BIG LARAMIE RIVER WATERSHED

Standards and Guidelines Assessment
2007 Field Season

RAWLINS FIELD OFFICE

Document for Agency, Permittee, and Interested

Public Information

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I have reviewed the Standards and Guidelines Final Report for the Big 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 Rangeland Standards. Based on this report, a determination will be prepared and transmitted to the appropriate parties.

Patrick Madigan, Field Manager- Rawlins	October 15, 2008 **Date**

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INTRODUCTION

The analysis area considered in this document includes the Big Laramie River Watershed. This watershed analysis area occupies 2,766,494 acres within the Rawlins Field Office and covers both Albany and Laramie Counties. Land ownership consists of: 3.4% acres of Bureau of Land Management land, 87% private land, 9% state land, 0.2% Forest Service acres, and 0.5% other land, e.g., municipal properties, military lands, and reservoirs. Within the Big Laramie River watershed 93,304 acres are administered by the Bureau of Land Management (Map 1).

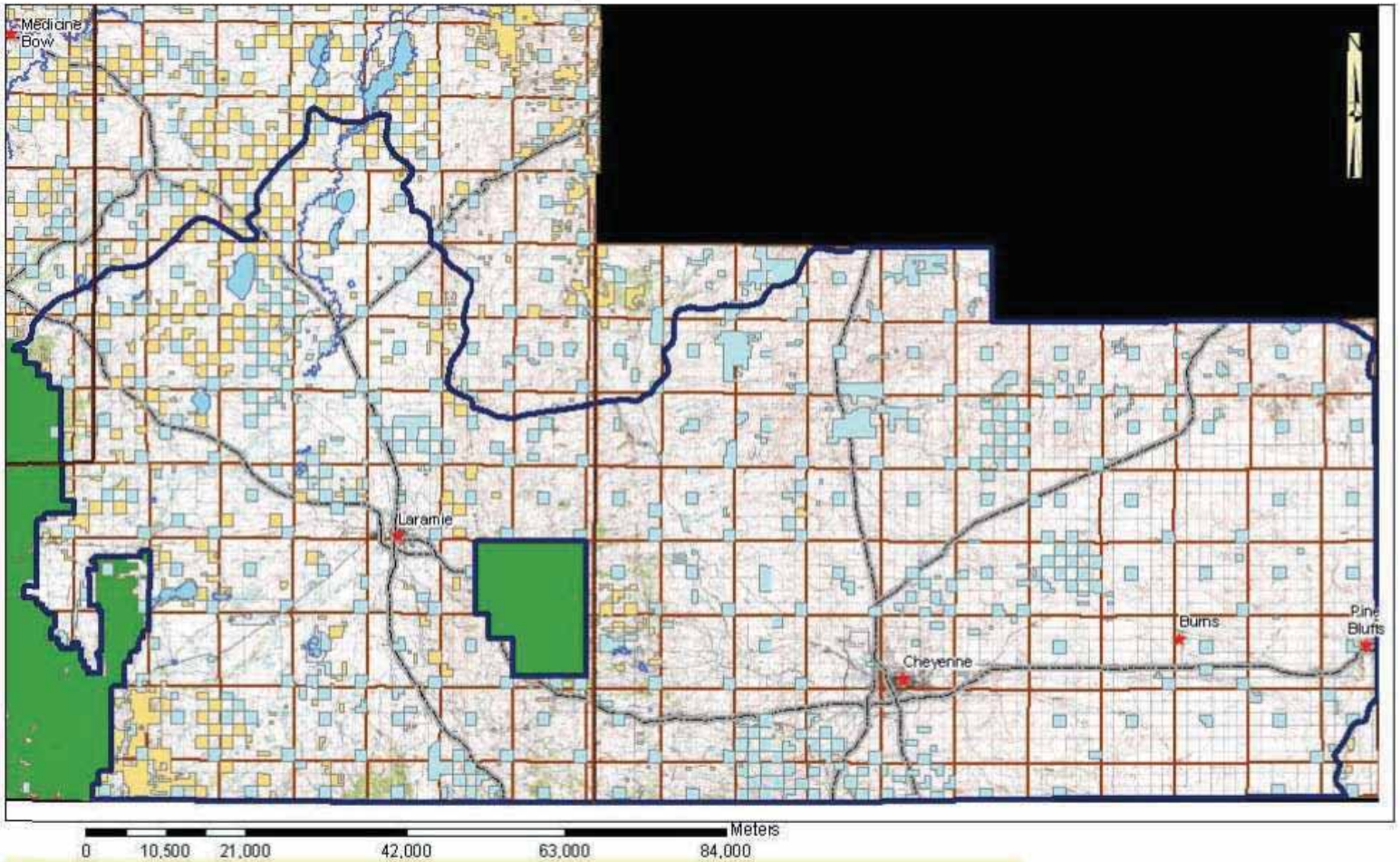
Land ownership patterns vary from small blocks of public lands to primarily a mixture of public and non-public lands. As there is a relatively small percentage of BLM in this watershed, most agricultural producers have relied on their Conservation District and the Cooperative Extension service for range management direction and information. There are two major urban centers within the Big Laramie Watershed; urbanization is a significant land use issue here. The Laramie River provides substantial irrigation and municipal waters to the State of Wyoming. Consequently, there are a large number of irrigation ditches and artificial canals and small reservoirs within the assessment area.

Field visits during the summers of 2007 and 2008 provided the opportunity to examine allotments at the farther reaches of the Rawlins Field Office. This watershed contains some of the smallest parcels of BLM in the Office. Nearly all of these small (< 40 acres) allotments exhibited healthy rangelands with vigorous plant growth, composition, and diversity overall. Most parcels had been lightly used by livestock and had high value as crucial parcels of large contiguous blocks of open space and wildlife habitat. A fair portion of the watershed that had been indicated as riparian by the National Wetland Inventory (1992) proved to not qualify as riparian, but still provides valuable rangeland and wildlife habitat. Field visits included various interdisciplinary team member combinations but generally consisted of two range management specialists, at least one wildlife biologist, and/or a soils scientist or hydrologist. Permittees and Conservation District personnel were invited and regularly attended field assessments.

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. However, allotment assessments tend to emphasize management and impacts from livestock grazing alone, rather than on all uses that 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 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

Map #1
Surface Ownership in the 2007 Assessment Area



Legend

- S&Gareas selection
- Bureau of Land Management
- Forest Service
- Private
- Counties
- State
- Water
- Towns and Cities
- Federal_highways
- Township - Range Boundary

No warranty is made by the Bureau of Land Management as to the accuracy, completeness, or reliability of theinformation presented.

4180-1 Rangeland Health Standards Handbook and provides guidance for conducting assessments and evaluations for ascertaining rangeland health on a watershed basis (Map 2).

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 restoration actions*." In order to complete all Standard Assessments within the original 10-year timeframe, watersheds have been divided into seven units; the Big Laramie River watershed is the seventh and final unit to be completed.

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.

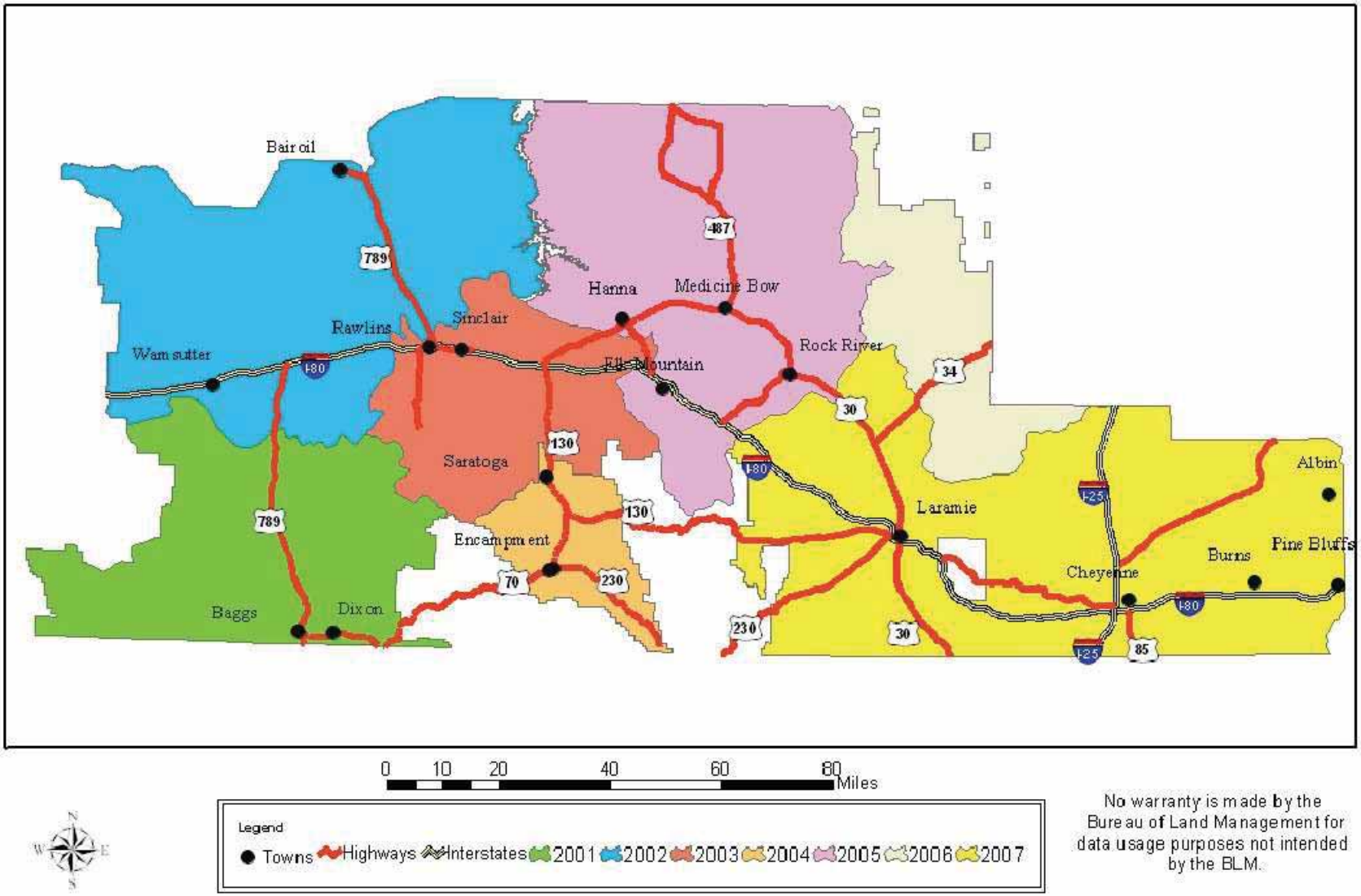
The standard is considered met if riparian/wetland habitat is rated in Proper Functioning Condition (PFC) and existing management will lead to maintaining or improving resource conditions.

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.

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, sensitive species, or BLM Wyoming special status species will be maintained or enhanced.

Map 2
Standards and Guidlines Assessement Area by Year



No warranty is made by the Bureau of Land Management for data usage purposes not intended by the BLM.

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.

Discussion of the Analysis of Standards: 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(s), as soon as practical, but no later than the start of the next 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 within lodgepole pine communities 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. Wyoming State Engineers Office.

- Section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 USC 1531 et. seq.). Formal consultation required for depletions exceeding 0.1 acre-feet/year in the Platte River Basin.

- Interagency Cooperation Regulation (50 CFR 402), concerning water depletions in the Platte River System. For example, under the Platte River Recovery Program proposed projects that may result in water depletions exceeding 0.1 acre-feet/year triggers a “may affect” situation and requires consultation with the U.S. Fish and Wildlife Service. Any actions taken need to be compliant with the North River Platte decree regarding surface and ground water.

- Biological Assessment for the Wyoming Toad for BLM activities in Wyoming-BLM will participate with development of species recovery plans in coordination with USFWS and other agencies. BLM-administered public lands that contain identified habitat will not be exchanged or sold unless it benefits the species.

- 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 the 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. Standard 1 – Watershed has been split into two descriptions for different hydrologic units, while Standards 2 through 6 are each described as one unit for the entire Big Laramie River report area. Where discussion items are similar between watersheds, previous sections will be referenced and only additional, specific information will be noted.

Table 1 describes fourth order HUC acreages, associated fifth order HUCs, BLM acreages, and percent BLM-administered public lands within each fourth order HUC.

BACKGROUND

The Big Laramie River watershed is located in the southeastern part of Wyoming, and includes all of Albany and Laramie Counties. The watershed has a diverse geographical make-up. There are two main mountain ranges in the watershed, the Laramie Mountains in the eastern part of the area, and the Snowy Range Mountains to the west. There are other mountainous spots throughout the assessment area as well. Open short grass steppe plains separate the two mountain ranges. The Laramie River is the major stream running through the north east half of the watershed.

There are two significant municipalities in the assessment area: Laramie and Cheyenne. Cheyenne, the State capital, is in Laramie County, and Laramie is in Albany County. The latest official census records Laramie with an approximate population of 30,890 (including UW students). Cheyenne is the largest incorporated municipality in Laramie County, with an approximate population of 85,384 as of 2007, according to the Laramie County clerk's office.

Topography of the assessment area is made up of four physiographic areas: Central Rocky Mountains, Central Shortgrass Prairie, Northern Shortgrass Prairie, and Wyoming Basin, all of which converge in the Big Laramie River Watershed assessment area. More contemporary classification organizes the assessment area into two ecoregions: the Wyoming Basin and the

High Plains. These are areas of general similarity in ecosystem and in the type quality and quantity of environmental resources. The Wyoming Basin ecoregion is a broad arid

Table 1 – Sub-Area Acreage Included in the Analysis Area

4th ORDER	HUC Acreage *	5TH ORDER	BLM Acres	Percent BLM %
Upper Laramie	**1,312,535**	*1018001002*	86,216	6.5
	120163	Cooper Creek		
	40959	Laramie River-Grace Creek		
	203660	Laramie River-Harney Creek		
	304573	Laramie River-Onemile Creek		
	139190	Laramie River-Spring Creek		
	150923	Laramie River-Squirrel Creek		
	235488	Little Laramie River		
	117578	Shell Creek		
Upper Lodgepole	**756,790**	*1019001502*	880	0.11
	181461	Lower Lodgepole Creek		
	168200	Muddy Creek		
	213062	Spring Creek		
	194067	Upper Lodgepole Creek		
Crow	**413,076**	*1019000902*	4,388	1.062
	87401	Little Crow Creek		
	111508	Middle Crow Creek		
	214167	Upper Crow Creek		
Horse	**578,205**	*1018001206*	238	0.04
	113632	Bear Creek		
	70367	Little Bear Creek		
	177819	Middle Horse Creek		
	216387	Upper Horse Creek		
Lone Tree-Owl	**136,106**	*1018001004*	827	0.06
	27794	Spring Creek		
	108313	Upper Lone Tree Creek		
Lower Lodgepole	**166,342**	*1019001602*	0*	
	96883	Crow Creek		
	36458	Crow Creek		
	33002	Crow Creek		
Cache La Poudre	**88,375**	*COLORADO*	158	0.09
		Boxelder Creek		
		Dale Creek		
TOTAL	**3,736,348**		**93,304**	****8.61%**

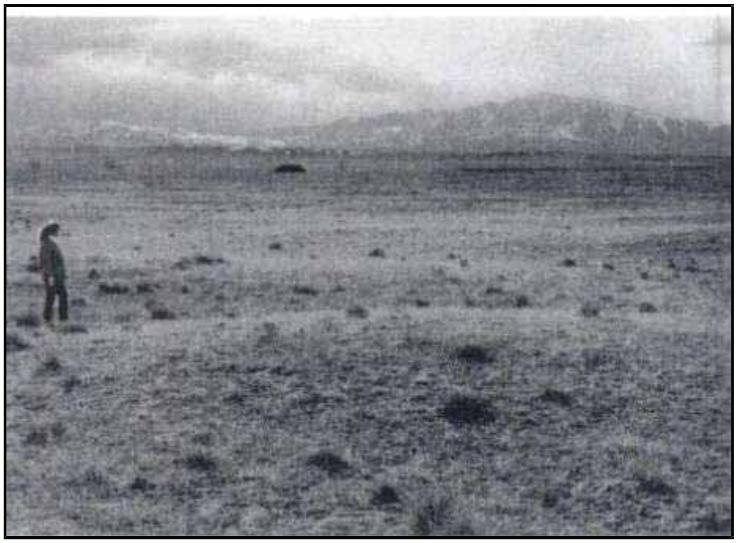
***** HUCs – United States Geological Survey Hydrologic Unit Codes. Acreage calculations include HUC portions NOT completely within RFO S&G Boundary (based on GIS calculations).

**Portions of allotment w/BLM do not fall within Assessment Boundary.

intermontane basin interrupted by hills and low mountains, dominated by grasslands and shrublands. The High Plains ecoregion is a landscape of rolling plains and tablelands formed by uplift and the erosion of the Rocky Mountains. Moisture is a limiting factor in the rain-shadow of the Rocky Mountains; as a result, drought resistant shortgrass and some mixed-grass prairie dominate the plains vegetation. The majority of precipitation falls during the growing season here. Not distinct, these ecoregions fade into one another and some characteristics of each region can be found near the borders, making the High Plains boundary a transitional area.

The overall assessment is an area of high mountains interspersed with open plains. It includes elevations up to 12,000 feet and expansive grasslands at an elevation of 6,000 feet. Medicine Bow Peak in the Snowy Range Mountains is the highest point in the assessment area at 12,031 feet (*Medicine Bow Peak Quadrangle 1:24,000 USGS*). The lowest point in the assessment area is 5,944 feet near Warren Air Force Base, just outside the city of Cheyenne. Escarpments and foothill transition zone have an important function in this watershed, as significant linear features that add diversity and provide more mesic environments for plants and animals. Glaciation has left broad flat valleys between mountain ranges. The area also contains gently rolling topography, with occasional canyons and bluffs. Broad intermountain basins, the Big Hollow for example, are interrupted by isolated hills and low mountains that merge with the Medicine Bow Range, and the Laramie Mountains of which extend into Colorado (see Pictures 1, 2, and 3 in the photo section).

A peculiar feature of some lowland grassland and shrublands in eastern Wyoming is circular or oval mounds, usually less than 0.5 meter high and 4-8 meters in diameter referred to as mima mounds. The explanation for these mounds has been the subject of controversy for many years, as Dennis Knight explains in his 1994 book *Mountains and Plains: the Ecology of Wyoming Landscapes*. Mima mounds are especially common south of Laramie, west of Cheyenne, and north of Medicine Bow.



The effect of the mounds on plants is subtle in some areas and striking in others. Origins of the mounds are disputed, and to date there are four prevailing theories: wind deposition (coppice dunes), erosion, frost, and burrowing animals. There are BLM grazing allotments in the area of mima mounds, although, as with most allotments in the assessment area, they contain much more private ground than BLM land.

Climate would be considered a semi-arid continental climate with temperature extremes. As the Big Laramie River assessment encompasses many different physiographic areas, topography is the primary climate influence. Summers are warm with July high temperatures averaging between 85 °F (29 °C) and 95 °F (35 °C) in this part of the state. With increasing elevation, this average drops rapidly with locations above 9,000 feet (2,743 m) averaging around 70 °F (21 °C). Summer nights throughout the assessment area are characterized by a rapid cool down; with the hottest locations averaging in the 50-60 °F (10-14 °C) range at night. Late spring and early summer is when most of the precipitation tends to occur. Winters are cold, but are variable with periods of sometimes extreme cold interspersed between generally mild periods. Chinook winds can provide unusually warm temperatures in some locations.

Much of the assessment area is considered arid with a considerable portion of the land receiving less than 10 inches (250 mm) of rainfall per year. Precipitation depends on elevation with lower areas averaging 5-8 inches (125 - 200 mm). The lower areas on the eastern plains typically average around 10-12 inches (250-300 mm), making the climate there semi-arid. Some of the more mountainous areas receive up to 20 inches (510 mm) or more, much of it as snow, and even 200 inches (510 cm) or more annually in some locations. Average frost-free growing season across the assessment area ranges from 60 to 110 days.

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.

Geology of the Big Laramie River area is comprised of various classic tectonic basin landforms characterized by relatively steep, mountainous sides and flat floors. The steep sides are created by displacement on faults such that the valley floor moves down relative to the surrounding margins or the margins move up relative to the floor. Differences in the elevations of valley floors and surrounding mountains or plateaus range from only several hundred feet to more than 6,600 feet in major rift valleys, e.g., the Big Hollow and the Centennial Valley.

The Laramide Orogeny, which created large ridges and hills in marine sediments, eroded away and exposed older igneous and metamorphic rocks, which are now part of the Medicine Bow and Laramie mountain ranges. Most of the stable landforms in the assessment area were created during the past tens or hundreds of thousands of years by glacial outwash waters. Sedimentary formations were beveled by water then covered with relatively thin veneers of cobbly and gravelly alluvium. These deposits are thicker and contain larger coarse fragments in the areas closest to the mountain sources. The Centennial valley is a prime example of remnant glacial wash on the valley floor.

In the east half of the assessment area, Laramie County, the most prominent landscape-shaping local rock is the pink, massive, mid-Proterozoic Sherman granite. Mid-Proterozoic granitoids of various ages are abundant in the assessment area. The Sherman granite, which intruded a series of older metamorphic rocks, has been sculpted into dramatic forms by protracted weathering and erosion. The Vedauwoo area is a classic example of weathering and erosion of this nature.

Parent material was a significant consideration when assessing the allotments for Proper Functioning Condition in Laramie County. The lentic streams and creeks in the Crow Creek

watershed are considered moderate to high gradient, coarse gravel bedded streams. Many of the stream bed walls were highly granitic, coarse and erodible. According to Lageson and Spearing in *Roadside Geology of Wyoming* "…the local granites are quite coarse-grained, rough surfaces displaying smoky quartz and larger alkali feldspar crystals 1-2 cm wide, with minor, smaller, darker hornblende and lesser biotite mica."

Soils in the Big Laramie Assessment area can be grouped into three broad categories, determined largely on the basis of the variable elevation and climatic zones in the assessment area. Those three types are aridisols, inceptisols and entisols. The aridisols are generally found in the lowlands of the sagebrush steppe, the mixed grass prairie and basin grasslands. The inceptisols are located in the higher elevation riparian areas; while the entisols are found in the foothill shrublands, ponderosa pine escarpments, and second terrace riparian areas.

Varieties of mountain soils are found throughout the many ranges in the basins 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. In this assessment area, the broader connection between geology and soils has considerable influence on vegetative site potential and overall landscape functions.

Vegetation throughout the watershed varies greatly, but in general is predominately shrub steppe, short-grass prairie and foothill shrublands and escarpments. At the higher elevations vegetation consists of mountain shrub community, with coniferous forest atop the highest areas.

Wyoming big sagebrush and Mountain big sagebrush, along with rabbit brush, are the most common species amongst the nine species or subspecies of sagebrush shrubs commonly occurring together or in site-specific habitats. 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 and aspen. Aspen woodland can be found above 7,000 feet in small pockets on north and east-facing slopes where snow accumulates or there is some other source of additional moisture. Conifer woodlands occur above 7,500 feet, with limber pine and juniper on drier sites, ponderosa, and lodgepole pine, subalpine fir, and spruce on wetter sites. The Big Laramie River Assessment area has very few allotments above 8,000 feet. Riparian and wetland habitats occur on less than one percent of public lands in this assessment area. Herbaceous and shrub-dominated riparian communities are the most common, with tree-dominated habitat, such as cottonwood, being the least common in occurrence and more present in Laramie County than Albany County on BLM-administered public lands.

Wildlife is abundant and diverse. Antelope, mule deer, and elk are common big game species. Moose are becoming much more common in the Snowy Range area and Centennial. Greater sage-grouse, furbearers, small game, and many different kinds of raptors are important species of interest. Laramie County does include designated critical habitat for Prebbles Jumping Mouse. Blue grouse and sharp-tail grouse also exist in the assessment area. Raptors include golden and bald eagles; ferruginous, red-tailed, and Swainson's hawks; burrowing owls; and other hawks, harriers, and owls. Other commonly observed wildlife are coyotes, badger, beaver, muskrat, cottontail and jackrabbits, prairie dogs, ground squirrels, waterfowl, and songbirds. There are few riparian systems in the assessment area that are suitable as fisheries. However, stream mega fauna-including fish are important indicators of functioning riparian systems and are present in many of the small streams assessed.

Human population levels are high in the assessment area. As mentioned, there are two major urban areas, one in each county, Laramie in Albany County and Cheyenne in Laramie County. Land use conversion is a significant land use factor, having direct effects on agriculture. Urbanization and the associated habitat fragmentation are significant drivers of change affecting rangelands (see Pictures 4 and 5).

According to most recent census records (2002), Albany County has a population of 30,890; 88% urban and 12% rural. In 2006 Laramie County had a population of 85,384. American Farmland Trust predicts that, through the year 2020, 80% of new development in Wyoming will be rural development on lots of 10-40 acres for each housing unit. Land use investigations by the Ruckelshaus Institute of Environment and Natural Resources found that Wyoming overall average residential development of each new resident is expected to be 2.9 acres. Land use conversion will have a significant effect on wildlife habitat and the aesthetic value of public lands in the assessment area.

Improved roads are limited to the paved state highways and dirt and graveled roads maintained by county and federal agencies. Human uses of the public lands within the Big Laramie River assessment area are wide spread. There are numerous recreation opportunities throughout the area; however, the prevailing use of BLM-administered public lands is for livestock grazing and wildlife habitat.

There are 112 allotments permitted for grazing use on BLM-administered public lands in the Big Laramie River watershed analysis area. Current grazing use is made primarily by cattle, with no permits/leases retaining sheep. Historical use in this area developed as both cattle and sheep use, depending on location. Cattle numbers have decreased consistently through the years, as many ranchers have aged out of the business and urbanization consumes formerly productive agricultural lands. There are a few small llama and goat permits in this assessment area. The Taylor Grazing Act in 1934 began a process of creating allotments and developing range improvements, which led to greater stewardship and on-the-ground management. Fencing of allotments has been an ongoing, long-term process, with pasture fencing becoming more common in recent times.

Table 2 lists the allotment name, number, and the factors for each allotment, which were used to prioritize monitoring in the standards assessment and corresponds to Map 3 depicting allotments within the watershed. This table was created using monitoring data, Proper Functioning Condition assessments of flowing and standing waters, and professional knowledge. Information or knowledge about these allotments from other agencies was also incorporated. Generally, the allotments with the most boxes checked will be the areas requiring direct BLM management actions. Best Management Practices (BMPs) describe various actions that have 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.

General recreation uses in the assessment area include skiing, hiking, horseback riding, hunting, fishing, camping, ORV use, snowmobiling, and wildlife-viewing. As there is relatively little BLM-administered land, the majority of activity occurs on Wyoming Game and Fish property, State lands, or other municipal properties.

Table 2 Assessment Factors for Prioritizing Allotment Management

FY 2007 Standards & Guidelines Priority List

Watersheds: Big Laramie River Watershed

Watershed	Allotment Name	Allot. #	Growing Season Use	Duration Of Use	Distribution Concern	No AMP/Agreement	Plan Present/Not Working	Riparian not PFC/FAR	303(D) List	Noxious Weeds	Non-Native, Invasive Weeds	T&E Habitat	Sensitive Species Habitat	Livestock Affecting Wildlife H	PFC or Close Look Needed	S&G Already Done	Allotment Satisfactory	Allot. Only Partially in WS	No BLM in S&G Boundary	Comments
Cache La Poudre	A.E. Hodgson	1207															x			Doesn't appear to have had much livestock use in the past; primarily used for wildlife.
Cache La Poudre	Dale Creek	9007								x	x									Many frogs here, snakes too. Good wildlife utilization, some livestock use.
Cache La Poudre	Sand Creek Ranch	1208															x			Very small amount BLM
Cache La Poudre	Timanth Farms	1200															x			No riparian. Very small amount of BLM
Cache La Poudre	W.J Logan	9093															x			No riparian. Very small amount of BLM
Crow	Armadillo	1205																		No riparian. Very small amount of BLM
Crow	Brush Creek	1213									x						x			High gradient rock armoured creek
Crow	Bufford	9130									x						x			Llama allotment-very little usegood wildlife habitat.
Crow	Ferguson Ranch A	1204									x						x			Urbanization/Land Use conversion, Toadflax
Crow	Gaspar	1201															x		x	Surrounded by cropland
Crow	Lazy D	1209															x			On Colorado border; WindFarm
Crow	Long	1222									x				x		x			Canadian thistle; in recovery-had once been a lot of grazing pressure.
Crow	Marius Willadsen	9174															x			Very small amount BLM; off I-80
Crow	McIntyre Draw	1211		x	x						x									Part of North Crow Creek Allotment System; grazing agreement required.
Crow	North Crow Creek	1210	x	x	x			x			x			x						Working w/owners to re-vamp entire operation; failed riparian & upland assessments/toadflax, flix-weed
Crow	S of Happy Jack	1220															x			Urbanization/Land Use conversion biggest issue; good wildlife habitat
Crow	Switzer	1216															x			No riparian. Very small amount of BLM
Crow	Timanth Farms	1200															x			No riparian. Very small amount of BLM
Crow	Warren Livestock B	9171															x			No riparian. Small amount of BLM

Watershed	Allotment Name	Allot. #	Growing Season Use	Duration Of Use	Distribution Concerns	No AMP/Agreement	Plan Present/Not Working	Riparian not PFC/FAR	303(D) List	Noxious Weeds	Non-Native, Invasive Weeds	T&E Habitat	Sensitive Species Habitat	Livestock Affecting Wildlife Hi	PFC or Closer Look Needed	S&G Already Done	Allotment Satisfactory	Allot. Only Partially in WS	No BLM in S&G Boundary	Comments
Crow	North Crow Creek	1210	x	x	x			x			x			x						Working w/owners to re-vamp entire operation; failed riparian & upland assessments/toadflax, flix-weed
Crow	S of Happy Jack	1220															x			Urbanization/Land Use conversion biggest issue; good wildlife habitat
Crow	Switzer	1216															x			No riparian. Very small amount of BLM
Crow	Timanth Farms	1200															x			No riparian. Very small amount of BLM
Crow	Warren Livestock B	9171															x			No riparian. Small amount of BLM
Horse	North Lodgepole Creek	9018															x			Very small amount BLM;lotts 2-tracks
Horse	Farthing Ranch	1203															x	x	x	
Lone Tree_Owl	A.E. Hodgson	1207															x			Doesn't appear to have had much livestock use in the past; primarily used for wildlife.
Lone Tree_Owl	Andres Willadsen	1219													x		x			Remenant drainage;does not appear to have had much livestock grazing; wildlife utilization.
Lone Tree_Owl	Dale Creek	9007								x	x						x			Many frogs here, snakes too. Good wildlife utilization, some livestock use.
Lone Tree_Owl	Ferguson Ranch C	9055						x		x	x									Flash flooding obvious;deep cattle trails, gilled willows, hummocking; trash from I-80,toadflax,Canada thistle
Lone Tree_Owl	Marius Willadsen	9174															x			Very small amount BLM; off I-80
Lone Tree_Owl	Sand Creek	1208									x						x			Very small amount BLM;developed water could help

Watershed	Allotment Name	Allot. #	Growing Season Use	Duration Of Use	Distribution Concerns	No AMP/Agreement	Plan Present/Not Working	Riparian not PFC/FAR	303(D) List	Noxious Weeds	Non-Native Invasive Weeds	T&E Habitat	Sensitive Species Habitat	Livestock Affecting Wildlife Hab	PFC or Clover Look Needed	S&G Already Done	Allotment Satisfactory	Allot. Only Partially in WS	No BLM in S&G Boundary	Comments
Upper Laramie	Anchor Ranch	9001									x						x			Urbanization encroaching
Upper Laramie	Anderson	9002								x							x			Railroad-toadflax; some headcut issues
Upper Laramie	Antelope Creek	9019						x		x	x									Canada thistle; houndstongue, distribution and season of use issuesleaky spring development needs to be repaired or removed.
Upper Laramie	Bamford	9083															x			Small amount of BLM; interstate pipelines
Upper Laramie	Bath Brothers	9012								x	x						x			Allotments have a number of inter and intra-state pipelines; experienceing new weed invasions; e.g halogeton
Upper Laramie	Berthel Land & Lives	9175								x							x			Houndstongue;considerable elk use, light livestock use, riparian area drying out, loosing obligate vegetation species.
Upper Laramie	Bessie Bath	9011									x						x			Adjacent to Hutton Lake area-Wyoming Toad re-introduction Game & Fish property
Upper Laramie	Boswell Ranch	9096		x	x			x		x				x						Small amount of BLM amoungst private; irrigated pasture-duration of use and issues, adjacent to forest-high big game utilization.
Upper Laramie	Bovee	9021								x							x			Houndstongue; lightly used
Upper Laramie	Bovee Horse Pasture	9020															x			No natural water source

Watershed	Allotment Name	Allot. #	Growing Season Use	Duration Of Use	Distribution Concerns	No AMP/Agreement	Plan Present/Not Working	Riparian not PFC/FAR	303(D) List	Noxious Weeds	Non-Native, Invasive Weeds	T&E Habitat	Sensitive Species Habitat	Livestock Affecting Wildlife Ha	PFC or Closer Look Needed	S&G Already Done	Allotment Satisfactory	Allot. Only Partially in WS	No BLM in S&G Boundary	Comments
Upper Laramie	Bovee	9021								x							x			Houndstongue; lightly used
Upper Laramie	Bovee Horse Pasture	9020															x			No natural water source
Upper Laramie	Brees	9143															x			Small amount BLM
Upper Laramie	Carroll	9048															x			Small amounts of BLM
Upper Laramie	Chimney Rock	9182			x															Large area,limited range-land; need to watch duration of use
Upper Laramie	Coalbank Mine	859														x			x	
Upper Laramie	Cole	9079								x										Low larkspur issues despite treatment efforts
Upper Laramie	Cooper Hill	875	x	x	x			x		x	x			x						Several livestock management issues; houndstongue, Canada Thistle, burdock
Upper Laramie	Cooper Lake	9069													x		x			No riparian, would like a closer look
Upper Laramie	County Line	878															x			Very lightly used by livestock; good wildlife habitat.
Upper Laramie	Croonberg Ranch	9039	x	x	x					x	x			x						Livestock & elk in riparian areas to soo and for too long;houndstonge,Canada thistle
Upper Laramie	Dirt Farm	9161								x							x			Railroad-toadflax
Upper Laramie	Downey Lakes	9117													x		x			No riparian, would like a closer look
Upper Laramie	Downey Lakes South	9076													x		x			No riparian, would like a closer look
Upper Laramie	Dunn	9016													x		x			No riparian, would like a closer look
Upper Laramie	Dutton Creek South	9173													x		x			No riparian, would like a closer look

FY 2007 Standards & Guidelines Priority List

Watersheds: Big Laramie River Watershed

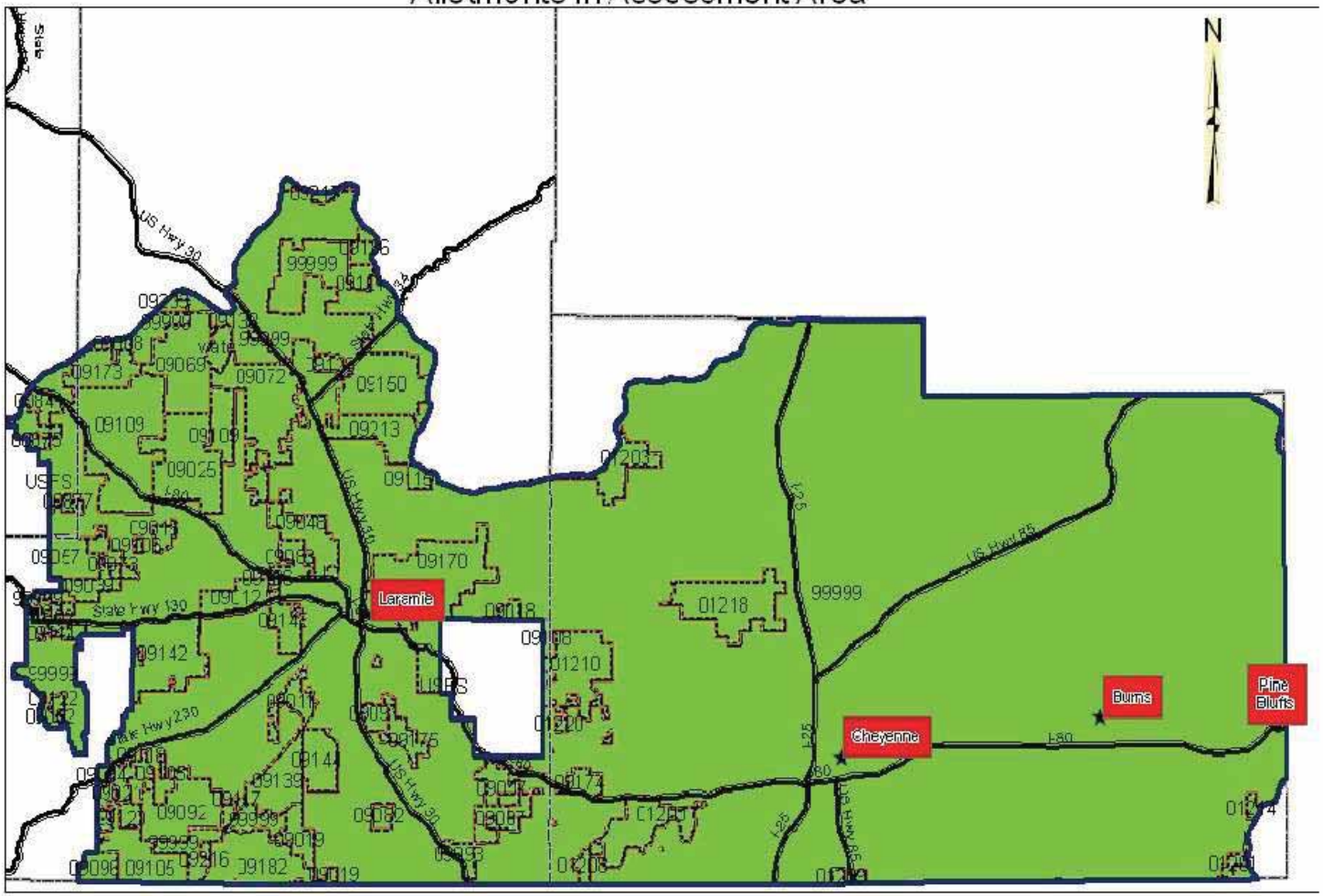
Watershed	Allotment Name	Allot. #	Growing Season Use	Duration Of Use	Distribution Concerns	No AMP/Agreement	Plan Present/Not Working	Riparian not PFC/FAR	303(D) List	Noxious Weeds	Non-Native, Invasive Weeds	T&E Habitat	Sensitive Species Habitat	Livestock Affecting Wildlife Ha	PFC or Closer Look Needed	S&G Already Done	Allotment Satisfactory	Allot. Only Partially in WS	No BLM in S&G Boundary	Comments
Upper Laramie	East Jelm Mountain	9118								x							x			Low larkspur;decant encroached aspen
Upper Laramie/Ho	Flat Top	9186																x		In 2 H2O sheds; no riparian
Upper Laramie	Government Creek	9082			x			x			x									Poorly constructed/engineered water development(s)
Upper Laramie	Harris Ranch	9072															x			No riparian, more state ground
Upper Laramie	Hecht	9122								x							x			No riparian, dalmation toadflax
Upper Laramie	Holland Lease	9119								x	x						x			Allotment in recovery;Canada thistle,houndstongue,low larkspur
Upper Laramie	I-80 Overpass	9166																x		Covered in Lower Laramie S&G report
Upper Laramie	Indian Chips	9150																x		Covered in Lower Laramie S&G report
Upper Laramie	Ione	9101																x		Covered in Lower Laramie S&G report
Upper Laramie	James Lake	9025																x		Covered in Lower Laramie S&G report
Upper Laramie	JMS Ranch	9063															x			No Riparian
Upper Laramie	JW/Sheep Mountain Ra	9142								x	x									Significant loco weed issues; needs AMP since sub-divided.
Upper Laramie	Laramie River	9215									x						x			Houndstongue

Watershed	Allotment Name	Allot. #	Growing Season Use	Duration Of Use	Distribution Concerns	No AMP/Agreement	Plan Present/Not Working	Riparian not PFC/FAR	303(D) List	Noxious Weeds	Non-Native, Invasive Weeds	T&E Habitat	Sensitive Species Habitat	Livestock Affecting Wildlife Ha	PFC or Closer Look Needed	S&G Already Done	Allotment Satisfactory	Allot. Only Partially in WS	No BLM in S&G Boundary	Comments
Upper Laramie	Leazenby Lake	9091															x			Game & Fish properties,very little BLM
Upper Laramie	Little Laramie River	9165			x			x												Should limit to fall use only;strong fence line willows contrast
Upper Laramie	Lookout Ranch	9138															x			Cactus,PrairieDogs,PendingWindFarm
Upper Laramie	Mill Creek	9106													x		x			Irrigated?
Upper Laramie	Miller	9080								x							x			Houndstongue near Laramie River,very small BLM
Upper Laramie	Monaghan Ranch	9144															x			No riparian, small amount BLM
Upper Laramie	Morgan & Edwards	9114	x		x			x						x						Should limit to fall use only;strong fence line willows contrast
Upper Laramie	Needmore Ranch	9115								x							x			No riparian, cheatgrass,Canada thistle
Upper Laramie	North Fork	9045												x			x			No riparian,need fence info
Upper Laramie	Pasco	9213															x			
Upper Laramie	Pine Ridge	9036															x			
Upper Laramie	R.O. Corp	9128															x			Near ridge line
Upper Laramie	Ring Mountain	9105		x	x			x		x							x			Stink Creek-timing, duration of use, heavy wildlife utilization;houndstongue

Watershed	Allotment Name	Allot. #	Growing Season Use	Duration Of Use	Distribution Concerns	No AMP/Agreement	Plan Present/Not Working	Riparian not PFC/FAR	303(D) List	Noxious Weeds	Non-Native, Invasive Weeds	T&E Habitat	Sensitive Species Habitat	Livestock Affecting Wildlife Ha	PFC or Closer Look Needed	S&G Already Done	Allotment Satisfactory	Allot. Only Partially in W/S	No BLM in S&G Boundary	Comments
Upper Laramie	Sand Creek Ranch	9139		x													x			Opportunity to develop water away from riparian area;
Upper Laramie	Sanders	9140								x							x			Toadflax; very light grazing use
Upper Laramie	Schick	9075															x			S
Upper Laramie	Schroeder	841															x			Against Forest;close to I-80
Upper Laramie	Seven Mile	876															x			High gradient rock armored streams
Upper Laramie	South Fork	9057															x			More bogg like than creek; remanant willows (drought), rock armored,
Upper Laramie	Spring Creek	9052														x	x			Covered in Lower Laramie S&G
Upper Laramie	Steamboat Rock	9092		x													x			Participating in CRM; good monitoring plan; larkspur, houndstongue
Upper Laramie	Strain	9053															x			Aspen grooves; smaller allotment
Upper Laramie	Strouse Hill	9109					x				x						x			tadpoles/drought affected/hi livestock
Upper Laramie	Sunrise Creek	9120								x							x			larkspur, houndstongue
Upper Laramie	T-K	9157	x	x	x			x						x						Heavy wildlife & livestock use; no recruitment of woodies
Upper Laramie	Talbott	13591															x			Lightly used;

Watershed	Allotment Name	Allot. #	Growing Season Use	Duration Of Use	Distribution Concerns	No AMP/Agreement	Plan Present/Not Working	Riparian not PFC/FAR	303(D) List	Noxious Weeds	Non-Native, Invasive Weeds	T&E Habitat	Sensitive Species Habitat	Livestock Affecting Wildlife Ha	PFC or Closer Look Needed	S&G Already Done	Allotment Satisfactory	Allot. Only Partially in W/S	No BLM in S&G Boundary	Comments
Upper Laramie	Trapper Springs	9216		x													x			Participating in CRM; good monitoring plan; larkspur
Upper Laramie	Upper PineRidge	9230																		No riparian; prairie dogs,pending wind farm
Upper Laramie	Ward Gulch	11002									x						x			sub-irrigated pasture, not a lot of utilization. Toadflax.
Upper Laramie	Warren Livestock A	9170		x	x			x		x	x									Spring not maintained; high livestock utilization
Upper Laramie	Webb Lake	9073													x		x			Need better fence information;
Upper Laramie	Wills	877	x	x	x			x			x			x						Pot-hole country,heavily used by both wildlife and livestock, timing and duration a problem. Hemlock & Canadian thistle.
Upper Laramie	Woods Landing	9054								x	x						x			Low Larkspur,hemlock;significant big game habitat, lotta game trails, good woodys.
Upper Lodgepole	Gaspar	1201															x	x	x	Small portion in watershed
Upper Lodgepole	Hockersmith	1214															x	x	x	Need better fence information
Upper Lodgepole	Lodgepole Creek	1218															x			No riparian; BLM steep north facing
Upper Lodgepole	McKecknie Meadows	9108									x						x			Very little BLM
Upper Lodgepole	North Crow Creek	1210	x	x	x			x		x	x			x						See Crow Creek
Upper Lodgepole	North Lodgepole Creek	9018															x			Very little BLM

Map #3
Allotments in Assessment Area



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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 where the general environment, current condition, and impacts are generally the same (see Map 4).

Cache La Poudre

1. Characterization

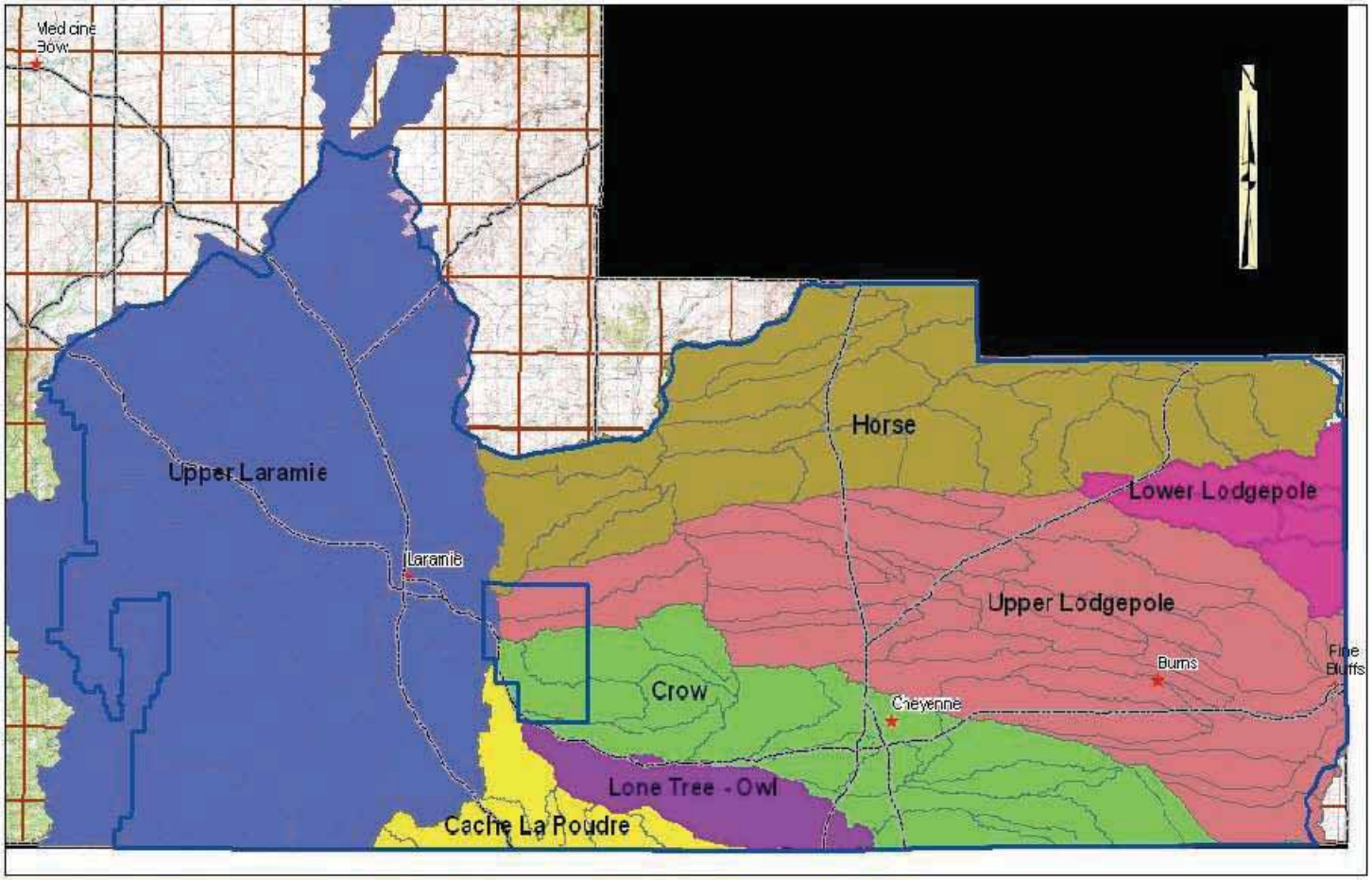
Only a small portion of the Cache La Poudre watershed is included in the Big Laramie River assessment area. The majority of the watershed lies in Colorado. However, the North Fork tributary, which lies in Wyoming, is a significant contributing head water that drains a mountainous area north of Larimer County Colorado and far South Albany County. It includes the area around Tie Siding, WY, and Virginia Dale, CO. There are 158 BLM acres in this watershed.

It rises in remote northwestern Larimer County in the foothills of the Roosevelt National Forest east of the Medicine Bow Range. It follows generally east, passing south of Virginia Dale, where it ultimately drains into, and is impounded by, Halligan Reservoir. The valley of the North Fork was historically used as a trail route between the Colorado Piedmont and the Laramie Plains, and included the Cherokee Trail and the Overland Trail. The valley of the North Fork later became the route of the Union Pacific Railroad and still later the route of U.S. Highway 287 between Fort Collins, Colorado, and Laramie, Wyoming.

Physiography of the Cache La Poudre watershed is considered unglaciated plains, nearly level floodplains and terraces with rolling alluvial fans. Streams are ephemeral or intermittent. Many streams are incised and flow into playas. Substrate is generally cobble, glacial outwash material consisting of granite, limestone, and quartzite. Elevation in this fourth order watershed ranges from 5,000 to 7,900 feet. The Geology of the area is described as quaternary alluvium and colluvium, tertiary gravels and fan deposits in stream and floodplain areas. There are also areas of tertiary soft marine shale, claystone and silty sandstone (Chapman, et al 2003).

Soils here are generally shallow, well drained, gently sloping to very steep slopes and rock outcrop on foothills and mountain slopes. They formed in colluviums, glacial till and alluvium. The soils also have gravelly moderately coarse textured surface layer and a very gravelly moderately coarse textured underlying material. Most of the area soils are further classified as aridisols (haplicalcids, calciarigid, (haplocamidbids), and entisols (torriorthents, ustifluvents). This implies a frigid, cryic/aridic regime. Average annual precipitation is 10 to 16 inches, the average annual air temperature is 44 to 80 degrees Fahrenheit, and the average frost-free period is 75-90 days. Dale Creek, and the West Fork of Dale, Dry Creek and Grant Creek are a few of the named creeks in this watershed in Wyoming.

Map # 4
Fourth Order Watersheds In Assessment Area



Legend

- BigLaramieS&GArea
- Highways
- Towns and Cities

4thOrder_MapHUCs

4th Order Watershed

- Cach La Poudre
- Crow
- Horse
- Lone Tree-Owl
- Lower Lodgepole
- Upper Laramie
- Upper Lodgepole
- Counties
- Lwr_Laramie_Allots2
- Township- Range Boundary

Miles: 0 5 10 20 30 40

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There are numerous small unnamed creeks and a considerable amount of irrigation in this watershed. Stream flow is generally intermittent the farther from the Medicine Bow range, with flows only reaching the reservoirs during high flow events. Irrigation for hay meadows is reliable here, but is more variable due to climate at lower elevations in the drainages. The coarse textured surface layer tends to be easily eroded and ground disturbances are inclined to exhibit in the form of head cuts and down cutting. The BLM in this area appeared to experience light livestock grazing pressure and has high value as wildlife habitat. Stream channels seen throughout the area, are generally stable with mature perennial vegetation cover, including willows, water-birch and other shrubs. There has been no annual flow monitoring for any of the streams on BLM in this area. Flows are generally highest in May and lowest during August or September.

Vegetation generally consist of mixed-grass prairie dominated by blue grama, Indian ricegrass, western wheatgrass, junegrass, Sanberg bluegrass, needle-and-thread grass, rabbitbrush, fringed sage and various forbs and other sub-shrubs. Riparian vegetation may include willow species and narrowleaf cottonwood with boxelder and wild plum in the northern parts of the watershed far from included BLM-administered public lands.

Early homesteads were developed in the wider valleys and gentler terrain along the larger streams. The BLM grazing allotments in the Cache La Poudre watershed include the following allotments: W.J. Logan, Dale Creek, Sand Creek Ranch, and A.E. Hodgson allotments, with a total of 158 acres of BLM.

The majority of stream channels in this watershed are C5 and C6 stream types (Rosgen 1996). The C5 stream type is a single-thread channel, slightly entrenched with moderate to high width/depth ratios. They have moderate to high sinuosity, sand to sand-silty dominated beds and an obvious floodplain (Rosgen 1996). The C6 stream type is a slightly entrenched, meandering, silt-clay dominated, riffle-pool channel with a well developed floodplain (Rosgen 1996). It occurs in broad valleys with gentle gradients of less than two percent (see Pictures 6 and 7). Rates of lateral adjustment are influenced by the presence and condition of riparian vegetation.

Principal human uses in this watershed are livestock grazing, hay production and recreation. Recently, housing developments in this area have increased significantly according to the Wyoming State Engineers Office, with an increase in water taps of 22% between 2002 and 2006 (*Wyoming State Engineers 2007 Annual Report*). Livestock use is with cattle, employing both cow/calf and yearling operations as well as a few llamas and goats. Seasons of use are primarily spring, summer and fall. Hay production includes both alfalfa and grass hay, with ground preparation and fertilization in the spring, summer irrigation, putting up hay in during the summer and fall. Recreation is primarily related to fishing, mountain biking, hiking, bird watching and antelope hunting. As land ownership in this area is mixed and there is a large portion of private land, the majority of recreating occurs on State land.

2. Issues and Key Questions

a. Livestock Grazing: The use on BLM in this watershed is by cattle. The W.J. Logan, Dale Creek, Sand Creek Ranch, and A.E. Hodgson Allotments all appeared to have very light utilization. Cattle seemed to have just been removed shortly before the 2007 field visits occurred on the Sand Creek Ranch allotment.

Although there is 0.18% BLM-administered land in this watershed, and many of the BLM parcels are less than ½ a section; it was apparent these parcels-particularly those with riparian areas were vital to the overall utility of the allotment.

b. ***Woody Plant Health:*** This watershed is dominated by mixed-grass to short-grass steppe plant communities. Those riparian areas with woody vegetation appeared to attract a great deal of big game. Utilization was generally heavy on the woody components. As there has been relatively light livestock utilization in the areas for the last several years, the riparian woody plants exhibited good vigor considering all the wildlife utilization. The upland shrubs in particular mountain mahogany, service berry and snowberry communities received considerable utilization, however appeared to be in good health (see Pictures 8, 9, and 10).

c. ***Erosion***: Erosion from roads, both improved and unimproved, is one of the most important factor relating to watershed health. In this watershed, increasing urbanization has meant a significant increase in roads. The State of Wyoming, BLM, and Albany County maintain improved roads within the watershed. The principal problem with improved roads is inadequate water control features, such as culverts, wing-ditches, and water-bars, to mitigate the effects of roads on upland surface water runoff and weeds. Road standards are based on how to build and maintain a safe road, rather than what effect the road has on altering the natural hydrology of the landscape. As a result, roads tend to collect water off a broad area and then release it in a more concentrated volume, in a draw or flared onto a hillside undeveloped for this flow, causing accelerated erosion. For each mile of improved road there are probably ten miles of unimproved roads or two-tracks. Many of these two-tracks do not cause increased erosion, but where it does occur there is usually no mitigation to correct the problem. Use of road systems by all users, particularly in bad weather or when roads are wet, leads to increased erosion from roads. The increasing use of the area for recreation, and the increasing use of 4-wheel drives and off-highway all-terrain vehicles, is creating new roads and new sources of erosion. The key questions here are: How do we improve the adequacy of water control features on improved roads? How can erosion sources from two-track roads best be addressed? How can we develop a long term strategy to address erosion issues from these roads? What educational and management tools should be employed to reduce erosion impacts from recreation and other users of public lands?

d. ***Urbanization:*** This issue has the most potential for impacting watershed health (see Picture 11). The key question is what will large scale development have on watershed health? The disturbance associated with homes, roads and other fragmenting, linear features impacts watershed health by decreasing diversity and homogenizing the landscape. This ultimately cascades through all trophic levels whereby once complex sound systems become simplified and require more outside inputs. Studies along the foothills of the Front Range have confirmed that where once fox, weasels, coyotes and badgers were the predominate predators; raccoons, skunks, magpies and crows appear and supplant those species (Knight, et al).

5. **Weeds/Invasive Species:** Noxious weeds and invasive species are spreading into undisturbed rangeland from the initial sites of introduction. Generally, roads are the primary source of invasive plant species. A number of private landowners adjacent to BLM-administered lands, especially given the large amount of private land in this watershed, have yet to implement noxious weed management programs. Many new comers to rural living are not aware of weeds, or why weeds are in issue. There is a Wyoming State law (W.S. 11-5-119 of the Wyoming Weed and Pest Control Act of 1973) that requires private land owners to control weeds on their property. When private land owners are not investing in a weed control effort, it frequently negates the potential effectiveness of treatments on BLM-administered public lands. Close cooperation with local Conservation Districts, County specialists, and the Wyoming Game and Fish Department provides the best avenue for engaging rural home owners into working together with the BLM to combat existing infestations and prevent further spread. Livestock movements are increasing weed present in some allotments and more direct action is needed in that regard. There is no reasonable measure to control wildlife movements that spread weeds. However, striving for diverse and hearty plant communities that can out compete invaders is a reasonable goal to strive toward.

3. Current Conditions

Quantifiable data about current erosion levels and stream flows, as well as condition and trend on BLM-administered public lands are not available. This area was assessed over twelve years ago. However, assessments were conducted on an allotment-by-allotment basis. Overall, watershed standards were not the focus of field investigations at that time, so no information is available regarding landscape-level condition. Each of the allotments visited the summer of 2007 in this watershed appeared to receive very light livestock use but considerable wildlife use. All indications affirmed the value of retaining large contiguous open space for wildlife which included the small parcels of BLM-administered lands within the four allotments. Livestock grazing appears to be a valuable tool for maintaining most of these allotments as supportive landscapes to wildlife.

Stream channels on the BLM in this watershed are generally stable, with good vegetative cover and reasonable width-to-depth ratios. Most seem to experience flash flooding on a regular basis. On BLM-administered public lands the streams assessed would be considered Rosgen C5 and C6 type streams (Rosgen, 1996). Many of the reaches assessed would appear to be one kind of channel, then farther down or up slope become a completely different kind of channel (see Pictures 12 and 13). In those channels that eventually exhibited narrowing, the active floodplain width would also expand, 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.

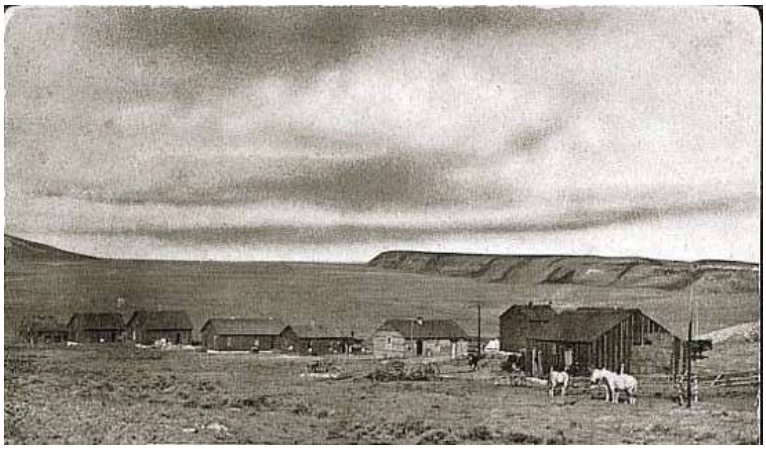
Vegetative cover and litter on upland sites vary with the soils, slope, aspect, elevation and precipitation. Research conducted in Wyoming indicated that upland plant communities often can be maintained with ground cover above 30%, while sediment yield increased dramatically when cover declined to less than 30% (Linse, Smith, and Trlica 1992). Ground cover ranges from 50% to nearly 100% on big sagebrush plant

communities, the most common vegetation types in this watershed. At higher elevations, plant cover is usually higher due to increased moisture and density of plants. In general, the overall ground cover appears good, but in many locations can still be improved with the use of BMPs for weed control, and travel management controls.

4. Reference Conditions

Laramie owes its existence to the construction of the Union Pacific railroad and the locating of Fort Sanders a short distance to the South. Fort Sanders, originally called Fort John Buford, was established in July 1866 to protect the Union Pacific Railroad and the Overland Trail from the depredations of Indians. Laramie is sometimes referred to as the third oldest town in Wyoming. Only Ft. Laramie and Ft. Bridger are older. Fort Sanders was designated as the county seat of Laramie County by the Dakota Territorial Legislative Assembly. The county seat was not moved to Cheyenne until the following year. Laramie has received its impetus from being a transportation crossroads and as the location of the University of Wyoming.

A few entries from the 1820s diary of William Ashley included mention of the abundance of wildlife, buffalo, beaver, and antelope in this area while en route to South Pass. Indications are the country looked much the same physiographically as it does today (*Historic Photographs courtesy of* ***wyomingtalesandtrails.com****)*



BOTH PHOTOS TAKEN NEAR TIE SIDING, APPROX. 1920, PHOTO BY HENNING SVENSON

5. Synthesis and Interpretation

BMPs for livestock grazing that will continue 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. As there is very little BLM-administered land in this watershed, landscape photo-points, at the very least, will be the primary monitoring tool for this watershed. Focus of management efforts will likely be toward weed control and invasive species management.

As mentioned previously, it was evident the area experienced considerable flash flood events. Fluvial erosion 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 changes in watershed health if vegetation is degraded.

As more housing developments are constructed and roads are upgraded and improved, problems associated with them are generally reduced. Main roads have been graveled or a harder surface developed to reduce long-term maintenance. Simple practices such as wing-ditching have become a standard operating procedure on new roads, but need to be added to older roads. Integrated pest management practices need to be incorporated into overall BLM and county transportation maintenance plans. Water flows are flared out into the vegetation where it benefits plant growth and infiltrates the soil instead of running down the middle or side of the road until it reaches a stream. Greater use of culverts would prevent water from running along the road and creating gullies. Improved or closed off stream crossings have reduced vehicular disturbance to channels and banks. Weed control and management will be the focus of management efforts with regard to roads as well.

6. Recommendations

Due to the very small amount of BLM-administered lands, the existing diversity and quantity of vegetative cover on uplands, the existing stream vegetation and channel morphology, and the small number of remaining management issues, it is determined that the majority of the Cache La Poudre watershed within the report area is meeting Standard 1. The Sand Creek Ranch Allotment riparian area rated as functioning-at-risk due to livestock. However, the trend is static and could be easily reversed with grazing management guidance. 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.

- 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. Implement invasive species management plan.

Crow Creek

1. Characterization:

The Crow Creek watershed is located in southeastern Wyoming and northern Colorado. Crow Creek is formed by the merger of the South Fork of Crow Creek with the Middle Fork and the addition of the North Fork of Crow Creek about 1.5 miles downstream. All the major tributaries of Crow Creek begin in the Laramie Range and flow eastwardly. Crow Creek then continues in an eastward direction, passing through the city of Cheyenne, and then heads east and south into Colorado where it eventually meets the South Platte River.

A High Plains ecoregion, the Crow Creek watershed is a landscape of rolling plains and tablelands formed by the erosion of the Rocky Mountains and fluvial deposits and eroded gravel from the Laramie Mountains. The landscape contains a great deal of variety. Vegetation includes needle-and-thread, prairie junegrass, winter fat and scattered yucca. Patches of mountain mahogany and skunkbush sumac grows on bluffs and hilltops. Land use is commonly livestock grazing.

ROUND UP PREPARATIONS OUTSIDE OF CHEYENNE, 1850'S

Elevations range from 7,600 feet in the western part to 4,700 feet in the eastern part of the watershed. Surficial and bedrock geology is quaternary sandy, gravelly and loamy colluviums, and tertiary deposits of light colored tuffaceous claystone, sandstone, and conglomerates. These are underlain by claystones and sandstones of the tertiary arikaree and ogallala formations. Soils in the Crow Creek watershed are mollisols (argiustolls, hapulustolls), entisols (torripsamments, torriorthents). These indicate a climate regime that is mesic, aridic, ustic. Precipitation averages are 12-16 inches, mean temperatures average lows of 8 degrees Fahrenheit and average highs of 32. There are between 100 to 125 frost-free days in the area (Chapman, et al. 2003).

The surrounding county landscape is mostly rolling prairie, which is primarily used for grazing, dry cropland and irrigated cropland. The Crow Creek watershed consists of approximately 413,000 acres, which lies in both Laramie and Albany Counties. It is the most populated watershed within the State of Wyoming (Wyoming State Engineers Office 2007).

Crow Creek consists of a diverse cross section of Class 2 perennial streams (a perennial seasonal or intermittent stream or spring in which habitat for aquatic non-fish vertebrates and or aquatic benthic macro-invertebrates exist), municipal-use water reservoirs, and a number of intermittent streams. Map 4 depicts the Crow Creek watershed. There are three distinct segments of the Crow Creek watershed. The upper watershed has a considerable amount of state lands, national forest lands, BLM-administered lands, and private lands, as well as municipal water supply reservoirs. These reservoirs and tributaries are potentially affected by forest management, livestock grazing, intense recreational uses, and development for small acreage housing. The middle section is characterized as urban, suburban, and industrial use, with suspected affects on water quality stemming from storm sewers, street and parking lot runoff, wastewater treatment facilities, and housing development. The lower section of Crow Creek from Cheyenne to the Wyoming/Colorado border is represented predominantly by dryland farming, center pivot irrigation, livestock grazing, and small acreage housing development uses. There are no BLM-administered lands in the middle or lower section of the Crow Creek watershed.

There are eleven BLM allotments in this watershed for a total of 4,388 BLM acres. Those allotments are primarily in the upper watershed portion. Overall watershed influences in this area result from storm water carry-over, wastewater treatment facilities, livestock grazing, small acreage housing, and irrigation practices. The major urban areas served by this watershed include the City of Cheyenne, F.E. Warren Air Force Base, as well as the unincorporated town of Carpenter. There are two major interstate highways (I-80 and I-25) that intersect near Cheyenne. In addition, within the watershed, the main line of the Union Pacific Railroad runs through the county along with the Burlington Northern Railroad and the Santa Fe Railroad.

The Crow Creek Watershed originates in the Laramie Mountains on very shallow steep soils. These types of soils, in the upper portions of the watershed have a high rate of water runoff potential. The majority of streams on BLM-administered lands in the Crow Creek watershed can be classified as the A3 type streams type (see Pictures 14 and 15) and C5 (Rosgen 1996). This stream type is characterized as an entrenched stream with low width to depth ratios (<12), low sinuosity; moderately steep slope, coarse gravel channel material- bed and first flood plain (Rosgen 1996). Channel sensitivity is high, as there is little fine grain material to enable establishment of bank stabilizing vegetation or settling. C5 streams are slightly entrenched, moderate to high width/depth ratios, and moderate sinuosity (Rosgen 1996). They have gravel-sand stream beds and generally well vegetated banks.

Around the Cheyenne area, runoff is quite high. Roughly 3% of the watershed is made up of the town of Cheyenne, which has mostly impermeable areas from rooftops, streets, and parking lots. These areas have high potential for runoff water to reach streams during storm events. This also makes these areas more likely to contribute pollutants to streams during storm events. Most of the remaining watershed area has soils with moderate to low runoff potential. These soils consist of deep, well-drained loamy textures. There are no BLM-administered lands immediately around Cheyenne.

2. Issues and Key Questions

Cheyenne is the largest and only incorporated town in the Crow Creek Watershed with a population of about 85,384. However, with the growth surrounding Cheyenne, the population of the greater Cheyenne area is nearing 90,000. Not all of this development lies within the Crow Creek watershed boundaries, but a significant portion of it does. Other population centers include Carpenter, F.E. Warren Air Force Base, South Cheyenne, and a subdivision development in the Table Mountain area west of Cheyenne. Laramie County population has increased steadily over the last 40 years. Growth in number of residents has gone from 60,149 in 1960 to 81,607 in 2000 (Census data). The towns and Census Designated Places (CDPs) in the watershed make up the majority of the county's population. Cheyenne houses about 65% of the county's population. Approximately 33% of the population resides in unincorporated areas. The unincorporated areas also saw the largest percentage of growth, up by almost 25% since the 1990 Census. Many areas of the state are expected to see population declines, but urban and resort areas are expected to continue to experience growth. Laramie County is one of these "urban" areas. In addition, Laramie County sits at the northern end of the growth corridor that extends along I-25. This placement will likely impact the positive growth predicted (Laramie County Comprehensive Plan 2001). One of the biggest trends in the agricultural community and agriculture in general is conversion of agriculture land to other uses. A shift away from resource development toward urban development is causing this trend. It can be seen in the subdivision of land over time in the county. Subdivision of the land was quite dramatic in the second half of the 1970s, with a total of 11,539 acres being given to subdivision at that time (see Picture 16).

The period from 1980 to 1994 saw only 3,767 acres (270 acres per year) being subdivided, with 1,478 new residential lots. However, from 1994 through 2000, approximately 7,400 acres (over 1,000 acres per year), with 1,337 new residential lots were created. This trend is expected to continue.

Principal human uses in this watershed are boating, fishing, hiking, mountain biking, horseback riding, and antler and big game hunting. Livestock use is cattle, employing both cow/calf and yearling operations as well as horses. Seasons of use are primarily spring, summer and fall.

Although there is not a high amount of BLM-administered land in this watershed, the location of those parcels, adjacent to Forest Service, State, and municipal properties, make them a vital component to an area of high recreation, aesthetic and wildlife value (see Pictures 17, 18, 19, and 20).

a. ***Livestock Grazing****:* There are 11 allotments in the watershed, for a total of 4,388 BLM-administered acres. Nine of those eleven allotments received light to moderate grazing. Generally, livestock grazing in this watershed appears to be at acceptable levels and an important vegetation succession tool for wildlife when looking at the landscape overall (see Pictures 21, 22, and 23).

However, the largest allotment in this watershed, the North Crow Creek Allotment, received unacceptably high livestock impacts (see Picture 24). The North Crow Creek Allotment is considered a Section 15 grazing lease allotment,

which means it's an allotment that is managed under rules in Section 15 of the Taylor Grazing Act. This pertains to grazing *leases* on public lands **outside** the original grazing district boundaries. It states that: *"The Secretary of the Interior is further authorized, in his discretion, where vacant, unappropriated, and unreserved lands of the public domain are so situated...to lease any such lands for grazing purposes, upon such terms and conditions as the Secretary may prescribe...."*

Livestock have had a significant impact on nearly all riparian areas of this allotment. A number of field and office visits have been conducted with the base property owners and the Laramie Conservation District. Amongst all parties a plan is being constructed to bring this allotment up to Healthy Rangeland Standards. In the mean while, the permittees have agreed to take non-use to allow for the entire allotment to recover. Monitoring has been established and riparian area protections and off site water developments are being planned.

b. ***Woody Plants:*** The age and canopy cover of mountain shrub 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, greater surface erosion, all leading to reduced late-season stream flows. Mixed ownership in this watershed does appear to be influencing vegetation patterns across the landscape, in particular with regard to woody species. During the summer of 2007, fence lines between private and BLM as well as Forest Service and BLM were noted, as many of the contrasts were abrupt with regard to aspen stands and narrow-leaf willow and cottonwoods (see Pictures 25, 26, 27, 28, 29, 30, and 31).

c. ***Erosion***: The allotments in this watershed are close to the Forest and occupy some of the higher elevations of the watershed. The pinkish Precambrian granite parent material of this area is very much exposed, practically wherever there has been flowing water in the area. In many of the stream beds exposed granite could be seen, sometimes throughout the entire reach. Consequently, silt from the uplands or any intermediate terrace, was usually quite obvious and easily traceable (see Pictures 32, 33, and 34). Streams here are Rogen A4 type systems; a regular observation was that one game path or livestock trail traversing the drainage would create a slump, releasing finer material into the stream bed, widening the drainage and preventing the reach from stabilizing, and increasing erosion overall. In-channel bank slough on outer corners and gradient adjustment of ephemeral side drainages are the primary sources of erosion. A number of the stream beds were down to bed rock and many had significant head cuts where topography was dramatic (see Pictures 35, 36, 37, and 38).

3. Current Conditions

Quantifiable data about current erosion levels and stream flows, as well as condition and trend on BLM-administered lands are not available. The smaller allotments visited the summer of 2007 in this watershed appeared to receive very light livestock use, but considerable wildlife use. Two allotments in the watershed had sufficient rangeland health issues, beyond livestock grazing, that management actions will need to be discussed and implemented. Stream channels are generally unstable, with poor

vegetative cover and declining width-to-depth ratios. Some channel narrowing is occurring; however current practices are offsetting this benefit. Reduction of bank cover due to the duration and season of cattle use has and continues to be the principle impacts to channels in this watershed. Changes in livestock management, including fencing, upland water developments and/or exclusion will be implemented. Weed control is clearly a need for the entire watershed, as mentioned; a concerted multi-agency and public coordinated invasive species management plan will need to be re-enforced.

All observations regarding the BLM-administered public lands in the watershed affirmed the value of the retaining large contiguous open space for wildlife and the aesthetics of the area.

4. Reference Conditions

As there is very little previously acquired natural history information about the BLM-administered land in the Crow Creek watershed, historical pictures with landscape background become useful, as do the diaries and journals of early frontiers men. The expedition notes of the Fremont party mention Crow Creek in reference to prolific Indian troubles, but very little about the landscape. Historic pictures from around the Cheyenne area and what today is the Vedewoo area, are helpful and indicate from a vegetation stand point there has been little change.

LARAMIE MOUNTAINS AREA 1869

ROPING AND CUTTING OUT, NEAR CHEYENNE, 1888, PHOTO BY C. D. KIRKLAND.

5. Synthesis and Interpretation

Vegetation and ground cover are the primary factors that will reduce fluvial and alluvial erosion in the uplands. Erosion can result in the loss of topsoil and reductions in site productivity in the uplands and horizontal adjustments of stream channels. The primary influences upon these factors that may impact watershed function are current increasing housing developments, livestock use, roads, and off-highway vehicle activities. Invasive species are ubiquitous in this watershed. In particular, Dalmation toadflax has a strong presence on BLM-administered public lands, National Forest, State, municipal recreation areas, and private ground. Again, close cooperation with local Conservation Districts, County specialists, and the Wyoming Game and Fish Department provides the best avenue for engaging rural home owners into working together with the BLM to combat existing infestations and prevent further spread.

Best Management Practices (BMPs) for livestock grazing that can be 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. Vegetative bank cover can increase significantly if relieved of growing season use by livestock and, therefore, reduce the unprotected bank area vulnerable to in-channel erosion. The bank building and expansion of riparian habitat (due to narrowing of stream channels) can lead 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 needed.

6. Recommendations

Although the exiting diversity and amount of vegetative cover on uplands and the condition of the shrublands overall is good, concerns exist regarding livestock management, weeds, and aspen health in the Crow Creek watershed. The existing and declining trend in stream vegetation, channel morphology, and the relatively small number of remaining management issues, it is determined that the McIntyre Draw Creek and North Fork of Crow Creek within the assessment area is only partially meeting Standard 1. The Brush Creek drainage, however, is currently meeting Standard 1.

Provided greater management and the implementation of Best Management Practices for livestock grazing, Standard 1 can likely be met within one or two grazing seasons. BMPs include 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.

During the field assessment, the issues were identified and discussed with the grazing operators and cooperating agency personnel. By restoring plant communities with diverse species, age classes, and cover types, overall watershed conditions will improve benefitting both livestock and wildlife. Improving composition of communities to maximize herbaceous cover and litter and, therefore, minimize surface runoff and soil erosion, and promote reliable, late-season stream flows would meet Standard 1. This will require careful grazing management and investment in developed water sources; which will involve multi agency cooperation, education, communication and commitment.

Horse Creek and Upper Lodgepole

There are no BLM jurisdiction lands in these fourth order watersheds.

The Horse Creek watershed originates on the east face of the Laramie Range and extends through the eastern plains of Wyoming. It covers about 1,530 square miles, and the main stem Horse Creek is about 130 miles long. Ownership of land along main stem Horse Creek is 98% private.

Lone Tree-Owl and Lower Lodgepole

1. Characterization

The BLM manages 827 acres in these combined fourth order watersheds. This watershed consists of irregular plains formed by fluvial deposits and eroded gravel resulting in the moderate relief plains (see Pictures 39, 40, and 41). The primary prairie vegetation includes needle-and-thread, prairie junegrass, winter fat, and scattered yucca. Patches of mountain mahogany and skunkbush sumac grow on bluffs and hilltops (see Picture 42). The topography ranges from steep limestone ash-juniper covered hills in the north, to mixed brush and mesquite covered plains to the south. The soils range from shallow and rocky in the west to rolling and nearly level medium textured loams in the east. Rock-outcrops are common throughout this watershed, and will frequently support juniper, ponderosa, and limber pine in varying densities.

It contains intermittent streams, with a few large perennial streams, which generally originate in mountains or higher relief areas. Many of those have more silty and sandy substrates than the other watersheds. Elevations here vary from 4,700 to 5,700 feet.

Geology, for the most part, is characterized as quaternary colluvim and localized loess deposits, tertiary gravel, deposits of light colored tuffaceous claystone, sandstone, and conglomerate. This contributes to soils that are mollisols, entisols; mesic/aridic, ustic for the most part. Precipitation in this watershed is typically 12-16 inches yearly. Frost-free

days average 100-125; while mean temperatures in January will be as low as 8 degrees Fahrenheit and may reach 32 degrees F on the average. Average July temperatures will be a minimum of 52 and a high of 88 degrees Fahrenheit.

LINCOLN HIGHWAY AT THE TREE IN THE ROCK

The majority of stream channels in these watersheds are C6 and B4 Rosgen stream types. The C6 stream type is a slightly entrenched, meandering, silt-clay dominated, riffle-pool channel with a well- developed floodplain (Rosgen 1996). This type occurs in broad valleys with gentle gradients of less than two percent. Rates of lateral adjustment are influenced by the presence and condition of riparian condition. Headwater streams on steeper gradients are B4 stream types. This stream type is found in narrow, moderately steep colluvial valleys, with gradients of two to four percent and channel materials composed predominantly of gravel with lesser amounts of boulders, cobble, and sand. The B4 stream type is considered relatively stable and is not a high sediment supply stream channel (Rosgen 1996).

Urbanization is also a significant land use issue throughout these watersheds (see Picture 43). Principal human uses tend to involve home improvement, gardening and property up keep. There are considerable recreation opportunities here and those include: horseback riding, hunting, off-road vehicle use, horn and antler hunting, and non-consumptive wildlife activities. Livestock use is primarily cattle, employing both cow/calf and yearling operations. Seasons of use are generally spring at lower elevations and summer and fall at higher elevations.

2. Issues and Key Questions

a. Livestock Grazing: (refer to issues identified for the Crow Creek watershed)

b. Woody Plants: (refer to issues identified for the Crow Creek watershed)

c. Urbanization: (refer to issues identified for the Crow Creek watershed)

d. **Invasive Plant Species/Weeds: (**refer to issues identified for the Crow Creek watershed)

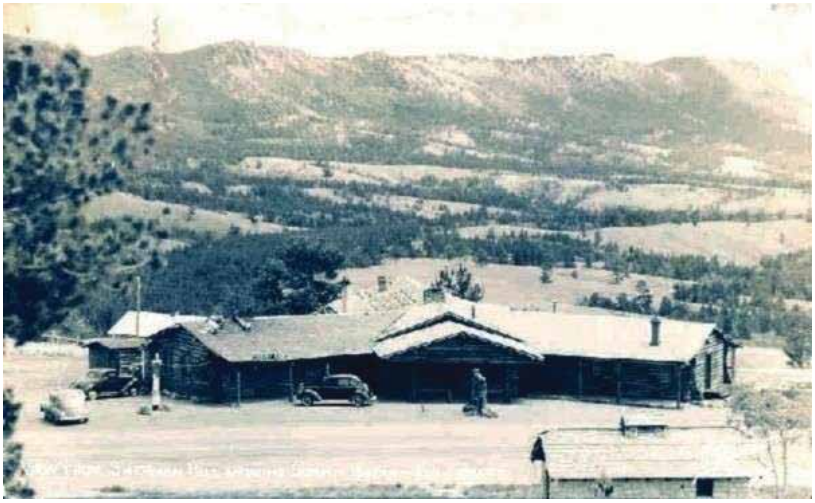
e. ***BLM Wyoming Special Status Species:*** The Colorado butterfly plant (*Guara neomexicanassp.coloradensis*) is currently considered a threatened species under the ESA of 1973. At this time, there are no known populations located on BLM-administered public lands in this watershed. However, there are native specimens located on and around Warren Air Force Base, T. 14 N., R. 67 W. The Preble's meadow jumping mouse is currently designated as a Wyoming BLM special status species as well. This species is known to use mixed shrublands during the spring and summer months and dryer uplands during the winter months.

3. Current Conditions

Quantifiable data about current erosion levels and stream flows, as well as conditions and trends on BLM-administered lands are not available. There are a total of 827 BLM-administered acres in these watersheds. Many of the allotments have very little BLM-administered lands within their borders; however, the location of the BLM-administered land is crucial to the functioning of the allotment. Wildlife utilization was prevalent on each of the allotments visited in this watershed. Mountain shrub communities in particular showed heavy use.

4. Reference Conditions

As there is very little previously acquired natural history information about the BLM-administered land in the Lone Tree-Owl watershed, historical pictures with landscape background become useful.



SUMMIT TAVERN, APPROX. 1945

5. Synthesis and Interpretation

Vegetation and ground cover are the primary factors that will reduce fluvial and alluvial erosion in the uplands. Erosion can result in the loss of topsoil and reductions in site productivity in the uplands and horizontal adjustments of stream channels.

6. Recommendations

The allotments in this watershed have a small amount of BLM-administered lands in each one and receive light to moderate livestock grazing use. It is clear these locations serve as important wildlife habitat. Small game, non-game, and big game are prevalent in these watersheds. One of the allotments visited the summer of 2007 had an exceptionally high number of frogs (see Picture 44). Due to the existing diversity and amount of vegetative cover on uplands, along with the existing and seemingly static trend in stream vegetation and channel morphology and the small number of remaining management issues, it has been determined that these watersheds within the report area are meeting Standard 1.

Upper Laramie River

1. Characterization

This is the largest watershed in the Big Laramie Standards and Guidelines Assessment, with 86,216 acres of BLM-administered public lands. The Laramie River is a tributary of the North Platte and is approximately 216 miles long in Colorado and Wyoming (see Picture 45). It begins in northern Colorado in the Roosevelt National Forest in western Larimer County. The river flows NNW into Wyoming, along the east side of the Medicine Bow Mountains 22 miles southwest of Laramie. The Laramie River then flows north through the town of Laramie. In the Laramie Plains it joins the Little Laramie River. The Laramie River then continues north through the Laramie Plains and through Wheatland Reservoir. It flows NE through the Laramie Mountains, emerging from the mountains, five miles north of Wheatland and Chugwater Creek seven miles NE of Wheatland. It joins the North Platte opposite the town of Fort Laramie.

PRES. THEODORE ROOSEVELT AND PARTY, RIDING FROM LARAMIE TO CHEYENNE, TELEPHONE CANYON, MAY 1903, PHOTO BELIEVED BY B. C. BUFFUM.

The Little Laramie River, often referred to as simply the Little Laramie, is one of the largest tributaries of the Laramie River. The Little Laramie is formed by the merger of three smaller streams: the North Fork of the Little Laramie, the Middle Fork of the Little Laramie, and the South Fork of the Little Laramie. The drainage basin of the tributaries of the Little Laramie River includes much of the eastern half of the Snowy Range as well as all streams flowing through the Centennial Valley. After leaving the base of the Snowy Range, the small river flows northeast, eventually emptying into the Laramie River.

The North Fork flows eastward from snowpack in the highest peaks in the Snowy Range, past the town of Centennial to where it merges with the Little Laramie River. The largest tributary of the North Fork is Libby Creek.

Libby Creek is a stream on the eastern slopes of the Snowy Range in southern Wyoming. Libby Creek starts out of Libby Lake and flows violently down the east side of the Snowy Range until it empties into the North Fork of the Little Laramie.

This watershed is entirely in Albany County. There are six dams located at Rob Roy Reservoir, Lake Owen Reservoir, Lake Hattie Reservoir, Wheatland Reservoirs #2 and #3, and Twin Buttes Reservoir. The Laramie River supplies about half of the City of Laramie's drinking water, with the Casper Aquifer supplying the rest.

Considered the Wyoming Basin ecoregion, this is a broad arid intermontane basin interrupted by hills and low mountains (see Picture 46). Almost surrounded by forest-covered mountains, this region is known for its extensive coal, trona, bentonite, and clay deposits and history of uranium mining. The Laramie Basin is a wide intermontane valley, dominated by mixed-grass prairie. Vegetation included needle-and-thread grass, western wheatgrass, blue grama, Indian rice grass, sandberg bluegrass, rabbit brush, fringe sage and various forb and sub shrub species.

LINCOLN HIGHWAY, TELEPHONE CANYON, SHERMAN HILL, EAST OF LARAMIE.

LINCOLN HIGHWAY TELEPHONE CANYON, PHOTO BY H. SVENSON.

Physiography here is unglaciated, in most parts, high elevation valleys (Centennial, Albany, etc.) with nearly flat flood plains and low terraces (see Picture 44). Streams and rivers are moderate gradient, riffle/run type streams. Substrate is generally cobble, glacial outwash material consisting of granite, limestone and quartzite. The geology is considered quarternary alluvium and colluvium, tertiary gravels, and fan deposits in stream and floodplain areas. Additionally, there are also areas of tertiary soft marine shale, claystone, and silty sandstone.

Soils in the Upper Laramie watershed are aridisols (haplocalcids, calciargids, haplargids, argicryids, haplocamibids), entisols (torriorthents, ustifluvents). Frost-free days are 75 -90 days, average precipitation varies 10-16 inches mean annual, while mean average temperatures are lows of 8-44 and highs in the 80 degrees Fahrenheit (Chapman, et al. 2003).

2. Issues and Key Questions

a. ***Livestock Grazing***: There are 82 grazing allotments in the Upper Laramie Watershed, for a total of 86,216 BLM-administered lands; this translates to 6.5% of the watershed area. Current grazing use is made primarily by cattle, with no permits/leases retaining sheep. Historical use in this area developed as both cattle and sheep use, depending on location. There are three llama/goat permits within this watershed. Of the nine allotments that failed field assessments, all but one resides in the Upper Laramie Watershed. Two allotments did not pass Standards 1 and 2, while the remaining six failed Standard 2, the riparian health standards. Generally, the riparian issue with these allotments was improper timing and duration of grazing. Most rated poorly with regard to woody plant health, excessive erosion due to bank sloughing and an excessive amount of non-native native vegetation, or a lack of any stabilizing vegetation in the first channel plane. Best Management Practices will mitigate the majority of the livestock grazing issues at those locations (see Pictures 46 and 47).

b. ***Woody Plants:*** This watershed is dominated by mixed-grass to short-grass steppe plant communities; however there are some BLM-administered lands at

the footslopes of the Medicine Bow Range and the Snowy Range Mountains with isolated aspen stands. These and the riparian areas with woody vegetation appeared to attract a great deal of big game. Utilization was generally heavy on the woody components. On the BLM-administered lands, the riparian vegetation could be improved with livestock management changes, while the aspen communities could benefit from direct management actions, like removal of encroaching conifer and temporary exclosures. For the majority of the watershed, woody plant health on BLM-administered lands is good, with adequate diversity and age structure overall. The upland shrubs in particular mountain mahogany, service berry, and snowberry communities received considerable utilization, however also appeared to be in good health (see Picture 49).

c. ***Urbanization:*** (refer to issues identified for the Crow Creek watershed) (see Picture 48).

d. ***Invasive Plant Species/Weeds:*** Low larkspur (see Picture 50), Dalmation toadflax, houndstongue, cheatgrass, and in one isolated area loco weed, are the primary invasive and noxious species in this watershed. Tamarisk is present in the Lake Hattie area and ongoing cooperative efforts with Albany County have been successful at keeping it in check. Maintenance removal around the shorelines is still crucial to keeping this species under control. Although the loco weed and houndstongue can be located and isolated areas identified to some extent, many of the other species are quite ubiquitous. For a number permittees in this watershed low larkspur bloom dictates much of their grazing regime. Continued close cooperation and education with County Weed and Pest, other Federal and State agencies, and home owner associations will be required.

e. ***Interstate Pipelines/Energy Development****:* At the writing of this document there are nine interstate pipelines and two proposed wind farms in this watershed. Each of these developments has their own set of issues that are beyond the scope of this document. However, the scale of impacts from each of these does have significant individual and cumulative impacts on productive agriculture. Urbanization and the associated fragmentation with subdivisions and a growing national interest in energy development on public lands compounds this challenging issue in the Upper Laramie River watershed.

3. Current Conditions

Quantifiable data about current erosion levels and stream flows, as well as condition and trend on BLM-administered lands are not available. This area was assessed over 12 years ago. However, assessments were conducted on an allotment-by-allotment basis. Overall, watershed standards were not the focus of field investigations at that time, so no information is available regarding landscape level condition.

The majority of stream channels on the BLM-administered lands in this watershed are generally stable, with good vegetative cover and reasonable width-to-depth ratios. As mentioned, eight of 82 (< 10%) allotments in this watershed failed field assessments. Two of the permittees on these allotments that failed Standard 2 have already initiated mitigations either by retrofitting existing spring exclosures with stock tanks well away

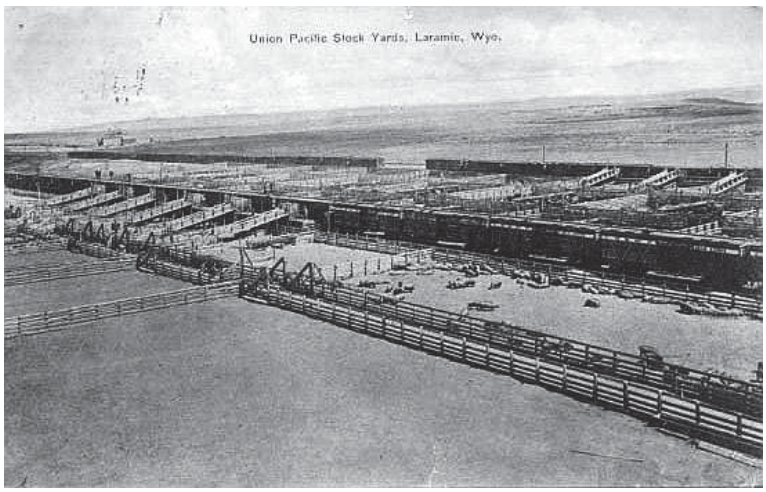
from the spring source or by arranging to take non-use for the pending spring growing season.

Vegetative cover and litter on upland sites vary with the soils, slope, aspect, elevation, and precipitation. In general, on BLM-administered lands, the overall ground cover appears good, but in many locations can still be improved with the use of BMPs for livestock control, weed control, and closure overall supervision by the BLM.

4. Reference Conditions

As there is very little previously acquired natural history information about the BLM-administered lands in the Upper Laramie watershed, historical pictures with landscape background become useful.

N. K. BOSWELL RANCH ON THE LARAMIE RIVER, WOODS LANDING, APPROX. 1908.



LARAMIE STOCKYARDS, 1910

5. Synthesis and Interpretation

This is a large watershed with more BLM-administered lands than the other fourth order watersheds assessed. The evaluation for Standard 1 requires evaluation of the watershed within the potential of the ecological site. The majority of allotments in the watershed are considered functioning well within their ecological site potential, e.g., soil type, landform, climate, and geology.

6. Recommendations

Although there is not a great deal of BLM-administered lands within this watershed, it is clear that those BLM-administered lands serve as important wildlife habitat. Small game, non-game, and big game are prevalent in the watershed. Due to the existing diversity and amount of vegetative cover on uplands, the existing and static trend in the majority of stream vegetation and channel morphology on BLM-administered lands, and the small number of remaining management issues. Outside of the specific areas discussed, the Upper Laramie watershed is meeting standard 1 for healthy rangelands.

STANDARD 2-RIPARIAN/WETLANDS

Riparian and wetland vegetation have structural, age, and species diversity characteristic of the state of channel success 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). As mentioned there is only 3.4% BLM-administered lands in the entire assessment area and riparian/wetland habitat makes up a small percentage of those BLM-administered lands the Big Laramie River assessment 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, and livestock production. The discussion of riparian/wetland habitat will be divided into two geographic regions: the High Plains upper elevation perennial streams and Wyoming Basin intermittent streams in the lower elevations.

1. Characterization

Riparian-wetland habitats within the assessment area are described in the following groups: springs and streams that flow out from the higher mountains; snow supported seeps; impoundments for recreational fisheries and/or irrigation and man-made wetlands. Streams in this assessment area generally flow perennially in the higher elevations and support riparian vegetation. At lower elevations, the flow is more intermittent. Riparian grassland habitat types are the most common form of vegetation, but there are also 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 the groundwater table within rooting depth during most of the growing season (see Picture 51). Willow riparian shrublands occur as scattered individuals or as denser communities, on wet sites that are somewhat thermally protected along drainages. 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. Cottonwood woodlands occur along drainages leaving the Pole Mountain area and line the larger water courses including the Laramie River, Little Laramie River, and North Crow Creek.

Mid- and lower-elevation seeps and springs primarily support riparian grassland habitat types (see Picture 52). Common species here include Nebraska and beaked sedges, Baltic rush, spike-sedge, tufted hairgrass, basin wildrye, wheatgrass, saltgrass, Kentucky bluegrass, redtop, mat muhly, alkali sacaton, cinquefoil, horsetail, plantain, mint, aster, and thistle. Streams may flow for short distances or for several miles from these sources. Examples within the assessment area include: lower portions of the Laramie River and Little Laramie River, Stink Creek, Lindsay Creek, Antelope Creek, Seven-Mile Creek, Dale Creek, North Crow Creek and numerous unnamed tributary draws to perennial creeks.

The seeps, springs and streams in the higher elevations support a mixture of riparian grassland and willow riparian shrublands habitat types (see Picture 53). 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. The main drainages are the Laramie River, Little Laramie River, Mill Creek, Dale Creek, and Crow Creek. These are diverse in both gradient and flow regimes, which creates greater diversity in vegetative communities and species composition. Adjacent to these habitats are cottonwood, aspen and in some cases spruce/fir riparian woodlands (see Picture 54). These sites closer to the mountains occur on all aspects below and adjacent to springs, streams or ponds, typically at 6,000 to 9,000 ft. Soils are generally poorly-drained and groundwater tables are within rooting depth during most of the growing season. 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 mountain mahogany, serviceberry, chokecherry, common juniper, currants, rose and big sagebrush. 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 drainages in the North Crow Creek watershed. Understory species include many of those already listed above, with a tendency towards those shrubs and herbaceous plants that prefer drier meadow habitats.

There are several man-made reservoirs and wetlands within the assessment area; some provide recreational fisheries, while others are primarily for irrigation. All catchments constructed for irrigation purposes and many other small ponds provide important waterfowl habitat during wet years and support riparian grassland and open aquatic-emergent wetland habitat (see Picture 55). Vegetation must be tolerant of salt and/or alkaline conditions, especially in the lower elevations. Common plant species include Nuttall's alkaligrass, alkali cordgrass, saltgrass, Baltic rush, cattails, tufted hairgrass, American bulrush, slim sedge, greasewood, arrowgrass, alkali plantain, sea milkwort, buttercup, cinquefoil, hairy goldaster, Rocky Mountain glasswort, as well as many of the lower elevation willow species such as yellow and coyote willow. Due to the extreme fluctuations in water levels, riparian vegetation can range from extremely limited/non-existent, 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.

2. Issues and Key Questions

Noxious and invasive weeds along creeks, reservoirs, hay meadows and especially the North Crow Creek area and the Centennial Valley are an important factor relating to riparian condition within the assessment area. How will the spread of these weeds be addressed, especially in complex land ownership patterns? (The weeds issue will also be addressed in the Standard 4 section).

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 which reduce the duration and/or change the season of grazing use for livestock.

There are a number of areas within the assessment areas where hummocking occurs adjacent to riparian areas (see Picture 56). Many of these are a factor of the soil involved (freeze/thaw regime) and the historic long duration of livestock use that has occurred within the area. Will implementation of best management grazing practices address these areas at risk?

Vertical instability is a problem in some areas (see Picture 57). Manmade structures, such as reservoirs, also have instability problems due to naturally fine sediments and lack of overflow pipes on older projects. Cutting of the spillways on reservoirs or around or through dikes are ongoing problems affecting functionality. What is practical to address these instability issues?

Another factor affecting riparian condition is existing roads and their associated impacts on these areas (see Picture 58). Given the considerable amount of urbanization occurring in the assessment area, roads are a significant issue. Roads that are directly

adjacent to riparian systems in many cases contain noxious weeds due to the addition of sediments from erosion in adjacent 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 channel dynamics and morphology. Roads can also interrupt surface and subsurface flow, which can effectively change the type of riparian system from one side to the other. Can road related concerns be addressed through culverts, improved crossings, rerouting, water bars, and roadside pits, and an integrated pest management plan 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 (see Picture 59). 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 with increased erosion and sedimentation into the systems.

3. Current Conditions

PFC assessments had been conducted in a few areas of this watershed in the late 1990s on an individual allotment basis. Individual staff from the Rawlins Field Office who participated in this earlier work also participated in this assessment as well. Present documentation of riparian condition, in addition to PFC, may include photo-points, channel cross-sections, groundwater wells, habitat quality assessments, and woody plant studies.

Drier conditions have impacted many of the riparian/wetland areas in the assessment area. Much of the high plains prairie ecosystems rely more on growing season precipitation, which has been drier than the previous decade. The riparian/wetland areas around the mountains tend to flow from a combination of groundwater and snowmelt. Many of these riparian areas have had much lower flows overall and even in some cases have stopped flowing earlier than usual. In addition, the drought has made a significant difference in some wetland areas, where normally perennial springs, seeps, and reservoirs have dried up.

In many cases, livestock grazing over the last few years has been reduced by grazing permittees due to drought conditions, economic stresses and urban encroachment. However, with less water available, many of these wetland/riparian areas have been less productive and many show signs of drought stress.

LENTIC SYSTEMS

Lentic systems within the assessment area primarily consist of natural spring and/or seep sites either perched within mostly upland portions of drainages or along water courses either below the upland vegetation line or immediately above it (see Picture 60). 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 exclosure. 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 which 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.

Lentic Areas Not Meeting PFC that are Livestock Related

Lentic sites consist almost entirely of seep/spring site areas within or at the headwaters of intermittent draws, which contain either static water or no surface water, or have limited flow for only a short distance. The few lentic sites in the Big Laramie assessment area were rated as" functioning-at-risk" (FAR) with a downward trend due to impacts from livestock have been impacted by summer season livestock grazing. As in most of the Rawlins Field Office, season long and/or hot season grazing leads to hummocking, encroachment of upland vegetation, and suppressed riparian species recruitment and/or regeneration. The majority of lentic sites evaluated in the entire area for the most part exhibited trends that would be considered static due to similar livestock use. These sites generally received summer long grazing pressure for many years, and there was little evidence that conditions on the specific sites have dramatically changed. Two reaches in the watershed rated FAR with upward trend. These were allotments under new ownership and in recovery.

North Crow Creek Allotment # 1210

The one lentic site located on BLM-administered lands that rated "functional at-risk" with downward trend due to livestock. A number of indications of excessive livestock utilization were documented on this lentic site. The quantity of remnant cow pies, existing hummocking and the encroachment of upland species (bluegrass, dandelion, and thistle) indicate the lack of long-term livestock management of this site. However, the fence line contrast was the most conspicuous evidence of historical livestock practices at this site (see Pictures 61 and 62).

LOTIC SYSTEMS:

The major perennial streams within the watershed include the Little Laramie River, the Laramie River, Dale Creek, Mill Creek, Lone Tree Creek, Lodgepole Creek, Horse Creek, and North Crow Creek. 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 tributaries and forks of these creeks constitute the majority of lotic riparian habitat on public lands in the assessment area. The numerous creeks that originate in the mountains are diverse and support grassland, shrubland and woodland riparian plant communities (see Picture 63).

In most cases, the highest elevation streams consist of high gradient, rock armored type systems originating in the mountains from springs or snowmelt, fed from additional seeps and springs along their routes. These resilient, armored systems are for all practical purposes, functioning properly throughout in those higher elevations. 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 lower elevations, lotic systems tend to exhibit more sinuosity, greater vegetation diversity, and more erosion/deposition evidence. Parent material and geology have a noticeable influence on many of the riparian areas in those parts of the assessment area within true high plains sub-watersheds.

Beaver are not common, but present in certain areas, in other areas 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 evidence of beaver is evident in private land irrigated meadow areas throughout the assessment area. The hydrologic modification by beaver are natural processes, so many areas are in stages of readjustment which is 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 material 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, although there are instances where it has already successfully run its course and, in some cases, 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 structures are stable and the riparian areas which they supply are for the most part, properly functioning and healthy.

Properly functioning streams have good species composition and stability, due to the deep-rooted sedges, grasses and willows. Woody plant communities are diverse in species composition and vertical structure, with good regeneration of young plants. Little to no bare ground, channel sloughing, or instability is currently present, with the exception of a few isolated areas. This does not imply that 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. Near the edge of the mountains the amount of hedging on young shrubs and trees is generally higher, and may be attributable to more frequent use by big game.

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 area to coyote willow-dominated areas 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.

Another kind of riparian community that is found throughout the assessment area (Centennial, Cooper Creek area and Laramie plains) are irrigation ditches that have flows sufficient in duration 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 dependent on augmented flows and their sole function is to transport water. Technically, these ditches are functioning properly as long as the water is directed to irrigated meadows. Therefore, even though these ditches met the definition of riparian, these systems were not evaluated for functionality. Overall, draws and water courses in the majority of the lowest portion of the assessment area are ephemeral with no existing riparian vegetation.

Lotic Areas Not Meeting PFC that are Livestock Related

Boswell Ranch Allotment #09096:

Four reaches in this allotment on BLM-administered lands were evaluated the summers of 2006 and 2007. Three of the four rated as functioning-at-risk. One of these rated as FAR due to influences from wildlife and a poorly placed road (see Picture 64). Two of those three exhibited downward trend due to livestock. However, each of those reaches could likely be remedied with livestock management and better placement of fencing. The riparian reach visited under/near the power line exhibited humicing, pillard woody plants, numerous year's cow pies and excessive amounts of wooly plantain, dandelions, and cheatgrass (see Pictures 65, 66, and 67.

In examining the uplands, there were some remnant two-track roads silting into an unnamed tributary and a spring development that has been poorly placed on the edge of an aspen grove and too close to the creek. This water development would have been better placed on an adjacent ridge to draw animals out of the drainage and near currently underutilized forage on the benches.

Strouse Hill Allotment # 09109

Issues found on this allotment. included improper placement of lick tubs in drainages (see Picture 68) and repeated use of the same pasture at the same time of year after year. Many of the riparian areas were heavily over utilized and under developed with offsite water structures. Tributaries visited on BLM-administered lands on this allotment could have offsite water developed on nearby benches and swales. In many of the reaches, bank shear and sluffing on slopes was common; the first terrace willows and birches exhibited significant mushrooming and deep cattle trails. Weeds are also a significant issue here, primarily Dalamation toadflax, but houndstongue and Canadian thistle also present (see Picture 69)

Ferguson Ranch C Allotment # 1204

The riparian area assessed in this allotment exhibited a high number of weed species, i.e., Dalmation toadflax, houndstongue, and Canadian thistle. Areas appeared to experience regular flash flooding. There was considerable hummocking and deep paths through the riparian area itself. Willows and shrubs were getting heavily utilized by wildlife, as is the riparian area (see Picture 70). Some of the other riparian areas assessed in on the Ferguson Ranch C Allotment exhibited undesirable species composition, head cuts, and overutilized uplands, all associated with improper grazing practices.

As this area is getting utilized by both wildlife and livestock, restricting use to fall only for a few grazing seasons and implementing a weed control plan could shift this allotment toward properly functioning (see Picture 71).

Little Laramie Allotment # 09114

Although there is only a small portion of riparian area on BLM-administered lands, this reach exhibited a few issues related to livestock grazing. The assessment team agreed that just changing the season and duration of use on this allotment would resolve those factors that did not meet proper functioning standards. The willows at the south end of the reach were significantly browsed (see Picture 72), the stream bed was quite loaded with silt, and fifty to sixty percent of the bank was damaged by trailing and over use (see Picture 73).

Morgan Edwards Allotment # 9114

The riparian area assessed on this allotment appeared to have experienced a large number of cattle, maybe for not a long time, but probably year after year. Braided trails into and along the creek, created slumps which silted into and continue to erode into the creek (see Picture 74). The stream bed is heavily silt loaded. This is compounded by heavily browsed willows and evidence of high big game utilization. Adjacent fence lines provide site potential reference and examples of big game utilization. The team suggests one or two growing seasons of rest, and then fall use only thereafter.

North Crow Creek Allotment # 1210

This is one of the larger allotments in the assessment area, of which nine reaches were assessed the summer of 2007 (see Pictures 75, 76, 77, and 78). Each of those reaches on BLM-administered lands rated Functioning-At-Risk; six due to improper livestock management. As will be explained further in the Reference Condition section, parent material and geomorphology factor largely into much of what is occurring in these B4 Rosgen type stream systems. Those reaches that rated FAR with downward trend due to livestock, exhibited excessive bank shear or slumping due to cattle trailing and erosion from the slumped bank material. Poor species composition and age structure, as well as weeds, e.g., Dalmation toadflax and houndstongue, indicated the trend as downward. Most of these six reaches have very significant headcuts, which are migrating up the drainage at a rapid pace. Although physical factors account for much of the problems in these drainages, improper livestock grazing is clearly exacerbating the decline of the riparian systems.

T-K Allotment #9157

Riparian areas were clearly being heavily utilized by both wildlife and livestock. Assessment was conducted with the livestock operator, whom acknowledged that his cattle utilized the allotment during the same time of year, year after year (see Picture 79). As the allotment is just below his forest permit, he consequently uses this allotment enroute to the forest. The pillared willows, hummocks, and significantly hedged willows, along with the dandelion, cinquefoil, and thistle, also indicate several years of prolonged utilization in the early part of the season (see Pictures 80 and 81). This operator has already taken remedial steps toward improving the condition of the riparian communities on this allotment; however, management actions will also be required. This includes delaying use until the fall and then for short duration.

Wills #0087

This riparian area was field visited in June 2007. This is a large shady willow-aspen-birch boggy area at the eastern footslope of the Medicine Bow range in the Seven Mile Creek drainage. Many of the larger willows and birch were pillard. There were a number of deep cattle trails throughout the bog and considerable hummocking on the periphery. There were remnant beaver dams throughout the location, which explained the “fen like” open areas (see Pictures 82 and 83). The riparian area location on BLM-administered lands in the allotment, sits in somewhat of a bowl. Many of the side walls of this bowl had deep cattle and wildlife trails traversing along the boggy area, creating considerable erosion of the hillsides.

Warren Livestock “A” Allotment #09170

This riparian area included remnant water development that has been neglected for many years but was still delivering a considerable amount of water. This has created a headcut and deviant gully, which although supporting riparian vegetation, it has not been properly placed on the landscape (see Pictures 84 and 85). The water development needs to be properly retrofitted and put to its original purposes. The allotment also contained burdock, Canada thistle, and houndstongue.

Ring Mountain Allotment #09105

The Ring Mountain Allotment contains a higher percentage of BLM-administered lands in the Upper Laramie watershed than other parts of the watershed. Riparian areas assessed, on BLM-administered lands, exhibited significant hummocking, bank shear, silted creek beds, and a high number of invader species and weeds. Although the area receives high use by all three big game species, many of the riparian areas exhibited signs of high erosion and deposition, instable bank structure, insufficient vegetative cover, and poor plant composition and diversity. Duration of use and in some areas season of use appears to be the underlying cause of most of the riparian degradation issues on this allotment (see Pictures 86, 87, 88, 89, and 90).

4. Reference Conditions

Reference conditions are also described under Standard 1. It is clear that the area has been and is still rich in game, and that beaver once inhabited its streams and drainages as late as the mid to later part of the 19th century.

The watershed has always been impacted by grazing ungulates, being home to elk, deer, antelope, and bighorn sheep, and probably most importantly, herds of buffalo. Cattlemen put up hay for the winter from the very beginning and, therefore, weathered the winters better than others. Sheep utilized the area as well, much more than presently, even though it was limited mostly to farm flocks. Since this time, almost all of the riparian areas in the watershed have been utilized for livestock production, either through direct grazing by stock, or conversion to hay lands, usually through the use of water diversion.

5. 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.

Following the Taylor Grazing Act, grazing districts were established and priority rights for grazing determined. Federal lands that fell outside of the established grazing districts had grazing leases 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 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 (see Picture 91). 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.

Fencing has been used to reduce duration of grazing on riparian habitats within most allotments. 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 AUM's.

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. Upland forbs and grass species resistant to grazing consequently 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. 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 and frequency of use and timing of use has resulted in a vigorous, productive, and, most importantly, stable vegetative communities.

6. Recommendations

Allotments containing riparian/wetland habitat that do not meet this standard have been described previously and include: Bosewell, Cooper Hill, Morgan-Edwards, Ferguson Ranch “C,” North Crow Creek, T-K, Warren Livestock “A,” and the Wills Allotments. For riparian systems along streams and creeks (lotic systems), only those portions of streams and creeks that have riparian on BLM-administered lands are evaluated. The non-riparian lengths and portions of streams and creeks not on BLM-administered lands were not assessed.

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

Specific recommendations are:

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.

Acquire funding and resources to construct projects to protect riparian habitat and provide off-site water for livestock and wildlife.

Identify and correct impacts from improved roads, including water flows and erosion, and weed proliferation into riparian systems. Two-tracks that are negatively impacting riparian areas should be identified and addressed.

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.

Vegetation in the Big Laramie River watershed in this assessment area 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. In order to simplify the overall descriptions of vegetation types, this analysis will address vegetation types in relation to the two eco-regions discussed in the background and watershed portions of the document. The description will begin at the higher portions of the watershed and descend to the lower portions of the analysis area.

1. Characterization

As mentioned in the background section, there are two general vegetation types within the watershed: the Wyoming Basin the High Plains ecoregions that occur to varying degrees (and with varying composition) throughout the elevation and precipitation ranges of the study area. Interspersed throughout the landscape is a diverse assortment of other communities including sagebrush/mountain shrubs, and aspen, cottonwood, spruce, ponderosa pine, lodgepole, spruce, and limber pine/juniper woodlands.

In the Wyoming Basin and High Plains vegetation cover types can be best described in relationship to elevation. Elevations range from 7,100 feet to 9,000 in the Big Laramie assessment area. The most abundant vegetation cover type throughout the area would be the mixed grass prairie, which is dominated by blue grama, Indian ricegrass, western wheat grass, june grass, Sandberg bluegrass, needle-and-thread grass, and various mixtures of shrubs. Shrub species here are fringed sage, rubber rabbitbrush, green rabbit brush, and various and foothills species, such as Utah juniper, pondersos, mountain mahogany, bitter brush, snow berry, and Wyoming sage brush.

Limited to sites that are inherently wetter or retain moisture for longer periods (mostly north and east facing bowls and slopes which trap more winter snow and less evaporation), aspen woodlands are scattered throughout the high-to-mid-level elevations in the area. Obviously dominated by aspens, understory species include snowberry, serviceberry, Scouler's willow, creeping juniper, rose, Oregon grape, geranium, bluebells, elkweed, columbine, licorice-root, sweet cicely, aster, elk sedge, Columbia needlegrass, blue wildrye, mountain brome, and slender wheatgrass. Forage is limited by litter/leaf cover and shading of the floors of the stands. Aspen stands are limited to portion of the watershed, carpeting the foothills of the Medicine Bow, Snowy Range, and occasional stands on Sheep Mountain, and near the Forest Service in the Woods Landing area and North Crow Creek area near Pole Mountain. Understory species include snowberry, rose, and currants, along with basin wildrye, green and Columbia needlegrass, Kentucky bluegrass, bluebells, columbine, aster, violets, elkweed, chickweed, and stinging nettle.

As soil depth increases on floodplains and draws, mountain big sagebrush gives way to basin big sagebrush stands. Varying soil conditions also promote big sagebrush/grass/mountain shrub mixtures. Mountain shrub vegetation types encountered throughout this zone on shallow soils and/or shallow rocky sites include relatively monotypical, intermingled xeric upland shrub steppe sites. This vegetation type contains true mountain mahogany, in some cases as the dominant shrub species, but more often intermixed with other mountain shrubs, including bitterbrush, snowberry, serviceberry, and basin big sagebrush. Dependent on soils, precipitation, and browsing levels, the dominant shrubs may reach up to five to seven feet in height. Common understory species are green needlegrass, needleandthread, bluebunch wheatgrass, Indian ricegrass, Sandberg's and mutton bluegrass, and mat forbs, such as phlox, buckwheat, locoweed, and golden weed. Wetter sites nestled within the rolling terrain are dominated by stands of basin wildrye.

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 native vegetation during the course of housing development and extraction, 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.

Although there are a few llama and goat allotments in the assessment area, livestock use is primarily comprised of cattle grazing. Seasons of use is restricted to late spring, summer, and early fall, during which time the area can be accessed and the vegetation utilized by grazing ungulates – snow usually precludes year-round use. 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 spring/summer/fall seasons, ranging from season-long to deferred and/or rotational use. Forage consumption by big game species is a significant consideration for determining Best Management Practices, and influences timing and duration of grazing systems throughout the watershed.

Recreation primarily takes place year round in this assessment area. Day hikes, mountain biking, horseback riding, 4-wheeling, family camping, and bird watching are some of the warm season activities taking place throughout the watershed. There are a number of areas for snow mobiling, cross-country skiing, and until the recent closure of the Snowy Range Ski Area, downhill skiing. Back country skiing with snowmobiles is also a growing recreational use in the area. Hunting (mid-August through November), although spring/summer/fall use occurs throughout both Albany and Laramie County, and springtime recreational uses such as shed-antler hunting, continues to increase at an accelerated pace. Associated with this use are an ever-increasing number of roads, trails, and tracks, which wind through all of the vegetation types and are restricted only by topographical impediments.

There are other consumptive human uses of watershed, commercial seed collection, 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.

2. 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 Big Laramie River watershed. Next to urbanization, domestic livestock grazing tends to provide the most impacts to the vegetation of the watershed. Localized portions of the watershed or specific vegetation communities and/or species may be more influenced by wildlife on BLM-administered lands in this assessment area.

Key question that arises from these impacts focuses on implementation and refinement of best management practices for integrated pest management and livestock grazing. What opportunities exist to educate newcomers to rural developments about the seasonal rhythms of formerly productive agricultural lands? 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? How will meeting desired resource conditions that allow for grazing of the vegetation resource use by domestic livestock, as called for under the Bureau's multiple use mandates, remain integral to the changing demographics of the area?

An increase in the expansion of unimproved roads and trails, where access is available, with the associated increase in the amount of off-highway vehicle (OHV) use, is apparent throughout the watershed. This use is most associated with general recreational activities by the public and is not usually associated with development actions described previously (although those actions may alter the landscape in ways that encourage further OHV expansion). The popularity and affordability of small, all-terrain vehicles leads 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 and losses similar to those associated with the expansion of oil and gas exploration and extraction. Unfortunately, it becomes a much longer-term disturbance as there is no reclamation unless a pioneered road or trail is left to naturally revegetate through lack of use (which, with ever increasing recreational use of these lands, rarely, if ever, happens). As the only barriers to this travel are terrain and rules governing off-highway travel (which are difficult to enforce), only vegetation in the roughest topography is currently or potentially free from this disturbance. Additionally, 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?

3. Current Conditions

There is less than 4% BLM-administered lands in the entire assessment area. However, it is heavily utilized for wildlife grazing use in its entirety (although in most cases,

significant wildlife use is seasonal). Impacts to vegetation from livestock grazing can, therefore, be considered not significant in most of the analysis area.

Quantifiable data about current vegetation conditions, vigor, and trends throughout the watershed varies as to availability, content, and quality. Only some portions of the assessment area have begun to have upland monitoring information available (see Pictures 92 and 93). Ideally, monitoring information 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 would be relied on to evaluate rangeland health and condition.

Vegetation and forage inventories of the watershed area in general are available in the form of satellite GAP analysis and the Soil Vegetation Inventory Method (SVIM) occurred during the early 1980s. Data from this one-time inventory suggested that rangeland conditions throughout the watershed fell into the acceptable range, mostly rated as "good" condition, but included "excellent" and "fair" condition rangelands. 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 mule deer habitat rated as fair, which probably should have been found to be good to excellent.

In general, varied livestock uses have resulted in assorted impacts to vegetation throughout the watershed. In many grazing allotments, summer grazing by cattle is the best-suited use by domestic livestock due to environmental, topographical, and climatic limitations. 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, usually seasonal, tends to impact different components of the vegetation communities than does domestic livestock use. Mule deer use concentrates primarily on shrub or "browse" species and is 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).

Like very much of most public lands the high elevation shrub stands, vegetation within the mule deer and elk winter habitat zone have experienced many years of fire suppression. Natural treatment events have been aggressively suppressed, in particular fire, for decades. 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; however, the consequences of fire suppression are beginning to take hold. Increasing urbanization of the Assessment area is likely to support more suppression.

Lower elevation wind-blown plateaus that are usually available and stay relatively snow-free in all but the most severe winters, are used by wintering and/or migrating wildlife as transitional or crucial winter range. Because vegetation communities in these specific areas are used throughout the year by wildlife and become heavily-used by concentrated populations during most, if not all, 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 big sagebrush during the winter if animals are concentrated in a limited area for a long time period.

Low larkspur mainly reproduces by seed. It is pollinated by bees and probably self-pollinates as well, but may reproduce vegetatively. It is found on sites ranging from open woods and grasslands to subalpine scree. It appears early in the spring, often at the edges of receding snowbanks. Low larkspur will grow in fairly dry to moist conditions and grows best in rich, black, sandy loams or clay loams and in soils of limestone or granitic origin. It is found on gentle to steep slopes at elevations of 4,600 to 11,600 feet (1,400-3,500 m) in Wyoming. Low larkspur prefers sites with full sun exposure. It colonizes recently disturbed sites and is often found on gravel banks and along roadcuts.

Low larkspur occurs on a number of allotments in the Upper Laramie watershed and dictates grazing regimes and grazing cycles where present. As low larkspur is highly toxic to cattle in the spring, many upland pastures with adequate forage cannot be utilized until after the growing season. Best management practices recommend no growing season use in riparian areas or areas in need of rest. Not being able to utilize a considerable portion of upland pastures during the growing season constrains the implementation of grazing BMPs in a number of allotments in this watershed.

Death camas and locoweed are also an issue in certain allotments of the Upper Laramie watershed for the same reasons (see Picture 94).

Deathcamas is one of the first plants to produce growth in spring. Livestock poisonings usually occur when animals are put on the range in early spring before more palatable plant species are available. Sheep are most commonly poisoned.

Deathcamas is a native, cool-season, perennial forb. It reproduces from seed, with pollination effected by syrphid flies and solitary bees. It can also reproduce vegetatively by bulb offsets. Deathcamas grows in dry, loamy to gravelly soils and is commonly found at 4,000 to 7,500 feet (1,300-2,600 m) in elevation throughout its range. It begins its growth in early spring and flowers from May to June.

Locoweed causes locoism in all classes of livestock (see Pictures 95 and 96). The toxin in locoweed is an indolizidine alkaloid, swainsonine that causes chronic neurological damage. Livestock must consume large amounts of locoweed for 1 to 3 months before death occurs. Signs of poisoning will appear after 2 to 3 weeks of continuous grazing. Symptoms are rough coats, nervous disorders such as trembling and paralysis, uncoordinated muscle movements, blindness, constipation, and emaciation. Most cattle will readily graze locoweed in the spring when grass is scarce. Sheep and cattle can

become chemically addicted to locoweed and will continue to graze it when grass becomes abundant. They are, however, more resistant than horses to its toxic effects. Horses never recover once poisoned. Cattle gain weight slowly and often have abortions, while sheep have a high number of abortions after grazing locoweed. Locoweed is poisonous to deer and elk if consumed in large quantities. The concentration of this toxin remains constant in leaves throughout the grazing season.

Overall, vegetation in the Big Laramie River watershed can be considered to be in good condition relative to the seral stage to which it has developed. Desirable species (including herbaceous and browse species important for livestock and wildlife forage, as well as those important for ground cover) are present at worst, usually found in locations where they are less available or vulnerable to grazing animals, and are prevalent at best, found interspersed throughout the various plant communities, with high vigor and density. Although less desirable increaser species are present in varying degrees throughout the watershed, in most cases, their presence does not indicate poor health or nonfunctional vegetation communities. Throughout various portions of the watershed, upland invader and weed species can be found. Additionally, implementation of various BMPs, as well as application of various control methods, can be utilized to manage, if not eliminate, many of these small-scale infestations. On the small amount of BLM-administered lands in the assessment area, indications and observations are of properly functioning upland vegetation communities.

4. Reference Conditions

As near as can be gleaned, it is likely that 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 remote 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). 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 random occurrence of wildfire, which removed vegetation in a haphazard pattern, probably led to a diversified vegetation pattern that was thoroughly stratified in age class and seral stage, as well as vertical and horizontal structure. 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, 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, bighorn sheep, and the large predators including 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 extremely large herds of the animals in more of a cyclic nature as their wanderings covered an extremely vast amount of country.

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. Overall, the general historical vegetation description of the Big Laramie River watershed appears to closely correspond to the existing communities.

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 Big Laramie River watershed varied little from that which is noted today, dominated by high plains mixed grass prairie and Wyoming Basin short-grass steppe.

5. Synthesis and Interpretation

As described and discussed previously, upland vegetative species within the Big Laramie River watershed are very similar at present to that which would have been encountered prior to settlement of the area. The principal changes are in the type of animals that utilize the resource, and the amount of disturbance that is levied towards the vegetation from other human activities. Bison were obviously present in this area during the spring through fall seasons, similar to current seasons of use, 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.

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-mid-summer); 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, the higher elevations within the watershed were grazed by cattle, both as summer and transitional (spring and fall) range. Lower elevations were traditionally used as late fall through spring range by cattle, usually adjacent to hay meadows. The summer, 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 decreasers to more unavailable locations (such as within shrubs and in rougher terrain). 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; 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, the predominant vegetation (typically shrubs) can be treated or removed, allowing increases in more productive herbaceous vegetation that create higher amounts of forage and higher overall nutritional value, and can create useable forage in areas that were previously 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

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. 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, and particularly the pioneering of new trails by illegal off-highway driving is increasing dramatically, including problems stemming from hunting, joy-riding and (especially noted during the last few years) the increasing popularity of antler hunting in the late winter and spring. Greater availability of disposable wealth has led to greater availability of all terrain vehicles (particularly 4-wheelers) and pickup trucks, which have exacerbated this impact, particularly in areas with easy access and proximity to towns, but also at an alarming pace in remote portions of the watershed.

6. Recommendations

At the present, the review of upland vegetation conditions in the Big Laramie River watershed reveals generally good overall community health. Natural ecological and biological processes appear to be functioning adequately by and large, although concerns about current, and especially near-future, functionality of certain community types remain. The assessment team acknowledges that aspen stands throughout the assessment area, although not a large landscape component of this assessment area, are generally in need of management attention. Many are heavily encroached with limber pine, receive a high concentration of use by elk, and are losing or have lost those understory large forb species, which typify healthy stands of aspen, e.g., hellerbore, meadow rue, sweet anise, big green gentians, Jacobs ladder, etc. This situation is not unique to aspen within the assessment area. Aspen stands throughout the Rawlins Field Office are in comparable condition. Given that, the assessment 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 and the overall small number of management issues that need to be dealt with by all surface owners, it is determined that the Big Laramie River watershed is meeting Standard 3 – Upland Plant Health. The following recommendations would expand upon the successes already achieved and help to meet desired resource conditions in the future.

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.

Vegetation treatments designed to modify the age and structural composition of aspen stands to stratify the seral stage mix within stands should be considered throughout the watershed. Where treatments are utilized to improve the health and productivity of aspen, they should attempt to promote juvenile, palatable seedlings within the community in addition to increasing the herbaceous understory component. 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, natural rangeland conditions rather than the creation of homogeneous monotype communities covering large tracts of land.

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.

1. Characterization

The plant communities/habitat types that occur within the Big Laramie River 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 (RFO) management area. 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. The 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. The Big Laramie River assessment area consists of roughly equal portions of Wyoming Basin and High Plains physiographic vegetation types. 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, 2002).

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 antelope (see Picture 97) and mule deer (see Picture 98) in open habitat, and elk (see Picture 99) in shrub and woodland habitat. Raptors are also very abundant and include golden and bald eagles; ferruginous, red-tailed and Swainson's hawks; burrowing owls; and other hawks, harriers, and owls. Other commonly observed mammals are coyotes, red fox, badger, cottontail and jackrabbits, prairie dogs ground squirrels, voles, and mice. Shorebirds

and waterfowl include great-blue herons, avocet, stilt, phalarope, 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 (see Picture 100) are an important species of interest. Blue grouse are found in higher elevation aspen and conifer woodlands. Horned lizards and prairie rattlesnakes are the most common reptiles, while tiger salamanders and northern leopard frogs are the most abundant amphibian species.

Species of Interest or Concern

Big Game Species

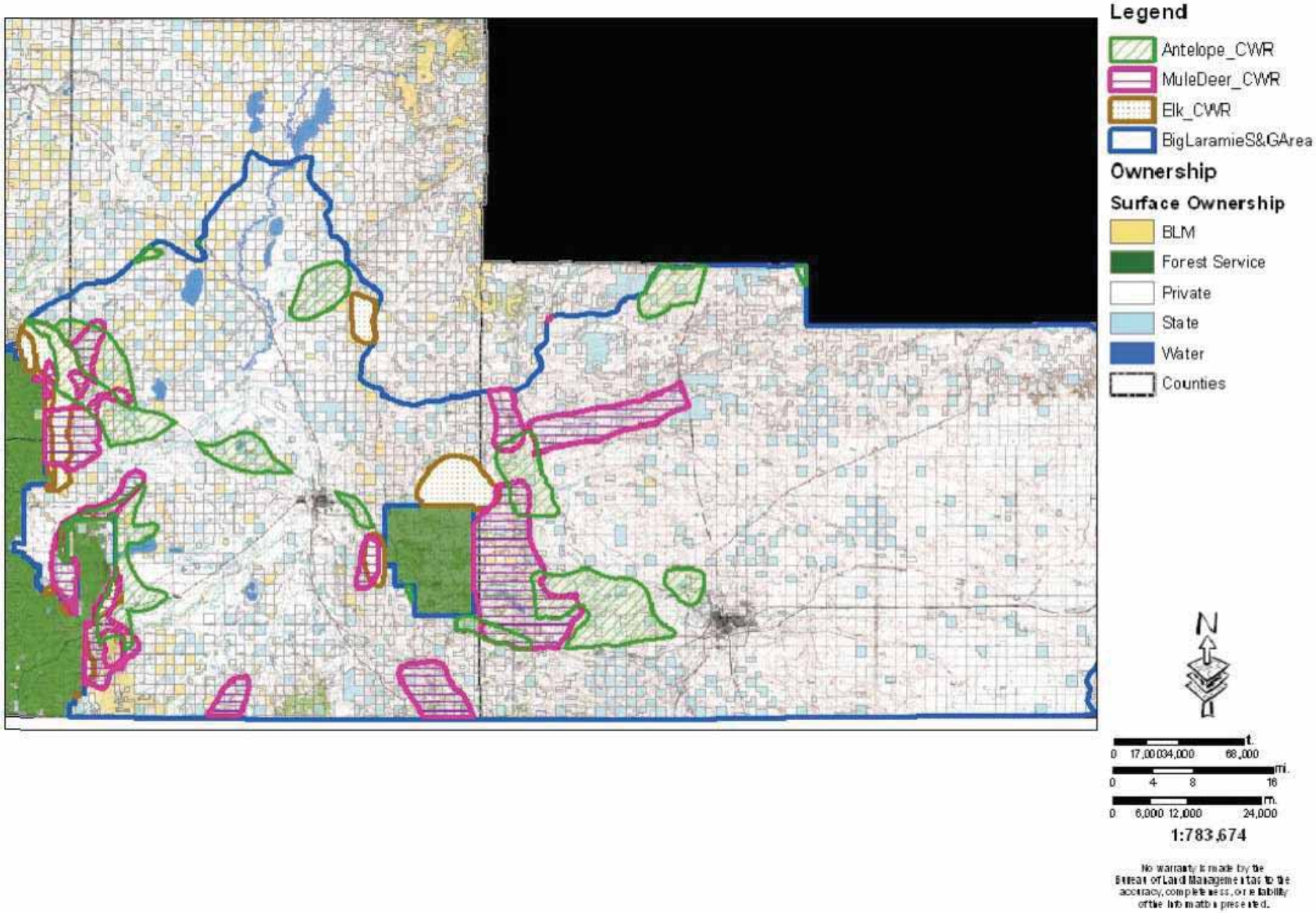
There are several big and trophy game species that inhabit the assessment area, including pronghorn, mule deer (and small numbers of white-tailed deer), elk, moose, black bear, mountain lion, and bighorn sheep. These species are either herbivores (pronghorn, deer, elk, moose, bighorn sheep) competing to some degree with other herbivorous wildlife and livestock; carnivores (mountain lion), competing with other wildlife predators; or omnivores (black bear), which have characteristics of both preceding groups. There is pronghorn, mule deer, and elk crucial winter range located on BLM-administered lands within the area and elk parturition habitat located on Forest Service lands within the watershed area (see Map 5). BLM-administered lands that occur within the analysis area are important for providing wildlife habitat as well as public access for hunting or wildlife viewing opportunities.

The populations of big game species that live in habitat managed by the BLM are managed by the WGFD using a complex process that considers both quantitative and qualitative data. Pronghorn, mule deer, and elk are the primary big game species present on BLM-administered lands. The WGFD Laramie Region covers this watershed area with big game population management emphasis on pronghorn, mule deer, and elk. White-tailed deer and moose populations are also evaluated and managed by the WGFD. The objective of this report is not to focus on herd population management, as this information can be obtained through the WGFD job completion reports. However, BLM information and key issues with focus on habitat conditions are discussed. Information on population trends are briefly discussed in the “current conditions” section of this document.

Antelope

Pronghorn antelope are the most visible and numerous big game species in the Big Laramie River 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. Portions of four antelope herd management units are located within the watershed area.

Map #5
Big Game Crucial Winter Range



Elk

Elk are the third most common big game species in this watershed (see Picture 101 and 102). Elk normally prefer staying close to hiding cover, so are most often associated with conifer and aspen woodlands 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.

Mule Deer

Mule deer are the second most abundant big game species following antelope in this watershed (see Picture 103). Mule deer, however, are not found evenly distributed across the landscape. They prefer areas with hiding cover and higher precipitation sites with forbs. These sites tend to occur close to mountainous areas, 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.

Whitetail Deer

White-tailed deer prefer an interspersed habitat area where several habitat types exist in a subclimax or "temporary" condition prior to maturation. Also, a mix of habitat types such as open meadows, wetland/riparian areas, forested woodlots, brushy areas, and croplands provide diversity and attract white-tailed deer. Ideal white-tailed deer habitat includes lower elevation areas with alfalfa or small grain croplands located adjacent to streamside cottonwood-willow dominated habitat; wetland marshes; or interspersed woodlots with intermixed abandoned farmsteads reverting to brushy cover. Wyoming's greatest concentration of white-tailed deer has traditionally been in the Black Hills area. However, in recent years whitetail populations have been gradually increasing statewide along cottonwood-willow stream/river bottoms and in agricultural areas (Olson 1992). The Big Laramie and Little Laramie River bottoms provide good habitat for whitetail deer.

Moose

Moose occupy forest and drainage bottom lands within the analysis area and have recently attained population levels which allow a limited annual harvest in the Snowy Range Mountains (see Picture 104). The species is not considered native to the area. The current population has colonized into Wyoming from populations introduced into the North Park area of Colorado during the late 1970s.

Big Horn Sheep

Bighorn sheep in southeastern Wyoming use open, grassy areas associated with escape cover as year round habitat. Bighorn sheep evolved in open, high-visibility habitats that allowed efficient foraging and enhanced detection of predators. Conifer encroachment and vegetative succession in the absence of periodic fire (either naturally-ignited or prescribed) have diminished habitat quality for bighorn sheep in many parts of Wyoming (WGFD 2008). Occasionally, bighorn sheep may migrate down from the Laramie Range into the analysis area.

Raptors

There are several raptor species that have been observed within the watershed area, and/or their nests have been identified within the area (see Picture 105). Raptors that have known nests within the area include the bald eagle, ferruginous hawk, golden eagle, Swainson's hawk, northern goshawk, great-horned owl, Cooper's hawk, prairie falcon, red-tailed hawk, burrowing owl, and American kestrel. The bald eagle, the ferruginous hawk, the burrowing owl, and the northern goshawk have been identified as BLM Wyoming special status species.

Hawks

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 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 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 red-tailed hawk inhabits a variety of open habitats. This hawk may perch, hover, or hold still into the wind when hunting and eats small mammals, birds, and reptiles.

Owls

The great-horned owl inhabits extremely varied areas including woods, deserts, and suburbs. These owls 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 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.

Other Raptors

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. 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 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 American 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 (Stokes 1996).

Threatened and Endangered Species

There are three threatened or endangered species (T&E species) that occur, or have the potential to occur, within the watershed and five species – the Platte River species – that do not physically occur within this watershed, but may be affected by actions that occur within the watershed (please see Table 3). The Platte River species include the least tern, pallid sturgeon, piping plover, Western prairie fringed orchid, and whooping crane.

Table3: Threatened and Endangered Species that are Expected to Occur in the Watershed. BLM Frequently Consults with USFWS for Projects that May Affect these Populations or Habitat.

Common Name ***(scientific name)***	**Expected Occurrence**
Endangered USFWS	
Wyoming toad *(Bufo baxteri)*	Riparian areas/wet meadows in Laramie Plains
Interior Least Tern *(Sterna antillarum)*	Barren sand or gravel beaches
Pallid Sturgeon *(Scaphirhyunchus albus)*	Moderate to swift rivers with sandy substrates
Whooping Crane *(Grus americana)*	Marshes and wetlands
Threatened USFWS	
Utes Ladies'-tresses orchid (*Spiranthes diluvialis*)	Riparian areas with permanent water
Colorado butterfly plant *(Gaura neomexicana spp. Coloradensis)*	Endemic to moist soils in mesic or wet meadows of floodplain areas in Laramie County, WY
Colorado butterfly plant Critical Habitat *(Gaura neomexicana spp. Coloradensis)*	Endemic to moist soils in mesic or wet meadows of floodplain areas – none identified in watershed
Western Prairie Fringed Orchid *(Platanthera praeclara)*	Moist to wet unplowed tallgrass prairie
Piping Plover *(Charadrius melodus)*	Sandy gravel beaches or sandbars

Wyoming Toad

The Wyoming toad (see Picture 106) was originally found from many breeding sites in the floodplains of the Big and Little Laramie rivers. During the mid-1970s, declines in both range and abundance were noted. Since 1983, all Wyoming toad observations have come from an area of approximately 30 square miles, located 10-15 miles southwest of Laramie around Mortenson Lake. Attempts have recently been made to introduce the Wyoming toad at several locations, including Mortenson Lake in the Mortenson Lake National Wildlife Refuge (NWR), Lake George, and Rush Lake at the Hutton Lake NWR (USFWS 2005).

Ute Ladies' Tresses

The Ute ladies' tresses are considered a threatened species under the Endangered Species Act (ESA) of 1973 (see Picture 107). 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 2002). Ute Ladies' Tresses are not known to occur on BLM-administered lands within the analysis area; however, suitable habitat exists and populations have been documented on private lands in the area.

Colorado Butterfly Plant

The United States Fish and Wildlife Service (USFWS) listed the Colorado butterfly plant as Threatened in 2000 (USFWS 2000) (see Picture 108). At the time of listing, the Service had not designated Critical habitat; however at this time Critical habitat has been designated and is discussed below.

The Colorado butterfly plant is a short-lived perennial herb. Flowering occurs from late-June or early-July until the first hard frost of fall (usually mid-September to early-October). The plant lives vegetatively for several years before bearing fruit once and then dying. Fruit is present from late-July to early-October. It reproduces only by seed. Plants are self-fertile but also outcross. Flowers open at dusk and are pollinated by moths (Fertig 2001). This plant typically occurs on subirrigated, alluvial soils on level or slightly sloping floodplains and drainage bottoms at elevations of 5,000–6,400 feet. Colonies are often found in low depressions or along bends in wide meandering stream channels. Most populations are found a short distance from the actual channel and may even occur at the base of low alluvial ridges at the interface between riparian meadows and drier grasslands. The Colorado butterfly plant is an early successional species adapted to periodically disturbed stream channel sites. Historically, flooding was probably the main cause of disturbance in the plant's habitat, although wildland fire and grazing also may have been important (Fertig 1996).

There are documented populations of the Colorado butterfly plant within the Rawlins Field Office management area; however, no populations are known to occur on BLM-administered lands in the RFO management area. Two of the populations are located at F.E. Warren Air Force Base, in Cheyenne, WY. Other populations within the RFO management area are located on private lands, between the Medicine Bow National Forest boundary (Pole Mountain) and the Wyoming-Nebraska border, on Middle Crow Creek, North Fork Crow Creek, South Branch Crow Creek, Lodgepole Creek, and Horse Creek. There are three small populations that are found partly or fully on Wyoming state school trust lands, which are managed mostly for agricultural uses. Most of the plant population locations of Colorado butterfly plant that are known to occur exist on private lands.

Colorado Butterfly Plant Critical Habitat

Critical habitat is essential to the conservation of a listed species and that may require special management considerations or protection.

Critical habitat for the Colorado butterfly plant receives protection under Section 7 of the ESA through the prohibition against destruction or adverse modification of Critical habitat with regard to actions carried out, funded, or authorized by a federal agency. Section 7 also requires consultation with the Service on federal actions that are likely to result in the destruction or adverse modification of proposed critical habitat. Not all areas that can be occupied by a species will be designated critical habitat. The Service designates those areas as critical habitat only if they are essential for that species. Areas outside the critical habitat designations will continue to be subject to conservation actions that may be implemented under Sections 7 and 9 of the ESA (USFWS 2002).

Platte River Species: Least Tern, Pallid Sturgeon, Piping Plover, Whooping Crane, and Western Prairie Fringed Orchid

The Platte River species include the endangered interior least tern, pallid sturgeon, whooping crane, the threatened piping plover and Western prairie fringed orchid (see Table 3). These species are downstream residents of the Platte River (species do not occur within analysis area), and the whooping crane is a migrant along the central Platte River in Nebraska. While populations or critical habitat designations do not occur in the analysis area, the BLM consults with the USFWS for projects that may affect habitat or populations that occur downstream of the analysis area. Typically, these consultations are for projects that result in water depletions to the Platte River system. These species are discussed in greater detail in Section 3 (Current Conditions) of this chapter and the pallid sturgeon is further discussed in the fisheries portion of this chapter.

BLM Wyoming Special Status Species

There are numerous species of special interest or concern that inhabit the watershed area for all or part of their entire life history. Migration routes or transitional habitat is also used in the analysis area. Table 4 contains a list of BLM Wyoming special status species that occur or have the potential to occur in the analysis area. There are 31 BLM-special status species that have the potential to occur within the analysis area. These species include 6 plants, 9 mammals, 14 birds, and 2 amphibians.

Table 4: BLM Wyoming State Director's Special Status Species that May Occur Within the Analysis Area.

Common Name (scientific name)	Habitat
Laramie columbine *(Aquilegia laramiensis)*	Crevices of granite boulders & cliffs at 6,400-8,000 feet in elevation
Weber's scarlet gilia *(Ipomopsis aggregata ssp. Weberi)*	Openings in coniferous forests & scrub oak woodlands at 8,500-9,600 feet in elevation
Persistent sepal yellowcress *(Rorippa calycina)*	Riverbanks & shorelines usually on sandy soils near high H2O line

Common Name (scientific name)	Habitat
Laramie false sagebrush *(Sphaeromeria simplex)*	Cushion plant communities on rocky limestone ridges & gentle slopes at 7,500-8,600 feet in elevation
Nelson's milkvetch *(Astragalus nelsonianus)*	Alkaline clay flats, shale bluffs and gullies.
Cedar Rim thistle *(Cirsium aridum)*	Barren, chalky hills, gravelly slopes
Long eared myotis *(Myotis evotis)*	Conifer & deciduous forests, caves and mines
Fringed myotis *(Myotis thysanodes)*	Conifer forests, woodland chaparral, caves and mines
Townsend's big-eared bat *(Corynorhinus townsendii)*	Forests, basin prairie shrub (rock outcroppings within), caves and mines
Spotted bat *(Euderma maculatum)*	Cliffs over perennial water, basin-prairie shrub
White-tailed prairie dog *(Cynomys leucurus)*	Basin prairie shrub, grasslands
Black-tailed prairie dog (Cynomys ludovicianus)	Short and mixed-grass prairie, no known colonies on BLM-administered public lands
Swift fox *(Vulpes velox)*	Grasslands
Wyoming pocket gopher *(Thomomys clusius)*	Meadows with loose soil
Preble's meadow jumping mouse *(Zapus hudsonius preblei)*	Riparian areas in Laramie County
White faced ibis *(Plegadis chihi)*	Marshes, wet meadows
Northern goshawk *(Accipiter gentilis)*	Conifer & deciduous forests
Bald eagle *(Haliaeetus leucephalus)*	Cottonwood associated riparian areas
Ferruginous hawk *(Buteo regalis)*	Basin prairie shrub, grasslands, (rock outcrops
Peregrine falcon *(Falco peregrinus)*	Tall cliffs
Mountain plover (Charadrius montanus)	Basin prairie shrub, grasslands
Greater sage grouse *(Centrocercus urophasianus)*	Basin prairie shrub, mountain foothill shrub
Long-billed curlew *(Numenius americanus)*	Grasslands, plains, foothills, wet meadows
Burrowing owl *(Athene cunicularia)*	Grasslands, basin prairie shrub

Common Name (scientific name)	Habitat
Loggerhead shrike *(Lanius ludovicianus)*	Basin prairie shrub, mountain foothill shrub
Sage thrasher *(Oreoscoptes montanus)*	Basin prairie shrub, mountain foothill shrub
Brewer's sparrow *(Spizella breweri)*	Basin prairie shrub
Sage sparrow *(Amphispiza belli)*	Basin prairie shrub, mountain foothill shrub
Baird's sparrow *(Ammodramus bairdii)*	Grasslands, weedy fields
Northern leopard frog *(Rana pipiens)*	Beaver ponds, permanent water in plains and foothills
Boreal Toad *(Bufo boreas)*	High elevation coniferous or deciduous forest

The objective of the Wyoming BLM special status 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 Wyoming BLM special status species policy to emphasize the inventory, planning consideration, management implementation, monitoring, and information exchange for the species on the list in light of the statutory and administrative priorities (USDI-BLM 2002 and BLM Manual 6840).

Plants

Of the special status species plants, those identified in the table above have the potential to occur; however, site-specific inventories have not recently been thoroughly completed within the watershed area.

Mammals

Of the specials status mammals, those identified in the table above have the potential to occur within the watershed area. There have been bat surveys completed that have documented the occurrence of bat species by numerous federal and state agencies as well as the University of Wyoming within the watershed area. The RFO has installed approximately 90 bat houses for bat use during the spring, summer, and early fall seasons – and some of these houses have recorded occupancy. In addition, swift fox, white-tailed prairie dogs, black-tailed prairie dogs, and Preble's meadow jumping mouse presence within this watershed have been recorded by the BLM, Forest Service, WGFD, The Nature Conservancy, Wyoming Natural Diversity Database, the University of Wyoming, Colorado State University, and other organizations. Information on the Wyoming pocket gopher is little known at this time; however, surveys may be required when site-specific projects are proposed.

Preble's Meadow Jumping Mouse

Currently, the Preble's Meadow Jumping Mouse is designated as a Wyoming BLM special status species. There have been many updates on the Preble's Meadow Jumping Mouse throughout its entire range since it was first listed as threatened under the Endangered Species Act in 1998. In 2003, critical habitat in Wyoming and Colorado was designated for the mouse. In 2004, the USFWS made a special rule for the Preble's that provided for exemptions from Section 9 take prohibitions for activities such as rodent control, ongoing agricultural activities, existing water uses, and certain other maintenance activities. In 2005, a 12-month finding on a petition to delist the Preble's was issued. On July 10, 2008, the USFWS removed Endangered Species Act protections for the Preble's meadow jumping mouse populations in Wyoming. Under the 2008 ruling, the USFWS also amended the listing for Preble's as a threatened species in Colorado. BLM policy for management of recently de-listed species includes cooperating in monitoring of species for a minimum of five years after delisting (BLM Manual 6840).

At this time, there are known habitats for Preble's located within the analysis area. Habitats located in Ranges 68-70 W., Townships 15-19 N., within the watershed, were identified as Critical Habitat; however, this status has been removed from the Endangered Species List, but habitat still exists. Riparian habitat located within the area has a potential to contain these mice.

Birds

Raptors

The northern goshawk inhabits deep woods and could be encountered on the western portion of the analysis area near the Forest boundary or the Laramie Range. 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. 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. 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. Bald eagles were removed from the endangered species list in 2008. They are found in conifer, cottonwood-riparian, and river ecosystems. They feed mainly on fish, but will also eat carrion and some small mammals. While the peregrine falcon has been observed in analysis area, there are no known nesting sites on BLM-administered lands within the analysis area. The peregrine falcon preys on small to medium-sized birds, small mammals, reptiles, and insects. The peregrine falcon was removed from the endangered species list in 1999 and is a BLM Wyoming special status species.

Greater Sage-Grouse

Greater sage-grouse inhabit parts of the analysis area. 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. 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 grouse.

Early brood rearing habitats 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. During the winter months, grouse feed almost exclusively on sagebrush leaves (USDI-BLM 2002). Some winter habitat has been identified for parts of this watershed.

Mountain Plover

Mountain Plover breeding habitat occurs within the watershed area and includes short grass prairie, and shrub-steppe landscape, dryland farms, and prairie dog towns. Plovers usually nest on sites where vegetation is sparse or absent and where vegetation at short grass prairie sites is less than four inches tall. Mountain plovers are rarely seen near water. They may be found on heavily grazed pastures throughout their breeding range and may selectively nest in or near prairie dog towns (USDI BLM 2003). The BLM, Forest Service, WGFD, The Nature Conservancy, Wyoming Natural Diversity Database, the University of Wyoming, and Colorado State University have completed mountain plover surveys within the watershed and documented use of breeding and nesting habitat has occurred.

Other migratory birds

Sagebrush obligate species include sage thrasher, sage sparrow, and Brewer's sparrow. They rely heavily on sagebrush for breeding. They are vulnerable to changes in the shrubland sagebrush communities. Sagebrush obligate bird populations are either in decline or unknown. Sage thrashers are almost always associated with big sagebrush communities for breeding and cover. The tallest, densest sagebrush areas are selected for nesting sites. Sage sparrows are associated with sagebrush communities co-dominated with perennial bunchgrasses. They prefer patchy clumped sagebrush landscapes with high sagebrush cover and low disturbance with little fragmentation. The Brewer's sparrow is tightly associated with sagebrush shrublands that have abundant, scattered shrubs and short grass. The sparrow is positively correlated with sagebrush shrub cover, above average vegetation height, bare ground, and is negatively correlated with grass cover. They tend to avoid burned sagebrush. All of the sagebrush obligate species have experienced decline throughout their range in the last century due to a number of factors including, but not limited to, habitat conversions and fragmentation, pesticide use, and urbanization.

Loggerhead shrikes are shrubland and grassland dependent birds. They prefer open country with low vegetation for foraging and scattered shrubs and trees for nesting and roosting. They feed chiefly on insects but also eat small birds and mammals. Their declines coincide with the use of pesticides (DDT) from the 1940s through the 1970s.

The long-billed curlew is a shorebird but is not associated with water during the breeding season. This bird breeds in short grass uplands, grazed mixed grass prairie, meadows, arid scrub prairies, and short, open sagebrush. Populations were decimated by uncontrolled hunting in the 19th and 20th century. Widespread habitat conversions and pesticides have prevented their recovery. Long-billed curlews may respond positively to burning or grazing before the breeding season (Page and Ritter 1999).

Grassland bird species include the Baird's sparrow. They prefer areas of taller, dense grass during all seasons. During the breeding season, they prefer idle or lightly to moderately grazed native grasslands. They have declined because of the conversion of native grasslands to agriculture. Bock et al. (1992) found that the Baird's sparrow responds negatively to grazing pressure. Baird's sparrows prefer a diversity of vegetation heights.

Shorebird species include the white-faced ibis. The white-faced ibis prefers areas with emergent vegetation of some type and inhabits primarily freshwater wetlands and marshes, especially those containing cattail (*Typhus* spp.) and bulrush (*Scirpus* spp.) (Ryder and Manry 1994), but it can inhabit estuarine wetlands and coastal areas as well.

Amphibians

Boreal Toads could occur on BLM-administered lands in the analysis area. They have been observed on the Medicine Bow National Forest, generally in elevations above 6,000 feet. In the Laramie area, the boreal toad is relatively common. During the daytime, boreal toads are found near water. At night, they can move far distances away from water and then return to some other mesic site after feeding. They can occur in areas above 10,000 feet, but beyond this elevation, it is assumed that populations are maintained via migration from lower elevations (Baxter and Stone 1980).

Northern Leopard Frogs are common throughout the analysis area. They are most commonly encountered in or near permanent water in the plains, foothills, and montane zones. It can live in habitats up to at least 9,000 feet. Preferred habitats are swampy marshes on the plains, and beaver ponds in mountainous areas (Baxter and Stone 1980).

Fisheries

BLM-administered lands within the analysis area are highly fragmented and generally consist of isolated blocks of BLM-managed land, most of which are bordered by private lands. The analysis area consists of 3% of BLM-administered lands and only a small portion of these lands actually contain fish populations. These populations, where they do occur, are important because they are indicators of overall watershed condition and represent a relatively limited resource in the Rawlins Field Office management area. Popular fishing waters in the area include Crow Creek, the Laramie River, Little Laramie River, and several small streams.

Lakes and reservoirs that provide fishing opportunities that occur on BLM-administered lands include Lake Hattie and Twin Buttes Lake. Lake Hattie receives lake trout from the Saratoga Federal Hatchery and is stocked with rainbow trout and kokanee from Wyoming Game and Fish Hatcheries. Twin Buttes Lake has been stocked with rainbow

trout. The lakes receive significant use. In 1998, Lake Hattie received an estimated 16,958 fishermen; Twin Buttes received an estimated 7,026 fishermen from May 1 to September 1 (WGFD 2007).

The streams and lakes in the analysis area provide anglers with opportunities to catch several species of salmonid fishes (i.e., trout), including brown trout, rainbow trout, brook trout, lake trout, kokanee, and yellow perch. Lake Hattie and Twin Buttes Lake receive significant use and have adjacent BLM-administered lands and are therefore a priority for BLM.

2. Issues and Key Questions

There are several issues and key questions that have been identified for wildlife and fish 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 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 a summary of issues affecting wildlife and aquatic habitats or populations.

Within the analysis area, energy development has grown at a much smaller pace than other portions of the RFO management area because of the specific geologic formations where cost-recoverable petroleum products are located. Small-scale wind energy development has occurred in certain portions of the analysis area. Several utility corridors, such as powerlines and pipelines, also cross the landscape. With growing national interest in securing additional energy sources, there could be increased interest in energy exploration and development in the analysis area on a larger scale than what has occurred.

Energy development can have negative consequences to many species of fish and wildlife. Sometimes these impacts are direct impacts (bats and migratory birds colliding with wind turbine blades), but many times the impacts are indirect (sedimentation into streams introduced via new road networks decreasing the reproductive success of trout). The BLM reviews energy development projects for their potential impact to fish and wildlife species. Special mitigation measures are implemented to reduce impacts to wildlife habitat and populations. What are the cumulative effects of energy development to wildlife species? To what extent are wildlife species impacted by increased disturbance and transformation of habitat or migration corridors? What are the

thresholds of significant decline among the various species of wildlife? To what extent are species and populations tolerant of disturbance and habitat loss? How much energy exploration and development will occur in the area? Wind energy development in the RFO is a relatively new activity whose impacts are not yet fully understood. What are the direct, indirect, and cumulative impacts of wind energy development and how can these projects be successfully mitigated?

Species of Interest and Concern

Antelope

Issues that relate to antelope across the watershed include impacts of fences and roads upon animal movement; these will be discussed for all herd areas at one time. Issues that affect antelope which are more specific to particular herd areas (and will be discussed by herd area) include urbanization, vegetation treatments, livestock management practices relating and type/season of use by livestock, and the development of private lands in the mountains and foothills.

Private land developments are another factor influencing antelope within the assessment area. These developments, primarily subdivisions, are resulting in a net loss of habitat that is important to antelope. Additionally, increased human activity associated with these developments may result in an effective habitat loss of these areas.

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 restrict movement. Additionally, many road rights-of-ways are bounded by woven wire fences. 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 help a lot. 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. 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? 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. 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?

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 shrublands 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. Topics of concern that are not common to all herd units are discussed for each individual herd unit.

In addition to fences and livestock management, elk are affected by the increasing age and decadence of shrub and woodland communities, especially on crucial winter ranges.

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 can't 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 Medicine Bow 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. 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? As noted in the previous antelope section, 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 elk?

Competition for forage between elk and cattle occurs to some degree. The percent diet overlap is around 80% for these two species. Elk herds are at or near herd population objectives, indicating that current levels of livestock use are not affecting elk numbers. 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. 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?

Aspen stands in the analysis area have probably declined from historical conditions. Lack of large scale disturbances such as fire has resulted in conifer encroachment and decadence of shrub and woody communities, especially in 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.

Increased human presence on critical 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, and cause big game to move onto adjacent, less desirable habitat. How can land management agencies manage the public land users so that negative impacts to wintering big game and their habitats are minimized?

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, with 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 (already discussed), type of livestock use (cattle versus sheep), and management impacts to mule deer habitat, particularly riparian plant communities. 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 that are important as forage and cover. Use of best management practices for cattle has improved many of these areas. However, 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 critical 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. How can human disturbance to wintering mule deer be minimized or mitigated?

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. The WGFD has no special management strategies that are directed towards whitetail deer in this area, and harvest occurs as part of the overall deer harvest in the valley, with no special seasons or quotas. 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 valley promote healthy mule deer populations so that they are better equipped to withstand competition from whitetail where interactions occur? (WGFD 2007)

Moose

Moose habitat in the analysis area ranges from aspen and willow riparian bottoms, dark spruce/fir and lodgepole pine timber, to moderately steep sagebrush slopes at the higher elevations of the analysis area. At this time, little is known about the issues facing moose in this area, but it can be inferred that healthy, productive riparian areas and upland habitat conditions are beneficial to moose populations. Key questions pertaining to vegetation and habitat for moose should focus on how to manage to encourage health and productive willow riparian communities within the mountain foothills, and what, if any special considerations should be addressed when analyzing positive and/or negative impacts of management actions. Additionally, seasonal habitat delineations should be further defined as recommended by the WGFD. (WGFD 2007)

T&E Species

The issues discussed above 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 Wyoming special status species. Protection and restoration of habitat required by threatened or endangered species is a critical component to ensuring the recovery of listed species.

The Platte River threatened and endangered species utilize habitat located in Nebraska along the Platte River. These species may be affected by activities such as water developments. Water developments can cause depletions to the Platte River, affecting downstream habitat that is essential to the maintenance and recovery of threatened or endangered species. Any project with federal nexus that may result in water depletion exceeding 0.1 acre-feet/year triggers a “may affect” situation and requires consultation with the U.S. Fish and Wildlife Service. Cooperation and coverage under the Platte River Recovery Program helps recover threatened or endangered species while managing certain land resources.

A key question with regard to rangeland management is “How can we provide off-site watering facilities that improve riparian and rangeland health while contributing to the recovery of listed species?” Rangeland health can often be improved by providing off-site watering facilities away from riparian areas. These water developments typically cause minor depletions to the Platte River system, mostly through evaporative losses. However, these evaporative losses have been found to jeopardize the existence of downstream threatened and endangered species. Affected species include the whooping crane, interior least tern, the northern Great Plains population of the piping plover, and pallid sturgeon. Whooping crane critical habitat is also affected by Platte River depletions.

There are many water development projects in the analysis area that no longer serve their intended purpose. Some of these developments have fallen into disrepair or silted in and are no longer suitable for providing a reliable source of water for livestock or wildlife. Because water is a limited resource, how should we identify which water developments to repair or which ones to abandon? Should water developments that no longer serve a vital wildlife or range management objective be reclaimed? How should the frequency, number, and size or type of water development projects be decided?

Under the statewide programmatic biological assessment for the Wyoming Toad, the BLM manages 2,393 acres of primary habitat and 29 acres of secondary habitat. Currently, none of these lands are being considered for disposal; however, some of the private lands adjacent to existing BLM-administered public lands are within potential Wyoming Toad habitat and may be targeted for acquisition and subsequent management by the BLM. Specific conservation measures for managing BLM-administered lands in potential Wyoming Toad habitats are described in the Programmatic Wyoming Toad Biological Assessment (2005).

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

BLM Wyoming Special Status Species

BLM Wyoming Special Status Species may occur, or have the potential to occur, within this watershed area. Managing for special status species habitat and populations in this area is difficult due to the high percentage of mixed ownership and relatively small proportion of BLM-administered lands. Additionally, habitat fragmentation and development of surrounding areas is a threat to special status species in the area.

Limited monitoring has occurred, and needs to occur, throughout the watershed area for Wyoming BLM special status 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 special status species located within the watershed? How much

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

Preble's Meadow Jumping Mouse

The Preble's is known to occur in the analysis area and Critical Habitat was designated under the Endangered Species Act within the analysis area. Even though a decision was made to delist the species and Critical Habitat from Wyoming, there are still management considerations that need to be addressed for all BLM projects occurring in potential Preble's range. How can we recover Preble's populations and habitat within the analysis area? Are there areas where Preble's occur that have not yet been identified within the area? How can we manage known or suspected habitat and populations to help prevent another listing of the mouse?

Greater Sage-Grouse

While greater sage-grouse do not occupy a large portion of the analysis area, they are present in certain areas. Conversion of sagebrush-grassland habitat types to grasslands has greatly impacted sage grouse populations. 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, specifically from April through June, their critical brood-rearing 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. 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 2003e). 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. 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 the BLM become involved in with to reduce and or eliminate impacts to grouse within and adjacent to private parcels?

Fisheries

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. Most of the riparian polygons in the analysis area were rated as properly functioning condition. The areas that received ratings of functioning at risk or not functioning showed evidence that the

riparian community had been impacted either through overutilization of riparian plants or streambank trampling.

Some of the riparian polygons that had been rated as functioning at risk or nonfunctioning also had nickpoints (areas of sharp gradient transitions). These nickpoints are a concern because they can lead to headcuts, (more severe gradient transitional areas), which can result in rapid erosion and channel incision. Channel incision results in a drop in water surface elevation and may reduce riparian areas by reducing the soil saturation zone required by riparian obligate species. Additionally, channel incision and nickpoints can also become barriers for fish and other aquatic organisms.

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. Conifer encroachment and fire suppression is an issue for some of the higher-elevation streams in the analysis area but is not generally a factor in low-elevation streams.

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. It is currently unknown if the availability of aspen and willow in the assessment area may be a limiting factor for recruitment/maintenance of beaver populations. 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.

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. 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 may 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-administered 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.

Habitat Fragmentation and Entrainment

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.

Entrainment of fish populations and other aquatic species can occur in areas where there are water diversions that do not have fish screens or other protective barrier structures. Fish and other aquatic species frequently become entrained in irrigation ditches, canals, and other waterways during irrigation periods. Artificial channels usually provide only marginal habitat for short durations and frequently dry up at the end of the irrigation season, resulting in the localized loss of those species. Entrainment is probably an issue in the analysis area, the extent of which is not fully understood. It is

likely that most of the canals or ditches lack devices that prevent entrainment of aquatic organisms.

Invasive Aquatic 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 cause 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 2005). Chytrid fungus has also been identified in wild and captive populations of the endangered Wyoming Toad (see wildlife section). Both of these pathogens can be transported via contaminated waders or other equipment.

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.

Water Developments

Water developments including stock ponds, pits, reservoirs, and other waterbodies provide fishing opportunities in the region. Generally, the smaller developments require annual stocking because they lack adequate overwintering habitat and they experience anoxic conditions during ice-over periods. Drought has impacted many of these smaller waterbodies and has reduced the number of water developments that are suitable for fishing.

Drought and Dewatering

High-elevation streams in the analysis area are generally snowmelt driven and commonly experience peak flows during spring runoff events. Dewatering or impounding water for irrigation or agricultural use can flatten the hydrograph and reduce peak flows. In the analysis area, low-elevation streams are frequently regulated by diversions, dams, or other water developments. In low-elevation streams, spring runoff plays a lesser role in building or maintaining key stream channel processes than in higher elevation streams. Heightened flows are important events that are responsible for the development or maintenance of fish habitat. Increased flows are important for aquatic habitat because they sort gravels, scour pools, store and recruit nutrients and provide woody debris input. Increased flows also store sediments and help maintain or promote recruitment of floodplain plant species. During periods of low flow, stream channel processes still occur, but they may occur at a much more gradual scale. During low flow periods, for instance, pools can fill in with sediment or organic debris as water velocity decreases.

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 aquatic habitat. During extreme drought conditions, streams that once contained fish may become totally dry or may flow intermittently. Reduced streamflows can result in elevated water temperatures, and in more extreme cases, alter riparian vegetation, both of which negatively affect stream productivity.

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. Salinities can also increase as water evaporates. 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).

Habitat for fish living in lakes and ponds in Wyoming is mostly determined by adequate water levels. Wyoming water law dictates that waterbodies with the oldest water rights

are filled first. Most lakes or reservoirs need a water right adjudicated before 1900 to ensure adequate water levels (WGFD 2007). The Lake Hattie water rights extend back to 1908; the Twin Buttes water right dates back only to 1975.

Dewatering and flow alteration have been identified as a major issue for downstream species that occur in the Platte River basin. Depletive losses in the Platte River, for example have been found to jeopardize threatened or endangered species such as the whooping crane, piping plover, interior least tern, and the pallid sturgeon. Federal-nexus projects resulting in depletions to the Platte River will require formal consultation with the USFWS and Wyoming State Engineer's office.

Threatened/Endangered Fish Species

Threatened or endangered fish species do not occur in the analysis area; however, the pallid sturgeon occurs downstream in the Platte River and is, therefore, considered for BLM projects that may result in depletive losses to the Platte River System. The pallid sturgeon was listed as endangered under the Endangered Species Act in 1990. It prefers large, free-flowing, turbid rivers and was a common species in the Missouri River drainage. Since 1978, the U.S. Fish and Wildlife Service has consistently found through formal Section 7 consultations with federal agencies, that water depletions the Platte River system are likely to jeopardize the continued existence of the pallid sturgeon. In 2006, the Platte River Recovery Implementation Program was signed by the governors of Colorado, Nebraska, and Wyoming, and the U.S. Secretary of Interior. Under the program, water users can obtain Endangered Species Act compliance for the pallid sturgeon and critical habitat while managing certain land and water resources to provide benefits for the species. One purpose of the Platte River Recovery Program is to allow the continuation of existing and certain new water-related activities in the Platte River basin while avoiding jeopardizing existing target species or critical habitat (for additional affected species and habitat, see wildlife section).

Within the Platte River basin, new water-related activities that are not covered by Wyoming's Depletion Plan may require mitigation measures to offset new depletions. These mitigation measures are recommended by the Wyoming State Coordinator and may include the acquisition of some other water source and/or the retirement of an existing consumptive water use. Future water development projects in the Platte River Basin will need to be balanced with the habitat requirements of threatened or endangered species such as the pallid sturgeon.

BLM Wyoming Special Status Species

There are no known BLM Wyoming special status fish species that occur in the analysis area. Northern leopard frogs, a BLM special status amphibian, were commonly encountered throughout many of the riparian areas that were visited by BLM staff during Proper Functioning Condition Assessments.

3. Current Conditions:

The following describes the current conditions of wildlife and fish 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

Antelope

Antelope habitat has been affected by drought throughout most of the analysis area. The drought has affected foraging conditions and resulted in antelope going into winter with below optimum body conditions. The Cooper antelope herd experienced higher winter mortality in 2006-2007 due to more frequent periods of extreme cold, high winds, and crusted and drifted snow. Fencelines in Area 43 limit pronghorn movements to escape these effects. Adverse weather conditions have also been attributed to declines in the Medicine bow antelope herd unit. High population variability has been observed in the Iron Mountain herd unit due to drought, poor forage conditions, and sensitivity to extreme weather. Subdivisions and fences limit migration routes out of extreme weather in the Iron mountain herd unit as well (WGFD 2007).

Elk

Elk are currently doing well throughout the analysis area. Expanding elk herds have been noted in the Snowy Range Unit, Laramie Peak/ Muddy Mountain Unit, and the Iron Mountain Unit. Chronic wasting disease was confirmed in the Snowy Range Unit, but surveillance in 2006 yielded no positive cases in the herd.

Mule Deer

Mule deer have been declining in the analysis area and are below objectives in the Laramie Peak Deer Herd Unit (below 4% objective) and the Sheep Mountain Deer Herd Unit. Drought and poor habitat conditions have been cited as factors in both units. Chronic wasting disease may be impacting the Laramie Peak Herd Unit. A lack of precipitation in 2006 resulted in a decrease of plant production available for lactating does. Palmer Drought Severity Indices show that the population has endured drought conditions over the past several years. Precipitation at the start of the 2006 biological year was below normal. The 2006-2007 winter had periods of extreme cold and deep snow and may have caused increased winter mortality. Body condition of deer entering winter was adequate. Spring was characterized by generally warmer weather than normal. The current drought and habitat conditions may be limiting the herd (WGFD 2007).

Whitetail Deer

There are no set population objectives for whitetail deer specific to the watershed. Whitetail deer are managed as part of the Southeast Wyoming White-tailed Deer Herd Unit, which has an objective of 4,000 animals. It should be noted that this herd unit is immense, stretching from the Wyoming-Nebraska border to the Continental Divide and Platte River, and that the Platte valley portion of the herd makes up a small portion on a landscape surface basis, and is even less significant on a population basis. White-tailed deer in the assessment area are considered an after-thought in the overall white-tailed deer management strategy for Wyoming and their presence and significance could be considered to be incidental.

Moose

Moose populations in the Snowy Range Moose Herd Unit are currently estimated at 150, above a tentative population objective of 100 animals. Based on observations from hunters, local personnel and results of the current moose habitat study; WGFD reported that moose numbers have been increasing in the Snowy Range (WGFD 2007).

Moose were fitted with GPS-collars by Eric Wald in December of 2004 and 2005. Moose from the 2004 captures were negative for all tested diseases and had no internal parasites, but had a low infestation of winter ticks. Pregnancy rates of marked moose were 91% and 100% in females in 2004 and 2005, respectively. Most moose populations throughout North America experience 90% pregnancy rates, even in habitat of questionable condition. (WGFD 2007)

Raptors

The raptors previously listed all nest and forage within the watershed. They are primarily affected by the abundance of their prey species, which fluctuate annually as a result of habitat and climate conditions. Bald and golden eagles often stay year-long, while other species migrate to warmer climates. The rough-legged hawk spends the winter in the watershed and migrates to arctic regions to nest. Prey species are common, with their abundance varying year to year due to climate. 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. Development of open space is a concern within the analysis area. In addition, some shrub-steppe and forested areas are advancing towards or at late-seral stage due lack of natural disturbance.

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.

Platte River Species: Least Tern, Pallid Sturgeon, Piping Plover, Whooping Crane, and Western Prairie Fringed Orchid

The Platte River species include the endangered interior least tern, pallid sturgeon, whooping crane, the threatened piping plover and Western prairie fringed orchid. Although these other species are not located within the watershed, projects that may cause water depletions within the North Platte River ecosystem must be evaluated for their impacts to these downstream species.

Interior Least Tern

The interior least tern has been listed as endangered in 1985, mostly due to the loss of nesting habitat resultant of river channelization and impoundment. The least tern is the smallest member of the gull and tern family. Breeding begins in early May and nests on small beaches of sand, gravel, or salt flats. Favorable water levels and food sources are important factors for nesting success. Water level fluctuations, nesting habitat

disturbances (people, predators, and livestock), and depletive losses to the Platte River system currently continue to jeopardize the population.

Pallid Sturgeon

The pallid sturgeon was listed as endangered in 1990. The pallid sturgeon is one of the largest fish that occupy the Missouri River drainage. Like most other sturgeon, the pallid sturgeon is a bottom dweller and prefers areas that contain strong current with sandy substrates. Pallid sturgeon are slow-growing late-maturing fish that feed on small fish aquatic insects. They spawn from mid to late summer. Dam construction and alterations of water quality, temperature, and flow patterns have disrupted habitat and continue to threaten isolated populations.

Whooping Crane

The whooping crane was listed as endangered in 1970. Whooping Cranes rely on the Platte River during their spring and fall migrations. Current population levels are very small and breeding programs have been implemented to help recover the population. Alterations of flows in the Platte River are believed to be a factor in the birds' decline.

Northern Great Plains Piping Plover

The piping plover was listed as threatened under the Endangered Species Act in 1986. The Northern Great Plains population is one of three breeding populations. Impoundments and diversions have greatly reduced breeding habitat in the Platte River Basin. The USFWS has determined that depletions resulting in reduced flows to the Platte River have had an adverse affect on the piping plover. In 2001, the USFWS designated critical habitat for the species, which included wetlands, river channels, and reservoirs. As with other water development projects that may affect Platte River species, the BLM consults with the USFWS on federal-nexus projects that may affect piping plover habitat in the Platte River downstream of Wyoming.

Western Prairie Fringed Orchid

The Western prairie fringed orchid is currently listed as threatened under the Endangered Species Act in 1989. They occur in mesic to wet unplowed tallgrass prairies and meadows. The greatest threat is habitat loss or degradation, mostly through conversion to cropland. Competition with exotic species, wetland destruction, fire suppression, and overgrazing are also factors that have led to the orchid's decline. Additionally, western prairie fringed orchids rely on hawkmoths for pollination. The use of insecticides has affected natural pollinators and this threatens the existence of this plant. Habitat protection and species reintroductions have been initiated to prevent the species' from further decline.

Ute Ladies' Tresses

Ute Ladies' Tresses were listed as threatened under the Endangered Species Act in 1992. It is a perennial, terrestrial orchid that prefers riparian edges, gravel bars, old oxbows, and moist to wet meadows along perennial streams. Ute Ladies' Tresses have been found in the Horse Creek Watershed of Goshen and Laramie Counties. Energy

development, housing developments, noxious weeds, and water developments remain threats to existing populations (Heidel 2007).

Colorado Butterfly Plant

In general, threats to Colorado Butterfly Plant include haying, grazing, herbicide spraying, and urban expansion. Fertig (2001) suggests that the primary threat to the plant may be a lack of disturbance mechanisms that limit seedling establishment. Other threats to the Colorado butterfly plant are herbicide spraying, conversion of riparian areas, water diversions, channelization, and insect herbivory.

Competition from non-native invasive plants is also a significant threat to the Colorado butterfly plant. Efforts to control Canada thistle, leafy spurge, and other invasive species with chemicals can pose a direct threat to the species. Invasive species are often spread by livestock management and recreational activities, but can also be spread by other land uses and management activities (USDI-BLM 2007).

Colorado Butterfly Plant Critical Habitat

Critical habitat units include only river and stream reaches and adjacent floodplains that are within Laramie County, WY. At this time there is no identified critical habitat for the Colorado butterfly plant located on BLM-administered lands within the RFO management area. There are no management recovery or conservation plans for this species within the watershed. If land designations are changed, the regulations identified in the Federal Register, Vol. 69, No. 185, September 24, 2004, Proposed Rules, will be followed concerning management of activities that are located or have the potential to be located within critical habitat for the Colorado butterfly plant. Conservation measures are binding measures that the Bureau will implement to facilitate the conservation of the critical habitat for the Colorado butterfly plant (USDI-BLM 2007).

Wyoming Toad

The Wyoming Toad is an extremely rare amphibian that was listed under the ESA as endangered in 1984. In 1993, Mortenson Lake National Wildlife Refuge was established to protect the last known populations of the Wyoming Toad. Mortenson Lake, Soda Lake, and Gibbs Pond are all located within the refuge and provide primary Wyoming Toad habitat. The habitat types supported by the refuge include open water, wetlands, wet meadows, grassland, sagebrush, and greasewood communities. To protect potential adverse impacts to the toad, public access to the refuge is not allowed. In 1995, captive-bred Wyoming toads were reintroduced at Mortenson Lake to try and re-establish the toad to historical habitats. Only re-introduced populations are currently known to exist.

BLM Wyoming Special Status Species

Several Wyoming BLM special status species have the potential to occur within this watershed. There are known nests for ferruginous hawks, and burrowing owls have been observed with some nesting habitat identified.

Currently, most of the sage-grouse are found in the western portion of the watershed area. Much of the Eastern portion of the watershed no longer supports sage-grouse due to conversion of sagebrush habitats to grassland dominated communities. Greater sage-grouse leks are monitored by the WGFD throughout portions of the watershed from March through mid-May each year to determine activity status of each lek. Populations of greater sage-grouse are declining across the West and in Wyoming; however, the actual cause(s) for this decline is unknown. Less is known of other BLM special status species; however, the habitats for these species are present and inventory or monitoring should occur to determine abundance and habitat use in the future.

Fisheries

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.

Issues currently affecting Lake Hattie identified by the WGFD include drastic water fluctuations, an exposed boat ramp when the water level drops, dense yellow perch populations, and no guaranteed minimum pool for water in the reservoir. Twin Buttes Reservoir suffers from high total dissolved solids (TDS), high ph in the summer and fall, which limits the timeframe when fish can be stocked, yellow perch drifting in from the water supply system, and piscivorous birds that nest on the islands and feed on newly stocked trout (WGFD 2007).

4. 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 the early to late 1800s. The historical descriptions of the area were compiled by Robert D. Dorn (1986). These excerpts include descriptions of the landscape and some of the wildlife that were present from some of the earliest historical accounts.

Laramie Plains, Medicine Bow Mountains

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.”

E. Willard Smith was in the area in late September of 1839. On entering the Laramie Basin from the Cache la Poudre, Smith wrote, “Large herds of Buffalo were scattered over this valley…The timber on all these mountains and hills is yellow pine – some of it

quite large." In Mid April of 1840, traveling by the Laramie River, he wrote, "We saw a great many buffalo every day we passed along."

John C. Fremont, the army topographer, visited the area in late July and early August of 1843. According to his writings, they killed an antelope near Tie Siding. Widely scattered groups of cottonwoods were noted along the Laramie River. Buffalo, hares, and antelope were observed closer to the Medicine Bow Mountains. The streams coming out of the mountains reportedly had "red willow and long-leaved cottonwood along them mingled with Aspen".

Francis Parkman, author of *The Oregon Trail*, was in the area in July of 1846. On the Laramie Plains were a "number of little lakes, where wolves, antelopes, and large plover were congregated." Buffalo were also noted. "Some Indian boys killed a sage grouse possibly towards Rock Creek."

Howard Stansbury, an Army Topographical Engineer, crossed the Laramie Range in late September of 1850. He wrote, "The west slope near the Lincoln Monument had aspen, fir, pine, and juniper in scattered clumps. The canyon of upper Lodgepole Creek was densely timbered." They observed large herds of buffalo between here and Crow Creek. "Willow fringed the streams...Crow Creek had good water." Howard Stansbury passed by in September of 1850 and noted that "The scenery on the Laramie Plains was one of broad grassy valleys over which ranged bands of buffalo and antelope. The sagebrush disappeared. Game was now in greater abundance. The Little Laramie River was twenty feet wide and eight or ten inches deep with a rapid current over a bed of pebbles...Buffalo were still abundant about 20 miles west-northwest of Laramie. Timber ceased at the base of the mountains and sagebrush had entirely disappeared." More buffalo were observed across the plains to the Laramie Range. He also reported that there was an isolated grove of cottonwoods on the Laramie River near Laramie.

In 1867, F.V. Hayden stated that "On the head of these lofty mountains (toward the head of Little Laramie) are some beautiful open spots without a tree, and covered with grasses and flowers. After passing through dense forests for 10 miles, we suddenly emerged into one of these park like areas…The big and Little Laramie, Rock Creek, Medicine Bow River, and their branches are literally filled with ties (cut for the railroad) at this time. Aspen groves are a favorite resort of elk, deer, grouse, and all kinds of game…."

The U.S. Geological Survey under F. V. Hayden entered the area in October of 1870. "…On the plains antelope are still present but the buffalo have disappeared. Their old trails and skulls "are fast passing away." Elk, mule deer, white-tailed deer, bighorn sheep, wolves, and smaller animals "are still quite abundant, especially in the valleys of the small streams" in the mountains (

F.V. Hayden visited the Laramie Range in August of 1870. He noted that the streams of the range were "full of fish, especially trout" and mule deer, white-tailed deer, and antelope were moderately abundant. "The range was covered with a thick growth of grass, with here and there a thin grove of pines…These trees are hardly ever more than from fifty to sixty feet high, and seldom more than two feet in diameter at the base." Big sagebrush was noted on the west side of the range, replacing silver sagebrush on the east side of the mountains.

In October of 1870, F.V Hayden from USGS noted the valley of the Little Laramie had been mostly occupied by ranches. He wrote, “Thousands of cattle wander over its broad meadows…and hundreds of tons of hay are prepared each year. On the plains antelope are still present but the buffalo have disappeared. Their old trails and skulls are fast passing away. Elk, mule deer, white-tailed deer, bighorn sheep, wolves, and smaller animals are still quite abundant, especially in the valleys of the smaller streams in the mountains.” (Dorn 1986)

R. W. Shufeldt, an army physician, reported blue grouse in the foothills of the Laramie Range in winter south and west of Fort Fetterman as well as immense herds of elk (Hayden 1883). He also reported Columbian sharptailed grouse along the banks of the Platte and tributaries in winter and spring.

Cheyenne, Southern Laramie Range

“John C. Fremont, the Army Topographical Engineer, entered Wyoming in July 1842 southwest of Pine Bluffs. He saw a herd of buffalo on the woodless prairie. Some stunted pines were noted on the summits of the ridges in northwest Laramie County. A tributary of Horse Creek (believed to be Bushnell Creek) was fringed with willow, chokecherry, and currants. “The grass was thin except along the stream where it was luxuriant.”

The Kearny campaign to protect emigrants along the Oregon Trail passed through two branches of Horse Creek and Lodgepole Creek in July 1845. They described the plain as “gravelly, scantily covered with short, crisp, buffalo grass, much like curled gray horse-hair, only three buffalo gave an interest to the dull scene, and one antelope.” They camped on Crow Creek and noted, “For forty miles we have seen but one tree – five miles off—and not a bush or shrub.” Cooke also documented fire on the plains: “The prairie was on fire in our front…In four or five miles over burned and toward burning prairies, we came to another little stream.”

Silas Reed, the surveyor general of Wyoming Territory, visited the Laramie Range in late June of 1871. Near the heads of Crow, Lodgepole, Horse, and Chugwater Creeks, “there is but little timber on this mountain, only here and there small groves of yellow pine, which have been nearly destroyed by fires within the last few years.”

Fisheries

Beyond anecdotal information regarding fish or other aquatic resources, there is limited information that characterizes fisheries before there was substantial development of reservoirs or water transport systems. Dorn’s (1986) synthesis of settlers in the area provides insight to what the water resources may have been like in earlier times. The historical account of F.V. Hayden in 1867 characterizes what may have been a plains lake: “The Laramie is a very clear stream, about 50 yards in width, and averaging two feet in depth, easily forded in most places. Like most of the western streams, the difference between high and low water is very great…Before reaching the mountains we passed a series of alkaline lakes…In the spring these lakes are quite large, and are filled by the overflow of the branches of the Big Laramie…Great quantities of fish are swept into the lakes from the neighboring streams, and in the autumn the water becomes so alkaline by evaporation that the fish die in great numbers along the shores.”

The Bryan Wagon Road Survey crossed the Laramie Range in 1856 (Dorn 1986). “The Laramie River in the vicinity of Laramie offered only a scattering of cottonwood. The river bottom was of quicksand while the Little Laramie had fine, hard bed of gravel and pebbles, and clear icy water.” They caught some fish in the Laramie River. In 1858, they wrote that near Laramie, “The soil of the plains is poor and sandy, and thickly covered with grass…not a tree or shrub of any kind growing on the river in this part of the course.”

More recent, history describes the Plains Lakes: Lake Hattie is one of the oldest Laramie Plains Lakes. It was built in 1912 by the Laramie Water Company. In 1925, Laramie Rivers Co. purchased control of the reservoir dam. In 1980, the Pioneer/Canal Company bought controlling interest in the lake. In recent years, the water fluctuation has varied greatly. At full pool, it covers nearly 3,000 acres and is about 75 feet deep (WGFD 2007). Lake trout have been caught from the reservoir that range from 8-12 lbs. Kokanee, yellow perch, rainbow trout have also been historically stocked in the lake. Yellow perch have at times over populated and become stunted.

Twin Buttes Reservoir was constructed in 1972 by the Wyoming Game and Fish Department to provide fishing and waterfowl hunting opportunities. Before the reservoir was developed, the standing water resulted in high salinities (37,000ppm) that precluded a fishery. Historically, plains killifish occupied the lake. With the cycling of fresh water obtained from the Laramie Rivers Company, salinities have been controlled and the lake has been managed as a recreational fishery. Rainbow trout, brown trout, and yellow perch have been stocked in the reservoir at various times (WGFD 2007).

In summary, several changes have taken place across the landscape, perhaps the most notable having been the loss of buffalo and wolves and the conversion of land to ranchlands. Development of water resources helped facilitate ranching and the settling of the area. The occurrence of bears also seems to have declined from earlier records when compared to later records. Bighorn sheep also declined, as they were not mentioned in later historical accounts. The vegetation landscape pattern remains mostly the same, with densely forested areas occurring in the mountain ranges, transitioning to sagebrush and mountain shrub communities and finally to open grasslands. The Little Laramie River and other smaller streams that drained the mountainous areas were reportedly “heavily stocked with beaver.” However, beaver were rarely mentioned in the plains areas (Dorn 1986).

5. Synthesis and Interpretation

Livestock grazing in the analysis area has impacted wildlife and aquatic resources. However, improved livestock management and range management have minimized impacts to these resources in many areas. In certain other areas, additional improvement is needed to ensure riparian areas are returned to properly functioning conditions and that uplands are in compliance with management standards.

Generally speaking, big game is still thriving and many streams still support a fisheries component. Urbanization in Wyoming has not occurred at the rate that it has in other states, however, habitat loss and fragmentation is more prevalent in this analysis area.

Native plant species are still abundant but weeds are becoming more prevalent in the analysis area (see weeds discussion below. Loss of or modification to habitats from developments on private land in mixed land ownership areas continue to increase. The lack of fire has led to a predominance of mature to decadent shrubs in some areas. The following analyzes specific habitat conditions within the watershed and the effects these may have on wildlife or fish species.

Species of Interest or Concern

Antelope

The presence of antelope in Wyoming was noted by all of the early explorers and emigrants that moved to or across the state. However, antelope in the Laramie Plains area have probably become more common since the decline of the buffalo herds. Antelope are still the most visible and abundant big game species in this area due to open expanses of a sagebrush dominated landscape. The health of Wyoming big sagebrush communities that antelope depend upon is generally good. In this assessment area, specific to the Big Laramie River, the antelope crucial winter ranges do receive concentrated animal use and show high utilization rates or severe hedge classes. 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, is 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 fencing, especially woven wire, 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 poses impacts, at an incremental rate, on antelope habitat and movement in broken land ownership areas. Land development frequently results in increased fence construction, which is a concern for movements and migration of antelope. Informing people about the potential impact to wildlife of development and fence construction 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. 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 effect 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 and mechanical 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.

Elk

Historically, elk were common plains inhabitants, and probably competed with bison for forage and space. At this time, elk are doing well across Wyoming and populations in this watershed area follow a similar trend, with herd populations that are near or exceed objectives. Elk are currently thriving, have good reproductive rates, survival rates, and have the habitat to support them. Large predators that historically regulated elk populations are absent from the watershed area and have resulted in population levels that are probably above historical levels. 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. Water developments, improved livestock management, and vegetative treatments could all help improve the habitat for and distribution of elk in this watershed.

Mule Deer

Mule deer were common in this watershed historically, and are still common today. 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. Returning fire to the ecosystem or using chemical or mechanical treatments would help promote a diverse mixture of species, age classes, and structure would also benefit mule deer populations. The descriptions for Standards 2 and 3 indicate where improvement could occur, primarily in riparian habitat and shrub and woodland communities on and adjacent to the mountains. 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 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. The urbanization of both Albany and Laramie County is and will continue to be a significant factor for managing mule deer populations.

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.

Moose

Moose have been demonstrated to be a species of considerable importance, both locally and on a landscape-wide scale. At this time, limited opportunities exist on BLM-administered lands within the watershed to manage directly for benefits to moose, mostly due to a lack of knowledge of the preferred and seasonal habitat selections of this particular population. Given the information from recent collaring studies, more explicit management goals can be expected.

Overall, BMPs that positively affect riparian and upland vegetation conditions should be beneficial to moose. Encouragement of woody species, especially willows, in riparian drainage bottoms should encourage use of these areas by moose. Additionally, upland vegetation treatments such as those mentioned previously for mule deer and elk will positively affect moose populations in the affected areas.

Raptors

Raptors are primarily affected by climate (indirect effects 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. The BLM has a timing stipulation for raptors attached to any proposed project that is located within three quarters of a mile 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 ferruginous hawk, northern goshawk, burrowing owl, peregrine falcon, and bald eagle are BLM Wyoming special status species that are found within this watershed.

Threatened, Endangered, Proposed, and Candidate Species

Threatened and endangered species that may occur in the watershed or could be impacted by activities that occur in the watershed are considered for all BLM projects. The BLM wildlife biologists complete informal and/or formal conferencing and/or consultation with the USFWS for all proposed projects that may contain habitat, or the species themselves, to avoid adverse impacts to threatened, endangered, candidate, and proposed species. For new depletions that are not covered by the Platte River Recovery Implementation Program for Platte River species, new net depletions to the Platte River system may need to be offset through the acquisition of some other water

source and/or the retirement of an existing consumptive water use. The Wyoming State Engineer's Office recommends such mitigation measures if projects are not covered by the Recovery Program.

BLM Wyoming Special Status Species

A field site investigation is completed for all proposed projects and protection measures are implemented on projects that may affect populations or habitats of BLM Wyoming special status species. During field site visits, special status species' presence or habitat is documented. Projects are designed with input from resource specialists, which can initially avoid or reduce impacts to species through project design and placement. Protection measures for projects may also include timing stipulations, avoidance of habitat, or special mitigation measures.

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 migratory birds such as the white faced ibis, mountain plover, long-billed curlew, Sage thrasher, Brewer's sparrow, Sage sparrow, Baird's, sparrow, as well as other species not given special status designations. Species' habitat loss and/or degradation are more difficult to measure and mitigate for these species.

Greater Sage-Grouse

The greater sage-grouse is found throughout approximately the western two-thirds of the watershed area. Although Wyoming has a healthy but declining population of this species, there are opportunities to improve both upland and riparian habitats used by these birds. In some areas, habitats exhibit reduced species diversity and forb abundance, and lack sufficient residual cover for high nesting success. Greater sage-grouse habitat recommendations developed for Wyoming, based on research, can be used for assessments to determine current conditions and where the need exists for vegetative treatments. Summer and fall brood-rearing habitat is especially dependent on riparian habitat, which is most influenced by livestock management. Stream segments that are in degraded condition are also not likely to provide high quality habitat for sage grouse. Implementation of livestock grazing BMPs would improve the use of both riparian and upland habitats for greater sage-grouse. Creating new water sources for wildlife use and operating livestock water sources for wildlife when livestock are not present are two other methods of improving habitat use by grouse.

Another tool the BLM uses is a timing stipulation attached to any proposed project that is located within two miles of a lek that prohibits surface disturbing and other activities from occurring between March 1 and July 15 for the protection of strutting and nesting greater sage-grouse. Generally, projects are not constructed within one quarter mile of an identified lek; proposed projects should be moved as far away from an active lek as possible. The timing stipulation reduces impacts to breeding and strutting grouse; however, the two mile buffer has been debated by wildlife biologists. Recent research conducted within Wyoming indicates that only 64% of the hens nest within this two mile buffer. Suitable nesting habitat may be selected as far away as 20 miles from the lek. Because of this, suitable nesting habitat should be mapped in association with leks, in order to allow management of all nesting habitat available to the hens, not just within two

miles of lek locations. The BLM has a winter greater sage-grouse timing stipulation that prohibits surface disturbing and other activities from occurring between November 15 and April 30 for the protection of winter concentration areas.

Riparian areas on BLM-administered lands receive protection from activities that could cause substantial disruption to riparian corridors (e.g., pipelines, oil and gas development, road construction, etc.). Five-hundred foot riparian buffer zones are usually implemented in areas where significant ground disturbance could occur and avoidance is not feasible. These riparian buffers help protect amphibians, fish, and other wildlife. In some cases, avoidance is not always possible (e.g., road/stream crossings) and in these instances, special project-specific mitigation measures are developed to minimize impacts to riparian areas.

Fisheries

The assessment area contains several aquatic resources. These include regionally and local important recreational fisheries such as the Laramie River, Little Laramie River, and Plains Lakes. 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 where there is suitable habitat for fish. Based on results from Standard 2, livestock grazing, urbanization/road development, vegetation management, and water development remain principle factors affecting riparian and wetland systems in the assessment area. While there has been some recent improvement in riparian resources, 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 and warmwater fish species.

Baseline inventory information is improving 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.

The Plains Lakes suffer from drastic water fluctuations and dense yellow perch populations from time to time. The drought and demand for water used for irrigation frequently results in no guaranteed minimum pool for fish populations, high total dissolved solids, and high ph during summer and fall. These factors influence the habitat fish need to survive.

6. Recommendations

Habitat needed to support healthy wildlife and aquatic populations and listed or proposed threatened and endangered species generally meets Standard 4. This does not mean that there aren't problems or concerns about 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 future condition”.

The majority of the assessment area is meeting Standard 4 and is also referenced in Standard 3 – Uplands. Generally, the composition of native plant species and diversity is good. The most notable issues of current concern to wildlife in terms of vegetation management are noxious weeds, the transition of mountain shrub/sagebrush steppe communities to late seral stages, and decadence/conifer encroachment occurring in woodland communities. Additionally, some riparian areas were rated as functional-at-risk or not functioning. Improving the structure, diversity, and age class of riparian/wetland and upland plant communities will help meet the needs of all wildlife or aquatic resources that occur within the watershed.

Species of Interest or Concern

Antelope, Elk, Mule Deer, White-tailed Deer, Moose

Riparian areas that were rated as functional-at-risk or not functioning that overlap big game crucial winter ranges should receive high priority for implementation of actions to return these areas to proper functioning condition.

The BLM should work with other state and federal cooperators, landowners, and permittees to identify areas where fences currently hinder or alter wildlife movements and continue to modify fences to wildlife friendly designs to facilitate movement through these areas. Private landowners should be encouraged to leave their lands unfenced or use fence designs that are compatible with big game movements. In many cases this simple idea could help wildlife passage, especially during severe winter conditions.

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. A Coordinated Resource Management Plan has been initiated near the Jelm Mountain area in the southwest portion of the watershed. Specific projects including the use of prescribed fire, mechanical treatments, and grazing implementation are planned in order to improve vegetation in this area. Coordinated wildlife resource improvement projects should be implemented.

Additional projects in the analysis area should be completed to enhance plant species diversity, structure, and age class, especially in mountain shrub, sagebrush-steppe communities. Riparian and woodland communities that would benefit from vegetation management should also be identified and implemented.

Existing water developments should be monitored and maintained as necessary. Any new water developments should be analyzed for their impacts to wildlife and they should be designed to provide benefits to wildlife. In winter ranges, projects should be ephemeral in nature, to not encourage year-round wildlife or livestock use. Isolated water sources and associated riparian habitat should be protected and managed to meet the needs of wildlife.

Land management agencies should work towards identifying and protecting crucial winter ranges from disturbance. Several crucial winter range areas have been identified

by WGFD and BLM. These areas should be protected from unnecessary activities that could cause animals to move from these areas to less suitable habitat. Development in crucial winter range should be avoided.

Bighorn sheep, although important, are not currently a high priority, in part due to: 1) there are not large populations in this watershed at this time, and 2) the difficulties encountered when trying to develop habitat treatment projects for sheep on federal lands can occur. Subsequently, habitat development programs for bighorn sheep should only be pursued when projects are warranted and have strong backing from private landowners.

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. In addition, 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. These dates should be changed if local conditions or activity warrant modification. 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

Platte River Species: Least Tern, Pallid Sturgeon, Piping Plover, Whooping Crane, Eskimo Curlew, and Western Prairie Fringed Orchid

The BLM should continue to identify projects that may affect threatened or endangered species' habitats within the Platte River system. The BLM should complete conferencing and/or formal consultation as appropriate with the USFWS for all proposed projects that may affect the Platte River Species. Projects should not be implemented until after consultation has been completed and concurrence is received from the USFWS. New and existing projects should be analyzed for their affect on downstream threatened and endangered species.

BLM Wyoming Special Status Species

The BLM should continue to use the seasonal restriction stipulation for breeding and nesting greater sage-grouse, which prohibits construction and other activities from occurring between March 1 and July 15 of each year, as well as continuing to restrict surface use within one quarter mile of occupied greater sage-grouse leks. In addition, the BLM should continue to use the seasonal restriction stipulation for greater sage-grouse winter habitat areas, which prohibits construction and other activities from occurring between November 15 and April 30 of each year. Implement (or continue) management and projects to improve greater sage-grouse habitat, including nesting cover and species diversity and age class structure in upland and riparian habitat (particularly forbs). Continued monitoring of habitat trends and grouse use where possible before and after projects has been implemented.

BLM Wyoming special status species should continue to be monitored throughout the analysis area. Population inventories and status assessments should be updated as new information becomes available. Special status species populations and habitat should continue to be considered for all BLM proposed projects, including avoidance, mitigation or adaptive measures where appropriate.
Riparian habitat located within the area has a potential to contain habitat for the Preble's meadow jumping mouse. Therefore, riparian habitats located within the Cooper Hill, Wills, TK Ranch, Morgan and Edwards, Boswell Ranch, Ring Mountain, Warren Lustk "A," and North Crow Creek Allotments should reach proper functioning condition to benefit this species. These riparian areas should take priority to reach PFC as soon as possible.

Fisheries

The improved management of riparian habitats through the use of grazing BMPs indicates Standard 4 is being met for fisheries for many of the streams in the assessment area. There is not a pass/fail system currently being used within the Rawlins Field Office management area that specifically assesses fisheries conditions in relation to land perturbations such as grazing. However, riparian sites that failed Standard 2 (Riparian/Wetland) would also fail Standard 4 for fisheries if they occur in that particular riparian area. Likewise, there are also sites that are rated in proper functioning condition, but these areas may lack specific habitat components required by fish.

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.

Aquatic Invasive Species

Avoiding the transportation of invasive species to new habitats is considered a high priority in the Rawlins Field Office management area. 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.

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. New and existing water development projects need to be in balance with the requirements of federally-listed downstream species. Concurrence from the USFWS and the Wyoming State Engineer's office for listed species on all projects that result in depletions to the Platte River should be obtained.

Riparian Management

A change in livestock management needs to be implemented in riparian areas that are currently adversely affected by livestock. Management tools that have been used successfully include reductions in the number of livestock, seasonal use restrictions, fencing, or implementing longer pasture rest periods.

Weeds

1. 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 has a comparatively smaller weed problem than other areas in the Rocky Mountain region.

The analysis area has noxious weeds, some more isolated than others and some that are ubiquitous throughout the assessment area, i.e., Dalmatian toadflax and cheatgrass. 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 found particularly 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 on BLM-administered lands within the area are Dalmation toadflax (see Picture 109) and houndstongue (see Picture 110). Other noxious species include Canada thistle, spotted knapweed, diffuse knapweed, musk thistle, and saltcedar. There are also several invasive species present which are generally restricted to disturbed areas. These include Russian thistle, cheatgrass, black henbane, and several annual mustards. Most invasive species are not treated.

2. Issues and Key Questions

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

- with the increasing development and urbanization, some private landowners adjacent to BLM-administered lands, have yet to implement weed management programs, thereby negating some of the potential effectiveness of treatments on BLM-administered lands
- multiple interstate pipelines
- noxious weeds and invasive species are spreading into undisturbed rangeland from the initial sites of introduction along many roadsides, fishing access points, campgrounds, irrigation ditches, and other disturbed areas
- Given the scale of invasion, are adequate mitigation measures are in place to address weed control on disturbed areas? Is the enforcement part of existing stipulations sufficient? How can responsibilities be best shared amongst all responsible land owners?
- Coordinated Weed Management Areas have not been delineated and there are presently no deliberate cooperative efforts underway to control weeds
- 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
- projected wind energy development would increase potential introduction and spread of noxious and invasive species

3. Current Conditions

Historically in the Rawlins Field Office, weed locations had been primarily restricted to disturbed areas associated with roads, irrigation, recreational use, and livestock grazing activities such as water developments. Today, many of the weeds occupy broad landscape in a scattered fashion in many different kinds of environments across this assessment area. There are now a number of areas where the noxious weeds are spread throughout native rangeland. Most Federal, State, and county improved roads are being treated for weeds.

At this point in time there are nine interstate pipelines crossing this watershed and three proposed wind farms. The newer interstate pipelines have brought in undesirable, noxious, and invasive species. Weed management direction for future wind farms has yet to be defined, however, will require multi-agency and multi level commitment and oversight.

As stated earlier, the principle noxious species found within the analysis area include Dalmatian toadflax and houndstongue.

Dalmatian toadflax is a short-lived perennial plant from central Europe east to central Asia. Dalmatian toadflax was originally introduced into North America as an ornamental plant, beginning in the late 1800s. Dalmation toadflax is a mildly poisonous perennial up to three feet tall which reproduces by seed and underground root stalks. It is very aggressive, with a deep root system, which renders it very difficult to eradicate or control. It can establish in naturally occurring disturbances or small openings in pristine areas and on rangeland in excellent condition. Once growth begins, condition of the rangeland does little to slow expansion of the infestation.

Dalmation toadflax is found throughout much of the entire assessment area, where ever there are dry well-drained sites. Dalamation toadflax can be found on many of BLM-administered lands throughout both Albany and Laramie counties, especially in the Centennial Valley.

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Houndstongue is 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 around Arlington to Rock River, and along the linear disturbances paralleling Interstate 80 from Elk Mountain to above Arlington, putting 850 acres of BLM-administered lands at risk.

Houndstongue (*Cynoglossum officinale L.*) is a biennial introduced to North America from Europe as a contaminant of cereal seed. In addition to being very invasive, it contains alkaloids that are highly toxic to cattle and horses. Houndstongue displaces native rangeland vegetation by capturing soil resources with its deep, well-anchored taproot, and infests pastures, hay fields, and disturbed areas throughout North America. Houndstongue produces a leafy rosette in the first year and then grows to one to four feet tall the second season. The taproot is thick, woody, black, and branching. The

plant's rough, hairy leaves are alternate, one to twelve inches long, one to three inches wide, and lack teeth or lobes. They have distinct veins and resemble a houndstongue. The lower leaves taper to the stem and are linear and pointed, while the upper leaves are smaller and stemless (see Picture 111).

Other Noxious Species Present in the Analysis Area Are:

Leafy spurge occurs throughout much of the assessment area and is a high priority treatment species for both counties. However, very few patches were found on BLM-administered lands in the Big Laramie Watershed assessment area (see picture 112).

Canada thistle occurs in and along riparian habitat, and in some cases along roads where runoff water accumulates (see Picture 113). 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. Each of the allotments that failed Standard 2 had a considerable amount of Canada thistle. Canada thistle occurs throughout the assessment area and is treated along most main roads.

Spotted knapweed is a biennial or usually a short-lived perennial, up to three feet tall. It grows along roadsides, disturbed areas, and dry rangelands, especially liking light, well-drained soils. Spotted knapweed occurs in the northwest end of the watershed along the linear disturbances (pipelines, roads, snow fences, and irrigation ditches) and creek bottoms from Cooper Cove to Quealy Dome.

Diffuse knapweed is an annual or short-lived perennial, up to two feet tall, preferring roadsides, disturbed areas, and dry rangelands. It is highly competitive and occurs in one known location along Roger Canyon. This thirty acre location has been treated annually since identified in 2003.

Musk thistle is a biennial up to six feet tall, which also grows basically anywhere. It spreads rapidly, forming dense stands which crown out other plants. The flowers are readily eaten by most wildlife and livestock, and, together with the wind, help spread this plant.

Saltcedar is a deciduous shrub introduced from Eurasia as an ornamental. In many places it has become naturalized along streams and reservoirs and tends to form monocultures that limit biodiversity. Saltcedar can dry up ponds and streams. In addition, they bring large amounts of salt up from the soil and deposit it on the surface, thus rendering adjacent sites uninhabitable by native species. This shrub is difficult and expensive to control. It occurs sporadically along Lake Hattie and other lakes in the valley, infesting less than 10 acres of BLM-administered lands.

Invasive Species of Concern are Henbane and Cheatgrass.

Cheatgrass occurs throughout the assessment area (see Picture 115). 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. These warmer sites, along with severe thunder storms, help this species to expand, even with good livestock management. Recent warm winters have also benefitted this species, as it sprouts in the fall, so seeds can overwinter.

Black henbane is poisonous and can expand rapidly in disturbed areas, so it is targeted for treatment, primarily along pipeline corridors and roadsides.

These are becoming large-scale problems, effecting both wildlife and livestock grazing management. 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. The RFO is presently working collaboratively to identify critical areas of infestation throughout the Field Office management area. Strategic plans by area will likely follow and begin to integrate more partners as the scale of infestation becomes more explicit.

4. 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.

5. Syntheses and Interpretation

Transportation of weed seeds across great distances via vehicles, wind, and animals poses threats for introduction of new species throughout the assessment area. Given the proliferations of subdivisions and their associated roads, combined with growing recreation use in the assessment area, in particular motorized recreation, control of weed species in this watershed will require strong multi-agency and private landowner cooperation. Invasive species management in this watershed is well beyond the scope of any one entity. Given the mixed ownership and the growing population of both Albany and Laramie Counties, there is opportunity to engage private, state, non-governmental groups, and federal agencies to create coordinated weed management areas as there are none at this time. Presently, each county is the primary entity managing weeds in the assessment area.

The highest priorities for treatment are the aggressive noxious weed species, such as toadflax and houndstongue, which are able to spread throughout stable native plant communities. These are promptly treated and monitored where possible and are not specifically related to livestock grazing. Weed movement by recreational vehicles and inadequate 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 infestations are being mapped on a statewide basis to help with assessing the overall problem 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.

Much of this watershed has not been inventoried for weeds. Where noxious weeds are already established in an area and have been properly documented through this assessment process, treatment regimes will begin. Weedy species along the rivers are increasing and a cooperative effort for control with the counties has already been initiated on BLM-administered lands. As native vegetation is reestablished, many of the invasive species will be crowded out. The species of long-term concern within the assessment area are the noxious species Dalmation toadflax and houndstongue, larkspur, and death camus.

6. Recommendations

Due to the existing condition of native vegetation and the scope of weed and invasive species in this watershed assessment area, it is determined that the majority of the watershed is basically meeting Standard 4 with respect to weeds but trending downward at this point in time. There are concerns regarding those infestations that are not occurring in patches are along linear features, e.g., Dalmatian toadflax and cheatgrass. These infestations are county wide and cannot be attributed to any one cause or any one responsible party. They are found disparately around the assessment area and rarely in isolated patches on one land owner. Cooperative and collaborative efforts will need to be required in order to achieve the necessary integrated weed management for this watershed.

There are known areas of noxious weeds that are expanding and are not being treated and, therefore, fail Standard 4, Lake Hattie Allotment. Expanding multiple uses of public lands by humans (energy development) and dimensioning open space for wildlife species require greater stewardship of those parcels available to the public and wildlife by investing in good habitat management.

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 document known infestations so as to contain or eradicate noxious weeds
- build working relationships with landowners and all land managers in functional areas of the watershed so as to develop integrated weed management areas
- continue to work with landowners on concurrent treatments with private lands
- enforcement of stipulations on ROWs (pipeline, roads, dikes, etc) 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

STANDARD 5 – WATER QUALITY

Water quality meets state standards.

1. 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. An additional, 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.

The majority of the major stream courses in this assessment area are rated as Class 2AB waters. BLM-administered lands adjacent to rated streams are very limited and, therefore, difficult to assess and manage. Waterbodies that do not meet their designated beneficial uses are placed on the State 303(d) list for factors identified that contribute to the impairment. Crow Creek in the Crow Creek sub-basin (10190009) in the Cheyenne area from Dry Creek upstream of and through Warren Air Force Base has been listed on the State's 303(d) list for fecal bacteria and ammonia. Nitrates and phosphates are also a major concern. Although the Lower Laramie sub-basin was addressed in a previous Standards and Guidelines Assessment, for this sub-basin (10180011), Wheatland Creek has been listed for ammonia and pH concerns. Horse Creek is not on the State 303(d) list, but the lower reach is of concern for dewatering and sedimentation issues as well as temperature increase for aquatic life use. For additional information regarding the most current 303(d) list for 2008, please refer to the document: "Wyoming's 2008 305(b) Integrated State Water Quality Assessment Report and 2008 303(d) List of Waters Requiring TMDLs located at:

http://deq.state.wy.us/wqd/watershed/Downloads/305b/2008/2008%20Integrated%20Report.pdf

It should be noted that no State listed 303(d) waters were found on BLM-administered lands for the purposes of this document and assessment area.

2. 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 the I-80 corridor and other highway systems, industrial, agricultural and municipal discharges. Municipal sources include the towns of Laramie, Cheyenne, Burns, Pine Bluffs, Tie Siding, Horse Creek, Centennial, Woods Landing, and Albin. No known major municipal and industrial potential sources are located in the assessment area.

3. Current Conditions

In general, water quality is excellent in the Big Laramie River watershed 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 a station located on the Crow Creek near Archer, WY, that generally represents current water quality conditions.

North Platte-Upper Laramie sub-basin (HUC 10180010)

The excellent water quality in the North Platte is evident by the water quality classifications described in the characterization section. In most cases, water quality classifications are based on the beneficial uses the quality of the water can support.

Both Big and Little Laramie Rivers are rated as class 2AB for supported uses of coldwater fisheries and aquatic life and have no 303(d) listing. This sub-basin includes all the drainages above Wheatland Reservoir #2. Major drainages in the Upper Laramie sub-basin are the Laramie and Little Laramie Rivers whose headwaters are in the Medicine Bow Mountains. Land uses are logging, recreation, and grazing at higher elevations; grazing, irrigated hay production, and some oil and gas development in the lower elevations. The City of Laramie (third largest in Wyoming) lies in this sub-basin. Extensive water quality assessments by universities, the Forest Service, and DEQ in the Little Laramie Drainage above Millbrook indicate that the majority of the streams and lakes are meeting their aquatic life uses.

DEQ assessment of the Middle Fork of Mill Creek indicates full support of its aquatic life uses. Water quality monitoring by DEQ in 1997 on the Big Laramie River indicated full aquatic life use support above Jelm. Water quality samples are collected by Laramie Rivers Conservation District (LRCD) during spring runoff on the Big and Little Laramie Rivers, for the past several years. The data show occasional high counts of fecal bacteria, but the geometric mean criterion has not been exceeded. Data from other times of the year were not collected. Because of the occasional high numbers further monitoring is recommended during both runoff and low flow conditions to determine if a

fecal contamination problem exists [Wyoming's 2008 305(b) Integrated State Water Quality Assessment Report, 2008]. Neither the BLM nor USGS have water quality data for this drainage.

South Platte-Upper Lodgepole sub-basins (HUC 10190015)

The Upper Lodgepole sub-basin originates in the Laramie Range, north of the Crow Creek Sub-basin and flows east through Pine Bluffs. Much of the stream is intermittent in the lower elevations with only isolated pools of standing water during the summer. The primary land use is agriculture with grazing in the upper sub-basin and irrigated and dryland crop production in the lower sub-basin. However, there has been considerable residential growth in the sub-basin in recent years, but effects of this growth on water quality are unknown [Wyoming's 2008 305(b) Integrated State Water Quality Assessment Report, 2008]. Neither the BLM nor USGS has water quality data for this drainage or is there any consideration for a State 303(d) listing.

South Platte-Crow sub-basin (HUC 10190009)

The Crow Creek sub-basin originates in the Vedauwoo area between Laramie and Cheyenne. Its flows are supplemented by water from the Cheyenne Stage II Project which pipes water from the Douglas Creek drainage in the Upper North Platte Sub-basin to Crow Creek for a portion of Cheyenne's municipal water supply. Primary land uses are grazing, residential development, irrigated hay production, and both irrigated and dryland cropping in the lower sub-basin.

The city of Cheyenne appears to have a major impact on the water quality of Crow Creek. As discussed above, fecal bacteria and elevated levels of ammonia is a problem in Crow Creek and therefore listed on the State 303(d) list. DEQ data show concentrations of these nutrients increase more than ten-fold, to levels well above any EPA proposed criteria, as Crow Creek flows through Cheyenne. Laramie CCD is conducting monitoring and working to provide education about water quality. With the City of Cheyenne, Laramie CCD has implemented management practices to reduce pollutant loading in Crow Creek. Implementations include construction of wetlands, riparian fencing and buffer strips to trap pollutants, irrigation system improvements, animal feeding operation projects, small acreage grazing projects, and storm drain stenciling. The district has also initiated a watershed planning effort and a watershed plan has been accepted and approved. Additionally, the greater Cheyenne metropolitan area is developing plans to address municipal stormwater. Both of Cheyenne's waste water treatment plants are using tertiary treatment which nearly eliminates ammonia loading to Crow Creek. However, it appears there may be other sources of ammonia in Crow Creek, so ammonia has not been removed as a pollutant from the State 303(d) list.

Several years of data indicate that the high *E. coli* counts are primarily related to grazing practices, although recreational users and wildlife may play a role. The Crow Creek Watershed Steering Committee is addressing this issue with the Forest Service, in cooperation with stakeholders, has developed Water Quality Action Plans which combine BMP implementation, monitoring, and management of potential sources. The Forest Service has also released the Pole Mountain Improvements Project Scoping Statement to improve wildlife habitat, water quality, and livestock utilization in riparian areas on Pole Mountain. Weekly monitoring conducted by LCCD during the primary

contact recreation season from 2005 through 2007 indicates Middle Crow Creek no longer exceeds the *E. coli* criterion, so Middle Crow Creek has been removed from the State 303(d) List. LCCD monitoring indicates water quality improvements have occurred on the North Branch of North Fork Crow Creek, however the *E. coli* levels still periodically exceed the State's 30-day geometric mean criterion [Wyoming's 2008 305(b) Integrated State Water Quality Assessment Report, 2008]. The BLM does not collect water quality data in this area but, the USGS does and has collected water quality data in the Crow Creek near Archer, which is located downstream and east of Cheyenne. This USGS data does not indicate a stabilized or downward trend for fecal coliform or ammonia.

North Platte-Horse sub-basin (HUC 10180012)

Head waters of the Horse Creek sub-basin are in the Laramie Mountains. Land uses are primarily grazing and irrigated hay production, with considerable dryland and irrigated cropping at lower elevations. Watershed assessments on upper Horse Creek show that aquatic life uses are fully supported. Elevated temperature is a concern in the lower watershed since the stream is protected by water quality standards as a cold water fishery. WGFD manages lower Horse Creek as a non-game fishery. Dewatering and sedimentation are water quality concerns in the lower watershed [Wyoming's 2008 305(b) Integrated State Water Quality Assessment Report, 2008]. Neither the BLM nor USGS has water quality data for this drainage or is there any consideration for a State 303(d) listing.

South Platte-Lower Lodgepole sub-basin (HUC 10190016)

A small portion of the Lower Lodgepole sub-basin is in eastern Laramie County, and drains east into Nebraska. This sub-basin is geographically small, with no perennial streams, and land uses are primarily dryland and sprinkler irrigated crop production, and grazing [Wyoming's 2008 305(b) Integrated State Water Quality Assessment Report, 2008]. Neither the BLM nor USGS has water quality data for this drainage or is there any consideration for a State 303(d) listing.

South Platte-Cache La Poudre sub-basin (HUC 10190007)

A small portion of the Cache La Poudre sub-basin is in Wyoming in the Laramie Mountains, before it drains south into Colorado. The primary stream in Wyoming's portion of this hydrologic unit is Dale Creek. Land use is primarily grazing, with limited hay production [Wyoming's 2008 305(b) Integrated State Water Quality Assessment Report, 2008]. Neither the BLM nor USGS has water quality data for this drainage or is there any consideration for a State 303(d) listing.

4. Reference Conditions

The expeditions of explorer John Charles Fremont, 1813-1890, have numerous mentions of the monotone landscape during most of the year, and ever changing Laramie River and development near and around the river. Paul L. Hedren, in his book *Fort Laramie in 1876: Chronicle of a Frontier Post at War*", mentions different diary notations of soldiers whom during "slow monotonous days" commented on the turtles and fish easily acquired in the clear full river. One diary entry by Cynthi Capron, one of

the women who found themselves staged at Fort Laramie, writes of her wish to be with her children down by the clear wide river with her boys catching fish and following mink.

There are likely countless historic references to the Big Laramie River through the ages. Cursory library searches cover years of Calvary occupation, rail road construction and booming, years of tie hacking – where in the river played a major role-and industrialization. There are accounts of abuses to the river by various parties and erosion/bank sloughing that “abused the camps” made along the river during the many waves of Calvary insurgence, pioneer homesteading and various episodes of Indian confinement.

5. Syntheses and Interpretation

Managing livestock and evaluating road designs to include culvert installations and implementation of BMPs 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 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 surface water 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.

6. Recommendations

Within BLM-administered lands in 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. The 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

Air quality meets state standards.

1. 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.

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).

2. 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 are not created occasionally by prior burned areas, could we be looking at larger wildfires with associated air quality issues?

3. 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 management area. 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). Three figures (1, 2, and 3) from that report document the clearest, middle, and haziest days across the country. 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.

Some roads have been surfaced to reduce dust levels, but there is still much that should be done. Dry soil conditions exacerbate the problem, so in the summer dust is increased. This not only affects air quality, but also public safety, as visibility when traveling by vehicle can be 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 conducted mainly in the fall. The 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.

No large wildfires have burned in the assessment area in recent times. The majority of wildfires is less than 10 acres and tends to be associated with railroad or highway right of ways. These wildfires have had a minimal impact on air quality in this assessment area. However, large-scale fires in the Intermountain West can affect air quality within the area as drift smoke. Depending on the fire season, these impacts can be short or long term.

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. In periods of drier climate conditions, dust created by livestock trailing, herding, and day to day movements increases.

4. Reference Conditions

Information gathered from longtime residents has alluded to the increased haziness in the area. Clear vistas were the norm, and being able to see over 100 miles from a high point was an everyday occurrence. At this time, most information is anecdotal since there is very little documentation. Possible causes of this long-term reduction in air quality could be the increased mineral development and associated powerplants to the west that contribute air pollutants. Days that have clear skies are relatively rare.

Historic livestock use tended to be much heavier and for longer periods of time which increased bare ground and decreased plant cover. Large bands of sheep trailed back and forth across the field office, and dust from their movements could be seen for miles.

5. Synthesis and Interpretation

Vehicular traffic related to increased development results in numerous trips through these areas by anything motorized ranging from ATVs, pickup trucks, semis, large

seismic semis, and miscellaneous heavy equipment. Vegetation along these roads has reduced vigor and production and is generally covered in dust particles.

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).

6. Recommendations

Within this assessment area there are 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 is an important concern, both on a resource basis and a public safety basis.

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 risk of large amounts of particulate matter in the air from local wildfires burning out of control.

SUMMARY

Standard 1 – Watershed

Due to the existing diversity, composition and amount of vegetative cover on uplands, the existing overall condition of stream vegetation and channel morphology, and the relatively small number of remaining management issues, it is determined that the majority of the Big Laramie River watershed lands are meeting Standard 1. Mixed surface ownership in this assessment area has a strong influence on nearly all aspects of resource management. At the landscape scale in particular, urbanization/fragmentation, invasive species and public access issues influence most other land management decisions. This makes multi-faceted partnerships and cooperative land management decisions between private land owners, state, county and federal agencies vital.

Those allotments failing this standard were the Cooper Hill in the Upper Laramie sub-watershed, Ferguson Ranch C in the Lone Tree-Owl sub watershed and the North Crow Creek Allotment in the Crow Creek sub-watershed allotments. Some of these allotments have relatively new operators who want to work towards improving their grazing management overall, and others have many alternatives for mitigating issues on a case-by-case basis. As these allotments fall in different fourth order watersheds across the assessment area, that is an indication that there is a need to work closely with grazing operators to implement best management practices for livestock grazing throughout this portion of the Rawlins Field Office.

Standard 2 – Riparian/Wetlands

Allotments containing riparian/wetland habitat that do not meet this standard due to livestock have been described previously and include: the Bosewell Allotment, Morgan-Edwards, T-K, Ring Mountain, Wills, Warren Livestock A, North Crow Creek, and Ferguson Ranch C Allotments. All but two of these allotments reside in the Upper Laramie fourth order watershed in Albany County and failed riparian assessments for similar reasons. Common assessment factors for these allotments regarded impacted physical channel characteristics and insufficient vegetation structure, diversity and/or quantity. As these allotments had common issues, there is a common strategy for moving these allotments toward Standard 2. Examining and shifting duration of use, frequency of use, and timing of livestock use on a case-by-case basis should move these allotments toward meeting Standard 2 in a couple of grazing seasons.

Ferguson Ranch C in the Lone Tree-Owl watershed and North Crow Creek in the Crow Creek watershed failed standard 2, each for a separate set of issues. The riparian in Ferguson Ranch C experiences flash flood events which make the area more vulnerable to grazing pressure if livestock is allowed on the allotment too early in the grazing season. As this allotment has no fencing, cattle are not utilizing the uplands and concentrating use in the riparian area. The upstream portion of the system had hummocking and high use in the center of the drainage. The wider midsection of the reach is beginning to headcut, while the adjacent floodplain had upland forbs and grass species that are generally resistant to grazing, blue grass, Canada thistle, plantago, yarrow, etc. These species may endure overgrazing, but provide very little riparian stability.

The North Crow Creek Allotment, lies on tablelands formed by the erosion of the Rocky Mountains and fluvial deposits and eroded gravel from the Laramie Mountains. Parent material in the area is exceptionally “soft” and many of the drainages have a moderate gradient, where

stream channels are entrenched, have low width to depth ratios and are not very sinuous. Those riparian areas that cattle could utilize exhibited high use and considerable erosion, headcuts and stream bed silting. Fence line contrasts indicated that given the opportunity to establish stream bank vegetation, these drainages will become stabilized and properly functioning given opportunity to recover and when BMPs for grazing are implemented.

For the most part, these 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 in isolated parts of the watersheds, these areas still meet the minimum standard of rangeland health. Other than the specific allotments listed previously, the remainder of the streams and lakes within this assessment area are meeting Standard 2 regarding Riparian/Wetland health.

Standard 3 – Uplands

At present, the review of upland vegetation conditions on BLM-administered lands in the Big Laramie River watershed reveals generally good overall community health. Natural ecological and biological processes appear to be functioning adequately overall, although concerns about current, and especially near-future, functionality of certain community types remain. Specifically, the review group has determined that the majority of upland vegetation communities on BLM-administered lands are properly functioning in relation to the seral stage to which they have evolved. Although aspen stands show various symptoms of disease and decadence – particularly encroachment by conifers, they were not determined to be failing this Standard at the current time. Due to the existing conditions and general vegetation community heath on uplands; and the overall small number of management issues that need to be dealt with by all surface owners, it is determined that the Big Laramie River watershed is meeting Standard 3 for Upland Plant Health. The following recommendations would expand upon the successes already achieved and help to meet desired resource conditions in the future.

- 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

- vegetation treatments designed to modify the age and structural composition of aspen stands to stratify the seral stage mix within stands should be considered throughout the watershed

- on a long-term basis, treatments and pre/post-treatment management should be designed to promote healthy, diverse, natural rangeland conditions rather than the creation of homogeneous monotype communities covering large tracts of land

Standard 4 – Wildlife/Threatened and Endangered Species/Fisheries Habitat, Weeds

Habitat needed to support healthy wildlife populations and listed or proposed threatened and endangered species is generally in acceptable condition. This does not mean that there are no problems or concerns regarding 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, composition of native species is good, other than the discussed weed issues. Due to the existing good condition of native vegetation and its ability to support diverse wildlife populations we currently have, it is determined that the majority of the Big Laramie River assessment area is meeting Standard 4 with respect to wildlife.

The improved management of riparian habitats through the use of grazing BMPs indicates both an upward trend and meeting Standard 4 for fisheries for some of the streams in the assessment area. However, many other sites that should support fisheries currently do not. Standard 4 for fisheries is not being met on streams that currently fail Standard 2 – Riparian/Wetland. There are also sites that are rated in proper functioning condition, but due to the lack of overhead cover (stream shading), exceed temperature requirements for some fish species and will not support them. However, these sites have not yet been defined. Due to the lack of credible data on the status of native fishes in the watershed, whether Standard 4 is being met for these species is unknown.

Due to the existing condition of native vegetation and the scope of weed and invasive species in this watershed assessment area, it is determined that the majority of the watershed is meeting Standard 4 with respect to weeds, but areas of concern remain about the overall expansion of weeds within the watershed. There are concerns regarding those infestations that are not occurring in patches are along linear features, e.g., Dalmatian toadflax and cheatgrass. These infestations are county wide and cannot be attributed to any one cause or any one responsible party. They are found disparately around the assessment area and rarely in isolated patches on one land owner.

There are known areas of noxious weeds that are expanding and are not being treated, and therefore, fail Standard 4, Lake Hattie area.

The following recommendations, in addition to following the Rawlins Weed Prevention Plan (BLM 1999), would help to meet desired resource conditions in the future.

- begin to and continue to inventory and document known infestations so as to contain or eradicate noxious weeds
- build working relationships with landowners and land managers, at all levels in geographic areas of the watershed so as to develop integrated weed management areas
- continue to work with landowners on concurrent treatments with private lands
- enforcement of stipulations on ROWs (pipeline, roads, dikes, etc.) 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

More education on weedy species (including landowners, recreationists, and equipment operators) and innovative ways to address weed infestation is needed for this watershed.

Standard 5 – Water Quality

Within the assessment area, water quality impairment has not been identified by the State of Wyoming for the Big Laramie River assessment area. Although specific compliance for some stream segments is unknown, existing information within available data indicates this Standard is being met.

Standard 6 – Air Quality

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.

Allotments Described in this Report That Do Not Meet Standards Due to Livestock Grazing

Boswell	Standard 2 - Riparian/Wetland
Cooper Hill	Standards 1, 2 & 3 - Watershed Health, Riparian/Wetland, Upland Vegetation
Ferguson Ranch C	Standards1 & 2 - Watershed Health, Riparian/Wetland
Morgan-Edwards	Standard 2 - Riparian/Wetland
North Crow Creek	Standard 2 - Riparian /Wetland
T-K	Standard 2 - Riparian/Wetland
Wills	Standard 2 - Riparian/Wetland
Warren Livestock A	Standard 2 - Riparian/Wetland
Ring Mountain	Standard 2 - Riparian/Wetland

Areas Described in this Report That Do Not Meet Standards Due to Other Causes

Standard 1 – None
Standard 2 – None
Standard 3 – None
Standard 4 – Weeds: Lake Hattie, Loco Weed
Standard 5 – None
Standard 6 – None

REFERENCES

Armour, C.L., D.A. Duff, and W. Elmore. 1991. *The effects of livestock grazing on riparian and stream ecosystems*. Fisheries 16:7-11

Ashley's Diary is from the William H. Ashley Papers, Missouri Historical Society, St Louis, MO. Ashley's Narrative was published in: *The Ashley-Smith explorations and the discovery of a central route to the Pacific, 1822-1829, with the original journals*, by Harrison Clifford Dale, Cleveland, The Arthur H. Clark Company, 1918.

Bear, B. and C. Barrineau. 2007. Status of Habitat and Native Species in Southeast Wyoming Prairie Streams. Wyoming Game and Fish Department. Cheyenne, WY.

Bisson, P.A., Rieman, B.E., Luce, C., Hessburg, P.F., Lee, D.C, Kershner, J.L., Reeves, G.H., and R.E. Gresswell. In press. *Fire and aquatic ecosystems of the Western USA: current knowledge and key questions.* Forest Ecology and Management. In Press.

Blackstone, D.L.(1988) Traveler's Guide to the Geology of Wyoming. Geol.Surv.Wyoming Bull. 67, 2nd edition, 130pp.

Boreal Toad Recovery Team, 2005. Report on the status and conservation of the boreal toad Bufo boreas boreas in the Southern Rocky Mountains. Colorado Division of Wildlife. Denver, CO.

BTRT. 2001. *Boreal toad conservation plan and agreement for the southern Rocky Mountain population of the boreal toad* (*Bufo boreas boreas*). Colorado Division of Wildlife, Denver, CO.

Chapman, S.S., Bryce, S.A., Omernik, J.M., Despain, D.G., ZumBerge, J., and Conrand, M., 2003, Ecoregions of Wyoming (color poster with map, descriptive text, summary tables and photographs): Reston, Virginia, U.S. Geological Survey (map scale: 1:400,000).

Dorn, Robert D. 1986. *The Wyoming Landscape, 1805-1878*. Mountain West Publishing, Cheyenne, WY.

Dwire, K.A. and B.J. Kauffman. 2003. Effects of wildland fire on aquatic ecosystems. Forest Ecology and Management, Vol. 178, No. 1-2, 61-74.

Easton,R.M (1994) Lichens and rocks: a review. Geoscience Canada 21, 59-76.

Forest Service (1973) The Medicine Bow National Forest in Wyoming. Forest Service, U.S. Department of Agriculture, 1:126,720 scale map.

Frémont, John Charles. 1813-1890. The *life of Col. John Charles Frémont, and his narrative of explorations and adventures, in Kansas, Nebraska, Oregon, and California*. The memoir by Samuel M. Smucker. New York, Auburn, Miller, Orton & Mulligan. 1856.

Gregory, S. V., Swanson, F. J., McKee, W. A., and K. W. Cummins. 1991. *An Ecosystem Perspective of Riparian Zones.* BioScience Vol. 41 No.8 540-551.

Hedren, Paul L.1988. Fort Laramie in 1876: chronicle of a frontier post at war. University of Nebraska Press.

Heidel, Bonnie. 2007. Survey of Spiranthes diluvialis (Ute Ladies' tresses) in Eastern Wyoming (Campbell, Converse, Goshen, Laramie, Niobrara and Platte counties 2006-2006). Wyoming Natural Diversity Database, Laramie Wyoming.

http://www.wyomingtalesandtrails.com/lincoln.html: Accordingly, if a reader plans to use a photograph, independent due diligence is recommended. If photographs are used from this site, the courtesy of credit to wyomingtalesandtrails.com will be appreciated.

Klebenow, D.A. 1972. The habitat requirement of sage grouse and the role of fire in management. Proc. Tall Timbers Fire, Ecological Conference. 12:305-315.

Knight, Dennis. 1994. Mountain and Plains: the Ecology of Wyoming Landscapes. Yale University Press.

Naiman, R. J., H Decamps, and M Pollock. 1993. The Role of Riparian Corridors in Maintaining Regional Biodiversity.. Ecological Applications, Vol. 3, No. 2, 209-212.

Olsen, R. and W.A. Hubert. 1994. *Beaver: water resources and riparian habitat manager*. University of Wyoming, Laramie, WY. 48 pp.

Pages 111-124 *in* F. B. Samson and F. Knopf, editors. Prairie conservation: preserving America's most endangered ecosystem. Inland Press, Washington D.C.

Patton, T.M. 1997. Distribution and status of fishes in the Missouri River Drainage in Wyoming: implications for identifying conservation areas. Ph. D. dissertation. University of Wyoming, Laramie, Wyoming.

R. L. Knight. 2001. Songbird and medium-sized mammal communities associated with exurban development in Pitkin County, Colorado. Conservation Biology.

Rinne, J.N. 1999. *Fish and grazing relationships: the facts and some pleas*. Fisheries 24:12-21.

Rosgen, Dave. 1996. *Applied River Morphology*. Wildland Hydrology, Pagosa Springs, CO.

Schlosser, I. J., and P. L. Angermeier. 1995. *Spatial variation in demographic processes of lotic fishes: conceptual models, empirical evidence, and implications for conservation.* Pages 392-401 *in* J. L. Nielsen, editor. Evolution and the aquatic system: defining unique units in population conservation. American Fisheries Society,Symposium 17, Bethesda, Maryland.

Smith, DR *et al.* (1999) Petrology and geochemistry of late-stage intrusions of the A-type, mid-Proterozoic Pikes Peak batholith (central Colorado, USA): implications for petrogenetic models. Precambrian Research 98, 271-305.

Stokes, Donald and Lillian. 1996. *Field Guide to Birds*. Western Region. Little, Brown and Company. Boston, New York, London.

Talmage, P.J., J.A. Perry, and R.M. Goldstein. 2002. Relations of instream and physical conditions of fish communities of agricultural streams in the northern Midwest. North American Journal of Fisheries Management 22:825-833.

Tweto, O (1987) Rock Units of the Precambrian Basement in Colorado. USGS Prof.Pap. 1321-A, 54pp.

USDI-BLM. April 9, 2001. *Issuance of BLM (Wyoming) Sensitive Species Policy and List*. Instruction Memorandum No. WY-2001-040. Expires 9/30/2002. 6840 (930)P.

USDI-BLM. November 1990. *Great Divide Resource Area Record of Decision and Approved Resource Management Plan*. United States Department of the Interior, Bureau of Land Management, Rawlins District Office, Great Divide Resource Area. BLM-WY-PT-91-010-4410

USDI-Fish and Wildlife Service. *Endangered, Threatened, Proposed, Petitioned and Candidate Species of Wyoming*. July 2001. Species List.

WGFD. 2007 Laramie Region *Annual Big Game Herd Unit JCRs*. Wyoming Game and Fish Department, Laramie, Wyoming.

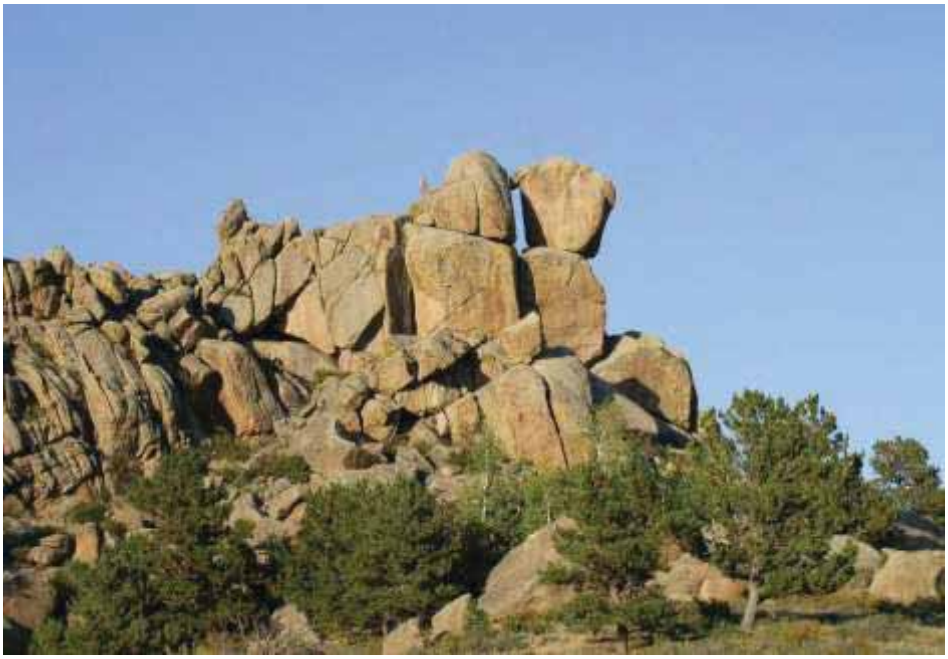
William H.Ashley Papers, Missouri Historical Society, St Louis, MO.

Wyoming DEQ. 2008. *Wyoming's 2008 305 (b) Integrated State Water Quality Assessment Report. Wyoming Department of Environmental Quality.*

"Wyoming Weed and Pest Control Act of 1973". http://www.wyoweed.org/documents.html

PHOTOS

INTRODUCTION & BACKGROUND



LOOKING INTO COLORADO

PICTURE 1 - BROAD INTERMOUNTAIN BASINS

PHOTO 2 - INTERRUPTED BY ISOLATED HILLS

PHOTO 3 - INTERRUPTED BY ISOLATED HILLS

PHOTO 4 - URBANIZATION – SUBDIVISIONS-ENCROACHMENT

PHOTO 5 - URBANIZATION

STANDARD 1 - WATERSHED

PHOTO 6 - C5 STREAM TYPE

PHOTO 7 - C6 STREAM TYPE

PHOTO 8 - UPLAND SHRUB COMMUNITY

PHOTO 9 - UPLAND SHRUB COMMUNITY

PHOTO 10 - UPLAND SHRUB COMMUNITY

CROW CREEK WATERSHED

PHOTO 11 - NEW HOUSING DEVELOPMENT

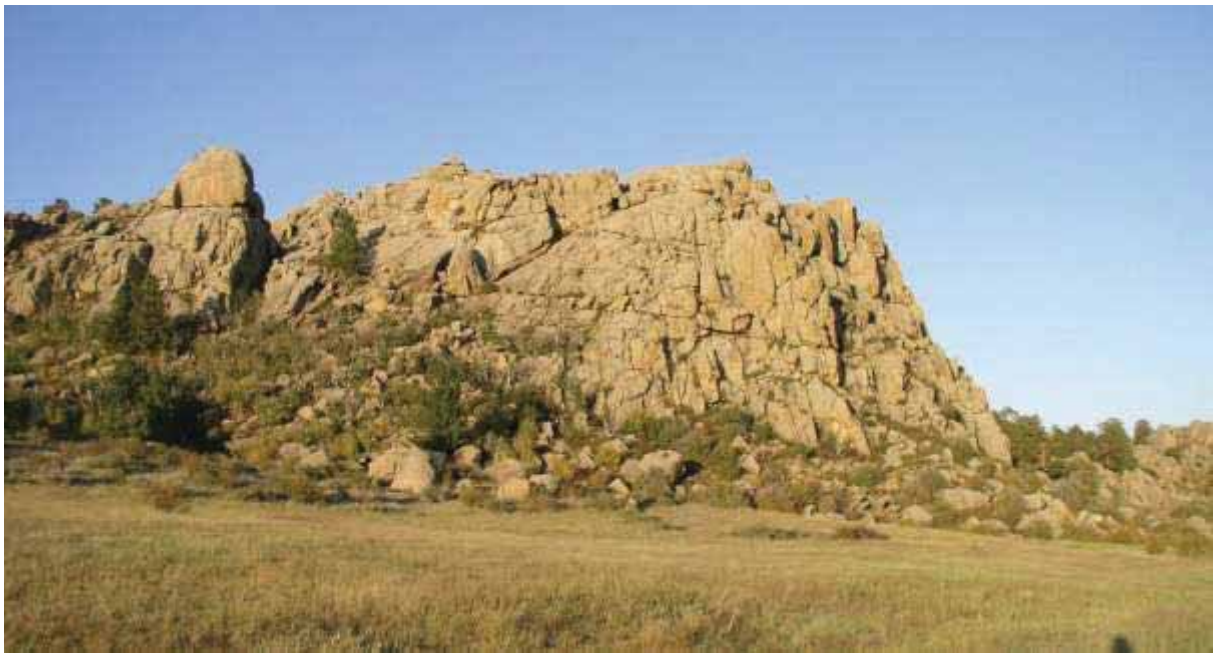
PHOTO 12 - DIFFERENT CHANNEL TYPES SAME SYSTEM

PHOTO 13 - DIFFERENT CHANNEL TYPES SAME SYSTEM

PICTURE 14 - ROSGEN A3 TYPE STREAM

PICTURE 15 - ROSGEN A4 TYPE STREAM

PICTURE 16 - URBANIZATION COW CREEK WATERSHED



PICTURE 17 - NORTH CROW CREEK LANDSCAPE

PICTURE 18 - NORTH CROW CREEK LANDSCAPE

PICTURE 19 - NORTH CROW CREEK LANDSCAPE

PICTURE 20 - NORTH CROW CREEK LANDSCAPE

ISSUE: LIVESTOCK

PICTURE 21 - GRAZED RIPARIAN AREA CROW CREEK WATERSHED

PICTURE 22 - LIGHTLY GRAZED RIPARIAN AREA CROW CREEK WATERSHED

PICTURE 23 - FROG IN THE CROW CREEK AREA

PICTURE 24 - RIPARIAN AREA NORTH CROW CREEK ALLOTMENT

ISSUE: WOODY PLANTS

PICTURE 25 - FAILED NORTH CROW CREEK ALLOTMENT STANDARD 1

PICTURE 26 - BLM ON THE RIGHT

PICTURE 27 - BLM ON THE RIGHT - ASPEN STAND

PICTURE 28 - HARD USED SHRUBS - HIGH AMOUNT OF BARE GROUND

PICTURE 29 - BLM-ADMINISTERED LANDS ON THE RIGHT

PICTURE 30 - LICK TUB IN DRAINAGE - SCORPION WEED - TOADFLAX - BARE GROUND

PICTURE 31 - PUSSY TOES (FORBS) - BARE GROUND - TOO MANY COW PIES

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PICTURE 32 - SILTED CREEK

PICTURE 33 - SILTED CREEK

PICTURE 34 - SILTED CREEK

PICTURE 35 - HUMMOCKED AREA

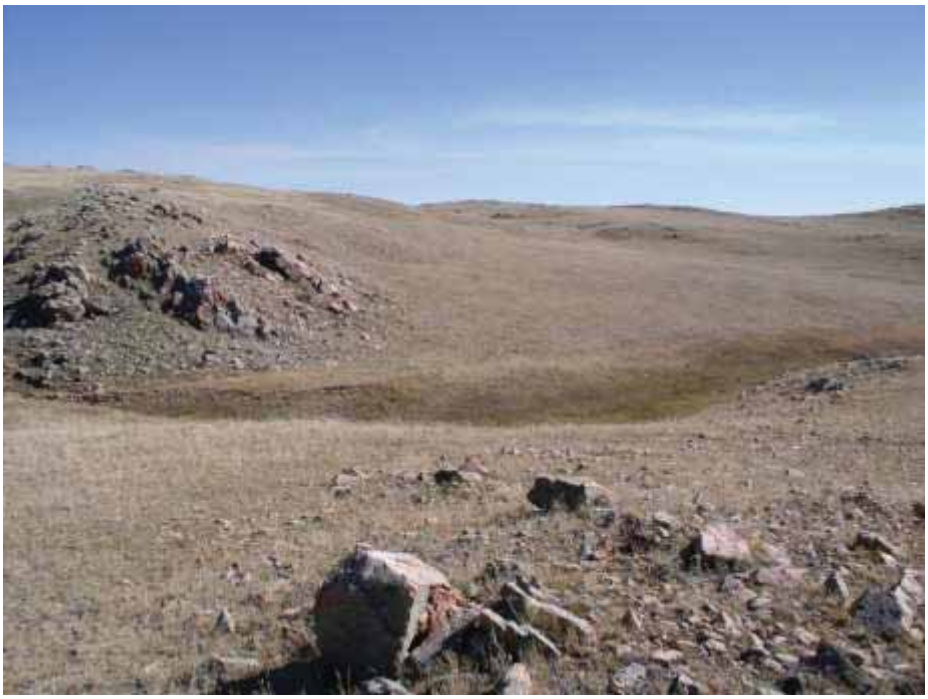
PICTURE 36 - TWO-TRACK THROUGH RIPARIAN AREA

PICTURE 37 - VERTICAL INSTABILITY

PICTURE 38

LONE TREE-OWL WATERSHED

PICTURE 39 - FERGUSON RANCH C



PICTURE 40 - ANDRES WILLADSEN

PICTURE 41 - BERTHEL LAND AND CATTLE

PICTURE 42 - MOUNTAIN SHRUB

PICTURE 43 - URBAN ENCROACHMENT

PICTURE 44 - LEOPARD FROG

PICTURE 45 - ABOVE CENTENNIAL LOOKING EAST

PICTURE 46 - JELM AREA

ISSUE: LIVESTOCK GRAZING

PICTURE 47

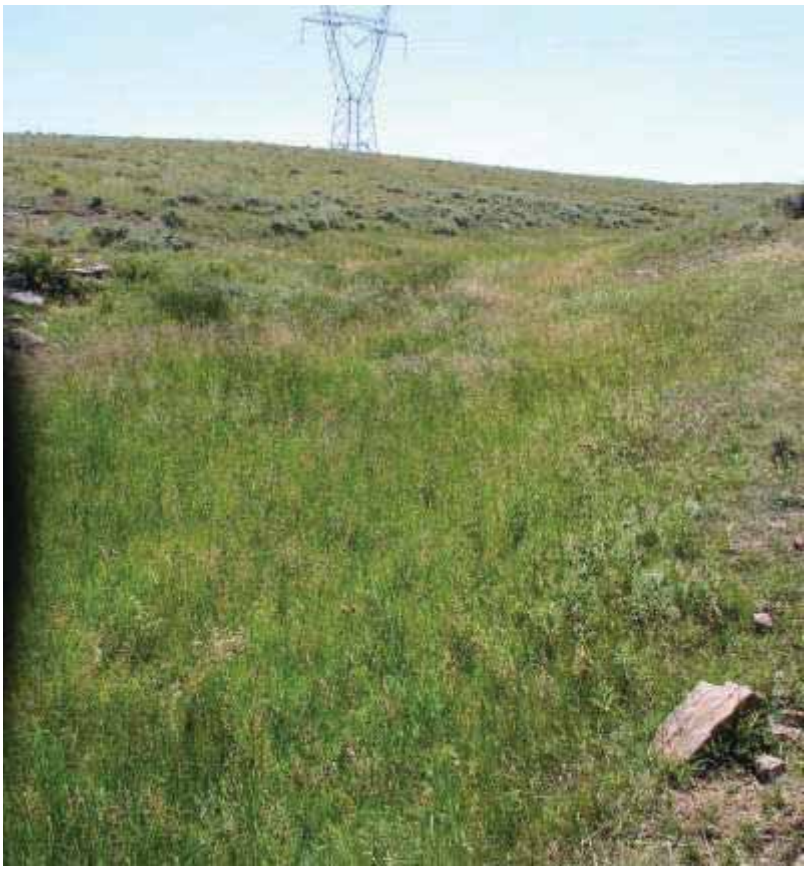
PICTURE 48 - LIGHT USE - LANDSCAPE - URBAN ENCROACHMENT

ISSUE: WOODY PLANT HEALTH

PICTURE 49

PICTURE 50 - LOW LARKSPUR

STANDARD 2 – RIPARIAN/WETLANDS



PICTURE 51 - LOWER ELEVATION RIPARIAN AREA

PICTURE 52 - LOWER ELEVATION RIPARIAN AREA

PICTURE 53 - HIGHER ELEVATION RIPARIAN AREA

PICTURE 54 - NARROW-LEAF COTTONWOODS

PICTURE 55 - LAKE HATTIE MAN-MADE RESERVOIR AREA

PICTURE 56 - HUMMOCKED RIPARIAN AREA

PICTURE 57 - VERTICAL INSTABILITY

PICTURE 58 - ROADS - EROSION

PICTURE 59 - REMNANT BEAVER DAM

LENTIC SYSTEMS

PHOTO 60

ALLOTMENTS NOT MEETING STANDARD 2 DUE TO LIVESTOCK

NORTH CROW CREEK ALLOTMENT

PHOTO 61 -

PHOTO 62

LOTIC SYSTEMS

PHOTO 63 - RIPARIAN AREA ADJACENT SAGEBRUSH UPLANDS

ALLOTMENTS NOT MEETING STANDARD 2 DUE TO LIVESTOCK

BOSEWELL ALLOTMENT

PHOTO 64

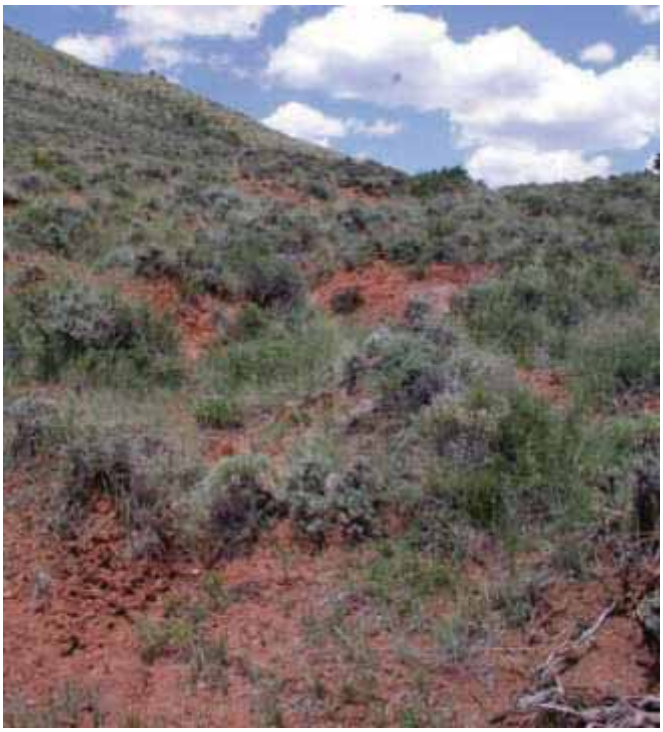


Photo 65

Photo 66

PHOTO 67

STROUSE HILL ALLOTMENT

PHOTO 68

PICTURE 69

FERGUSON RANCH C ALLOTMENT

PICTURE 70

PICTURE 71

LITTLE LARAMIE ALLOTMENT

PICTURE 72

PICTURE 73

MORGAN-EDWARDS ALLOTMENT

PICTURE 74 - BLM -ADMINISTERED LANDS ON THE RIGHT

NORTH CROW CREEK ALLOTMENT

PICTURE 75

PICTURE 76

PICTURE 77

PICTURE 78

T-K ALLOTMENT

PICTURE 79

PICTURE 80

PICTURE 81

WILLS ALLOTMENT

PICTURE 82

PICTURE 83

WARREN LIVESTOCK "A"

PICTURE 84

PICTURE 85

RING MOUNTAIN ALLOTMENT

PICTURE 86

PICTURE 87

PICTURE 88

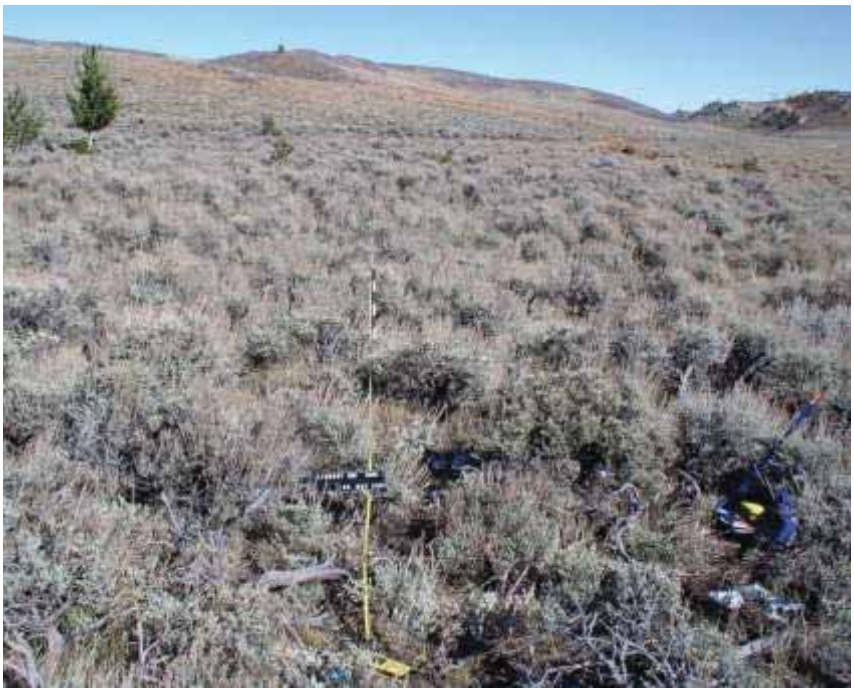
PICTURE 89

PICTURE 90

PICTURE 91 - EXCLOSURE AND TANK

STANDARD 3 – UPLANDS

PICTURE 92 - UPLAND MONITORING



PICTURE 93 - UPLAND MONITORING

PICTURE 94 - DEATH CAMUS

PICTURE 95 - LOCO WEED CASUALTY

PICTURE 96 - WYOMING LOCOWEED (*OXYTROPIS NANA*)

STANDARD #4 WILDLIFE/WEEDS

PICTURE 97 - PRONGHORN

PICTURE 98 - MULE DEER BUCK

PICTURE 99 - BULL ELK

PICTURE 100 - GREATER SAGE-GROUSE

PICTURE 101 - COW ELK

PICTURE 102 - ELK HERD NEAR RED MOUNTAIN

PICTURE 103 - MULE DEER

PICTURE 104 - MOOSE SNOWY RANGE

PICTURE 105 - GREAT-HORNED OWL

PICTURE 106 - WYOMING TOAD

PICTURE 107 - UTES LADIES' TRESSES

PICTURE 108 - COLORADO BUTTERFLY PLANT

WEEDS

PICTURE 109 - DALMATION TOADFLAX

PICTURE 110 - HOUNDSTONGUE NEAR THE LARAMIE RIVER

PICTURE 111 - HOUNDSTONGUE

PICTURE 112 - LEAFY SPURGE AND CHEATGRASS

PICTURE 113 - CANADA THISTLE

PICTURE 114- CHEATGRASS WYOMING-COLORADO STATE LINE AREA