeper	<i>Certhia americana</i>								x
Rock Wren	<i>Sainpinctes obsoletus</i>						x		
Canyon Wren	<i>Catherpes mexicanus</i>						x		
House Wren	<i>Troglodytes aedon</i>						x		
<b>Eastern Bluebird</b>	<b><i>Sialia sialis</i></b>	Species of Concern	Species of Special Concern						x
Mountain Bluebird	<i>Sialia currucoides</i>						x		
Townsend's Solitaire	<i>Myadestes townsendi</i>								x
Veery	<i>Catharus fuscescens</i>						x		
American Robin	<i>Turdus migratorius</i>						x		
Gray Catbird	<i>Dumetella carolinensis</i>						x		
Northern Mockingbird	<i>Mimus polyglottos</i>						x		
<b>Sage Thrasher</b>	<b><i>Oreoscoptes montanus</i></b>	On Review					x		
Brown Thrasher	<i>Toxostoma rufum</i>						x		
Cedar Waxwing	<i>Bombycilla cedrorum</i>						x		
Northern Shrike	<i>Lanius excubitor</i>								x
Loggerhead Shrike	<i>Lanius ludovicianus</i>			Sensitive	Sensitive		x		
European Starling	<i>Sturnus vulgaris</i>						x		
Warbling Vireo	<i>Vireo gilvus</i>							x	
<b>Plumbeous Vireo</b>	<b><i>Vireo plumbeus</i></b>	On Review					x		
Yellow Warbler	<i>Dendroica petechia</i>						x		
Yellow-rumped Warbler	<i>Dendroica coronata</i>						x		
American Redstart	<i>Setophaga ruticilla</i>						x		
Ovenbird	<i>Seiurus aurocapillus</i>						x		
Common Yellowthroat	<i>Geothlypis trichas</i>						x		
Yellow-breasted Chat	<i>Icteria virens</i>						x		

Common Name	Scientific Name	MT Status	WY status	BLM STATUS	FS STATUS	USESA	Confirmed	Probable	Possible
Western Tanager	<i>Piranga ludoviciana</i>						x		
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>						x		
Lazuli Bunting	<i>Passerina amoena</i>						x		
Green-tailed Towhee	<i>Pipilo chlorurus</i>						x		
Spotted Towhee	<i>Pipilo maculatus</i>						x		
American Tree Sparrow	<i>Spizella arborea</i>								x
Chipping Sparrow	<i>Spizella passerina</i>						x		
Clay-colored Sparrow	<i>Spizella pallida</i>							x	
<b>Brewer's Sparrow</b>	<b><i>Spizella breweri</i></b>	Potential Concern	Species of Special Concern				x		
Field Sparrow	<i>Spizella pusilla</i>						x		
Vesper Sparrow	<i>Poocetes gramineus</i>						x		
Lark Sparrow	<i>Chondestes grammacus</i>						x		
<b>Sage Sparrow</b>	<b><i>Amphispiza belli</i></b>	On Review	Species of Special Concern	Sensitive					x
Lark Bunting	<i>Calamospiza melanocorys</i>						x		
Savannah Sparrow	<i>Passerculus sandwichensis</i>							x	
<b>Grasshopper Sparrow</b>	<b><i>Ammodramus savannarum</i></b>	Potential Concern	Species of Special Concern				x		
Song Sparrow	<i>Melospiza melodia</i>						x		
Dark-eyed Junco	<i>Junco hyemalis</i>						x		
Bobolink	<i>Dolichonyx oryzivorus</i>								x
Red-winged Blackbird	<i>Agelaius phoeniceus</i>						x		
Western Meadowlark	<i>Sturnella neglecta</i>						x		
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>						x		
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>						x		
Common Grackle	<i>Quiscalus quiscula</i>						x		
Brown-headed Cowbird	<i>Molothrus ater</i>						x		
Bullock's Oriole	<i>Icterus bullockii</i>						x		
Cassin's Finch	<i>Carpodacus cassinii</i>						x		
House Finch	<i>Carpodacus mexicanus</i>							x	
Red Crossbill	<i>Loxia curvirostra</i>						x		
Pine Siskin	<i>Carduelis pinus</i>						x		
American Goldfinch	<i>Carduelis tristis</i>						x		
Evening Grosbeak	<i>Coccothraustes vespertinus</i>						x		
House Sparrow	<i>Passer domesticus</i>						x		
<b>FISH</b>									
Northern Pike	<i>Esox lucius</i>						x		
Lake Chub	<i>Couesius plumbeus</i>						x		
Common Carp	<i>Cyprinus carpio</i>						x		
<b>Brassy Minnow</b>	<b><i>Hybognathus hankinsoni</i></b>	On Review					x		
Golden Shiner	<i>Notemigonus crysoleucas</i>						x		
Sand Shiner	<i>Notropis stramineus</i>						x		
Fathead Minnow	<i>Pimephales promelas</i>						x		
Longnose Dace	<i>Rhinichthys cataractae</i>						x		
River Carpsucker	<i>Carpodes carpio</i>						x		
Longnose Sucker	<i>Catostomus catostomus</i>						x		
White Sucker	<i>Catostomus commersoni</i>						x		
Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>						x		
Stonecat	<i>Noturus flavus</i>						x		
Black Bullhead	<i>Ictalurus melas</i>						x		
Rock Bass	<i>Ambloplites rupestris</i>						x		
Green Sunfish	<i>Lepomis cyanellus</i>						x		
Pumpkinseed	<i>Lepomis gibbosus</i>						x		
Smallmouth Bass	<i>Micropterus dolomieu</i>						x		
White Crappie	<i>Pomoxis annularis</i>						x		
Yellow Perch	<i>Perca flavescens</i>						x		
<b>Sauger</b>	<b><i>Stizostedion canadense</i></b>	Species of Concern					x		
Walleye	<i>Stizostedion vitreum</i>						x		
<b>MAMMALS</b>									
Masked Shrew	<i>Sorex cinereus</i>							x	
<b>Preble's Shrew</b>	<b><i>Sorex preblei</i></b>	Species of Concern		Sensitive				x	
<b>Dwarf Shrew</b>	<b><i>Sorex nanus</i></b>	Species of Concern	Species of Special Concern						x



Common Name	Scientific Name	MT Status	WY status	BLM_STATUS	FS_STATUS	USES A	Confirmed	Probable	Possible
Western Terrestrial Garter Snake	<i>Thamnophis elegans</i>							x	
Plains Garter Snake	<i>Thamnophis radix</i>							x	
Common Garter Snake	<i>Thamnophis sirtalis</i>	On Review						x	
Western Rattlesnake	<i>Crotalus viridis</i>						x		

**Appendix 3. Plant Species of Concern Documented or Potentially Occurring  
in the Hanging Woman Basin**

Appendix 3. Plant Species of Concern Documented or Potentially Occurring in the Hanging Woman Basin.

<b>Plant Species of Concern Documented or Potentially Occurring in the Hanging Woman Basin.</b>			
<b>Scientific Name</b>	<b>Common Name</b>	<b>Global Rank</b>	<b>State Rank</b>
<i>Astragalus barrii</i>	Barr's Milkvetch	G3	S2S3 (MT) S3 (WY)
<i>Carex gravida</i> var. <i>gravida</i>	Pregnant Sedge	G5T5 ?	S1 (MT) S2 (WY)
<i>Ceanothus herbaceous</i> var. <i>pubescens</i>	New Jersey Tea	G5T?	SH (MT)
<i>Cypripedium parviflorum</i> var. <i>pubescens</i>	Large yellow Lady's-slipper	G5	S1S2 (WY)
<i>Dichanthelium oligosnthes</i> var. <i>scribnerianum</i>	Scribner's Panic Grass	G5T5	S1 (MT) S3 (WY)
<i>Eragrostis hypnoides</i>	Teal Love Grass	G5	S1 (WY)
<i>Eupatorium maculatum</i> var. <i>bruneri</i>	Joe-pye Weed	G5T4T5Q	S2 (MT) S2 (WY)
<i>Lomatium nuttallii</i>	Nuttall's Desert-parsley	G3	S1 (MT) S3 (WY)
<i>Musineon vaginatum</i>	Sheathed Musineon	G3G4	S3 (MY) S2 (WY)
<i>Nothocalais troximoides</i>	False Agoseris	G5	S1 (WY)
<i>Pedicularis contorta</i> var. <i>ctenophora</i>	Coil-beaked Lousewort	G3T3	S2 (WY)
<i>Physaria brassicoides</i>	Rydberg Double Twinpod	G5	S2 (MT) S3 (WY)
<i>Physaria didymocarpa</i> var. <i>lanata</i>	Woolly Twinpod	G5T2	S1 (MT) S2 (WY)
<i>Polygonum spergulariiforme</i>	Fall Knotweed	G5T4 ?	S1 (WY)
<i>Schoenoplectus heterochaetus</i>	Slender Bulrush	G5	S1 (MY) S1 (WY)
<i>Sparganium eurycarpum</i>	Large Bur-reed	G5	S1 (WY)
<i>Sullivantia hapemanii</i> var. <i>hapemanii</i>	Hapeman's Sullivantia	G3T3	S2 (MT) S3 (WY)
<i>Symphyotrichum mollis</i>	Soft aster	G3	S3 (WY)
<i>Triodanis leptocarpa</i>	Slim-pod Venus' Looking-glass	G5?	S1 (WY)
<i>Viburnum lentago</i>	Nannyberry	G5	S1 (MT) S2 (WY)

## **Appendix 4. Potential Plant Associations**

Appendix 4. Plant Associations with potential to be located on Forks Ranch Unit, Padlock Ranch.

<b>Plant Associations with potential to be located on Forks Ranch Unit, Padlock Ranch *</b>		
<b>Plant Association Name</b>	<b>G-Rank</b>	<b>S-Rank</b>
<i>Acer negundo</i> / <i>Prunus virginiana</i> Forest	G3	G3
<i>Artemisia cana</i> / <i>Pascopyrum smithii</i> Shrubland	G4	S4
<i>Artemisia cana</i> ssp. <i>cana</i> / <i>Pascopyrum smithii</i> Shrub Herbaceous Vegetation	G4	S3?
<i>Artemisia tridentata</i> ssp. <i>tridentata</i> / <i>Pascopyrum smithii</i> - ( <i>Elymus lanceolatus</i> ) Shrubland	G3?	S3
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> - <i>Atriplex confertifolia</i> Shrubland	G3G5	S3
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Hesperostipa comata</i> Shrubland	G2	not recorded
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / Mixed Grasses Shrub Herbaceous Vegetation	G5	not recorded
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Pascopyrum smithii</i> Shrubland	G4	S?
<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	G4	S3
<i>Calamovilfa longifolia</i> - <i>Hesperostipa comata</i> Herbaceous Vegetation	G3	S3
<i>Cercocarpus montanus</i> var. ??; (no specifics given for undergrowth!)		
<i>Crataegus douglasii</i> - ( <i>Crataegus chrysocarpa</i> ) Shrubland	G2?	S2
<i>Festuca idahoensis</i> - <i>Pascopyrum smithii</i> Herbaceous Vegetation	G3	S?
<i>Fraxinus pennsylvanica</i> / <i>Prunus virginiana</i> Forest CEG000642	G3?	S2S3
<i>Hesperostipa comata</i> - <i>Bouteloua gracilis</i> - <i>Carex filifolia</i> Herbaceous Vegetation	G 5	S?
<i>Pascopyrum smithii</i> - <i>Bouteloua gracilis</i> Herbaceous Vegetation	G5	not recorded
<i>Pascopyrum smithii</i> - <i>Hesperostipa comata</i> Central Mixedgrass Herbaceous Vegetation	G4	not recorded
<i>Pascopyrum smithii</i> - <i>Nassella viridula</i> Herbaceous Vegetation	G3G4	S4?
<i>Pinus ponderosa</i> / <i>Carex inops</i> ssp. <i>heliophila</i> Woodland	G3G4	S3S4
<i>Pinus ponderosa</i> / <i>Festuca idahoensis</i> Woodland	G4	S4
<i>Pinus ponderosa</i> / <i>Mahonia repens</i> Forest	G3Q	S3
<i>Pinus ponderosa</i> / <i>Prunus virginiana</i> Forest	G3	S4
<i>Pinus ponderosa</i> / <i>Pseudoroegneria spicata</i> Woodland	G4	S4
<i>Pinus ponderosa</i> / <i>Symphoricarpos occidentalis</i> Forest	G3	S3
<i>Populus angustifolia</i> / (no specifics given for undergrowth!)		
<i>Populus deltoides</i> / no specifics given for undergrowth)		
<i>Populus deltoides</i> / <i>Pascopyrum smithii</i> Woodland	G3?	WY: S3?
<i>Pseudoroegneria spicata</i> - <i>Bouteloua curtipendula</i> Herbaceous Vegetation	G4G5	S3
<i>Pseudoroegneria spicata</i> - <i>Bouteloua gracilis</i> Herbaceous Vegetation	G4	S3
<i>Rhus trilobata</i> / <i>Carex filifolia</i> Shrub Herbaceous Vegetation	G3?	S3
<i>Rhus trilobata</i> / <i>Festuca idahoensis</i> Shrub Herbaceous Vegetation	G3	S3
<i>Rhus trilobata</i> / <i>Pseudoroegneria spicata</i> Shrub Herbaceous Vegetation	G4	S4
<i>Sarcobatus vermiculatus</i> / <i>Artemisia tridentata</i> Shrubland	G4	S\$
<i>Sarcobatus vermiculatus</i> / <i>Pascopyrum smithii</i> - ( <i>Elymus lanceolatus</i> ) Shrub Herbaceous Vegetation	G4	S4
<i>Sarcobatus vermiculatus</i> / <i>Pseudoroegneria spicata</i> Shrubland	G3	S3
<i>Schizachyrium scoparium</i> - <i>Carex filifolia</i>	G4	S3
<i>Spartina pectinata</i> Western Herbaceous Vegetation	G3	S3
<i>Yucca glauca</i> / <i>Calamovilfa longifolia</i> Shrub Herbaceous Vegetation	G4	S4

\* Probability of occurrence determined from Great Plains Rapid Ecological Assessment (Martin et al. 1998) and Wyoming Natural Diversity Database