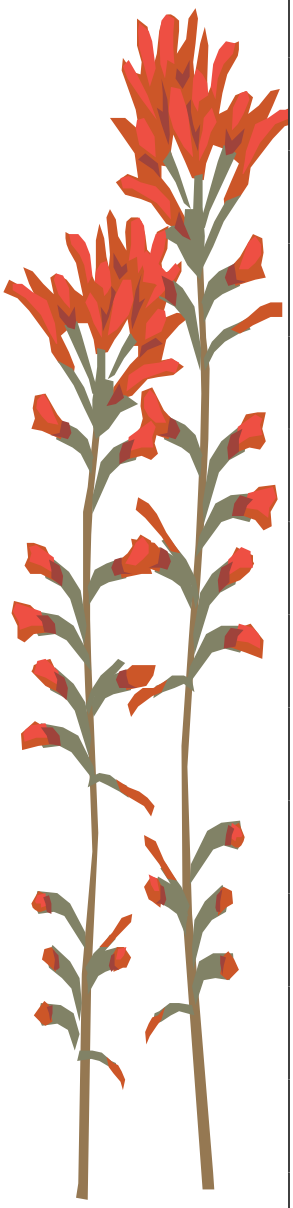

LOWER LARAMIE RIVER WATERSHED STANDARDS AND GUIDELINES ASSESSEMENT

2006 FIELD SEASON

RAWLINS FIELD OFFICE

DOCUMENT FOR AGENCY, PERMITTEE AND INTERESTED PUBLIC INFORMATION
SEPTEMBER 2007

Bureau of Land Management
Rawlins Field Office
2006 Standards and Guidelines
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I have reviewed the Standards and Guidelines Final Report for the Lower Laramie River Watershed. I concur with the evaluation procedures and with the conclusion and recommendations of the review team with respect to each of the six Rangelands Standards. Based on this report, a determination will be prepared and transmitted to the appropriate parties.

Dennis J. Carpenter, Field Manager — Date September 28, 2007

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LOWER LARAMIE RIVER WATERSHED STANDARDS AND GUIDELINES ASSESSMENT

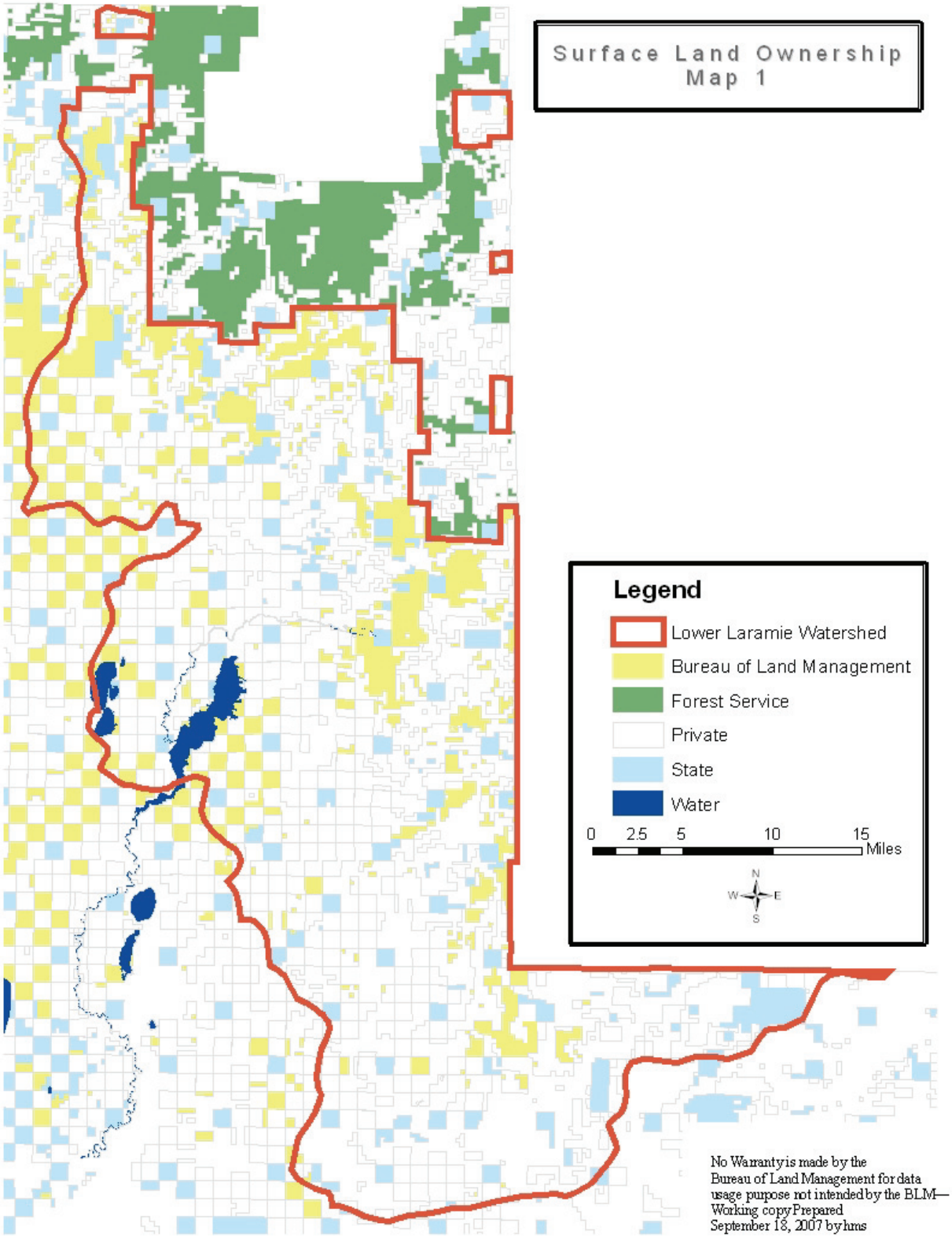
INTRODUCTION

The analysis area considered in this document includes Fortymile Peak, Buck Point, Mule Creek Mountain, Smith Mountain, Indian Head Rock, Sellers Mountain, Mentor Knob, Pine Mountain, Split Rock, Reese Mountain, Bills Mountain, Moonshine Peak, Tony Ridge, Sugar Loaf, Government Peak, Douthitt Mountain, Elmers Rock, Yaunt Mountain, Overton Mountain, Poe Mountain, Limestone Rim, Iron Mountain, The Buttes, Indian Guide, the Kafika Reservoir area, the Toltec Reservoir area, Wheatland Reservoir #3, Wheatland Reservoir #2, the Laramie River area, the North Laramie River area, the Corduroy Creek area, the Twentytwo Mile Draw area, Buckland Draw, Jock Draw, Wildcat Gulch, the Antelope Creek area, the Asbestos Spring area, the Tweety Creek area, the Gunlock Creek area, Mentor Draw, Morril Draw, Seibolt Creek, Potato Creek, Sturgeon Creek, Ashly Creek, Cherry Creek, Moonshine Hollow, Bradbury Gulch, Dripping Vat Creek, Bluegrass Creek, Halleck Canyon, Sybille Creek, Meiser Creek, Canteen Creek, Hay Canyon, Spring Creek, Middle Chugwater Creek, Threemile Creek, and Cottonwood Creek Allotments. The analysis area occupies 675,000 acres within the management area of the Rawlins Field Office, primarily in Albany County. Land ownership consists of 15% federal lands, 75% private lands, and 10% state lands. Federal ownership includes 102,000 acres administered by the Bureau of Land Management (Map 1).

Land ownership patterns vary from small blocks of public lands to various mixtures of public and non-public lands. Improved management has been initiated in most of the assessment area to better manage livestock and address issues such as riparian condition, erosion problems, and noxious weeds. Various government entities (local, state, and federal), private individuals, livestock operators, and non-profit organizations have all contributed to these efforts. In project planning and implementation, monitoring, education, and cost-sharing, these groups and their employees have been a tremendous help in improving the resource conditions on public and private/state lands.

The 1995 rangeland reform process modified the grazing regulations to address the fundamentals of rangeland health. In August 1997, the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the Bureau of Land Management in the State of Wyoming* were approved by the Wyoming State Director. The objectives of the rangeland health regulations are to “promote healthy sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangelands to properly functioning conditions…and to provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy public rangelands.” The fundamentals of rangeland health combine the basic precepts or physical function and biological health with elements of law relating to water quality and plant and animal populations and communities. Initially, the standards focused on livestock grazing on BLM-administered lands, but the standards were developed to apply to all uses and resources.

In the Rawlins Field Office, rangeland standards were assessed on an allotment basis from 1998 through 2000. Some of the allotments contained within this watershed assessment were already evaluated and that information and determination has been incorporated into this document. However, allotment assessments tend to emphasize management and impacts from


Surface Land Ownership
Map 1
Legend
Lower Laramie Watershed
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Private
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livestock grazing, rather than on all uses which occur to and potentially impact public lands. In addition, assessing watersheds, water quality, and habitat for wildlife, fisheries, and threatened and endangered species, often does not correspond to allotment boundaries and is more logically evaluated at a larger scale. In January 2001, Instruction Memorandum (IM) No. 2001-079, Guidance for Conducting Watershed-Based Land Health Assessments, was sent to Field Offices from the Director of the BLM. This IM transmitted the 4180 Manual Section and 4180-1 Rangeland Health Standards Handbook and provides guidance for conducting assessments and evaluations for ascertaining rangeland health on a watershed basis. Under Policy/Action it states: "The Field Offices are to consider all assessment requirements for the watershed being assessed and select methods which will provide information needed to fulfill those requirements. When a field office invests its resources in an assessment, the end product should substantially meet all assessment needs to avoid conducting multiple assessments for multiple needs. For example, a well-planned, watershed-based assessment can provide the information needed for allotment evaluations, biological assessments for Section 7 Endangered Species Act consultation, and developing habitat management plans, Water Quality Improvement Plans for Total Maximum Daily Loads on impaired waters, and watershed 2 restoration actions." In order to complete all Standard Assessments within the original 10-year timeframe, watersheds have been divided into seven units; the Lower Laramie is the sixth unit to be completed (see Map 2).

The standards are the basis for assessing and monitoring rangeland conditions and trend. The assessments evaluate the standards and are conducted by an interdisciplinary team with participation from permittees and other interested parties. Assessments are only conducted on BLM-administered public land; however, interpretation of watershed health and water quality may reflect on all land ownerships within the area of analysis. The six standards are as follows:

Standard 1 - Watershed: *Within the potential of the ecological site (soil type, landform, climate, and geology), soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff.*

The standard is considered met if upland soil cover generally exceeds 30% and obvious signs of soil erosion are not apparent, and stream channels are stable and improving morphologically.

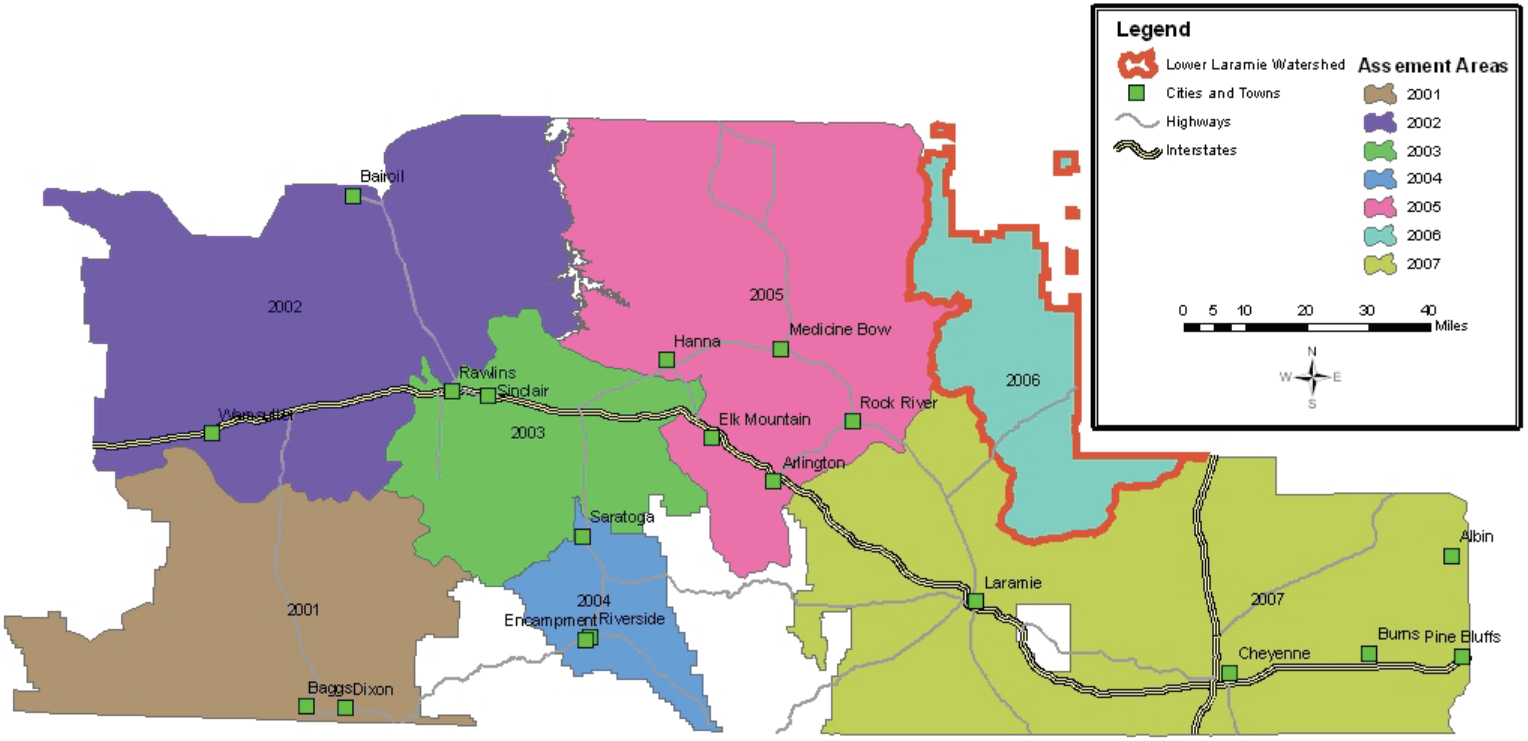
Standard 2 - Riparian/Wetland: *Riparian and wetland vegetation have structural, age, and species diversity characteristic of the state of channel succession and is resilient and capable of recovering from natural and human disturbance in order to provide forage and cover, capture sediment, dissipate energy, and provide for ground water recharge.*

The standard is considered met if riparian/wetland habitat is rated in Proper Functioning Condition (PFC) and existing management will lead to maintaining or improving resource conditions.

Standard 3 - Upland Vegetation: *Upland vegetation on each ecological site consists of plant communities appropriate to the site, which are resilient, diverse, and able to recover from natural and human disturbance.*

The standard is considered met if plant communities are sustaining themselves under existing conditions and management.

Assessement Areas by Year
Map 2



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Standard 4 - Wildlife/Threatened and Endangered Species Habitat, Fisheries Habitat, Weeds: *Rangelands are capable of sustaining viable populations and a diversity of native plant and animal species appropriate to the habitat. Habitats that support or could support threatened species, endangered species, species of special concern, or sensitive species will be maintained or enhanced.*

The standard is considered met if habitat needed to support wildlife species is being sustained under existing conditions and management.

Standard 5 – Water Quality: *Water quality meets State standards.*

The standard is considered unknown unless information provided by the State of Wyoming determines the status of a water body as impaired (not meeting) or is meeting its beneficial uses.

Standard 6 – Air Quality: *Air quality meets State standards.*

The standard is considered met or impaired based on information provided by the State of Wyoming.

ACTIONS AFTER STANDARDS ASSESSMENT

If an assessment shows that a standard(s) is not being met, factors contributing to the non-attainment are identified and management recommendations developed so the standard may be attained. If livestock are contributing to the non-attainment of a standard, as soon as practical, but no later than the start of the first grazing season, management practices will be implemented to ensure that progress is being made toward attainment of the standard(s). The rangeland standards establish a threshold; however, the desired resource condition will usually be at a higher level than the threshold.

The desired range of conditions portrays the land or resource values that would exist in the future if management goals are achieved. The length of time to achieve the desired range of conditions would vary depending on the resources involved, the management actions required, and the speed at which different resources can effectively change. For instance, improving plant cover and litter or changing species composition with treatments may be achieved relatively quickly in 5 to 10 years. However, developing a mixed age structure of willows along a stream by changing livestock management may take 20 to 30 years, even though it may be properly functioning. Other actions, such as restoring aspen woodlands by using prescribed or natural fire, may take 50 years or more.

The following regulatory constraints or special management considerations govern some of the resource values in the area:

- State of Wyoming water quality classifications and regulations on water rights, reservoir permitting, well permitting, and storm water discharge permitting

- Section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 USC 1531 et. seq.), and the Interagency Cooperation Regulation (50 CFR 402) concerning water depletions in the Platte River System

- Army Corp of Engineer permitting for dredged and fill materials in wetland areas located in the North Platte River Basin authorized under Section 404 of the Clean Water Act

The framework for this report will be an introduction and background information, followed by discussion of each rangeland standard in the order described earlier in this document. Within the discussion for each standard will be a map and description of how the standard will be addressed. The outline of discussion for each standard will follow a six-step process for ecosystem analysis at the watershed scale. The six steps are: 1) characterization of the watershed, 2) identification of issues and key questions, 3) description of current conditions, 4) description of reference conditions, 5) synthesis and interpretation of information, and 6) recommendations. Core topics will be discussed under the appropriate standard, with erosion processes, hydrology, and stream channels under Standard 1; vegetation split into wetland/riparian or upland under Standards 2 and 3; species and habitats under Standard 4; water quality under Standard 5; and air quality under Standard 6. Human uses would be discussed under each Standard, where appropriate. Where discussion items are similar between watersheds, previous sections will be referenced and only additional, specific information will be noted. All photographs will be included in an appendix located at the end of this document.

BACKGROUND

Topography of the Lower Laramie Watershed is dominated by rolling to steep foothills tapering up to steep mountain grades. Gentle to moderately-sloping flats, basins, terraces and hills are found in the south and west, while moderately steep to steep slopes are found in the Laramie Range to the east. The highest point in the area is Forty-Mile Peak at 8,789 feet; and the lowest is where the Laramie River flows out of the area at about 5,200 feet. BLM-administered public lands exist through the entire area.

Climate varies from arid to semi-arid, with low annual precipitation and frost-free growing season of less than 130 days. Temperatures are moderately warm during the summer and cold in the winter. Extreme fluctuations in temperatures from day-to-day and in annual precipitation from year-to-year are common. These climatic variations have strong effects on vegetation and in determining land capabilities and use. Summers are accompanied by prevailing southwesterly winds that become stronger as fall approaches. Winter winds are often out of the northwest, creating blizzard conditions. The Lower Laramie Watershed contains plains and foothills of the Laramie Range. While elevations typically increase toward the north and east, rivers typically flow east toward the upper Great Plains. These rivers are within steep canyons and draws as they flow through the Laramie Range. The Laramie Range, on the east side of the Lower Laramie Watershed contains higher elevation mountains and hills. The range affects weather patterns, has greater precipitation amounts, and accumulates more snow than the lower elevation of the Lower Laramie Watershed. Snow distribution is driven by wind, with drifts forming in topographic features. The elevation at the Sybille Research Unit is 6,100 ft., where the average annual precipitation was 15.84 inches from 1964 to 2007. Historic Wyoming Climate Stations within the Lower Laramie Watershed include Lookout 14NE, which recorded an average yearly precipitation of 13.55 inches from 1948 to 1965 and Double Four Ranch which recorded an average yearly precipitation of 14.74 inches from 1948 to 2005 (http://www.wrcc.dri.edu/summary/climsmwy.html). From March through October, the Sybille Unit averages more than one inch of precipitation per month, from April through July, the Unit

averages more than one and one-half inches per month, and in May and June, the average monthly precipitation is over two inches. This pattern of precipitation is similar for the historical stations. The average annual high temperature for the Sybille Unit is 58.7 degrees and the average annual low temperature is 32.9 degrees. The watershed is typically mid elevation, with ten to fourteen inches of precipitation annually. The area typically has excellent to outstanding wind energy potential

Larger rivers within the Lower Laramie Watershed are fed by precipitation primarily from the Snowy Range Mountains to the southwest. Additional water and smaller rivers and streams are fed by precipitation from the Laramie Range. High evaporation rates within the Laramie Plains reduce the effectiveness of precipitation in this area for stream-flow, groundwater recharge, and plant growth.

The Laramie Range is composed of Precambrian, Paleozoic, Mesozoic, and early Tertiary rocks that have been uplifted as the rock layers were compressed into anticlines and uplifted along low-angle thrust faults and high-angle reverse faults. Most of the uplift occurred 75 to 50 million years ago in latest Cretaceous and early Tertiary time. This mountain-building period, known as the Laramie Orogeny, occurred through much of the Western states of Wyoming, Colorado, Utah, Montana, Arizona, and New Mexico (Snoke 1993). The cores of the range contain Precambrian rocks that have been uplifted thousands of feet through movement on low-angle to high-angle reverse faults. Elevational relief occurs throughout the Lower Laramie area, though limited in the southwestern portion of the area.

Soils in the area have a granitic base, with fractured uplifts of sandstone and limestone. Soils surrounding the range formed in residuum or alluvium, derived dominantly from shale or sandstones. Layers of both these types are often found together in alternating bands of varying thickness. Textures range from sands to loams with some areas of clays and silt loams. Soil depths range from very shallow to deep. Sandy and loamy soils generally allow precipitation to leach salts sufficiently to allow them to function (effective rooting depth) as moderate to deep soils. Clay- and silt-dominated soils are more likely to be saline or alkaline due to low infiltration rate restricting precipitation ability to leach salts out of the soil profile and allowing evaporation to bring salts back to the surface level. Fine-textured soils have lower infiltration rates and higher rates of runoff, with high to severe potential for soil erosion; while loam to sandy soils have moderate to high rates of infiltration and produce low to moderate runoff with low to medium potential for soil erosion. Finer-textured soils will usually have lower amounts of vegetative cover and litter. There is essentially no mining or oil and gas development in this area.

Vegetation is predominantly sagebrush-grass, grasslands, or conifer woodlands. Mountain big sagebrush and Wyoming big sagebrush are the most common species amongst the nine species or subspecies of sagebrush shrubs commonly occurring together or in site-specific habitats. Grasslands typically have short, cool-season grasses. Mountain shrubs, which include bitterbrush, snowberry, serviceberry, chokecherry, and mountain mahogany, occur in 10-inch or higher precipitation zones and are usually intermixed with themselves or with sagebrush, aspen, and/or juniper. Warm season grasses are more common in these mountain shrub communities within the Laramie Range. Conifer woodlands occur above 7,500 feet, with limber pine and juniper on drier sites and lodgepole pine, subalpine fir, and spruce on wetter sites. Aspen woodlands are usually found above 7,000 feet in small pockets associated with springs or other sources of additional moisture. Gardner's saltbush and black greasewood are the distinctive species of saline-influenced communities. Riparian and wetland habitats occur

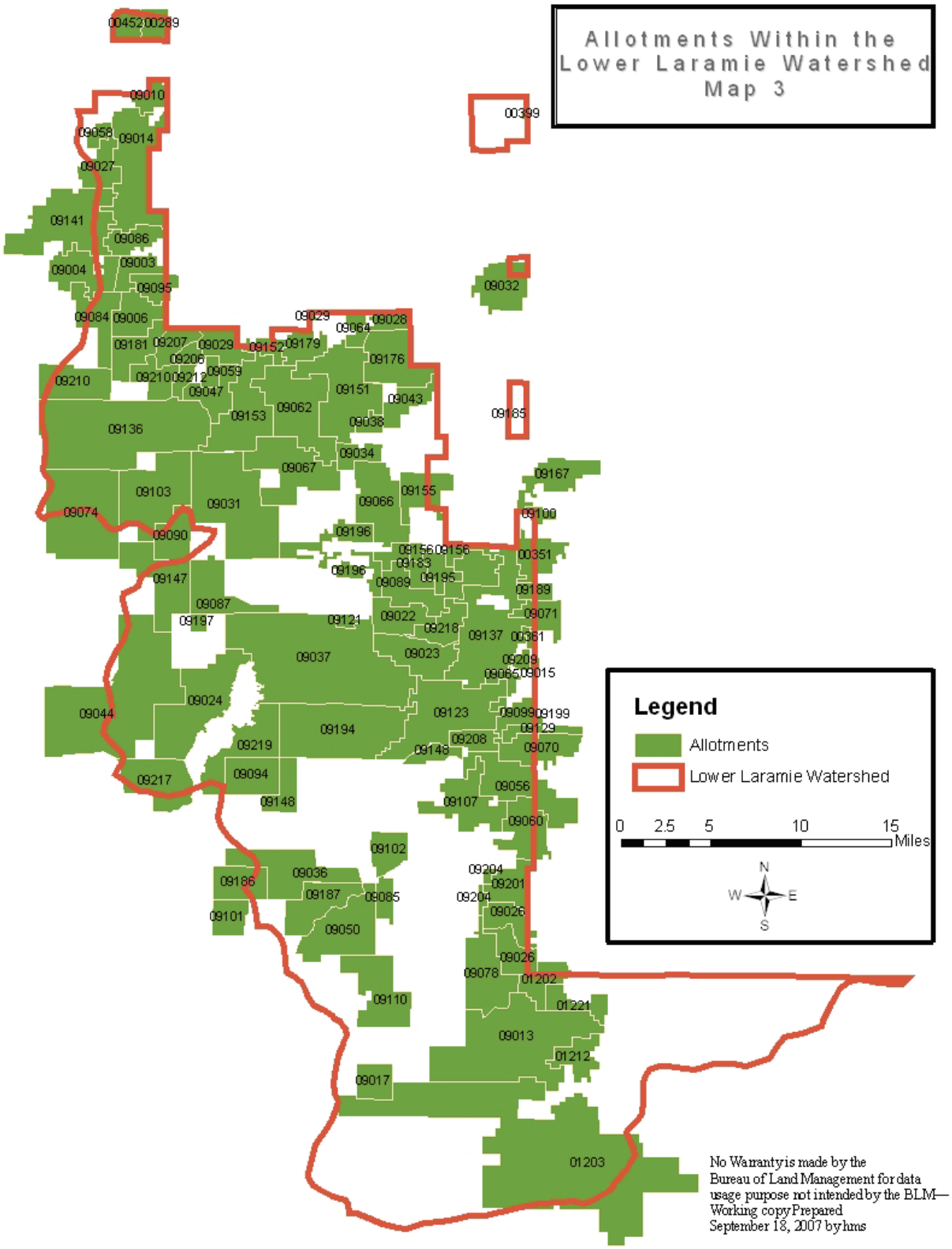
on a small portion of public lands. Herbaceous- and shrub-dominated riparian communities are the most common, with tree-dominated habitat, such as cottonwood, being the least common in occurrence.

Wildlife is abundant and diverse. Antelope, mule deer, and elk are common big game species, as well as bighorn sheep in the Laramie Range. White-tailed deer also inhabit the watershed area. Other commonly-observed mammals are coyotes, red fox, badger, cottontail and jackrabbits, prairie dogs, ground squirrels, voles, and mice. Raptors that are known to exist within the area include golden eagles and red-tailed hawks; however, it is possible that other raptors are also present. Greater sage-grouse are an important species of interest and the watershed contains wintering areas, brood-rearing habitat, and leks. Blue grouse are found in higher elevation aspen and conifer woodlands. Shorebirds and waterfowl include great-blue herons, avocets, stilts, phalaropes, sandpipers, coots, Canada geese, white pelicans, and other various ducks (primarily dabblers). Songbirds vary by habitat type, with sparrows, meadowlark and horned lark most often seen in sagebrush and saltbush areas, and warblers, swallows and flycatcher species observed in riparian habitats. Horned lizards and prairie rattlesnakes are the most common reptiles, while tiger salamanders are the most abundant amphibian species. Fisheries are most recognized for various species of trout, which have been introduced into streams and ponds for recreational use. Increasing attention is being directed at non-game fish species found in the North Platte River drainage.

Human population levels are low within the area. Laramie, the county seat of Albany County, is the largest nearby community, with approximately 27,000 people. Wheatland and Rock River are the closest communities to the area, with approximately 3,600 and 250 people respectively. Other nearby communities includes Chugwater (approximately 250 people), Medicine Bow (approximately 300 people), and Esterbrook (approximately 30 people). There are no paved roads within the area. Albany County maintains a number of improved dirt and gravel roads. Human use on public lands within the Lower Laramie Watershed is generally related to mineral development, livestock grazing, and recreation.

There are 103 allotments permitted for grazing use on public lands in the Lower Laramie Watershed analysis area (Map 3). Grazing on public land is primarily cattle, which has been the predominant livestock in this area. Historically sheep have also grazed within the areas as well, but there are no current sheep permits. The Taylor Grazing Act began a continuing process of creating allotments and developing range improvements. Greater stewardship and on-the-ground management have improved as knowledge and abilities increase. Allotment fencing is common within the area, as are pastures. This assessment was completed using monitoring data, PFC assessments, and professional knowledge, as well as information or knowledge about these allotments from other agencies. Best Management Practices (BMPs) describe various actions which have been or can be implemented to change impacts from grazing management. They include altering the season, duration, or type of livestock use, as well as the use of herding, fencing, water developments, vegetation treatments, or other tools where appropriate.

Recreation use includes hunting, fishing, camping, ORV use, and wildlife viewing. The numbers of people involved in these activities are generally low, except fishing along the Platte, rafting during spring high water, and fall hunting seasons. Recreational activities are most numerous on public land which can be accessed by public routes.


Allotments Within the Lower Laramie Watershed Map 3
Legend
Allotments
Lower Laramie Watershed
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Standard 1 - Watershed

STANDARD 1 - WATERSHED

Within the potential of the ecological site (soil type, landform, climate, and geology), soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff.

Watershed discussions are grouped by 5th level Hydrologic Unit Code (HUC) (see Map 4).

Table 1.1 –Sub-Area Acreage Included in the Analysis Area

Sub-Area (report sections)[1]	Acreage	5th Level HUC's[2]
La Bonte Creek	38,534	1018000803
Upper North Laramie River	211,310	1018001106
Laramie River-Dry Laramie River	228,685	1018001101
Laramie River-One Mile Creek	60,269	1018001007
Bluegrass Creek	89,369	1018001102
Upper Sybille Creek	144,703	1018001103
Upper Chugwater Creek	253,317	1018001108
Total	**1,026,187**	

[1]Not all sub-area acreage contained in analysis area.
[2]HUCs – United States Geological Survey Hydrologic Unit Codes.

LA BONTE CREEK

CHARACTERIZATION

Only the southern most portion of this watershed lies within the analysis area. Drainage is to the north and includes portions of Fourmile Creek, Brush Creek, and Brumley Creek. Based on the NRCS data set for Wyoming from 1961-1990, the average annual precipitation for this area is 20 to 24 inches annually. Elevations range from 8,300 to 7,500 feet above sea level, with varied rugged topography and steep slopes.

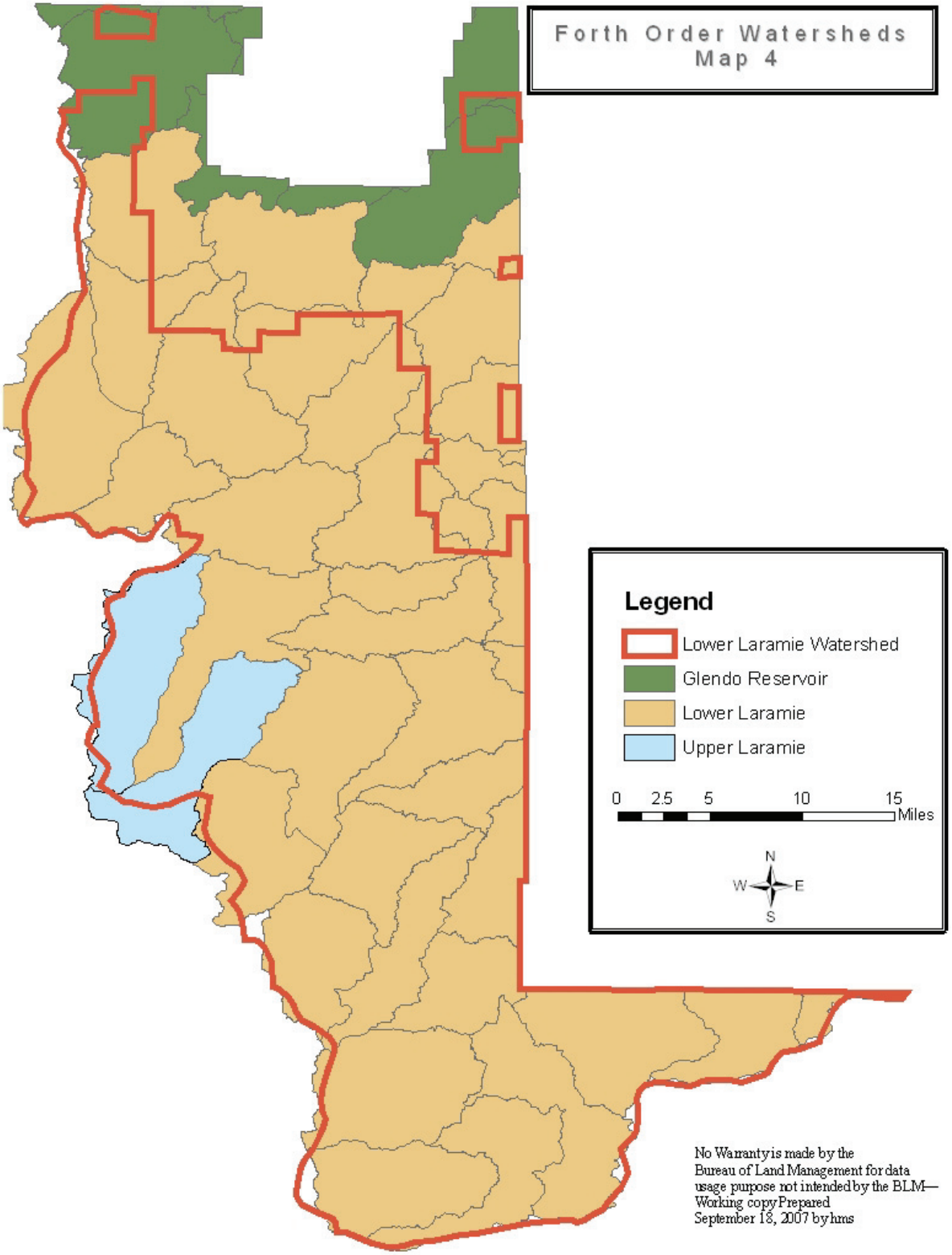
Stream flow is perennial. The majority of the watershed has either a gravel or rocky base, which promotes more lateral stream movement with disturbance, rather than down-cutting. Stream channels are generally stable with rocks and perennial vegetation cover, including willows, waterbirch and other shrubs, and in some locations cottonwood and aspen. There is one USGS gaging station located near La Bonte , Wyoming (06651500). Table 1.2 summarizes the mean monthly flow at this gaging station for the years 1916 to 1969.

Table 1.2 La Bonte Creek near La Bonte, Wyoming (06651500) for the years 1916 to 1969

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Monthly Mean[1]	5.7	7.2	21	151	294	98	19	7.5	4.9	6.1	6.8	6.4

[1] Monthly Mean in Cubic Feet Per Second

There is insufficient data to classify the drainages in this HUC as per the Rosgen (1996) classification methodology.


Forth Order Watersheds
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Lower Laramie Watershed
Glendo Reservoir
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ISSUES AND KEY QUESTIONS

Livestock Grazing: Livestock impacts relate primarily to stream channels, which affect bank stability and width/depth ratios. In some areas there is also a need to address grazing impacts to woody shrubs and aspen vigor and regeneration. Livestock grazing has been and continues to be the principal factor affecting watershed values in terms of vegetative cover and litter (Picture 1.1). Where channels and flow regimes are ephemeral, the focus is primarily on uplands. Management issues relate to the season, duration, and distribution of use rather than stocking rates. The key question is: In what locations do further refinements in BMPs or other actions still need to be made to improve watershed health and meet desired resource conditions?

Woody Plant Health: Large scale wildland fires have occurred within the watersheds in much of the timber plant community in the last few years, reducing ground cover, increasing surface erosion for the short term, and are expected to improve late season stream flows and reduce erosion in the long-term. The age and canopy cover of big sagebrush, mountain shrub, timber communities and aspen woodland plant communities is increasing, leading to lower herbaceous ground cover and water yield. Older shrub and tree communities use more water, have lower infiltration rates, and have greater surface erosion, all leading to reduced late-season stream flows. The key question is: How do we, as an agency, decide on what amounts of treatments should occur to promote higher stream flows and lower soil erosion levels and still address all of the resource values that we are obligated to manage?

Erosion: Erosion in the Laramie Range is primarily a result of intense thunderstorm events. The topography of the area is steep and rocky, which intensifies overland flow in storm events. Areas within the watershed that have had areas of large fires also increase erosion rates (see Picture 1.2 and 1.3). Forested systems on the Laramie Range Mountains are in poor health in some areas and have high fuel loading because of fire suppression for many years. However, several major fires in the have reduced the amount of decedent timber stands (Picture 1.4). Promoting forest health in the headwaters by mechanical thinning in diseased/dense stands can be an effective method to improve the sustainability of headwater vegetation and, therefore, reduce erosion. The creation of fire breaks and returning fire to its natural role in the ecosystem will further reduce catastrophic fire events. Because there are many pockets of diseased trees in the Laramie Range, these areas are less able to withstand and recover from a large scale wildland fire. Prescribed fire and/or timber harvest is needed as a management tool to lower fuel loads and provide a mosaic of vegetation and increased diversity of species and age classes. The key question is: What educational and management tools should be employed to reduce erosion impacts from fire suppression, livestock grazing, recreation and other users of public lands?

CURRENT CONDITIONS

Quantifiable data about current erosion levels and stream flows, as well as condition and trend, are not available. However, stream channels are generally stable, with good vegetative cover and/or rock for armoring, and good width-to-depth ratios. Some channel narrowing will still occur. As the channels narrow, the active floodplain width expands, including both lateral expansion on cobble, gravel, and silt-bottomed streams. In-channel bank sloughing on outer corners and gradient, adjustment of ephemeral side drainages are the primary sources of erosion. Beaver were once present on portions of these streams, but are now largely absent.

Vegetative cover and litter on upland sites vary with the soils, slope, aspect, elevation, and precipitation. At higher elevations, plant cover is usually higher due to increased moisture and density of plants. Trend data shows increases in plant cover and litter as well as plant densities, which occur primarily as grasses fill in the spaces between shrubs. In general, the overall ground cover appears good, but in many locations can still be improved with the use of BMPs.

REFERENCE CONDITIONS

The U.S. Geological Survey, under F.V. Hayden, entered the area in August 1870 (Hayden 1872a). La Bonte Creek was "bordered with bitter and sweet cottonwood, box elder, and large tree willows." The bottoms were luxuriantly grass covered. The pine forests at sources of Horseshoe and La Bonte Creeks were denser and with larger trees than any other portions of the range that was visited. On returning in October, it was noted that "south of Laramie Peak there is a great scarcity of timber on this range." The streams of the range were "full of fish, especially trout" and mule deer, whitetailed deer, and antelope were moderately abundant. Grouse were also noted. The range was "cover[ed] with a thick growth of grass, with here and there a thin grove of pines...These trees are hardly ever more than form fifty to sixty feet high and seldom more than two feet in diameter at the base." Spruce and other coniferous trees were present at the higher elevations. Big sagebrush was noted on the west side of the range, replacing the silver sagebrush on the east side of the mountains.

SYNTHESIS AND INTERPRETATION

BMPs for livestock grazing that have been implemented in this watershed include: pasture grazing systems to control duration of use, deferment of riparian pastures to late summer or fall use when possible, and development of upland water sources to reduce dependence on streams as water sources. The bank building and expansion of riparian habitat (due to narrowing of stream channels), have led to increased late season flows in all perennial streams. In most cases there are adequate pastures for rotational grazing, the key is to control the duration and season of use on streams where improvement is still needed.

Fluvial erosional processes dominate this area due to the higher precipitation and higher ground cover. Flood events due to summer rainstorms are the most likely cause of natural topography and geology. Forested systems on the Laramie Range Mountains are in poor health in some areas and have high fuel loading because of fire suppression for many years. However, several major fires in the area have reduced the amount of decedent timber stands. Promoting forest health in the headwaters by mechanical thinning in diseased/dense stands can be an effective method to improve the sustainability of headwater vegetation. Because there are many pockets of diseased trees in the Laramie Range, these areas are less able to withstand and recover from large scale wildland fires. Prescribed fire and/or timber harvest is needed as a management tool in this area to lower fuel loads and provide a mosaic of vegetation and increased diversity of species and age classes for both woodlands and shrublands.

RECOMMENDATIONS

Due to the existing diversity and amount of vegetative cover on uplands, the existing and improving trend in stream vegetation and channel morphology, and the small number of remaining management issues, it has been determined that the majority of the Lower Laramie Watershed within the assessment area is meeting Standard 1. The following recommendations

would expand upon the success already achieved and help to meet desired resource conditions in the future.

- Continue to implement or manage using BMPs for livestock grazing. This primarily means controlling the season, duration, and distribution of livestock use to meet desired resource objectives for both riparian and upland habitats. Specific dates or times must be decided on a case-by-case basis. Methods to achieve this include, but are not limited to, herding, pasture fencing, water developments, and vegetation treatments.

- Identify and correct any problems with improved and two-track roads with identified erosional areas or the road should be closed and reclaimed.

- Implement vegetation treatments to restore plant communities with diverse species, age classes, and cover types. Promote composition of communities to maximize herbaceous cover and litter and, therefore, minimize surface runoff and soil erosion, and promote reliable, late-season stream flows.

- Reintroduce beaver into suitable habitats whenever possible.

- Expand public education about its role in public land management, particularly regarding impacts from fire and road and off-highway vehicular activities.

UPPER-NORTH LARAMIE RIVER

CHARACTERIZATION

The Upper-North Laramie River HUC occupies approximately the northern 25% of the assessment area and has an areal extent of 211,310 acres. Drainage is to the south along the North Laramie River, which then turns east flowing along the northern flank of Seller Mountain and out toward Wheatland, Wyoming. The abrupt turn in the North Laramie River is attributed to changing topography through the Paleocene. It has been suggested that, because the range had been largely buried by sediment by the end of the Oligocene, rivers flowed predominately southwest to northeast. As erosion began to expose the range, rivers were appropriated by subsequent local topographic control. This mixture of old and recent topography is thus the origin of the abrupt turns in Laramie Range rivers (e.g., the North Laramie River) that reverse direction to cut back through the crest of the range.

The North Laramie is joined by several major tributaries including: Soldier Creek Reservoir, Beaver Dam Creek, Pole Creek, Bar M Creek, Hay Draw, Cottonwood Creek, Antelope Creek, Cow Creek, Willow Creek, Coyote Canyon, Yankee Draw, Rattlesnake Draw, Bear Creek, and Manter Draw. Based on the Natural Resource Conservation Service (NRCS) data set for Wyoming between 1961-1990, the average annual precipitation for the northern part of the HUC near Soldier Creek Reservoir averages 20 to 24 inches annually to 14 to 16 inches annually near Seller Mountain. There is one USGS gaging station located near Wheatland, Wyoming (06667500). Table 1.3 summarizes the mean monthly flow at this gaging station for the years 1914 to 1974.

Table 1.3 - North Laramie River near Wheatland Wyoming (06667500) for the years 1914 to 1974

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Monthly Mean[1]	6.1	7.4	22	83	196	102	28	13	7.9	8.4	8.3	7.0

[1] Monthly Mean in Cubic Feet Per Second

The majority of stream channels identified in the HUC are C2 stream types. The C2 stream type is a boulder-dominated channel with high width-to-depth ratio and well developed flood plains (Rosgen 1996). This type occurs in broad valleys with gentle gradients of less than two percent (Pictures 1.5 and 1.6). Rates of lateral adjustment are influenced by the presence and condition of riparian condition. Pole Creek has been identified as a G3 type stream. A G3 is characterized as a deeply incised in depositional material with a cobble-dominated channel (Rosgen 1996). G3 channels have moderate gradients with low width-to-depth ratios. G3 type streams are relatively unstable with a high degree of bank erosion and bedload transport.

ISSUES AND KEY QUESTIONS

Livestock Grazing: Please refer to issues identified for La Bonte Creek.

Woody Plants: Please refer to issues identified for La Bonte Creek.

Erosion: Please refer to issues identified for La Bonte Creek.

CURRENT CONDITIONS

No quantifiable data exists about current erosion levels and stream flows is this area. Information available from photo-points and personal observations shows that the trend for watershed values is upward. Specific management implemented along with range improvements and vegetative treatments, at least indirectly, should also relate to improved resource conditions in most areas. This area has been subject to drought conditions the last five years. These conditions have lead to decreased vegetative cover and plant heath throughout the watershed.

Based on PFC observations, stream channels are generally stable, with good vegetative cover and width-to-depth ratios. Some channel narrowing will still occur. As the channels narrow, the active floodplain width expands, including both lateral expansion on cobble, gravel, and silt-bottomed streams. In-channel bank sloughing on outer corners and gradient adjustment of ephemeral side drainages are the primary sources of erosion. Reduction of bank cover due to the duration and season of cattle use has been and continues to be the principle impacts to channels on public lands. Changes in livestock management, including fencing, upland water developments, and/or exclusion will be implemented. Beaver are not present in any portions of these streams within the Rawlins BLM Field Office.

REFERENCE CONDITIONS

Please refer to issues identified for La Bonte Creek.

SYNTHESIS AND INTERPRETATION

Please refer to issues identified for La Bonte Creek**.**

RECOMMENDATIONS

Please refer to issues identified for La Bonte Creek.

LARAMIE RIVER AND DRY LARAMIE RIVER

CHARACTERIZATION

The Laramie River-Dry Laramie River HUC has an areal extent of 228,685 acres. The principal drainage is the Laramie River, which flows north from Laramie, Wyoming, into the Wheatland Reservoir. From the Reservoir, the Laramie River flows to the northeast toward Wheatland, Wyoming. Downstream of Wheatland Reservoir, the Laramie River is joined by several major tributaries including Dodge Creek, Pre-emption Creek, Dipping Vat Creek, Duck Creek, and Sheep Camp Creek. During the irrigation season, up to 450 cubic feet per second can be diverted from the Laramie River via the Wheatland Tunnel to Bluegrass Creek (HUC 1018001103). Water diversion is ceased during the winter months, and during this time the diversion impoundment is allowed to sluice downstream, adversely affecting water quality, which has resulted in fish kills. A 1997 study to mitigate these impacts was sponsored by the Wheatland Irrigation District and evaluated by Kennedy Engineering. To avoid excessive sedimentation, the Wheatland Irrigation District constructed a box around the outlet and modified the intake to draw water from the top rather than the bottom of the reservoir.

Based on the NRCS data set for Wyoming from 1961-1990, the annual precipitation for the lower elevations downstream of Wheatland Reservoir averages 12 to 14 inches, increasing to 16 to 18 inches in the higher elevations to the northeast. There are several USGS gaging stations located on the Laramie River. Within or closest to the assessment area are Laramie River below Wheatland Reservoir #2 (06663500) and Laramie River near Wheatland (06664000). Tables 1.4 and 1.5 summarize the mean monthly flow at these gaging stations for the years specified.

Table 1.4 Laramie River Below Wheatland Reservoir #2 (06663500) for the years 1951 to 1963

	Jan	**Feb**	**Mar**	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**
Monthly Mean[1]	6.7	8.9	12	31	101	292	318	252	91	13	8.5	7.1

Table 1.5 Laramie River near Wheatland (06664000) for the years 1912 to 1933

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Monthly Mean[1]	4.0	4.0	32	29	31	92	16	10	4.7	10	13	6.8

[1] Monthly Mean in Cubic Feet Per Second

The Laramie River has a varied character that can range from a C2 to C4 stream type. C2 is typical of streams with boulder-dominated channels, well developed meanders, and high width-to-depth ratios (Rosgen 1996). They are found in many valley types, but are most common to

broad gentle gradient alluvial valleys. C4 streams occur in similar valley types as the C2 streams, but are slightly entrenched with well developed meanders. The bed material commonly consists of gravel with lesser amounts of cobble, silt and clay. Duck Creek, a tributary to the Laramie River within the assessment HUC, is classified as a C2.

ISSUES AND KEY QUESTIONS

Livestock Grazing: Please refer to issues identified for La Bonte Creek.

Woody Plants: Please refer to issues identified for La Bonte Creek.

Erosion: Please refer to issues identified for La Bonte Creek.

CURRENT CONDITIONS

Based on PFC observations, stream channels are generally stable, with good vegetative cover and width-to-depth ratios. Some channel narrowing will still occur. As the channels narrow, the active floodplain width expands, including both lateral expansion on cobble, gravel, and silt-bottomed streams. In-channel bank sloughing on outer corners and gradient adjustment of ephemeral side drainages are the primary sources of erosion. Reduction of bank cover due to the duration and season of cattle use has and continues to be the principle impacts to channels on public lands. Changes in livestock management, including fencing, upland water developments, and/or exclusion will be implemented. Beaver are not present in any portions of these streams within the Rawlins BLM Field Office.

REFERENCE CONDITIONS

Please refer to issues identified for La Bonte Creek.

SYNTHESIS AND INTERPRETATION

Please refer to issues identified for La Bonte Creek**.**

RECOMMENDATIONS

Please refer to issues identified for La Bonte Creek.

LARAMIE RIVER - ONE MILE CREEK

CHARACTERIZATION

The Laramie River-One Mile Creek HUC has an areal extent of 60,269 acres. The principal drainage is the Laramie River, which flows north from Laramie, Wyoming, into the Wheatland Reservoir. Please see Laramie River-Dry Laramie River HUC for characterization.

ISSUES AND KEY QUESTIONS

Livestock Grazing: Please refer to issues identified for La Bonte Creek.

Woody Plants: Please refer to issues identified for La Bonte Creek.

Erosion: Please refer to issues identified for La Bonte Creek.

CURRENT CONDITIONS

There are no PFC observations or other observational data available for this HUC.

REFERENCE CONDITIONS:

Please refer to issues identified for La Bonte Creek.

SYNTHESIS AND INTERPRETATION

Please refer to issues identified for La Bonte Creek**.**

RECOMMENDATIONS

Please refer to issues identified for La Bonte Creek.

BLUEGRASS CREEK

CHARACTERIZATION

The Bluegrass Creek HUC has an areal extent of 89,369 acres. The principal drainage is Bluegrass Creek, which flows east-southeast toward Wheatland, Wyoming. Major tributaries include West Bluegrass Creek, East Bluegrass Creek, Tunnel Creek, Camp Creek, Halleck Creek, Little Halleck Creek, and Tower Canyon Creek.

Based on the NRCS data set for Wyoming from 1961-1990, the annual precipitation for the lower elevations downstream of Wheatland Reservoir averages 14 to 16 inches, increasing to 16 to 18 inches in the higher elevations to the northeast within the assessment area. There is one USGS gaging station located on Bluegrass Creek near Wheatland, Wyoming (06664900). Table 1.6 summarizes the mean monthly flow at this gaging station for the years specified.

Table 1.6 Bluegrass Creek Near Wheatland, WY (06664900) for the years 1958 to 1979

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Monthly Mean[1]	5.2	8.9	18	41	146	243	377	359	155	10	7.5	5.8

[1] Monthly Mean in Cubic Feet Per Second

There are insufficient data to classify the drainages in this HUC as per the Rosgen (1996) classification methodology.

ISSUES AND KEY QUESTIONS

Livestock Grazing: Please refer to issues identified for La Bonte Creek.

Woody Plants: Please refer to issues identified for La Bonte Creek.

Erosion: Please refer to issues identified for La Bonte Creek.

CURRENT CONDITIONS

Based on PFC observations, stream channels are generally stable, with good vegetative cover and width-to-depth ratios. Some channel narrowing will still occur. As the channels narrow, the active floodplain width expands, including both lateral expansion on cobble, gravel, and silt-bottomed streams. In-channel bank sloughing on outer corners and gradient adjustment of ephemeral side drainages are the primary sources of erosion. Reduction of bank cover due to the duration and season of cattle use has been and continues to be the principle impacts to channels on public lands. Changes in livestock management, including fencing, upland water developments and/or exclusion will be implemented. Beaver are not present in any portions of these streams within the Rawlins BLM Field Office.

REFERENCE CONDITIONS

Please refer to issues identified for La Bonte Creek.

SYNTHESIS AND INTERPRETATION

Please refer to issues identified for La Bonte Creek**.**

RECOMMENDATIONS

Please refer to issues identified for La Bonte Creek.

UPPER SYBILLE CREEK

CHARACTERIZATION

The Sybille Creek HUC has an areal extent of 144,703 acres. The principal drainage is Sybille Creek and South Sybille Creek, which flow northeast out of the assessment area, eventually joining Bluegrass Creek near Wheatland, Wyoming. Major tributaries to Sybille Creek include: Plumbago Creek-North Sybille Creek, Long Canyon Creek, Bear Creek, Middle Sybille Creek, Little Creek, Johnson Creek, Trail Creek. Tributaries to South Sybille Creek include: Spring Timber Creek, West Fork, and Iron Mountain Creek.

Based on the NRCS data set for Wyoming from 1961-1990, the annual precipitation for the lower elevations averages 16 to 18 inches, increasing to 18 to 20 inches in the higher elevations to the northeast within the assessment area. Although there are several USGS gaging stations located on Sybille Creek near Wheatland, Wyoming, the one within the assessment area occurs above Bluegrass Creek (06664500). Table 1.7 summarizes the mean monthly flow at this gaging station for the years specified.

Table 1.7 Sybille Creek AB Bluegrass Creek, NR Wheatland, WY (06664500) for the years 1941 to 1968

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Monthly Mean[1]	8.2	8.3	11	27	46	41	26	9.7	5.6	8.6	10	9.8

[1] Monthly Mean in Cubic Feet Per Second

A Rosgen (1996) classification was only completed on Middle Sybille Creek, which is classified as a C3 stream type. C3 is characterized as a slightly entrenched, pool-riffle, cobble dominated channel with a well-developed flood plain (Rosgen 1996). These are common to broad alluvial valleys. South Sybille Creek has been characterized as an E3 stream type. E3 streams have moderate sinuosity, low to moderately steep gradients, and channels dominated by cobble with lesser amounts of gravel and sand (Rosgen 1996). These can be located in a variety of valley types including mountain meadows, alpine tundra, and broad alluvial valleys.

ISSUES AND KEY QUESTIONS:

Livestock Grazing: Please refer to issues identified for La Bonte Creek.

Woody Plants: Please refer to issues identified for La Bonte Creek.

Erosion: Please refer to issues identified for La Bonte Creek.

There is one spring located along Sybille Creek that has been rated as Functioning at Risk with a downward trend.

REFERENCE CONDITIONS

Please refer to issues identified for La Bonte Creek.

SYNTHESIS AND INTERPRETATION

Please refer to issues identified for La Bonte Creek**.**

RECOMMENDATIONS

Please refer to issues identified for La Bonte Creek.

UPPER CHUGWATER CREEK

CHARACTERIZATION

The Upper Chugwater Creek HUC makes up the southern portion of the assessment area and has an areal extent of 253,317 acres. The principal drainage is Chugwater Creek, which flows northeast out of the assessment area toward the town of Chugwater, Wyoming. Some of the drainage within the HUC is captured by a reservoir located near Limestone Rim (T. 19N., R. 71 W., section 36). Middle Chugwater Creek, Shanton Creek, and Strong Creek flow into this reservoir. Major tributaries to Chugwater Creek include: Ricker Creek, Sand Creek, Threemile Creek and Spring Creek.

Based on the NRCS data set for Wyoming from 1961-1990, the annual precipitation is variable across the HUC. The lower elevations average 16 to 18 inches, increasing to 20 to 24 inches near the headwaters of Chugwater Creek in the southern-most portion of the assessment area (i.e., King Mountain, T. 17 N., R. 72 W., section 3). There is one USGS gaging station located at Chugwater, Wyoming (06669500). Table 1.8 summarizes the mean monthly flow at this gaging station for the years specified.

Table 1.8 Chugwater Creek at Chugwater, WYO (06669500) for the years 1911 to 1940

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Monthly Mean[1]	9.8	11	21	40	41	24	9.8	16	12	12	12	9.6

[1] Monthly Mean in Cubic Feet Per Second

There are insufficient data to classify the drainages in this HUC as per the Rosgen (1996) classification methodology.

ISSUES AND KEY QUESTIONS

Livestock Grazing: Please refer to issues identified for La Bonte Creek.

Woody Plants: Please refer to issues identified for La Bonte Creek.

Erosion*:* Please refer to issues identified for La Bonte Creek.

CURRENT CONDITIONS

PFC ratings in this HUC is Functioning at Risk with an upward trend (trib to Upper Chugwater Creek, Spring Creek at Iron Mountain) and Proper Function Condition (Cottonwood Creek).

REFERENCE CONDITIONS

Please refer to issues identified for La Bonte Creek.

SYNTHESIS AND INTERPRETATION

Please refer to issues identified for La Bonte Creek**.**

RECOMMENDATIONS

Please refer to issues identified for La Bonte Creek.

STANDARD 2-RIPARIAN/WETLANDS

STANDARD 2 - RIPARIAN/WETLANDS

Riparian and wetland vegetation have structural, age, and species diversity characteristic of the state of channel succession and is resilient and capable of recovering from natural and human disturbance in order to provide forage and cover, capture sediment, dissipate energy, and provide for ground water recharge.

Riparian zones are the interfaces between terrestrial and aquatic ecosystems. As ecotones, they encompass sharp gradients of environmental factors, ecological processes, and plant communities (Gregory et. al. 1991). Riparian/wetland habitat makes up a relatively small percentage of the Lower Laramie area. These important communities are some of the most productive found on public lands. They are important for recreation, fish and wildlife habitat, water supply, cultural and historic values, as well as livestock production.

CHARACTERIZATION

Riparian-wetland habitats within the assessment area are springs and streams that flow out from the higher mountains; snow supported seeps, impoundments for recreational fisheries; and/or larger river systems. Streams in this assessment area generally flow perennially in the higher elevations and support riparian vegetation. The higher elevation consist of rocky steep timbered slopes with incised rocky channels and riparian grassland habitats types are the most common form of vegetation, but also include several willow riparian shrublands, aspen/spruce riparian woodlands, and cottonwood woodlands. Riparian grasslands are wetland, stream, or spring associated grass and grass-like communities, which are maintained by water tables within rooting depth during most of the growing season (Picture 2.1). Willow riparian shrublands occur as scattered individuals or as denser communities, on wet sites that are somewhat thermally protected along drainages (Picture 2.2). Aspen riparian woodlands occur at higher elevations in the foothills of the mountain ranges in deep, loamy soils and on north and east aspects where snow drifts protect and support their moisture requirements. Spruce/fir woodlands occur along the highest elevation foothill and mountain streams within steep gradients and confining canyons into the Laramie Range Mountains and line the larger water courses, including the Laramie River, and major contributors, such as the forks of Blue Grass Creek, Duck Creek, and Bear Creek.

The seeps, springs, and streams in the higher elevations support a mixture of riparian grassland and willow riparian shrublands habitat types (Picture 2.3). Riparian grassland species are generally the same as those listed above. The willow riparian shrublands are dominated by Geyer, Booth, sandbar, and yellow willows. Additional shrubs found here include: chokecherry, dogwood, waterbirch, currant, snowberry, rose, and individual quaking aspen. The herbaceous understory generally includes: Nebraska sedge, beaked sedge, tufted hairgrass, Kentucky bluegrass and redtop. Adjacent to these habitats are: cottonwood, aspen, and, in some cases, spruce/fir riparian woodlands. S ome examples of these drainages are: Blue Grass Creek, Canyon Creek Little Pinto Creek, Sybille Creek, Mill Creek, North Fork Duck Creek, Pinto Creek, Potato Creek, Rattlesnake Draw, Little Halleck, Ashley Creek, Chugwater Creek, and George Creek

Over-story species are aspen, willow, spruce, subalpine fir, and lodgepole pine. The shrub layer is more open than the willow riparian sites and is dominated by serviceberry, chokecherry, common juniper, currants, rose, and big sagebrush (Picture 2.4). Other species associated with

this habitat type are shrubby cinquefoil, tufted hairgrass, Columbia needlegrass, elk and other sedges, bluegrasses, wildrye, rushes, and various forbs in the herbaceous layer. At middle and higher elevations, quaking aspen can also be added to this list and, where abundant, these sites are classified as aspen riparian woodlands. Cottonwood riparian woodlands are found on lower gradient and sometimes drier sites along the Sybille Creek, Blue Grass Creek, Little Halleck Creek, and dispersed portions of the lesser feeder creeks (Picture 2.5). Understory species include many of those already listed above, with a tendency towards those shrubs and herbaceous plants that like drier meadow habitats.

The remaining portion of the basin consists of the valley bottom where almost all of the perennial water courses lie on deeded land, the majority of which constitutes irrigated meadows. Water courses on public land within this portion of the watershed consist of intermittent to ephemeral drainages. Where water is more reliable, usually tied to springs or snowmelt, these areas may support riparian habitat. As water becomes more limitede they do not support wetland vegetation, nor do they have hydric soils. Hydric soils are formed when there are at least two weeks of water saturation during an average year, which produces anaerobic conditions within the soil.

There are several man-made wetlands within the assessment area; some provide recreational fisheries, while others are primarily for irrigation. Due to the extreme fluctuations in water levels, riparian vegetation can range from extremely limited/nonexistent, to quite abundant and healthy.

EVALUATION METHOD

The primary method used in evaluating this standard is through a qualitative assessment procedure called Proper Functioning Condition (PFC). This process evaluates physical functioning of riparian/wetland areas through consideration of hydrology, vegetation, and soil/landform attributes. A properly functioning riparian/wetland area will provide the elements contained in the definition:

- dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality
- filter sediment, capture bed load and aid floodplain development
- improve flood-water retention and ground water recharge
- develop root masses that stabilize streambanks against cutting action (TR 1737-15 1998)

It is important to note that the PFC assessment provides information on whether an area is physically functioning in a manner that allows maintenance or recovery of desired values (e.g., fish habitat, neotropical birds, or forage) over time. PFC is not desired or future condition (TR 1737-15 1998). PFC assessments are used along with other existing information such as stream cross-sections, photo-points, and habitat assessments to evaluate this standard of rangeland health.

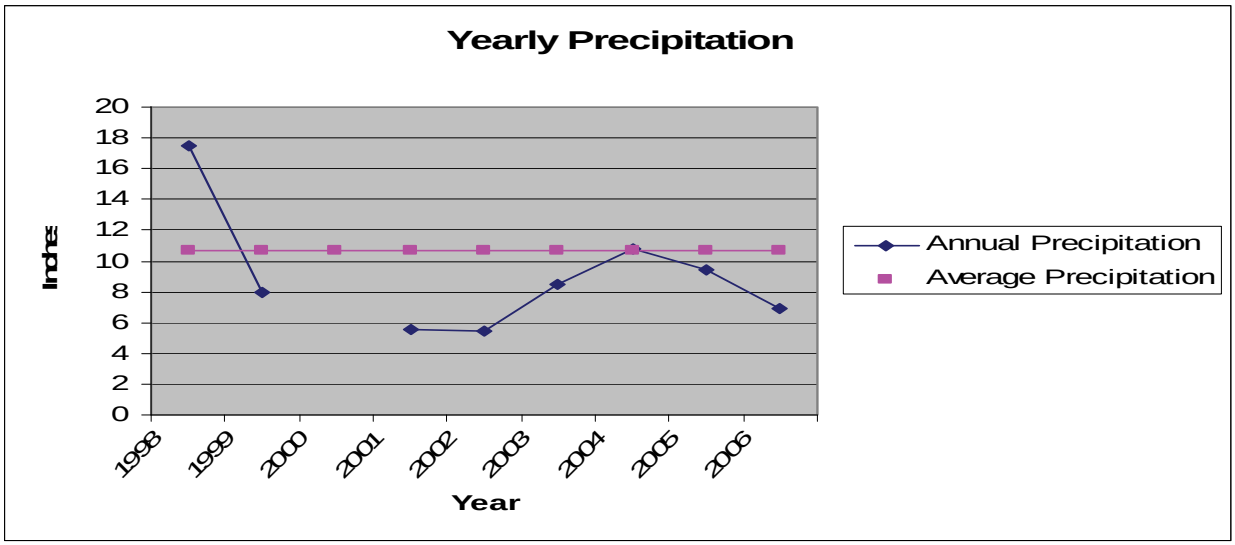
ISSUES AND KEY QUESTIONS

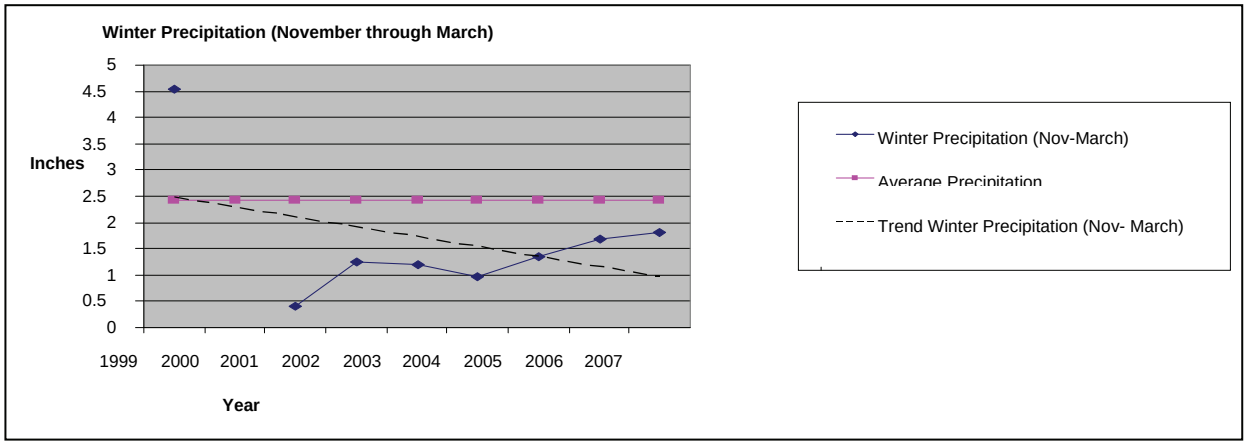
Drought has affected most of the Rawlins Field Office management area since 2000. Average annual precipitation has been consistently below average at Laramie, Wyoming. Important spring precipitation was above average in Laramie in 2004 and 2005; summer and fall precipitation amounts have been above average since then. Precipitation trends since the

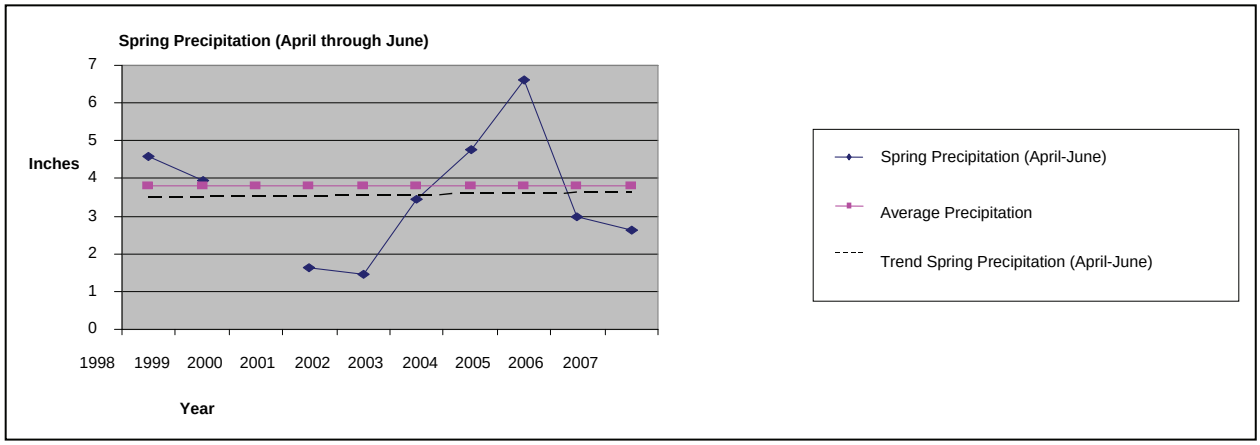
beginning of the drought have been generally upward. Trends beginning in 1998, a high moisture year, have been generally static for spring and summer precipitation, lower precipitation during the winter and increasing precipitation in the fall (see Figures 2.1).

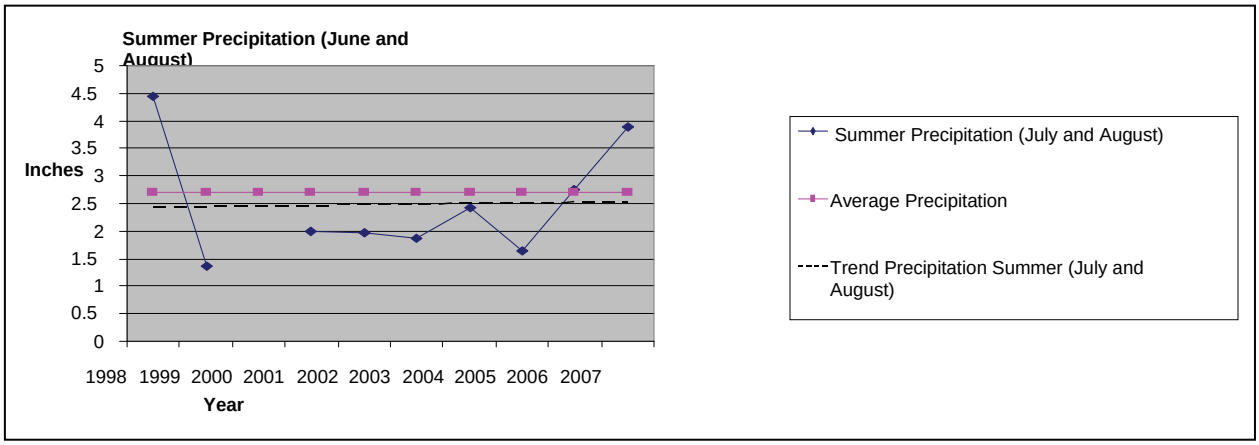
The key question is: How have these drier conditions impacted riparian/wetland areas in the S&G area?

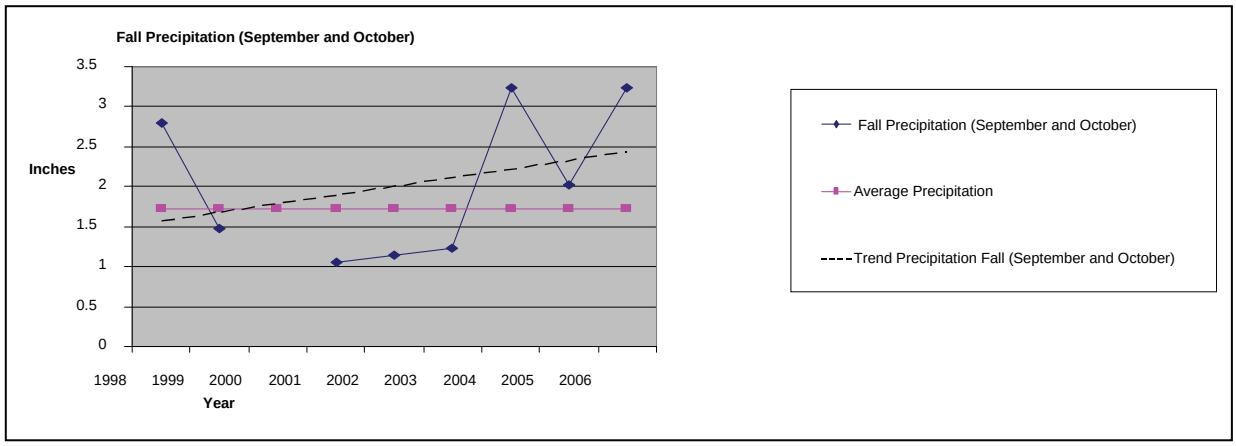
Figures 2.1- Precipitation











Noxious and invasive weeds along creeks, reservoirs, hay meadows and, especially the Laramie River, is an important factor relating to riparian condition within the assessment area. The key question is: How will the spread of these weeds be addressed, especially in complex land ownership patterns? (The weeds issue will be also be addressed in Standard 4.)

Livestock use of riparian habitats has been and continues to be an important factor relating to riparian condition within the assessment area. Historic livestock grazing use that included

grazing and trailing large numbers of livestock and much longer durations of use, trapping beaver out of the systems, and the lack of upland water sources contributed to the decline in riparian conditions. Current livestock grazing use can negatively impact establishment and/or production of woody riparian plant species such as aspen, willows, dogwood, waterbirch, or cottonwood in some portions of the watershed. Movement of animals through riparian areas can affect functionality by increasing bare ground, usually observed in the form of trails and crossings. Higher numbers or an increased duration of use will create a greater impact from bank shear and trampling, leading to more bare ground. Increased bare ground reduces the ability of the system to function properly in high flow events. In many cases, best management practices have been implemented that reduce the duration and/or change the season of grazing use for livestock. Continued refinement of these practices will address the current livestock grazing use aspect.

There are certain areas within the assessment area where hummocked areas occur adjacent to riparian areas (Picture 2.6). Many of these are a factor of the soil involved and the historic long duration of livestock use that has occurred within the area. The key question is: Will implementation of best management grazing practices address these areas at risk?

Vertical instability is a problem in some areas (Picture 2.7). Some of these head-cuts have been stabilized within the watershed; however, there are still areas that need to be addressed or maintained. Manmade structures, such as reservoirs, also have instability problems due to naturally fine sediments and lack of pipes on older projects. Cutting of the spillways on reservoirs or around or through dikes are ongoing problems affecting functionality. The key question is: What is practical to address these instability issues?

Another factor affecting riparian condition is roads and their associated impacts on these areas. Roads that are directly adjacent to riparian systems in many cases channel sediments directly into creeks and reservoirs. In addition, improper size or placement of culverts can increase erosion directly into riparian systems. If the amount of sediment is high enough, it can reduce vegetation, reduce functionality, decrease water quality, and change the channel dynamics. Roads can also interrupt surface and subsurface flow, which can effectively change the type of riparian system from one side to the other. The key question is: Can road related concerns be addressed through culverts, improved crossings, rerouting, water bars, and roadside pits or are there additional solutions that can be implemented?

Additionally, overall changes in historic use of and impacts on riparian zones have altered the conditions of these areas. Many portions of these streams historically involved the presence of beavers and their associated activities and alterations of the systems. Subsequent loss of beaver populations due to trapping or the animals removal of their main food source has allowed the systems of dams and ponds to collapse and increased erosion and sedimentation into the systems (Picture 2.8). Lack of turnover has led to the predominance of spruce/fir type communities adjacent to the streams precluding recolonization by beaver which could aid in riparian system recovery. The key question is: How can shifts in vegetation species composition be addressed and recolonization by aspen/will types be encouraged?

CURRENT CONDITIONS

PFC assessments have been conducted in the watershed since the mid-1990s, with the most recent assessments occurring throughout the spring/summer/fall of 2005, concluding during the summer of 2006.

The assessment area has had below average precipitation since 2001, as determined by average annual precipitation measured at Laramie, Wyoming. Growing season precipitation has improved since 2004, though recently much of this precipitation has came later in the season and is reflected in precipitation trends. These short-term trends seem to improve conditions for forage growth, but reduce snow-pack and possibly groundwater recharge.

In many cases, livestock grazing over the last few years has been reduced by grazing permittees due to drought conditions. However, with less water available, many of these wetland/riparian areas have been less productive and may show signs of drought stress. Assessments for PFC have been completed from the late 1990s (on an individual allotment basis) until 2006 (as part of the watershed assessment), and several limited areas have been reevaluated. Reassessments of these limited areas showed stable or improved condition, generally moving from functioning-at-risk with a stable trend to functioning-at-risk upward trend or even properly functioning due to implementation of BMPs.

Lentic systems within the assessment area primarily consist of natural spring and/or seep sites either perched within mostly upland portions of drainages or within water courses either below the upland vegetation line or immediately above it. Regardless of location, these sites are generally relatively small (less than an acre to an acre or two) and, during a normal year, flow water only a short distance down slope or stream, sometimes drying completely by late summer prior to fall moisture. Some of these water sources have been fenced to protect wetland vegetation and provide water sources for livestock and wildlife using troughs outside the fencing. The condition of these developments ranges from very good and functional to almost non-existent due to a lack of maintenance. Other natural water sources that are unfenced have been (and currently are in many cases) used seasonally by livestock and year-round by wildlife, resulting in high amounts of trampling and utilization with changes or loss of species composition. Changes in species composition include increases in undesirable (from a forage point of view) species such as Baltic rush and arrowgrass; increased amounts of grazing resistant species like Kentucky bluegrass and mat muhly; greater amounts of early successional forbs like strawberry cinquefoil and dandelion; and almost total loss of vegetative cover.

Lentic sites in the foothill and mountain areas include natural ponds, seeps, and bogs, and a few man-made reservoirs. For the most part, these sites have good species composition (already described) and bank cover, and are in proper functioning condition.

AREAS NOT MEETING PFC THAT ARE LIVESTOCK RELATED

Allotment Number	Allotment	Reach Name	PFC Rating	Miles	Type
09062	William Goodrich	Antelope Creek	FAR DOWN		Lentic
09066	West Fork	Spring Sec 22 (All 09066)	FAR DOWN		Lentic
09067	Antelope Basin	George Creek	FAR DOWN	0.14	Lotic
09074	Elk Horn	Elkhorn Series of Seeps Sec 18	FAR DOWN	0.27	Lotic
09074	Elk Horn	Elkhorn draw Sec 18	FAR DOWN	0.69	Lotic
09107	Poe Mtn-Canyon Creek	Spring off Sybille Cr.	FAR DOWN		Lentic
09153	Sellers Mnt.	Seller Springs	FAR DOWN		Lentic
09013	Iron Mountain	Spring Creek - Seep	FAR UNK		Lentic
09066	West Fork	Pole Creek Sec 20	FAR UNK	0.04	Lotic
09127	C U Ranch INC	Yankee Draw	FAR UNK	0.10	Lotic
09155	McFarland Creek	Top of Shorty Creek	FAR UNK	0.13	Lotic

William Goodrich Allotment #09062

Five out of six of the riparian areas assessed on the William Goodrich Allotment are properly functioning. However, Antelope Creek was found to be functioning at risk with a downward trend. This sites was borderline riparian with residual riparian vegetation. The site showed signs of heavy grazing in 2005; however, this area had little production due to drought conditions. Current livestock use in this allotment is summer use by cattle. It is proposed that the allotment be reevaluated to address current allotment issues and make adjustments to allotment grazing management.

West Fork Allotment #09066

One out of three of the riparian areas assessed on the West Fork Allotment are properly functioning. However, Spring Section 22 and Pole Creek Section 20 (Lotic) was found to be functioning at risk. The Spring Creek sites have been developed with a tire tank within the spring. The site showed signs of heavy grazing in 2005 and impacts from hoof action. Current livestock use in this allotment is summer use by cattle. It is proposed that the spring source could be fenced off and additional water could be supplied to a tank in the uplands. The Pole Creek Section 20 was found to be functioning at risk. This stretch of creek intersect BLM surface for approximately 200 ft. It is proposed that the allotment be reevaluated to address current allotment issues and make adjustments to allotment grazing management.

Antelope Basin Allotment #09067

Six out of seven of the riparian areas assessed on the Antelope Basin Allotment are properly functioning or functioning at risk with an upward trend. However, George Creek was found to be functioning at risk with a downward trend. The site showed signs of heavy grazing in 2005, server hummocking, and heavy use on the willows. However, there was very good species diversity in the riparian wetland vegetation. Current livestock use in this allotment is summer use by cattle. It is proposed that the allotment be reevaluated to address current allotment issues and make adjustments to allotment grazing management.

Elk Horn Allotment #09074

Two of the riparian areas assessed on the Elk Horn Allotment are properly functioning. However, Elkhorn Series of Seeps Section 18 and Elkhorn Draw Section 18 were found to be functioning at risk with a downward trend. T his allotment has had a new management plan in place. The allotment has been changed from a two-pasture to a four-pasture rotation system and has had upland water developed. These sites are borderline riparian with some residual riparian vegetation. They showed signs of heavy grazing in 2005; however, the area had little production due to drought conditions. Current livestock use in this allotment is summer use by cattle. It is proposed that the allotment be reevaluated to address current allotment issues with the new grazing management system.

Poe Mountain-Canyon Creek #09107

Two out of the three riparian areas assessed on the Poe Mountain-Canyon Creek Allotment are properly functioning. However, Spring Off Sybille Creek was found to be functioning at risk. The Spring Off Sybille Creek site has been developed with a tire tank within the spring. The site showed signs of heavy grazing in 2005 and impacts from hoof action. Current livestock use in this allotment is summer use by cattle. It is proposed that the spring source could be fenced off and additional water could be supplied to a tank in the uplands. It is proposed that the allotment be reevaluated to address current allotment issues and make adjustments to allotment grazing management.

Sellers Mountain Allotment #09153

One out of the two the riparian areas assessed on the Sellers Mountain Allotment is properly functioning. However, Seller Springs was found to be functioning at risk with a downward trend. The site showed signs of heavy grazing in 2005, severe hummocking, and heavy use on the willows. However, there was very good species diversity in the riparian wetland vegetation. Current livestock use in this allotment is summer use by cattle. It is proposed that the spring source could be fenced off and additional water could be supplied to a tank in the uplands.

Iron Mountain Allotment #09013

Four out of the five the riparian areas assessed on the Iron Mountain Allotment are properly functioning or functioning at risk with an upward trend. However, Spring Creek - Seep was found to be functioning at risk with an unknown trend. The site showed signs of heavy grazing in 2006, severe hummocking, and heavy use on the willows. The site also had several weed species including thistle, houndstongue, white top, and burdock. This spring is located in the corner of a pasture where cattle concentrate. Current livestock use in this allotment is summer use by cattle. It is proposed that the spring source could be fenced off and additional water could be supplied to a tank in the uplands.

C U Ranch Inc. Allotment # 09127

The riparian areas assessed on the C U Ranch Inc. Allotment were found to be functioning at risk with an unknown trend. The site showed signs of heavy grazing in 2005, severe hummocking, and heavy use on the willows. However, this area had little production due to drought conditions. Current livestock use in this allotment is summer use by cattle. It is proposed that the spring source could be fenced off and additional water could be supplied to a

tank in the uplands. It is also proposed that the allotment be reevaluated to address current allotment issues with the new grazing management system.

McFarland Creek #09155

One out of the two riparian areas assessed on the McFarland Creek Allotment are properly functioning. However, Top of Shorty Creek was found to be functioning at risk. The site showed signs of heavy grazing both from cattle and from elk, there were also down cutting associated with old beaver dams. Current livestock use in this allotment is summer use by cattle. It is proposed that the spring source could be fenced off and additional water could be supplied to a tank in the uplands. It is also proposed that the allotment be reevaluated to address current allotment issues and make adjustments to allotment grazing management.

The majority of these creek and water courses lie across deeded land, split by public lands for only short, infrequent sections. Higher elevation public lands encompass many of the feeder draws tributaries, and forks of these creeks, constituting the majority of lotic riparian habitat on public lands in the valley. The numerous creeks that originate in the mountains are diverse and support grassland, shrubland, and woodland riparian plant communities.

In most cases, the highest elevation streams consist of high gradient, highly armored type systems originating higher in the mountains from springs or snowmelt, fed from additional seeps and springs along their routes. These resilient, highly armored systems are, for all practical purposes, functioning properly throughout the valley. As elevation drops, stream gradients tend to become lower and surrounding topography is, for the most part, more gentle, allowing for more meandering, less armored systems, which are more influenced by outside uses such as livestock grazing, road encroachment, beaver activity, etc. At these elevations, lotic systems tend to exhibit more sinuosity, greater vegetation diversity, and more erosion/deposition evidence.

Beaver are common in certain areas, in other areas old remnants of old dams and gnawed off aspen trees are still visible reminders of their presence. The loss of aspen habitat to conifer succession will be further discussed in Standard 3 – Upland Plant Communities. Beaver can still be found on public land riparian areas, but are scattered, occupying a fraction of historical habitat. Additional beaver activities are evident in private land irrigated meadow areas. The processes that occur with the hydrologic modification by beaver are natural, so many areas in stages of readjustment are normal under these influences. In some instances, conifer encroachment into historical beaver habitat has completely altered the habitat, making it unsuitable for beaver use due to a lack of suitable dam/lodge building materials and preferred food sources. Most of the gradient readjustment and revegetation of dams and ponds that comes after the beaver have gone seems to be actively occurring at this time, although there are instances where it has already successfully occurred or has yet to earnestly begin. The riparian evaluations revealed that, in limited portions of the watershed, this process can still be observed. In many cases, historical beaver activity has readjusted through natural processes, and has resulted in intermittent stream channels with scattered seep sites emerging from old pond areas, classified as lentic. Areas where aspen and willow stands support beaver activity, structures are stable and the riparian areas that they support are, for the most part, properly functioning and healthy.

Most streams have good species composition and stability, due to the deep-rooted sedges, grasses and willows, which dominate these sites. Woody plant communities are diverse in species composition and vertical structure, with good regeneration of young plants where good management is in place. Near the edge of the mountains, the amount of hedging on young shrubs and trees is higher, and may be attributable to more frequent use by big game species. In general, many of these streams meet proper functioning condition. Little to no bare ground, channel sloughing, or instability in these systems is present today, with the exception of a few isolated areas. However, some changes to meet desired future condition should still occur, such as greater cover or age class structure of a particular grass, shrub or tree.

Intermittent and Ephemeral Drainages

In the lower elevations of this analysis area, water courses on public lands consist of mainly intermittent and ephemeral drainages. Most of the true riparian habitat in the valley bottoms has been homesteaded and currently consists of deeded hay-lands, where flows are augmented and/or controlled by irrigation practices. Naturally-occurring riparian communities on public lands vary from riparian herbaceous-dominated, to coyote willow-dominated, to an absence of riparian vegetation of any kind. In many cases, riparian communities occur sparingly enough that individual stretches are described under lentic system parameters.

An additional riparian community that is found throughout the valley (Laramie River, Sybille Creek, and Chugwater Creek) is irrigation ditches, which have constant enough flows to support riparian species, mostly mixed willow stands, with some cottonwood galleries occurring along the back-slopes of ditches. Although riparian in nature, these man-made features are totally dependant on augmented flows and their sole function is to carry water from one location to another. Technically, these ditches are functioning properly as long as they flow water to irrigated meadows. Therefore, even though meeting the definition of riparian, these systems were not evaluated as to functionality. Overall, draws and water courses in the majority of the lowest portion of the assessment area are ephemeral with no riparian vegetation.

REFERENCE CONDITIONS

Reference conditions are also described under Standard 1. Mention of water in the area usually centers on the difficulty or ease of crossing encountered by various parties or the quality of water encountered at layover spots.

It is clear that the area was rich in game and that beaver abounded in its streams and drainages as late as the mid to later part of the 19th century. It is possible that beaver activity along the various drainages in the valley played one of the earliest roles in shaping the current systems. Trappers' descriptions of the area, where winter camps or small rendezvous were held, spoke of streams rich in fur.

The watershed has always been impacted by grazing ungulates, being home to elk, deer, antelope, and bighorn sheep, bison, and probably most importantly, herds of elk. During the late 1870s, streams and riparian areas within the area saw the first influences of domestic livestock, with the arrival of the first longhorn cattle. This roughly coincided with the removal of buffalo from the area. Cattlemen put up hay for the winter from the very beginning and, therefore, weathered the winter of 1886 better than others. Sheep utilized the area as well, limited mostly to farm flocks. Since this time, almost all of the riparian areas in the watershed

have been utilized for livestock productions, either through direct grazing by stock, or conversion to hay lands, usually through the use of water diversion.

SYNTHESIS AND INTERPRETATION

Because of favorable growing conditions in the valleys between the mountain ranges, many homesteads were developed during the late 1800s and well into the 1900s. The early settlers to the assessment area realized the value of irrigation and putting up hay for the sometimes harsh winters and, therefore, the major river bottoms were converted to productive hay meadows that provided a base operation for livestock grazing. Originally, almost exclusively cattle, later some of the operations in the valley ran sheep as well, which trailed from the lower elevations along the Platte River all the way up to summer sheep grounds on the National Forest, as well as wintering on the high desert of the Great Divide to the north and west. All of the sheep operations have recently been converted to cattle and, therefore, have changed significantly the way these lands are managed today.

An important natural element in riparian and wetland habitats is beaver. Beaver are considered hydrologic modifiers in the PFC process. This means they can directly affect stability of those systems that have a woody component. Their dams often provide gradient control on steeper slopes, extend the stream flow period later into the year, and create more diverse vegetation and wildlife habitat. Loss of aspen habitat, trapping, and browsing of aspen and willow by cattle and elk has contributed to the reduction in beaver. There is more than adequate willow-waterbirch riparian habitat along some streams to support beavers. However, they seem to prefer irrigated hay meadows, which lead to their removal via trapping. Long-term improvement in the aspen communities, discussed in Standard 3, would result in expanding beaver populations and the positive impacts they can have on riparian and wetland systems.

Following the Taylor Grazing Act, grazing districts were established and priority rights for grazing determined. In addition to fencing of private allotments, it also led to adjustments in stocking rates and AUMs available for livestock use to maintain or improve range conditions. In the southern portion of the valley, federal lands fell outside of the established grazing districts and grazing leases were issued in conjunction with adjacent deeded property to account for private grazing on the public land resource. From a management perspective, grazing leases outside of established grazing districts have become more synonymous with permits, and are held to the same standards as the permits. When addressing livestock management issues over the last twenty years, it has not been necessary to reduce livestock numbers to achieve resource (primarily riparian) objectives. Depending on the specific situation, best management practices for livestock grazing have been implemented on a case-by-case basis in the majority of the watershed. In some cases, many practices and improvements needed to be implemented. In others, just a slight adjustment was needed.

In addition to adjusting duration and season of use by livestock in riparian areas, additional water sources have helped to greatly improve riparian areas. Upland water developments such as spring developments, reservoirs, and pipelines reduce the dependence of livestock on riparian habitats and result in better distribution of the animals in a pasture (Picture 2.9). Specifically, spring developments protect the water source, improve water quality and flow, and provide greater flexibility in grazing rotations. In some cases, pastures with riparian habitat are either used early or deferred to late summer or fall use.

Vegetation treatments, prescribed burning, and herbicide applications, also improve distribution of both livestock and wildlife, while diversifying upland shrub communities and age classes. These treatments also increase water recharge into the overall riparian system, resulting in higher and longer duration of flows. In some cases, springs may start to flow that had not prior to treatment. To date, use of treatments within the assessment area has been fairly limited.

Fencing has been used to reduce duration of grazing on riparian habitats within most allotments (Picture 2.10). For the most part, there are few exclosures (besides spring/seep developments) within the watershed. Managing livestock use across the watershed by strategic placement of fences and other improvements has resulted in decreased grazing duration on riparian communities overall without the need for exclusion, complete rest, or decreasing AUMs.

The principle impacts of livestock management upon the condition of riparian-wetland habitat are long duration of use (from two months to all summer) and hot-season use (primarily late June through early September). Historic (long-term) livestock use in this manner has led to many of these areas being dominated by upland grass species, such as Kentucky bluegrass, redtop, and mat muhly, that are adapted to drier riparian zone areas and increase because of heavier grazing use. Consequently, upland forbs and grass species resistant to grazing increased along stream channels. These species may endure overgrazing but provide very little riparian stability. They have shallow roots that are not capable of stabilizing soils adjacent to riparian areas especially in high flows. With only upland species protecting the stream bank, bank sloughing, bare ground, and vertical cutting were commonly observed results. Platts et al. (1987), states that the highest rating for stream bank alteration is when less than 25% of the stream bank is false, broken down, or eroding. Where BMPs for livestock grazing have been implemented, riparian herbaceous communities have responded quickly. Early successional plants, such as spike-sedge, brookgrass, and creeping potentilla, respond initially by increasing in bank cover and encroaching into the stream channel. Then sedges, rushes, and desired grasses begin to expand and later dominate the riparian community. Shortening duration of use, frequency of use, and timing of use has resulted in a vigorous, productive and, most importantly, stable vegetative communities.

RECOMMENDATIONS

There has been significant improvement in riparian/wetland condition within the assessment area over the last 10 years; however, there are still some specific areas that need attention. Allotments containing riparian/wetland habitat that do not meet this standard have been described previously and include: William Goodrich, West Fork, Antelope Basin, Elk Horn, Poe Mountain-Canyon Creek, Sellers Mountain, Iron Mountain, West Fork, C U Ranch Inc., and McFarland Creek. For riparian systems along streams and creeks (lotic systems), only those portions of streams and creeks that have riparian on BLM land were included. The non-riparian lengths and portions of streams and creeks not on BLM land were not assessed. For the Lentic values, the total acres of water bodies and wetland features were calculated. For example, a lake with a portion of the shore line as wetland was tallied for the entire portion of the lake that could exhibit open water or wetland characteristics.

Many of the lentic and lotic sites not meeting the standard have been, or are in the process of being, addressed in management plans or as range improvement projects. Continued progress in grazing management of livestock will ensure further improvement of all riparian areas within this area. Although there are areas where desired future condition is yet to be reached in woody species dominance and composition, these areas still meet the minimum standard of

rangeland health. Other than the specific allotments listed previously, the remainder of the allotments within this assessment area are meeting Standard 2 – Riparian/Wetland.

SPECIFIC RECOMMENDATIONS

- Continue to implement or manage using BMPs for livestock grazing. This primarily means controlling the season, duration, and distribution of livestock use to meet desired resource objectives for riparian habitats. Specific dates and timing of use must be determined on a case-by-case basis. Methods to achieve this include, but are not limited to: herding, additional wildlife-friendly fencing, water developments, and vegetation treatments. Address trespass livestock problems where needed. In allotments that have allotment management plans, ensure that they are being followed and revise when necessary.

- Continue existing projects to protect riparian habitat and provide off-site water for livestock and wildlife.

- Plantings may be undertaken where needed within the watershed. Species diversity and vertical structure of wetland and riparian communities can be easily enhanced through vegetative plantings. When just a few individual seedlings are planted, they establish exceedingly well.

- Continue to expand the beneficial practices that improve riparian condition and maximize public involvement and education regarding resource issues.

STANDARD 3-UPLANDS

STANDARD 3 – UPLANDS

Upland vegetation on each ecological site consists of plant communities appropriate to the site which are resilient, diverse, and able to recover from natural and human disturbance.

The health of vegetation communities includes the stage of succession within the ecological site and other factors, such as grazing or browsing, insects, disease, fire, chemical and mechanical treatments, and climate. Typical elements used in describing health include: species and cover composition, vertical structure, and age class. Upland vegetation on each ecological site consists of appropriate plant communities that are resilient, diverse, and able to recover from natural and human disturbance.

Vegetation in the Lower Laramie Watershed is a mix of a variety of habitat and range types, interspersed within and between, and/or transitioning from one to another. An assortment of environmental factors influence the location(s), extent, seral stage(s), and/or types of vegetation found throughout the area. Elevation, precipitation zone, topography, soils and underlying parent materials, slopes, and exposures all contribute to the general vegetation composition throughout the watershed.

CHARACTERIZATION

The most common vegetative type on public lands within the watershed is grassland, primarily mixed grass prairie type. Other common vegetative types include sagebrush-grasslands, and mountain shrub lands, primarily mountain mahagony. Mixed juniper woodland and other coniferous vegetative types are scattered throughout the watershed where elevation and precipitation allow. Interspersed throughout the landscape are other assorted communities including: shortgrass prairie, rocky, shallow soil grasslands, saltgrass meadows, greasewood shrublands, aspen, cottonwood, ponderosa pine, lodgepole, and limber pine/juniper woodlands.

The most abundant vegetation type within the assessment area is a mixed grass prairie type. The high altitude, cool summers, and frequent thunderstorms in July and August, combined with sandy soils allow an isolated pocket of mixed-grass prairie to exist. Vegetation within this mixed-grass prairie includes: needle-and-thread, western wheatgrass, blue grama, Sandberg bluegrass, threadleaf sedge, needleleaf sedge, prairie junegrass, Indian ricegrass, prickly pear cactus, globemallow, fringed sagebrush, and various species of milkvetch and locoweed (Picture 3.1)

Because of the altitude and prevalence of sandy soils, the Laramie Basin is an isolated pocket of mixed-grass prairie. Summers in this area are cool, which reduces evapotranspiration. Frequent thunderstorms in July and August maintain this grassland, a situation also found in higher precipitation zones to the north and east. Mixed-grass prairie is characterized by: needle-and-thread, western wheatgrass, blue grama, Sandberg bluegrass, threadleaf sedge, needleleaf sedge, prairie junegrass, Indian ricegrass, prickly pear cactus, globemallow, fringed sagebrush, and various species of milkvetch and locoweed. This area is predominantly used for livestock and wildlife grazing.

Within the Lower Laramie area where precipitation is between 16 and 20 inches and at elevations between 7,500 and 8,500 feet, Rocky Mountain juniper often occurs in association with limber pine. These sites often occur in shallow, poorly developed soils. Juniper can also be

associated with basin and mountain big sagebrush steppe. Understory vegetation may include: bluebunch wheatgrass, needle-and-thread, slender wheatgrass, Wyoming big sagebrush, mountain big sagebrush, snowberry, and common juniper (Picture 3.2).

Shortgrass prairie vegetation within the Lower Laramie area includes: blue grama, buffalo grass, western wheatgrass, side-oats grama, yucca, and prickly pear cactus. T his area typically receives 12 to 20 inches of annual precipitation. Soils include sandy loams, loams, and clay loams. This area is typically southeast of the Laramie Range and very little is managed by the BLM.

Rocky, shallow soils and grassland occur throughout the Lower Laramie Watershed. The shallowness of the soils restricts the amount of available precipitation; these areas are more susceptible to drought and are subject to greater extremes in temperature and overland flow. Vegetation includes grasses found in the shortgrass prairie as well as short shrubs found in mixed shrub grasslands depending on precipitation and aspect.

Saltgrass meadows can occur in shallow depressions that have low drainage rates and high evaporation potential. They are not common in the Lower Laramie area. Vegetation includes inland saltgrass, alkaligrass, alkali sacaton, and alkali cordgrass (Knight 1994).

Mountain mahogany occurs on dry rocky slopes or in very shallow, undeveloped soils in the 10- to 14-inch precipitation zone. It occurs as both the dominant shrub or as an understory of juniper, occurs at higher elevations, and mixes with bitterbrush, snowberry, serviceberry, green rabbitbrush, broom snakeweed, and mountain big sagebrush. Common herbaceous plants include: bluebunch wheatgrass, Indian ricegrass, Sandberg bluegrass, and mat-forming forbs such as phlox, buckwheat, false locoweed, Hooker sandwort, goldenweed, and milkvetch. Fire generally lessens the density of the shrub stands, allowing grasses and other herbaceous plants to increase while still providing wildlife browse. Mountain mahogany is an important wildlife fall and winter forage. A notable characteristic is the hedging growth pattern exhibited by mountain mahogany plants after they have been browsed by mule deer and elk.

The Wyoming big sagebrush/grassland type occurs in the western portion of the Lower Laramie Watershed. It occurs in shallow-to-moderately deep soils within the 9- to 16-inch annual precipitation zones. Shrub height varies from as little as 6 inches on shallow sites to around 30 inches in deeper soils. Common species include: bluebunch and thickspike wheatgrass, Sandberg and mutton bluegrass, Indian ricegrass, needle-and-thread, threadleaf sedge, bottlebrush squirrel tail, phlox, Hooker sandwort, onion, goldenweed, sego lily buckwheat, penstemon, Indian paintbrush, globemallow, and prickly pear cactus. Wyoming big sagebrush is the most frequently eaten sagebrush and is a staple for pronghorn antelope and greater sage-grouse (Picture 3.3).

Mountain big sagebrush is located in shallow-to-moderately deep soils at elevations above 6,500 feet, in 12- to 20-inch annual precipitation zones, and intermixed with aspen and conifer woodlands. This community occurs in the foothills of the Laramie Range and is intermixed with conifer and/or aspen woodlands. Shrub height will vary from 10 to 30 inches, with canopy cover reaching 50 to 60 percent. After removal, mountain big sagebrush is relatively quick to re-colonize, reaching pre-disturbance levels (when not rested from grazing) in as little as 20 to 30 years. Understory herbaceous species include: buckwheat, larkspur, lupine, paintbrush, sandwort, mulesear wyethia, yarrows, Oregon grape, and penstemons. Grasses found in these communities include: green and Columbia needlegrass, elk sedge, mountain brome, king-spike

and Idaho fescue, Kentucky, and big bluegrasses; and slender, thickspike, bluebunch, and western wheat grasses. In many instances within the sagebrush community at these elevations, a large percentage of the overall shrub community is comprised of various other mountain shrubs including: serviceberry, snowberry, antelope bitterbrush, mountain mahogany, chokecherry, and rose (Picture 3.4).

Basin big sagebrush shrubland is found in moderately deep-to-deep soils of all soil textures, in zones of 10 to 16 inches of annual precipitation (Beetle 1960). It occurs as pockets within Wyoming big sagebrush, as the dominant plant type along valley bottoms and canyons, and along ephemeral washes. It is not as common within the Lower Laramie Watershed as it is in the rest of the Rawlins Field Office. This subspecies of big sagebrush may reach 12 feet in height, with canopy cover reaching 70 percent. Basin big sagebrush mixes with serviceberry, green and rubber rabbitbrush, snowberry, bitterbrush, silver sagebrush, and mountain mahogany, depending on the soil depth, annual precipitation, and elevation. Grasses occurring in these communities include: basin wildrye, green needlegrass, Idaho fescue, thickspike wheatgrass, Kentucky and mutton bluegrass, and bottlebrush squirrel tail. Common forbs include: bluebells, groundsel, onion, violet, buttercup, false dandelion, buckwheat, penstemon, Indian paintbrush, lupin, locoweed, and prickly pear cactus. Basin big sagebrush is not palatable forage. It usually shows little or no use, even in extreme winters when use levels of other plants are severe. It is important, however, as hiding cover for mule deer and elk and as habitat for other wildlife species. In some areas it also provides critical winter habitat for greater sage-grouse when snow covers most other shrubs. Basin big sagebrush often increases in density and cover with poor livestock management and interruptions in the fire cycle. To increase diversity in basin big sagebrush shrublands, prescribed fires and chemical and mechanical treatments are employed, resulting in increases of grasses and other understory plants. The natural fire reoccurrence interval in the sagebrush type is approximately 30 to 75 years.

Occasional greasewood shrublands occur adjacent to streams where high evaporation rates concentrate surface salts within the Lower Laramie area. Subdominant shrubs can include: shadscale, Gardner saltbush, and basin big sagebrush. Understory vegetation can include such salt-tolerant herbaceous species such as: inland saltgrass, western wheatgrass, alkali sacaton, bottlebrush squirreltail, Sandberg bluegrass, biscuit root, pepperweed, and sea blight.

Pockets of aspen are present along streams, in draws, or on the leeward areas of hills and ridges where snow collects in mid to high level elevations within the Lower Larmaie area. Aspen colonies typically reproduce asexually, producing clones in which separate trees are connected by root suckers. Therefore several acres of aspen may be interconnected through their roots (Barns 1966). The soils of these areas are usually well-developed deep loam and sandy loam soils with good drainage and high organic matter.

Acting as snow traps, aspen stands have associated herbaceous plants that are productive and diverse. Understory plants commonly include: snowberry, serviceberry, Scouler's willow, arnica, creeping juniper, rose, Oregon grape, wood rose, geranium, bluebells, elkweed, columbine, licorice-root, yarrow, lupine, sweet cicely, aster, yampah, fairy bells elk sedge, Columbia needlegrass, blue wildrye, mountain brome, slender wheatgrass, and common juniper..

Limber pine can be the dominant tree on rocky escarpments or as a subdominant tree in juniper woodland. Limber pine-dominated areas are normally associated with bluebunch wheatgrass,

globemallow, phlox, sand sage, fringed sage, snowberry, and mountain big sagebrush (Picture 3.5).

Lodgepole pine occurs in the Lower Laramie area at elevations between 8,000 and 10,000 feet. Lodgepole pine is considered a pioneer species, as it returns rather quickly following fire. The lodgepole pine forest canopy does not allow for a very diverse understory plant community. Plants that occur here are: pine reedgrass, Wheeler bluegrass, heartleaf arnica, bedstraw, wortleberry, common juniper, wood rose, wax currant, and russet buffalo berry. Lodgepole pine will grow in mixed stands of aspen, Engleman spruce, subalpine fir, Douglas fir, and Ponderosa pine (Picture 3.6).

Ponderosa pine occurs on the eastern slopes of the Laramie Range, a portion of which is within the Lower Laramie Watershed. Ponderosa pine forests are often open woodlands and support a mixed-grass or shortgrass understory (Picture 3.7).

Cottonwood occurs near or within riparian zones within the Lower Laramie Watershed, primarily on private and state land. Understory vegetation is often mixed including mesic grasses and forbs.

Microbiotic crusts are an important factor in vegetative and watershed health. These species are not as common in the Lower Laramie Watershed as further west within the Rawlins Field Office management area. This may be due to greater amounts of precipitation late in the growing season and higher amounts of vegetative ground cover. Principal human uses throughout the area, which impact the vegetation resource, tend to center around allocations of forage for livestock (in some cases and/or areas, forage is not specifically allocated, and may be used by wildlife), removal of vegetation by disturbance, and recreation uses. Additionally, vegetation in the watershed is directly influenced by human activity through the application or repression of intentional and/or naturally occurring “vegetation treatments,” including wildfire, prescribed fire, chemical, and mechanical vegetation removal.

Livestock use is primarily comprised of cattle grazing. Livestock use can occur during any time of the year in much of the area. At higher elevations, snow can restrict areas, but many of the mountainous areas provide shelter for livestock not available in the Laramie Plains. Cattle operations vary between grazing of cow-calf pairs, yearling steers, and yearling and/or second-year heifers. Grazing use occurs during various portions of the year, ranging from season-long to deferred and/or rotational use.

Recreation, such as hunting, primarily takes place during the late-summer and fall (mid-August through November). Other recreation activities, such as horseback riding and wildlife watching, take place throughout the year, though not as often in the winter. Springtime recreational uses also occur, such as shed-antler hunting. Associated with recreational use are a number of roads, trails, and tracks, which exist in all of the vegetation types and are restricted by topographical impediments and closely spaced trees.

Additional human uses of the watershed include commercial seed collection, off-highway vehicle use not associated with the previously-mentioned activities, and the collection of moss-rock for commercial decorative purposes. All of these activities influence the vegetative component of the watershed where they occur, either indirectly via associated changes, or directly by contact with and/or removal of vegetation.

ISSUES AND KEY QUESTIONS

Removal of vegetation in the form of grazing forage for large ungulates has been and continues to be the principal factor affecting vegetation throughout the Lower Laramie Watershed. Domestic livestock grazing tends to provide the most impacts to the vegetation of the watershed, throughout its area, although localized portions of the watershed (or specific vegetation communities and/or species) may by more influenced by grazing of wildlife.

Livestock use is the most direct and manageable action affecting vegetation. Through varied management processes, including rangeland inventories, management agreements and grazing plans, and implementation of various "best management practices," stocking rates have been adjusted to fit available livestock forage on public lands throughout the watershed since inception of the Taylor Grazing Act. Because of these adjustments, livestock management focuses on the season, duration, and distribution of use as well as the stocking rate.

The effect of grazing on vegetation is influenced by the duration, season, and amount of use. For instance, long duration use by cattle from spring through fall has been a common practice during the 1900s. On uplands, this led to increases in species like rhizamotous wheatgrass, cactus, and annual forbs, whereas species sought-after by livestock became less common. In most areas this trend has been reversed through the use of grazing BMPs.

The most common issues concerning livestock management include:

- Uneven use patterns (heavier grazing use associated with reliable water sources as opposed to light to nonexistent forage utilization in other, more isolated locations).

- Shifts in vegetation species types that favor increaser species (e.g., big sagebrush) over cool-season, perennial bunchgrasses where uninterrupted, season-long livestock grazing occurs.

The key question that arises from these impacts focuses on implementation and refinement of best management practices for livestock grazing. What opportunities exist to implement or refine best management practices for livestock grazing or other actions that will maintain and/or improve the overall condition and value of upland vegetation and meet desired resource conditions and allow for grazing of the vegetation resource use by domestic livestock as called for under the Bureau's multiple-use mandate?

Changes in vegetation health due to aging and succession are more subtle. T he suppression of wildland fires and lower fire occurrence because of grazing of fine fuels has compounded this issue. Decadence and aging is common in sagebrush, aspen, and mountain shrub, including mountain mahogany communities.

Policies that govern the use of vegetation treatments and the suppression of such vegetative community alteration, have played and continue to play an important role in the existing make-up and continual alteration of vegetation in the watershed. Wildfire suppression, coupled with an inability to successfully implement manipulation of vegetative communities within the watershed at the level which is required, has led to a predominance of uniform old age-class timber stands throughout the analysis area. Large, uninterrupted expanses of vegetation allow for large-scale losses of key habitat types if and when natural disturbances occur. The key question is: How do the BLM and other natural resource management agencies and partners

determine the level of vegetation treatment which should occur in order to promote better overall landscape diversity for all species? To what extent should portions of key vegetation types and habitats be temporarily altered in order for the overall condition of the vegetation/habitat/watershed to be maintained or improved?

Another important factor relating to upland vegetation condition throughout the watershed is use of varied vegetation resources by native wildlife, in particular ungulate big game species. The principal issues that should be addressed regarding big game management relate to seasonal habitat forage requirements for mule deer, elk, and pronghorn antelope. Although transitional, winter/yearlong, and crucial winter ranges for all species have traditionally been the habitats of concern (limiting the populations), relatively recent research has elevated the importance of quality spring/summer/fall habitat to healthy individual and population conditions. Key questions to be addressed include how to manage vegetation resources on key seasonal habitats to provide adequate quality forage for wildlife species, yet continue to provide forage for seasonal, managed livestock use. How can the mix of uses of the vegetation resource in the watershed be managed so that vegetative condition is maintained or enhanced? Additionally, how do the principal players (agencies and landowners) involved in the management of vegetation and wildlife within the watershed balance the sometimes necessary impacts of multiple use management (and/or livestock management) activities with habitat requirements on seasonal big game ranges?

Off-highway vehicle (OHV) use is most associated with general recreational activities by the public. This use is most obvious where public access is not limited, though is does occur with public land management activates. The popularity and affordability of small, all-terrain vehicles can lead to their use farther and farther into previously remote and roadless areas, creating or "pioneering" unauthorized and illegal trails through the vegetation wherever possible, which are then repeatedly traveled until vegetation is lost along the route and it becomes a road for all practical purposes. This disturbance leads to vegetation shifts, increased erosion, and wildlife impacts. Unfortunately, it becomes a much long-term disturbance as no reclamation typically occurs. Natural revegetaion will occur through lack of use. Barriers to this travel include terrain and rules including needing permission to cross private land to gain access to public lands. Recreational OHVs are not subject to minerals management stipulations designed to mitigate the spread of weed seeds and so have the potential to add weed infestation to their impacts. The key questions which should be addressed center around the need for the Bureau to decide if limits should be set which regulate off-highway vehicle use, what they should be, and how to effectively enforce these limits. Additionally, what educational tools should be employed to reduce impacts from recreational uses of public lands?

CURRENT CONDITIONS

Grazing strategies that are used with existing permits in the Rawlins Field Office management area include:

Season-Long—grazing occurs for part or for the duration of the permitted time, often lasting from late spring through fall

Yearlong—grazing is permitted for any time during the year

Rotation—grazing is rotated during the growing season between pastures in the allotment to provide partial growing season rest before use or recovery time after use

Deferred Rotation—grazing is rotated between pastures or allotments to provide full growing season rest every second or third year

Dormant Season—grazing occurs after seed-set by grasses (includes late summer, fall, and/or winter grazing)

Split Season—grazing occurs during two separate time periods by removing livestock from the allotment and returning them later in the year to provide partial growing season rest.

Rest Rotation—grazing is rotated between pastures, with each pasture receiving no grazing use for an entire year, usually every third or fourth year.

Public land within the watershed area is allotted to some form of livestock grazing use during various periods of the year and is also utilized for wildlife use. Impacts to vegetation from grazing can, therefore, be expected to occur to measurable extents throughout the analysis area. Quantifiable data about current vegetation conditions, vigor, and trends throughout the watershed varies as to availability, content, and quality. Upland monitoring information is available for varied grazing allotments and sub-basins within the Rawlins Field Office management area in the form of photo-points, aerial and basal cover transects, utilization studies, shrub belt density transects, and other, more species and/or impact-specific studies. Studies vary by amount, type, and content throughout the watershed in relation to the relative priority of the area/allotment, the level of management that was or is implemented, and/or the urgency of determining specific impacts. In the past, monitoring efforts focused on the collection of utilization information (what animals do to the plant), rather than on trend information (what the plant response is to animal use).

Vegetation and forage inventories in the Rawlins Field Office management area have occurred periodically during the relatively recent past, the last of which, the Soil Vegetation Inventory Method (SVIM) occurred during the early 1980s. Data from this one-time inventory suggested that rangeland conditions throughout the Field Office fell into the acceptable range, mostly rated as “good” condition, but including “excellent” and “fair” condition rangelands. It should be noted, however, that these inventories and associated conditional assessments were one-time snapshots of the vegetation communities and did not and/or have not been altered or updated to take into account trends in ecological vegetation conditions. They also tended to undervalue shrub communities, resulting in areas such as mule deer habitat being rated as fair, which should have been found to be good to excellent.

In general, varied livestock uses have resulted in assorted impacts to vegetation throughout the watershed. Vegetation may be impacted to various extents when grazed during its growing period. This type of use also tends to primarily impact the herbaceous component of the vegetation community, except where young, available, palatable shrub seedlings are abundant. Wildlife use in the watershed tends to impact different components of the vegetation communities than does domestic livestock use. Mule deer use concentrations are primarily on shrub or “browse” species and are most pronounced on winter ranges where the animals concentrate for extended periods. Elk use impacts both the herbaceous and browse components of the communities, usually at higher elevations throughout the year (dependent on the severity of winter weather). Pronghorn use impacts tend to be most noticeable in the lower elevation sagebrush, where they may be concentrated during the winter, but more nomadic than other species (somewhat mitigating their impacts). These differences in impacts tend to affect vegetation communities as species are favored or shunned in various management/use

scenarios, leading to shifts in overall community make-up. Vegetative traits, such as species abundance, vigor, diversity, and age/structure classes, are all affected. These trends occur in addition to those which are influenced as a function of natural conditions (e.g., wetter to dryer sites, slope, aspect, soil depth, and material).

In many cases (dependent on the specific situation), best management practices for livestock grazing have been implemented on a case-by-case basis throughout portions of the watershed. In some cases, multiple practices and improvements were necessary to maintain or improve overall vegetative condition, and in others, only minor adjustments to grazing management have been or are required. Direct changes to grazing timeframes, including adjustments to duration, intensity, and season of use, have been implemented to remove constant, repetitive pressure on key forage communities during the heart of their growth period. Rotational grazing schedules that include deferment and recovery periods allow for preferred vegetation species to concentrate energy reserves towards vegetative growth. Upland water developments, including small stock-ponds and reservoirs, water wells, spring developments, and pipeline systems have led to better overall distribution of livestock use and facilitate grazing rotations and pasture systems. Fencing has been implemented to control livestock movement, allowing rotational grazing systems, and better distributing livestock use. Vegetation treatments are being considered within limited areas of the watershed in order to introduce, or possibly accelerate, the rate at which vegetation communities evolve and develop towards different seral stages. Very seldom (if ever) are vegetation treatment projects initiated with the objective of converting vegetation permanently to another type, but instead are intended to diversify and stratify the overall age class and structural variation similar to estimated conditions prior to European settlement. Treatment of (mostly) shrub stands can also be used to improve livestock distribution, diversify shrub age classes and structure, and increase forage quality and herbaceous content (through the removal of competition for nutrients and moisture). Overall, livestock management throughout the watershed has been improved through the use of rangeland improvements and more intensive management without resorting to grazing exclusion, complete rest, or reducing permitted use.

The lack of treatments and aggressive suppression of all fire within this watershed can affect the condition of aspen and conifer stands by allowing them to over-mature and/or become decadent, diseased, and increased encroachment of understory shrubs and coniferous vegetation (fir and pine) at the highest elevations. Bleeding rust can occur in larger trees and spread through the root systems of aspen stand clones. Removing these larger, diseased trees can prevent the bleeding rust from spreading to young trees. As the older trees die or fall to wind events, they may not be replaced by juveniles or suckers, and eventually, the stand dies or is reduced to a few remnants, dominated by big sagebrush, serviceberry, or other mountain shrubs. Leaf blight can also affect aspen stands, but resprouting continues and the aspen sprouts exhibit good vigor. Of course, historical season-long livestock grazing has concentrated use on the seedlings in the past, but relatively recent implementation of rotational use and other upland grazing management tools currently mitigates these impacts, leaving a lack of stand replacement events as the missing element to enhanced aspen health. Prescribed burns can be used to restore aspen health by stimulating sucker regeneration and removing other plant species that compete with aspen.

Similar to higher elevation shrub stands, vegetation within the mule deer and elk winter habitat zone has been largely untreated and natural treatment events have been aggressively suppressed before large acreages can be burned. As with higher elevation vegetation, this has allowed monotypic shrub stands to be dominated by mature-to decadent, even-age classes of

shrubs. Vegetation generally exhibits high vigor, plant density, and diversity where BMPs have been initiated.

Areas with enough topography to encourage shrub growth from winter snow deposits yet flat enough to allow relatively snow-free wind blown area provide wintering areas for wildlife. Because vegetation communities in these specific areas are used throughout the year by wildlife, and can become heavily-used by concentrated populations during winter months, the preferred browse species are comprised of even-aged and structured, mature-to-decadent shrub stands. High levels of grazing use from pronghorn can harm shrubs such as sagebrush during the winter if animals are concentrated in a limited area for a long time period. Current antelope populations are generally above objectives within the watershed.

Overall, vegetation in the Lower Laramie Watershed can be considered to be in good condition. Desirable species (including herbaceous and browse species important for livestock and wildlife forage, as well as those important for ground cover) are present in poorer condition areas, usually found in locations where they are less available or vulnerable to grazing animals, and at higher condition areas, found interspersed throughout the various plant communities, with high vigor and density. `Less desirable increaser species are present in varying degrees throughout the watershed; however their presence does not indicate poor health or nonfunctional vegetation communities in most cases. The majority of the watershed has undergone the implementation of various BMPs, to some extent, which favor more desirable forage species over increasers, and the results can be readily observed in the form of more plentiful bunchgrasses, higher ground cover, greater plant diversity, and higher vigor and nutritional value of individual plants. Throughout various portions of the watershed, upland invader and weed species can be found, but these populations exist at relatively low levels and have not converted entire communities. Additionally, implementation of various BMPs, as well as application of various control methods, are being and can be utilized to manage, if not eliminate, many of these small-scale infestations. All of these observations are indications of properly functioning upland vegetation communities.

REFERENCE CONDITIONS

Generally, historical influences on vegetation in the watershed were similar to those that shape the communities today. Environmental conditions, including soil conditions, climate, topography, and elevation determined the general composition, location, and interaction of vegetation communities, which were and are influenced by additional, less constant factors. Due to low human population levels in this area, influences by native peoples were probably relatively minor and/or secondary in nature (e.g., the influence that hunting cultures had on seasonal use of certain areas by grazing game animals including possible fires to improve wildlife forage or availability). Prior to settlement of the area by Euro-Americans, additional factors that probably had the most influence on vegetation conditions would have been limited to grazing impacts from native ungulates and catastrophic stand-replacement type natural events such as wildfires. The combination of varied, wandering use patterns and the occurrence of wildfire, which removed vegetation in a haphazard pattern, a diversified vegetation pattern that was thoroughly stratified in age class and seral stage was likely maintained with vertical and horizontal structure as well. It is such diversity at the landscape scale and maintenance of age class stratification and structure diversity that past and future vegetation treatments are intended to simulate.

The early descriptions of portions of the watershed suggest the presence of grazing ungulates throughout, including seasonally migratory species such as bison, pronghorn, mule deer (called

black-tailed deer in many early journals), and elk. Additionally, bighorn sheep and grizzly bears could be found, even at lower elevations. Although wildlife population levels prior to the adoption of structured harvest strategies and conservation measures in the first half of the 1900s can only be estimated, most of the species remain (excepting wild bison, wolves, and grizzly bears). Topographic and climatic factors would have dictated seasonal use areas and migration patterns then, much as they do today. Although, as indicated by various accounts, herds of bison could be found through the watershed on a resident basis, the area was also used by large herds of the animals in more of a cyclic nature as their wanderings covered an extremely vast amount of country (Dorn 1986).

Historical documentation, mostly in the form of journals, descriptions, and writings of explorers who traversed the area in the mid-1800s, compared and contrasted with additional accounts made in the same area during the same general time frame, can paint a picture of the overall landscape. Although generally vague to the point that overall vegetation, range, and/or habitat communities and sites cannot be delineated, they do provide a fairly recognizable overview of the area (Dorn, 1986).

Overall, the general historical vegetation description of the Lower Laramie Watershed appears to closely correspond to the existing communities. Although the popular perception of western rangelands prior to Euro-American settlement is that of rolling grasslands and foothills bounded by timbered mountains, which have only relatively recently (in the last century and a half) been turned to shrub-dominated steppe type communities due to grass use by livestock, accounts offer a different view, indicating shrub dominance in this area through the mid-and-late-1800s.

If taken as a whole and compared to and against each other, these specific accounts and those presented in Standards 1 and 2, tend to suggest that the majority of the upland vegetation in the Lower Laramie Watershed varied little from that which is noted today, dominated by short grass prairie, mixed shrub grasslands, and juniper woodlands with inclusions of aspen and conifer woodlands where conditions allow.

Historical or reference vegetation conditions in the Lower Laramie Watershed prior to extended human influence appear to mimic those found today; i.e., species composition and general distribution are probably similar. Although, in some areas, fire suppression may have affected the vegetative communities age-class structure and virtually eliminated large-scale, random, stand-replacement wildfires and their vegetative impacts as well as the manipulation and management of fires that do occur.

SYNTHESIS AND INTERPRETATION

As described and discussed previously, upland vegetative species within the Lower Laramie Watershed are currently similar to those which occurred prior to settlement of the area. The principal changes are in the type of animals, which utilize the resource and the amount of disturbance that is levied towards the vegetation from other human activities. Bison were likely present in this area yearlong in varying degrees and eat the same types of plants favored by cattle. However, bison would come and go that probably provided more rest periods for vegetative recovery than under cattle grazing. Another important issue was the settlement of the area by families into small ranches and putting up hay for the winter. These practices allowed for more stable levels of livestock and better care and management of such “private use” areas that led to longer term better management of upland vegetation. This is reflected in the plant communities and species observed at the current time.

Grasslands, mixed shrub grasslands, juniper woodlands with some aspen and conifer woodland continue to dominate the landscape throughout the watershed. The most obvious changes in vegetation on the landscape are evident where all or a portion of an existing community has been removed or "converted" to some other type. This can be observed as hay-land, occurring on private land and along roads and trails in the landscape, which cut through and dissect large-scale community types. Agricultural actions have probably affected plant communities that grow on floodplains bordering riparian habitat. Less obvious are changes within vegetation communities that have occurred naturally as communities evolve or have gradually been altered through the addition, subtraction, or manipulation of additional influences (e.g., a shift in vegetation consumed as traditional livestock uses are supplanted by animals with different dietary preferences).

Shifts in vegetation communities from historical conditions are partially the result of use by grazing ungulates. Generally, grazing use throughout the watershed has placed pressure on developing vegetation through various portions of its seasonal life cycle. Late spring and early summer grazing by cattle, historic sheep, and/or big game wildlife species places the majority of grazing pressure on growing herbaceous material. As the summer hot season progresses, cattle use within the watershed continues to primarily remove grasses, while wildlife use tends to shift towards browse species on uplands. Fall and winter use by cattle and wintering elk herds, although still focused on grasses, removes mostly dead and dormant material, and pronghorn and winter mule deer use removes portions of the summer's growth mostly on shrub species mixed with dried and desiccated forbs. Shifts in composition that have occurred internally in various upland vegetation communities in the watershed (due to grazing pressure by ungulates) have been primarily driven by the following factors: continuous, repeated, and sustained grazing pressure on selected, preferred herbaceous species through their peak growth periods (primarily on cool-season bunchgrasses during late spring and early-to-midsummer) and intense, concentrated, and sustained seasonal browse use on preferred shrub species (by wintering big game herds) in stands that have reached a high overall level of late-maturity to decadence.

Historically, most of the Lower Laramie Watershed was grazed by cattle from spring through fall, with winter use occurring within appropriate areas of the Laramie Range and outside the area. The season-long grazing that occurred repeatedly during the last century has generally allowed more of an influence by increaser species within communities and tended to push more desirable decreaser species to relatively unavailable locations (such as rough terrain or distance from water). Availability and predominance by more desirable forage species is enhanced as distance is gained from water sources, and terrain becomes steeper. Livestock grazing management changes have and can be implemented in order to mitigate the effects of growing season grazing pressure and include pasture or use area rotational systems that manipulate the duration, intensity, and timing of use to provide deferment and/or recovery periods for vegetation growth. Fencing and/or herding are used to control the livestock's activities during use periods, facilitating implementation of rotational systems, and upland water developments are designed to more evenly distribute levels of vegetation use throughout pastures and allotments, protect isolated riparian sites, and provide watering locations to dry pastures. Additionally, shrub-lands can be treated to allow more productive, nutritious, useable herbaceous vegetation to encourage use of areas which have been underutilized. These types of treatments are usually temporary in nature, and revert to pre-treatment conditions after the passage of various time frames, allowing other areas to be manipulated during the interim and creating a mosaic of vegetation types. During the last half of the 20th century, all of these

practices have been implemented, to various extents; throughout the watershed where summer cattle grazing use occurs.

Wildlife impacts to vegetation, although applied across the watershed, tend to most directly impact preferred, desirable shrub species on transitional, winter-yearlong, and to a lesser extent truly “crucial” winter habitat for mule deer. Most intensive negative impacts can be observed on the mid-elevation transitional and wintering habitat, where large herds have settled in for the last several “easy” winters and removed large portions of the current and previous years’ vegetative growth. As the individual plants reach a stage of over-maturity and decadence, annual vegetative production decreases, and as the current and/or portions of the previous years’ growth is removed, the plants become more and more hedged, further deteriorating overall stands. New, juvenile plants are removed quickly if they are available, due to the higher palatability and/or nutritional content, leading to an overall loss of productivity and further aging of the stand. Additionally, as stands age, rival vegetation surrounding the shrubs, such as junipers, tends to spread into and intermingle with the shrubs, out-competing them and shifting the overall community composition. Management changes that would focus on stratifying shrub stands and diversifying overall community composition, stand age and structural class, and habitat production would center on setting portions of the communities back to early seral stages, in staggered time frames. This would involve the application of treatments to remove portions of the existing vegetation in a mosaic pattern, allowing re-colonization of new, juvenile shrub species; new and additional herbaceous species; and shifting the community composition immediately following conversion. Treatments can be designed in scope, coverage, seasonality, and implementation methods to achieve predetermined objectives and to allow medium to long-term community development towards habitat objectives. Treatments can also be planned and implemented so that total vegetation community conversion is not achieved or encouraged; allowing shrub stands to evolve towards pre-treatment conditions over an extended timeframe. In some areas considered “crucial” winter range in the watershed, shrub stands appear to be in better overall condition, most likely due to more limited seasonal use, affecting less of the current year’s growth, and very rarely extending into the previous year’s production. Cooperative efforts are being undertaken to diversify these important shrublands.

Loss of vegetation that occurs due to the proliferation of roads and trails, although proportionally smaller than other impacts, tends to be more evident and can be equally severe on a small scale because all vegetation is totally removed along the entire area of impact. Roads and trails allow greater access and opportunities for hunting, joy-riding, and antler hunting in the late winter and spring. Even improved roads, if not adequately designed and/or drained, lead to vegetation loss/community conversion on adjoining lands through increased erosion/sedimentation immediately along the route and introduction of less desirable species from disturbance along the route. As noted in the watershed section, there is a large need for further work on nearly all improved roads to reach an adequate level of improvement practices (gravelling, additional culverts, wing-ditching, and water-bars) to minimize or eliminate overland flow alterations and vegetation species movement/colonization. Equipment used to sustain or improve highly traveled routes should be maintained in a weed-free status, as noxious weed infestations have arisen in areas of recent maintenance in various portions of the watershed. Recreational use of roads and trails is increasing throughout the Rawlins Field Office management area, including some areas of the Lower Laramie Watershed. Impacts are exacerbated with the pioneering of new trails by illegal, off-highway driving. Greater availability of disposable wealth has led to greater availability of all terrain vehicles (particularly 4-wheelers) and pickup trucks, allowing easier accessibility to open landscapes, particularly those areas with public access.

RECOMMENDATIONS

At present, the review of upland vegetation conditions in the Lower Laramie Watershed reveals generally good overall community health. Natural ecological and biological processes appear to be functioning adequately overall, although concerns about near-future functionality of certain community types remain. Specifically, the review group has determined that the majority of upland vegetation communities are properly functioning in relation to the seral stage to which they have evolved.

The diversity, vigor, productivity, and overall amount of upland vegetation within the watershed, as well as the cooperation exhibited by the majority of livestock permittees towards grazing management, suggest that no insurmountable vegetation problems are evident on a significant scale in most vegetation communities. Due to the existing conditions and general vegetation community heath on uplands, the management responsibility by private industry, agricultural interests, and agencies that design and mitigate impacts to the vegetative resources from natural resource uses and the generally small number of management issues that need to be dealt with, it is determined that the majority of the Lower Laramie Watershed is meeting Standard 3 – Uplands. The following recommendations would expand upon the successes already achieved and help to meet desired resource conditions in the future.

- Continue to implement or manage using best management practices (BMPs) for livestock grazing. These practices utilize, but are not limited to, the control of season, duration, intensity, and distribution of livestock use to meet desired resource objectives for upland vegetation as well as riparian habitat. Specific dates or timing of use must be decided on a case-by-case basis specific to the management unit and/or site limitations. Methods that can be used to achieve resource conditions include, but are not limited to, livestock control by pasture fencing or herding, water developments, vegetation treatments, and/or the manipulation of livestock turn-out/removal dates.

- Identify and correct problems with improved roads that affect vegetation community health and/or composition, including the implementation of mitigation and/or improvements to improved travel routes that will modify overland flow regimes and erosion/deposition patterns which influence the surrounding and adjacent vegetation communities.

- Vegetation treatments designed to modify the age and structural composition of predominant shrub stands and stratify the seral stage mix within stands should be continued and/or initiated and implemented throughout the watershed. Where treatments are utilized to improve the health and productivity of mountain mahogany, sagebrush, and mountain shrub communities, they should attempt to promote juvenile, palatable shrub seedlings within the community, in addition to increasing the herbaceous component. Mechanical treatments may be used to thin areas within the Laramie Range that have been neglected. Treatment methods designed to improve watershed conditions should (at least initially) maximize herbaceous vegetation and litter in order to provide healthy, productive forage and habitat for livestock and wildlife. On a long-term basis, treatments and pre/post-treatment management should be designed to promote healthy, diverse, and natural rangeland conditions rather than the creation of homogeneous monotype communities covering large tracts of land.

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STANDARD 4-Wildlife/Threatened and Endangered Species/Fisheries Habitat and Weeds

STANDARD 4 – Wildlife/Threatened and Endangered Species/Fisheries Habitat and Weeds

Rangelands are capable of sustaining viable populations and a diversity of native plant and animal species appropriate to the habitat. Habitats that support or could support threatened species, endangered species, species of special concern, or sensitive species will be maintained or enhanced.

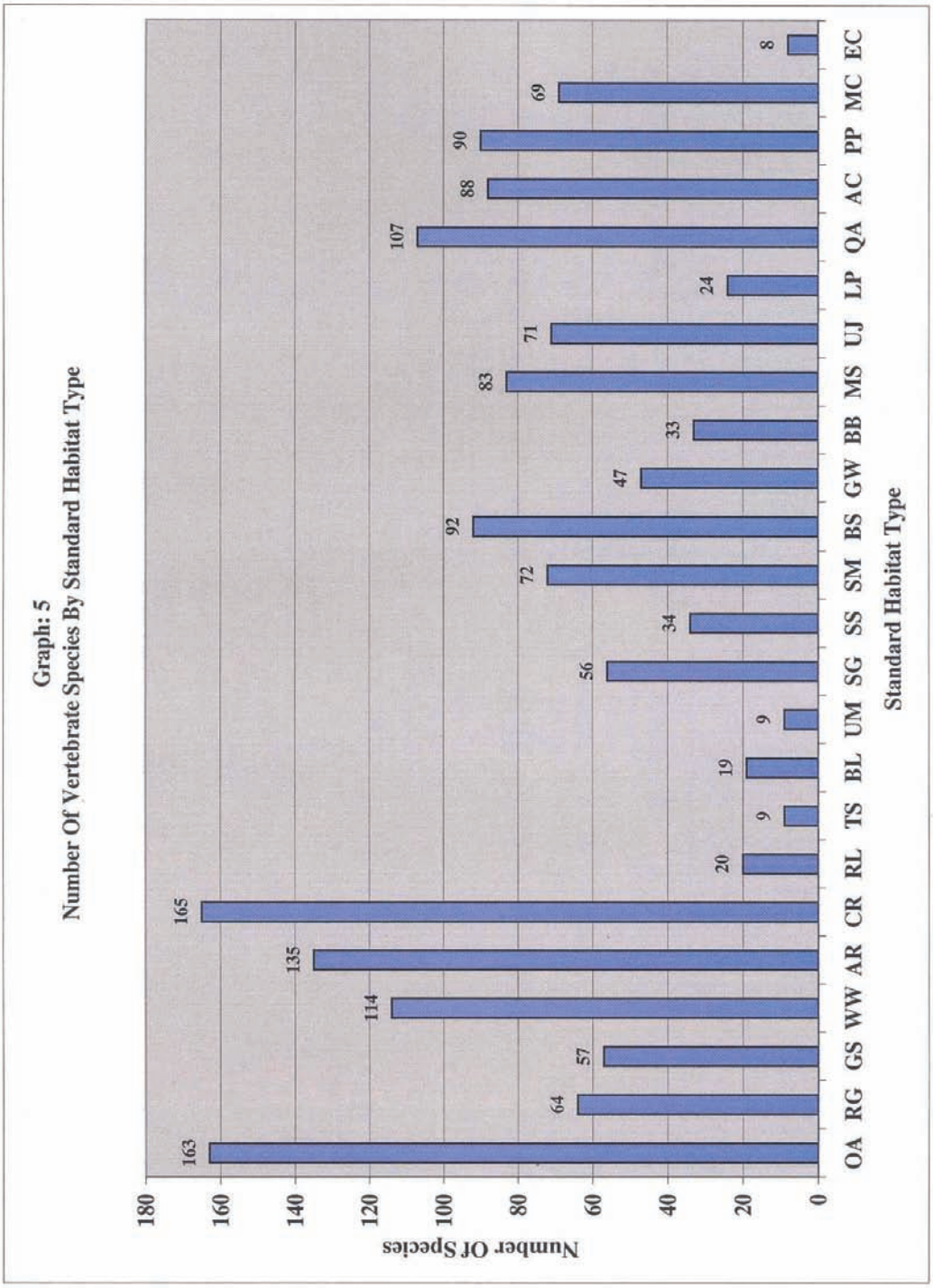
WILDLIFE/THREATENED AND ENDANGERED SPECIES

CHARACTERIZATION

The plant communities/habitat types that occur within the Lower Laramie Watershed have been described under the Characterization section of Standard 2 Wetland/Riparian Health) and Standard 3 (Upland Plant Health). These habitat types vary greatly in their ability to support wildlife, depending on species composition, age classes, single-species dominance, horizontal and vertical structure, type abundance, mosaic mix with other habitats, and proximity to features such as migration corridors and winter concentration areas. Over 374 species of wildlife, including birds, mammals, reptiles, and amphibians, are known or expected to occur within the Rawlins Field Office management area. Graph 5 lists the number of wildlife vertebrate species by standard habitat types that are found within the management area and have the potential to be located within this watershed. In general, aquatic habitats support the greatest diversity of species (up to 165) and are the least common types of habitat, comprising about one percent of the landscape. Aspen woodlands are next in terms of supporting the greatest diversity of species, followed by big sagebrush, conifer, mountain shrub, and juniper woodland habitat types. Grasslands and sagebrush/mixed grass are the most common plant communities in this watershed. Habitats with the lowest diversity of plants, cover, and structure, such as sand dunes, badlands, and rock outcrops, correspondingly support the lowest number of wildlife species (USDI-BLM 2001).

The RFO Resource Management Plan (RMP) management objectives for wildlife species are to provide habitat quality (food, cover, space, and water) adequate to support a natural diversity of wildlife and fisheries, including big game, upland game, waterfowl, non-game species, game fish, sensitive, threatened, and endangered species, species of special management interest in Wyoming, as well as to assist in meeting goals of recovery plans. The RMP has an objective to maintain or improve vegetation condition and/or avoid long-term disturbance in high priority standard habitat sites and fisheries areas. In addition, there is an objective to also maintain or improve overall ecological quality, thus providing good wildlife habitat, within the constraints of multiple-use management in moderate and low priority standard habitat sites (USDI-BLM 1990). Although the RMP gives direction to manage the higher priority habitats first, there are circumstances when managing moderate and low priority habitats will take priority. Management of all three of these habitat types to obtain a diversity of vegetative species, cover, age classes, and structure is essential to maintain healthy wildlife populations and their associated habitat types.

The most commonly-observed wildlife is big game, particularly bighorn sheep (Picture 4.1), antelope (Picture 4.2), and mule deer (Picture 4.3) in open, high elevation habitat, and elk (Picture 4.4) in shrub and woodland habitat. In addition, there are white-tailed deer that inhabit


Graph: 5
Number Of Vertebrate Species By Standard Habitat Type
Number Of Species
0
20
40
60
80
100
120
140
160
180
163
64
57
114
135
165
20
9
19
9
56
34
72
92
47
33
83
71
24
107
88
90
69
8
OA RG GS WW AR CR RL TS BL UM SG SS SM BS GW BB MS UJ LP QA AC PP MC EC
Standard Habitat Type

Key to Graph: 5

Guide To The Standard Habitat Types

1. **Open Aspen - OA**
2. **Riparian Grassland – RG**
3. **Greasewood/Sagebrush Riparian Shrubland – GS**
4. **Willow/Waterbirch Riparian Shrubland – WW**
5. **Aspen Riparian Woodland – AR**
6. **Cottonwood Riparian Woodland – AR**
7. **Rockland – RL**
8. **True Sand Dune – TS**
9. **Badland – BL**
10. **Upland Meadow – UM**
11. **Short Grassland – SG**
12. **Saltbush Steppe – SS**
13. **Sagebrush/Mixed Grass Steppe – SM**
14. **Big Sagebrush/Rabbitbrush Steppe – BS**
15. **Greasewood Steppe – GW**
16. **Bitterbrush/Sagebrush Steppe – BB**
17. **Mountain Shrubland – MS**
18. **Utah Juniper Woodland – UJ**
19. **Limber Pine Woodland – LP**
20. **Quaking Aspen Woodland – QA**
21. **Aspen/Conifer Woodland – AC**
22. **Ponderosa Pine/Douglas Fir Forest – PP**
23. **Mixed Conifer Forest – MC**
24. **Early Successional Conifer Forest - EC**

the watershed area. Raptors that are known to exist within the area include golden eagles and red-tailed hawks; however, it is possible that other raptors are also present. Other commonly-observed mammals are: coyotes, red fox, badger(Picture 4.5), cottontail and jackrabbits, prairie dogs, squirrels(Picture 4.6), voles, and mice. Shorebirds and waterfowl have the potential to include: great-blue herons, avocets, stilts, phalaropes, sandpipers, coots, Canada geese, white pelicans, and other various ducks (primarily dabblers). Songbirds vary by habitat type, with sparrows, meadowlark, and horned lark most often seen in sagebrush and saltbush areas, and warblers, swallows, and flycatcher species observed in riparian habitats. Greater sage-grouse (Picture 4.7) are an important species of interest and the watershed contains wintering areas, brood-rearing habitat, and leks. Blue grouse are found in higher elevation aspen and conifer woodlands. Horned lizards and prairie rattlesnakes are the most common reptiles, while tiger salamanders are the most abundant amphibian species.

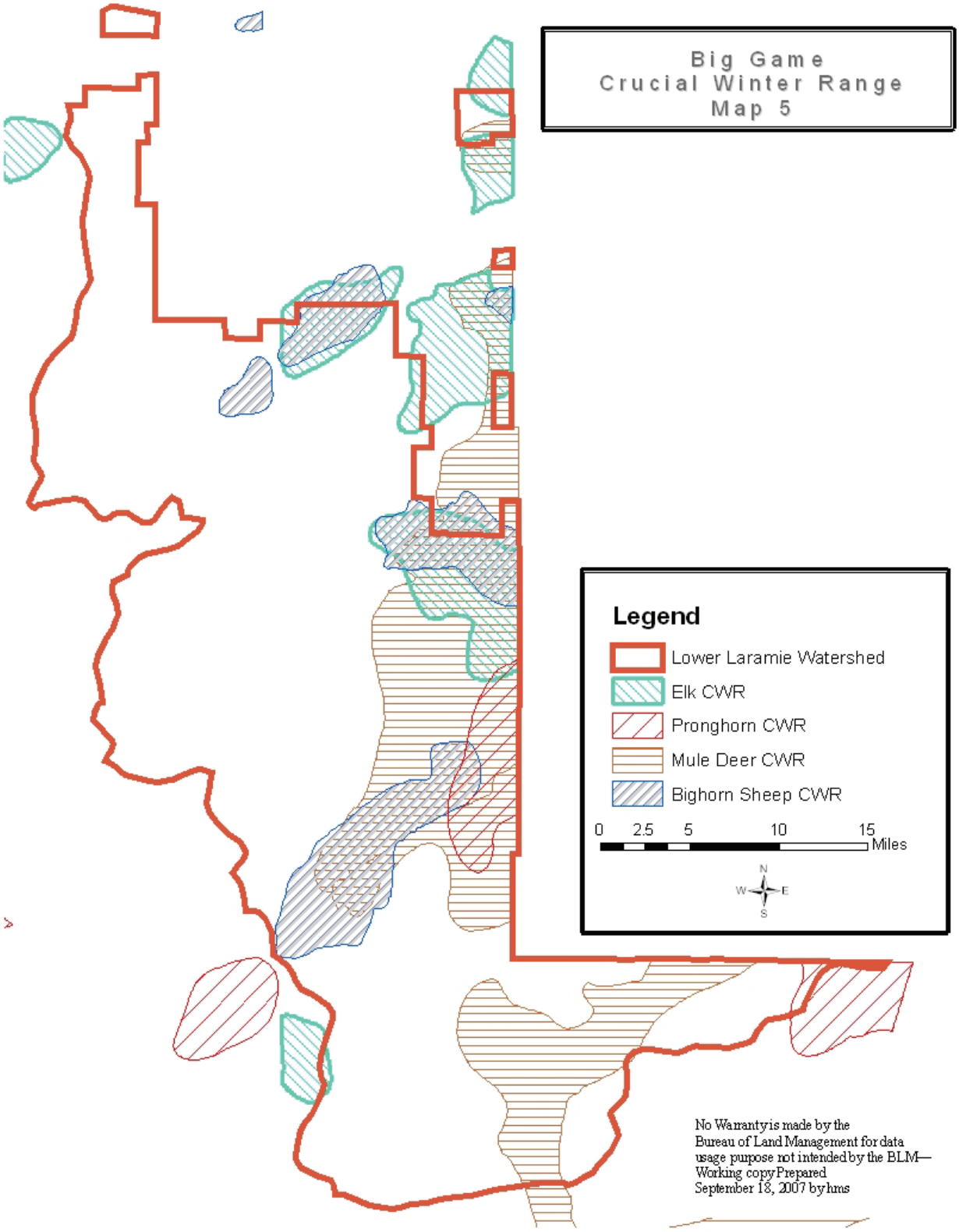
SPECIES OF INTEREST OR CONCERN

There are numerous species of special interest and or concern that inhabit the watershed area, or use parts of the watershed area for migration, transitional zones and/or other corridors, and crucial winter range habitat. There are three antelope herd units, two elk herd units, one bighorn sheep herd unit, two white-tailed deer herd units, and three mule deer herd units—all managed by the Wyoming Game and Fish Department (WGFD)--that are primarily or partially located within this watershed. In addition, other species of special interest and or concern within this watershed include threatened, endangered, and candidate species (T&E species), BLM-State Sensitive Species, and raptors. Accounts of these are described in the following paragraphs; however, the latest data from the Wyoming Game and Fish Department (WGFD) is from. Crucial winter range for big game species are shown on Map 5.

BIG GAME SPECIES

Bighorn Sheep: The watershed area contains crucial winter range for bighorn sheep (Map 6). The *Laramie Peak Bighorn Sheep Herd Unit* occurs throughout the watershed area. This contains Hunt Area 19 and the area begins at the junction of Interstate Highway 25 and Wyoming Highway 211 at the town of Chugwater; southwesterly along Wyoming Highway 211 to the Iron Mountain-Jordan Road (Platte County Road 10-Laramie County Road 106-2); southwesterly along said road to Wyoming Highway 211; southerly along said road to the Fisher Canyon-Rogers Canyon Road (Laramie County Road 228-1 - Albany County Road 17) at Horse Creek Station; southwesterly along said road to U.S. Highway 30 at the town of Laramie; northwesterly along said highway to Wyoming Highway 487; northerly along said highway to Wyoming Highway 220; northeasterly along said highway to Interstate Highway 25; southeasterly along said interstate to Wyoming Highway 211. There were no proposed changes for this herd unit for the 2006 season (WGFD 2005).

Antelope: The watershed area contains crucial winter range for antelope (Map 7). Pronghorn antelope are located throughout the Laramie Basin watershed. Antelope rely heavily on Wyoming big sagebrush habitat, in addition to other “open” communities like saltbush steppe, greasewood, and short grasslands, as well as open juniper woodlands. During the winter, antelope diets consist of primarily Wyoming big sagebrush. However, spring and summer diets include higher amounts of forbs, grasses, and other shrubs. There are portions of three antelope herd units that are located within the watershed area. These herd unit areas are identified as: 1) Iron Mountain Herd Unit (which is located in the southern portion of the watershed area); 2) Dwyer Herd Unit (which is located in the north-eastern portion of the


Big Game
Crucial Winter Range
Map 5
Legend
Lower Laramie Watershed
Elk CWR
Pronghorn CWR
Mule Deer CWR
Bighorn Sheep CWR
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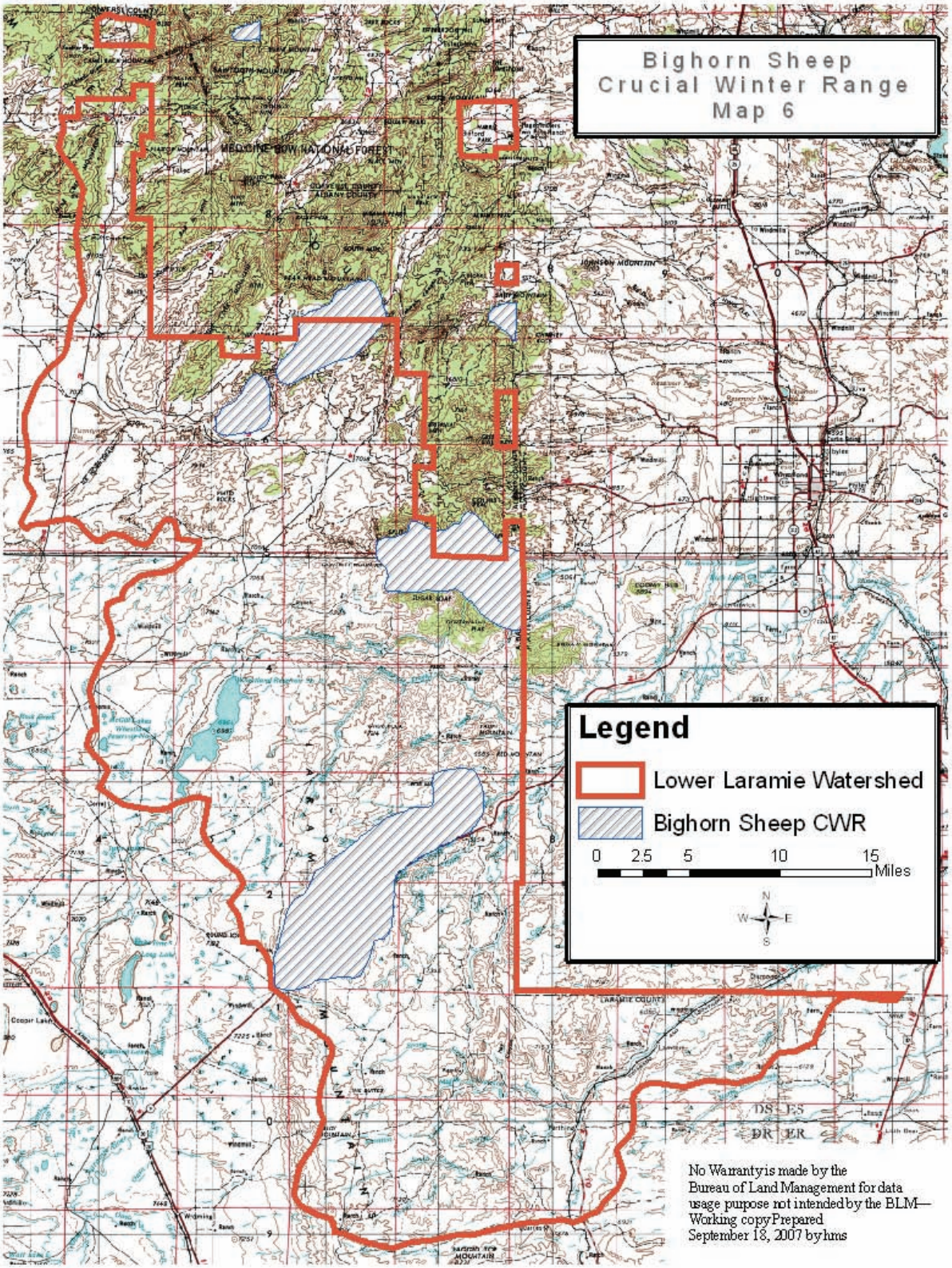
Bighorn Sheep
Crucial Winter Range
Map 6
Legend
Lower Laramie Watershed
Bighorn Sheep CWR
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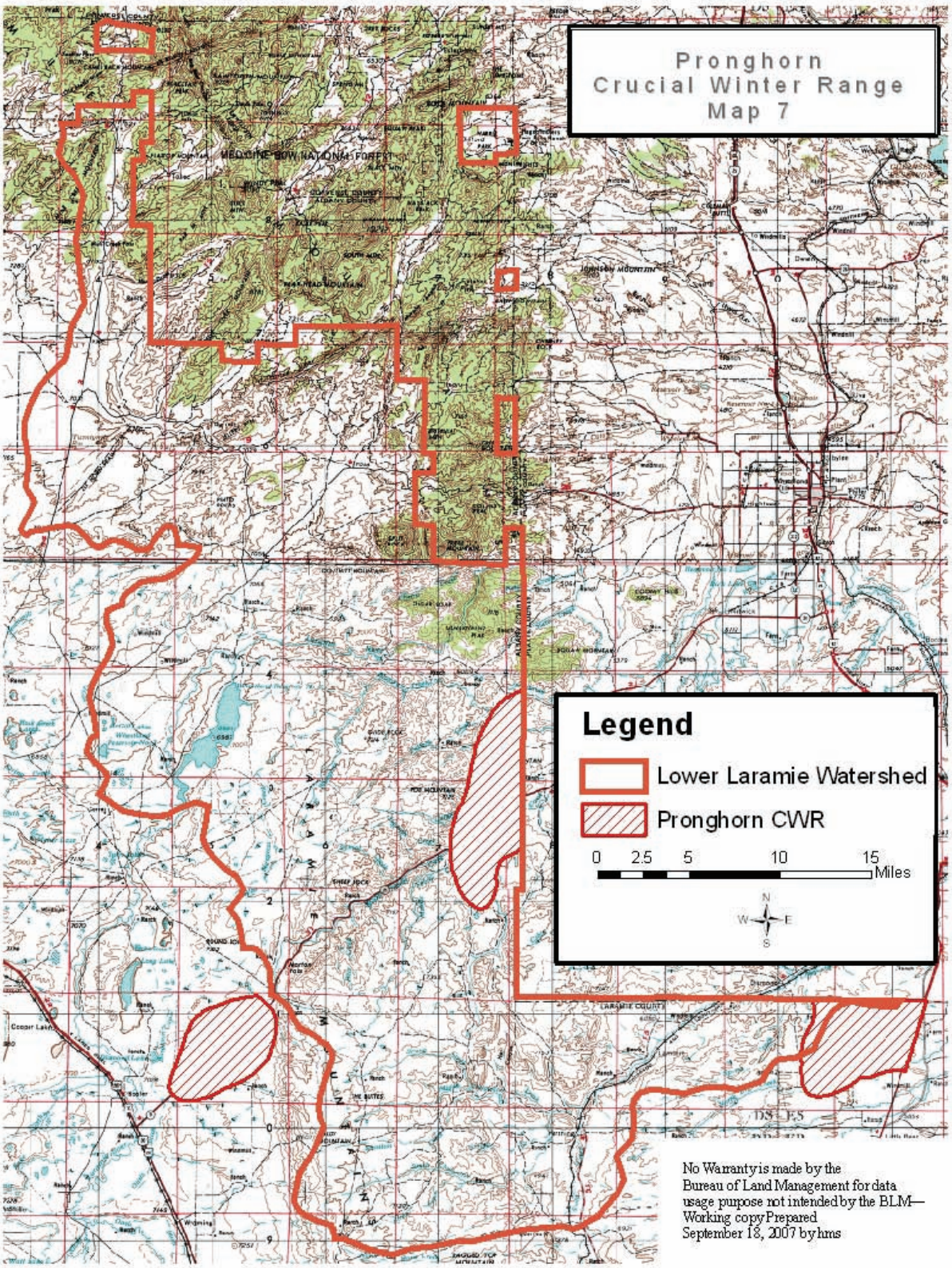
Pronghorn
Crucial Winter Range
Map 7
Legend
Lower Laramie Watershed
Pronghorn CWR
0 2.5 5 10 15
Miles
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watershed area); and 3) Medicine Bow Herd Unit (which is located in the north-western portion of the watershed area).

The *Iron Mountain Antelope Herd Unit* was estimated at approximately 23,000 pronghorn in 2004. This herd unit contains Hunt Areas 38, 39, 40, and 104. The proposed WGFD 2006 season was designed to bring the population closer to the objective of 13,000 (WGFD 2005).

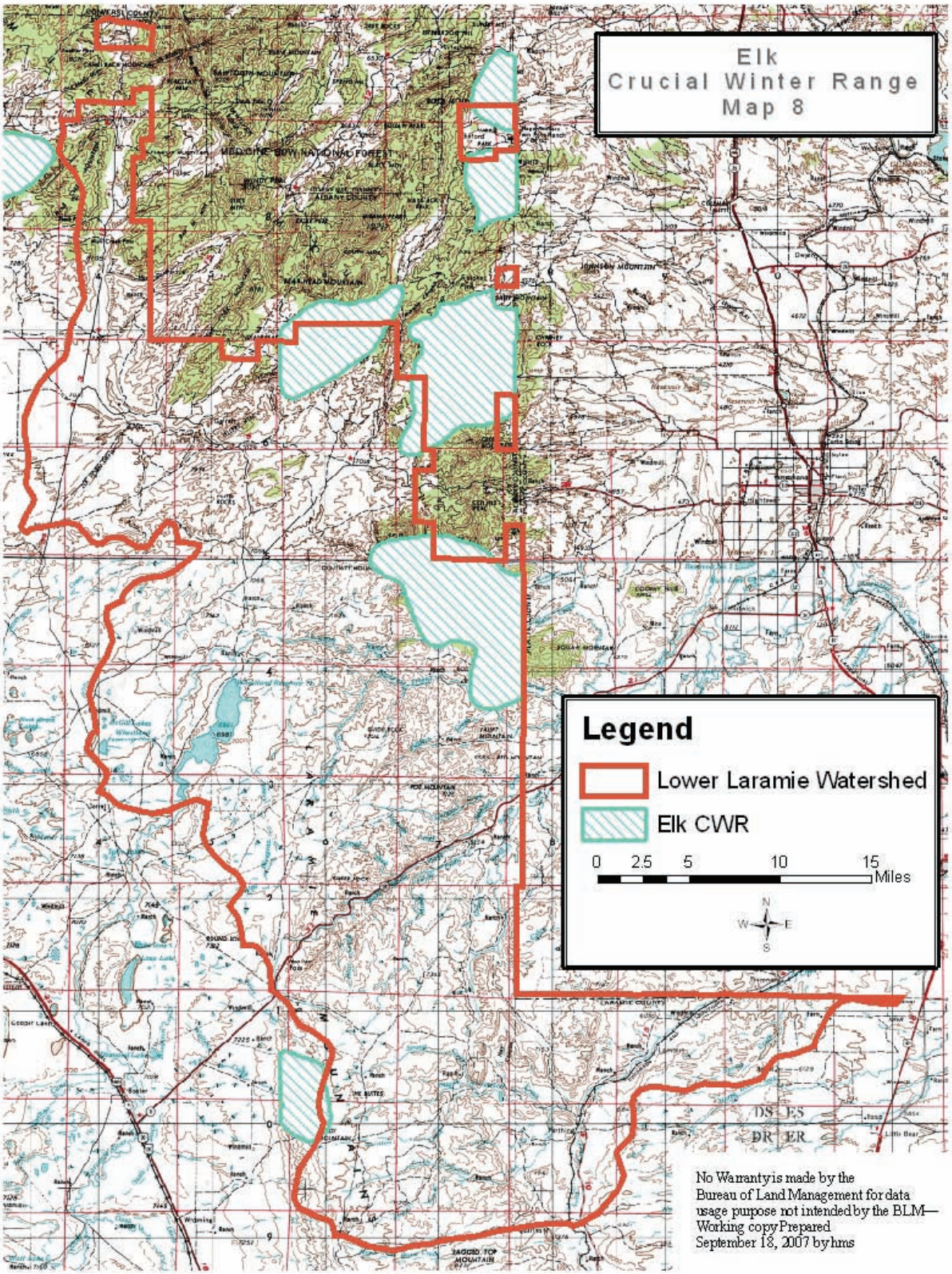
The *Dwyer Antelope Herd Unit* 2005 post-season population estimate was approximately 4,300 antelope, which was about 7% above the objective of 4,000. This herd unit contains Hunt Area 103. This population has declined since 1994. Low fawn production has been the main factor in driving the population down. Based on WGFD 2005 shrub transect data, habitat conditions did improve when just looking at leader production; however, shrub stands are still old with little nutrient content. As stated above, it is apparent that theses shrub stands benefited substantially when the WGFD analyzed nutrient content, leader, and herbaceous production compared to control areas. Given the predicted harvest and average fawn production, the 2006 post-season population estimate for this herd was supposed to be around 4,000 pronghorn, putting the herd at objective (WGFD 2005).

The *Medicine Bow Antelope Herd Unit* is one of the largest in the state in terms of area, pronghorn numbers, and harvest. This herd unit contains Hunt Areas 41, 42, 46, 47, and 48. The herd unit extends from Elk Mountain and about 20 miles north of Laramie to Casper and over toward Douglas. The herd unit is bounded by Interstate Highway 80 to the south, Interstate Highway 25 to the north, the North Platte River to the west, and the Laramie River and the foothills and mountains of the Laramie Range on the east. More pronghorn are harvested in the Medicine Bow Herd than in any other pronghorn population in the Laramie Region, or, in some years, in any other herd statewide. The goal of the population management for the Medicine Bow Pronghorn herd is to reduce pronghorn numbers in order to address habitat concerns. The Medicine Bow pronghorn herd has been near the objective of 60,000 since 2004. Current habitat conditions indicate that this herd needs to be reduced below objective level and likely held there for some time until habitat conditions improve. The harvest needs to be increased significantly just to prevent population growth. It should be noted that this herd provides the only public land pronghorn hunting within the Laramie Region; however, WGFD management for habitat condition in this herd is constrained not only by access to private lands but by the WGFD's goal of maintaining some quality hunting on accessible public lands (WGFD 2005).

Elk: The watershed area contains crucial winter range for elk (Map 8). Elk are another big game species that are located within this watershed. Elk normally prefer staying close to hiding cover, so are most often associated with conifer and aspen woodlands and/or tall shrublands. They prefer grasses and have a high diet overlap with cattle, but will include more forbs in their spring diets and more shrubs in their winter diets. There are two elk herd units that are primarily located within the watershed area. These herd unit areas are identified as: 1) Iron Mountain Herd Unit; and 2) Laramie Peak/Muddy Mountain Herd Unit.

The *Iron Mountain Elk Herd Unit* contains portions of Hunt Areas 5 and 6. WGFD data collected from 2000, 2001, and 2003 and harvest statistics support field personnel, landowner, and hunter observations that the herd is continuing to increase (WGFD 2005).

The *Laramie Peak/Muddy Mountain Elk Herd Unit* begins at the confluence of Deer Creek and the North Platte River in the town of Glenrock, Wyoming; easterly and southerly down said river to the town of Guernsey, Wyoming, and U.S. Highway 26; westerly along said highway to


Elk
Crucial Winter Range
Map 8
Legend
Lower Laramie Watershed
Elk CWR
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Interstate Highway 25; southerly along said highway to Wyoming Highway 34; southwesterly along said highway to U.S. Highway 30-287; northerly along said highway to Wyoming Highway 487 at the town of Medicine Bow; northerly along said highway to the Little Medicine Bow River; northerly up said river to the Little Medicine Road (Carbon County Road 99); northeasterly along said road to the Shirley Ridge Road (Carbon County Road 2); northerly and easterly along said road to Wyoming Highway 487; northerly and westerly along said highway to the divide between Spring Creek and Bates Creek; easterly along said divide to the Bates Creek Road (Natrona County Road 402); easterly along said road to the Squaw Springs Trail Road; northeasterly along said road to U.S.F.S. Road 660; easterly along said road to Curry Creek; northwesterly down said creek to Deer Creek; northerly down said creek to the Stephens Road (Converse County Road 20); northerly along said road to the Deer Creek Road (Converse County Road 19); northerly along said road to Wyoming Highway 20-26 in the town of Glenrock; easterly along said highway to Deer Creek; northerly down said creek to the North Platte River. Hunt Area 7 and Hunt area 19 are located in this Herd Unit (WGFD 2005).

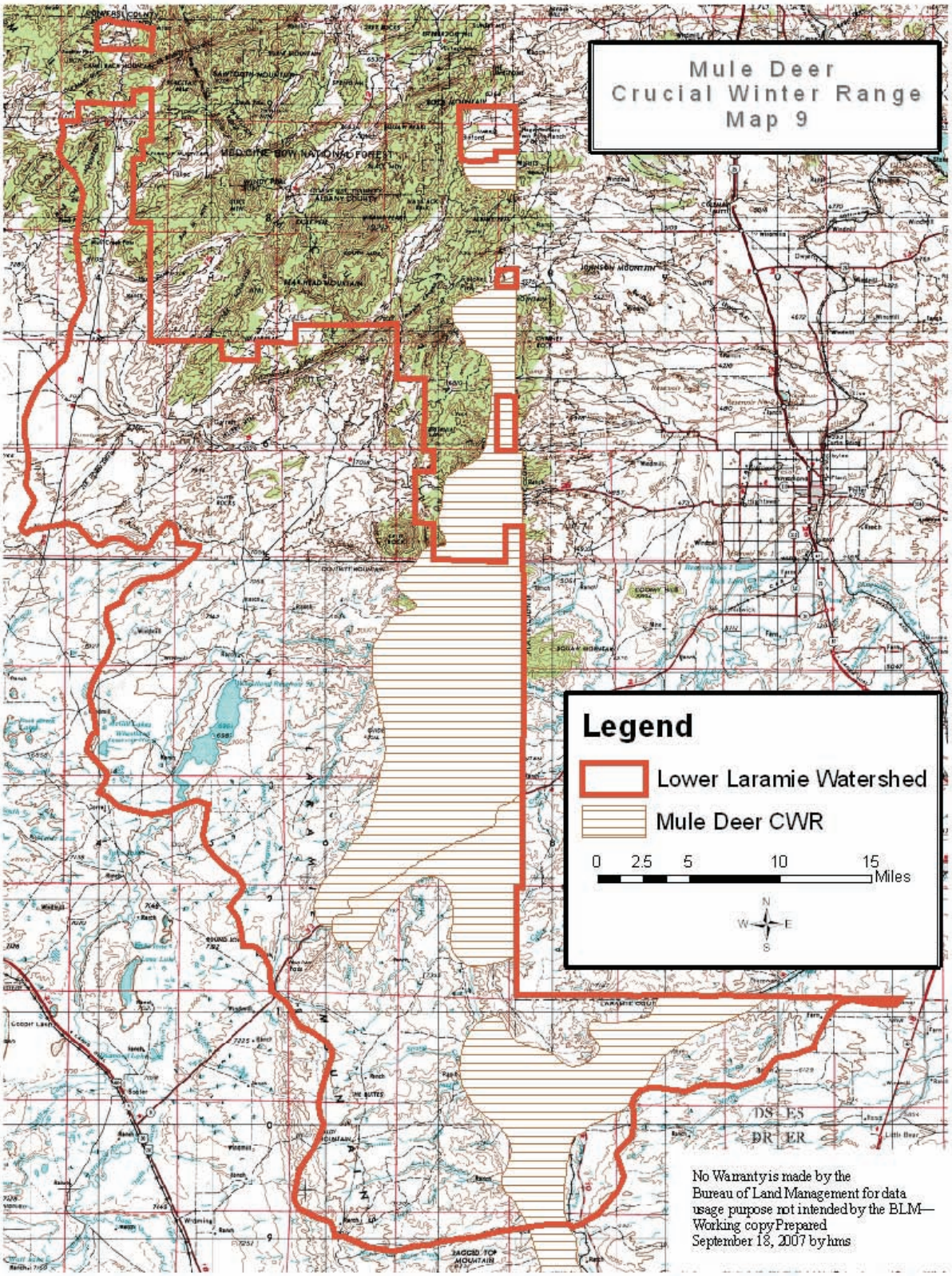
Mule Deer: The watershed area contains crucial winter range for mule deer (Map 9). Mule deer are the second most abundant big game species following antelope in this watershed. However, mule deer are not found evenly distributed across the landscape. They prefer areas with hiding cover and higher precipitation sites with forbs, which tend to occur close to the mountains, rims, and along stream drainages and lakes. Mule deer select forbs and grasses when green and more nutritious, shifting to primarily shrubs in the fall and winter. Compared to antelope, mule deer prefer a mixture of sagebrush and other shrubs during the winter. There are currently two mule deer herd units located within the watershed area (the Laramie Mountains Herd Unit and the Iron Mountain Herd Unit were combined). The herd unit areas are identified as: 1) South Converse Herd Unit; and 2) Laramie Mountains Herd Unit (WGFD 2005).

The *South Converse Mule Deer Herd Unit* is located in the northern most portion of the watershed area and has a population objective of 16,000 deer. Hunt Area 65 is located within this Herd Unit (WGFD 2005).

The *Laramie Peak Mule Deer Herd Unit* and the *Iron Mountain Mule Deer Herd Unit* were combined into the *Laramie Mountains Mule Deer Herd Unit* in 2004. The herds were combined by the WGFD based on personnel observations and a high number of vehicle collisions with mule deer along the Wyoming Highway 34 boundary indicated that there was enough movement between the two herd units to warrant combination. The combined herd objective was set at 29,000, based on the sum of the Laramie Peak (15,000) and Iron Mountain (14,000) herd objectives (WGFD 2005).

White-tailed Deer: White-tailed deer are also located within specific habitats in this watershed. Their diet is similar to mule deer diets. They prefer areas with hiding cover and higher precipitation sites with forbs, which tend to occur close to the mountains, rims, and along stream drainages and lakes. These deer are usually found associated with coniferous forested areas, deciduous riparian habitats, and agricultural croplands associated with major drainages. There are currently two white-tailed deer herd units located within the watershed area. The herd unit areas are identified as: 1) Southeast Wyoming White-tailed Deer Herd Unit (the largest unit); and 2) Central White-tailed Deer Herd Unit.

The *Southeast Wyoming White-tailed Deer Herd Unit* contains Hunt Areas 16, 55, 57, 59-64, 70-81, 83, and 161. The lack of adequate classification and harvest field check data, combined


Mule Deer
Crucial Winter Range
Map 9
Legend
Lower Laramie Watershed
Mule Deer CWR
0 2.5 5 10 15
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with limited harvest information and lack of a closed population, prohibits any effort for the WHGD to reliably estimate the white-tailed deer numbers in this area (WGFD 2005).

Only an extremely small portion of the northern segment of the watershed is located within the *Central White-tailed Deer Herd Unit*. In April 2002, the Central and Thunder Basin white-tailed deer herd units were combined because they shared similar habitat and management characteristics and it helped to facilitate data reporting. The new Central White-tailed Deer Herd Unit was formed with a management objective of >20 bucks per 100 does postseason. The Central White-tailed Deer Herd Unit is bounded on the east by the Wyoming-Nebraska-South Dakota state line, the south by the Niobrara/Goshen, Converse/Platte, Converse/Albany and Natrona/Carbon county lines, the west by the Dry Creek Road, Gas Hills Road and Waltman-Arminto Road, and the north by Highway 387, I-90 and Highway 16. The Herd Unit includes Hunt Areas 7-15, 21, 22, 34, 65-67, 88, 89, 158, and 167. Dominant habitat types found within the area include basin-prairie shrub steppe, mountain-foothills shrub steppe, eastern Great Plains grasslands and riparian shrub steppe. Most of the area is characterized as open rolling prairie with intermixed deciduous riparian habitats and scattered ponderosa pine and juniper communities (WGFD, 2005).

RAPTORS

There are two raptor species that have been observed within the watershed area, and/or their nests have been identified within the area (Picture 4.8). These raptors that have known nests within the area include the golden eagle and red-tailed hawk. Although nests have not been identified for other species they have the potential to nest within this watershed and are also discussed below.

Species Known to Nest Within the Watershed: The red-tailed hawk inhabits a variety of open habitats. This hawk may perch, hover, or hold still into the wind when hunting. This hawk eats small mammals, birds, and reptiles.

The golden eagle inhabits mountains, foothills, and adjacent grasslands. This bird hunts by soaring and then diving down on prey such as rabbits and rodents and some birds, and they also feed on road-killed animals.

Species That May Nest Within the Watershed: Other raptor species that have the potential to nest within the watershed include: the bald eagle, ferruginous hawk, Swainson's hawk, northern goshawk, great-horned owl, Cooper's hawk, sharp-shinned hawk, northern harrier, prairie falcon, burrowing owl, kestrel, long-eared owl and short-eared owl (Picture 4.9). A description of these species and their potential and/or known habitat is noted below. It should be noted that the bald eagle, ferruginous hawk, burrowing owl, and northern goshawk have been identified as BLM State Sensitive Species and a description of those species is located in the BLM State Sensitive Species report.

The Swainson's hawk inhabits prairies and open arid land. This hawk often feeds by hopping on the ground, eating insects such as grasshoppers and crickets. They soar and catch mice, rabbits, lizards, frogs, and birds. The great-horned owl inhabits extremely varied areas including woods, deserts, and suburbs. This large fearsome hunter will capture a wide variety of prey, ranging from insects to prey the size of a great blue heron. They eat squirrels, mice, rabbits, snakes, skunks, weasels, porcupines, domestic cats, crows, ospreys, as well as other owls and hawks, including barred owls and red-tailed hawks. The Cooper's hawk inhabits

mixed forests and open woodlands. This hawk has regular feeding routes during the breeding season, where it hunts for common medium-sized birds such as mourning doves, jays, and starlings. The sharp-shinned hawk is found in mixed deciduous and coniferous woods during the summer season; and winters in woods and near bird feeders. These hawks feed by catching small birds in midair and carrying them off to eat. They may also be seen hunting among bird feeders. The northern harrier inhabits open fields, grasslands, prairies, and marshes. This raptor feeds by coursing close to the ground and quickly swooping down on its prey. They eat mice, rats, birds, snakes, frogs, and other small mammals.

The prairie falcon inhabits the plains, grasslands, and other open country. This raptor catches birds in midair or on the ground; and mammals after a swift swoop. The kestrel inhabits a wide variety of open habitats, including urban areas. This raptor hunts by perching or hovering, then diving to catch prey. They eat voles, mice, birds, and insects. The long-eared owl inhabits woods and willow patches near open fields and marshes. This owl eats mostly voles and mice, but has been known to eat amphibians, reptiles, and insects. The short-eared owl inhabits open fields, marshes, dunes, and grasslands. This owl feeds mostly on voles, but will also hunt songbirds and some game birds. They hunt mainly at dawn and dusk (Stokes 1996).

THREATENED, ENDANGERED, PROPOSED, AND CANDIDATE SPECIES

There are four threatened, endangered, proposed, and candidate species (T&E species) that occur, or have the potential to occur, within this watershed, and six species--the North Platte River species--that do not physically occur within this watershed, but may be affected by actions that occur within the watershed (see Table 4.1). These include the black-footed ferret, Preble's meadow jumping mouse, Ute ladies' tresses plant, Colorado butterfly plant, as well as the North Platte River species (Interior least tern, pallid sturgeon, piping plover, whooping crane, western prairie fringed orchid, and American burying beetle). There are eight species within the Rawlins Field Office management area, but that are not known to occur within and/or their habitat is not known to occur within this watershed. These include the blowout penstemon, Canada lynx, Colorado River species (Colorado pikeminnow, humpback chub, bonytail chub, and razorback sucker), Wyoming toad, and yellow-billed cuckoo.

Black-Footed Ferret: The black-footed ferret is considered "endangered" and is the rarest mammal in North America. It receives full protection under the Endangered Species Act of 1973 (Act) where it occurs naturally. On the extreme western portion of the analysis area there is an introduced "non-essential experimental population" of black-footed ferrets. Under this designation on BLM lands the ferret is protected as a "proposed" species rather than an "endangered" species. With this designation, many Section 9 prohibitions are waived and management of the species is allowed much greater flexibility. This species lives in prairie dog towns and relies on prairie dogs and their burrows for both food and shelter. The original range of the black-footed ferret corresponded closely with the prairie dog, extending over the Great Plains area from southern Canada to the west-Texas plains and from east of the 100th Meridian to Utah and Arizona (USDI-BLM 2001).

Preble's Meadow Jumping Mouse: The Preble's meadow jumping mouse occurs in riparian shrub/grass habitat types, marshy areas, and moist meadow grasslands near streams. This species uses mixed shrublands during the spring and summer months and dryer uplands during the winter months. There is critical habitat located within the southern portion of this watershed in T. 19 N., R. 69-71 W., and T. 18 N., R. 70-71 W., in various sections. These include portions of Strong, Middle Chugwater, South Chugwater, Ricker, and Shanton Creeks.

Ute Ladies' Tresses: The Ute ladies' tresses plant is considered a threatened species under the ESA of 1973. This plant is a perennial, terrestrial orchid. This plant blooms from late July through August; however, depending on location and climatic conditions, orchids may bloom in early July or still be in flower as late as early October. This orchid is endemic to moist soils in mesic or wet meadows near springs, lakes, seeps, and riparian areas within the 100- year flood plain of perennial streams ranging from 4,300-7,000 feet in elevation. It colonizes early successional riparian habitats such as point bars, sand bars, and low laying gravelly, sandy, or cobble like edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season (USDI-BLM 2001). Although the model shows this plant in the Casper Field Office area, which is to the east of this watershed, the USFWS still recognizes the potential for this plant to occur in this watershed.

Colorado Butterfly Plant: The Colorado butterfly plant is endemic to moist soils in mesic or wet meadows of floodplain areas and has the potential to occur within this watershed. This plant flowers from June to September and the fruiting period is from July through October. This plant is endemic to southeast Wyoming, western Nebraska, and northeast Colorado. It occurs at elevations between 5,800 feet and 6,400 feet (Fertig et al, 1994).

North Platte River Species: The North Platte River species include: the endangered Interior *least* tern, pallid sturgeon, piping plover, whooping crane, western prairie fringed orchid, and American burying beetle. The species are downstream residents of the Platte River, and the whooping crane is a migrant along the central Platte River in Nebraska. (FWS March 2004).

Table 4.1: BLM Threatened, Endangered, Proposed, and Candidate Species That May Occur In the Watershed

Mammals		
Common Name	**Scientific Name**	**Habitat Types**
Black-footed ferret	*Mustela nigripes*	Prairie dog towns
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	Riparian habitats east of Laramie Mountains and south of the North Platte River
Critical habitat for Preble's meadow jumping mouse	*Designated*	Varying widths (360 to 394 feet from stream edge) along portions of Strong Creek, Middle Chugwater Creek, South Chugwater Creek, Ricker Creek, and Shanton Creek.
Plants		
Common Name	**Scientific Name**	**Habitat Types**
Ute ladies' tresses	*Spiranthes diluvialis*	Seasonally moist soils and wet meadows of drainages below 7,000 feet
Colorado butterfly plant	*Gaura neomexicana ssp. coloradensis*	Wet meadows in floodplains
North Platte River Species		
Interior Least tern	*Sterna antillarum*	Downstream resident of the Platte River
Pallid sturgeon	*Scaphirhyunchus albus*	Downstream resident of the Platte River
Piping plover	*Charadrius melodus*	Downstream resident of the Platte River
Whooping crane	*Grus americanus*	Downstream resident of the Platte River
Western prairie fringed orchid	*Platanthera praeclara*	Downstream resident of the Platte River
American burying beetle	*Nicrophrorus americanus*	Downstream resident of the Platte River

BLM STATE SENSITIVE SPECIES

Many wildlife and plant species are experiencing population declines. The BLM developed a sensitive species list to better manage species and their habitats. There are 29 BLM-state sensitive species that have the potential to occur within this watershed. These species include nine mammals, fifteen birds, and two plants. A description of the habitat type that each species is associated with is shown in Table 4.2. The BLM state sensitive fish, reptiles, and three amphibians that may occur within this watershed are discussed in the Fisheries section.

Table 4.2: BLM State Sensitive Species That May Occur In the Watershed

Mammals		
Common Name	**Scientific Name**	**Habitat Types**
Long-eared myotis	*Myotis evotis*	Conifer and deciduous forests, caves and mines
Fringed myotis	*Myotis thysanodes*	Conifer forest, woodland, caves and mines
Spotted bat	*Euderma maculatum*	Cliffs over perennial water, basin-prairie shrub
Townsend's big-eared bat	*Corynorhinus townsendii*	Forests, basin-prairie shrub, caves and mines
Pygmy rabbit	*Brachylagus idahoensis*	Basin-prairie and riparian shrub
White-tailed prairie dog	*Cynomys leucurus*	Basin-prairie shrub, grasslands
Black-tailed prairie dog	*Cynomys ludovicianus*	Basin-prairie shrub, grasslands
Wyoming pocket gopher	*Thomomys clusius*	Meadows with loose soil
Swift fox	*Vulpes velox*	Grasslands
Birds		
Common Name	**Scientific Name**	**Habitat Types**
Bald eagle	*Haliaeetus leucocephalus*	Found throughout state
White-faced ibis	*Plegadis chihi*	Marshes, wet meadows
Trumpeter Swan	*Cygnus buccinator*	Lakes, ponds, rivers
Northern goshawk	*Accipiter gentilis*	Conifer and deciduous forests
Ferruginous hawk	*Buteo regalis*	Basin-prairie shrub, grassland, rock outcrops
Mountain plover	*Charadrius Montanus*	Short-grass prairie, shrub-steppe, prairie dog towns
Peregrine falcon	*Falco peregrinus*	Tall cliffs
Greater sage-	*Centrocercus urophasianus*	grouse Basin-prairie shrub, mountain-foothill shrub
Long-billed curlew	*Numenius americanus*	Grasslands, plains, foothills, wet meadows
Burrowing owl	*Athene cunicularia*	Grasslands, basin-prairie shrub
Sage thrasher	*Oreoscoptes montanus*	Basin-prairie shrub, mountain-foothill shrub
Loggerhead shrike	*Lanius ludovicianus*	Basin-prairie shrub, mountain-foothill shrub
Brewer's	*Spizella breweri*	sparrow Basin-prairie shrub
Sage sparrow	*Amphispiza billineata*	Basin-prairie shrub, mountain-foothill shrub
Baird's sparrow	*Ammodramus bairdii*	Grasslands, weedy fields

Plants		
Common Name	**Scientific Name**	**Habitat Types**
Laramie False Sagebrush	*Sphaeromeria simplex*	Cushion plant communities on rocky limestone ridges & gentle slopes, 7,500-8,600 feet
Laramie Columbine	*Aquilegia laramiensis*	Crevices of granite boulders & cliffs, 6,400-8,00 feet

The objective of the sensitive species designation is to ensure that the BLM considers the overall welfare of these species when undertaking actions on public lands and do not contribute to the need to list the species under the provisions of the ESA. The lack of demographic, distribution, and habitat requirement information compounds the difficulty of taking management actions for many of these species. It is the intent of the sensitive species policy to emphasize the inventory, planning consideration, management implementation, monitoring, and information exchange for the sensitive species on the list in light of the statutory and administrative priorities (USDI-BLM 2001).

Mammals: The nine sensitive mammals that have the potential to occur within the watershed in a diversity of habitats types include four bat species: the long-eared myotis, fringed myotis, spotted bat, and Townsend's big-eared bat; one rabbit species: the pygmy rabbit; two prairie dog species: the white-tailed and black-tailed prairie dog; one gopher species: the Wyoming pocket gopher; and one fox species: the swift fox. The bat species have the potential to occur in both coniferous and deciduous forests, cliffs over perennial water, basin-prairie shrub, caves, and abandoned and/or active mines. The pygmy rabbit has the potential to occur in basin-prairie and riparian shrub habitat and, although this species is known to be located mainly in the south-western portion of the state, there is the potential for this species to occur in the watershed area as well. Prairie dogs occur in basin-prairie shrub and grasslands and have the potential to occur within the watershed. The Wyoming pocket gopher occurs in meadows with loose soils, which are scattered throughout the watershed. The swift fox inhabits grasslands, which are located throughout the watershed.

Birds: The fifteen sensitive bird species that have the potential to occur within the watershed include: bald eagle, white-faced ibis, trumpeter swan, northern goshawk, ferruginous hawk, mountain plover, peregrine falcon, greater sage-grouse, long-billed curlew, burrowing owl, sage thrasher, loggerhead shrike, Brewer's sparrow, sage sparrow, and Baird's sparrow. The bald eagle, northern goshawk, ferruginous hawk, burrowing owl, and greater sage-grouse are described below.

Bald Eagle: The current status of the bald eagle is no longer threatened, but this species is considered a BLM sensitive species. Bald eagles are found in conifer, cottonwood-riparian, and river ecosystems. They feed mainly on fish, but will also eat carrion and some small mammals. At this time, there are no known bald eagle nests located within the watershed area; however, the potential exist for these birds to nest within and/or use the habitat within this watershed.

Northern Goshawk: The northern goshawk inhabits deep woods with mostly conifers. These hawks feed on birds by catching them in the air and feed on mammals by swooping down on them. They eat medium size birds and mammals such as grouse and squirrels.

Ferruginous Hawk: The ferruginous hawk inhabits arid open land and grasslands. This hawk feeds by swooping down on prey from the air. They eat mostly small mammals such as Wyoming ground squirrels and prairie dogs, and occasionally take rabbits, and birds.

Burrowing Owl: The burrowing owl inhabits open plains, grasslands, and desert scrub. They eat insects, scorpions, crayfish, mice, ground squirrels, young prairie dogs, rabbits, amphibians, snakes, and rarely birds.

Greater Sage-Grouse: Greater sage-grouse (sage grouse) occur within this watershed, specifically within the western and southern portion of this area (Picture 4.7). Sage grouse populations have exhibited long-term declines throughout North America, with a 33% decline over the past 30 to 40 years. No one causal factor has been identified for these declines. Wyoming supports the largest populations of grouse, more than all the other states combined; however, there are population declines occurring in Wyoming as well. Sage grouse are a sagebrush obligate species and each aspect of their life cycle requires slightly different elements within the sagebrush communities. Grass height and cover play an important role in the nesting success of sage grouse. Early brood rearing habitat exists within this watershed and consists of relatively open stands of sagebrush or narrow, shrub-free stringers of meadows in draws or other areas with somewhat more soil moisture. Sagebrush, sometimes dense, often has invaded the latter habitats, thus making them less desirable or unsuited for brood habitat (Klebenow, D.A. 1972). During the summer months, grouse move to more mesic sites seeking succulent forbs. Movements to winter ranges are slow and meandering and occur from late August to December. There are wintering areas located within this watershed and during the winter months, grouse feed almost exclusively on sagebrush leaves (USDI-BLM 2001). There are 18 known sage grouse leks located within the watershed boundary and several more leks located adjacent to the watershed border.

Plants: The two sensitive plant species that have the potential to occur within this watershed include the Laramie False Sagebrush and the Laramie Columbine. The Laramie False Sagebrush plant is endemic to southeastern Wyoming and grows in cushion plant communities on rocky limestone ridges and gentle slopes. This plant occurs at 7,500 feet to 8,600 feet. The flowering and fruiting period for this plant is May through August. The Laramie Columbine plant is endemic to the Laramie Range and grows in crevices of granite boulders and cliffs. This plant occurs at elevations of 6,400 feet to 8,000 feet. The flowering and fruiting period for this plant is June through August (Fertig et al, 1994).

ISSUES AND KEY QUESTIONS

There are several issues and key questions that have been identified for wildlife species. The major issues that concern wildlife species include the overall health of the ecosystem including both the quality and quantity of a diversity of habitat types that species depend on throughout their life cycles; the availability of these habitat types for wildlife species; and existing or potential disturbance of these habitat types. Priority wildlife habitats include riparian grassland, willow-waterbirch riparian, aspen and cottonwood woodlands, and wet forested meadow areas; in addition to open aquatic; sagebrush-grass communities, mountain shrub, saltbush steppe, conifer forest, and rock land areas (USDI-BLM 1990). Habitat diversity includes vegetation cover types and age distribution, as well as the need for disturbance-such as fire, disease, and/or climatic change. Factors that affect the availability of these habitat types for wildlife include livestock management, development of private lands, natural fire suppression, and inter- and intra-species competition for available forage and associated diet overlap. Existing and

potential disturbances to wildlife species include impacts to priority habitats from 73 fencing, water development projects, vegetative treatments, and livestock use; disturbance to individual life cycles from human activity, including recreational activities, OHV use, and noise. The following describes issues and key questions that pertain to specific wildlife species and impacts that may occur as a result of activities taking place.

SPECIES OF INTEREST AND CONCERN

Bighorn Sheep

Issues which affect bighorn sheep populations in the valley are related to maintaining healthy, viable herds where they currently occur and, in time, expanding population numbers in these areas. Interactions with domestic sheep appear to be one of the most influencing factors which affect bighorn sheep populations in the Rocky Mountains. Because there is so little domestic sheep grazing permitted on BLM public lands within the assessment area, interactions between the two species on BLM should be nonexistent at best, and minimal at worst. National BLM policy centers on the removal of the possibility of interactions between wild and domestic sheep, which usually precludes conversion of cattle permits or leases to sheep use in BLM grazing allotments in proximity to wild sheep herd units. Where domestic sheep permits are authorized in proximity to wild sheep herd units, conversions to cattle will be considered and encouraged. Many of the same habitat issues affecting mule deer and elk impact these bighorn sheep, most notably mature to decadent, even-aged sagebrush and mixed mountain shrub stands found in the mountain foothills. Additionally, conifer encroachment into decadent aspen, riparian woodland, and mountain shrub stands throughout bighorn sheep ranges has degraded habitat conditions. The key question is: What vegetation management actions can be taken to restore important mountain shrub, riparian woodland, and aspen stands within the watershed that will benefit, or at least not negatively impact existing bighorn sheep populations and herd units?

The *Laramie Peak Bighorn Sheep Herd Unit* occurs throughout the watershed area. Lamb ratios did increase, but still remains alarmingly low. Distribution was similar to the last two winters with the majority of the sheep concentrated in the southern 1/3 of the watershed area. The WGFD harvest data does support a decrease in population when compared to the five-year average and it appears that ram numbers are decreasing. In general, wildlife managers are concentrating management efforts in southeast Wyoming on the Laramie Peak bighorn sheep population (WGFD 2005).

Antelope

Much of the fencing in the assessment area was constructed prior to standards being created to reduce impacts on wildlife. Many of the older fences were either woven where sheep were historically grazed or had four to six barbed wires, which restricts movement. Additionally, many road rights-of-ways are bounded by woven wire fences as well. Few adults will jump over fences; the majority of antelope prefer to pass under or through fences. Woven wire and four to six barbed wire fences prevent passage under or through them, forcing antelope to find low spots such as gully crossings where they can get under the fence. During severe winter conditions, antelope have to expend additional time and energy to get through these types of fences while migrating, which may reduce their chance for survival. They may even get stuck in fences, where they are likely to die. Modifications continue to be made to sheep style (woven wire) fences, in particular, to reduce the impacts to antelope migrating between spring/summer/fall and winter ranges. Even though some of these have been modified to BLM

fencing standards, to assist antelope in moving through fences, more needs to be done. In some cases, installing gates in corners that could be left open during the winter would be a significant help. The key questions are: Because not all of this work can be done at once, what locations should have the highest priority to be modified, and what areas should be targeted for future years? How can we accomplish the modification of a significant amount of fence each year to help resolve this issue in a reasonable amount of time?

Many livestock management practices primarily relate to water, both in terms of new developments and their management, as well as protection of natural seeps and streams. When new water sources are developed, which are usually for summer cattle use, antelope and other wildlife will use them and become dependent upon them, especially during times of drought. However, if these water developments are wells, they may only be available during specific times of the year and the wildlife must look for water elsewhere. There have been incidents where antelope get stuck in certain pastures due to woven wire fences and cannot move to new locations when the water they were using is no longer available. The key questions are: How can these situations be avoided? Are there certain times or locations when water should remain available, either through continuing to pump water or development of other sources? In other situations, water developments have been created for wildlife, such as guzzlers or other projects. These are often developed and maintained by individuals working for state or federal agencies, but may not be properly maintained when these individuals retire or move to other jobs. How can this situation be rectified to maintain the use of these facilities for the long-term benefit of antelope and other wildlife?

Generally, almost 100% of all livestock use is made by cattle, which have a low overlap in diet similarities with antelope. However, cattle can have a significant impact on riparian habitat that is important to antelope. The key question is: Through the use of riparian pastures or exclosures, these areas are managed or protected from a livestock perspective, but from a wildlife viewpoint, what mix of vegetative species and structure should be promoted and what form of management will it take to achieve this?

Private land developments are another issue influencing antelope within the watershed area. These developments, primarily summer homes and, in some cases, subdivisions, are resulting in a net loss of habitat that is important to antelope. Additionally, increased human activity associated with these developments may also result in an effective habitat loss of these areas.

The *Iron Mountain Antelope Herd Unit* is located in the southern portion of the watershed analysis area. WGFD data shows that in 2005, postseason population estimate of 15,500 antelope was 19% over the objective of 13,000, which was the same objective for 2006. Habitat conditions did improve; however, shrub stands are still old with little nutrient content. These conditions may have negative impacts to antelope utilizing the habitats within this watershed. Based on increased doe harvest and below average fawn ratios it is plausible that the population is decreasing (WGFD 2005).

The *Dwyer Antelope Herd Unit* is located in the extreme north-east corner of this watershed. The 2005 population estimate was approximately 4,300 antelope which was about 7% above the objective of 4,000 (WGFD 2005).

The *Medicine Bow Antelope Herd Unit* is one of the largest in the state in terms of area, pronghorn numbers, and harvest. This herd unit contains Hunt Areas 41, 42, 46, 47, and 48. The herd unit extends from Elk Mountain and about 20 miles north of Laramie to Casper and

over toward Douglas. The herd unit is bounded by Interstate Highway 80 to the south, Interstate Highway 25 to the north, the North Platte River to the west, and the Laramie River and the foothills and mountains of the Laramie Range on the east. More pronghorn are harvested in the Medicine Bow Herd than in any other pronghorn population in the Laramie Region, or in any other herd statewide in some years (WGFD 2005).

Elk

The major issues affecting elk are fence impacts on animal movement; competition with cattle for forage; reduced health and productivity of forest, aspen, and shrub-lands due to the lack of natural fire; and increased human activities. Fencing and competition with cattle are issues common to both herd units and are discussed together.

Elk movement is affected by fences much differently than with antelope. Elk, being considerably larger, will generally jump over fences or run right through them, sometimes causing considerable damage. Young elk, however, will have to pass under or through fences for a time and can get stuck behind a fence they cannot get through or get a leg caught while attempting to jump a fence. Woven wire fences constructed for sheep present problems for very young elk, but these fences usually are not over 40 inches tall and can be jumped fairly easily by adult elk. Old style fences built for cattle may be 50 to 55 inches tall and present considerable problems for both young and adult elk. Elk, which summer on the National Forest, may not have many fences to pass over until they migrate in the spring and fall to and from the winter range. Fence locations requiring annual maintenance due to big game movement are good indicators of areas where fence modifications should occur to reduce both the cost of maintenance and the impact to big game species. The key questions are: How can a program be implemented to modify fences where needed in the short-term, and correct all fences to meet BLM standards in the long-term? Possible livestock management strategies could involve fences to control cattle use periods in certain areas. How can livestock management structures such as fencing be designed and implemented to maximize benefits and reduce adverse impacts to these elk during periods of disbursement?

Competition for forage between elk and cattle occurs to some degree. The percent diet overlap is around 80% for these two species. The fact that both elk herds are at or above herd population objectives would indicate that current levels of livestock use are not negatively affecting the population. In terms of there being available forage for use by both types of animals, this is probably true, but distribution of livestock use will affect where adequate forage is available and where elk have to move in order to find forage. Water development and improved riparian and upland range conditions are also affecting elk distribution and how long they stay in a particular area. The key question is: Should more attention be paid to these changes in elk distribution and use patterns, and how does this reflect back on the management of cattle or other activities in these areas?

Increased human presence on crucial winter ranges has introduced stress to elk, as well as other big game species by pushing the animals off of their preferred winter habitat onto less desirable and less accessible ranges. This is especially true during the late winter months of February and March, and early April, when the animals are weakest and most vulnerable to weather and poor forage conditions. Many people flock to the winter ranges during this period to pick up shed antlers, which can cause big game to move onto adjacent, less desirable habitat. The key question is: How can land management agencies manage the public land users so that negative impacts to wintering big game and their habitats are removed?

The *Iron Mountain Elk Herd Unit* is located in the southern 1/3 of the watershed area. At this time the herd is continuing to increase (WGFD 2005).

The *Laramie Peak/Muddy Mountain Elk Herd Unit* is located in the northern 2/3 of the watershed area. This population has exhibited substantial growth over the last several years, it is currently above objective, and the population is growing (WGFD 2005).

Mule Deer

The issues that relate to mule deer include fence impacts on animal movement, livestock management practices, health of shrub and woodland habitats, and development of private lands. The affect of fences upon mule deer are similar to those described for elk. Mule deer will typically jump over fences; however, there continue to be concerns relating to fence height and the spacing of the top two wires. Young deer may have to pass under or through fences, so that woven wire fences raise the greatest concerns. The affect of development of private lands are similar to those described for antelope.

Livestock management practices that have the greatest effect on mule deer are fencing, type of livestock use, and management impacts to mule deer habitat, particularly to the riparian plant communities. Domestic sheep diets are very similar to mule deer and antelope, so competition for forage can be an important factor. Use by cattle and mule deer primarily overlap in riparian habitat. Spring through fall use of riparian habitat by cattle has degraded the value of these sites for mule deer use, especially the woody plants which are important as forage and cover. The use of best management practices for cattle has improved many of these areas for mule deer. The key questions are: How can these BMPs become the standard operating procedure so that these kinds of issues are no longer present? How can BMPs, such as rotational grazing implemented through the use of pasture fencing, be implemented so as to not cause unacceptable negative impacts to mule deer and other wildlife?

As with elk, increased human presence on crucial winter ranges has introduced stress to mule deer, as well as other big game species by pushing the animals off of their preferred winter habitat onto less desirable and less accessible ranges. This is especially true during the late winter months of February and March, and early April, when the animals are weakest and most vulnerable to weather and poor forage conditions. Many people flock to the winter ranges during this period to pick up shed antlers and cause big game to move onto adjacent, less desirable habitat. The key question is: How can human disturbance to wintering mule deer be minimized or mitigated?

The *South Converse Mule Deer Herd Unit* is located in the northern most portion of the watershed area and only contains an extremely small portion of the watershed area. The population objective of this herd is 16,000 deer. This population declined substantially from 1998 to 2003; however, the population has recently stabilized given recent improved but stabilized fawn production, mild winters, and minimal female harvest. Illegal off-road motorized travel on FS lands has also been a concern for this herd, as well as various influences on these deer such as disease, nutritional availability, predation, and/or increased human presence (WGFD 2005).

The *Laramie Peak Mule Deer Herd Unit* and the *Iron Mountain Mule Deer Herd Unit* were combined into the *Laramie Mountains Mule Deer Herd Unit* in 2004 and is located within the entire watershed area, minus the tiny portion of the South Converse Mule Deer Herd Unit to the

north. The combined herd objective was set at 29,000, and the 2005 population estimate for the Laramie Mountains Mule Deer Herd was approximately 27,500, putting the herd at 5% below the objective. Mild winter conditions two out of the three past years, timely spring and fall precipitation ,and above average fawn production in 2003 and 2005 have helped this herd to increase. There is an abundance of old to decadent age shrub stands throughout southeast Wyoming. This population is somewhat in line with long-term habitat carrying capacity and WGFD model simulations/field observations reflect that this population did not experience any large increases or declines (WGFD 2005).

Whitetail Deer

Whitetail deer are found mostly in valley habitat that occurs predominantly on deeded land. Management practices on public lands have little potential to impact whitetail deer or their preferred habitat. Whitetail deer are considered by most to be a species of secondary importance to mule deer and, in fact, are thought by some to be a threat to healthy mule deer populations where the two species interact. Therefore, issues and key questions regarding whitetail deer in the analysis area center on promoting mule deer habitat and populations over considerations for whitetail deer. How can management actions in the watershed area promote healthy mule deer populations so that they are better equipped to withstand competition from whitetail where interactions occur?

The *Southeast Wyoming White-tailed Deer Herd Unit* is located throughout the watershed area, minus a very small portion of the Central White-tailed Deer Herd unit located on the very north-east of the watershed area. It is difficult to reliably estimate the white-tailed deer numbers in this area. The population decreased in 2001, but began to rebound in 2004 and 2005. This population will continue to fluctuate over time (WGFD 2005).

The *Central White-tailed Deer Herd Unit* is located in the very northern portion of the watershed area. In April 2002, the Central and Thunder Basin white-tailed deer herd units were combined because they shared similar habitat and management characteristics and to facilitate data reporting. There is a management objective of >20 bucks per 100 does postseason in this herd unit. There were adequate white-tailed deer recruitment and survival in 2005. Throughout the vast majority of eastern Wyoming, white-tailed deer rely heavily upon riparian cottonwood groves to meet nutritional and cover requirements throughout the year. The high prevalence rate of CWD is also a concern in this herd unit (WGFD 2005).

Raptors

Raptors are primarily affected by the abundance of their prey species, which will fluctuate annually as a result of habitat and climate conditions. Factors that influence habitat condition and availability include the impacts that may occur from recreation (falconry practices), subdivision development, and livestock management (condition of habitat for food base). The key question is: What types of impacts are affecting raptors and what types of mitigation can be implemented to reduce and or eliminate these impacts?

T&E Species

The issues are closely associated with the health and diversity of habitat types. In general, a healthy ecosystem lends to the survivability and vigor of T&E and BLM State Sensitive species.

The Ute ladies' tresses and Colorado butterfly plant are two plant species that are both located in riparian habitats. These plants are listed as a threatened species and may be impacted by livestock grazing, but grazing may not cause irreversible impacts to the species. The key question is: What locations are most likely to support this plant in order to inventory and determine if it even exists in this watershed? If plant populations are found then further steps in analyzing current and future management practices would occur.

The Preble's meadow jumping mouse occurs in riparian shrub/grass habitat types, marshy areas, and moist meadow grasslands near streams. This species uses mixed shrublands during the spring and summer months and dryer uplands during the winter months. There is a small amount of Critical Habitat located within the southern portion of this watershed in T. 19 N., R. 69-71 W., and T. 18 N., R. 70-71 W., in various sections. The concerns for this species are the issues pertaining to riparian habitat function. The majority of streams located within the watershed are functioning properly (Proper Function Condition or PFC); however, there are some streams (located mostly in the northern portion of the watershed) that are Functioning at Risk (FAR).

The issues relating to black-footed ferrets would be potential impacts to white-tailed prairie dog towns (the major food base and habitat for black-footed ferret) that may occur as a result of any authorized action. In general, livestock management should not impact potential black-footed ferret habitat. The key questions are: Where are impacts to white-tailed prairie dog towns occurring? What affects has plague had on prairie dog populations? Potential causal factors, other than plague, which may negatively impact the prairie dog population include population decline due to drought, unusually heavy rains and runoff causing abandonment of prairie dog towns with the potential for drowning, substantial recreational shooting by organized groups of shooters during March and April (when females are pregnant, or May and June, when pups are totally dependent upon their mothers for substance and are very vulnerable to shooting), and population shifting–immigration or emigration across established prairie dog town boundaries.

The North Platte River threatened and endangered species utilize habitat located in Nebraska along the North Platte River. Factors which may affect these species relate to water depletions in the North Platte River system as a result of implementing proposed projects. A proposed project that may result in water depletion, including evaporative losses, triggers a "may affect" situation and requires a biological assessment to be prepared. Formal consultation with the U.S. Fish and Wildlife Service is required. The key question is: How many projects within this watershed cause a water depletion to the North Platte River system and have these depletions had any affect on local populations?

BLM State Sensitive Species

There are nine mammals, fifteen birds, two plants, and one amphibian that have been identified as BLM state sensitive species and may occur, or have the potential to occur, within this watershed area. The main key issues include the lack of information concerning exact locations of most of these species and the affects that authorized actions may have on these species.

Monitoring has occurred, and will continue to occur, throughout the watershed area for these species. There are numerous questions concerning these species--for example, what affects do vegetation treatments (prescribed burns, chemical treatments), grazing management, recreational activities, private land development, and roads have on these species? What affects do management practices have on other sensitive species located within the watershed?

How much information should be obtained concerning specific species before land management actions are implemented?

Issues relating to riparian health in this watershed center on the health and vigor of the riparian vegetation, specifically of cottonwood trees along the major river systems. Livestock grazing and use may affect tree health and vigor along the river system if there is excessive rubbing and browsing that can damage young trees. Lack of high flow events may reduce the regeneration of young cottonwood trees. The key questions are: What areas on public lands are being used by raptors; is there nesting activity; and if so, how successful are they? What types of impacts are attributable to other land uses and what actions can be implemented to reduce and or eliminate them?

Greater Sage-Grouse

Approximately 18 greater sage-grouse leks and associated nesting habitat occurs within the watershed. However, there are leks bordering the watershed and in close proximity as well. Upland drought reduces the amount and height of vegetative cover, which may lead to lower nesting success and chick survival for the next year. Drought also affects the production of understory forbs, which may have negative impacts to early brood-rearing habitats, specifically from April through June, and is their critical time period. Water sources placed in the uplands may increase cattle use in areas that grouse use for nesting. This may affect grouse nesting success and survival of chicks by further reducing herbaceous cover. Livestock use on some riparian habitats has led to degradation of species, vigor and cover that is important to late season brood-rearing by sage grouse. The key question is: What levels and seasons of use by livestock in upland and riparian habitat are appropriate in conjunction with the needs of sage grouse and other wildlife? Habitat loss from subdivision activities continues (WGFD 2003). Large scale sagebrush treatments may cause negative impacts if located in nesting habitat, but smaller scale sagebrush habitat conversions (less than 200 acres in size) may actually cause beneficial impacts to nesting grouse. Fences constructed next to strutting grounds may also cause negative impacts to grouse by becoming perches for raptors or obstructions to fly into. The other key questions are: What are the cumulative impacts to greater sage-grouse as a result of authorizing actions including livestock management and associated projects (water development, fences, habitat treatments), and recreation activities? What educational programs can BLM become involved in to reduce and or eliminate impacts to grouse within and adjacent to private parcels?

CURRENT CONDITIONS

The following describes the current conditions of wildlife populations and their habitat for those species that inhabit the watershed, or have the potential to use habitats within the watershed.

SPECIES OF INTEREST OR CONCERN

Bighorn Sheep: The *Laramie Peak Bighorn Sheep Herd Unit* occurs throughout the watershed area. Drawing any inference from classifications, harvest, success, and hunter observations on the herd's performance are somewhat difficult. The 2005 sample size contained 31 ewes, 18 rams, and 9 lambs (n=58 sheep) and was down slightly compared to 2004 data of 41 ewes, 16 rams and 7 lambs (n=64 sheep). This was also well below the 2003 aerial classifications of 49 ewes, 49 rams, and 8 lambs (n= 106 sheep). Lamb ratios did increase, but still remains alarmingly low. Distribution was similar to the last two winters with the majority of the sheep

concentrated in the southern 1/3 of the herd unit. There were no confirmed cases of pneumonia in 2005. However, there were several reports of unhealthy looking sheep in the Sybille Canyon and Duck Creek sub-herds. The WGFD harvest data does support a decrease in population when compared to the five-year average. Based on low recruitment and yearling ram ratios it appears that ram numbers are decreasing. There were no proposed changes for the 2006 season. In general, wildlife managers are concentrating management efforts in southeast Wyoming on the Laramie Peak bighorn sheep population (WGFD 2005).

Antelope: The *Iron Mountain Antelope Herd Unit* was estimated at approximately 23,000 pronghorn in 2004. The WGFD will analyze the 2007 line transect data to see if it is consistent with the 2001 or 2004 estimate. The 2005 postseason population estimate of 15,500 antelope was 19% over the objective of 13,000. Below average fawn production from 2000-2002 and liberal doe/fawn seasons most likely brought the population down towards the objective. Based on the 2005 WGFD shrub transect data, habitat conditions did improve when just looking at leader production; however, shrub stands are still old with little nutrient content. Based on shrub data post prescribed fire treatments, it is apparent that these shrub stands benefited substantially when nutrient content, leader, and herbaceous production was analyzed compared to the control areas. Based on increased doe harvest and below average fawn ratios it is plausible that the population is decreasing. The proposed WGFD 2006 season was designed to bring the population closer to the objective of 13,000 (WGFD 2005).

The *Dwyer Antelope Herd Unit* 2005 post-season population estimate was approximately 4,300 antelope, which was about 7% above the objective of 4,000. This population has declined since 1994. Low fawn production has been the main factor in driving the population down. Based on WGFD 2005 shrub transect data, habitat conditions did improve when just looking at leader production; however, shrub stands are still old with little nutrient content. As stated above, it is apparent that theses shrub stands benefited substantially when the WGFD analyzed nutrient content, leader, and herbaceous production compared to control areas. Given the predicted harvest and average fawn production, the 2006 post-season population estimate for this herd was supposed to be around 4,000 pronghorn, putting the herd at objective (WGFD 2005).

The *Medicine Bow Antelope Herd Unit* is one of the largest in the state in terms of area, pronghorn numbers, and harvest. The goal of the population management for the Medicine Bow Pronghorn herd is to reduce pronghorn numbers in order to address habitat concerns. The herd has been near the objective of 60,000 since 2004. Current habitat conditions indicate that this herd needs to be reduced below objective level and likely held there for some time until habitat conditions improve. The harvest needs to be increased significantly just to prevent population growth. It should be noted that this herd provides the only public land pronghorn hunting within the Laramie Region; however, WGFD management for habitat condition in this herd is constrained not only by access to private lands but by the WGFD's goal of maintaining some quality hunting on accessible public lands (WGFD 2005).

Elk: The *Iron Mountain Elk Herd Unit* harvest statistics support field personnel, landowner and hunter observations that the herd is continuing to increase (WGFD 2005).

The *Laramie Peak/Muddy Mountain Elk Herd Unit* has exhibited substantial growth over the last several years, it is currently above objective, and the population is growing. During the WGFD 2004 postseason aerial (helicopter) classification surveys, 4,693 elk were observed and follow-up ground surveys resulted in locating additional elk in areas that were not flown. As a result, a total of 5,330 elk were observed during postseason classification and trend count efforts. Data

from 2000, 2001, and 2003 and harvest statistics support field personnel, landowner, and hunter observations that the herd is continuing to increase (WGFD 2005).

Mule Deer: The *South Converse Mule Deer Herd Unit* is located in the northern most portion of the watershed area and has a population objective of 16,000 deer. This population declined substantially from 1998 to 2003, a result of extremely poor fawn production and recruitment, continued declines in habitat condition and shrub production caused by drought, a harvest regiment designed to reduce the population below objective given such poor habitat conditions, and possibly due to the high prevalence of Chronic Wasting Disease (CWD) in this herd. This population has recently stabilized given recent improved but stabilized fawn production, mild winters, and minimal female harvest. Recruitment has likely been improving in this population over the last five years. Recent high buck ratios may indicate the male segment of this herd is being under-harvested. The continued decline in shrub utilization was likely a result of the decline in the population over the last five years and increased precipitation in the spring of 2005. True mountain mahogany is a vital component of crucial winter ranges in this herd unit. The condition of crucial winter ranges in this area is of great concern, especially in the event of moderate to severe winters. Until widespread habitat rejuvenation is accomplished, either via natural processes or prescription, this mule deer population should be managed near current levels (below objective) to avoid further degradation of crucial winter ranges. The high prevalence rate of CWD is also a concern in this herd unit and may be having adverse impacts on a population-wide scale. Limited hunter access to private and land-locked public lands is a significant management issue for the WGFD in this herd unit. Mountain shrub and aspen communities are in dire need of disturbance to set back plant succession throughout this area, especially on winter ranges. Although spring/summer/fall habitat conditions do not appear to be the primary limiting factor on these lands, the role of various influences on these deer such as disease, nutritional availability, predation, or increased human presence (including off-road travel) is unknown. Illegal off-road motorized travel on USFS lands has also been a concern for this herd (WGFD 2005).

The *Laramie Peak Mule Deer Herd Unit* and the *Iron Mountain Mule Deer Herd Unit* were combined into the *Laramie Mountains Mule Deer Herd Unit* in 2004. The combined herd objective was set at 29,000, based on the sum of the Laramie Peak (15,000) and Iron Mountain (14,000) herd objectives. The 2005 population estimate for the Laramie Mountains Mule Deer Herd was approximately 27,500, putting the herd at 5% below the objective of 29,000. Mild winter conditions two out of the three past years, timely spring and fall precipitation, and above average fawn production in 2003 and 2005 have helped this herd to increase. Southeast Wyoming has been in a moderate to severe drought since 2000. The only relief in these drought conditions was an increase in spring moisture during the spring of 2003 and 2005. Above average growing season moisture helped to increase forage production for lactating does resulting in an increase of post-hunt fawn:doe ratios in 2003 and 2005. Big game animals also went into the winter of 2004/05 and 2005/06 in good condition based on fall body score indices. The winter of 2005/06 was the first in several years were the area experienced severe cold spells and heavy snow. There is an abundance of old to decadent age shrub stands throughout southeast Wyoming. The Laramie Range is the endemic area for chronic wasting disease (CWD), with an average prevalence rate of 18%. Decreased herd productivity and a stable population since 1993 may mean that this population is somewhat in line with long-term habitat carrying capacity. WGFD model simulations and field observations reflect that this population did not experience any large increases or declines (WGFD 2005).

White-tailed Deer: White-tailed deer are also located within specific habitats in this watershed. Their diet is similar to mule deer diets. They prefer areas with hiding cover and higher precipitation sites with forbs, which tend to occur close to the mountains and rims, and along stream drainages and lakes. These deer are usually found associated with coniferous forested areas, deciduous riparian habitats, and agricultural croplands associated with major drainages. There are currently two white-tailed deer herd units located within the watershed area. The herd unit areas are identified as: 1) Southeast Wyoming White-tailed Deer Herd Unit (the largest unit); and 2) Central White-tailed Deer Herd Unit.

The *Southeast Wyoming White-tailed Deer Herd Unit* lack of adequate classification and harvest field check data, combined with limited harvest information and lack of a closed population, prohibits any effort for the WHGD to reliably estimate the white-tailed deer numbers in this area. These limitations reduce the population objective for this herd to minimal or no value. Management is driven primarily by the WGFD personnel perception of population trend and landowner tolerance for this species. Harvest data indicates that the population trend has decreased since 2001, but started to rebound in 2004/05. Outbreaks of epizootic hemorrhagic disease (EHD) occurred in the higher white-tailed deer density areas in 1998, 1999, 2001, and 2003. No outbreaks were identified in 2004-2005. Due to the nature of this disease, where outbreaks occur frequently the population will continue to fluctuate over time. Post-season classifications, anecdotal observations by WGFD personnel, and contacts with landowners and hunters, suggest white-tailed deer numbers are increasing in portions of this herd unit in 2004 and 2005. Southeast Wyoming has been in a moderate to severe drought since 2000. The only relief in these drought conditions was an increase in spring moisture during the spring of 2003 and 2005. Above average growing season moisture helped to increase forage production resulting in an increase of post-hunt fawn:doe ratios in 2003 and 2005. Big game animals also went into the winter of 2004/05 and 2005/06 in good condition based on fall body score indices. Generally, the last three winters have been warmer than normal. The winter of 2005/06 was the first in several years were the area experienced severe cold spells and heavy snow. Harvest statistics and other indicators of trend seem to indicate that this population decreased from 2001-2005. However, from 2003-2005 it appears the population started to rebound based on the average fawn production observed in 2004 and 2005. Low deer densities in this area, lower management priority, the secretive nature of white-tailed deer, and the habitats they occupy, contribute to poor distribution and a low classification sample for this area (WGFD 2005).

Only an extremely small portion of the northern segment of the watershed is located within the *Central White-tailed Deer Herd Unit*. In April 2002, the Central and Thunder Basin white-tailed deer herd units were combined because they shared similar habitat and management characteristics and to facilitate data reporting. Climatic conditions from 2003-2005 were not particularly favorable for white-tailed deer productivity but were generally mild enough to permit adequate white-tailed deer recruitment and survival. Drought conditions prevailed for most of the reporting period, as indicated by below-average precipitation and above-average temperatures recorded during the growing season for the eastern Wyoming. Winters have generally been extremely mild from 2003-2005 and these mild winter conditions are thought to have offset the impacts of drought, resulting in moderate white-tailed deer recruitment and over-winter survival. Drought conditions were particularly bad during the 2004 calendar year. Such dry years are often conducive to outbreaks of Epizootic Hemorrhagic Disease (EHD), which happened in 2001 and 2003, although no substantial outbreaks were documented in 2004. Spring moisture was excellent in 2005, causing vastly improved forage production and somewhat improved fawn production. Throughout the vast majority of eastern Wyoming, white-tailed deer rely heavily upon riparian cottonwood groves to meet nutritional and cover

requirements throughout the year. The high prevalence rate of CWD is also a concern in this herd unit (WGFD 2005).

Raptors

The raptors previously-listed all nest and forage within the watershed. Golden eagles often stay year-long, while other species migrate to warmer climates. Monitoring occurs in some areas of the watershed to determine nest activity and status. Timing stipulations to avoid disturbance during nesting seasons are used on a project specific basis. Most nest sites are found on natural substrates; however, artificial nests are used to mitigate conflicts between human activities and nest locations by ferruginous hawks and golden eagles.

Threatened, Endangered, Proposed, and Candidate Species

The following paragraphs describe the current status of threatened, endangered, proposed, and candidate species that may occur, or have the potential to occur within this watershed. Species may use portions of the watershed during their entire life cycle or portions of their life cycle.

Ute Ladies' Tresses: The Ute ladies' tresses plant is currently considered a threatened species under the ESA of 1973. Although the model shows this plant in the Casper Field Office area, which is to the east of this watershed, the FWS still recognizes the potential for this plant to occur in this watershed.

Colorado Butterfly Plant: The Colorado butterfly plant is currently considered a threatened species under the ESA of 1973. At this time, there are no known populations located within the watershed; however, the model for the plant shows a low to medium potential for existence in T. 21 and 22 N., R. 68-71 W., in various sections, and in T. 19 N., R. 67-70 W., in various sections, within this watershed.

Preble's Meadow Jumping Mouse: The Preble's meadow jumping mouse is currently considered a threatened species under the ESA of 1973. This species has the potential to use mixed shrublands during the spring and summer months and dryer uplands during the winter months within this watershed. In addition, there is Critical Habitat located within the southern portion of this watershed in T. 19 N., R. 69-71 W., and T. 18 N., R. 70-71 W., in various sections.

Black-Footed Ferret: The black-footed ferret is currently considered a "non-essential experimental population" within this watershed. Under this designation, on BLM lands the ferret is protected as a "proposed" species rather than an "endangered" species. With this designation, many Section 9 prohibitions are waived and management of the species is allowed much greater flexibility.

North Platte River Species: The North Platte River species include the currently-endangered interior least tern, pallid sturgeon, whooping crane, and the threatened piping plover, Western prairie fringed orchid, and American burying beetle. Although these species are not located within the watershed, any proposed projects leading to water depletion within the North Platte River ecosystem must currently evaluate impacts to these downstream species.

BLM State Sensitive Species

There are nine sensitive mammals, fifteen sensitive bird species, and two sensitive plant species that have the potential to occur within this watershed. These species may use portions of the watershed during their entire life cycle or portions of their life cycle. The BLM will evaluate potential impacts to these species as a result of implementing proposed projects and will implement BMPs to reduce and/or eliminate these impacts during and after construction and use of the project.

REFERENCE CONDITIONS

There are several historical accounts that have described wildlife species that were present within the watershed area during different eras. The following are descriptions that were recorded by individuals or groups that traversed or lived in the watershed in historic times. Immediately following are historical descriptions of the area that were compiled by different authors. These excerpts include descriptions of the landscape and some of the wildlife that were present at that time:

For the Laramie Plains, Medicine Bow Mountains, Elk Mountain Area, William H Ashley, a St. Louis fur trader, entered the Laramie Plains in March of 1825. As he proceeded north and west around the Medicine Bows he commented that, “I was delighted with the variegated scenery presented by the valleys and mountains, which were enlivened by innumerable herds of buffalo, antelope, and mountain sheep grazing on them, and what added no small degree of interest to the whole scene, were the many small streams issuing from the mountains, bordered with a thin growth of small willows and richly stocked with beaver” (Dorn 1986).

Daniel Kinnaman wrote about the Laramie River area and the Laramie Mountains, which some people called the Black Hills in the mid-1800s: “The Laramie River, Little Laramie River, Rock Creek, Medicine Bow River, and the North Platte River had to be crossed by wagon trains and stagecoaches. These water courses in May and June would be overflowing with the spring melt-off, and were a major obstacle to travel. During the rest of the year the water was low and fordable or frozen, and could be crossed on the ice.” (Kinnaman 1996).

He was the first to mention that the area from Bridger Pass to rock Creek was a favorite campground for the numerous war-parties which annually meet in this region to hunt buffalo and one another. ”This area is south-west of the watershed, but still within the vicinity.” (Kinnaman 1996).

“The trappers entered the Laramie Plains on September 21, 1839 and proceeded up the Laramie River and crossed the North platte River two days later, observing 2000 buffalo that day.” “…in June 1844…description of the Laramie Plains. He wrote that buffalo abounded and that they killed one each day. One grizzly bear was encountered in one instance, and a female grizzly and two cubs in another.” (Kinnaman 1996)

“He was with a hunting expedition and remarked on the abundance of elk at the junction of the North Platte and Medicine Bow Rivers. He also saw signs of bear and beaver. Sage described a “mountain fowl” (sage chicken) which was found in great abundance.” (Kinnaman 1996).

SYNTHESIS AND INTERPRETATION

Livestock impacts, although still present, have been reduced, and range conditions on upland and riparian habitats are improving in most areas (USDI-BLM 2002). Antelope, elk, mule deer, and bighorn sheep are generally thriving, and Wyoming has the largest population of greater sage-grouse in the country, although the majority of these species are located to the west of this watershed. Development in Wyoming in this watershed has not occurred at the rate that it has in other parts of the state and/or in other states; thereby reducing the habitat loss and fragmentation. Native plant species are still present; weeds, although present in some areas, have not taken over large areas of the range. Impacts from off-highway vehicle use and loss of or modification to habitats from developments on private land in mixed land ownership areas continue to increase (USDI-BLM 2002). The lack of fire has led to a predominance of mature to decadent shrubs and conifer species in some areas. The following analyzes specific habitat conditions within the watershed and the effects these may have on wildlife species.

SPECIES OF INTEREST OR CONCERN

Bighorn Sheep

Prior to the arrival of eastern white settlers, it is apparent that bighorn sheep were common across the Rocky Mountain west, including this watershed area. Trends in bighorn sheep populations across the analysis area that can be influenced by federal vegetation and land management decisions and actions are limited to habitat quality and interactions with domestic livestock. Because of the relative lack of domestic sheep preference within the watershed, direct livestock interactions with wild sheep are not the highest concern at this time, at least on BLM-administered public lands. Requests for conversions of cattle preference to sheep use should be addressed on a case-by-case basis in the watershed, but will be directed overall by national Bureau policy towards domestic/wild sheep interactions. Habitat management and manipulations, which affect sheep, would be similar to those which would affect mule deer and elk in the watershed. The use of vegetative treatments or natural fire to promote a diverse mixture of species, age classes, and structure would benefit bighorn sheep populations. Mechanical treatments can be utilized in order to reverse negative trends and impacts to habitat from encroachment of coniferous species and mountain pine beetle epidemics over time. Analysis of the amount, timing, and location of various treatments will be important to ensure that treatments are beneficial, or, at worst, benign towards resident wild sheep populations and habitat. The use of BMPs would improve riparian and upland shrub and herbaceous species important to bighorn sheep.

There are three riparian areas within the bighorn sheep crucial winter range habitats out of approximately 29 riparian areas within this habitat type that are functioning at risk with either a downward trend or an unknown trend. Therefore, approximately 10% of the riparian habit within the crucial winter range is functioning at risk; however, 90% of the riparian areas are PFC within the crucial winter range. These riparian areas include Yankee Draw (CU Ranch Inc. Allotment), Seller Springs (Sellers Mountain Allotment), and a spring off of the Sybille Creek (Poe Mountain-Canyon Creek Allotment). Although these riparian areas may not be functioning at this time at PFC, there should not be any overall negative impacts to bighorn sheep as a result of these conditions. In addition, this is a very small percentage of the riparian habitat that is not in optimum condition compared to the other riparian areas that are in good condition.

Antelope

The presence of antelope in Wyoming was noted by all of the early explorers and emigrants that moved to or across the state. Antelope are still the most visible and abundant big game species in this area, due to open expanses of the sagebrush and sagebrush-grass dominated landscape. The health of Wyoming big sagebrush communities that antelope depend upon is generally good. High cover and density of shrubs that limit the under-story species is only observed at higher elevations and precipitation. There appears to be a good mix of winter, summer, and transitional habitat to support objective levels of antelope; however, current populations are above objective for this area. Antelope, being the smallest of the big game species, are probably more susceptible to die-offs during severe winters. However, their reproductive capacity also allows them to respond more quickly after such events to repopulate their habitat.

The presence of woven wire fencing and its effect in hindering or altering antelope movement is the most important issue needing to be addressed. Research conducted in the early 1980's in the Red Desert antelope herd unit showed that woven wire fences were a significant impediment to antelope movement during severe winter weather. Modification of fence corners and other key locations should continue to be part of the annual goals and accomplishments of the Rawlins Field Office, in order to address this issue.

Private land that is developed into home sites could pose impacts, at an incremental rate, on antelope habitat and movement in broken land ownership areas. Informing people about the potential impact to wildlife of these actions may help address this situation, or on a broader scale, exchanging lands to block up public land to maintain wildlife habitat should be pursued.

Livestock management affects antelope in a number of ways in addition to fencing. Sheep compete with antelope for forage; however, sheep use only makes up only 10% of all livestock use currently occurring in the Rawlins Field Office management area, so this issue is not as important as it would have been 50 years ago. Water development also can affect antelope. The creation of new sources of water has allowed antelope to expand their use into areas that formerly did not have reliable water. On summer range this is a benefit, but increasing seasonal use on winter range may have a negative affect on the vegetative resource. In these latter areas, the use of controllable facilities, like wells, is preferred in order to discourage year-long use of winter range by antelope. The problem of livestock water being turned off when wildlife use is still needed should be addressed on a case-by-case basis. This may vary depending on the climatic conditions experienced each year, what other water sources are available, and whether animals can move to water sources in other pastures or allotments. BLM-sponsored water projects, developed for wildlife, that are in disrepair should be maintained or removed. Interest groups or individuals may be willing to voluntarily oversee and maintain these types of projects.

The Wyoming big sagebrush habitat that antelope depend upon as their principle habitat and forage source is stable and long-lived. While plant succession in this community type is relatively slow, it is occurring and changing over time. For antelope, greater sage-grouse, and other sagebrush obligate species, it is important to maintain healthy stands of big sagebrush, with a diverse mixture of grasses, forbs and shrubs. The use of prescribed fire, natural fire, or chemical treatments and their respective effects in this plant community are currently being studied in this watershed to try and answer some of the questions and improve future management.

There is only one riparian area within the antelope crucial winter range habitats out of approximately six riparian areas within this habitat type that are functioning at risk with either a downward trend or an unknown trend. Therefore, approximately 17% of the riparian habit within the crucial winter range is functioning at risk; however, 83% of the riparian areas are PFC within the crucial winter range. This riparian area includes a spring off of the Sybille Creek (Poe Mountain-Canyon Creek Allotment). Although this riparian area may not be functioning at PFC at this time, there should be no overall negative impacts to antelope as a result of this condition. In addition, this is a very small percentage of the riparian habitat that is not in optimum condition compared to the other riparian areas that are in good condition.

Elk

Prior to the arrival of white men, elk were common plains inhabitants and probably competed with bison for forage and space. At this time, elk are doing well across Wyoming and this watershed area follows a similar trend. Herd units have current populations that exceed population objectives and growth of the herds continues. This would indicate that elk are thriving, have good reproductive rates and survival rates, and have the habitat to support them. In general, there are no significant problems with any winter or summer ranges that elk utilize. Drier conditions than average may have lowered calf survival rates. Although diet overlap is high between elk and cattle, there appears to be enough forage to provide for the needs of both at current levels of use. As BMPs for cattle continue to be implemented or improved, forage production and availability for elk should be increased. The practice of leaving gates open in pasture fences when they are not needed should be promoted. In many cases this simple idea could help wildlife passage, especially during severe conditions.

In addition to fences and livestock management, these elk herds are affected by the increasing age and decadence of shrub and woodland communities, especially on crucial winter ranges. The loss of aspen habitat for cover and forage, especially later in the summer when forage in other areas has dried up, has negative impacts on elk. Water developments, improved livestock management, and vegetative treatments could all help improve the habitat for and distribution of elk in this watershed.

There is one riparian areas within the elk crucial winter range habitats out of approximately 19 riparian areas within this habitat type that are functioning at risk with either a downward trend or an unknown trend. Therefore, approximately 5% of the riparian habit within the crucial winter range is functioning at risk; however, 95% of the riparian areas are PFC within the crucial winter range. This riparian area includes the Yankee Draw (CU Ranch Inc. Allotment). Although these riparian areas may not be functioning at PFC at this time, there should be no overall negative impacts to elk as a result of these conditions. In addition, this is a very small percentage of the riparian habitat that is not in optimum condition compared to the other riparian areas that are in good condition.

Mule Deer

Historically, mule deer were common in this watershed and are still common today; however, the herd numbers within this watershed are currently at or below objective. Trends in mule deer populations may be highly affected by conditions on crucial winter ranges. Poor fawn crops and die-offs during severe winter weather are climate related factors that cannot be altered, but habitat and forage for mule deer are the factors that can be manipulated by land managers. The dominance of mature to decadent mountain shrub communities is also affecting mule deer.

The use of vegetative treatments or natural fire to promote a diverse mixture of species, age classes, and structure would also benefit mule deer populations. Riparian habitat is primarily influenced by cattle grazing. Use of best management practices would improve shrub and herbaceous species important to mule deer.

Development of private lands continues to slowly reduce the available winter range available to mule deer. Fences also impose barriers to mule deer in transition areas, especially during severe weather and also to fawns during the spring and early summer months.

There are two riparian areas within the mule deer crucial winter range habitats out of approximately 48 riparian areas within this habitat type that are functioning at risk with either a downward trend or an unknown trend. Therefore, approximately 4% of the riparian habit within the crucial winter range is functioning at risk; however, 96% of the riparian areas are PFC within the crucial winter range. These riparian areas include a spring off of the Sybille Creek (Poe Mountain-Canyon Creek Allotment) and Spring Creek Seep (Iron Mountain Allotment). Although these riparian areas may not be functioning at PFC at this time, there should be no overall negative impacts to mule deer as a result of these conditions. In addition, this is a very small percentage of the riparian habitat that is not in optimum condition compared to the other riparian areas that are in good condition.

Whitetail Deer

Whitetail deer in the watershed are not noted as a high priority species within the assessment area and their presence may, in fact, be detrimental to mule deer which are of higher priority. At this time, there are no identified habitat management practices that would be considered solely for the management of whitetail deer. The use of BMPs for grazing management would continue to improve riparian and upland conditions and shrub and herbaceous species important to whitetail deer.

Raptors

Raptors are primarily affected by climate (indirect affects on prey species) and human activities around nesting and perching areas. Ferruginous hawks and, to a lesser extent golden eagles, will sometimes nest on or near man-made structures such as windmills and old corrals buildings; or in areas with high levels of activity. Artificial nests are used to draw the birds away from these sites so that human activities do not force the abandonment of active nest sites. These artificial nests have also been documented to be more productive in terms of the number of birds fledged per nest compared to natural sites. Within the Rawlins Field Office management area, there are currently 101 artificial nest sites, with about 50% being actively used; however, the majority of these nests are located to the west of this watershed. The BLM has a timing stipulation for raptors attached to any proposed project that is located within ¾ to one mile (depending on each species) from any nest, which prohibits surface disturbing and other activities from occurring between February 1 and July 31. In addition, the Bald Eagle and Golden Eagle Protection Act, 16 U.S.C. 668, prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald or golden eagles or their body parts, nests, or eggs, which includes collection, molestation, disturbance, or killing. The bald eagle, ferruginous hawk, northern goshawk and burrowing owl are BLM-State Sensitive species that have the potential to occur within this watershed.

Threatened, Endangered, Proposed, and Candidate Species

The threatened, endangered, candidate, and proposed species that have the potential to occur within this watershed include the Ute ladies' tresses (threatened); Colorado butterfly plant (threatened), Preble's meadow jumping mouse (threatened)and black-footed ferret ("nonessential-experimental" population – proposed). The North Platte River species (least tern, pallid sturgeon, piping plover, whooping crane, Western prairie fringed orchid, and American burying beetle) are not actually physically located within this watershed; however, water depletions that occur within the North Platte River system, and within this watershed, may cause an impact to these downriver species. The BLM wildlife biologists complete informal and/or formal conferencing and/or consultation with the Service for all proposed projects that may contain habitat, or the species themselves, to avoid adverse impacts to threatened, endangered, candidate, and proposed species.

The model does show that Ute ladies' tresses plant has the potential to be located in the Casper Field Office area, which is to the east of this watershed. In addition, the USFWS recognizes the potential for this plant to occur in this watershed. The only known locations of the Ute ladies' tresses within the State of Wyoming are located in Converse, Goshen, Laramie, and Niobrara counties at elevations between 5,000 and 6,000 feet; however, this plant has the potential to occur in riparian habitat within this watershed. Site-specific field investigations occur for all projects; therefore, these projects will be surveyed for the Ute ladies' within or near riparian habitat.

At this time, there are no known populations of the Colorado butterfly plant located within the watershed; however, the model for the plant shows a low to medium potential for existence in T. 21 and 22 N., R. 68-71 W., in various sections, and in T. 19 N., R. 67-70 W., in various sections within this watershed. Site-specific field investigations occur for all projects; therefore, these projects will be surveyed for the Colorado butterfly plant within or near riparian habitat.

The Preble's meadow jumping mouse has the potential to use mixed shrublands during the spring and summer months and dryer uplands during the winter months within this watershed. In addition, there is Critical Habitat located within the southern portion of this watershed in T. 19 N., R. 69-71 W., and T. 18 N., R. 70-71 W., in various sections. Site-specific field investigations occur for all projects; therefore, these projects will be surveyed for the Preble's meadow jumping mouse within or near riparian habitat, as well as identified upland habitat areas. Critical Habitat will be analyzed if proposed projects are identified within this habitat type.

The black-footed ferret does occur within the watershed as a non-essential experimental population. There are no known or expected occurrences of the ferrets outside of the area managed for the experimental population. Because ferrets inhabit prairie dog towns, these sites are identified and delineated over broad areas or on a site-specific project basis. All proposed projects have a field site investigation completed prior to disturbance to determine if suitable habitat for the ferret exists. Projects are located outside of suitable habitat or black-footed ferret surveys are completed to determine the presence or absence of ferrets. The BLM biologists informally or formally consult with the Service when black-footed ferret surveys are completed.

The North Platte River species include the currently endangered interior least tern, pallid sturgeon, whooping crane and the threatened piping plover, Western prairie fringed orchid, and American burying beetle. Although these species are not located within the watershed, any

proposed projects leading to water depletion within the North Platte River ecosystem must currently evaluate impacts to these downstream species.

BLM State Sensitive Species

Mammals: The nine sensitive mammals that have the potential to occur within the watershed in a diversity of habitats types include: the long-eared myotis, fringed myotis, spotted bat, Townsend's big-eared bat, pygmy rabbit, white-tailed prairie dog, black-tailed prairie dog, Wyoming pocket gopher, and the swift fox. Habitat loss and/or degradation are more difficult to measure and mitigate for these sensitive mammal species. Project proponents are encouraged to move the projects outside of habitat for wildlife protection. For example, projects are generally moved outside of existing white-tailed prairie dog towns, not only for the protection of the prairie dogs themselves, but for the protection of other species such as the mountain plover and burrowing owl that depend on the prairie dog town ecosystem. The swift fox may travel through the watershed and should not be impacted by proposed projects that occur as a result of implementing BLM-authorized actions. A field site investigation is completed for all proposed projects and the BLM-State Sensitive plant species can be monitored at that time, and/or their likelihood of occurring should be noted in the event that additional field site investigations are required.

Birds: The fifteen sensitive bird species that have the potential to occur within the watershed include: the bald eagle, white-faced ibis, trumpeter swan, northern goshawk, ferruginous hawk, mountain plover, peregrine falcon, greater sage-grouse, long-billed curlew, burrowing owl, sage thrasher, loggerhead shrike, Brewer's sparrow, sage sparrow, and Baird's sparrow. The bald eagle, northern goshawk, ferruginous hawk, burrowing owl, and greater sage-grouse are described below.

Bald Eagle: The current status of the bald eagle is no longer threatened, but this species is considered a BLM sensitive species. Bald eagles are found in conifer, cottonwood-riparian, and river ecosystems. They feed mainly on fish, but will also eat carrion and some small mammals. At this time there are no known bald eagle nests located within the watershed area; however, the potential exist for these birds to nest within and/or use the habitat within this watershed.

Northern Goshawk: The northern goshawk inhabits deep woods with mostly conifers. These hawks feed on birds by catching them in the air, and feed on mammals by swooping down on them. They eat medium size birds and mammals such as grouse and squirrels.

Ferruginous Hawk: The ferruginous hawk inhabits arid open land and grasslands. This hawk feeds by swooping down on prey from the air. They eat mostly small mammals such as Wyoming ground squirrels and prairie dogs, and occasionally take rabbits, and birds.

Burrowing Owl: The burrowing owl inhabits open plains, grasslands, and desert scrub. These owls eat insects, scorpions, crayfish, mice, ground squirrels, young prairie dogs, rabbits, amphibians, snakes, and rarely birds.

Greater Sage-Grouse: Greater sage-grouse (sage grouse) occur within this watershed, specifically within the western and southern portion of this area (Picture 4.7). Sage grouse populations have exhibited long-term declines throughout North America, with a 33% decline over the past 30 to 40 years. No one causal factor has been identified for these declines. Wyoming supports the largest populations of grouse, more than all the other states combined;

however, there are population declines occurring in Wyoming as well. Sage grouse are a sagebrush obligate species and each aspect of their life cycle requires slightly different elements within the sagebrush communities. Grass height and cover play an important role in the nesting success of sage grouse. Early brood rearing habitats exist within this watershed and consist of relatively open stands of sagebrush or narrow, shrub-free stringers of meadows in draws or other areas with somewhat more soil moisture. Sagebrush, sometimes dense, often has invaded the latter habitats, thus making them less desirable or unsuited for brood habitat (Klebenow, D.A. 1972). During the summer months, grouse move to more mesic sites seeking succulent forbs. Movements to winter ranges are slow and meandering and occur from late August to December. There are wintering areas located within this watershed and during the winter months, grouse feed almost exclusively on sagebrush leaves (USDI-BLM 2002). There are 18 known sage grouse leks located within the watershed boundary and several more leks located adjacent to the watershed border.

Plants: The two sensitive plant species that have the potential to occur within this watershed include the Laramie False Sage and the Laramie Columbine. The Laramie False Sage plant is endemic to southeastern Wyoming and grows in cushion plant communities on rocky limestone ridges and gentle slopes. This plant occurs at 7500 feet to 8600 feet. The flowering and fruiting period for this plant is May through August. The Laramie Columbine plant is endemic to the Laramie Range and grows in crevices of granite boulders and cliffs. This plant occurs at elevations of 6,400 feet to 8,000 feet. The flowering and fruiting period for this plant is June through August (Fertig et al, 1994).

Specific protection measures for BLM-State Sensitive Species, other than those required for raptors, mountain plover and greater sage-grouse, have not been identified in the RFO management area. The Migratory Bird Treaty Act, 16 U.S.C. 703, enacted in 1918, prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations and does not require intent to be proven. This Act and its regulations should protect the white-faced ibis, long-billed curlew, sage thrasher, loggerhead shrike, Brewer's sparrow, sage sparrow, and Baird's sparrow from actual destruction of the nests and or the bird itself. Habitat loss and/or degradation are more difficult to measure and mitigate for these species.

RECOMMENDATIONS

Habitat needed to support healthy wildlife populations and listed or proposed threatened and endangered species is generally in good condition. This does not mean that there are no problems or concerns about wildlife habitat. The discussion under Standard 2 – Wetland/Riparian Health and Standard 3 – Upland Plant Health outlines the current conditions and recommendations for improving management of these resources. Although an area may meet a standard, it still may not be at our "desired or future" condition. On the other hand, our composition of native species is good, with some weed problems at this time. Due to the existing good condition of native vegetation and its ability to support the diverse wildlife populations we currently residing in the watershed, it is determined that the majority of the watershed assessment area is meeting Standard 4 with respect to wildlife. The following recommendations address actions to address deficiencies identified, as well as to help meet future desired resource conditions in other habitat throughout the assessment area.

- Implement recommendations described for Standards 2 and 3. Improving the health of riparian/wetland and upland plant communities will help meet the needs of all wildlife, which use this watershed.

SPECIES OF INTEREST OR CONCERN

- **Bighorn Sheep, Antelope, Elk, Mule Deer, and White-tailed Deer:** management actions within the watershed will emphasize improvement of these habitat types as one of the primary considerations. An area specific assessment of this region should be considered in order to determine what management actions may be necessary to move this habitat towards the standard for healthy wildlife habitat. Cooperative management actions should be implemented involving livestock permittees, the BLM, and the WGFD in order to coordinate benefits to multiple public lands resource uses.

- Throughout the assessment area, continue to modify existing woven wire fences and older cattle-type fences to meet BLM standards. This should be accomplished in key locations in the short-term, while working towards all fences in the long-term. Cooperative efforts should be pursued with grazing permittees, WGFD, and conservation districts. When possible, relocate or remove fences to reduce impacts to wildlife movements. Encourage livestock permittees to leave gates open through as much of the fall through spring seasons and/or when not needed, in order to help wildlife move between seasonal ranges. Documentation of locations where fences are affecting big game movements should continue. Construct new fences to BLM standards for controlling livestock in habitat occupied by the affected big game. New fence locations should attempt to avoid highly traveled concentration areas or migration paths. If avoidance is not possible, management practices such as sections of let-down, drop panels, or pole-tops should be incorporated into fence designs to facilitate wildlife passage.

- Management plans should consider other grazers, such as wildlife in making recommendations and to properly assess impacts. Water developments should benefit as many species as possible, and should consider sustaining water in the summer, even after livestock have been moved. In winter ranges, projects should be controllable (ephemeral) in nature, to not encourage year-round wildlife use. Isolated water sources and associated riparian habitat should be protected and managed to meet the needs of wildlife. Monitoring information, particularly trend data for big game crucial winter range, should be coordinated with the WGFD for use in evaluating and changing herd objective levels.

- Continue to implement vegetative treatments in shrub and woodland habitats to improve the diversity of cover, species, age-class, vertical structure, and mosaic mix of plant communities. Management efforts should also emphasize the use of naturally ignited fires to benefit resource values in accordance to preplanned conditions and objectives outlined in a Wildland Fire Implementation Plan. Monitor the effects for all treatment projects, to document and analyze results and improve future prescriptions to achieve management objectives. Utilize habitat recommendations for greater sage-grouse and other species where available in both assessing and planning habitat treatments. Begin to implement mechanical treatments to a greater extent where prescribed burns or chemical treatments are impractical, in order to stimulate native, desirable, or obligate species and remove late seral increaser species such as juniper in riparian systems and aspen woodlands. Begin to implement mechanical treatments in other upland woodland types where increaser species have established and/or become dominant. Encourage the development of interagency long-term habitat treatment plans (WGFD 2004a). Coordinate vegetation treatments in critical wildlife habitat with the WGFD so that the

determination can be made to change herd objective levels if significant amounts of habitat are temporarily modified, and critical forage is reduced in the short-term.

- Evaluate the need and institute measures where necessary to reduce disturbance to big game species on crucial winter ranges, or other habitat areas where needed. This could involve seasonal closures of roads, seasonal closures of habitat for antler collecting, general off-highway vehicle use, and other activities. Private landowners should be encouraged to leave their lands unfenced, or use fence designs that are compatible with big game movements (WGFD 2004b).

Bighorn Sheep

- Management actions within this habitat should stress the improvement of uplands and riparian habitats in this area for the benefit of the overall vegetation component, rather than species-specific objectives. Analysis of management actions in this area should determine the best course of action which will not negatively affect bighorn sheep or their habitat within the area to the benefit of any other wildlife use. Cheatgrass treatment should be considered throughout the area where possible, by the best, most practical methods available to the manager at the time. Any management actions considered for vegetation, watershed, or riparian enhancement in this area should be analyzed to ensure that cheatgrass infestations are not spread to new areas within and outside of this habitat as a result. BMPs for livestock grazing should be considered for this area, with the primary objective of riparian habitat enhancement, which is the resource most impacted by current grazing practices (refer to Standard 2 – Riparian/Wetlands.). The use of BMPs and specific management recommendations outlined previously for elk, mule deer, antelope, and other species will also benefit bighorn sheep in this area and should be implemented where possible.

- Mixed mountain shrub habitat within this seasonal habitat should be considered for treatment in order to enhance the health of the vegetation overall in the area, and the methods employed (specific to the treatment) should be designed so that importance is placed on objectives which emphasize benefits to bighorn sheep habitat (i.e., maximize mosaics, enhance edge effect, enhance herbaceous and bitterbrush production following treatment, etc.). Additionally, mechanical treatments which enhance riparian and upland woodlands by creating a more natural, early seral vegetation community dominated by desirable shrubs and aspen should be stressed.

Raptors

- The BLM should continue to use the seasonal restriction stipulation for breeding and nesting raptors which prohibits construction and other activities from occurring between February 1 and July 31. The BLM should continue to use the seasonal restriction stipulation for identified raptor winter habitat areas which prohibits construction and other activities from occurring between November 15 and April 30. In addition, the BLM should continue to use the 825 foot (1,200 feet for ferruginous hawks) Controlled Surface Use management action to reduce impacts to nesting raptors. Monitoring efforts should continue, in order to determine the activity status of known raptor nests and to identify new nest locations.

THREATENED, ENDANGERED, PROPOSED, AND CANDIDATE SPECIES

- **Ute Ladies' Tresses, Colorado butterfly plant, Preble's meadow jumping mouse, and black-footed ferret:** The BLM should continue to complete informal and/or formal consultation with the Service for any proposed project that may be constructed within these species known and/or potential habitat. Identified stipulations will be attached to all projects to avoid adverse impacts to the species.

- **North Platte River Species: least tern, pallid sturgeon, piping plover, whooping crane, Western prairie fringed orchid, and American burying beetle:** The BLM should continue to identify any proposed project that may cause depletions within the North Platte River system and should initiate formal consultation with the Service for each proposed project. Projects should not be implemented until after formal consultation has been completed.

BLM State Sensitive Species

- There are nine mammals: long-eared myotis, fringed myotis, spotted bat, Townsend's big-eared bat, pygmy rabbit, white-tailed prairie dog, black-tailed prairie dog, Wyoming pocket gopher, swift fox; fifteen bird species: bald eagle, white-faced ibis, trumpeter swan, northern goshawk, ferruginous hawk, mountain plover, peregrine falcon, greater sage-grouse, long-billed curlew, burrowing owl, sage thrasher, loggerhead shrike, Brewer's sparrow, sage sparrow, and Baird's sparrow; and two plant species: Laramie False Sage and the Laramie Columbine that have the potential to occur within this watershed. The BLM should continue to assess potential and/or known impacts that may occur to these species and/or their associated habitat for any proposed project that may be constructed within these species known and/or potential habitat. Identified stipulations will be attached to all projects to avoid adverse impacts to the species.

FISHERIES

CHARACTERIZATION

Regionally or Locally Important Recreational Fisheries

Recreational fisheries within the assessment area that include significant portions of BLM-administered lands include Wheatland Reservoirs #2 and #3, Laramie River, and North Laramie River. Other streams of importance within the analysis area include Johnson Creek, Sybille Creek, Middle Sybile Creek, Mille Creek, Bluegrass Creek, and Duck Creek. Several smaller streams and impoundments support fish populations as well. These fisheries afford the opportunity to catch several salmonid species (i.e., trout), including brown trout, rainbow trout, and brook trout. The fisheries represent a somewhat limited yet important resource in this arid region of Wyoming. As such, these areas receive significant use within the assessment area and are therefore a priority for the BLM and cooperating agencies.

ISSUES AND KEY QUESTIONS

Vegetation Management

The potential impacts of livestock grazing on stream processes and fish habitats have been well documented (Armour et al. 1991, White 1996, Rinne 1999). They include the loss of stabilizing riparian vegetation which can lead to stream instability and an associated loss of habitat complexity, the loss of shading vegetation which can lead to elevated stream temperatures, increased sediment delivery, and loss of stream channel complexity provided by fluvial processes and woody debris.

The importance of landscape-scale disturbances resulting from either wildfire or prescribed fires to aquatic species and riparian ecosystems has recently received additional attention (Bisson et al. 2003). Natural disturbance regimes maintain the diversity of riparian ecosystems (Naiman et al. 1993). These disturbances can include fire and fire-related flooding, debris flows and landslides (Dwire and Kauffman 2003). These types of disturbance events can affect aquatic ecosystems by altering channel complexity and stream productivity.

As in many areas of the western United States, fire activity within the analysis area has been suppressed from the landscape. This can result in an older age class of riparian vegetation that lacks age diversity and can also promote conifer encroachment in riparian areas. Conifer encroachment can eventually shade out woody riparian species such as willow, cottonwood, water birch, alder, and dogwood, resulting in decreased riparian plant diversity and lowering the water table. Shading can also reduce or eliminate aspen stands which decreases suitable beaver habitat.

Beaver Habitat

Beaver activity can have several benefits to aquatic ecosystems including elevated water tables that enhance riparian vegetation, reduction of stream water velocities that reduce erosional forces, stabilization of stream flows throughout the summer and droughts, improvement of fish habitats, and improvement of terrestrial wildlife habitats (Olsen and Hubert 1994). The historic distribution of beaver colonies throughout the assessment area is unknown, but was likely correlated to areas containing healthy communities of willow or aspen. Limited availability of aspen and willow in the majority of the assessment area is thought to currently limit the suitability of the area for beaver colonization. This loss of woody vegetation can be related to many causes including livestock grazing, herbicide spraying, conifer encroachment, fire suppression, and wildlife grazing. A negative feedback mechanism often exists between the loss of woody vegetation and the water table of riparian systems. As woody vegetation is lost, the stream channel can become unstable and begin to actively incise. As this incision proceeds, the water table can be lowered and result in a reduction in the amount and area of woody vegetation available for beaver use.

Energy Development

Energy development activities are currently limited throughout the assessment area and are not believed to significantly affect fish habitats. Future energy development will be monitored for influential impact on system fisheries and habitat.

Transportation and Access Planning

Roads can affect fish populations through fragmentation of habitats at road crossings, concentration of overland flow which can result in stream channel adjustments, and increased sediment delivery. Fragmentation of stream habitats can limit access to habitat features that are required by stream fishes. Stream fishes require habitats for spawning, rearing, feeding, and refuge from environmental extremes (Schlosser and Angermeier 1995). The spatial distribution of these required habitats can necessitate the seasonal movement of fishes among habitats. If barriers to movement are present, such as those caused by improperly designed road crossings, fish may not have access to all of the habitats necessary to fulfill their life history requirements. Additionally, barriers can interrupt meta-population dynamics that allow for the recolonization of habitats that have experienced local extirpations.

Roads can also concentrate overland flow. This concentration of flow may generate greater water velocities that are foreign to the stream channel. The stream channel can, in turn, adjust to these increased velocities by changing its geometry through erosional processes such as channel incision.

Additional impacts of roads on fish communities are associated with increased sedimentation. The concentration of overland flow and increased rill and gully erosion associated with roads can affect required fish habitats by introducing sediment into the stream channel. Excessive sediment delivery can negatively affect aquatic physical habitat by filling in pools. Pools are important because they provide critical resting, feeding, and overwintering habitat for fish and many other aquatic species. Increased sediment delivery to the stream can also lead to the embedding of stream gravels. Some stream fishes, such as trout species, require clean gravels for successful reproduction. Clean gravels are also necessary for macroinvertebrate production - a key food source for many stream fishes. Excess sediment delivery can also affect stream channels by altering stream width/depth ratios. Over time, excess sediment delivery can increase stream width and reduce stream depth. This process can result in elevated water temperatures, reduced spatial habitat, and altered stream channel morphology.

Public access to popular recreational fisheries is limited in portions of the analysis area because of private land holdings or limited road access. BLM lands in the analysis area tend to consist of highly fragmented portions where road access to suitable fishing locations is very limited. Public demand for access to recreational fisheries continues to increase within the watershed. Though the pursuit of additional access points has remained a priority, additional interest in private land easements or acquisition of access through land trades is needed to meet public demand.

Sensitive Species

The Hornyhead chub (*Nocomis viguttatus*) occurs within the analysis area and is currently proposed as a BLM sensitive species. The Hornyhead chub's small distribution, population status and trends and vulnerability to additional habitat loss has warranted various species status listings. Wyoming Game and Fish has classified the Hornyhead chub as a NSS1 status species (populations are physically isolated and/or at extremely low densities throughout its historic range and extirpation appears possible). The Hornyhead chub is also on the Forest Service Region 2 Sensitive Species List (a species that may need special management to prevent it from becoming threatened or endangered).

Hornyhead chubs prefer clear, gravel-bottomed streams for survival and reproduction (Baxter and Stone 1995). Given their habitat preferences, they are especially vulnerable to changes in physical habitat and water quality. Hornyhead chubs have been found in the Laramie River downstream from Wheatland Reservoir #2 and in the North Laramie River. Wyoming Game and Fish collected hornyhead chubs from only two sites on the North Laramie River and two sites on the Laramie River (Bear and Barrineau 2007). In 2006, the BLM and WGFD documented Hornyhead chubs in the North Laramie River. This area has been relatively unimpacted and provides diverse aquatic and riparian habitat. Additional surveys are needed to establish geographic distribution, population structure, and habitat availability throughout the Hornyhead chub's range.

Invasive Species

On February 3, 1999, Executive Order 13112 on Invasive Species was signed. This order directed federal agencies to:

> "use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them…" as well as "…not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions."

Introduced pathogens of concern in the assessment area include *Myxobolus cerebralis,* which can causes whirling disease in salmonid fishes, and Chytrid fungus (*Batrachochytrium dendrobatidis*), which can impact amphibian populations. Whirling disease is a parasitic infection that attacks the nerves and cartilage of small trout, reducing their ability to feed and avoid predators. These infections can significantly impact wild trout populations. The occurrence of whirling disease has been documented throughout many parts of Wyoming. Chytrid fungus has been cited as a major cause of declines in amphibian populations. Chytrid fungus attacks keratin of metamorphosed amphibians and can lead to 90-100% mortality in some species. The Boreal Toad Recovery Team (BTRT) has cited Chytrid fungus as a major concern in the southern Rocky Mountain population (BTRT 2001). The occurrence of Chytrid fungus has not been documented in the assessment area. Both of these pathogens can be transported via contaminated waders or other equipment.

Additional invasive species of concern include zebra mussel and New Zealand mud snail. Zebra mussels have become widely distributed in the United States, particularly east of the 100th meridian. These exotic mussels have recently been discovered as near as Colorado, likely the result of overland transport by trailered boats. These mussels can be found in large lakes,

ponds, and river systems throughout their range in the U.S. A major transport mechanism of these mussels is through attachment to boats and trailers. New Zealand mud snails appear to prefer flowing water habitats with stable flows. Springs, spring creeks, and river sections downstream from dams are all places that they thrive in. They are most typically found on larger cobble substrates or on pieces of wood. These snails are known to occur in the Great Lakes region, as well as in isolated regions of the west, including Yellowstone National Park. New Zealand mud snails can be transported with fishing waders or other equipment that has been exposed to infected waters. The dispersal of these snails has been associated with recreational fisheries exhibiting high angler use. Neither the zebra mussels nor the New Zealand mud snails are currently known to occur in the analysis area and preventing their spread into this region will be particularly challenging.

The spread of several invasive species has been contributed to transport via anglers. Education of the angling community in relation to effective disinfection procedures has proven a difficult undertaking to many State and Federal resource management agencies.

Nonnative fishes have been introduced and become naturalized in much of the assessment area. Their impact on native fishes is not fully described in this area, but they have caused declines in native fish communities due to several factors including competition, predation and genetic hybridization with native species. Emphasis should be placed on enhancing or restoring populations of native fishes that have been designated special conservation status where feasible. Managing habitats for desirable nonnative fishes and providing sportfishing opportunities will need to be balanced with improving or restoring populations of imperiled native fishes.

Drought and Dewatering

Fisheries resources have been negatively impacted by drought conditions throughout the analysis area. Much of Wyoming has been in a moderate to severe drought since 2000. Drought conditions reduce stream flows, affecting the quality and quantity of usable habitat. During extreme drought conditions, streams that once contained fish may become totally dry or may flow intermittently. Reduced streamflows can also result in elevated water temperatures, affecting stream productivity.

Most systems in the analysis area are snowmelt driven but short duration, high intensity thunderstorms can cause significant changes in the hydrograph over relatively short periods of time. The elevated streamflows that result from snowmelt or thunderstorms are important because many of the channel forming processes that occur (scouring and deposition) result during high flow events. Some channel processes such as pool formation occur during high streamflow events. During periods of low flow, channel processes occur at a more gradual scale. During low flow periods, pools can fill in with sediment or organic debris as water velocity decreases.

Drought has also adversely affected lake and impoundment elevations. Most of the major lakes and impoundments that are used to store water for irrigation or other uses experience a significant drop in water elevation during the summer months. As the demand for water increases, lake elevations may decrease, resulting in elevated water temperatures and algal blooms. The rise in water temperature and algal blooms can stress fish and result in decreased water quality. As aquatic vegetation decomposes during the winter months, bacteria may consume dissolved oxygen to levels that may be lethal for fish.

Dewatering and water management activities for irrigation, municipal water supplies and other uses can impact fisheries resources and remains a major challenge for managing fish populations. Water impoundments can insulate flows, diversions can lengthen low flow periods, and return flows from irrigation alter water chemistry and turbidity (Rabeni 1996; Talmage et al. 2002).

CURRENT CONDITIONS

The BLM has not recently completed fish habitat investigations for recreational fisheries within the assessment area. Though PFC and riparian reference reach assessments do not specifically constitute assessments of fish habitat conditions, they are useful to determine the stability of riparian and wetland systems, which are generally strongly associated with aquatic habitat conditions. See Standards 2 and 5 for accounts of riparian habitat conditions. Subsequent investigations will be necessary to describe stream or wetland conditions that may be limiting the productivity of specific fisheries.

REFERENCE CONDITIONS

References to historical stream conditions are limited. See Standards 2 and 5 for historical accounts of stream habitat conditions. Distributional changes of native fishes east of the Continental Divide were recently assessed by Patton et al. (1997).

SYNTHESIS AND INTERPRETATION

The assessment area contains several aquatic resources. These include regionally and important recreational fisheries such as the Laramie River, North Laramie River, Wheatland Reservoirs, and several small impoundments. The importance of these fisheries to the local economy and to the quality of life of the citizens of the area is significant.

The description for Standard 2 (Riparian/Wetland) also applies in most cases to fisheries. Based on results from Standard 2, livestock grazing and loss of beaver are principle factors affecting riparian and wetland systems in the assessment area. While there has been significant improvement in riparian resources within the last 10 years, there are additional opportunities for riparian improvement. As streams improve in vegetative condition, instream habitat complexity increases, water flows improve, and water temperatures decrease, all of which are more likely to be supportive of coldwater game species such as trout.

Baseline inventory information is lacking for native species of fish and wildlife throughout much of the assessment area. Though some broad-scale inventories have been conducted to identify trends in populations of native fishes in Wyoming (Patton et al. 1998, Bear and Barrineau 2007), site-specific information required for effective land management is needed.

RECOMMENDATIONS

The improved management of riparian habitats through the use of grazing BMPs indicates both an upward trend and meeting Standard #4 for fisheries for many of the streams in the assessment area. Standard #4 for fisheries is not being met on streams which currently fail Standard #2 – Riparian/Wetland. There are also sites that are rated in proper functioning

condition, but these areas may lack specific habitat components required by fishes. Describing the condition of aquatic systems using methods that incorporate the habitat requirements of fish should be a priority.

Because of limited information on native fishes within the analysis area, it is currently unknown if habitats that support or could support sensitive species is being maintained or enhanced. The hornyhead chub (*Nocomis biguttatus*) is a special status species known to occur within the assessment area. Populations appear to be stable (Barrineau, WGFD pers. communication). Completing investigations on the hornyhead chub and other coexisting species should be a priority for the fisheries program in the coming years to identify opportunities that would enhance hornyhead chub populations.

Vegetation Management

In areas not meeting Standard 2, formal allotment management plans or grazing management adjustments should be implemented to provide the amount of vegetation necessary to ensure adequate watershed protection under grazing use to perpetuate vegetation, enhance woody plant vigor, and assure soil stability. Further evaluation of riparian areas may present opportunities to reduce conifer encroachment in important riparian areas. These may include options such as mechanical and/or prescribed burn treatments to reduce riparian successional stages.

Transportation and Access Planning

Designing road crossings that simulate natural stream processes would allow for the passage of aquatic organisms and allow stream fishes to move freely among required habitats. This can be accomplished by using a number of designs including bridges, bottomless culverts, and baffled culverts. Several references are available to help in this design process. Road designs should also consider appropriate energy dissipation in order to limit the concentration of overland flows and resulting sedimentation.

The design of an effective transportation network within the assessment area that considers the effects of road design criteria on fish habitat conditions and the benefits of increased public access to popular recreational fisheries should become a major focus of land management activities within the assessment area.

Invasive Species

Avoiding the transportation of invasive species to new habitats should be considered a high priority for the Rawlins Field Office. Angler use and movement between infected and non-infected drainages has the potential to spread invasive species. The BLM's opportunities to educate anglers about the problems associated with invasive species and appropriate disinfection procedures may help avoid the spread of invasive species.

As the distribution of invasive species is not fully known, disinfecting equipment and materials that have been used in riparian or wetland environments should be considered standard precautions for BLM operations. All programs should use the chlorine bath maintained by the fisheries crew for disinfecting their equipment and materials before they are used in a new location. Instructional Memorandum No. WY-030-99-007 outlines required disinfection procedures for the Rawlins Field Office.

Cause-effect relationships between non-native fish species and special status species should be further investigated. Control or isolation of non-native fish species should be considered in waters where it is scientifically, socially, and economically feasible to do so.

Drought and Dewatering

Drought and dewatering remains a major threat to existing fisheries populations. Participation with private landowners or other agencies to maintain or enhance instream flows or improve fish passage at irrigation structures should be considered where appropriate.

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WEEDS

CHARACTERIZATION

Weeds, invasive non-native plants, ecologically threaten natural ecosystems and greatly impact natural plant communities throughout the West. The reduction of light, water, nutrients, and space available to native species can change the hydrological patterns, soil chemistry, erodibility, and may even change fire patterns on a localized basis (NPS ref). These invaders can reduce biodiversity, affect threatened and endangered species, change habitats and natural plant/animal associations, and prevent native species from remaining or encroaching upon a site. Weed infestations reduce forage availability for livestock and wildlife. Unlike many areas of the West, the Rawlins Field Office management area has a comparatively smaller weed problem than other areas in the Rocky Mountain region. The analysis area is relatively noxious weed free, with just small problem areas. The term ***noxious*** is a legal designation used specifically for plant species that have been determined to be a major threat to agricultural and/or natural ecosystems and are subject, by law, to certain restrictions. Invasive species include those that increase and invade disturbed areas, may or may not be able to invade native rangeland, and include noxious species. Within the analysis area, noxious and invasive species are predominantly found along roadways and other disturbed areas, and perennial waterways associated with recreational use, agriculture, and animal grazing activities. Road building, development, grazing, fire suppression, recreation, and other activities can directly increase weed establishment, introduction, and/or maintain their presence within the ecosystem.

The main noxious species present within the area are houndstongue (picture 4.10), burdock (picture 4.11), and Canada thistle. There are also several invasive species present which are normally restricted to disturbed areas. These include Russian thistle, gumweed, cheatgrass, henbane, curly dock, wild licorice, prickle poppy, water hemlock and several annual mustards. Most invasive species are not treated.

ISSUES AND KEY QUESTIONS

The area is seeing an expansion of noxious and invasive weed species. Current issues in the assessment area follow:

- Noxious weeds and invasive species are spreading into undisturbed rangeland from the initial sites of introduction.
- Some private landowners adjacent to BLM land, especially in the intermixed land pattern areas, have yet to implement noxious weed management programs, thereby negating some of the potential effectiveness of treatments on BLM lands.
- Livestock movements are increasing weed presence in some allotments and more direct action is needed.

- There are no reasonable measures available to control wildlife movements that spread weeds.
- Budget constraints do not allow for the treatment of all areas with weed infestations.

CURRENT CONDITIONS

Weed locations are primarily restricted to disturbed areas associated with roads, irrigation, recreational use, and livestock grazing activities such as water developments. There are only a few areas where the noxious weeds are spread throughout native rangeland. A goal is to avoid having them spread elsewhere by vehicle, equipment, water, or animal movements. Most federal, state, and county improved roads are being treated for weeds.

As stated earlier, the principle noxious species found within the analysis area include houndstongue, burdock, and Canada thistle.

Houndstongue is a biennial growing up to three feet tall and is poisonous to all classes of livestock. It has alkaloids which cause liver cells to stop reproducing. It occurs generally in areas with soil disturbance such as along animal trails or roads, or places where animals congregate like aspen stands. It is found scattered throughout the analysis area, but rarely in dense patches.

Burdock occurs in and along riparian habitat in disturbed areas. It is a biennial, reaching up to ten feet tall and the flower heads have slender hooked spines that entangle in animal fur which aids seed dispersal. The rosettes look similar to rhubarb. It is found rarely in the analysis area.

Canada thistle is a perennial which occurs in and along riparian habitat, and in some cases along roads where runoff water accumulates. As long as the riparian habitat is being properly managed, Canada thistle is not expanding and occupies the niche between the riparian and upland habitats. Canada thistle commonly occurs throughout the assessment area and is treated along most main roads.

The invasive species of concern are gumweed, and cheatgrass. Other invasive species include henbane, wild licorice, curly dock, prickle poppy, water hemlock, and several annual mustards. Gumweed is native but excels in disturbed areas, especially during dry times. It can form nearly pure stands along roadsides and is unpalatable forage for all animals. Cheatgrass occurs sporadically throughout the assessment area. Disturbed areas along roads, corrals and salting sites are common locations. However, it is also found on rangelands on well-drained, disturbed soils, particularly on south and west facing slopes. Annual mustards and dock occur along disturbed roadsides throughout the area. These generally are not large-scale problems, but patchy ones. Most invasive species are not treated unless they are interfering with reclamation of disturbances or are specifically identified as a potential safety or other hazard.

REFERENCE CONDITIONS

“Early European settlers in North America inadvertently brought weed seeds with them, perhaps in the hay they brought for their animals or in the dirt they used as ballast for their ships, or even in their clothes or bedding. Some activities, such as clearing the land, opened up niches that created places for weeds to grow. Settlers also purposely brought plants from their ‘home country’ to reseed areas, make dye for clothing and use as ornamental plants. Some of these

non-native plants became invasive, reducing the diversity and quantity of native plants. Weeds are continuing to spread rapidly in many areas across the country. Weeds spread to an estimated 4,000 acres each day on public lands managed by the BLM and Forest Service" (BLM Noxious Weed Webpage).

Settlers along riparian corridors have historically impacted these areas by clearing the land, irrigation, and overall human presence-associated disturbances. These areas also tended to have higher concentrations of livestock, especially historically, when riparian systems were "sacrifice areas" and did not receive the management attention that they receive today.

SYNTHESES AND INTERPRETATION

Although the majority of the watershed assessment area is relatively free from weeds, the potential for introduction and/or spread from existing sites is high. Transportation of weed seeds across great distances via vehicles, wind and animals poses threats for introduction of new species throughout the assessment area. Wildfires also open the door to exposure and expansion of weeds.

Weed movement by recreational vehicles, and adequate weed control on mostly private land that could spread to public lands needs to be addressed. Where livestock grazing is contributing to the invasion or expansion of weed species, management must be adjusted.

Locations and size of cheatgrass patches are being mapped on a statewide basis to help with assessing the overall infestation and identifying treatment priorities. Although good management of existing native plant communities may minimize this threat, there are still sites that will require more active treatment. Cheatgrass appears to thrive on south and west slopes where effective temperatures are higher and where runoff from rocks or steep slopes promotes site disturbance.

Less than half of the watershed has been inventoried for weeds, but it is generally assumed that, unless there are soil disturbances or recreation areas nearby, there are probably minimal weedy species present other than Canada thistle or invasive species. The exceptions are where noxious weeds are already established in an area, and buffer zone inventories around the patches are not complete. The species of long-term concern within the assessment area are the noxious species and cheatgrass.

RECOMMENDATIONS

Due to the existing good condition of native vegetation it is determined that the majority of the watershed is meeting Standard 4 with respect to weeds. The areas that fail have already failed Standard 2. The following recommendations, in addition to following the Rawlins Weed Prevention Plan (BLM 1999), would help to meet desired resource conditions in the future.

- Continue inventory and initiate treatment efforts in the area to identify and contain or eradicate noxious weeds. Begin to work with landowners on concurrent treatments with private lands. Continue to work with the Cheatgrass Partnership group to map and plan treatment of cheatgrass. Enforcement of stipulations on ROWs to control weeds must occur.

- Identify all weed species that need to be treated throughout the assessment area. Although some may not be a major focus for treatment, they can be a significant problem within localized areas. In addition, more education on weedy species (including landowners, recreationists, and equipment operators), and innovative ways to address weed infestation is needed for this watershed.

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Standard 5 - Water Quality

STANDARD 5 – WATER QUALITY

Water quality meets state standards.

CHARACTERIZATION

In 1972, the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act, was signed into law. Its purpose is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The Act gave the Environmental Protection Agency the authority to implement pollution control programs through partnerships with individual states. Provisions for establishing water quality standards were included in the Clean Water Act, as amended, and in the Wyoming Environmental Quality Act, as amended. Regulations are found in Part 40 of the Code of Federal Regulations and in Wyoming's Water Quality Rules and Regulations. The latter regulations contain Quality Standards for Wyoming Surface Waters.

The State of Wyoming has surface water quality standards for water bodies rated from class 1 to 4. Each rating class has specific numeric and narrative water quality standards. Class 1 waters of the State are waters where no additional water quality degradation will be allowed. Classes 2 through 4 waters are differentiated based on their ability to support aquatic life, fish and other human and wildlife uses. In general, Class 2 waters support game fisheries, Class 3 waters are non-game fisheries protected for aquatic life, and Class 4 waters do not have the potential to support fish and contain few areas that support aquatic life. In addition, the classification scheme describes the multiple goals of a water body, for example, supporting both drinking water and game fish (Class 2AB). The "A" refers to the ability to support drinking water and the "B" refers to its ability to support aquatic life. For example, a 3B classification would be non-game protected for aquatic life, but does not protected for drinking water.

Class 2AB is the highest numeric classification for Wyoming water bodies. Water bodies that do not meet their designated beneficial uses are placed on the State 303(d) list for factors identified that contribute to the impairment.

ISSUES AND KEY QUESTIONS

Non-point source impacts to water quality can result from localized erosion due to surface disturbance and also from poorly maintained upland habitats and riparian/wetland systems. These impacts can also result from increased erosion from roads which can result in altered surface hydrology and decreased vegetative cover. Decreased vegetation can increase erosion by exposing soil to wind or water. Overuse of water sources can cause reductions or near riparian/wetland areas can cause disturbance to vegetation and soils in localized areas and as a result of hoof action can lower the water table in localized areas.

Point source impacts include the potential for toxic spills along roadway corridors and other highway systems, industrial, agricultural and municipal discharges. Municipal and industrial sources are downstream and outside the assessment area.

CURRENT CONDITIONS

In general, water quality is excellent in the Laramie Peaks assessment area and is evident by the water quality classifications described in the characterization section. In most cases,

classifications are based on the beneficial uses supported by the water quality present. The USGS has collected water samples from stations located on the Laramie River Near Fort Laramie that represents current water quality conditions.

La Bonte Creek (HUC 1018000803)

La Bonte is rated Class 2AB and there is no 303(d) listing consideration. Neither the USGS or BLM have water quality data for this drainage.

Upper North Laramie River (HUC 1018001106)

The North Laramie River is rated Class 2AB and there is no 303(d) listing consideration. Neither the USGS or BLM have water quality data for this drainage.

Laramie River-Dry Laramie River- One Mile Creek (HUCs 1018001101 & 1018001007)

The Laramie River-Dry Laramie River are rated Class 2AB. There is a 303(d) listed segment on the Laramie River an undetermined distance below Laramie WWTP Discharge resulting from Ammonia, Chlorine, and Fecal Coliform. The EPA approved a TMDL and the WDEQ changed the class of this segment to 4A. This listing segment is outside of the assessment area. During the irrigation season, up to 450 cubic feet per second can be diverted from the Laramie River via the Wheatland Tunnel to Bluegrass Creek (HUC 1018001103). Water diversion is ceased during the winter months, and during this time the diversion impoundment is allowed to sluice downstream, which can adversely affecting water quality and has resulted in fish kills. A 1997 study to mitigate these impacts was sponsored by the Wheatland Irrigation District and evaluated by Kennedy Engineering. To avoid excessive sedimentation, the Wheatland Irrigation District constructed a box around the outlet and modified the intake to draw water from the top rather than the bottom of the reservoir.

The Laramie River flows north from Laramie, Wyoming, into the Wheatland Reservoir. From the Reservoir, the Laramie River flows to the northeast toward Wheatland, Wyoming. Current conditions in the Laramie River include the consideration of Wheatland reservoir. Reservoirs provide important recreational opportunities and are protected for the game fisheries by a 2AB classification. Water quality in reservoirs is mostly driven be nutrients. Nutrients can cause Algal blooms that may lead to eutrophication and anaerobic (no available oxygen) conditions. Some metals are more likely to go into the dissolved state when oxygen in lacking, and therefore it is important to monitor the accumulation of nutrients in reservoirs. In general he annual emptying of these reservoirs in response to irrigation demands downstream allow for enough circulation to prevent euthrophic conditions. The most common source for nutrients is large confined animal operations such as feedlots and municipalities. There are no feedlots in the analysis area and a limited amount of municipal systems upstream.

Bluegrass Creek (HUC 1018001102)

Bluegrass Creek is rated Class 2AB and there is no 303(d) listing consideration. Neither the USGS nor BLM have water quality data for this drainage.

Upper Sybille Creek (HUC 1018001103)

Sybille Creek and South Sybille Creek are rated Class 2AB and there is no 303(d) listing consideration. The USGS has one sample location at a gaging station near Wheatland, Wyoming (06664400). Water quality parameters were tested for a suite of organic contaminates and all levels were at or less than 0.01 microgram/L.

Upper Chugwater Creek (HUC 1018001108)

Chugwater Creek is rated Class 2AB. There is a 303(d) listed segment for habitat degradation above an irrigation diversion located (NE SW S26 T25N R67W) upstream an undetermined distance below Antelope Gap Road. This listed segment is outside of the assessment area. The USGS has one sample location at a gaging station near Chugwater, Wyoming (06664400). Water quality parameters were tested for a suite of organic contaminates and all levels were at or less than 0.01 microgram/L except for picloram which ranged from <0.01 to 0.09 micorgrams/L and 2,4-dichlorophenoxyacetic acid which ranged from <0.01 to 0.03 micrograms/L .

SYNTHESES AND INTERPRETATION

Managing livestock and evaluating road designs on a project and allotment basis is the best way to address human contributions and can be measured and evaluated on a case-by-case basis or in monitoring vegetation condition. Livestock grazing, road density and other human practices contribute to non-point source pollution. Human disturbances may be additive to natural disturbance that may lead to exceedences; however separating human from natural disturbance sources is difficult at best.

Non-Point Pollution Sources

Livestock can contribute to vegetation disturbances altering the developed soil profile by degrading protective vegetation and the structure of the soil horizons. This disturbance can reduce infiltration, increase runoff, and create more soil compaction. Soil compaction increases water runoff and, thereby, promotes sheet, rill and gully erosion on site and stream down cutting and gullying off site. The greatest compaction occurs when soils are moist or wet. Compacted soils are less accommodating to plant roots, and seed germination is difficult in such soils. This physically reduces soil productivity.

Roads, off-road travel with vehicles, and other human practices that remove the protective vegetative cover from soils and funnel water down ruts or through culverts and ditches can degrade water quality. These affects may be short-term if the vegetation can recover, or may be long-term if down-cutting and gullying occur. Water tables may drop, reducing moisture available for plant growth that in turn leads to lower site productivity and cover, and therefore, more long-term potential for soil erosion and degradation of water quality.

Disturbance in or adjacent to riparian areas can increase sediment into channels and degrade water quality. The PFC analysis method is designed to evaluate if a given riparian or wetland system is sustainable during a typical disturbance such as flooding. If a stream channel is degraded it is an indication that the system will contribute to water quality problems by eroding during a storm event. Riparian and wetland systems can also be an effective buffer by trapping

suspended sediment during storm events, therefore if they are degraded the quality of the water downstream will generally be lower than if the system was healthy.

RECOMMENDATIONS

Within the assessment area, water quality impairment has not been identified in any water bodies by the State of Wyoming by listing them on the State's 303(d) list. There are indirect indications that water quality parameters are being influenced by livestock grazing, roads and other human practices within this watershed.

- The BLM will continue to implement or refine BMPs for livestock grazing, which promote perennial vegetation to stabilize stream banks and improve cover and litter on uplands. Season and duration of use are the principal factors in considering management changes to maintain meeting this standard. BLM will continue to identify and correct existing road problems that alter surface water flows and result in accelerated erosion. The BLM will continue to promote mixed-age shrub and woodland communities with higher proportions of young and middle-aged stands, which have greater amounts of herbaceous cover to reduce runoff and soil erosion and increase infiltration and ground water recharge.

Standard 6 - Air Quality

STANDARD 6- AIR QUALITY

Air Quality Meets State Standards.

CHARACTERIZATION

Air quality within the field office cannot be easily documented, because monitoring data has not been gathered for the most part, except for site-specific projects. Air quality regulations consist of the National Ambient Air Quality Standards (NAAQS) and the Prevention of Significant Deterioration (PSD) increments. The NAAQS limit the amount of specific pollutants allowed in the atmosphere. All BLM-administered lands are classified PSD Class II, which means that moderate, controlled growth can take place. However, adjacent to this field office is a high priority airshed for the Mt. Zirkel Wilderness Area. The Savage Run Wilderness on U.S. Forest Service is a State of Wyoming Class I area.

In 1999, EPA issued regulations to address regional haze, which are visibility impaired areas caused by numerous sources located across a wide geographical range. Visibility impairment happens when light is scattered or absorbed by particles and gases in the atmosphere. It is most easily described as haze that obscures the clarity, color, texture, and form of what we see (NAQETR 1999).

ISSUES AND KEY QUESTIONS

Several different factors can greatly affect air quality within this analysis area, but most are unrelated to livestock grazing. Vehicle traffic contributes pollutants through the combustion of fossil fuels. Where interstates or highways are present, more motor vehicle traffic will result in increased levels of these pollutants. In less developed areas, such as along two-tracks these levels of pollutants will be greatly reduced due to less traffic. Traffic along these dirt roads also affects air quality over the short term, especially during dry conditions. How can we reduce pollutants that enter the air at their source, and also address associated air quality issues such as dust abatement from vehicular travel?

Prescribed burns and wildfires affect air quality in a localized area for a short period of time. Prescribed burns are implemented in coordination with and permitted by the Wyoming Department of Environmental Quality. Most are planned in a way to minimize impacts to more-populated areas. Large-scale fires are becoming much more common due to decades of fire suppression. If fuel breaks aren't created occasionally by prior burned areas, could we be looking at larger wildfires with associated air quality issues?

CURRENT CONDITIONS

Overall air quality is good within the area, which is due in large part to the presence of reliable winds. According to a letter received from the Wyoming Department of Environmental Quality there are no air quality criteria pollutant non-attainment areas for either state or federal standards within the boundaries of the Rawlins Field Office. Lichens (an important air quality indicator) are prevalent throughout the assessment area and the field office.

Current annual average conditions range from 18-40 miles in the rural portions of the eastern United States to 35-90 miles in the rural western portions. On an average basis, they are

estimated at approximately 80-90 miles in the east and up to 140 miles in the west (NAQETR 1999). On a local basis, visibility as reported from the Rawlins airport is on average 60 miles. On days that are hazy due to drift smoke this visibility can be less than 10 miles.

Un-surfaced roads contribute to dust conditions. Dry soil conditions exacerbate the problem, so dust typically increases in the summer dust. Dust from roads affects air quality and public safety when visibility is severely hindered.

Short-term impacts from prescribed burning and/or wildfires can also impact air quality. There have been very limited prescribed burns in this area. Burns usually only take a few days to implement and generally require winds in the burn plan prescription. If they are close to communities, the burn plan tries to mitigate short-term impacts to air quality.

Wildfires are common within the assessment area. These fires have had a minimal long-term affect on air quality within the assessment areas, but can have dramatic impacts in the local area during the short-term. Large-scale fires in the Intermountain West can affect air quality within the assessment area due to drift smoke. These impacts can be short or long-term depending on the fire and weather conditions.

Depending on the type of grazing management implemented, number of animals, and habitat type, pollution from livestock presence varies. Season-long use and/or heavy use levels can increase bare ground, thereby increasing dust. With dry conditions, dust created by livestock trailing, herding, and day to day movements increases.

REFERENCE CONDITIONS

Haziness within the area changes dramatically from week to week depending on wildfires burning throughout the western states. Clear vistas are common, and being able to see over 100 miles is not a rare occurrence. At this time, most information is anecdotal since there is very little documentation, and trends in airborne particulate matter or haziness are not readily apparent.

Historic livestock use tended to be much heavier and for longer periods of time that increased bare ground and decreased plant cover. Both cattle and sheep have used the area historically. When bands of sheep trailed forth across the area during dry periods dust from their movements could be seen for miles.

SYNTHESIS AND INTERPRETATION

Vehicular traffic includes ATVs, pickup trucks, and occasionally large trucks and semis, and miscellaneous equipment. Vegetation along roads will be generally covered in dust particles for part of the year and have reduced vigor and production.

Catastrophic wildfires throughout the West are a problem beyond the scope of this document. Forest fires both regionally and locally could continue to have a significant impact on the area's air quality. Continued efforts to address this widespread problem are being implemented on a national basis; however, in the short-term there will continue to be large-scale wildfires. On the local level, creating fuel breaks and diversifying vegetation communities will help to ensure that wildfires in this area do not become catastrophic in scope.

Best management practices for livestock grazing will continue to reduce particulate pollution caused by this use. Reducing the size of disturbed areas, reestablishing vegetation on disturbed sites and managing livestock to reduce bare ground will reduce soils susceptible to wind erosion (dust).

RECOMMENDATIONS

Within this assessment area there is no air quality criteria pollutant non-attainment areas for either state or federal standards as determined by the Wyoming DEQ. Due to prevailing winds, limited pollution within the general area, overall air quality meets this Standard.

Dust abatement due to vehicle traffic could become a concern on a resource and public safety basis if traffic increases sufficiently.

- Continue prescribed burning and other vegetation treatment operations to provide for fuel breaks to ensure catastrophic wildfires do not occur. Treatments will greatly reduce the potential of large amounts of particulate matter in the air from local wildfires burning out of control.