

Bureau of Land Management

WIND RIVER/BIGHORN BASIN DISTRICT
Worland Field Office

West Cottonwood Allotment #00535

Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management

for

Public Lands Administered by the Bureau of Land Management in the
State of Wyoming

Worland Field Office, Wind River/Bighorn Basin District, Wyoming

FY 2014/15



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1.0 INTRODUCTION

The Bureau of Land Management (BLM) grazing regulations at 43 CFR 4130.3-1(c) require that grazing permits issued by the BLM contain terms and conditions that ensure conformance with BLM regulations at 43 CFR 4180, which are the regulations under which the Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for Public Land Administered by the Bureau of Land Management in the State of Wyoming were developed. Recently, the Worland Field Office completed an assessment of the achievement of these standards on the West Cottonwood Allotment No. 00535. The results of this assessment are presented in this report. This assessment will serve to inform the BLM's determination as to whether these standards are being met, and, if they are not met, whether existing grazing management practices contribute to their lack of attainment.

1.1 Standards

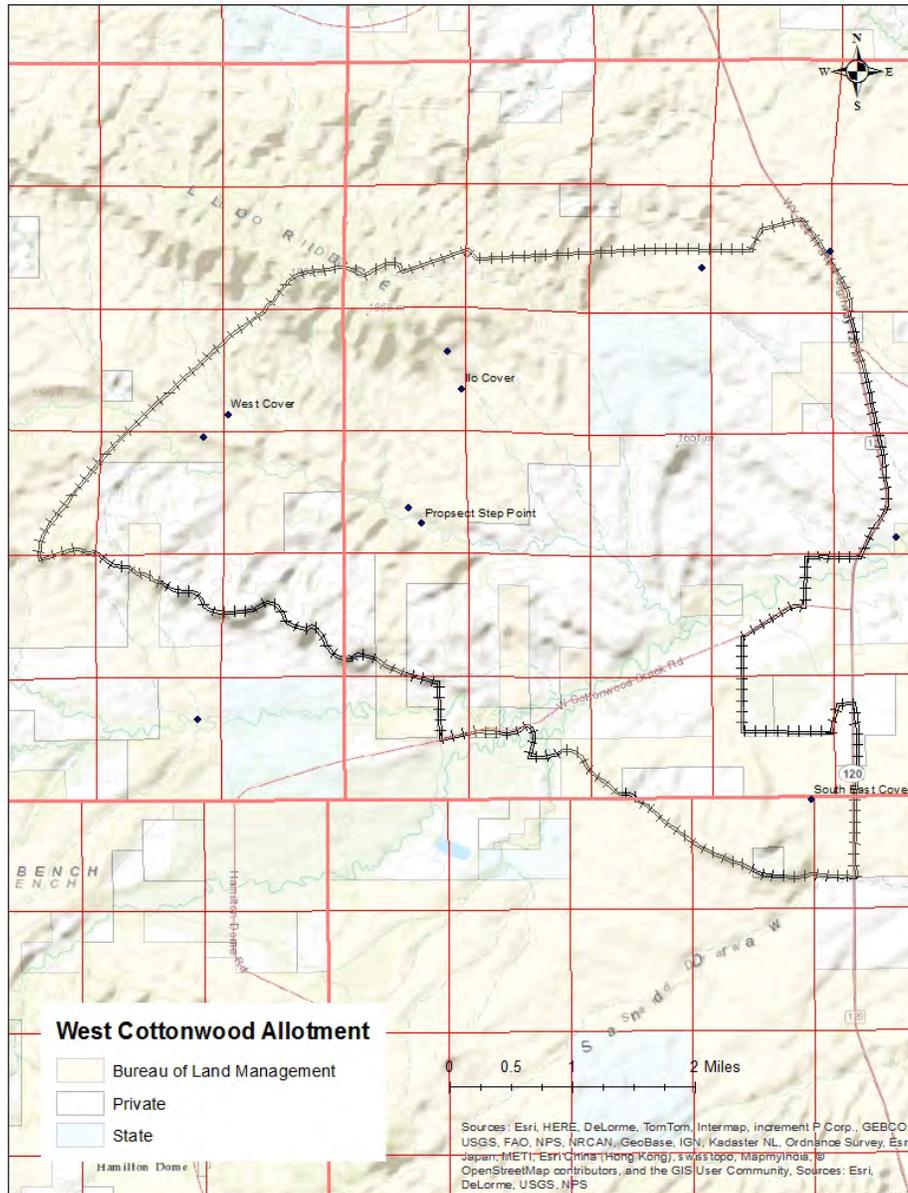
The approved standards for rangeland health are as follows:

- Standard #1: 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.
- Standard #2: Riparian and wetland vegetation has 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 ground water recharge.
- Standard #3: 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.
- Standard #4: 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.
- Standard #5: Water quality meets State standards
- Standard #6: Air quality meets State standards

2.0 Affected Environment – Allotment Description, Resource Values, and Uses

2.1 Location and Land Ownership

West Cottonwood Allotment is located in the western reaches of Hot Springs county-northwest of Thermopolis, Wyoming. The average elevation ranges from approximately 6000 feet to 5000 feet above sea level. The allotment encompasses approximately 14,576 total acres including approximately 7,113 public acres and 7,463 State/private land acres (Grass Creek RMP). The allotment is classified in the “C” (Custodial) category.



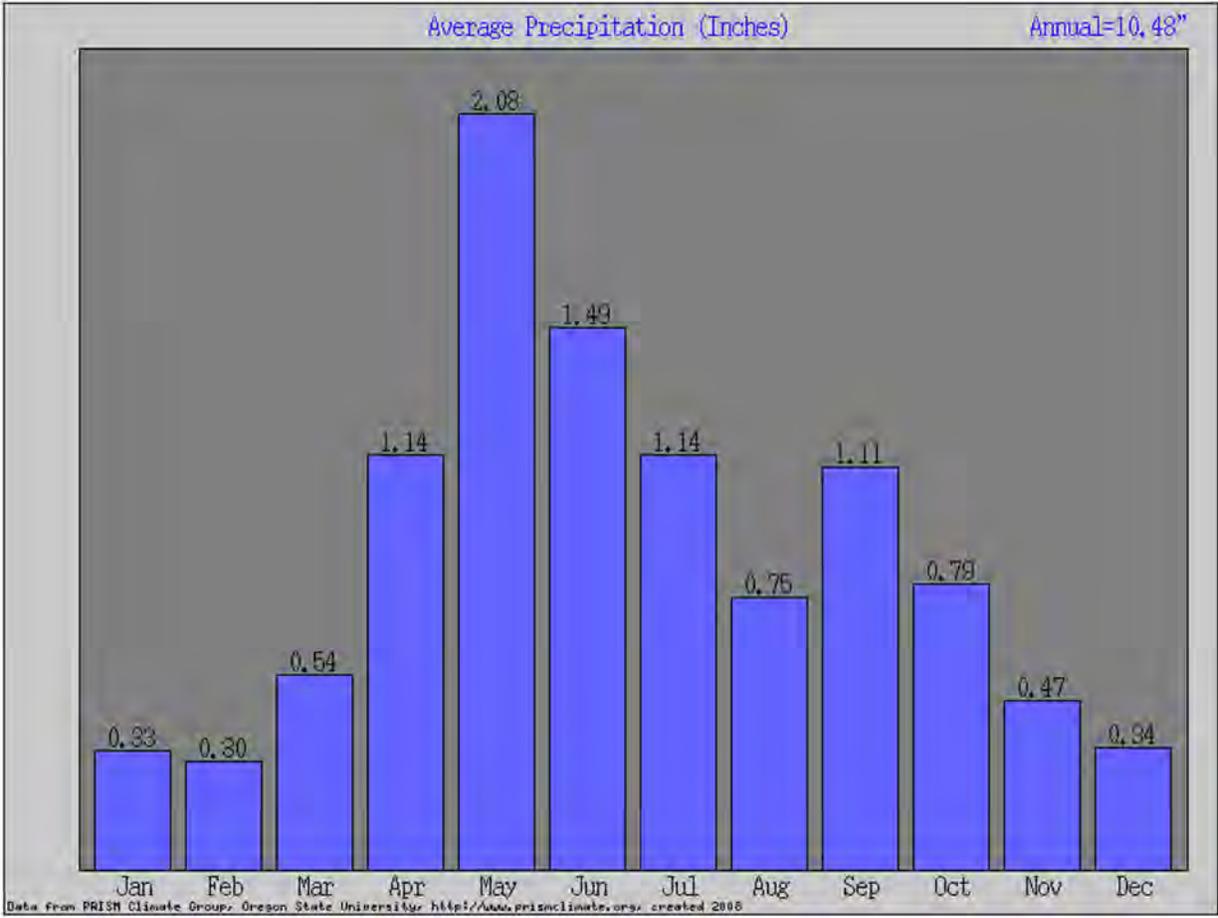
2.2 Climatic Features

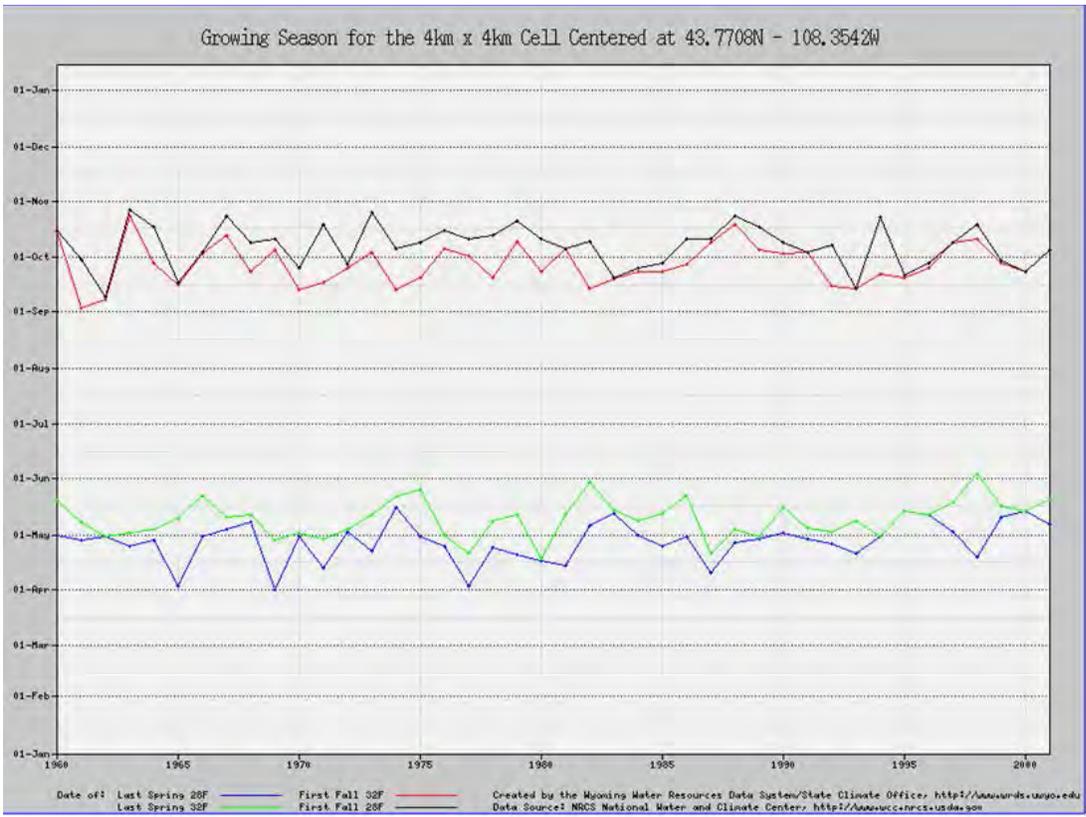
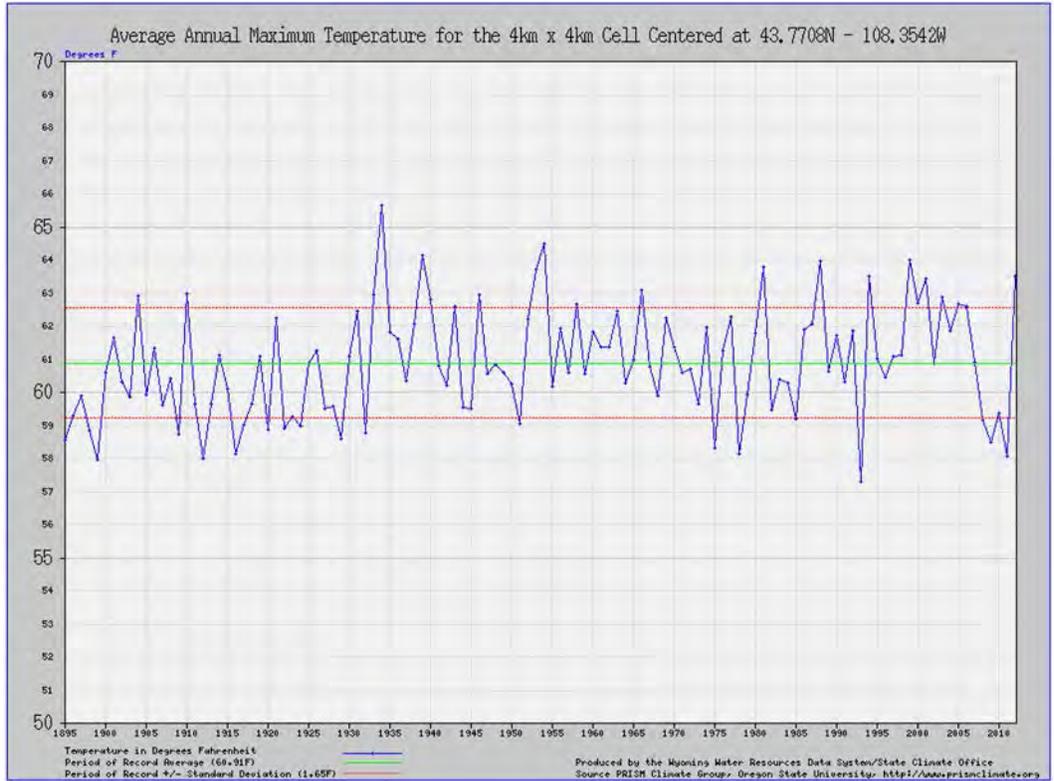
Annual precipitation ranges from 10-14 inches per year. The normal precipitation pattern shows the least amount of precipitation in December, January, and February, increasing to a peak during the latter part of May. Amounts decrease through June, July, and August and then increase some in September. Much of the moisture that falls in the latter part of the summer is lost by evaporation and much of the moisture that falls during the winter is lost by sublimation.

Average snowfall exceeds 20 inches annually. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation. Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring. Winds are generally not strong as compared to the rest of the state. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 75 mph. Growth of native cool-season plants begins about April 15 and continues to about July 15. Cool weather and moisture in September may produce some green up of cool season plants that will continue to late October. The following information is from the "Thermopolis 2" climate station: Minimum Maximum 5 yrs. out of 10 between Frost-free period (days): 74 149 May 23 – September 16 Freeze-free period (days): 112 180 May 8 – October 1 Annual Precipitation (inches): 7.6 21.9 Mean annual precipitation: 12.35 inches Mean annual air temperature: 46.2 F (30.1 F Avg. Min. to 62.3 F Avg. Max.) For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at <http://www.wcc.nrcs.usda.gov/> website. Other climate station(s) representative of this precipitation zone include "Grass Creek 1E", "Thermopolis", Thermopolis 25NW", "Buffalo Bill Dam" and "Black Mountain".

	Averaged
Frost-free period (days):	111
Freeze-free period (days):	146
Mean annual precipitation (inches):	14.00

An additional climate source is referenced to present overall climate data. According to the PRISM (PRISM,2012) (Parameter-elevation Regressions on Independent Slopes Model), overall averages from monthly precipitation, mean annual precipitation, mean annual air temperature, have been sampled from 4 kilometer x 4 kilometer grid cell selected that is centered at the mean elevation for the allotment. In total, 40 percent of the annual precipitation is during the months of April-June. Additionally the 30 year frost free period for 28 and 32 degree days for the watershed is displayed below along with the 30 year average maximum temperature. The modeled amount is slightly lower than the NRCS data presented above from the Thermopolis station.





The maximum and minimum elevations for each allotment within the watershed were calculated along with the average slope given in percent rise for each 10 meter digital elevation grid. The West Cottonwood allotment is at the middle elevations of the Cottonwood Creek watershed with the maximum, minimum, and average listed in the table below. The average slope is 15.2 percent and higher than adjacent allotments due to topography and geology of the watershed.

Allotment	Max Elev (ft)	Min Elev (ft)	Average Elev (ft)	Average Slope (% Rise) 10m
East Cottonwood	5270	4782	4974	8.4
West Cottonwood	6176	4942	5261	15.2
Wagonhound Bench	5769	5168	5374	7.1
Wagonhound	6229	5390	5715	17.1

2.3 Soils

The soils reflect the desert environment in which they formed. They are highly variable, reflecting differences in parent material (shale, sandstone and/or mixed alluvium), position on the landscape, slope and aspect. Soil depth ranges from 10 inches to over 60 inches with sandstone and soft shale bedrock common below the substratum. The soils typically have a light brown surface layer. Loamy and sandy surface textures dominate most of the landscape. The subsoil often reflects an increase in clay being expressed as an argillic horizon. Increases in sodium are also common being reflected as a natric horizon in the subsoil. Slopes range from 0 to 60 percent, but are generally less than 30 percent. The average slope for the allotment as calculated above is 15.2 percent.

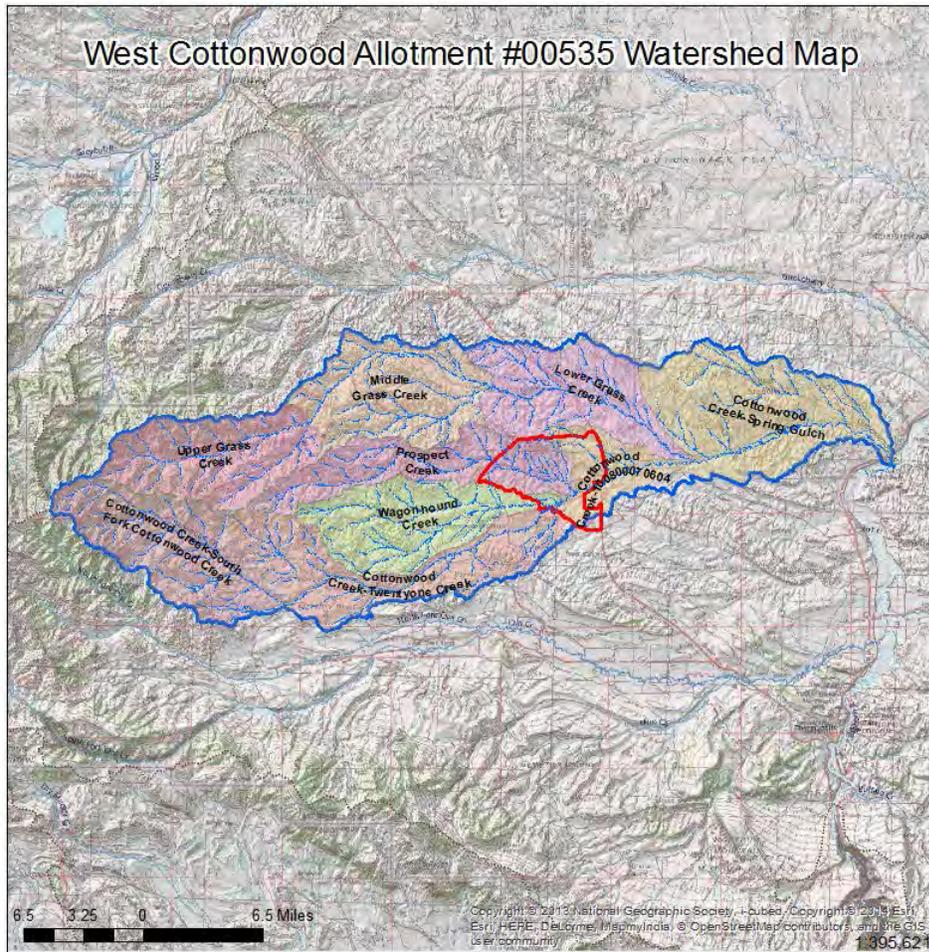
The West Cottonwood Allotment is situated within the 10-14 inch Big Horn Basin (BH) Precipitation Zone as depicted by NRSC spatial data. Based on the soil survey data for Hot Springs County, the dominant soil units, soil map and amount of acres for the allotment is listed below:

West Cottonwood Soils (May 2014)							
SOIL_NO	Map_Unit_N	Surface Text	Slope	Precip_Zone	Ecological Site	Acres	
60	CADOMA(45%)-KIM(45%) COMPLEX	sicl,l	1-10	10-14	SU,Ly(Cy)	221.54	
69	KIM LOAM	l	0-10	10-14	Ly(Cy)	116.54	
70	CADOMA SILTY CLAY LOAM	sicl	1-15	10-14	SU	50.64	
93	VONA(50%)-OLNEY(30%) SANDY LOAMS	sl,sl	0-10	10-14	Sy,Sy	33.94	
102	ROCK OUTCROP	ro	0-100	5-19	RO	731.14	
111	ROCK OUTCROP(30%)-SHINGLE(25%)-TASSEL(25%) COMPLEX	ro,l,sl	3-60	10-14	RO,SwLy,SwLy	2147.4	
190	EPSIE(45%)-SHINGLE(30%)-COMPLEX	sic,l	6-45	10-14	SU,SwLy	127.02	
243	KIM ALKALI(50%)-KIM(30%) LOAMS	l,l	0-6	10-14	SL,Ly(Cy)	129.86	
244	KIM ALKALI LOAM	L	0-6	10-14	SL	0.29	
247	TORRIORTENTS SEVERELY ERODED	all	0-15	5-19	none	34.3	
322	NIHILL(45%)-SHINGLE(30%) GRAVELLY LOAMS	grl,grl	3-45	10-14	Gr,SwLy	699.57	
324	LARIMER(40%)-NIHILL(40%) COMPLEX	l,grl	3-45	10-14	Ly,Gr	451.94	
346	NELSON(30%)-TERRY(30%)-OTERO(20%) COMPLEX	fsl,sl,fsl	3-20	10-14	Sy,Sy,Sy	680.46	
372	TASSEL(50%)-NELSON(25%) SANDY LOAMS	sl,sl	3-45	10-14	SwSy,Sy	72.01	
382	ROCK OUTCROP(40%)-TASSEL(40%) COMPLEX	ro,l	3-60	10-14	RO,SwSy	300.69	
383	ROCK OUTCROP(30%)-TASSEL(30%)-NELSON(20%) COMPLEX	ro,sl,sl	3-60	10-14	RO,SwSy,Sy	695.3	
393	OLNEY(45%)-BOWBAC(35%) FINE SANDY LOAMS	fsl,fsl	3-15	10-14	SwLy,Ly	118.51	
448	TORRIFLUVENTS SALINE	none	0-6	5-19	NONE	185.94	
490	SHINGLE(40%)-THEDALUND(35%) LOAMS	l,l	3-45	10-14	SwLy,Ly	230.19	
705	KIM(50%)-THEDALUND(30%) LOAMS	l,l	3-15	10-14	Ly(Cy),Ly	14.81	
UNK	UNKNOWN	unk	unk	unk	unk	19.59	
sicl=silty clay, ro= rock outcrop, l= loamy, grl=gravel, c=clay, sl= sandy loam, fsl=fine sandy loam						Total	7061.68

2.4 Hydrology/Riparian

2.4.1 Surface Water/Watershed

The West Cottonwood allotment falls mainly within the Cottonwood Creek watershed with a minor portion in Sand Draw-Bighorn River watershed. The amount of acres from the allotment as related to the 6th level sub-watersheds as defined by the United States Geologic Survey (USGS) is found in the table below. The majority of the allotment is in Prospect Creek and Cottonwood Creek sub-watersheds of the Cottonwood Creek watershed (1008000706)(See watershed map below).



Sub-Watershed Name (HU12)	HUC 12	Acres	(mi)	Allot Acres	Allot mi ²	% of Acres of Sub-watershed in the allotment
Prospect Creek	100800070605	26588	41.54	7291	11.3919	27.4
Cottonwood Creek-100800070604	100800070604	12965	20.26	5197	8.11989	40.1
Wagonhound Creek	100800070603	28335	44.27	739	1.15436	2.6
Sand Draw-Bighorn River	100800070403	29039	45.37	419	0.65514	1.4
Cottonwood Creek-Twentyone Creek	100800070602	34550	53.98	212	0.33136	1.2
Lower Grass Creek	100800070608	28855	45.09	18	0.02812	0.7
	Total:	160332	250.52	13876	21.6807	

The Cottonwood/Grass Creek watershed is located in Hot Springs and Washakie Counties. The watershed is comprised of the combined drainage basins of Cottonwood Creek and its main tributaries of Grass Creek, Prospect Creek, Twentyone Creek, and Wagon Hound Creek. These main drainages flow in an eastern direction, originating from the upper elevations of the Absaroka foothills. The majority of the main drainages with perennial flow are located on state or private land, with the exception of some meander segments that are located on public land throughout the reaches. There are several smaller perennial and intermittent tributaries that are located on public land segments. The Cottonwood/Grass Creek watershed was recently studied by the Wyoming Water Development Commission (WWDC) in 2007 under a level I study and 2011 with a more detailed level II study with site specific information. The study encompasses the hydrology of the creeks and summarizes the overall water use and availability of surface water in the watershed.

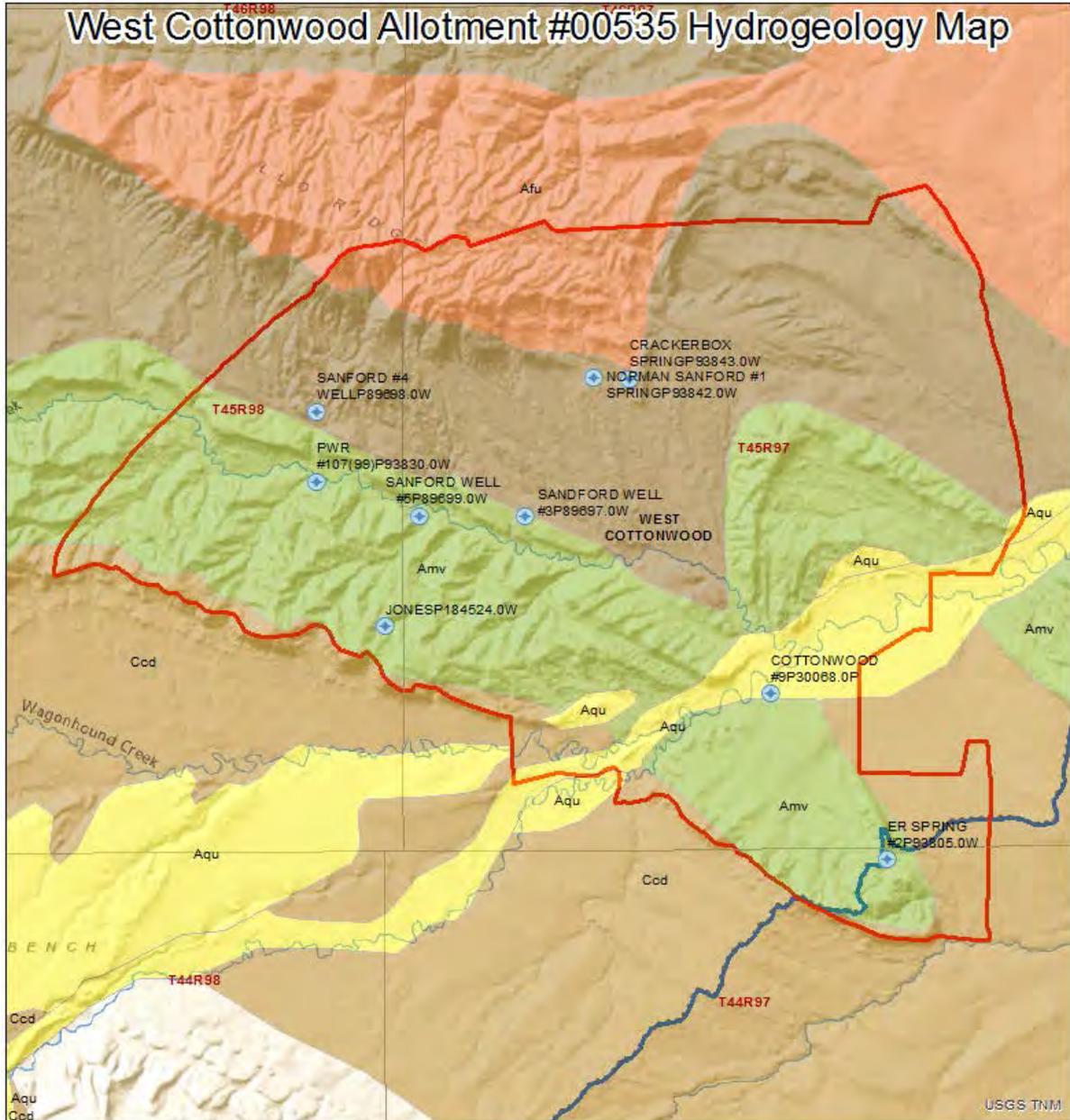
The economy of the watershed is based on agriculture (primarily cattle ranching and associated forage production) and oil and limited natural gas extraction at two larger (Hamilton Dome and Grass Creek) and a number of smaller still active fields (SEH, 2007 p.5).

The perennial stream reaches in the watershed (including the uppermost reaches of Cottonwood and Grass Creeks and their high elevation tributaries) are the result of higher precipitation (including greater snowpack) and greater groundwater recharge that, in turn, results in higher spring time runoff flows and sustain seep and spring discharge to these stream reaches through the summer and fall. As noted by local ranchers and other stakeholders in the watershed, the extent of the upper watershed perennial stream reaches has declined significantly over the course of the current drought, with many smaller springs ceasing to flow and greatly reduced flows in larger springs (SEH, 2007 p.32).

2.4.2 Groundwater

The area is located in an erosive area with high amounts of runoff and low permeability due to very fine grained geologic outcrops of primarily of the Cretaceous Cody Shale Formation. Other portions of the allotment are other the Mesaverde Sandstone, Tertiary Fort Union formation, and undefined Mesozoic units of sandstone and mudstone. According to Wyoming State Engineers records of 2014 there are four wells and two springs on public land in the allotment, see map and table below.

West Cottonwood Allotment #00535 Hydrogeology Map



-  WRBBD SEO Wells All 2014
-  Cody Shale confining unit, Ccd
-  Fort Union aquifer, Afu
-  Mesaverde aquifer, Amv
-  Quaternary unconsolidated deposit aquifers, Aqu
-  undefined Mesozoic hydrogeologic units,



The following are the groundwater development projects with Wyoming State Engineers Office permits. Each project was inspected during the field season of 2014 to determine current conditions. This data is presented later in the document.

FACNAME	APPLICANT	RANGE	SECTION	QTRQTR	USES	YLDACT	Water_DEPTH
SANFORD WELL #5	USDI - BLM	97	19	NWSW	STK	18	320
PWR #107(99)	USDI - BLM	98	24	SENV	STK	1	-1
CRACKERBOX SPRING	USDI - BLM	97	17	NWSE	STK	4	-1
ER SPRING #2	USDI - BLM	97	3	NWNE	STK	1	-1
NORMAN SANFORD #1 S	USDI - BLM	97	17	NESW	STK	1	-1
COTTONWOOD #9	DIAMOND BAR RANCH	97	28	SWSE	DOM_GW	5	150
JONES	JONES BRETT	98	25	SENE	DOM_GW	20	0
SANFORD #4 WELL	USDI - BLM	98	13	SESW	STK	18	300
SANFORD WELL #3	USDI - BLM	97	19	NESE	STK	20	210

2.4.3 Water Quality (Surface)

The following is taken from the Wyoming DEQ 2012 305b report (p.102).

2012 WY Integrated Report

Bighorn River Basin (continued)					
305(b) Identifier	Waterbody	Location	Class	Miles/Acres	Uses Supported
Cottonwood Creek	WYBH100800070609_01	From the confluence with the Bighorn River upstream to the confluence with Wagonhound Creek	2AB	29.5 mi.	Cold Water Fishery, Aquatic Life other than Fish, Wildlife, Agriculture, Industry

The associated beneficial uses for class 2AB streams are found in the table below. This is the rating given by the DEQ following a use attainability analysis and public comments. DEQ defines “these streams support drinking water, game fish, aquatic life, recreation, wildlife, agriculture, industry, and provide scenic value throughout portions of the year.

Wyoming DEQ Surface Water Use Class and TMDL Summary

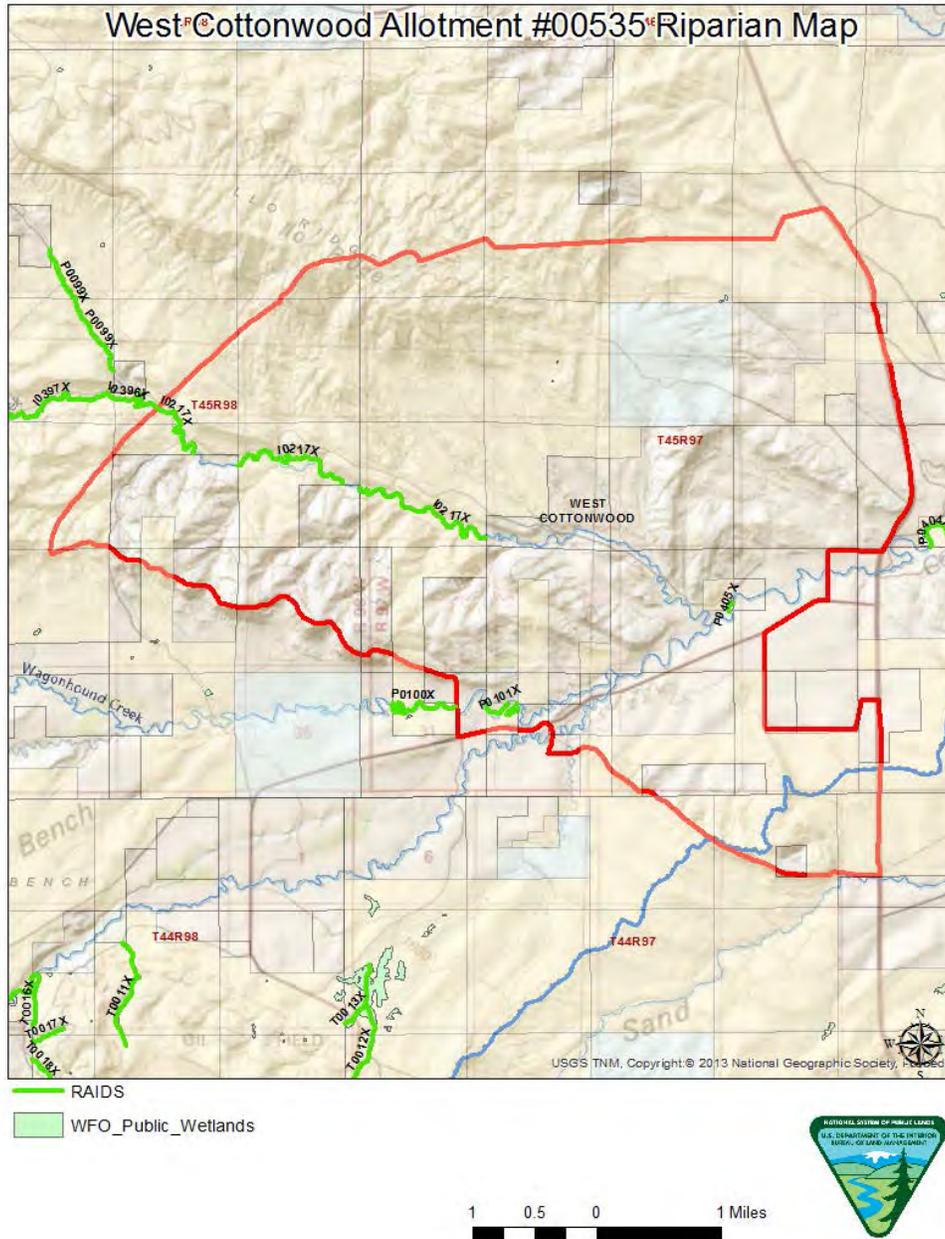
WY DEQ Use Designations										
Surface Water Classes	Drinking Water	Game Fish	Non-Game Fish	Fish Consumption	Other Aquatic Life	Recreation	Wildlife	Agriculture	Industry	Scenic Value
	2AB	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2C	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3B	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes

2.4.4 Riparian

The main drainage with riparian characteristics is Prospect Creek that flows through the allotment. The drainage has an intermittent flow regime using the (Hedman,1983) definition of flow likely occurring in the channel between 30 to 90 days on average out of the year. Flow in the channel is present following snow melt in the spring and following storm events during the summer and fall months. There is sufficient ground water that occurs at a depth that supports various Cottonwood galleries within the floodplain area along the western portions of the creek. The adjacent upland terraces are populated by Basin Big Sage, greasewood, and Plains prickly pear cactus. There are

two segments of Prospect Creek (P0217X), one small meander located on Cottonwood Creek (P0405X), one at the mouth of Wagonhound Creek (P0101X), and small riparian area around Norman Sanford Spring (902105).

Table 2: Riparian Areas										
ID#	Riparian Area	TWN (beg)	RNG (beg)	SEC	QTR	Miles	Acres	Width	DE Q Class	Gradient
I0217X	Prospect Ck	045N	098 W	19	SESE	3.6	13.1	30	3B	3
P0101X	Wagonhound Ck	045N	097 W	32	SWN W	0.5	2.1	50	2A B	<2
P0405X	Cottonwood Ck	045N	097 W	28	SENW	0.1	0.7	60	2A B	<2
902105	Norman Sanford Spr	045N	097 W	17	SWNE	N/A	0.2	10	N/A	<1
	Total									



2.5 Upland Vegetation

The native plant species identified included Needle and thread, Sandberg bluegrass, Blue grama, Textile Onion, Sego lily, Plains pricklypear cactus, Aster, Wyoming big sagebrush, biological crusts, lichens, Alkali sacaton, Bluebunch wheatgrass, phlox (*Phlox* spp.), Western wheatgrass, Woody Aster, Bottlebrush squirreltail, Scarlet globemallow, carex, vetches, prairie junegrass, rabbit brush, black sage, rose pussytoes, greasewood, junipers, winterfat, six weeks fescue, broom snakeweed, fringed sagewort, wildrye, and gardeners saltbush. This list identifies the those species within transects or noted within areas of the transects but does not ensure a complete list of every plant within the allotment.

2.6 Invasive Species

Weed species noted within the allotment include saltcedar and cheatgrass.

2.7 Livestock Grazing Management

Currently there is no active grazing permit to authorize grazing on public lands of the allotment. The most recent grazing permit for the allotment appeared as follows:

West Cottonwood No. 535	Livestock Number/kind	Grazing Begin	Grazing End	%PL	AUMS
	330	3/1	4/23	48	281
	330	11/20	2/28	48	526

The calculated livestock grazing use was compiled from paid grazing bills, notes and actual use reports.

West Cottonwood Allotment			
Year	AUMS		
	Early Spring	Fall/Winter	Total
1994	--	304	304
1995	311	397	708
1996	268	542	810
1997	279	835	1114
1998	325	328	653
1999	477	474	951
2000	332	811	1143
2001	308	72	380
2002	201	187	388
2003	125	--	125
Average use	263	395	658

The grazing permit allowed for 281 Spring AUMs and 526 fall use AUMs by cattle. From 1994 through 2003 the average use was 263 AUMS or 94% of Spring AUMs and 395 AUMs were averaged in the non-growing season which accounts for 75%. The annual average use was 658 or 82% of the permitted use.

2.8 Wildlife

The West Cottonwood allotment provides wildlife habitats, specifically forage and cover needs, for several big game, none game, BLM sensitive and migratory birds species, some seasonally and some yearlong. Provided are yearlong and seasonal habitats for numerous species like mule deer and pronghorn antelope, and sagebrush obligate bird species like the sage-grouse, sage thrasher, sage and Brewer's sparrow. The primary vegetative communities providing wildlife forage and cover needs are the sagebrush/bunchgrass communities and juniper/limber pine breaks. These sagebrush communities are important to wintering mule deer, antelope and wintering and nesting sage grouse, as well as other sagebrush obligate passerines. Wintering big game and sage-grouse depend on the sagebrush plants for forage, and the avian sagebrush obligates depend on both the sagebrush and standing herbaceous residue for nesting cover. All of this allotment is mapped as crucial mule deer winter range, and the northeast portion is mapped as crucial antelope winter range, (see Wildlife Map). The juniper/limber pine breaks provide hiding and thermal cover for mule deer, and the trees also provide valuable nesting habitat and forage in the form of cones and berries, for species like Pinyon jays, Townsend solitaire and mountain blue birds.

2.9 Threatened, Endangered, Candidate, or Sensitive Species

The sagebrush/bunchgrass communities mentioned above, in addition to providing big game winter range, provide winter, breeding, nesting and early brood rearing habitat for sage-grouse as well as breeding, nesting and foraging habitat for sagebrush obligate passerine species like the sage thrasher, sage and Brewer's sparrow. The western half

this allotment falls within Core sage-grouse habitat, (see Wildlife Map). Sagebrush communities both in and outside of Core are likely providing some level of sage-grouse seasonal habitats as well as nesting and foraging habitat for the other sagebrush obligate passerines. Both sage-grouse wintering and breeding habitats have been documented through inventory and monitoring efforts. Nesting and late brood rearing habitats have not been well documented, however in an analysis of sage-grouse studies conducted in 7 areas in Wyoming since the mid-1990s, Holloran and Anderson (2005) found that 45% of nests were located within 2 miles (3km) of the lek where the hen was bred, and 64% of the nests were within 3 mile (5 km) of the lek. There is 1 occupied lek, Cottonwood lek, within the allotment, and the next closest occupied lek is approximately 2.5 miles west. Therefore female sage-grouse from both of these leks could be using suitable sagebrush habitats within this allotment for nesting habitat. Male sage-grouse lek attendance, as well as the peak and low male counts for the 2 leks already mentioned, as well as 3 others in the vicinity, is provided in the Section 3.5 Table__ below. Sage-grouse habitat assessments were conducted within representative sage-grouse habitats throughout this allotment, where 3 monitoring sites or transects were selected and run where sage-grouse habitat data was collected, (see Wildlife Map_ for transect locations). Data from these assessments is summarized in Section 3.5 Table.

Exact movements between seasonal habitats have not been documented but anecdotal observations lead biologist to believe that these sage-grouse, post hatch, migrate up in elevation as green-up progresses, into upper Cottonwood and Owl creeks to the west and south. An analysis of sage-grouse nest site selection from 7 study areas in Wyoming indicates that residual grass height should be a minimum of 3.9 inches (10 cm) in Wyoming big sagebrush dominated sites (Holloran et al. 2005) compared to 7 inches (18 cm) minimum live perennial herbaceous vegetation height recommended by Connelly et al. (2000) in breeding habitats. Hens nesting in these cover conditions experience higher nest success rates than those nesting under inferior cover conditions (Delong et al. 1995, Holloran et al. 2005). An idea of available nesting cover in the form of standing herbaceous residue can be observed in the sage-grouse habitat assessment transect data, (height and % cover of residual herbaceous) and nesting habitat monitoring photos, (see section 3.5).

There are no known threatened or endangered wildlife species within these allotments, but the sage-grouse listed as a Candidate species, sage thrasher, sage and Brewer's sparrow, are all Wyoming BLM sensitive species. And there are several other raptor and migratory bird species inhabiting these allotments, at least seasonally, that were not mentioned or analyzed.

3.0 Summary of Monitoring Data / Assessments

3.1 Monitoring Data

In the summer of 2014, 3 vegetation monitoring sites were selected in the allotment as part of the Rangeland Health Assessment process and an additional monitoring point from Wagonhound Bench-North Cover-was used as representative of some of the acres within the allotment. Complimenting those locations were additional photo-points and an additional cover transect. Ecological site, soil type, vegetative community, topography, location of water sources, and livestock grazing history are some of the factors that were considered in the selection of these monitoring sites.

Line intercept cover transects were completed in each monitoring site. A summary of the cover data collected from each monitoring site is shown below:

Vegetation Monitoring Data					
Monitoring Site	Ecological Site	Basal Veg. Cover	Litter	Bare Ground	Brte presence ((hits/transect pts)*100)
SE Cover	Loamy 10-14		25.1	35.7	0
Ilo Cover	Loamy 10-14		43.8	20.4	0
North Cover	Loamy 10-14		56.5	13.5%	0
West Cover	Sandy 10-14		50.5	10.6	8.7

Cheatgrass presence is derived from total “hits” on cheatgrass, canopy or basal, throughout the transect. It is a representation of the amount times the plant was encountered along a transect in relation to the amount of points observed on the transect.

Rangeland Health Assessments were conducted at the monitoring sites by an interdisciplinary team on using the 17 Indicators of Rangeland Health as described in BLM Technical Reference 1734-6. Field observations were compared to the Reference Sheet for the Loamy 10-14 and the Sandy 10-14 precipitation zone. This was done to determine departures from normal-as prescribed in the reference sheet. Individual ratings to the Rangeland Health Indicators are displayed for each monitoring site below.

Rangeland Health Indicators				
Indicator	Departure from Reference Sheet			
	SE Cover	North Cover	Ilo Cover	West Cover
1. Rills	N-S	NS	NS	NS
2. Water-flow patterns	M-E	M	M	SM
3. Pedestals and/or terracettes	M-E	SM	M	SM
4. Bare ground	M	SM	SM	NS
5. Gullies	N-S	NS	M	M
6. Wind-scoured, blowouts, and/or deposition areas	N-S	NS	NS	NS
7. Litter movement	N-S	SM	M	SM
8. Soil surface resistance to erosion	S-M	NS	NS	NS
9. Soil surface loss or degradation	M	SM	SM	SM
10. Plant community composition and distribution relative to infiltration	ME	SM	M	SM
11. Compaction layer	NS	NS	NS	NS
12. Functional / structural groups	ME	M	SM	M
13. Plant mortality / decadence	NS	NS	NS	NS
14. Litter amount	SM	NS	NS	NS
15. Annual production	NS	NS	NS	NS
16. Invasive plants	ME	ME	M	M
17. Reproductive capability of perennial plants	NS	NS	NS	NS
Indicator Summary				
Soil / Site Stability (<i>Indicators 1-9, 11</i>)	M	SM	SM	SM
Hydrologic Function (<i>Indicators 1-5, 8-11, 14</i>)	M	SM	SM	SM
Biotic Integrity (<i>Indicators 8-9, 11-17</i>)	M-E	M	SM	M
N-S None to Slight S-M Slight to Moderate M Moderate M-E Moderate to Extreme E-T Extreme to Total				

3.2 Soils and Site Stability

Data collected for the Rangeland Health Assessments were used to evaluate soil and site stability on the allotment. Standard 1 for Healthy Rangelands was evaluated based on the attribute ratings for *Soil and Site Stability* and *Hydrologic Function* using rangeland health indicators 1 through 11 and 14.

3.3 Hydrology

3.3.1 Surface Water/Watershed

Surface Flow

The Cottonwood Creek drainage has headwaters located further to the west and the flow in the creek through the allotment is typical of higher elevation watersheds with peak flows occurring in May through June following snow melt. During the other months of the year the flow is augmented from discharge of produced water from Hamilton Dome oil field. There are irrigation demands and diversions located throughout the segment. For full details of flow and flow conditions see the Level I and Level II watershed study as provided in the reference section.

“The stream reaches and tributaries in the Plains region of the watershed typically range from intermittent in the mid-elevations to ephemeral in the lower elevation (eastern) portion of the watershed. Ephemeral streams are defined herein as those streams/reaches that flow only in response to direct precipitation events, and where any groundwater inflows are insufficient to sustain streamflow due to losses from evaporation, transpiration, and seepage. The hydrologic behavior of intermittent streams/reaches is transitional between perennial and ephemeral stream hydrology. Typical intermittent streams include Prospect Creek and Wagonhound Creek; ephemeral streams include Boulder Gulch, Spring Gulch, Lester Draw and Chimney Gulch, all tributary to lower Cottonwood Creek below the Grass Creek confluence.”(Note that there is another Spring Gulch tributary to Grass Creek; that stream is perennial to intermittent.) (SEH, 2007 p. 32).

Rosgen Types-Channel Characteristics

As part of the Level I inventory in 2006 channel cross sections, channel Rosgen Types, and other channel information were determined on the main reaches in an effort to determine the watershed health, functionality, and sources of impairments or disturbances that have altered stream channels and runoff conditions.

The following information was taken from this report for the West Cottonwood allotment. The map and following chart indicate the Rosgen channel stream type and other information relevant to the allotment. Sites PC-01 and WH-01 are within the allotment.

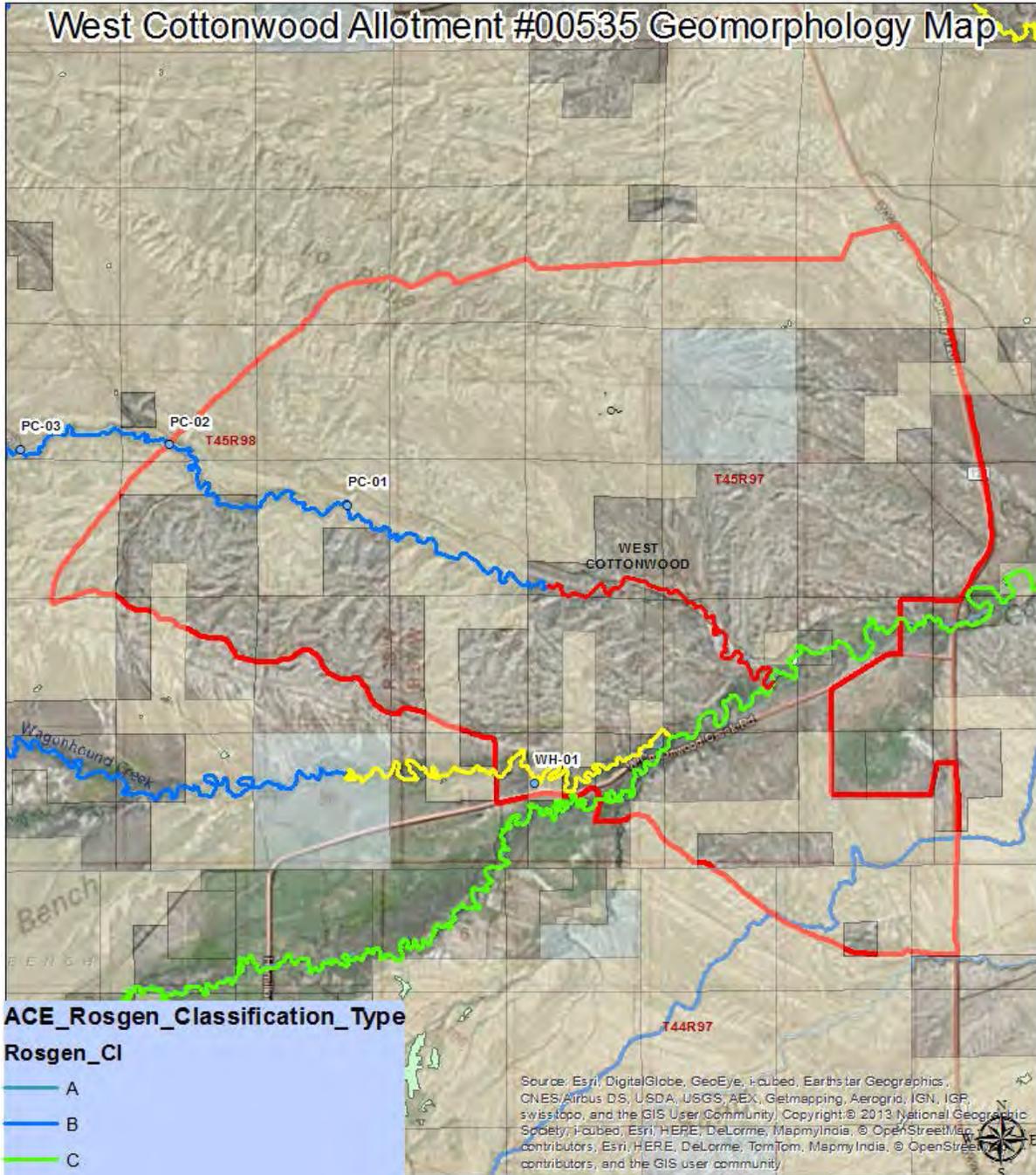
The purpose of the Level II classification was to obtain more detailed morphological description of the Wagonhound Creek, Prospect Creek, and Spring Gulch subwatersheds. These areas were identified during the initial Level I investigation as potentially being impaired and being locations of potential watershed improvement projects.

Cottonwood Creek is considered a C type stream with access to the floodplain. Other channels are B, E, and F type channels as described in the chart below.

“Many of the first-order tributaries in the basin can be classified as G-Type channels, or gullies. These channels are highly erosive, generate high sediment volumes, and can result in the loss of productive lands and destabilize upland conditions (Figure 2.4.-13 – Tributary to Wagonhound Creek – (Type G Channel)). Observation of many of these channels indicates that while the major stream channels appear to have achieved a level of stability, the upper reaches of the watershed are still suffering a level of destabilization. These channels could be forming in response to one or more of numerous stimuli including but not necessarily limited to: channel realignment (straightening), road and culvert construction, rangeland management practices, or base-level lowering associated with main channel incision.” (SEH,2007 p.44).

Wagonhound Creek in the allotment is considered an E type channel that is developed inside of a wide, entrenched meandering channel and is considered relatively stable. Portions of the Prospect drainage are considered an F type, that is an entrenched meandering channels working toward re-establishment of a floodplain. This type channel contains highly weathered rock and erodible materials, and high bank erosion rates, with accelerated aggradation and or degradation with a high sediment supply.

West Cottonwood Allotment #00535 Geomorphology Map



ACE_Rosgen_Classification_Type

Rosgen_Cl

- A
- B
- C
- E
- F
- G
- ACE_Cross_Sections_Level_2
- WFO_Public_Wetlands

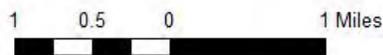


Figure 1- From SEH,2007 Cottonwood Creek Level I Watershed Study

Table 2.4-3
Summary of Level II Geomorphic Characterization

Stream	Cross Section	GPS Waypoint	Bankfull Width (ft)	Bankfull Width (ft)	Width/D epth Ratio	Width of Flood Prone (ft)	Entrenchment Ratio	Channel Slope (ft/ft)	Sinuosity	Bed Material (D50-mm)	Stream Type
Prospect Creek	PC-01	36	15.2	1.5	10.1	21.5	1.4	0.005	1.42	45.3	F4
	PC-02	38	14.6	1.2	12.2	20.3	1.4	0.023	1.47	64	F4
	PC-03	39	9.6	2.2	4.4	16	1.7	0.015	1.41	64	B4c
	PC-04	40	13	2.3	5.7	54	4.2	0.008	1.38	2	C5b
	PC-05	56	22.5	1.5	15	40.5	1.8	0.016	1.27	8	C5
	PC-06	53	11.8	0.7	16.9	14.5	1.2	0.013	1.26	11.3	F4
	PC-07	50	4.3	1.1	3.9	10.4	2.4	0.012	1.26	8	F4c
	PC-08	46	13	0.65	20	43	3.3	0.028	1.27	11.3	C4b
	PC-09	43	4	1.3	3.1	16	4	0.03	1.19	5.6	E5b
	PC-10	41	6	2	3	10.5	1.8	0.08	1.15	5.6	B5a
Wagonhound Creek	WH-01	18	7.5	3.3	2.3	27.3	3.6	0.008	1.92	2	E5b
	WH-02	20	26	2.5	10.4	65	2.5	0.008	1.4	2	B4c
	WH-03	21	66	3.3	20	128	1.9	0.01	1.3	11.3	B4c
	WH-04	32	13.8	0.7	19.7	19.4	1.4	0.032	1.34	11.3	F4b
	WH-05	30	17	1.8	9.4	76	4.5	0.039	1.45	11.3	C4b
	WH-06	26	13.6	1.7	8	20	1.5	0.087	1.26	8	G4
Spring Gulch	SG-1	67	6.5	0.88	7.4	13	2	0.012	1.41	16	B4c

Rangeland Health17 Indicators

The hydrologic and soil rangeland health indicators as outlined and discussed in the table above were assessed to determine current conditions in the allotment related to runoff and soil water retention. The overall ratings from 4 monitoring sites are found in the table in section 3.1 above. One site recorded a moderate departure from reference conditions; the other three sites had an overall hydrologic rating of slight to moderate. Generally in areas where a moderate or greater departure was referenced for soil or hydrologic function, these areas are not currently meeting standards. The causal factors are described below.

Human Influence

Anthropogenic uses and activities on the landscape can have significant impacts – both adverse and beneficial– on water quality and the health of a watershed. Human-related disturbances are numerous and include livestock grazing, land clearing, mining, timber harvesting, ground- water withdrawal, stream flow diversion, channelization, urbanization, agriculture, roads and road construction, off-road vehicle use, camping, hiking, and vegetation conversion. Biological stressors include habitat loss, alteration, effluent discharge, and degradation from decline in water quality, and changes in channel and flow characteristics (EPA, 2008 p.65). The allotment was reviewed for these types of hydrologic stressors on the watershed. The only types present that were found in the allotment were from grazing and roads which are common historic and present day activities that occur in the watershed.

Figure 2- From SEH,2007 Cottonwood Level I Watershed Study

Table 2.4-4
Summary of Geomorphic Impairments

Stream	Channel Degradation ¹	Bank Erosion ²	Range Management ³
Cottonwood Creek	✓	✓	✓
Grass Creek			✓
Prospect Creek	✓	✓	✓
Wagonhound Creek	✓	✓	✓
Spring Gulch	✓	✓	✓

¹ Channel Degradation: Channel downcutting, headcutting, gully formation
² Bank Erosion: Channel widening, channel migration, irrigation diversion abandonment
³ Range Management: Riparian vegetation, erosion impacts, bank erosion

The table below as provided below (EPA,2014 and Rosgen 1994,1996) represent management interpretations by stream type, sensitivity to disturbance, recovery potential, sediment supply, streambank erosion potential, and vegetation controlling influence factors as related to channels in the allotment. The segments in the allotment are F4 and E5 types that have extreme and very high rating sensitivity to disturbance that has historically occurred in the allotment.

Table 3. Management interpretations by stream type (Rosgen 1994, 1996)

Stream Type	Sensitivity to Disturbance ^a	Recovery Potential ^b	Sediment Supply ^c	Streambank Erosion Potential	Vegetation Controlling Influence ^d
A1	very low	excellent	very low	very low	negligible
A2	very low	excellent	very low	very low	negligible
A3	very high	very poor	very high	very high	negligible
A4	extreme	very poor	very high	very high	negligible
A5	extreme	very poor	very high	very high	negligible
A6	high	poor	high	high	negligible
B1	very low	excellent	very low	very low	negligible
B2	very low	excellent	very low	very low	negligible
B3	low	excellent	low	low	moderate
B4	moderate	excellent	moderate	low	moderate
B5	moderate	excellent	moderate	moderate	moderate
B6	moderate	excellent	moderate	low	moderate
C1	low	very good	very low	low	moderate
C2	low	very good	low	low	moderate
C3	moderate	good	moderate	moderate	very high
C4	very high	good	high	very high	very high
C5	very high	fair	very high	very high	very high
C6	very high	good	high	high	very high
D3	very high	poor	very high	very high	moderate
D4	very high	poor	very high	very high	moderate
D5	very high	poor	very high	very high	moderate
D6	high	poor	high	high	moderate
DA4	moderate	good	very low	low	very high
DA5	moderate	good	low	low	very high
DA6	moderate	good	very low	very low	very high
E3	high	good	low	moderate	very high
E4	very high	good	moderate	high	very high
E5	very high	good	moderate	high	very high
E6	very high	good	low	moderate	very high
F1	low	fair	low	moderate	low
F2	low	fair	moderate	moderate	low
F3	moderate	poor	very high	very high	moderate
F4	extreme	poor	very high	very high	moderate
F5	very high	poor	very high	very high	moderate
F6	very high	fair	high	very high	moderate
G1	low	good	low	low	low
G2	moderate	fair	moderate	moderate	low
G3	very high	poor	very high	very high	high
G4	extreme	very poor	very high	very high	high
G5	extreme	very poor	very high	very high	high
G6	very high	poor	high	high	high

- a Includes increases in streamflow magnitude and timing and/or sediment increases.
- b Assumes natural recovery once cause of instability is corrected.
- c Includes suspended and bedload from channel derived sources and/or from stream adjacent slopes.
- d Vegetation that influences width/depth ratio-stability.

3.3.2 Ground Water

There are three types of ground-water that occur in the watershed in the form of springs, alluvial aquifers, and bedrock aquifers.

The estimated depth to groundwater is estimated to be greater than 100 feet in upland areas. The amount of evaporation s indicated in the Wyoming Climate Atlas is 26 inches per year for the Thermopolis area. This exceeds the annual precipitation of 10-12 inches per year, and therefore the amount of groundwater recharge into the primary Mesaverde Aquifer is minimal. The Cody Shale formation is considered a confining unit and not a primary aquifer. The only other potential recharge is along Quaternary aquifers located beneath stream channels through infiltration following storm events.

There have been a total of nine water developments of wells and springs that are presented in section 2.3.2. The beneficial use is for livestock water. These areas were inventoried in the field season of 2014. All of the uses are considered minor developments by the Wyoming State Engineer's Office and are permitted less than 25 gallons per minute.

3.3.3. Water Quality (Surface/ Ground)

There is no direct or recent BLM water quality data for this allotment. The majority of the data is from DEQ observations of Cottonwood Creek and in conjunction with the level I and level II watershed studies of Cottonwood Creek.

Wyoming DEQ:

Cottonwood Creek was classified as a type 2AB stream from the confluence with the Bighorn River upstream to the Wagonhound Creek confluence (in the West Cottonwood allotment). The use attainability report for the segment indicates that diversion and flow regulation in the creek occurs. The beneficial use of agriculture is dominant throughout the creek and according to the 2012 305b report the use is currently being met. Water quality degrades generally downstream where outside anthropogenic influences increase.

The most significant water quality issue for groundwater use in the watershed appears to be the potential for salt impacts to less resistant species and salt accumulation in inadequately drained soils. These potentials are related to the relatively high levels of sulfate, TDS and specific conductance present in many of the samples summarized in Table 2.6-3. Levels of Selenium discharged from Hamilton Dome into Cottonwood Creek has historically been an issue with water quality with TMDL levels established and analyzed by the DEQ as part of their WYPDES (Wyoming Pollutant Discharge Elimination System) discharge permit.

3.3.4 Riparian

The riparian areas found in the allotment are meander segments of Cottonwood Creek, two reaches of Prospect Creek, Wagonhound Creek, and Norman Sanford Spring and identified in the riparian table in section 2.3.4. The segments were evaluated using BLM Technical Reference Manuals 1737-15 and 1737-16 "A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lentic and Lotic Areas"

Table 6: Riparian Segment									
BLM ID#	Riparian Area	(mi)	Water Type	Date Assessed	Gradient (%)	Rosgen Class	Function	Trend	Rating Scale
I0217X	Prospect Ck	3.6	Intermittent	2014	2.3	F4	FAR	Up	NA
P0101X	Wagonhound Ck	0.5	Intermittent	8/20/2002	0.8	E5	PFC	NA	NA
P0405X	Cottonwood Ck.	0.1	Perennial	6/15/1994	0.2	C5	NF	NA	0
902105	Norman Sanford Spring		Lentic	7/23/2014	NA	NA	PFC	NA	
Total:									
PFC=Proper Functioning Condition FAR=Functioning at Risk N/A= Not Apparent U=Unknown Rating Scale= 0- Non Functioning, 1-9 Functioning at Risk, 10-19-PFC, 20=Potential Natural Community.									

I0217X- Prospect Creek

These segments were initially inventoried in 2004 and rated functioning at risk with an upward trend. There was note of previous historic overgrazing and long term recovery of this intermittent segment is needed. There was evidence of vertical instability with head-cuts common and channel instability present. There were nick points and headcuts present in the channel as the channel attempts to reestablish equilibrium.

These segments were further evaluated as part of the Level I watershed study with cross sections that provide additional information.

These segments were also assessed in the field season of 2014 following a local heavy rain event. There was evidence of minor erosion and scouring of channel banks. The upper reaches have greater riparian characteristics such as canopy cover provided mainly by Cottonwood trees and higher amounts of water in the soil profile (Figure 3-4) compared to lower segments (Figure 5) that are intermittent/ephemeral in nature. Periodic pooling of water is common in the channel following rain events as captured in the photos.

Figure 3- Prospect Creek Upper Reach (I0217X)



Figure 4- Prospect Creek (I0217X)

I0217X
Prospect Creek
View of riparian area
N 43.85901°
W 108.57853°



Figure 5-Lower Ephemeral Reach Prospect Creek (I0217X)

I0217X
Prospect Creek
Overview of riparian area
N 43.85039°
W 108.53881°



P0101X

This is a segment on public land at the confluence of Wagonhound and Cottonwood Creek. The vegetation consists of sedges, salt cedar, inland salt grass, alkali sacaton and Rubber Rabbit Brush. The flow regime is intermittent and this segment was rated to be in Proper Functioning Condition in 2002.



P0405X

This is an isolated meander segment of Cottonwood Creek that is completely surrounded by private land. The initial inventory in 1994 indicated that the segment was non-functional due to private ownership as a large portion of the drainage, weeds, and historic channel degradation beyond the control of the BLM. This segment is similar to segments rated the same as segments in the East Cottonwood allotment. There has been Salt Cedar removal in 2008 and 2009 that has improved the conditions; however regrowth has occurred until present in 2014. Further information is needed for additional analysis on this segment.

Norman Sanford Spring

This spring has been developed with the spring source fenced for protection. The majority of the water and riparian vegetation is present surrounding the tanks that are located below the enclosure. The natural spring area is dominated by facultative dry with some wet plant type species near the center of the area. There are cattails and sedges growing around the tank area. The area currently has a perimeter fence and the functionality of the area was rated to be in proper functioning condition (PFC).



3.4 Upland Vegetation

Data from the line intercept cover transects, the 17 Indicators of Rangeland Health, and other field observations were used to evaluate the vegetative community on the allotment. Standard 3 for Healthy Rangelands was evaluated based on the attribute ratings for Biotic Integrity using rangeland health indicators 8 through 9, and 11 through 17.

The vegetative community, ground cover, and soil surface attributes for the assessment sites were noted, measured and compared to the ecological site description (ESD) and corresponding reference sheet. The sites were compared to the Loamy 10-14 inch precipitation zone and the Sandy 10-14 precipitation zone ESD.

The cover transects at Ilo, North and Southeast were compared to the Loamy ESD.

The Historic Climax Plant Community for this ecological site is a Bluebunch wheatgrass/Rhizomatous wheatgrass community. This community would be dominated by cool season grasses (75%) followed by a nearly even balance of woody species (15%) and forbs (10%). With moderate continuous season long grazing a transition from HCPC to a Perennial Grass/Big sagebrush state may occur. This state is dominated by cool season grasses such as bluebunch wheatgrass, rhizomatous wheatgrass and needleandthread grass. This state would portray an increase in blue grama, and cactus may have invaded but only in small areas. Bluebunch may have decreased and species like Indian ricegrass (if it did occur on site) may be in protected areas only. The state has a hydrologic, soil, and biotic community that is stable and intact. From this state, with frequent and severe grazing, lack of fire, extended droughts or a severe grazing in conjunction with wildfire the vegetative state can be converted to a big sagebrush/bare ground community, a blue grama sod community, or a Salt tolerant shrub/bare ground community.

States beyond the Perennial grass/sagebrush community are likely to have a biotic, soil, and hydrologic function that is at risk or not functioning. Herbaceous production will decline, the undesirable species increase as the desirable

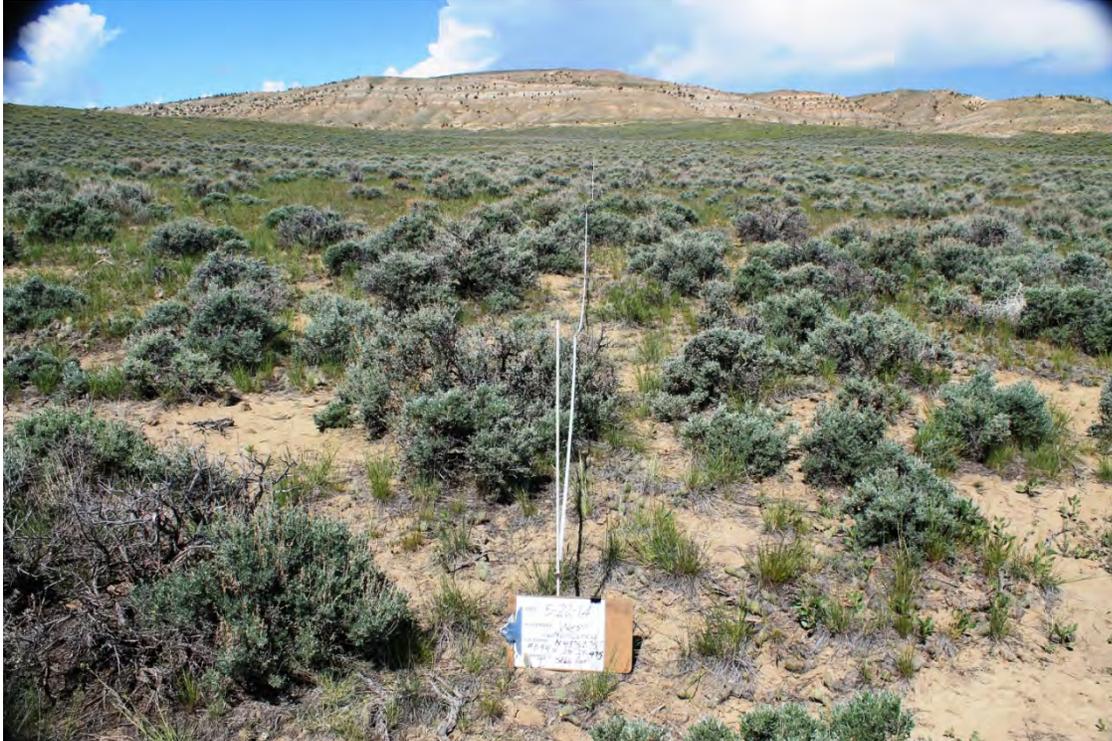
species decrease, and the ability to move towards HCPC is diminished without mechanical treatments, reseeding efforts, soil remediation efforts, and intense grazing management.

Ho Cover

The data collected at this site indicates that this site has characteristics of a Perennial grass/sagebrush community. The attribute rating justification for the Biotic Integrity at this assessment was “Slight to Moderate.” The functional/structural groups are slightly altered from HCPC. The cool season bunch grasses on site include bluebunch wheatgrass, needle and thread grass, junegrass, poa’s, and there was also western wheatgrass (rhizomatous). Blue grama, a warm season native is also present which has likely reduced some of the perennial bunchgrasses. The forbs noted in the transect were a minor component. The main woody species on site is big sagebrush. The percent litter was within expected at the transect site but the bare ground was rated as slight to moderate even though the amount was within expected. The higher rating was because of the connectivity of the bare areas. The invasive plants indicator number 16 was rated as moderate because of the amount of cactus and blue grama on site. While no cheatgrass was documented within the transect it and cactus were noted as being in the area in small isolated locations.



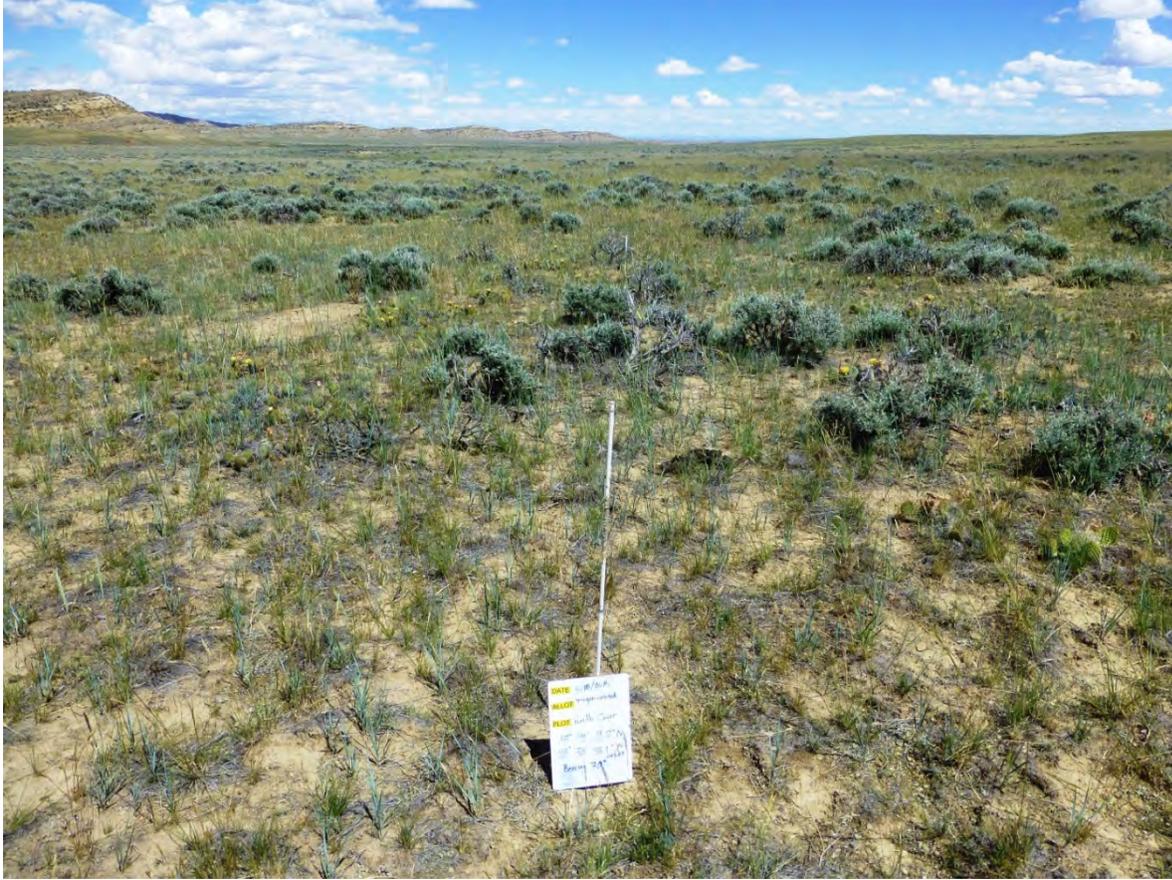
Ho looking south



Looking north towards Ilo transect

North

The data collected at this site indicates that this site has characteristics of a state in transition that is at a blue grama sod condition with indicators of recovering or moving towards a Perennial Grass/Big Sagebrush community. This transect, while in the neighboring allotment, represents that which was observed in the northeast of the West Cottonwood allotment. The attribute rating justification for the Biotic Integrity at this assessment was “Moderate.” The functional/structural groups are altered from HCPC (indicator 12 Moderate deviation from expected with 16 rated at moderate to extreme). The dominant grasses on site are bluegrama, sandberg blue grass, and needleandthread. It appears that blue grama and cactus once dominated these sites but needle and thread is still on site. The forbs were noted in the transect were in minor component and were primarily annuals in the area. The main woody species on site is sagebrush. Biological crusts were common in the area and readily observed on the transect. The percent litter was within expected at the transect site as was the amount of bare ground. The invasive plants indicator number 16 was rated as moderate to extreme because of the amount of cactus and blue grama on site. While no cheatgrass was documented within the transect it and cactus was noted as being in the area in small isolated locations.



NORTH COVER

South East Cover

The data collected at this site indicates that this site has characteristics of a Blue Grama sod Community. The attribute rating justification for the Biotic Integrity at this assessment was “Moderate to Extreme.” The functional/structural groups are reduced/altered and the plant diversity is low with very few desirables on site. The grass on site is blue grama. Perennial forbs are few.. The main woody species on site is sagebrush. Biological crusts were common in the area and readily observed on the transect. The percent litter was less than expected and the bare ground was more than expected for the site. The invasive plants indicator number 16 was rated as moderate to extreme. While no cheatgrass was documented within the transect it was noted as being in the area in small isolated locations.



South East Cover

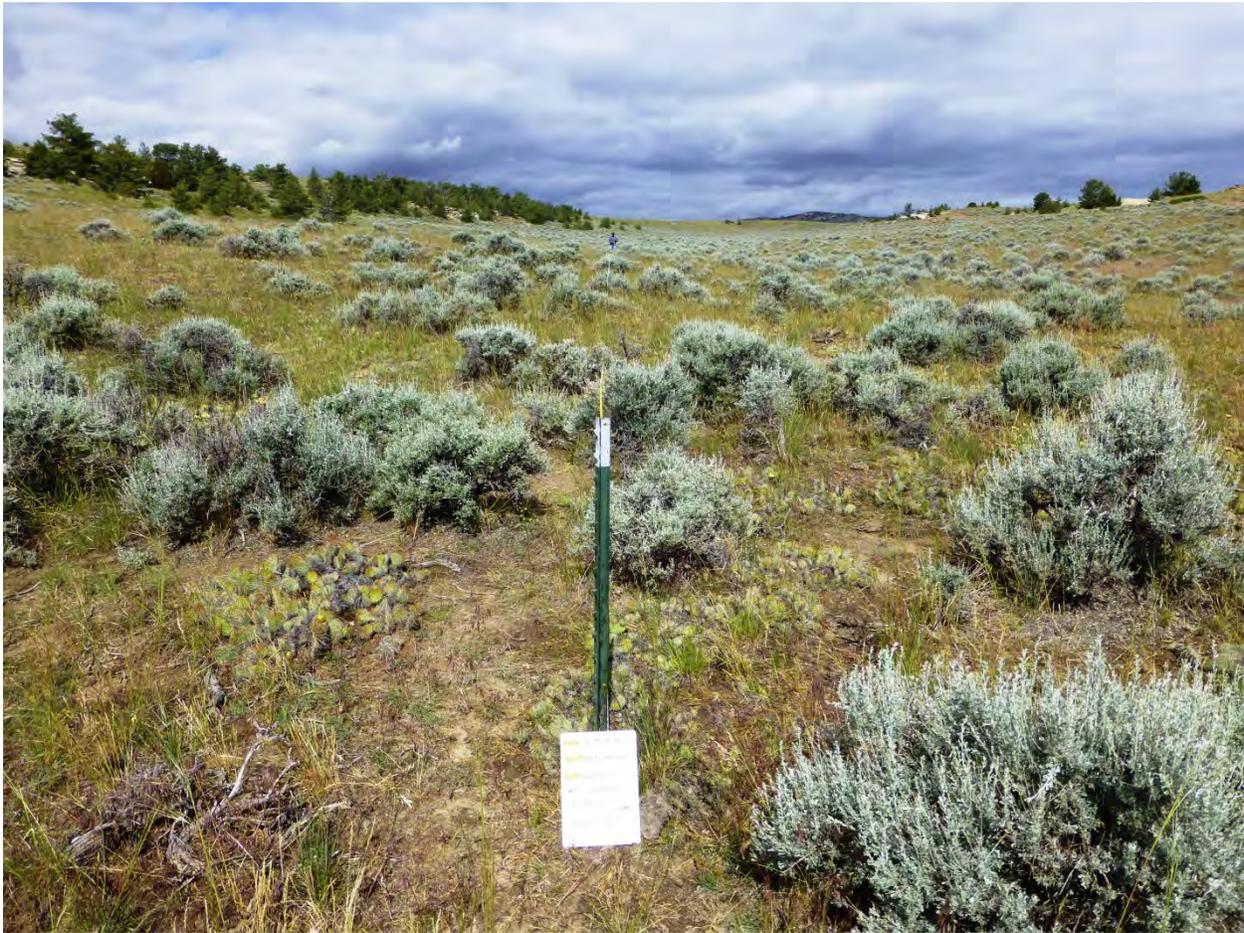
This West transect was compared to the Sandy 10-14 inch precipitation zone (R032XY350+W Y). The Historic Climax Plant Community for this ecological site is a Needleandthread/Indian ricegrass plant community. This community would be dominated by cool season grasses (75%) followed by a nearly even balance of woody species (10%) and forbs (15%). With moderate continuous season long grazing or extended droughts a transition from HCPC to a Perennial Grass/Big sagebrush state may occur. This state is dominated by cool season grasses but Bluebunch may have decreased and species like Indian ricegrass would be a minor component and be in protected areas only while species such as carex spp., blue grama and cactus would have increased. The state has a hydrologic, soil, and biotic community that is stable and intact. From this state, with frequent and severe grazing, lack of fire, extended droughts or a severe grazing in conjunction with wildfire the vegetative state can be converted to a big sagebrush/bare ground community or a threadleaf sod community.

States beyond the Perennial grass/Big sagebrush community are likely to have a biotic, soil, and hydrologic function that is at risk or not functioning. Herbaceous production will decline, the undesirable species increase as the desirable species decrease, and the ability to move towards HCPC is diminished without mechanical treatments, reseeding efforts, soil remediation efforts, and intense grazing management.

West Cover Transect

The data collected at this site indicates that this site has characteristics of a Big sagebrush/bare ground community. The attribute rating justification for the Biotic Integrity at this assessment was “Moderate.” The functional/structural groups are lacking in the correct species. The dominant cool season grass is sandberg bluegrass with needleandthread grass present, the dominant species on site is cactus and big sagebrush. The forbs were a minor component of the area. The main woody species on site is big sagebrush and it makes up a larger than expected part of the community. The percent litter was within expected as was the amount of bare ground. The

invasive plants indicator number 16 was rated as moderate because of the amount of cactus present and found within the transect and the large areas of cheatgrass found throughout the range site. The cheatgrass is not being found within disturbed areas but actually dominates smaller polygons within the range site polygon.



West Transect

3.5 Wildlife Habitat

Below is a summary of sage-grouse lek data for leks in the vicinity of West Cottonwood allotment, and transect photos and summary of the three sage-grouse habitat assessment transects located within representative sage-grouse habitat in the allotment, (see Wildlife Map for transect locations). These were run during the growing season of 2014, to determine and record the sagebrush canopy cover, shrub height, shrub age diversity and composition, and all other vegetation cover class composition and height.

Sage-grouse Lek Data Summary for leks inside or within 2 miles of East & West Cottonwood, Wagonhound and Wagonhound Bench Allotments

Lek (C-Core Area)	Average Male Attendance	Peak Male Count & Yr	Low Male Count & Yr	Years of Monitoring
Wagonhound Cr 1 (C)	22	45 in 2009	10 in 2007	22
Cottonwood	4	20 in 1983	0 in 1996	12
Wagonhound 2 (C)	8	18 in 2010	0 in 2013	5
Putney Mine (C)	11	39 in 2006	0 in 1993	21
Kester Coulee (C)	4	19 in 1992	0 in 2006	18

Sage-grouse Habitat Assessment Transects for East and West Cottonwood Allotments, 5/22–29/2014

Line Intercept Canopy Cover					
	East Cottonwood Allotment		West Cottonwood Allotment		
	Transect 039	Transect 041	Transect 044	Transect 046	Transect 048 (Core Area)
Shrub Species					
Live Big Sagebrush	16	24	14	17	20
Dead Big Sagebrush			1.5		
Other SPP: (Fringe sage)					
Other SPP: (Shadscale)					
Other SPP: (R Rabbit B)					
Shrub Height (inches)					
Live Big Sagebrush	15.3	16.3	11.7	14.3	13.4
Other SPP: (Fringe sage)					
Other SPP: (Shadscale)					
Other SPP: (R Rabbit B)					
Belt Transect					
Species	Transect039	Transect041	Transect044	Transect 046	Transect 048
Big Sagebrush					
% Young	10	2	7	30	22
% Mature	73	82	76	61	62
% Decadent	6	11	13	9	7
% Dead	11	5	4	0	9
Daubenmire Cover Class & Vegetation Height Data					
Summary of Vegetation Height (inches)	Transect 039	Transect 041	Transect044	Transect 046	Transect 048
New Herbacious Mean Height	7.4	3.6	11	6.9	8.4
Residual Herbacious Mean Height	T	T	7	1	0
Summary Cover Class %					
New Perennial Grass	10	7.3	5.3	8.5	6
New Annual Herbacious	2.5	3.7	8.4	2	1.8
Perennial Forb	2.5	2.5	2.5	2.5	0
Residual Herbacious	3.5	0	1.5	2.5	0
Other	64.25	74.7	69	86.5	85.5
Browse Utilization					
Species	Transect039	Transect 041	Transect044	Transect 046	Transect 048
ATTR	Low	Low	Low	Low	Low



Figure 6 Sage-grouse habitat assessment transect 044

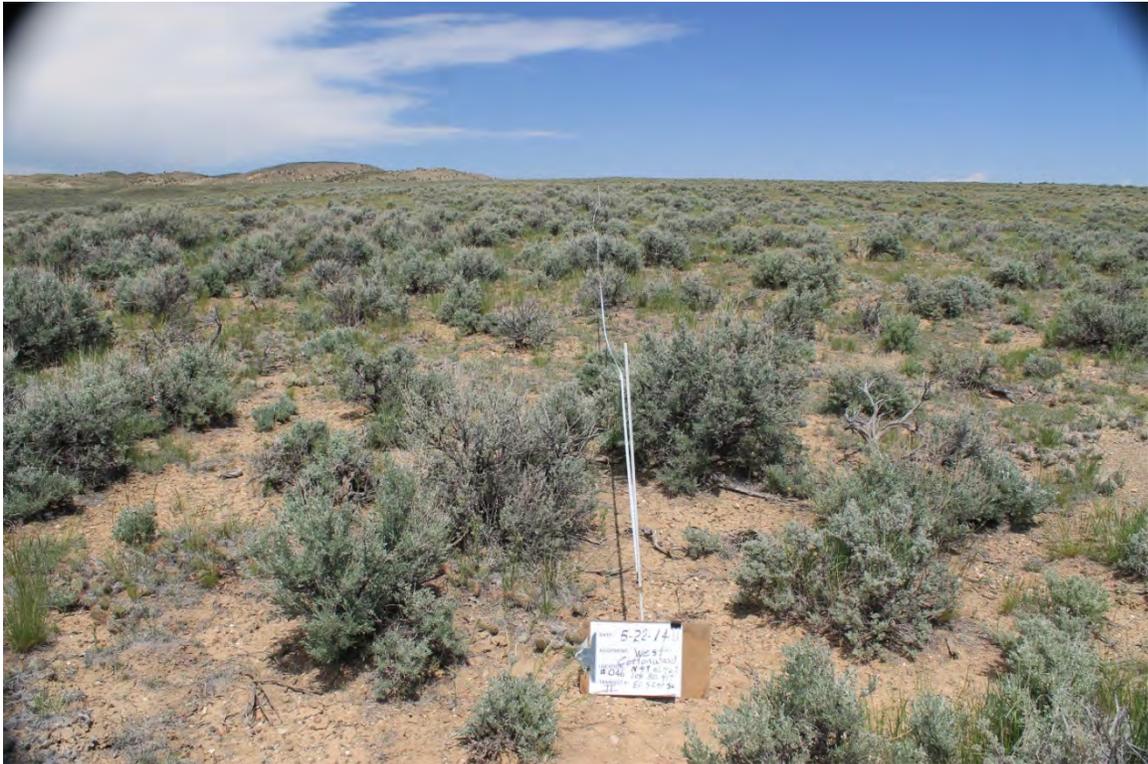


Figure 7 Sage-grouse habitat assessment transect 046

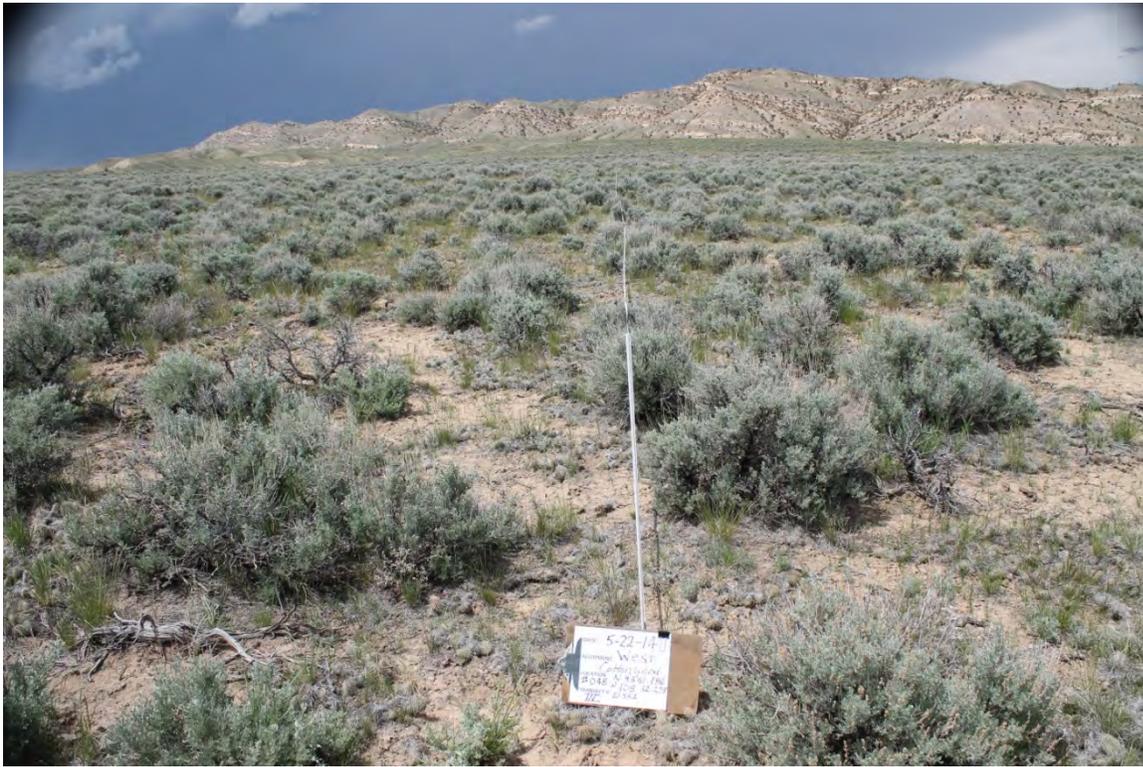


Figure 8 Sage-grouse habitat assessment transect 048

4.0 Conclusions

This section draws conclusions and makes determinations regarding:

- A. Progress towards or attainment of the standards for rangeland health, and
- B. Whether livestock management is in conformance with the guidelines, and
- C. Whether existing grazing management or levels of grazing use are significant factors in failing to achieve the standards or conform to the guidelines.

Land Health Category	Land Health Sub-Category
1	Public Land Achieving
2a	Public Land Not Achieving-Significant Factor is Undetermined
2b	Public Land Not Achieving-Significant Factor is non-BLM or Not BLM Authorized
2c	Public Land Not Achieving- Current Management or Disturbances Affect Land Health
2d	Public Land Not Achieving- Current management or disturbances affect land health, but ways to achieve significant progress are unknown
2e	Public Land Not Achieving- Current management or disturbances changed- significant factors addressed- to result in significant progress toward achieving
2f	Public Land Not Achieving- Current management or disturbances are appropriate- monitoring data indicate making significant progress toward achieving
3	Public Land Where Standard Does Not Apply
4	Public Land Unevaluated

4.1 Standard 1

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. MET

1. Rationale:

MET:

The loamy and shallow loamy range sites rated as a slight to moderate departure from reference conditions according to the ecological site description for these acres. These acres have appropriate amounts of vegetation, litter, and soil stability to allow for water infiltration to provide for optimal plant growth for these sites.

Not Met

The areas represented from the SE cover transect have a moderate departure from reference conditions. The soil and hydrologic indicators evidence elevated runoff from these areas with minor instability and reduced infiltration as a result. These areas are located along the historic terraces of Prospect Creek where vegetation communities have been significantly altered.

Casual Factor- Historic Livestock Grazing-

West Cottonwood – Standard 1		
BLM ACRES	MET/NOT MET	Significant Factor
2687	NOT MET	Historic Grazing
4376	MET	

4.2 Standard 2

Riparian and wetland vegetation has 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 ground water recharge. Met and Not Met (see Standard 2 code below)

Rationale:

Standard 2 Riparian

SEG_CODE	Miles	Standard 2 Code	Significant Factor
P0405X	0.09	2e	Weeds
I0217X	0.57	2f	Channel_Cond
I0217X	0.2	2f	Channel_Cond
I0217X	1.29	2f	Channel_Cond
I0217X	1.56	3	Ephemeral
P0101X	0.27	1	NA
P0101X	0.23	1	NA
902105	0	1	<null>

The riparian segment P0405X Cottonwood Creek has recently received ongoing weeds treatment that has occurred throughout Cottonwood Creek since 2009. The functionality of the riparian area has improved recently as a result and this segment has been placed in category 2f as outlined above with the causal factor as weeds.

Segment I0217X currently was rated as functioning at risk with an upward trend in 2004 with the rating given due to some vertical and horizontal instability along with headcuts observed during the assessment. The rating was not livestock related with no signs of overuse in the riparian areas. This alteration was determined to be from historic alterations to vegetation cover in the watershed that has caused a slight to moderate and moderate increase in runoff as a result. In 2014 monitoring data suggest that the riparian area is improving and making progress toward achieving this standard. This segment was placed under category 2f with the causal factor being the channel condition as a result. Lower portions of the reach were rated as ephemeral and placed in category 3.

Wagonhound Creek (P0101X) and Norman Sanford Spring were rated to be at PFC and are currently meeting the standard as outlined above. These segments were placed in category 1 accordingly.

4.3 Standard 3

*Upland vegetation on ecological site consists of plant communities appropriate to the site which are resilient, diverse, and able to recover from natural and human disturbance. **MET / NOT MET***

Rationale:

Based on the assessment of the data collected as well as observations throughout the allotment, the following table summarizes the number of acres that were determined to meet Standards, the number of acres that were determined to not meet Standards, and the number of acres that no determination was made. This table is also visually represented in the map at the end of the document.

Land Health Reporting Categories	Acres
Public Land Achieving Standard 3	2638
Public Land Not Achieving Standard 3	2637
Public Land where Land Health Standard 3 Does Not Apply or Unevaluated (rock outcrop, badlands, roads, pipelines, etc)	1786
Total Public Land Acres	7061

As described in the monitoring section above there were three assessment sites that, after extensive touring of the allotments, were determined to represent multiple areas within the allotment.

RATIONALE-MET: As it pertains to the acres that did meet the standard, these sites are in a dynamic equilibrium with the Historic Climax Plant Community. This means that at this time these sites have appropriate pathways available to them to respond to proper grazing strategies, favorable environmental conditions, and environmental disturbances. The sites have a vegetative community that is stable, intact, resistant to change, and provides for soil and watershed stability.

RATIONALE-NOT MET: Acres that were determined to have not met the standard are those that have had a significant change or shift from the potential of the site and do not have an appropriate plant community capable of recovering or returning to a functional community without mechanical treatments, seedings, intensive grazing management, etc. These sites have little capability or probability of returning to a more desirable state.

Overall the standard is not met on these acres due to the loss of or reduction of functional structural plant groups. Grazing has not been permitted on the public lands for approximately a decade therefore the determination that current grazing management attributed to the current range conditions can't be made. Since the 1970's the grazing permit has been grazed primarily in the dormant season-a time when plants are least susceptible to damage. However, timing is just part of the equation-proper stocking rates is another part of the equation and that would be addressed in future environmental analysis.

4.4 Standard 4

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. MET/NOT MET (see rationale)

Land Health Reporting Categories	Acres
Public Land Achieving Standard 4	2638
Public Land Not Achieving Standard 4	2637
Public Land where Land Health Standard 4 Does Not Apply or unevaluated (rock outcrop, badlands, roads, pipelines, etc)	1786
Total Public Land Acres	7061

RATIONALE:

Seven monitoring locations were chosen in the allotment for monitoring and evaluation purposes. Three of these transects were primarily for sage-grouse habitat assessment, and the other three to measure soil and vegetative parameters for evaluating the 17 Indicators of Rangeland Health. Two of the sage-grouse habitat assessment locations were in the east and northeast non-Core portion near Cottonwood lek, and the other in west central Core portion of the allotment. All transects were intentionally located in representative sage-grouse habitat in the allotment with gentle topography and larger continuous sagebrush communities (see Wildlife Habitat Resources map for transect location). The other four monitoring locations where the 17 Indicators of Rangeland Health were assessed were more representative of the allotment in general. Sagebrush canopy cover measured at sage-grouse habitat assessment transect ranged from 14 - 20%. Some level of sage-grouse wintering, breeding, nesting and early brood rearing is likely occurring, at least in and near the Cottonwood lek. Sagebrush canopy cover within sagebrush stands used for nesting generally ranges from 15 to 25%, and winter habitat is generally defined as sagebrush stands with 10-30% canopy cover (Connelly et al. 2000a). Nesting and early brood rearing have not been documented in the allotment, but some minor level of nesting would be anticipated within suitable habitats. Nesting would not be anticipated at significant levels, primarily because nesting habitat conditions are marginal with low frequency of cool season bunch grasses and high frequency of invasive plants, see Section 3.4.

MET:

As was mentioned above in the rationale for Standard 3, one of the four monitoring sites, Ilo Cover, was best described as a Perennial grass/sagebrush community. This community still retains appropriate pathways available to respond to favorable environmental conditions, and environmental disturbances, and is stable, intact, resistant to change, and provides for soil and watershed stability. The Biotic Attribute of Rangeland Health for this site was rated at "Slight-Moderate", and this community maintains enough diversity and dominance by desirable perennial grasses to return to HCPC. It also provides for a diversity of plant species including an overstory of sagebrush and understory of bunchgrasses and forbs, and in turn provide for the diversity of wildlife habitat needs like cover, forage and nesting habitats. Most importantly these vegetation communities provide a diversity of native plant species that in turn provide for a diversity of animal species, of which all are appropriate to the habitat, and therefore do meet Standard 4.

NOT MET:

The remaining three monitoring sites; South East Cover, North Cover and West Cover were found to best be described as Blue Grama sod Community for South East Cover and North Cover, and Big sagebrush/bare ground community for West Cover. These communities are characterized as being sites where invasive species, including Blue Grama and Prickly Pear, have either taken over the site, and/or sites where the desirable perennial grasses have been lost from the plant community. Also the Biotic Attribute of Rangeland Health was rated "Moderate" or "Moderate to Extreme" for these sites, meaning that they have at least moderately departed from what the potential Historic Climax Plant Community (HCPC) is for the site. These plant communities exhibit a low level of plant diversity and therefore do not provide for a diversity of wildlife habitat needs in the form of cover, forage, or nesting habitat. And most importantly these vegetation communities contain invasive species that are not appropriate for their habitats, and compete with native plant species for space and resources and in turn do not provide for a diversity of animal species, and for these reasons do not meet Standard 4.

4.5 Standard 5

Water quality meets State standards. Met

Rationale:

The use classifications defined (WYDEQ, 2001) for the drainages in the allotment are considered to be Class 2AB waters.

Class 2AB streams are those surface waters known to support game fish populations or spawning and nursery areas at least seasonally and all their perennial tributaries and adjacent wetlands and where a game fishery and drinking

water uses are otherwise attainable. Such waters are additionally protected for nongame fish, fish consumption, aquatic life other than fish, primary contact recreation, wildlife, industry, agriculture, and scenic value (DEQ,2001).

Disturbance in or adjacent to riparian areas can increase sediment into channels and degrade water quality. The PFC analysis method is design to evaluate if a given riparian or wetland system is sustainable during a typical disturbance such as flooding. Therefore, if a stream channel is not meeting PFC, 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 and trap 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. Therefore, if allotments have areas that fail PFC it can be assumed to contribute to non-point pollution in downstream water bodies.

However currently within the assessment area, water quality impairment has not been identified in any water bodies by the State of Wyoming by listing them on the State's 303d list. The UAA performed by the DEQ have determined that the appropriate beneficial uses are currently being met for this section of Cottonwood Creek and its tributaries of Wagonhound Creek and Prospect Creek in the allotment. These segments are reported under category 1 for this standard.

4.6 Standard 6

Air quality meets State standards. UNKNOWN

Rationale:

No information is currently available to indicate that this Standard is or is not being met. An air quality monitoring station was recently established in the Bighorn Basin, but no monitoring data is available at this time. Until specific data becomes available, the determination for this Standard is UNKNOWN, per direction from the BLM Wyoming State Office.

4.7 Guidelines for Livestock Grazing Management

Guidelines provide for, and guide the development and implementation of, reasonable, responsible, and cost-effective management practices at the grazing allotment and watershed level. These management practices will either maintain existing desirable conditions or move rangelands toward statewide standards within reasonable timeframes. Appropriate guidelines will ensure that the resultant management practices reflect the potential for the watershed, consider other uses and natural influences, and balance resource goals with social, cultural/historic, and economic opportunities to sustain viable local communities. ~~COMPLIANT/NOT COMPLIANT~~

RATIONALE:

To state that current management is the possible cause of acres not meeting a standard or not in compliance with the Guidelines cannot be made as there is no active grazing permit and has not been for approximately a decade. A review of the records indicates that the grazing has been dominated by fall –winter use, the dormant season for vegetation since the 1970's. Documents within the allotment files (1981 and 1988) indicate that the allotment was in "poor to fair condition" and that the vegetative community was less than desirable. It cannot be stated when the degradation of the vegetative community occurred but it does appear that it occurred decades before this analysis.

5.0 Resource Specialist Signatures

X

X

[Handwritten signature] 5-22-15

John Elliott
Supervisory Rangeland Management Specialist

X

[Handwritten signature]

Tim Stephens
Wildlife Habitat Biologist

X

[Handwritten signature]

Jared Dalebout
Hydrologist

X

[Handwritten signature] 5/26/15

Michael J. Phillips
Assistant Field Manager - Resources

WC

6.0 DETERMINATION

Based on information provided in this assessment, I have determined that standard 1 is being met, standards 2, 3 and 4 are being met in part, standards 5 is met and 6 is unknown. I have determined that the acres that do not meet standard 3 are not due to the current livestock use.

X  X

JUN 08 2015

Rebecca Good
Worland Field Manager

DATE

7.0 Factors related to nonconformance with standards:

The historic grazing use as described above in combination with the aggressive and opportunistic nature of cheatgrass, cactus, and blue grama is determined to be the causal factor for acres not meeting the standard.

WK

7.0 REFERENCES

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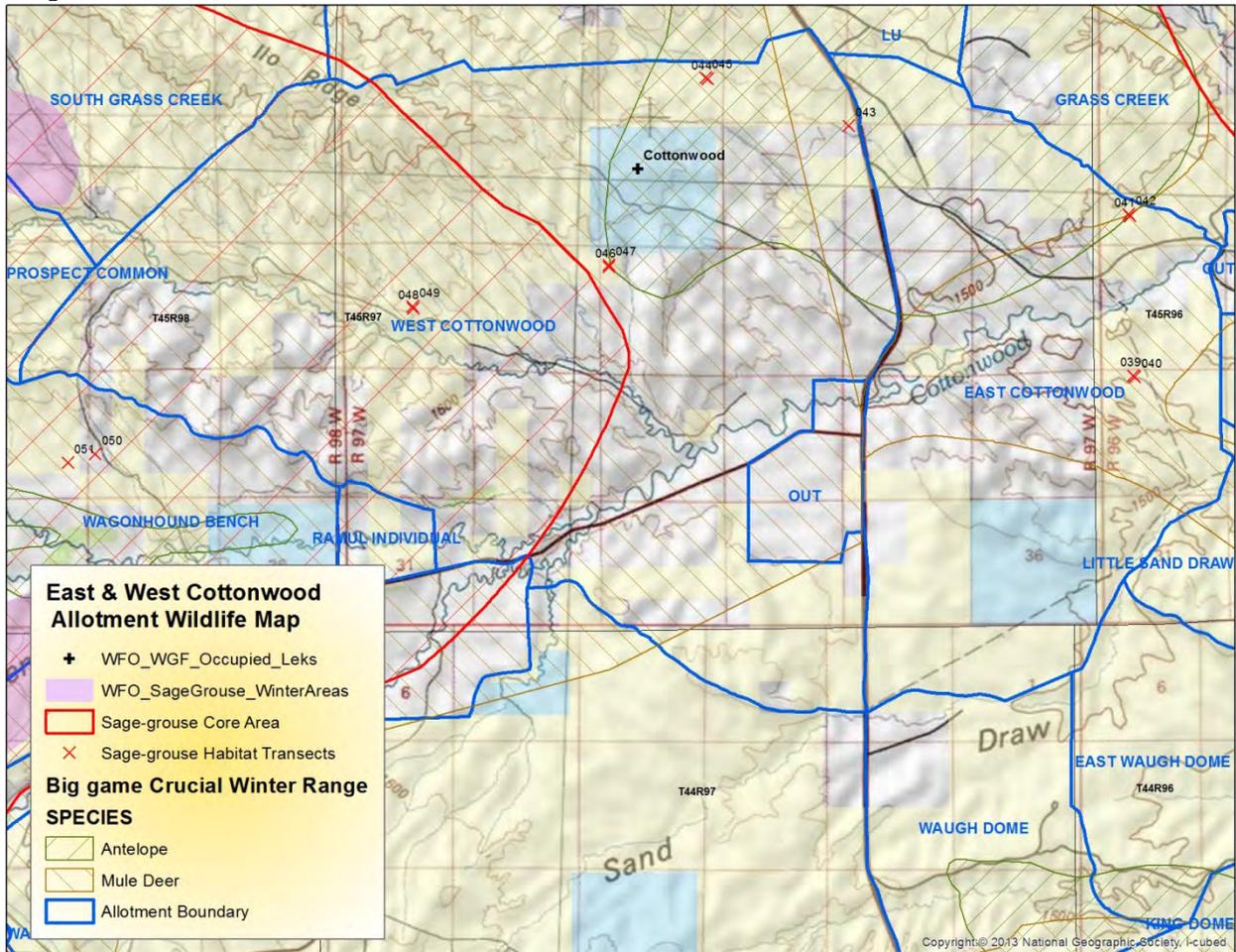
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Wyoming DEQ 2012 305b Report

Map: Wildlife Habitat Resources for West and East Cottonwood Allotments



Map: Upland Vegetation Standard Conformance (Standard 3)

