UTAH'S STANDARDS FOR RANGELAND HEALTH

LAND HEALTH ASSESSMENT AND EVALUATION FOR THE BIG CREEK, NEW CANYON, SAGE CREEK, STUART, AND TWIN PEAKS ALLOTMENTS

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BLM

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1. Introduction

To help sustain land health, the Bureau of Land Management (BLM) periodically assesses and evaluates the public lands to evaluate their condition relative to land health standards. This document assesses and evaluates the conditions of the public lands in parts of Rich County, including Big Creek (04002), New Canyon (04013), Sage Creek (04016), Stuart (04019) and Twin Peaks (04020) allotments.

The conditions of the public lands in these allotments are assessed and evaluated relative to the BLM Utah Standards for Rangeland Health. The Standards were developed with input from the Utah Resource Advisory Council and describe the specific conditions needed for public land health, as follows:

Utah Rangeland Health Standards

Standard 1

Upland soils exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform. As indicated by:

a) Sufficient cover and litter to protect the soil surface from excessive water and wind erosion, promote infiltration, detain surface flow, and retard soil moisture loss by evaporation.

b) The absence of indicators of excessive erosion such as rills, soil pedestals, and actively eroding gullies.

c) The appropriate amount, type, and distribution of vegetation reflecting the presence of (1) the Desired Plant Community (DPC), where identified in a land use plan, or (2) where the DPC is not identified, a community that equally sustains the desired level of productivity and properly functioning ecological conditions.

Standard 2

Riparian and wetland areas are in properly functioning condition. Stream channel morphology and functions are appropriate to soil type, climate and landform. As indicated by:

a) Streambank vegetation consisting of, or showing trend toward, species with root masses capable of withstanding high streamflow events. Vegetative cover adequate to protect stream banks as dissipate streamflow energy associated with high-water flows, protect against accelerated erosion, capture sediment, and provide for groundwater recharge.

b) Vegetation reflecting: Desired plant community, maintenance of riparian and wetland soil moisture characteristics, diverse age structure and composition, high vigor, large woody debris when site potential allows, and providing food, cover, and other habitat needs for dependent animal species.

c) Revegetating point bars; lateral stream movement associated with natural sinuosity; channel width, depth, pool frequency and roughness appropriate to landscape position.

d) Active floodplain.

Standard 3

Desired species, including native, threatened, endangered, and special-status species, are maintained at a level appropriate for the site and species involved. As indicated by:

a) Frequency, diversity, density, age classes, and productivity of desired native species necessary to ensure reproductive capability and survival.

b) Habitats connected at a level to enhance species survival.

c) Native species re-occupy habitat niches and voids caused by disturbances unless management objectives call for introduction or maintenance of non-native species.

d) Habitats for threatened, endangered, and special-status species managed to provide for recovery and move species toward de-listing.

e) Appropriate amount, type, and distribution of vegetation reflecting the presence of (1) the Desired Plant Community, where identified in a land use plan conforming to these standards, or (2) where the DPC is not identified a community that equally sustains the desired level of productivity and properly functioning ecological processes.

Standard 4

BLM will apply and comply with water quality standards established by the state of Utah (R.317-2) and the Federal Clean Water and Safe Drinking Water Acts. Activities on BLM lands will fully support the designated beneficial uses described in the Utah Water Quality Standards (R.317-2) for surface and groundwater. As indicated by:

a) Measurement of nutrient loads, total dissolved solids, chemical constituents, fecal coliform, water temperature and other water quality parameters.

b) Macro invertebrate communities that indicate water quality meets aquatic objectives.

Assessment Area Description

The Big Creek, New Canyon, Sage Creek, Stuart, and Twin Peaks allotments are located in Rich County, Utah. The allotments are a mix of BLM-managed, State Institutional Trust Lands (SITLA), and private, lands totaling approximately 87,590 acres. Table 1 shows the acres of land ownership by allotment.

Table 1. Land Ownership within the Assessment Area

Allotment	Allotment Number	BLM	SITLA	Private
Big Creek	04002	21,760	3,660	6,330
New Canyon	04013	30,370	1,360	6,780

Allotment	Allotment Number	BLM	SITLA	Private
Sage Creek	04016	11,300	0	2,430
Stuart	04019	1,040	0	0
Twin Peaks	04020	2,240	0	320
Total		**66,710 (76%)**	**5,020 (6%)**	**15,860 (18%)**

Located within the Wyoming Basin physiographic province, the allotment ranges from 6,387 to 7,580 feet in elevation. The climatic regime is semi-desert and upland, with an average annual precipitation of 8 to 14 inches. Precipitation occurs mainly as snowfall from October through March, with spring and fall rain events. Soils are shallow and gravelly on steep side slopes and ridges and moderate to very deep on uplands, foothills, and plateaus. More detailed information about these soils can be found in the *Soil Survey of Rich County, Utah* (USDA-SCS 1982).

Interdisciplinary Team

BLM specialists in Range Management, Riparian, Water Quality, Wildlife, Aquatics, and Fisheries collected and reviewed information within the assessment area. Data from Utah State University, Utah Division of Wildlife Resources, Utah Division of Water Quality were also reviewed and used in the assessment.

2. Assessment Data

A variety of data sets were used to assess the conditions of the public lands in these allotments, including: interpreting indicators of rangeland health, upland trend, observed apparent trend, terrestrial Assessment, Inventory, Monitoring (AIM) Strategy, soil stability, ecological site inventory, proper functioning condition, multiple indicator monitoring, aquatic AIM Strategy, water quality monitoring, special status animal species' occurrences, and supplementary information.

Interpreting Indicators of Rangeland Health

A BLM interdisciplinary team completed the *Interpreting Indicators of Rangeland Health* protocol (IIRH; Pellant et al. 2005) on the Big Creek allotment in 2008 and on the New Canyon, Sage Creek, Stuart, and Twin Peaks allotments in 2007. Figure 1 shows the location of the sites assessed. IIRH provides data to assess Utah Rangeland Health Standards 1 and 3. However, no "Determination of Rangeland Health" was made at the time, as the BLM recognized that more quantitative data was needed to make a determination.

Big Creek

A total of 22 assessment sites were rated in the Big Creek allotment in 2008 (BLM 2008c). The assessment indicators at the assessment sites had no or slight departure from the conditions described in the corresponding Ecological Site Descriptions (ESD). Three sites (#4, 8, and 15)

exhibited the greatest departure from the conditions described in the ESDs, all related to a treatment-induced sagebrush mortality and biotic integrity. When considered with the other indicators of biotic integrity, these sites were still considered intact. When summarized into the categories of soil/site stability, hydrologic function, and biotic integrity, all 22 of the assessment sites were rated as having stable soils, functioning hydrologic characteristics, and intact biotic integrity. No determination of rangeland health was made based at the time, as the BLM recognized that more quantitative data was needed to make a determination.

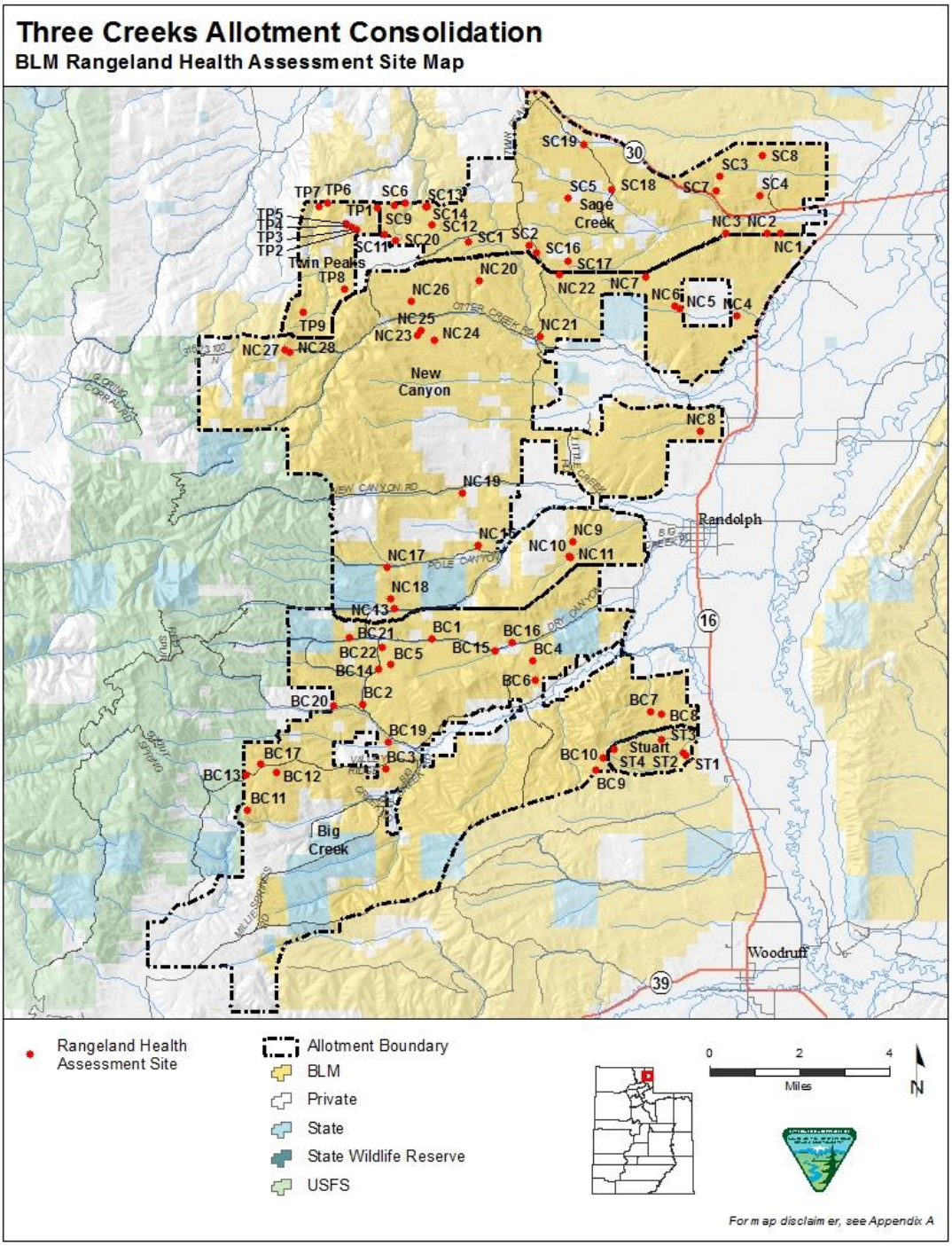

Figure 1: Location of Interpreting Indicators of Rangeland Health Monitoring Sites

<u>New Canyon</u>

A total of 28 assessment sites were rated in the New Canyon allotment in 2007 (BLM 2007c). The majority of those sites were found to have no to slight departure from the conditions described in the corresponding ESDs. As exceptions, two sites (#1 and 5) had moderate to

extreme departures from the conditions described in the ESDs. The conditions at Site 1 were the result of a vegetation treatment. At Site 5 there was a shift from grasses to forbs at a nearby watering trough. Moderate departures were observed at eight sites for the amount of water flow patterns, gullies, plant mortality, litter amount, presence of introduced plants (i.e., crested wheatgrass) and reproductive capability of perennial plants. When summarized into categories of soil/site stability, hydrologic function, and biotic integrity, Site 13 had a slight to moderate departure from the Ecological Site Description for soil stability and hydrologic function, and Sites 5 and 9 had a slight to moderate departure for biotic integrity. Site 13 was considered functional-at-risk for excessive water flow patterns. Site 5 was also considered functional-at-risk, as a result of the change in grass and forb composition near a trough. The remaining monitoring sites in the New Canyon allotment were rated as having stable soils, functioning hydrologic characteristics, and intact biotic integrity. No determination of rangeland health was made at the time, as the BLM recognized that more quantitative data was needed to make a determination.

Sage Creek

A total of 20 assessment sites were rated in the Sage Creek allotment in 2007 (BLM 2007d). Most sites had no to slight departure from the conditions described in the ESDs for the 17 indicators of rangeland health. However, Sites 6 and 8 had moderate to extreme departures for indicators relating to plant mortality and presence of functional/structural groups. At both sites, the departure was the result of a recent wildfire. When summarized into the categories of soil/site stability, hydrologic function, and biotic integrity, Site 6 had a slight to moderate departure from the conditions described in the ESDs for all three categories (again, related to a wildfire), and three other sites had a slight to moderate departure for biotic integrity. In spite of these departures, all sites were all rated as having stable soils, functioning hydrologic characteristics, and intact biotic integrity. No determination of rangeland health was at the time, as the BLM recognized that more quantitative data was needed to make a determination.

Stuart

A total of 4 assessment sites were rated in the Stuart allotment in 2007 (BLM 2007e). Two sites had conditions that moderately departed from those described in the ESDs. Site 3 had longer water flow patterns than expected, though they were still discontinuous. Site 2 had higher plant mortality or decadence and greater litter amounts than were expected. The conditions at Site 2 were the result of a vegetation treatment. When summarized into the categories of soil/site stability, hydrologic function, and biotic integrity, all four sites had no to slight departure from the ESDs and were rated as having stable soils, functioning hydrologic characteristics, and intact biotic integrity. No determination of rangeland health was made at the time, as the BLM recognized that more quantitative data was needed to make a determination.

Twin Peaks

A total of 9 assessment sites were rated in the Twin Peaks allotment in 2007 (BLM 2007f). All but two sites had no to slight departures from conditions described in the ESDs. The exceptions were Site 1 which had slightly lower annual production than expected and Site 2 which had more aspen (*Populus tremuloides*) decadence than expected and a change in the litter amount. When summarized into the categories of soil/site stability, hydrologic function, and biotic integrity, all 9 sites had only no to slight departure from the ESDs and were rated as having stable soils,

functioning hydrologic characteristics, and intact biotic integrity. No determination of rangeland health was made at the time, as the BLM recognized that more quantitative data was needed to make a determination.

Summary

Of the 83 sites located within the assessment area, nearly all of them were rated to have stable soils, functioning hydrologic characteristics, and intact biotic integrity. There were only two sites considered to be functional-at-risk because of the departures from the conditions described in the ESDs; one for excessive water flow patterns and low vigor of perennial grass, and the other for a change in grass and forb composition near a watering trough.

Upland Trend

The measurement of upland trend is used to help understand how the vegetative conditions of the upland areas of the public land are changing over time. The BLM employed two metrics to assess trend on these five allotments: nested frequency and foliar cover, per the Utah Monitoring Protocol (BLM 2010). Sites monitored were selected from existing key areas. Upland trend provides data to assess Utah Rangeland Health Standards 1 and 3. The data was collected at a total of 20 sites in 2009 and again in 2012 (Figure 2).

Frequency data is used to describe the abundance and distribution of a species by providing the number of times a species is present in a sampling unit and is usually expressed as a percentage. Species measurements between 20 and 80 percent are needed in order to detect changes in abundance and distribution. A slightly modified method, nested frequency, allows for collecting frequency data at two or more different sized plots at one time (Coulloudon et al. 1996a). The BLM collected nested frequency during the 2009 and 2012 growing seasons using a quadrat having four nested plots. In 2009, the BLM collected nested frequency on a number of grass species, but in 2012 the data collection was narrowed to key grass forage species. The 2009 and 2012 nested frequency of key grass species was compared using a chi-squared statistical analysis (BLM 2010) to help understand if key species increased in amounts greater than expected.

Foliar cover is the extent of the ground covered by the vertical projection of the aerial portions of the plant, excluding openings in the canopy (Coulloudon et al. 1996a). Foliar cover data was collected by the BLM at the same locations as the nested frequency data, and was also collected in 2009 and 2012. The comparison of cover was categorized into components that provide or fail to provide protection from raindrop impact. Protective components include any vegetation, litter, rock, and duff. Non-protective components consist of bare ground.

Big Creek

4aac-A, Big Creek: This study was established in the 1000 Dollar Ridge pasture of the Big Creek allotment in 2009. It is located in an upland sagebrush plant community at an elevation of approximately 7,750 feet. The dominant shrubs are Wyoming big sagebrush (*Artemisia tridentata* var. *wyomingensis*) and yellow rabbitbrush (*Chrysothamnus viscidiflorus*), and an understory of perennial grasses and forbs. A series of small ponds is located on the slope approximately 0.15 miles to the east. The chi-squared analysis of nested frequency of key species found that the decrease in frequency of western wheatgrass (*Agropyron smithii*) and Letterman's needlegrass (*Achnatherum lettermanii*) between 2009 and 2012 was greater than expected, and

that the increase of California brome (*Bromus carinatus*) was not greater than expected. Bare ground cover remained constant at 6 percent in 2009 and 2012. Sagebrush cover was near 30 percent in those same years.

4cca-D, Big Creek: This study was established in the Dry Canyon Lower pasture of the Big Creek allotment in 2009. It is located in an upland shrub community on a northeast facing slope at an elevation of 6,650 feet. Yellow rabbitbrush and crested wheatgrass are the dominant species on the site. The Dry Canyon riparian area is located approximately 120 feet to the north, a stock pond is located 0.25 miles to the east, and a reservoir is located 0.15 miles to the south. The chi-squared analysis of 2009 and 2012 nested frequency of key species show that the decrease in crested wheatgrass was greater than expected, and the decrease in Sandberg bluegrass (*Poa secunda*) was not greater than expected. Bare ground cover decreased slightly from 27 percent in 2009 to 24 percent in 2012. Sagebrush cover increased from 1 percent in 2009 to 2 percent in 2012.

7cad-A, Big Creek: This study was established in the Dry Canyon Upper pasture of the Big Creek allotment in 2009. It is located in an upland shrub community at an elevation of 6,960 feet. The dominant shrub is yellow rabbitbrush, and the understory is dominated by western wheatgrass, Nevada bluegrass (*Poa nevadensis*), and Sandberg bluegrass. The chi-squared analysis of frequency of key species indicate that frequency of Sandberg bluegrass decreased more than expected, but that the changes in frequency of western wheatgrass and Letterman's needlegrass were not more than expected. Bare ground cover decreased from 20 percent in 2009 to 11 percent in 2012. Sagebrush is present, but only accounted for approximately 3 percent cover in both 2009 and 2012.

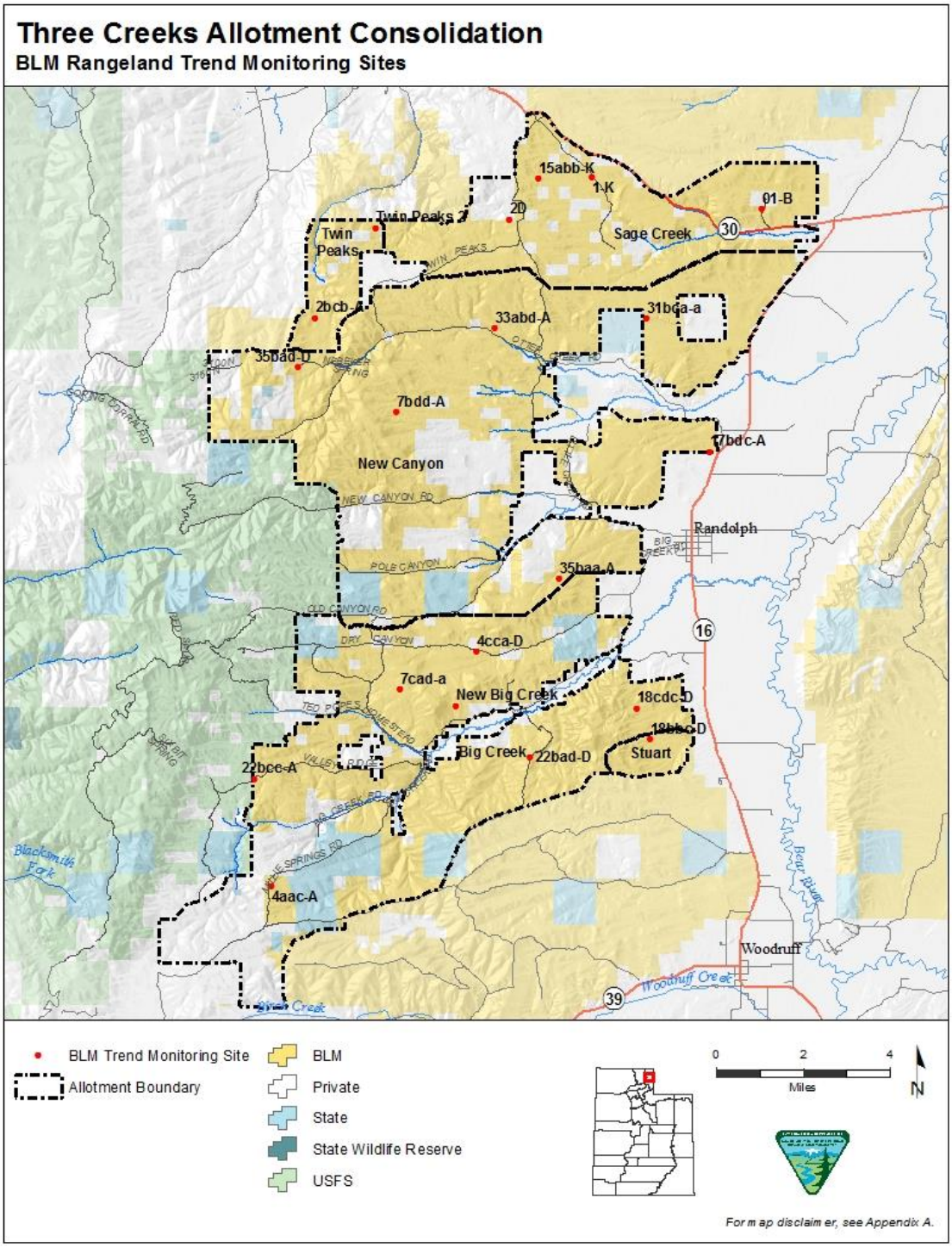

Figure 2: Location of BLM trend monitoring sites

18cdc-D, Big Creek: This study was established in the eastern portion of the Limestone pasture of the Big Creek allotment in 2009. It is located on the northeast slope of Sugarloaf Mountain in a sagebrush community at an elevation of 6,630 feet. The dominant species are Wyoming big

sagebrush and crested wheatgrass. The nearest water source for livestock is a trough located approximately 0.6 mile to the east. The chi-squared analysis indicates that the frequency of crested wheatgrass did not change from 2009 to 2012, and Sandberg bluegrass increased more than expected. A case of mistaken identification may have led to an observed decrease in western wheatgrass frequency from 41 percent to 1 percent in the largest frequency plots. Crested wheatgrass frequency, however, remained nearly constant at 99 percent. Bare ground cover increased from 19 percent in 2009 to 24 percent in 2012. Sagebrush cover increased from 13 percent in 2009 to 19 percent in 2012.

22bad-D, Big Creek: This study was established in the western portion of the Limestone pasture of the Big Creek allotment in 2009. It is located along a small ridge in a black sagebrush (*Artemisia nova*) community at an elevation of 6,850 feet. The understory is comprised of few species, the dominant one being Sandberg bluegrass. The nearest existing water sources are approximately 1 mile away and include a trough to the southwest and Big Creek to the north. The chi-squared analysis shows that the frequency of Indian ricegrass (*Achnatherum hymenoides*) increased more than expected from 2009 to 2012, but that western wheatgrass and Sandberg bluegrass did not. Bare ground cover decreased from 29 percent in 2009 to 22 percent in 2012. Black sagebrush cover was near 27 percent in both 2009 and 2012.

22bcc-A, Big Creek: This study was established in the west side of the Dry Canyon upper pasture of the Big Creek allotment in 2009. It is located in an upland sagebrush community at an elevation of 7,400 feet, and is adjacent to a small riparian area. Two small reservoirs located less than a mile to the south provide additional water. The understory is dominated by Idaho fescue (*Festuca idahoensis*), Letterman's needlegrass, and silvery lupine (*Lupinus argenteus*). The chi-squared analysis found that the frequency of key species did not change from 2009 to 2012. Bare ground cover decreased from 16 percent in 2009 to 12 percent in 2012. Sagebrush cover was fairly constant at near 20 percent.

Moved Burn/New Big Creek: This study was established in the southeast corner of the Dry Canyon Upper pasture of the Big Creek allotment in 2009. It is located in an upland sagebrush community at an elevation of 6,700 feet. The dominant shrubs include Wyoming big sagebrush and yellow rabbitbrush, and the understory is dominated by western wheatgrass and Sandberg bluegrass. The study is on a southwest-facing hillslope. The nearest watering points are two troughs located approximately 0.75 mile to the northwest. The chi-squared analysis indicates that the frequency of western wheatgrass, bluebunch wheatgrass (*Pseudoroegneria spicata*), and Sandberg bluegrass did not change more than expected from 2009 to 2012. Bare ground cover decreased from 16 percent in 2009 to 12 percent in 2012. Sagebrush cover decreased from 29 percent in 2009 to 25 percent in 2012.

New Canyon

7bdd-A, New Canyon: This study was established in the Middle Otter pasture of the New Canyon allotment in 2009. It is located in an upland sagebrush community on an east-facing slope at an elevation of 7,275 feet. The study sits on the divide between the South Branch Otter Creek and Middle Branch Otter Creek. In addition to these two streams, there are multiple ponds, troughs, and springs located within a 0.5-mile radius. Mountain big sagebrush (*Artemisia tridentata* var. *vaseyana*) is the dominant shrub, though yellow rabbitbrush and snowberry (*Symphoricarpos albus*) are also present. The understory is dominated by western wheatgrass

and orange helenium (*Helenium hoopesii*) or fleabane (*Erigeron* sp.), and other perennial forbs and grasses. The chi-squared analysis shows that the increase in frequency of western wheatgrass between 2009 and 2012 was not more than expected. The frequency of bluebunch wheatgrass and Columbia needlegrass (*Stipa columbiana*) were too infrequent to appropriately analyze change. Bare ground cover decreased from 15 percent in 2009 to 10 percent in 2012. Sagebrush cover was found to be near 20 percent in both years.

17bdc-A New Canyon: This study was established in the southeast corner of the Little Grey Hills pasture of the New Canyon allotment in 2009. The study is located in an upland sagebrush community at an elevation of 6,300 feet. Wyoming big sagebrush is the dominant shrub and crested wheatgrass is the dominant component of the understory. The chi-squared analysis found that the frequency of crested wheatgrass increased more than expected between 2009 and 2012; however, the increase resulted in frequencies greater than 80 percent. The frequency of Sandberg bluegrass also increased more than expected. Bare ground cover decreased from 38 percent in 2009 to 26 percent in 2012. Sagebrush cover did increase from 2009 to 2012, but the increase was only from 7 percent to 8 percent.

31bca-A, New Canyon: This study was established in the Hawk Springs pasture of the New Canyon allotment in 2009. It is located in an upland sagebrush community at an elevation of 6,675 feet. The dominant shrub species is Wyoming big sagebrush and the understory is dominated by crested wheatgrass and Sandberg bluegrass. The nearest water source is Hawk Springs and an associated trough, which are approximately 0.4 miles to the east. The chi-squared analysis shows that the frequency of the key forage species did not change more than expected between 2009 and 2012. Bare ground cover decreased from 30 percent in 2009 to 23 percent in 2012. Sagebrush cover was 21 percent in both years.

33abd-A, New Canyon: This study was established in the Otter pasture of the New Canyon allotment in 2009. It is located in an upland sagebrush community on a ridge north of Otter Creek at an elevation of 6,775 feet. A spring, watering trough, and Otter Creek are all within 0.5 miles of the study. The dominant plant species are Wyoming big sagebrush and yellow rabbitbrush in the shrub canopy, and Sandberg bluegrass, western wheatgrass, and squirreltail (*Elymus elymoides*) are the dominant species in the understory. The chi-squared analysis found that the frequency of western wheatgrass decreased more than expected between 2009 and 2012. The frequency of Sandberg bluegrass also decreased, but not more than expected. The frequency of squirreltail increased from 19 percent to 46 percent, but since the frequency in 2009 was less than 20 percent, application of the chi-square analysis would not be appropriate. Bare ground cover decreased from 28 percent in 2009 to 22 percent in 2012. Sagebrush cover was approximately 25 percent in both 2009 and 2012.

35baa-A, New Canyon: This study was established in the Spring Creek pasture of the New Canyon allotment in 2009. It is located in an upland sagebrush community. The dominant shrubs are Wyoming big sagebrush and yellow rabbitbrush, and the understory is dominated by crested wheatgrass and Sandberg bluegrass. The chi-squared analysis shows that although the frequency of crested wheatgrass, western wheatgrass, and Sandberg bluegrass decreased between 2009 and 2012, the decrease was not more than expected. Bare ground cover decreased from 27 percent in 2009 to 23 percent in 2012. Sagebrush cover increased from 23 percent to 28 percent during those same three years.

35bad-D, New Canyon: This study was established in the Upper Otter pasture of the New Canyon allotment in 2009. It is located in an upland sagebrush community within 0.25 miles of a large pond at an elevation of 7,350 feet. Wyoming big sagebrush is the dominant component in the shrub canopy, and the understory is comprised of a mix of perennial grasses and forbs. The chi-squared analysis indicates that the frequency of both western wheatgrass and Letterman's needlegrass decreased more than expected between 2009 and 2012. The frequency of Idaho fescue also decreased considerably, but since frequency was greater than 80 percent in 2009, application of the chi-square test is not appropriate. Bare ground cover decreased from 11 percent in 2009 to 4 percent in 2012. Sagebrush cover decreased from 31 percent to 28 percent in that same time.

Sage Creek

01-B, Sage Creek: This study was established in the Dump pasture of the Sage Creek allotment in 2009. It is located in an upland sagebrush community at an elevation of 6,430 feet. The nearest perennial water source is located approximately 0.4 miles to the south. The shrub canopy is dominated by Wyoming big sagebrush and western wheatgrass and Sandberg bluegrass dominate the understory. The chi-squared analysis shows that the frequency of western wheatgrass and Sandberg bluegrass did not change more than expected from 2009 to 2012. Letterman's needlegrass frequency did increase considerably in those years (from 18 percent to 66 percent), but since frequency in 2009 was less than 20 percent, applying the chi-square analysis would not be appropriate. Bare ground cover was 25 percent in both years. Sagebrush cover was also stable at 21 percent.

2-D, Sage Creek: This study was established in the Sage Creek allotment in 2009. It is located in an upland sagebrush community at an approximate elevation of 7,200 feet. The shrub canopy is dominated by Wyoming big sagebrush and yellow rabbitbrush, which account for approximately 23 percent and 9 percent cover, respectively. The understory is comprised of perennial grasses and forbs including western wheatgrass, Sandberg bluegrass, silvery lupine, tailcup lupine (*Lupinus caudatus*), and muttongrass (*Poa fendleriana*). Two troughs 0.3 mile to the southwest and a trough and pond 0.75 mile to the northwest provide water to livestock. The chi-square analysis shows that the frequency of muttongrass did not change more than expected between 2009 and 2012. A change was also observed in the wheatgrass species observed at the study from 2009 to 2012. The 2009 data indicated that western wheatgrass was present in 95 percent of the 24x24-inch plots, but was not present in any plots in 2012. And, whereas there was no bluebunch wheatgrass observed in any plots in 2009, it was present in 32 percent of the24x24-inch plots in 2012. It is possible that the species may have been inappropriately identified during one of the monitoring events. Bare ground cover was fairly stable at 13 to 14 percent in both years. Sagebrush cover increased slightly from 22 percent in 2009 to 23 percent in 2012.

15abb-K, Sage Creek: This study was established in the Sage Creek allotment in 2009. It is located in an upland sagebrush community on an east-facing slope at an approximate elevation of 7,000 feet. Wyoming big sagebrush and yellow rabbitbrush are the dominant shrubs, and western wheatgrass, muttongrass, and Sandberg bluegrass are the dominant grass species at this study. The nearest water sources are approximately 0.6 mile to the northeast and 1.0 mile to the east. Frequency data from was collected in 2009, but not in 2012. Bare ground cover increased slightly from 17 percent in 2009 to 18 percent in 2012. Sagebrush cover was approximately 24 percent in both years.

1-K, Sage Creek: This study was established in the Sage Creek allotment in 2009. It is located in a rabbitbrush community at an elevation of 6,825 feet. Yellow rabbitbrush is the dominant shrub, and western wheatgrass and Sandberg bluegrass are the dominant grasses in the understory. There are two troughs which provide water in the vicinity, one is 0.4 mile to the north and the other is 0.75 mile to the southwest. The chi-square analysis shows that the frequency of western wheatgrass did not change more than expected from 2009 to 2012. Bare ground cover was about 25 percent in 2009 and 2012. Sagebrush cover was around 1 percent in both years.

Stuart

18bcc-D, Stuart: This study was established in the Stuart allotment in 2009. It is located in a sagebrush community at an elevation of 6,500 feet. Both black sagebrush and Wyoming big sagebrush are present in the shrub community, though Wyoming big sagebrush is dominant. Western wheatgrass and Sandberg bluegrass are the most common grass species. The nearest water source is a trough located 0.4 mile to the east. The chi-squared analysis indicates that the increased frequency of squirreltail and Sandberg bluegrass was not more than expected. Western wheatgrass frequency decreased dramatically from 63 percent to 18 percent in the largest frequency plots (since the frequency decreased to less than 20 percent, applying the chi-square analysis would not be appropriate). Bare ground cover was about 13 percent in both 2009 and 2012. Sagebrush cover decreased from 22 percent in 2009 to 20 percent in 2012.

Twin Peaks

2bcb-A, Twin Peaks: This study was established in the Twin Peaks allotment in 2009, and is located in an upland sage community at an elevation of 7,200 feet. The nearest water sources include a pond 0.6 mile to the south and a spring and associated riparian area in Laketown Canyon 0.8 mile to the north. The shrub canopy is dominated by big sagebrush, but also includes yellow rabbitbrush and snowberry. The understory is comprised of a number of perennial grass and forb species including Kentucky bluegrass (*Poa pratensis*), western wheatgrass, Idaho fescue, slender wheatgrass (*Elymus trachycaulus*), California brome, and silvery lupine. The chi-squared analysis shows that the frequency of Idaho fescue increased more than expected from 2009 to 2012, and that Kentucky bluegrass decreased more than expected. Western wheatgrass frequency increased, but not more than expected. Bare ground cover was fairly constant at near 7 percent in 2009 and 2012, and sagebrush cover was approximately 33 percent.

Twin Peaks 2, Twin Peaks: This study was established in the northeast corner of the Twin Peaks allotment in 2009. It is located in an upland sagebrush community on an east-facing slope at an elevation of 7,175 feet. Wyoming big sagebrush accounts is the dominant shrub, though Saskatoon serviceberry (*Amelanchier alnifolia*), yellow rabbitbrush, antelope bitterbrush (*Purshia tridentata*), and snowberry are also present. The understory is dominated by western wheatgrass, fleabane, muttongrass, and Kentucky bluegrass. The nearest source of water is two small ponds located approximately 0.3 mile to the west. The chi-square analysis shows that the frequency of muttongrass increased more than expected between 2009 and 2012, while the frequency of Kentucky bluegrass decreased more than expected. The frequency of western wheatgrass was stable. Bare ground cover was 4 percent in 2009 and increased slightly to 6 percent in 2012. Sagebrush cover was near 23 percent in both 2009 and 2012.

Summary

In summary, the BLM monitored a total of 20 rangeland trend sites in the assessment area. According to the nested frequency dataset, key forage species are predominantly stable. The chi-squared analysis of the frequency of key grass species found that 11 of the monitoring sites experienced a no change between 2009 and 2012 (i.e., the change was not greater than expected), five of the sites experienced a net negative change (i.e., species had a greater than expected decrease), three experienced a net positive change (i.e., species had a greater than expected increase), and the analysis could not be completed at one site because of lack of data. Bare ground cover did not change at five monitoring sites, increased at four monitoring sites, and decreased at 11 monitoring sites. The collective average change in percent bare ground cover between 2009 and 2012 was an increase of 3 percent. Sagebrush cover did not change at 12 monitoring sites, increased at five monitoring sites, and decreased at three monitoring sites. The collective average change in percent sagebrush cover was an increase of less than 1 percent.

Observed Apparent Trent

Observed apparent trend considers seeded and native vegetation, vigor, surface litter, and soil movement (BLM 1992). In 2007 and 2008, an assessment of observed apparent trend was made at each of the 83 Ecological Site Inventory (ESI) locations in Big Creek, New Canyon, Sage Creek, Stuart, and Twin Peaks allotments, and each site was rated as either upward, static to upward, static, or downward (Table 2). Observed apparent trend provides data to assess Utah Rangeland Health Standards 1 and 3. The ESI locations correspond to the Interpreting Indicators of Rangeland Health Assessment locations (Figure 1). Of the 83 sites, one had a downward apparent trend (NC-5; New Canyon allotment), 24 had a static apparent trend, 36 had a static to upward apparent trend, and 22 had an upward apparent trend. NC-5 had a downward apparent trend due to the lack of graminoid species and abundance.

Table 2. Summary of observed apparent trend for the allotments in the analysis area.

Observed Apparent Trend	Big Creek	New Canyon	Sage Creek	Stuart	Twin Peaks	Total
Upward	8	9	1	1	3	22
Static to Upward	9	8	15	2	2	36
Static	5	10	4	1	4	24
Downward	0	1	0	0	0	1

Terrestrial Assessment Inventory Monitoring (AIM) Strategy

Terrestrial AIM data were collected in 2016 on or near eight random points provided as part of a field office sample design by the BLM National Operations Center. Of the eight points, four are located on the Big Creek allotment, one on the New Canyon allotment, and three on the Sage Creek allotment. Cover, gap, shrub height, perennial grass height, soil stability, and a complete list of site species were collected at each monitoring location. Terrestrial AIM provides data to

assess Utah Rangeland Health Standards 1 and 3. Table 3 shows cover values and soil stability for the monitoring sites within the analysis area.

Table 3. AIM Cover and Soil Stability.

Allotment	Site Name	Ecological Site	Foliar Cover	Bare Ground	Basal Cover	Total Litter	Avg. Soil Stability
Big Creek	MS-240	R047XA338UT	55%	17%	7%	51%	5
	MS-311	R028AY220UT	50%	29%	6%	49%	5
	INT-268	R047XB222UT	61%	25%	1%	40%	5
	INT-625	R047XB252UT	47%	23%	1%	10%	5
New Canyon	INT-064	R047XB508UT	99%	0%	0%	91%	6
Sage Creek	MS-248	R025XY316UT	72%	5%	5%	43%	5
	INT-260	R025XY314UT	87%	8%	5%	61%	5
	INT-303	R047XA338UT	81%	9%	2%	49%	6

Summary

These data show that soils at the sample sites have high stability ratings (see also Soil Stability section below for description of the soil stability testing method and an additional data set on soil stability from 2012). Foliar cover is present in sufficient amounts at all sites to dissipate energy of raindrop impact on the soil. All sites, with the exception of INT-625, have high litter cover on the soil surface that helps prevent excessive water and wind erosion, promotes infiltration, detains surface flow, and retards soil moisture loss by evaporation.

Site INT-625 is ecological site R047XB252UT; soils for this site are deep and well drained, runoff is slow, and the water erosion hazard is slight. At 10%, litter cover for this site is slightly below the expected 15-50%, but foliar cover is within expected ranges for this site. Soil surface at this site has 36% cover of rock fragments, which also helps armor the soil and protect it from water and wind erosion.

Terrestrial AIM data are also used in Greater sage-grouse Habitat Assessment Summary Report that was prepared for this land health assessment (BLM 2017).

Soil Stability

Measurements of soil stability were collected at 21 sites across the five allotments during 2012. The test that was used measured resistance to soil erosion from soil surface particles based on a scale of 1–6. A score of 1 is the lowest and indicates that half of structural integrity is lost within 5 seconds after submerging in water. A score of 6 is the highest and indicates that 75–100 percent of soil structural integrity remains after 5 cycles of submersion. Soil stability provides data to assess Utah Rangeland Health Standards 1.

Mean soil stability scores calculated for the sites ranged from 2.1 to 4.4. Mean soil stability scores for allotments ranged from 2.8 to 3.6, including Sage Creek (2.8), Stuart (3.0), New Canyon (3.3), Twin Peaks (3.4) and Big Creek (3.6). Expected soil stability ratings for the main ecological sites within the project area are as follows. Site R034AY122WY ranges in stability from 6 to 1, with a 6 under vegetation and a 1 in interspaces where loamy soil is present. New Canyon and Sage Creek have the highest number of acres for this ecological site and it makes up

the largest amount of acres across the assessment area. Site R034AY222WY has an expected rating of 3 or greater. This site is predominantly found on Big Creek and New Canyon. Site R047AY3332UT has an average soil stability rating of 4 and is predominantly found on the New Canyon and Big Creek allotments. The ratings found are as expected for the ecological sites present. Sage Creek and Stuart allotments have a higher amount of the R034AY122WY soil types, so their average numbers are lower than the other allotments that have ecological sites with higher expected stability ratings.

Ecological Site Inventory

The BLM completed Ecological Site Inventories (ESI) for the BLM allotments in the assessment area in the summers of 2007 and 2008 at a total of 83 locations. Based on those inventories, a total of 17 ecological sites occur on the BLM portion of the assessment area (Table 4). The most common ecological sites were Loamy 7-9 inch, Loamy 10-14 inch, Upland Stony Loam, and Mountain Shallow Loam.

Once the ecological sites present in an area are identified during the ESI, a comparison of vegetation production and composition can be made between the existing community and the community described in the Ecological Site Description. This comparison involves sampling the productivity by species (i.e., clipping and weighing), or estimating the productivity based on previous samples, in order to generate a similarity index. The current production of each species is compared to the production observed in a representative Historical Climax Plant Community (HCPC). If a measured species has greater production than occurs in the HCPC, the measured productivity is reduced to the maximum allowed in the HCPC. The adjusted productivity is then summed for all measured species and described as a percentage of the total productivity in the HCPC. The percentage is then used to calculate the similarity index and corresponding successional status, which is noted in Table 4 based on the classes listed in Table 5. Based on the data that was collected, the similarity index indicated that the ecological condition is early seral at one, mid seral at 32, late seral at 41, and HCPC at nine sites. ESI provides data to assess Utah Rangeland Health Standards 1 and 3.

Table 4. Ecological Sites and successional status in the assessment area.

Ecological Site and ID	NRCS Biotic Name or Dominant Vegetation	Elevation Range (feet)	Which Allotment and Approximate Acres	Successional Status (ac)	Total Acres in Assessment Area	Percent Bare Ground
Mountain Aspen Thicket O25XY410UT	*Populus tremuloides – Bromus carinatus*	6,000-7,000	Big Creek (226) New Canyon (1,970) Sage Creek (57) Twin Peaks (382)	Late (all) Mid (23) Late (1947) Mid (all) Late (all)	2,635	2-5 0 0 -
Loamy 7-9” R034AY122WY	*Artemisia tridentata ssp. wyomingensis – Elymus lanceolatus*	6,000-7,200	Big Creek (1,280) New Canyon (6,286) Sage Creek (4,933) Stuart (816)	Mid (all) Mid (2585) Late (3701) Late (4894) HCPC (39) Mid (112) Late (704)	13,315	20 19 17 12

Ecological Site and ID	NRCS Biotic Name or Dominant Vegetation	Elevation Range (feet)	Which Allotment and Approximate Acres	Successional Status (ac)	Total Acres in Assessment Area	Percent Bare Ground
Coarse Upland R034AY208WY	*Purshia tridentata* – *Pseudoroegneria spicata*	6,500-7,500	Big Creek (754), New Canyon (300) Sage Creek (698) Stuart (4)	Late (all) Mid (all) Late (36) HCPC (662) Late (all)	1,756	8 15 14 12
Gravelly 10-14” R034AY212WY	*Pseudoroegneria spicata*	6,500-7,500	New Canyon (97) Sage Creek (162)	HCPC (all) HCPC (all)	259	4 24
Loamy 10-14” R034AY222WY	*Artemisia tridentata ssp. wyomingensis* – *Pascopyrum smithii*	6,500-7,500	Big Creek (5,307) New Canyon (3,235) Sage Creek (1,846)	Mid (4524) Late(783) Late (1139) HCPC (2096) Late (all)	10,388	12 19 14
Overflow 10-14” R034AY230WY	*Artemisia tridentata ssp. tridentata* – *Pascopyrum smithii*	6,500-7,500	Big Creek (1,091) New Canyon (252) Sage Creek (180)	Mid (733) Late (358) Mid (101) Late (151) Mid (all)	1,523	6 11 25
Shallow Loamy 10-14” R034AY262WY	*Artemisia tridentata ssp. wyomingensis* – *Pseudoroegneria spicata*	6,500-7,500	Big Creek (283) New Canyon (1,929)	Mid (all) Mid (1303) Late (359) HCPC (266)	2,212	4 22
Upland Loamy Shale R047XA325UT	*Artemisia arbuscula ssp. arbuscula* – *Pseudoroegneria spicata*	6,200-7,700	Big Creek (1,385) New Canyon (2,814) Sage Creek (2,129) Twin Peaks (3)	Late (all) Mid (all) Mid (all) Mid (all)	6,331	25 21 19
Upland Stony Loam R047AY332UT	*Artemisia nova* – *Pseudoroegneria spicata*	5,400-8,000	Big Creek (5,619) New Canyon (4,098) Sage Creek (392) Stuart (256) Twin Peaks (19)	Mid (all) Mid (542) Late (335) Late (all) Late (all) Late (all)	10,384	8 26 28 28 28
Upland Stony Loam (Pinyon-Utah Juniper) R047CY335UT	*Pinus edulis/Juniperus osteosperma* – *Pseudoroegneria spicata*	6,400-8,400	Big Creek (22)	Late (all)	22	10

Ecological Site and ID	NRCS Biotic Name or Dominant Vegetation	Elevation Range (feet)	Which Allotment and Approximate Acres	Successional Status (ac)	Total Acres in Assessment Area	Percent Bare Ground
Mountain Loam R047CY430UT	*Artemisia tridentata ssp. vaseyana – Pseudoroegneria spicata*	5,100-8,400	Big Creek (379) New Canyon (1,755) Sage Creek (835) Twin Peaks (871)	Mid (all) Late (all) Mid (123) Late (712) Mid (720) Late (151)	3,840	8 33 6 -
Mountain Shallow Loam R047CY446UT	*Artemisia tridentata ssp. vaseyana – Pseudoroegneria spicata*	5,200-8,500	Big Creek (4,610) New Canyon (4,272) Twin Peaks (551)	Mid (2449) Late(1116) HCPC (1045) Late (2071) HCPC (2201) Late (all)	9,433	11 12 -
Mountain Stony Loam (Antelope bitterbrush) R047CY456UT	*Purshia tridentata – Pseudoroegneria spicata*	5,000-8,500	Big Creek (153) New Canyon (369) Sage Creek (49) Twin Peaks (90)	Late (all) HCPC (all) Late (all) Late (all)	661	9 12 12 -
Mountain Stony Loam (Browse) R047CY460UT	*Cercocarpus montanus – Pseudoroegneria spicata*	6,800-9,000	Big Creek (31) Sage Creek (42) Twin Peaks (225)	Mid (all) Late (all) Late (all)	298	20 13 -
Mountain Stony Loam R047CY461UT	*Artemisia tridentata ssp. vaseyana – Pseudoroegneria spicata*	5,500-8,400	Big Creek (61)	Late (all)	61	7
Mountain Stony Loam R047CY462UT	*Artemisia tridentata ssp. vaseyana – Pseudoroegneria spicata*	6,800-9,999	New Canyon (2,045)	Late (all)	2,045	8
Mountain Windswept Ridge R047CY475UT	*Artemisia nova – Pseudoroegneria spicata*	6,800-9,400	New Canyon (1,088) Twin Peaks (125)	Late (all) Late (all)	1,213	20 -
Sources: BLM ESI Data-ESI summary sheets; Percent bare ground from the BLM ESI Summary table, if available.						

Table 5. Similarity index and corresponding successional status (after Habich 2001).

Similarity Index	Successional Status
0-25%	Early
26-50%	Mid
51-75%	Late
76-100%	Historic Climax Plant Community

Riparian Area Assessment

To assess if lentic and lotic riparian areas were in proper function condition, data were collected according to multiple types of protocols in the assessment area over the last 10 years, with the exception of the Stuart Allotment, which does not have any riparian areas. The protocols included in this assessment are the Proper Functioning Condition protocol (PFC; Prichard et al. 2003, Dickard et al. 2015), Multiple Indicator Monitoring (lotic areas only; MIM; Burton et al. 2011) and aquatic Assessment, Inventory, and Monitoring (lotic area only; AIM; BLM 2016a). All of these types of data were collected in the assessment area and were evaluated by an interdisciplinary team to support the assessment, evaluation, and determination of condition of lentic and lotic riparian areas. Each of these methods provide data to assess Utah Rangeland Health Standard 2, and in some case, Standard 3.

On BLM-managed land in the assessment area there is approximately 29.6 acres of lentic sites (spring and wetland sites) and 17 miles of lotic sites (perennial streams), with 5.5 miles of perennial streams in grazing exclosures.

PFC data were collected in 2007-2008 to assess riparian areas. Following this data collection, the BLM recognized that lotic riparian system needed additional quantitative data to be collected to better understand the condition of the riparian habitat. Therefore, riparian areas were assessed by MIM and/or aquatic AIM protocols in 2009, 2012, 2015, and 2016. Conditions appear to have changed over time.

Proper Functioning Condition Protocol

Proper Functioning Condition (PFC) is a qualitative assessment of riparian-wetland areas based on quantitative science (Prichard et al. 2003, Dickard et al. 2015). Monitoring is based on a checklist completed by an interdisciplinary team that evaluates hydrology, soils, and vegetation characteristics in the field. The result of the checklist is a rating that indicates how well physical processes are working and if existing conditions of a water feature can hold together during a high-flow event. The PFC method can identify if a riparian-wetland area is physically functioning in a manner that will maintain or allow recovery of biological resources over time (e.g. forage and wildlife habitat; Prichard 1998).

Proper Functioning Condition protocol data were collected on lentic and lotic sites during 2007-2008 within Big Creek allotment (2008), New Canyon allotment (2008), Sage Creek allotment (2007), and Twin Peaks allotment (2007) (BLM 2007a, BLM 2007b, BLM 2008a, BLM 2008b).

Overall, the majority of stream miles and lentic acres were ranked at PFC with a stable or upward trend (72.7 percent lotic; 98.9 percent lentic). A small percentage of habitats were considered not functioning (NF) or functioning at risk (FAR) with a downward or static trend (8.7 percent lotic; 0.5 percent lentic). Conditions varied among allotment. For lentic sites, there was no additional data collected since the 2007-2008 PFC protocol surveys. For lotic sites, the data sets described below provides additional information for the assessment, except Twin Peaks allotment, which was only assessed with the PFC protocol.

Multiple Indicator Monitoring

Multiple Indicator Monitoring (MIM) sites were established at seven sites on BLM land in 2009. The MIM protocol was developed in response to recommendations from a study team examining the use of stubble height for managing riparian areas by federal agencies (University of Idaho Stubble Height Review Team 2004). The MIM protocol incorporates several existing procedures (e.g. greenline vegetation, pebble counts, stubble height) into a single method that yields statistically defendable results (Cowley and Burton 2005). This method is currently used to monitor impacts from livestock and other large herbivores on wadeable streams. MIM designated monitoring areas are selected to be representative of a larger stream reach that would be responsive to management changes or as a representative reference site. MIM surveys were conducted in 2009, 2012, and at 4 sites in 2016 (Figure 3). An additional MIM site was established in 2015 and surveyed once.

The MIM method includes protocols for measuring 10 indicators: three short term and seven long-term indicators. Some or all of these indicators may be measured dependent upon site potential and resource priorities. Indicators evaluate vegetation, bank condition, and instream characteristics. Monitoring values can be interpreted as a trend over time, in comparison to a reference site, or in relation to an established or agreed upon benchmark. Some benchmarks are set in the terms and conditions of allotments such as a 5-inch stubble height requirement for riparian areas on the New Canyon and Sage Creek allotments after livestock removal, while others such as fine sediment can be established based on departure from reference condition for sites in a similar ecoregion (Miller et al. 2014), and others such as bank stability and cover are based on best professional judgement. While not all allotments had a term and condition for stubble height, the 5 inch standard was used as a benchmark in all allotments (Table 6).

Table 6 shows the measurements of vegetation and streambank indicators, including riparian stubble height. In general these indicators were more stable, less altered, and more covered inside livestock grazing exclosures compared to outside. Riparian areas inside exclosures are in better condition than outside exclosures as seen by differences in stubble height, and bank stability, but riparian exclosures in the assessment area have not been perfect in eliminating the impact of livestock grazing. Riparian exclosures should not be assumed to represent undisturbed reference conditions. Due to their small size and impacts from upstream watershed uses, a direct comparison of data inside and outside exclosures may not be applicable – especially for in channel measurements (Sarr 2002).

Table 7 shows in channel measurements such as green line to green line width (GGW), percent fine sediment, and pools. These indicators are likely to be impacted by activities outside of exclosures and do not show clear differences between sites inside and outside of the exclosure. One of the largest changes occurred inside the exclosure on Randolph Creek where GGW

increased by more than five meters, a 370 percent increase, from 2009 to 2012. This change could have been influenced by peak runoff and sustained flow volumes that occurred in spring and summer of 2011, which had above-average precipitation based on the past 30 years of record (Utah Climate Center 2014).

In channel measurements of percent fine substrate, number of pools, and residual pool depth are important indicators for aquatic species habitat such as Bonneville cutthroat trout. Bonneville cutthroat trout prefer clean well sorted gravels for spawning with low levels of fine sediment and complex habitat with deep pools (UDWR 2000). Expected level of fine sediment will vary naturally based on geology and other geographic features. Separate guidelines have been developed by ecoregions. The area of these allotments is divided by two ecoregions with the boundary falling between upstream and downstream sites on Randolph and Big Creek. Reference sites in the Southern Rockies ecoregion have a lower percent of fine sediment. Since these streams are important habitat for Bonneville cutthroat trout which prefer less fine sediment, we are using the more conservative values of the Southern Rockies ecoregion for all sites except Sage Creek. For the Xeric-Eastern Plateau, for the percent of fine sediments, the least departure is <47 percent and most departure is >80 percent; for the Southern Rockies least departure is <24 percent and most departure is >44 percent.

Table 8 shows the percent woody species composition at each MIM site and the percent woody species use. Terms and conditions of the New Canyon and Sage Creek allotments specify a maximum willow use of 20 percent. Willows and all woody species are not common in the assessment area but occurrence and percent use is monitored during MIM surveys. Due to the low sample sizes, all woody species were evaluated, not only willow species. Note the low sample sizes.

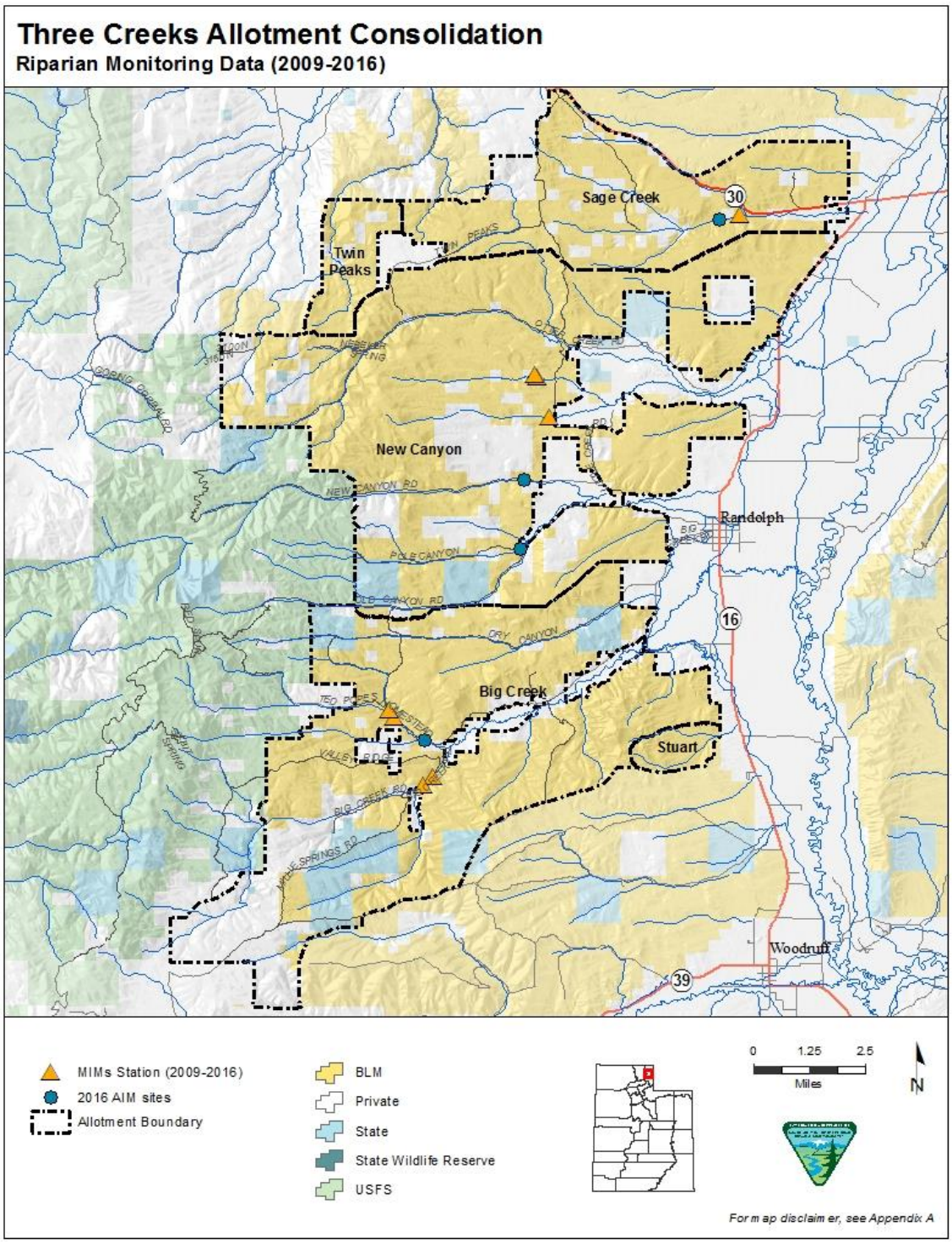

Figure 3. MIM and Aquatic AIM monitoring sites (2009-2016)

Table 6. Multiple Indicator Monitoring data on stream bank alteration and cover.

		Stubble Height (in)	Streambank alteration (%)	Streambank Cover (%)	Streambank Stability (%)
Stream	**Year**	**Avg.**	**Avg.**	**Avg.**	**Avg.**
Big Creek (exclosure)	2009	30.7[a]	0	100[a]	100[a]
	2012	10.4[a]	28	92.0[a]	65.0[b]
	2016	10.3[a]	13	92[a]	83[a]
Big Creek	2009	2.4[c]	50	72.0[b]	68.0[b]
	2012	3.7[c]	53	82.0[a]	63.0[b]
	2016	2.8[c]	69	72[b]	45[c]
Middle Fork Otter Creek (exclosure)	2009	13.2[a]	4	96.0[a]	97.0[a]
	2012	17.3[a]	16	99.0[a]	58.0[c]
Middle Fork Otter Creek	2009	3.7[c]	46	81.0[a]	78.0[b]
	2012	4.6[b]	43	75.0[b]	57.0[c]
Randolph Creek (exclosure)	2009	17.5[a]	0	98.0[a]	98.0[a]
	2012	20.6[a]	9	93.0[a]	82.0[a]
	2016	16.8[a]	0	98[a]	91[a]
Randolph Creek	2009	2.5[c]	58	94.0[a]	81.0[a]
	2012	3.1[c]	41	95.0[a]	60.0[c]
	2016	3.6[c]	51	83[a]	76[b]
Sage Creek	2015	1.9[c]	76	90[a]	61[b]
South Fork Otter Creek	2009	5.8[b]	58	84.0[a]	80.0[a]
	2012	5.9[b]	34	83.0[a]	65.0[b]

Benchmarks for streambank stability and cover are based on professional judgment of: good >80 “a”, fair >60-<80”b”, and poor <60% “c” (Miller et al 2014).

Benchmarks for stubble height are as follows: good “a” is greater than 5 inch stubble height, fair “b” is when confidence interval overlaps 5 inch stubble height, poor “c” is when 5 inch stubble height not met.

Table 7. In channel measurements from Multiple Indicator Monitoring.

		Greenline -Greenline Width (m)	Substrate - fine sediments (%) (<6mm)	Pool frequency (#/mi)	Residual pool depth (m)
Stream	**Year**	**Avg.**	**Avg.**	**Avg.**	**Avg.**
Big Creek (exclosure)	2009	2.78	55[c]		
	2012	3.06	55.0[c]	136.0	1.5
	2016	2.54	18[a]	156	.37
Big Creek	2009	4.35	39.0[b]		
	2012	5.13	42.0[b]	134.0	0.4
	2016	3.86	28[b]	140	.36
Middle Fork Otter Creek (exclosure)	2009	1.92	75.0[c]		
	2012	2.03	50.0[c]	134.0	0.6
Middle Fork Otter Creek	2009	3.21	32.0[b]		
	2012	3.84	59.0[c]	92.0	0.5
Randolph Creek (exclosure)	2009	1.45	68.0[c]		
	2012	7.29	31.0[b]	145.0	0.8
	2016	1.63	25[b]	152	.14
Randolph Creek	2009	2.61	39.0[b]		
	2012	2.73	36.0[b]	118.0	0.2
	2016	2.5	56[c]	132	.13
Sage Creek	2015	1.06	97[c]		
South Fork Otter Creek	2009	2.54	45.0[c]		
	2012	2.67	61.0[c]	206.0	0.3

Table 8. Percent woody species composition and use at Multiple Indicator Monitoring sites.

		% woody composition		% woody species use	
Site	**Year**	**n**	**Avg. (%)**	**n**	**Avg. (%)**
Big Creek (exclosure)	2009	4	4	4	12.5[a]
	2012	3	1	1	30[c]
	2016	10	5	45	54[c]
Big Creek	2009	0	n/a	0	n/a
	2012	0	n/a	3	70[c]
	2016	0	n/a	0	n/a
Middle Fork Otter Creek (exclosure)	2009	9	6	0	n/a
	2012	16	9	0	n/a
Middle Fork Otter Creek	2009	9	6	0	n/a
	2012	25	13	3	10[a]
Randolph Creek (exclosure)	2009	0	n/a	0	n/a
	2012	5	3	3	10[a]
	2016	3	2	0	n/a
Randolph Creek	2009	6	5	0	n/a
	2012	2	1	0	n/a
	2016	9	3	0	n/a
Sage Creek	2015	0	n/a	0	n/a
South Fork Otter Creek	2009	12	7	0	n/a
	2012	24	12	8	42[c]
"a" refers to %woody use less than 20%. "c" refers to %woody use greater than 20%.					

<u>Aquatic Assessment, Inventory, and Monitoring (AIM) Strategy</u>

The aquatic AIM strategy data utilize a set of standardized, core quantitative indicators and methods with a statistically valid, randomized, sampling design. Factors that are monitored include: bank cover and stability, macroinvertebrate community, water quality, and substrate.

These data can be interpreted as a trend over time, in comparison to a reference site, or in relation to an established or agreed upon benchmark.

The first year of aquatic AIM monitoring in the Salt Lake Field Office was completed in 2016. In the assessment area, four sites were sampled using AIM protocols (random) and an additional four established MIM sites were monitored using both MIM and AIM protocols (Table 9). Reference conditions were derived from the Southern Rockies and Eastern Xeric ecoregions. For drainages that occur in both ecoregions, the reference conditions for the Southern Rockies ecoregion was used as the standard, which has lower levels of fine sediment and greater vegetative cover than the Eastern Xeric, to accommodate current or potential use of the area by Bonneville cutthroat trout. Sage Creek is entirely within the Eastern Xeric ecoregion so this ecoregion was used as the standard for this site. Table 9 summarizes condition assessments of streams based on these aquatic AIM data.

Table 9. Aquatic AIM data and condition assessment in the assessment area.

Allotment	Stream name	Site Type	Overhead Cover %	Bank Overhead Cover (%)	Fine Sediments (%) (≤2mm)	Bank Cover (%)	Bank Stability (%)	Condition Assessment
Big Creek	Randolph Creek	MIM/AIM	0.9[c]	7.8[c]	53.5[c]	56[c]	38[c]	Function at Risk
Big Creek	Randolph Creek	AIM	1.9[c]	40.4[c]	32.9[b]	78[b]	19[c]	Not-Functioning
Big Creek	Randolph Creek Exclosure	MIM/AIM	27.7[b]	72.7[a]	22.2[a]	94[a]	81[a]	Proper Functioning Condition
Big Creek	Big Creek	MIM/AIM	0[c]	1.6[c]	24.6[b]	67[c]	18[c]	Not-Functioning
Big Creek	Big Creek Exclosure	MIM/AIM	4.5[c]	55.6[b]	17.4[a]	88[a]	75[b]	Proper Functioning Condition
New Canyon	New Canyon Creek	AIM	21.9[b]	49.5[c]	28.4[b]	55[c]	38[c]	Function at Risk
New Canyon	Little Creek	AIM	2.4[c]	10.2[c]	59[c]	61[c]	50[c]	Function at Risk
Sage Creek	Sage Creek	AIM	2.3[c]	14.4[c]	99.5[c]	21[c]	12[c]	Not-Functioning

"a" refers to indicators that are meeting benchmark conditions, "b" refers to indicators with moderate departure from benchmark conditions, "c" refers to indicators with significant departure from reference conditions.

Summary

In summary, the BLM assessed both lentic and lotic sites in the assessment area. These data were reviewed and discussed by the BLM interdisciplinary (ID) team to assess the condition of the riparian areas.

Lentic sites showed a small fraction as functioning at risk or non-functioning (Table 10). The lentic areas evaluated were found to have stable banks, appropriate width to depth ratio, and gradient appropriate for the stream channels.

Lotic sites showed several sites as functioning at risk or non-functioning, while sites inside of exclosures exhibited characteristics of properly functioning condition (Table 9). Sites that were found to be functioning at risk had more indicators in the moderate departure category or were closer to moderate departure than those that were found to be not functioning, which had more indicators well into the significant departure category. Condition of monitoring sites within the allotments were extrapolated to stream miles and miles within exclosures to calculate an allotment-scale condition (Table 11).

Table 10. Condition assessment for lentic sites in the assessment area.

Allotment	Acres of Lentic Sites (total of 29.6 acres)	% Proper Functioning Condition	% Functioning At Risk	% Not Functioning
Big Creek	17.7	99	1	0
New Canyon	9.2	99	1	0
Sage Creek	1.7	100	0	0
Twin Peaks	1	100	0	0
Stuart	0	-	-	-

Table 11. Condition assessment for lotic sites within the assessment area.

Allotment	Miles of Lotic Sites (total of 16.9 miles)	% Proper Functioning Condition	% Functioning At Risk	% Not Functioning
Big Creek	4.4	61	13	26
New Canyon	8.0	35	65	0
Sage Creek	3.3	0	0	100
Twin Peaks	1.2	100	0	0
Stuart	0	-	-	-

Water Quality Monitoring

The Utah 2014 Integrated Report (IR) lists the impaired (Category 5) water bodies in Utah (Utah DWQ 2014b). The Utah Department of Water Quality (DWQ) assesses their designated monitoring sites every 5 years by collecting samples at designated monitoring sites at least monthly during the year. Water samples are measured at the waterbody and also taken back to the lab for chemical testing. If more than 20% of samples at any site exceed the beneficial use standard the waterbody is considered impaired. Four water bodies in the assessment area are on the list, including Sage Creek, North Fork Sage Creek, Big Creek, and Randolph Creek (Figure 4). All four streams are considered impaired from *Escherichia coli* (*E. coli*). The lower segments of Big Creek and Sage Creek are impaired due to high temperature. The lower segment of Big Creek is also impaired from high levels of Total Dissolved Solids (TDS). The standard for each parameter and the beneficial use protected by the standard is shown in Table 12. The 2014 IR also includes a list of water bodies that are fully supporting all beneficial uses. Otter Creek and tributaries show no evidence of water quality impairment.

Table 12. Beneficial use and associated water quality standards for impaired waterbodies located in the assessment area.

Name	Pollutant of Concern	Beneficial Use Class	Standard / Indicator Value
North Fork Sage Creek	*E. coli*	2B – Secondary Contact Recreational Use	*E. coli* (max) ≤ 668 no./100 ml *E. coli* (30-day)$_1$ ≤ 206
Sage Creek (above NF Sage)	*E. coli*	2B – Secondary Contact Recreational Use	*E. coli* (max) ≤ 668 no./100 ml *E. coli* (30-day)$_1$ ≤ 206
Sage Creek (below NF)	Temp.	3A – Cold Water Aquatic Life	Temperature ≤ 20 ºC
Randolph Creek	*E. coli*	2B – Secondary Contact Recreational Use	*E. coli* (max) ≤ 668 no./100 ml *E. coli* (30-day)* ≤ 206
Big Creek (above Randolph Ck)	*E. coli*	2B – Secondary Contact Recreational Use	*E. coli* (max) ≤ 668 no./100 ml *E. coli* (30-day)$_1$ ≤ 206
Big Creek (below Hwy 16)	Temp. TDS pH	3A – Cold Water Aquatic Life 4 – Agriculture	Temperature ≤ 20 ºC Total Dissolved Solids ≤ 1,200 pH = 6.5 – 9.0
* E. coli 5-sample 30-day geometric mean ≤ 206			

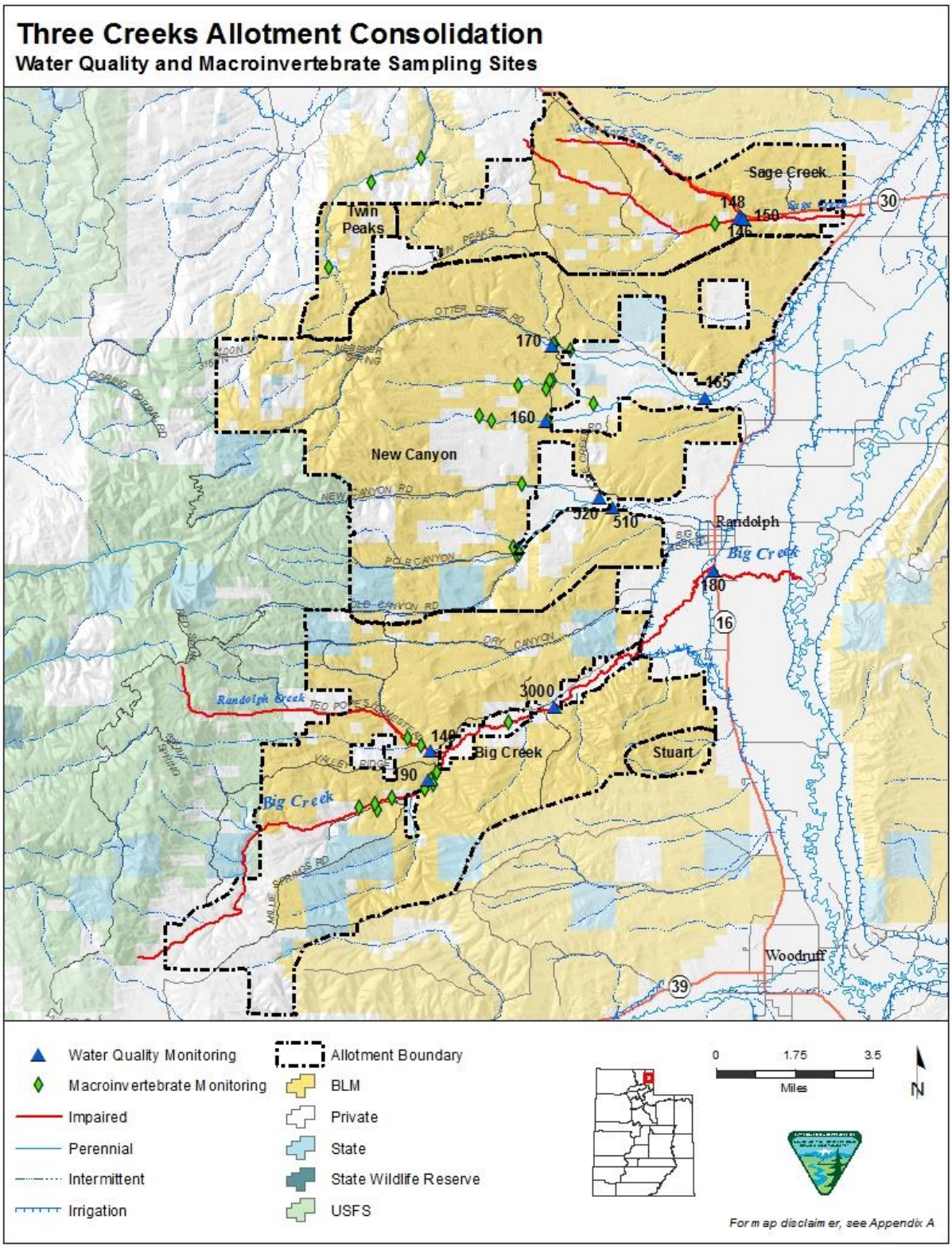

Figure 4. Water quality and macroinvertebrate monitoring sites in the assessment area.

Desired Animal Species' Occurrences

Desired animal species include threatened or endangered species (U.S. Fish and Wildlife-designated), species of special concern (BLM-designated), and other sensitive species (State of Utah-designated). The most recent listing Utah BLM State Sensitive species is IM UT-2011-037 (BLM 2011). The BLM special status species potentially occurring in the allotments are listed in Table 13, including a professional assessment of the suitability of the species' habitat and appropriate references.

Table 13. BLM Special Status Animal Species Potentially Occurring in the Allotments.

Species	Status	Comments
Birds		
Ferruginous hawk *Buteo regalis*	SENS	This species is known to occur in the assessment area and suitable habitat is present.[3 4 7 8 9]
Greater sage-grouse *Centrocercus urophasianus*	SENS	This species has been documented in the assessment area.[7 9] More discussion for this species is included in text below.
Long-billed curlew *Numenius americanus*	SENS	This species is known to occur in the vicinity of in the assessment area, but habitat within the assessment area is marginal due to the limited amount of open short grass habitat.[1 3 7 9]
Burrowing owl *Athene cunicularia*	SENS	This species is known to occur near the assessment area and suitable habitat is present.[3 7 8 9]
Lewis's woodpecker *Melanerpes lewis*	SENS	This species is known to occur near the assessment area and suitable habitat is present.[3 7 9]
Grasshopper sparrow *Ammodramus savannarum*	SENS	This species is known to occur near the assessment area and suitable habitat is present.[1 3 7 9]
Mammals		
Pygmy rabbit *Brachylagus idahoensis*	SENS	This species is known to occur in the assessment area. Suitable habitat is present.[7]
Canada lynx *Lynx canadensis*	Federally Threaten	The assessment area is mapped as "unoccupied" lynx habitat, but considered as "linkage area" for lynx. Lynx

Species	Status	Comments
	ed	from Colorado with GPS tracking collars have been documented in Utah. No Lynx Analysis Units (LAU) or critical habitat is designated within the assessment area.
North American wolverine *Gulo gulo*	Proposed Threatened	There are records for this species in Cache and Rich Counties and limited suitable habitat exists in higher elevation areas in the assessment area.[1]
White-tailed prairie dog *Cynomys leucurus*	SENS	This species is known to occur in the assessment area[7] and suitable habitat is present.
Fish		
Bonneville cutthroat trout *Oncorhynchus clarki utah*	SENS	There is suitable habitat for and the subspecies is known to occur in the assessment area.[7]
Northern leatherside chub *Lepidomeda copei*	SENS	The Upper Bear River Watershed is within the current and historic range of Northern leatherside chub.[11] There are no historic records within the assessment area, but there is suitable habitat for the species and it will be introduced to the Otter Creek Drainage as part of the Bonneville cutthroat trout restoration work.[12]

[1] NatureServe, www.natureserve.org.
[3] Sullivan *et al*, 2009, eBird, www.ebird.org.
[4] RINS data
[5] BatBase data
[6] Wolves in Utah, http://wildlife.utah.gov/wolf/
[7] Utah Conservation Data Center, http://dwrcdc.nr.utah.gov/ucdc/default.asp
[8] Birds of North America, http://bna.birds.cornell.edu/bna
[9] Sauer, *et al*. 2015.
[11]UDWR 2009
[12]USFWS 2012

Sage Grouse

The Utah Division of Wildlife Resources (UDWR) conducts annual, or nearly annual, counts of male attendance at leks. The Rich-Summit-Morgan sage-grouse population that includes the assessment area is one of the largest in Utah. A total of 78 leks are included in counts in the population area. Total of number of males counted ranged from 443 to 1,719 between 2004 and 2016 (producing an estimated population size of about 1,700 to 6,900). The average number of males per lek (for the leks with males present) ranged from 16 to 45 between 2004 and 2016

(UDWR 2017). The population appears to be stable (lambda calculations from 2014-2016 ranged from 0.90-1.26; that is, some years had a slight population decrease and some years had a strong population increase (methods described in BLM/Forest Service 2015)).

Eight of these leks are within the assessment area and an additional four leks are near the assessment area. Total of number of males counted ranged from 18 to 180 between 2004 and 2016 (producing an estimated population size of about 72 to 720). The average number of males per lek (for the leks with males present) ranged from 9 to 45 between 2004 and 2016 (UDWR 2017).

Additionally, as part of this rangeland health assessment effort, a habitat assessment for greater sage-grouse was conducted in accordance with BLM Instruction Memorandum No.2016-144 (BLM 2016b) and the Utah Approved Resource Management Plan Amendment for greater sage-grouse (ARMPA; BLM 2015). That report (BLM 2017) was used to inform land health standards in this document. The habitat assessment found that the habitat in the assessment area is suitable for greater sage-grouse at the mid-scale and fine-scale, however only marginal at the site-scale, due to the condition of brood-rearing/summer habitat (specifically, lotic riparian areas and total shrub canopy cover).

Supplementary Information

Two additional data sets were collected on the allotments in the assessment area. While these data are not directly related to indicators for land health standards, it is used in the rangeland health determination to assist in determining causal factors that may attribute to land health standards not being met.

Utilization

Utilization is a measure of the amount of annual vegetation production that was removed or destroyed, as measured at the end of the growing season; the BLM used the *Key Forage Plant Method* (Coulloudon et al. 1996b). Utilization provides data to assess Utah Rangeland Health Standards 1 and 3.

The BLM assessed the utilization on some or all of the allotments in the assessment area in 2003, 2008, 2009, and 2012. To do so, the BLM categorizes utilization for the key forage species as the percent of the annual production which has been grazed (Table 14). The key forage species are typically perennial grasses and forbs, though grasses only have been used when forbs are not abundant enough to adequately represent utilization. The term and condition of the existing grazing permits specify that utilization of key herbaceous forage species in uplands will not exceed 50 percent of the current year's growth.

Since 2003, the average upland utilization of key forage species has never exceeded 'light' levels and has always been below the 50 percent utilization standard for these five allotments. Table 15 shows a summary of utilization by year by allotment. As 2012 was a drier-than-average year, livestock were removed from the allotments in mid-August rather than mid-September.

Recognizing that utilization of key forage species would likely be higher in areas favored by livestock, the BLM constructed use pattern maps for the Big Creek, New Canyon, and Sage Creek allotments in 2009. The use pattern maps were made by sampling the utilization of key

forage species at more points across the allotments, and then creating polygons for the different utilization levels. This data show elevated utilization in riparian areas. This process identified areas where utilization was occurring at higher amounts and allow for a summation of utilization levels across the allotments (Table 16). The BLM did not create use-pattern maps for the Twin Peaks or Stuart allotments, but it is anticipated that a similar pattern showing elevated utilization in riparian areas with less use in upland areas would exist. Additional use patterns have been measured by placing GPS collars on cattle (UDAF 2012, UDAF 2013, UDAF 2014).

Table 14. Utilization classes and corresponding percentages and descriptions (per Coulloudon et al. 1996b).

Class	Percent Use	Description
None	0-5	Key species show no use or negligible use.
Slight	6-20	Key species has the appearance of being very lightly grazed. The plants may be topped or lightly used, with little disturbance to current seedstalks and young plants.
Light	21-40	Key species may be topped, skimmed or grazed in patches. Between 60 and 80 percent of current seedstalks remain and most young plants are not damaged.
Moderate	41-60	Key species show that approximately half of the available forage has been utilized. Between 15 and 25 percent of current seedstalks remain intact.
Heavy	61-80	Key species show that more than half of the available forage has been utilized. Less than 10 percent of current seedstalks remain intact and the shoots of rhizomatous grasses are missing.
Severe	81-94	Key species appears to have been heavily utilized with indications of repeated defoliation. No evidence of key species reproduction or no current seedstalks remaining.
Extreme	95-100	The key species appears to have been completely utilized and remaining stubble has been utilized to the soil surface.

Table 15. Average key forage species utilization level on allotments and corresponding precipitation data for the analysis area.

	2003	2008	2009	2012
Big Creek (% utilization)	--	26	19	18
New Canyon (% utilization)	--	33	23	21
Sage Creek (% utilization)	27	30	22	22

Stuart (% utilization)	--	--	8	19
Twin Peaks (% utilization)	--	--	5	16
Observer Annual Precip. (inches) (WRCC 2017)	13.0	11.25	13.19	9.67
Long-Term Average Precip. (inches) (WRCC 2017)	13.35	13.35	13.35	13.35

Table 16. Utilization levels in Big Creek, New Canyon, and Sage Creek allotments in 2009.

Utilization Class	Acres	Percent of Surveyed Area
None	1,346	1.5
Slight	36,151	41.1
Light	37,793	42.9
Moderate	9,272	10.5
Heavy	3,883	3.9
Severe	81	0.1

Actual and Billed Grazing Use

Under the method of stocking and monitoring, actual use data (i.e., livestock numbers and grazing date ranges converted to AUMs) over several years are coupled with utilization and weather data. When actual use data is not available, the number of billed AUMs is used as a substitute. In the years between 2004 and 2013, the actual use on BLM allotments has ranged from a low of 10,447 AUMs in 2012 to a high of 13,557 AUMs in 2009 (Table 17).

Table 17. Actual or billed use (AUMs) on BLM and Forest Service allotments in the assessment area from 2004-2013.

Allotment	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Big Creek	4,696	4,014	4,991	5,003	4,979	5,005	3,759	4,901	3,316	3,315
New Canyon	6,325	6,616	6,094	6,219	6,335	6,277	7,093	6,128	5,416	5,694
Sage Creek	1,467	1,472	1,512	1,482	1,481	1,482	1,449	1,349	1,373	1,361
Stuart	106	106	106	106	106	106	85	106	94	106
Twin Peaks	411	475	491	714	427	687	436	497	248	286
Total	13,005	12,683	13,194	13,524	13,328	13,557	12,822	12,981	10,447	10,762

3. Evaluation of Standards

Standard 1

Upland soils exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform.

Resource Conditions Meet the Standard?

Big Creek Allotment: Yes

New Canyon Allotment: Yes

Sage Creek Allotment: Yes

Stuart Allotment: Yes

Twin Peaks Allotment: Yes

Rationale

Data used to evaluate this standard were: 2007-2008 upland ESI/IIRH/Observed Apparent Trend, 2009 and 2012 upland trend, 2012 soil stability, and 2016 terrestrial AIM.

Sufficient cover and litter to protect the soil surface from erosion, promote infiltration, detain surface flow, and retard soil moisture were shown to exist in the allotments from data collected under a variety of protocols, including IIRH, upland trend, observed apparent trend, and terrestrial AIM.

No data sets showed excessive erosion, such as rills, soil pedestals, or actively eroding gullies. Furthermore, the soil stability condition class for all 21 sites scored within the expected ranges, as indicated by the site's ecological site descriptions, and shows that soil structural integrity is resistant to surface disturbance. Given the ecological site descriptions for these locations these sites are considered to be within the range of being stable.

The data sets show that the allotments have an appropriate amount, type, and distribution of vegetation. For example, the ecological site inventory data show that the vegetation in the allotments are at a variety of seral stages, allowing for a dynamic and diverse ecological community. Similarly, terrestrial AIM data show that soil is stable and there is sufficient amounts and the types of vegetation.

Considering the assessment of data, and the indicators included in the Utah Rangeland Health Standards, the BLM evaluated that this standard was met for every allotment.

Standard 2

Riparian and wetland areas are in properly functioning condition. Stream channel morphology and functions are appropriate to soil type, climate and landform.

Resource Conditions Meet the Standard?

Big Creek Allotment: No

New Canyon Allotment: No

Sage Creek Allotment: No

Stuart Allotment: Not applicable (no riparian/wetlands areas)

Twin Peaks Allotment: Yes

Rationale

Data collected on these allotments that pertain to this standard includes: 2007-2008 PFC, 2009, 2012, 2015, and 2016 MIM, and 2016 Aquatic AIM.

PFC data were collected in 2007-2008 to assess riparian areas. Following this data collection, the BLM recognized that lotic riparian system needed additional quantitative data to be collected to better understand the condition of the riparian habitat. Therefore, riparian areas were assessed by MIM and/or aquatic AIM protocols in 2009, 2012, 2015, and 2016. Conditions appear to have changed over time.

Generally, the data showed that lentic sites were in properly functioning condition across the allotments, while lotic sites outside of livestock grazing exclosures were functioning at risk or not-functioning in Big Creek, New Canyon, and Sage Creek allotments. Lotic sites inside of exclosures exhibited characteristics of properly functioning condition. For lotic sites in Big Creek, New Canyon, and Sage Creek allotments, streambank vegetation cover to protect stream banks, capture sediment, and provide for groundwater recharge, and to maintain soil moisture, habitat needs, etc. was shown by aquatic AIM data (outside of exclosures) to be highly departed from reference conditions. MIM data in these allotments showed that stubble height measurements in riparian areas were typically not meeting the five-inch stubble height benchmark standard. MIM data also indicated that the limited woody species in some riparian area were being over-utilized. These data suggest a lack of appropriate vegetation.

Furthermore, MIM data showed that fine sediment conditions were moderately-to-highly departed from reference conditions in Big Creek, New Canyon, and Sage Creek allotments, which indicates soils are eroding more than desired. Aquatic AIM data showed similar fine sediment conditions. Both MIM data and aquatic AIM data showed that bank stability was also lower than reference conditions in in Big Creek, New Canyon, and Sage Creek allotments.

Data regarding in-channel measurements for streams in Big Creek, New Canyon, and Sage Creek allotments show, for example, reduced pool frequency compared to expected amounts.

Considering the assessment of data, and the indicators included in the Utah Rangeland Health Standards, the BLM evaluated that this standard was not met for Big Creek, New Canyon, and Sage Creek allotments due to the condition of lotic sites. The BLM evaluated that this standard was met for Twin Peaks allotment. As the Stuart allotment has no riparian or wetlands area, this standard is not applicable for this allotment.

Standard 3

Desired species, including native, threatened, endangered, and special-status species, are maintained at a level appropriate for the site and species involved.

Resource Conditions Meet the Standard?

Big Creek Allotment: No

New Canyon Allotment: No

Sage Creek Allotment: No

Stuart Allotment: No

Twin Peaks Allotment: No

Rationale

Most desired species in the assessment area appear to be maintained at a level appropriate for the species involved, according to known and predicted species occurrences and with consideration of the habitat conditions based from on vegetation data collection protocols, such as Interpreting Indicators of Rangeland Health, upland trend, and terrestrial AIM.

For greater sage-grouse specifically, the population that includes the assessment area appears to be maintained at a level appropriate for the area. The Rich-Summit-Morgan sage-grouse population that includes the assessment area is one of the largest in Utah. A total of 78 leks are included in counts in the population area. Total number of males counted ranged from 443 to 1,719 between 2004 and 2016 (producing an estimated population size of about 1,700 to 6,900). The average number of males per lek (for the leks with males present) ranged from 16 to 45 between 2004 and 2016 (UDWR 2017). The population appears to be stable.

Additionally, as part of this rangeland health assessment, a habitat assessment for greater sage-grouse was conducted in accordance with BLM Instruction Memorandum No.2016-144 (BLM 2016b; BLM 2017) and the Utah Approved Resource Management Plan Amendment for greater sage-grouse (ARMPA; BLM 2015).

The habitat assessment found that the habitat in the assessment area is suitable for greater sage-grouse at the mid-scale and fine-scale. At the site-scale, the habitat assessment found that breeding/nesting and winter habitat meet the ARMPA's habitat objectives and the BLM found these seasonal habitats to be suitable for greater sage-grouse (BLM 2017). However, conditions in the assessment area, at the site-scale, for brood-rearing/summer habitat do not meet two of the ARMPA's habitat objective: 1) riparian areas/mesic meadow are in proper functioning condition; and 2) percent shrub cover is 10-25%. Therefore, the BLM found brood-rearing/summer habitat to be marginal for greater sage-grouse (BLM 2017).

For the riparian area habitat objective, the BLM rated the Big Creek, New Canyon, and Sage Creek allotments as not being in proper functioning condition (see Standard 2). More specific to greater sage-grouse brood-rearing/summer habitat, the BLM found that lotic sites in the assessment area's brood-rearing/summer habitat are unsuitable for greater sage-grouse (BLM

2017). For the shrub cover habitat objective, monitoring data collected in the assessment area's brood-rearing/summer habitat showed that shrub cover, at 30.5-41.5%, is over the objective of 10-25%, and therefore is considered marginal for greater sage-grouse (BLM 2017).

Considering the assessment of data, and the indicators included in the Utah Rangeland Health Standards, the BLM evaluated that this standard was not met for every allotment due to the condition of greater sage-grouse habitat, specifically site-scale brood-rearing/summer habitat, while recognizing that the population itself appears to be stable.

Standard 4

The BLM will apply and comply with water quality standards established by the state of Utah (R.317-2) and the Federal Clean Water and Safe Drinking Water Acts. Activities on BLM lands will fully support the designated beneficial uses described in the Utah Water Quality Standards (R.317-2) for surface and groundwater.

Resource Conditions Meet the Standard?

Big Creek Allotment: No

New Canyon Allotment: Yes

Sage Creek Allotment: No

Stuart Allotment: Not applicable (no riparian/wetlands areas)

Twin Peaks Allotment: Yes

Rationale

The following streams within these allotments are evaluated, with consideration to the water quality standards for their State of Utah designated beneficial use (Utah DWQ 2014), as follows:

Big Creek Allotment: Big Creek and tributaries (including Randolph Creek): not meeting the total maximum daily load (TMDL) required for *E. coli* since 2014, pH since 2006, temperature since 2010, and total dissolved solids since 2014.

New Canyon Allotment: Little Creek and tributaries: insufficient data to evaluate; Otter Creek and tributaries: no evidence of impairment.

Sage Creek Allotment: Sage Creek and tributaries: not meeting the TMDL required for *E. coli* since 2014 and temperature since 2010.

Stuart Allotment: no riparian/wetlands areas.

Twin Peaks Allotment: Laketown Creek: insufficient data to evaluate.

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Appendix A – Map Disclaimer

The following disclaimers apply to all map figures in this document:

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