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 analysis area contains portions of the North Platte River Basin within the RFO boundary (Maps #4 & #5). Table #2 depicts the 4th Order HUCs, acreages, and groupings of these watersheds that will be discussed for Standard 1.

Table # 2 –Sub-Area Acreage Included in the Analysis Area

Sub-Area (report sections)	Acreage	4th Level HUCs*
Sage Creek Basin	160,705	1018000209- Sage Creek Basin and associated watersheds
Sugar Creek	130,580	
North Platte River-Iron Springs Draw	215,058	
Jack Creek	67,427	10180002 – Upper North Platte
North Platte River-Cow Creek	77,145	
Pass Creek	96,600	
Saint Mary's Creek	90,583	
Total	**838,098**	

***** HUCs – United States Geological Survey Hydrologic Unit Codes.

Sage Creek Watershed and Sugar Creek, Iron Springs Draw

1) Characterization:

This area of analysis includes the Sage Creek, Sugar Creek, and Iron Springs Draw sub-areas. For simplicity the Sugar Creek and Iron Springs areas will be included with the Sage Creek watershed as they are very similar. The watershed varies in precipitation from an average of <8 inches at the lower elevations to >16 inches near the Continental Divide. Soils are formed from alternating shale and fine grained sandstones, which tend to be easily erodible. Due to lower precipitation and soil development, saline and alkaline soils are common in the lower elevations. Snowmelt or thunderstorms can produce moderate to high runoff with medium to high erosion potential, in many cases due to the unstable Niobrara Formation. Sheet and rill erosion, occurring on soils derived from marine shales, contributes sediment to Sage Creek and its tributaries resulting in high levels of suspended sediment and colloidal clays (Sage Creek Watershed Report [SCWR]). The USDA-SCS estimated natural erosion rates for 95% of the watershed at between ½ and 1 acre feet per square mile per year. Sources of the sediment include sheet and gully erosion and provide approximately 190 acre feet of sediment to the mouth of Sage Creek (USDA-SCS, 1980).

Topography is flat to gently rolling landscape for the most part, becoming moderately steep to steep close to the rims and Miller Hill (photo 9-1). Sage Creek starts along the Continental Divide at 8400 feet and drops 1800 feet at its confluence with the Platte River (photo 9-2). Gradient adjustments (in the form of incised channels) due to the change in elevation are prevalent throughout the watershed. Sage Creek has been modified both recently and historically by man through gradient control structures, dams, and diversions (photo 9-3). Perennial, intermittent and in some areas ephemeral draws, drain into the over 170 stream miles within this watershed.

Wind redeposits snow on the leeward side of vegetation and topographic features, typically the north and east sides (photo 9-4). This can alter vegetation and soils, as well as runoff occurrence and duration. The remaining water sources have been developed around wells or natural springs. These areas can be important for livestock and wildlife and may support wetland vegetation as discussed in Standard 2. Groundwater resources are critical for these areas and will be discussed in Standard 5.

Due to gradient changes and fairly infrequent high flow events, channel formation is moderately to severely incised from the middle to the lower reaches. Upper Sage Creek and its tributaries would be classified as a B6 stream type (photo 9-5). The B6 stream type is described as a moderately entrenched system, higher gradient with a low sediment supply and dense riparian vegetation. As Sage Creek drops in elevation it starts to reach the more erosive silts and clays of the Niobrara Shale formation and changes to a C6 stream type (Rosgen, 1996) (photo 9-6). The C6 stream type is described as a slightly entrenched, meandering, silt-clay dominated system with a well developed floodplain.

Principal human uses in this watershed are livestock grazing, recreation and limited mineral development (photo 9-7). Livestock use is primarily cattle, both cow/calf and yearling operations. Seasons of use for livestock vary by allotment. Winter use is somewhat dependent on annual climate conditions. Recreation levels tend to be primarily related to hunting, during the fall (September through October).

2) Issues and Key Questions:

Water and wind erosion, as well as gully formation, are important indicators of watershed adjustments in function, which are influenced by existing upland vegetation and groundcover. Erosion can result in the loss of topsoil and reductions in site productivity in the uplands and various adjustments of stream channels. Within the Sage Creek watershed, naturally occurring erosion is by far the greatest contributor of sediment (Ellison, 2004 Not yet published). However, there are management factors that also affect these processes and they are described below.

1. Livestock Grazing: Livestock grazing has been and continues to be a factor affecting watershed values in terms of vegetative cover and litter. Management issues relate to the season, duration, and distribution of use rather than stocking rates. The key question is in what locations do further refinements in BMPs or other actions still need to be made to improve watershed condition and meet desired resource objectives?

2. Erosion: Erosion from roads, both improved and unimproved, is also an important factor relating to watershed condition. The BLM, Carbon County, and to a small extent mineral operations 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 runoff hydrology (photo 9-8). 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. Where recreational access is limited due to the checkerboard land pattern, road proliferation is not an issue. However, where there is public access two-track roads are a considerable problem. In these areas, 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 parts of this watershed for recreation, and the increasing use of 4-wheel drives and off-highway 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 erosional issues from these roads? What educational and management tools should be employed to reduce erosion impacts from recreation and other users of public lands?

3. Woody Plants: The age and canopy cover of big sagebrush, mountain shrub, and aspen/cottonwood woodland plant communities is increasing, leading to lower herbaceous ground cover and water yield. Older shrub and tree communities use more water, have lower infiltration rates and greater surface erosion, all leading to reduced late-season stream flows. Prescribed burns conducted in adjacent watersheds have shown improvements in ground cover, reduced surface erosion, and improved late season stream flows. The key question is: How do we as an agency decide on what amounts of treatments should occur to promote higher stream flows and lower soil erosion levels and still address all of the resource values that we are obligated to manage?

4. Water Control: Past practices including instream structures, canals and ditches have impacted the watershed. Adams Reservoir washed out (in the upper reaches of Sage Creek) and contributed to the vertical instability on Lower Sage Creek. In addition, diversions and other water conveyances have contributed negatively and positively to erosional problems within the watershed (photo 10-1, 10-2). The headwaters of Sage Creek provide a major source of water for the city of Rawlins. There is a large reservoir and an intensive spring collection system that has altered the flow regimes of this portion of the Sage Creek basin. Although most of these practices are outside the responsibility of the BLM, more recent requirements tied to funding require some cooperative analysis which may reduce negative impacts in the future.

3) Current Conditions:

Information is available for specific locations from photo-points, upland cover transects, intensive monitoring on Sage Creek by SERCD and UW, USGS, and personal observations.

Perennial and intermittent stream channels that support riparian vegetation are narrowing, with banks becoming more stable with perennial, deep-rooted sedges, rushes, grasses, and in some areas with willows. As the channels narrow, the active floodplain width expands, including within incised banks where the upper slopes continue to widen and become more stable with vegetative cover. In-channel bank sloughing on outer corners and gradient adjustment of ephemeral side drainages are the important contributors of erosion. In a few locations, this includes gully movement through the dams or spillways of old beaver ponds. Hydrologic function is improving due to the above-mentioned changes in stream channels and floodplains. The majority of these watersheds have ephemeral stream channels that are moderately vegetated with rhizomatous wheatgrass, basin wildrye, big sagebrush, greasewood and other upland species. Erosion occurs from confined, in-channel sites and from rill and gully erosion from uplands. Much of this is considered background or natural rates of erosion, compared to accelerated rates of erosion caused by impacts from roads or poor grazing practices.

Vegetative cover and litter on uplands varies 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 varies from 40% to 85% on big sagebrush plant communities and from a low 28% on two locations(in minimal cover) to 50% on saltbush steppe plant communities, the two most common vegetation types in this watershed (photo 10-3, 10-4). The areas that had less than 30% cover were at sites that were marginal of minimal slope, or impacted by natural conditions but on a limited but natural basis for this watershed. At upper elevations, plant cover is usually higher, for instance the average cover values on Miller Hill and Chokecherry Knob were respectively 75% and 68%. Trend data shows increases in plant cover and litter, as well as plant

densities and vigor, which occur primarily as grasses fill in the spaces between shrubs. While the areas of lower plant densities defy the conditions listed above for accelerated sediment yield, this is not the case, since these sites are on flats and are often the endpoints for water flow off adjacent slopes. The water will pond on these sites with nearly a sealed soil surface due to salts and clays, resulting in most of the water leaving the site as evaporation. This is particularly true for the lower elevation valleys along Sage Creek. In general, the overall ground cover appears good, it can continue to be improved with the use of BMPs.

4) Reference Conditions:

Both John C. Fremont (1843) and Howard Stansbury (1850) traveled through the area from Atlantic Rim to the Platte and their accounts were very similar. Stansbury's account follows: "Very thick sagebrush and numerous gullies were noted in the Sage Creek area about 13 miles south of Rawlins. Grass and water were scarce here."

Because the Overland Trail dissected the Sage Creek basin there are numerous accounts of conditions. For example, in addition to Fremont and Stansbury, the Bryan Wagon Road Survey passed through in 1856 and 1858, James Evans for Union Pacific Railroad and Hayden passed thru during1868, 1870 and 1877. The Bryan Survey commented as they traveled along Sage Creek "The country is miserably poor and desolate, being covered almost entirely by sage plant and much washed by water." Almost all accounts discussed the desolate nature of the Sage Creek basin. Bare ground, low plant production, and the erosive nature were common threads throughout all of the surveys. Although there may have been some changes within the Sage Creek Basin, inherently it is just as described in the 1800's.

As elevation climbs in the watershed, these reports show distinct variation. According to "Bridger Pass Overland Trail 1862-1867" as you head west from Sage Creek you cross 10 miles of "dry, dusty, sagebrush, greasewood and rabbit brush country" you get to the Pine Grove stage stop. "The station was located at the foot of Miller Hill, out in a grassy meadow on the bank of Pine Grove Creek, near a beautiful grove of evergreen and quaking aspen trees. At times water and green grass greeted the travelers. In mid-summer it was dry." Although the stage stop is no longer there, the grassy meadow, the spruce/aspen grove and the creek remain (the creek still flowing intermittently) (photo 11-1). A wildfire burned many of the old spruce and aspen trees, however regeneration is already occurring. In many ways, the historical accounts regarding the different stage stops document fairly well how little man has changed the landscape within recent times.

5) Synthesis and Interpretation:

A large portion of the Sage Creek basin is dominated by saltbush and the ability of sheep to survive on snow, led to winter sheep being the principle use of this country for many years. Too much snow or lack of snow would limit the annual amount of sheep use. Although high levels of utilization probably occurred, the dormant season of use would still have helped maintain the native plant species. For the majority of the area, current species composition and levels of plant cover appear to be in good condition. In those areas of higher elevation and more perennial water, there tended to be cattle and/or sheep. Use in these areas is limited by weather, providing grazing use during late spring, summer and fall. Head-cuts and gullies are more pronounced in areas with greater relief and differences in gradient, such as lower Sage, Little Sage and Miller Creeks.

The principal changes observed today in this watershed are very limited and include roads, water developments and fences relating to the existing land uses. Road improvements are probably the most visible recent change seen in this area.

Management changes relating to livestock grazing include: pasture grazing systems to manipulate duration and season of use to provide some growing season rest in each pasture and development of upland water sources to improve livestock distribution. These practices have occurred as sheep permits were converted to cattle. Although most allotments now have some type of pasture management system, there are a few allotments without a

management system. These management plans have resulted in both improved cover and site stability. Species such as basin wildrye have expanded in valley bottoms, adding litter and cover that help hold sediment from adjacent uplands wild rye (photo 12-1, 12-2). Along wetter draws willows have also expanded to improve channel stability. Areas of historic impact, still observable today, are old sheep bed-grounds along trail routes, adjacent to water sources, and on ridgetops. Plant cover and species composition were negatively affected by the trampling and soil compaction, with site recovery still occurring.

Current management systems are being modified where needed to improve plant vigor and vegetative cover by ensuring at least partial rest during the growing season. New water developments are used to improve livestock distribution and to create more reliable water sources, in order to get through periods of drought.

6) Recommendations:

Due to the existing diversity and amount of vegetative cover on uplands, the existing condition of most intermittent and ephemeral channels, the management responsibility of most permittees, and the small number of management issues that need to be dealt with, it is determined that the Sage Creek Basin watershed is meeting Standard #1. The following recommendations would expand upon the success already achieved and help to meet desired resource conditions in the future.

Identify and correct problems with improved roads, which affect water flows and soil erosion. Two-track roads are too numerous to deal with as a whole, however, problem areas should be identified and fixed or the road should be closed and reclaimed.

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.

Implement vegetation treatments where needed to restore plant communities with diverse species, age classes, and cover types. Promote composition of communities to maximize herbaceous cover and litter, and therefore, minimize surface runoff and soil erosion.

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

Lower Platte from Jack Creek to the southeast portion of Seminoe Reservoir (excluding Sage , Sugar Creek and Iron Springs Draw)

1)Characterization:

This discussion includes the following sub-areas: Jack Creek, Cow Creek, and Pass Creek which have perennial headwaters derived from the Sierra Madre and Medicine Bow Mountains, and the North Platte River. Soils are predominantly shale and sandy clay-loam soils, with short portions of perennial and intermittent stream segments in the higher elevations, turning into ephemeral drainages in the lower elevations. Rapid snowmelt or thunderstorms can produce moderate to high runoff with medium to high erosion potential. Topography is flat to gently rolling landscape at lower elevations, becoming moderately steep to steep closer to the mountain ranges (photo 12-3). This creates high gradient changes near headwater areas, potentially increasing the potential for head-cuts and gullies. The lower elevation drainages have low gradients with lower potential for gullies. All of these stream segments (when flowing) make their way into the North Platte River system.

Stream flow is generally intermittent on lower reaches away from the mountains, with flows only reaching the reservoirs during high flow events. Early homesteads were developed in the wider valleys and gentler terrain along the larger streams, such as Jack, Pass, and Rattlesnake Creeks. Irrigation for hay meadows is reliable, but is more variable due to climate at lower elevations in the drainages. Higher elevations streams have either a gravel or rocky base which promotes more lateral stream movement with disturbance, rather than down-cutting (photo 13-1). Stream channels are generally stable with rocks and perennial vegetation cover, including willows, waterbirch, cottonwood, aspen and other shrubs. There has been no annual flow monitoring for any of the streams in this area. Flows are highest in May and lowest during August or September.

The majority of stream channels in this watershed are C6 and B4 stream types. 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 (photo 13-2). 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 (photo 13-3). The B4 stream type is considered relatively stable and is not a high sediment supply stream channel (Rosgen 1996).

The North Platte River is a C3, meaning a slightly entrenched, meandering, riffle/pool, cobble-dominated channel with a well developed floodplain (Rosgen 1996)(photo 13-4). It is found in U-shaped valleys. C3 Channels have gentle gradients of less than 2%, display a high width/depth ratio, are slightly more sinuous and have a high meander width ratio. Rates of lateral adjustment are influenced by the presence and condition of riparian vegetation. This is not a high sediment channel, with the exception of Sage Creek feeding into the river.

Principal human uses in this watershed are livestock grazing, hay production and recreation. Livestock use is primarily cattle, employing both cow/calf and yearling operations. There is one allotment in the eastern portion of the assessment area that has bison grazing(photo 13-5). Seasons of use are primarily winter and spring at lower elevations and summer and fall at higher elevations. 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 hunting, fishing, and camping. The Platte River receives a high percentage of recreational use related to fishing, boating and other water activities. In addition, hunting is also prevalent during the fall (September through October).

2) Issues and Key Questions:

1. Livestock Grazing: (please refer to issues identified for Sage Creek)

2. Woody Plants: (please refer to issues identified for Sage Creek)

3. Erosion: (please refer to issues identified for Sage Creek)

3) Current Conditions:

Quantifiable data about current erosion levels and stream flows is available to some extent for most streams by the USGS. Additional information is available from photo-points, channel cross-sections, and personal observations show that the trend for watershed values is upward. Specific management implemented along with range improvements and vegetative treatments, at least indirectly, should also relate to improved resource conditions in most areas.

Stream channels are generally stable, with good vegetative cover and/or rock for armoring, with good width-to-depth ratios. Some channel narrowing will still occur. As the channels narrow, the active floodplain width expands, including both lateral expansion on cobble, gravel, and silt-bottomed streams. In-channel bank sloughing on outer corners (such as along Pass Creek) and gradient adjustment of ephemeral side drainages are the primary sources of erosion. Loss of vegetation due to the duration and season of cattle use and the limited availability of water and associated dewatering by irrigation has negatively impacted Pass Creek. Changes in livestock management, including fencing, upland water developments and/or exclusion will be implemented. Beaver are still present on upper portions of these streams, and contribute to stream stability and sediment storage.

Vegetative cover and litter on uplands varies 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. Trend data shows increases in plant cover and litter, as well as plant densities, which occur primarily as grasses fill in the spaces between shrubs(need monitoring from Elk Mountain). In general, the overall ground cover appears good, but in many locations can still be improved with the use of BMPs.

4) Reference Conditions:

Both John C. Fremont (1843) and Howard Stansbury (1850) traveled through the area from Atlantic Rim to the Platte and their accounts as stated before were very similar. Stansbury's account follows: "After the crossing of Sage Creek [about four miles above its mouth], upon approaching the Platte, we encountered many ravines coming down from a ridge on our right, the intervening ground being washed almost entirely bare of grass or vegetation of any kind. At the Platte were gigantic cottonwoods and luxuriant grass. The cottonwoods were 60 feet high and 2-3 feet in diameter. They killed several buffalo and saw several herds."

5) Synthesis and Interpretation:

The descriptions for Sage Creek generally documents impacts and conditions through development similar to this watershed. 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 livestock use, wildfire suppression, mining reclamation, and roads/off-highway vehicle activities.

Best Management Practices (BMPs) for livestock grazing that have been implemented in this watershed include: pasture grazing systems to control duration of use, deferment of riparian pastures to late summer or fall use when possible, and development of upland water sources to reduce dependence on streams as water sources. For example, Kelley Land and Cattle constructed several crossfences (many electric), developed water and implemented a more intensive rotation. As a result, changes have been documented in channel morphology along Coad Mountain, over the last 10 years (photo 14-1,14-2). Monitoring has shown improvement in bank cover and stability, which has led to surface stream width (at base flows) reductions. Vegetative bank cover has increased significantly, and, therefore, reduced the unprotected bank area vulnerable to in-channel erosion. The bank building and expansion of riparian habitat (due to narrowing of stream channels), have led to increased late season flows in all perennial streams. In most cases there are adequate pastures for rotational grazing, the key is to control the duration and season of use on streams where improvement is still needed.

Fluvial erosional processes dominate in the upper elevations due to the higher precipitation and higher ground cover. Flood events due to summer rainstorms are the most likely cause of changes in channel conditions if vegetation is degraded. Forested systems on the Medicine Bow Mountains are in poor health in some areas and have high fuel loading since there have not been any major fires for decades due to fire supression. Promoting

forest health in the headwaters by mechanical thinning in diseased stands can be an effective method to improve the sustainability of headwater vegetation. Currently, one permittee is thinning some of the stands around Elk Mountain through the use of minimal impact horse logging. Prescribed fire is needed as a management tool in this area to lower fuel loads and provide a mosaic of vegetation and increased diversity of species and age classes for both woodlands and shrublands.

As roads are upgraded and improved, problems associated with them are generally reduced. Main roads need to be 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. 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 prevents water from running along the road and creating gullies. Improved or closed off stream crossings have reduced vehicular disturbance to channels and banks. Off-road vehicle use, particularly four-wheelers, continue to be a problem where people drive them off existing roads and are creating new roads. These are often in an attempt to get higher on the mountain, in steeper terrain, that is more susceptible to erosion once the ground cover is removed.

6) Recommendations:

Due to the existing diversity and amount of vegetative cover on uplands, the existing and improving trend in stream vegetation and channel morphology, and the small number of remaining management issues, it is determined that the majority of the Lower Platte River watershed within the report area is meeting Standard #1. The following recommendations would expand upon the success already achieved and help to meet desired resource conditions in the future.

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

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

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

Reintroduce beaver into suitable habitats whenever possible.

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