Eagle Creek Allotments

Apache-Sitgreaves National Forest

Existing Conditions - Range

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for:
Clifton Ranger District
Apache-Sitgreaves National Forests

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Table of Contents

Tables

Figures

Introduction

This report describes the existing conditions of the range resources for the AD Bar Hogtrail, Baseline-Horsesprings, Dark Canyon, Double Circle, East Eagle, Mesa, Mud Springs, and Tule grazing allotments. It also identifies desired conditions and potential management opportunities to help bridge the gap between existing conditions and desired conditions.

Precipitation data

When considering changes in vegetation it's necessary to look at the role of precipitation. This discussion is included here to help shape the vegetation discussion in the following sections.

The Eagle Creek allotments are located in an area that exhibits a bimodal precipitation pattern, with the amounts of cool season and warm season precipitation having varying effects on vegetation. Cool season or winter precipitation is considered to occur from October through May, while warm season or summer precipitation occurs from June through September. May precipitation is usually low and may contribute either to spring growth or summer growth but normally has the effect of extending spring growth and usually is followed by a dry, semi-dormant period in June. October precipitation may contribute to extended summer growth or regrowth on warm season grasses, especially in the pinyon-juniper cover type. It may also contribute to fall growth of cool season grasses and provide soil moisture that may carry through the winter. For purposes of analysis any month or other period with less than 75% of the long-term average can be considered as a dry period (SRM 1989) and any period with 125% or more of the long-term average can be considered as wet.

Figure 1 displays a summary of the yearly precipitation as recorded at the Trail Cabin RAWS station located on the Clifton Ranger District of the Apache – Sitgreaves National Forest. This station is the closest reliable station to AD Bar Hogtrail, Baseline-Horsesprings, Dark Canyon, Double Circles, Mesa, Mud Springs, and Tule allotments. The average annual precipitation (since 1996) is approximately 17 inches, as indicated with the orange horizontal line in the graph. For twelve of the past 24 years, the total yearly precipitation has been below average, while precipitation has been above average for twelve of the past 24 years. In 2001, 2002, and 2020 the yearly precipitation was less than 75% of the long-term average. In 2007, 2015 and 2016 the yearly precipitation was greater than 125% of the long-term average.

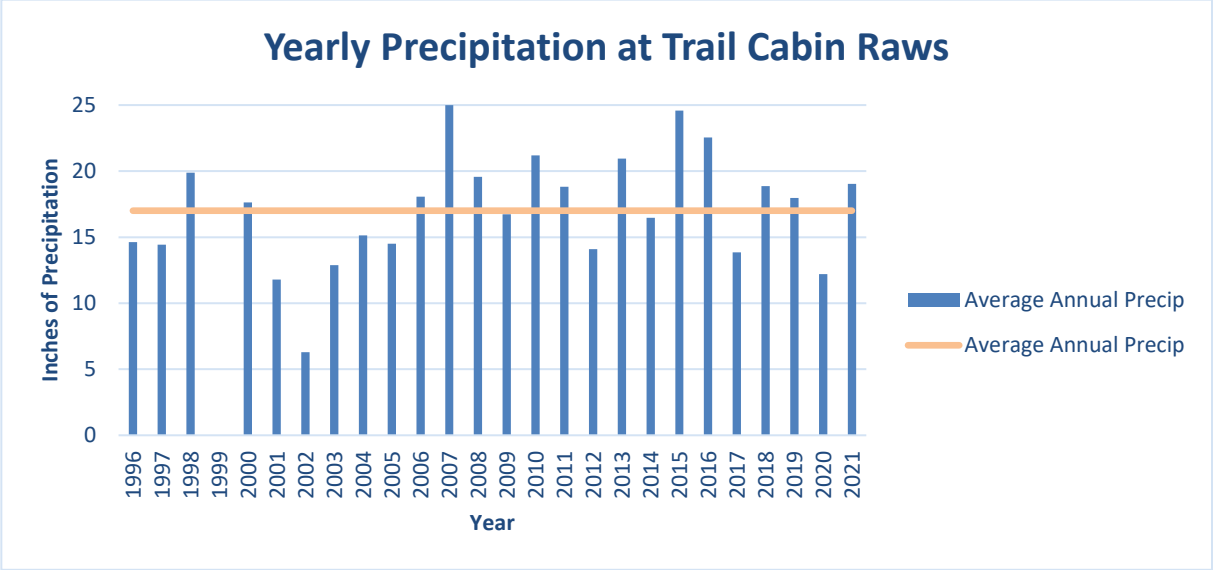

Figure 1. Yearly precipitation recorded at the Trail Cabin RAWS Station, 1996-2021

Figure 2 displays the warm and cool season precipitation totals as well as the yearly totals. Data was unavailable for 1999. It should be noted that only in 2007, 2008 and 2015 were the warm season precipitation and the cool season precipitation totals both greater than the long-term averages.

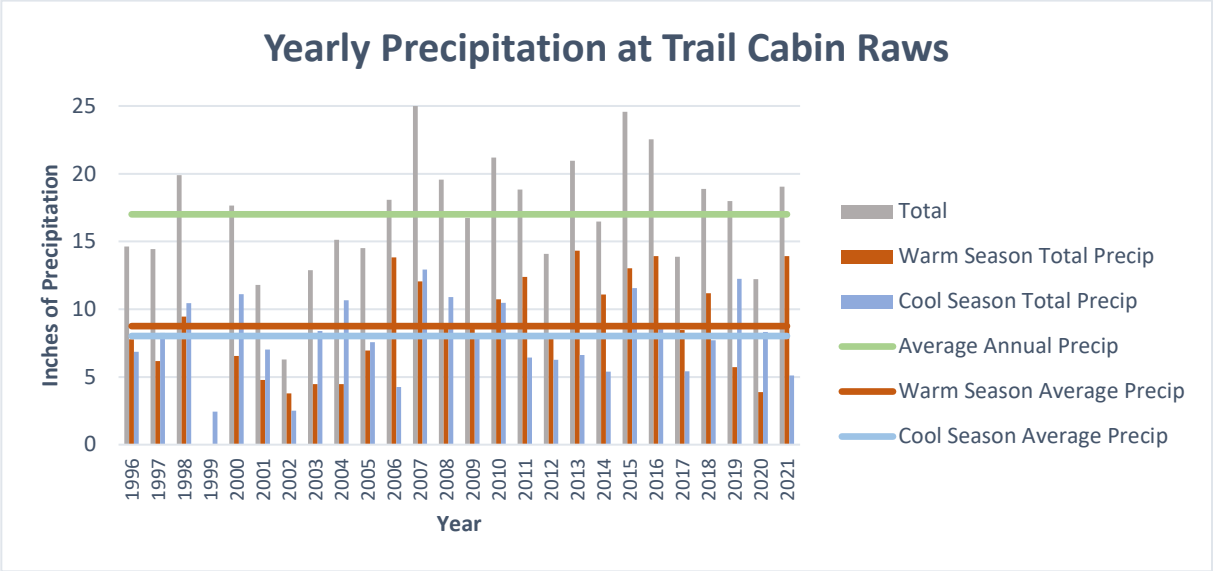

Figure 2. Warm and cool season precipitation totals, recorded at the Trail Cabin RAWS Station, 1996-2021

Figure 3 displays a summary of the yearly precipitation as recorded at the Stray Horse RAWS station located on the Clifton Ranger District of the Apache – Sitgreaves National Forest. This station is the closest reliable station to the East Eagle allotment. The average annual precipitation (since 2003) is approximately 21 inches, as indicated with the green horizontal line in the graph. For eight of the past 19 years, the total yearly precipitation has been below average, while precipitation has been above average for eleven of the past 19 years. In 2012 and 2020, the yearly precipitation was less than 75% of the long-term average. In 2008 the yearly precipitation was greater than 125% of the long-term average.

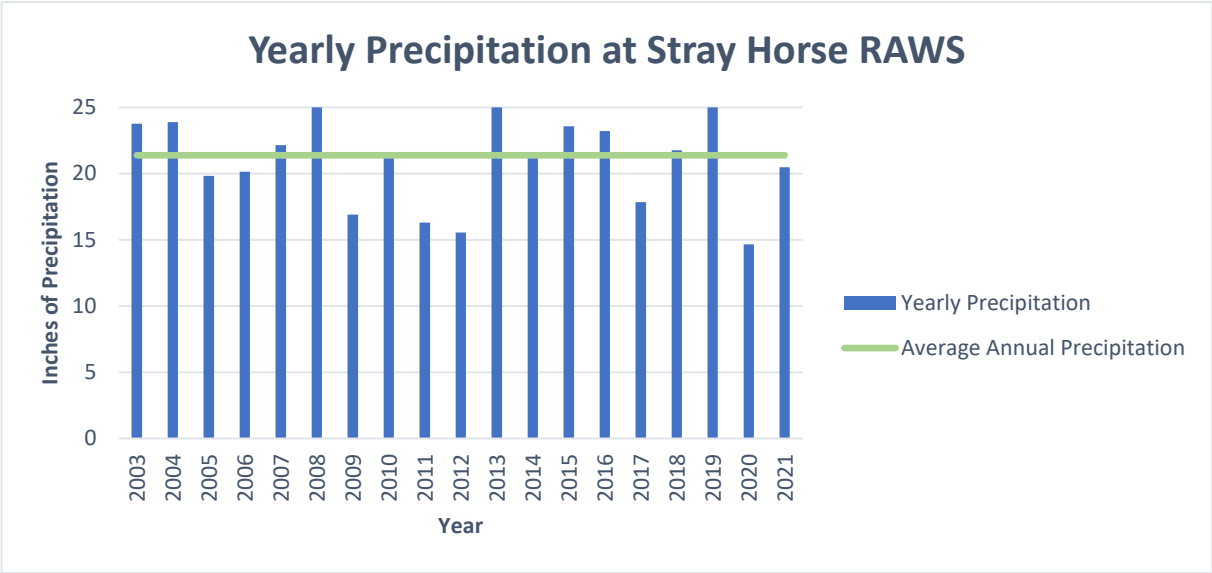

Figure 3. Yearly precipitation recorded at the Stray Horse RAWS Station, 2003-2021

Figure 4 displays the warm and cool season precipitation totals as well as the yearly totals. It should be noted that the only in 2016 were the warm season precipitation and the cool season precipitation totals both greater than the long-term averages.

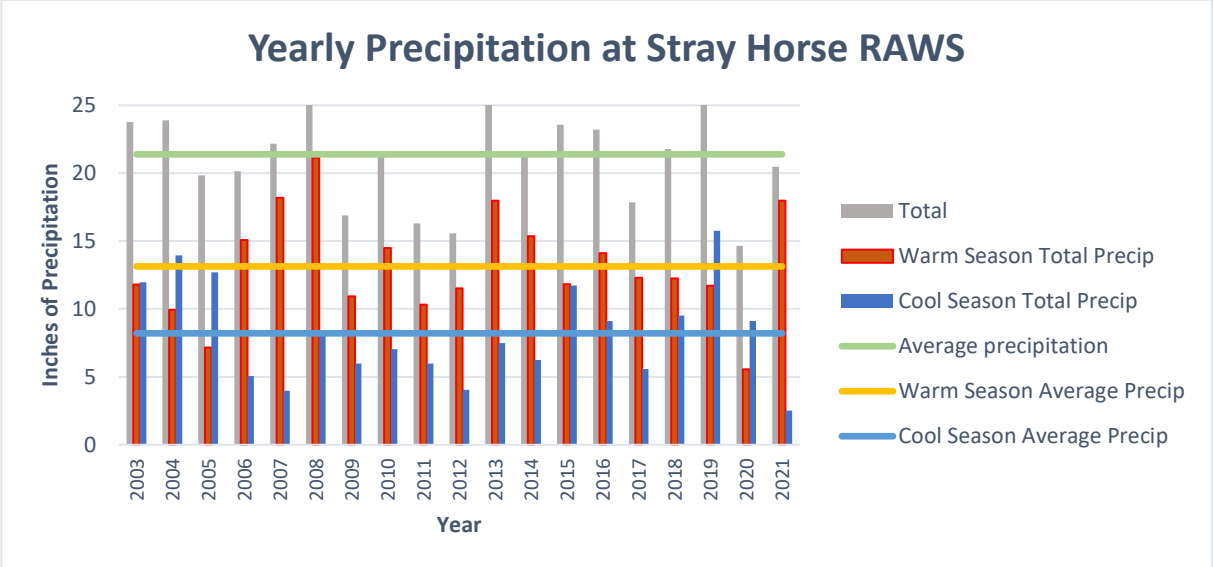

Figure 4. Warm and cool season precipitation totals, recorded at the Stray Horse RAWS Station, 2003-2021

Long-term monitoring data

Data collected at permanently established locations across grazing allotments help us identify changes in vegetative and soil stability conditions, as well as progress toward meeting resource or management objectives (trend). Throughout this document each cluster is referred to by its established cluster number (i.e. cluster 1 or simply C1) followed by the pasture name. Multiple attributes are measured along each transect using either the Parker 3-step protocol, dry-weight rank protocol and Daubenmire cover class protocol. Because these transects are permanently established the attributes can be measured repeatedly over time, documenting any changes. We can use the changes in these measured attributes to determine the trend towards or away from our desired conditions.

The Parker 3-step protocol was developed in 1948. The protocol includes not only a method to collect data but also a scoring technique for determining resource conditions. The scorecard component of the Parker 3-step protocol provides a vegetation score that is tied to a forage value. Plant species are grouped by their response to heavy grazing, i.e. 'decreasers' decrease under heavy grazing while 'increasers' increase under heavy grazing. It also provides a soil condition score tied to ground cover at each site. The calculated scores can be compared over the years to determine the vegetative trend (in terms of forage production) and soil trend for the area. Ruyle and Dyess (2010) point out that assumptions regarding plant dynamics and a reliance on subjective data weightings, as is done when assessing range condition using Parker data based on the scorecard approach, have limited value for present day management interpretation. They recommend using the data collected in terms of determining the species composition and site protection (based on ground cover) rather than relying on scores calculated from the data. To move towards a more contemporary view of vegetative conditions while maintaining the historical data set, the data collected with the Parker 3-step protocol are discussed here in terms of species composition rather than Parker 3-step scoring. When interpreting trend and drawing conclusions for resource conditions we use a preponderance of evidence approach, including changes in species composition, site protection attributes (ground cover), similarity to potential natural condition, weather data, and professional experience. Reference site ground cover percentages from the Apache-Sitgreaves Terrestrial Ecosystem Survey (TES) map unit narratives are displayed to compare existing conditions to map unit sites. It's important to note that reference conditions represent the existing conditions at a representative site at the time of the TES inventory, not necessarily the desired conditions. However, they are useful as a reference of site potential based on soil attributes.

When examining the changes in species composition we use the following general trend indicators:

- An increase in the percentage of undesirable species (such as a state-listed noxious weed) would indicate a move away from desired conditions or a downward trend; alternately, an increase in native, perennial vegetation may indicated an upward trend.
- An increase in species diversity indicates an upward trend, unless species diversity has increased due to an influx in annual weeds coupled with a loss of native perennial plants, which would indicate a downward trend.
- A sustained decrease in similarity to the Potential Natural Community (PNC) as described in the Terrestrial Ecosystem Survey may indicate a downward trend. Alternately, an increase in similarity to PNC may indicate an upward trend.

While the Parker 3-step scoring protocol includes assigning a 'range condition' based on the calculated score, it is now known that the traditional range condition model may incorrectly predict vegetation trajectory, resilience and resistance (Ruyle and Dyess 2010). Therefore a range condition has not been assigned here other than assessing if sites are meeting desired conditions. Instead a brief description of the species composition and the ground cover of each cluster site is included below.

To transition from the Parker protocol to a newer protocol, cover-frequency data were collected using Daubenmire frames for some sites. The cover-frequency data enable us to calculate the botanical composition for the site. Most recently, botanical composition has been recorded using the dry-weight rank method which estimates plant composition on a dry weight production basis. Not all species present at the cluster are displayed in the botanical composition summaries below. Species with a total composition less than 0.5% are not displayed as well as species that were not identified (listed as unknown) at the time of the survey.

Similarity indices were calculated at each cluster location using the description of potential natural communities (PNC) provided by the terrestrial ecosystem survey (TES) map unit narratives. By calculating the relative similarity of the existing plant community to that described as the potential natural community we can determine the current status of the plant community (as compared to the PNC). Table 1 displays the classes of similarity as identified in the Region 3 Rangeland Analysis and Management Training Guide (USDA FS 2013).

Table 1. Similarity status classes

Similarity index	Status class
67 - 100	high similarity
34 - 66	mid-similarity
0 - 33	low similarity

It's important to note that the desired plant community may or may not be the same as that described for PNC. A desired plant community must currently exist in the general area, and be capable of occupying the site within a reasonable time period, through management change. For example, many areas in Region 3 have converted from a bunchgrass PNC to a blue grama dominated community. These sites will not convert back to a bunchgrass community with grazing management alone. In such cases the PNC would not be considered the desired plant community as it would not be an attainable desired condition (USDA FS 2013). It is also important to note that cluster transects are generally located in areas most sensitive to changes in management and representative of capable grazing land within the allotment. These areas generally have less tree and shrub cover than described in the TES map unit potential natural community narratives. For this reason, tree cover was not incorporated into the similarity indices calculations. Species comprising less than 0.5% of the botanical composition were not included in the tables below but were used to calculate similarity indices.

Utilization monitoring data

It is well-accepted that long term excessive grazing pressure (over-stocking) can have adverse effects on vegetation and soils. To prevent excessive grazing pressure and ensure proper stocking, range managers monitor forage utilization levels. This monitoring helps managers identify management problems and make short-term management decisions. Utilization monitoring is also helpful when establishing cause and effect for long-term trends in other attributes.

We will use utilization monitoring data as one indicator of the capacity of the allotment. The Region 3 supplement to Forest Service Handbook 2209.13 Chapter 90 (USDA FS 2016) states:

> *Capacity can be estimated during the Plan-to-Project analysis and adjusted adaptively with a stock and monitor approach. "The stock and monitor approach involves measuring the effects of actual stocking levels over time (either short-term or long-term) on utilization and utilization patterns, composition of vegetation, vigor, soil cover, and other factors (including wildlife) to see if changes in stocking and/or management are needed.…The stock and monitor approach is recommended for establishing proper livestock stocking rates on grazing allotments. It is adaptive management i.e. continually reviewing and revising as necessary to*

meet changes in weather or other environmental factors as well as changes in management objectives. Utilization data can guide stocking when combined with other data or observations that indicate a change either up or down is probably needed." (Smith et al. 2012).

Smith and others (2012) also state that the stock and monitor approach is recognized as sounder than the forage inventory and allocation approach to grazing capacity estimation.

Utilization monitoring occurs in key areas but may also occur outside of key areas. A key area is a portion of rangeland selected as a monitoring site because of its location, use or grazing value. Key areas are usually ¼ to 1 mile from water, located on productive soils on level to intermediate slopes where prescribed use will occur first. They are five acres or more in size. Properly selected key areas will reflect the overall acceptability of current management. Currently the key areas in the allotment are at the long-term monitoring cluster locations. Over time, changes in resource conditions or management may result in changes in livestock use patterns. As livestock use patterns change, new key areas may be established, and existing key areas may be modified or abandoned in cooperation with the permittees

Allowable use of forage is based on the amount and kind of forage on the allotment, plant needs, range condition, trend, and grazing management strategy. Duration, frequency, and timing may be manipulated within the grazing schedule to meet allowable use standards. The allowable use levels for this allotment are established for key areas and key species by pasture for the time period livestock are in a pasture. The use on key species in key areas will ultimately determine the length of the grazing period in each pasture.

AD Bar Hogtrail

The AD Bar Hogtrail allotment is a large allotment located approximately 20 miles north of Clifton, Arizona on the Clifton Ranger District, Apache-Sitgreaves National Forest. The allotment is split by the Coronado Scenic Byway which runs north to south through the allotment. The AD Bar Hogtrail allotment is comprised of five large pastures and numerous smaller pastures, corrals, and traps. Vegetation is predominantly pinyon/juniper woodlands and oak/pinyon/juniper woodlands with an understory of grama grasses. The allotment is characterized by steep terrain with numerous drainages including Rousensock Creek, Squaw Creek, Pipestem Creek, Clear Creek, Sheep Wash, Pine Canyon, Bear Canyon, and Hogtrail Canyon. Figure 5 displays a general overview of the allotment. Comprised of approximately 37,176 acres of National Forest System land, the AD Bar Hogtrail allotment is located in Greenlee County, Arizona.

AD Bar Hogtrail Allotment

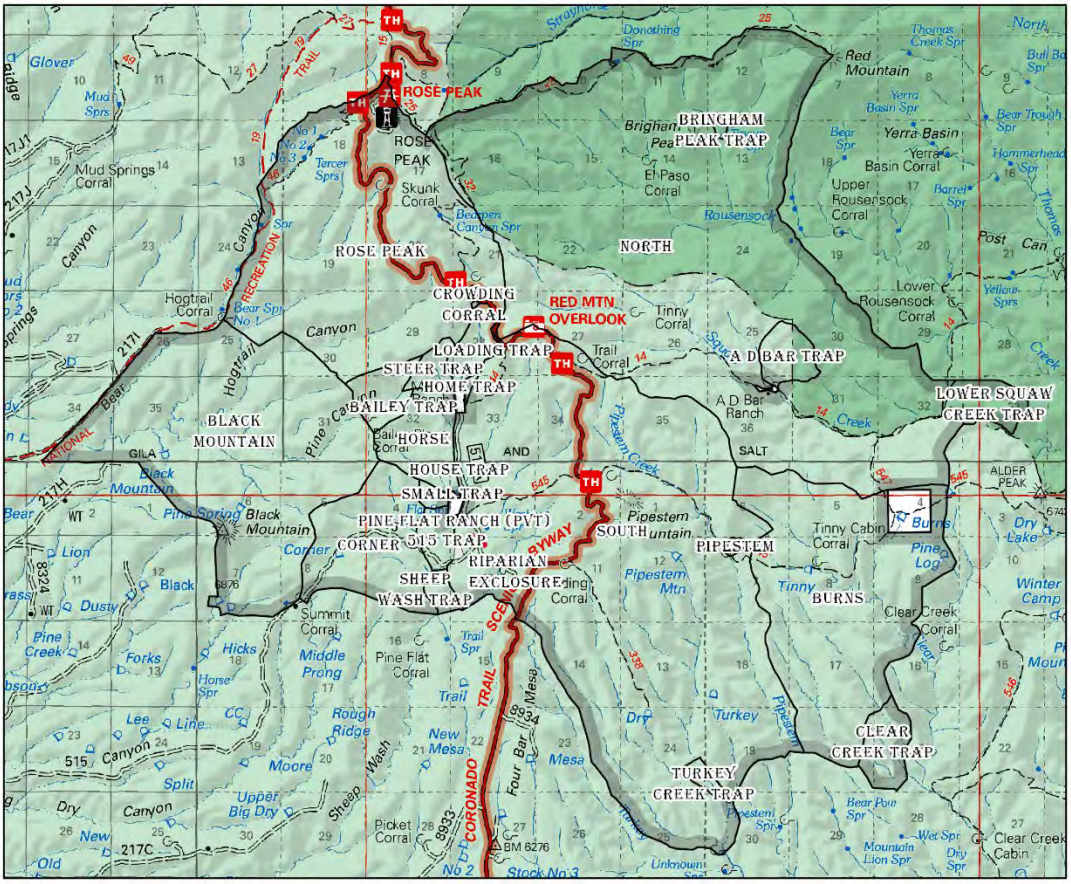

Figure 5. AD Bar Hogtrail Allotment

Historical Use

Prior to 2006, the AD Bar Hogtrail allotment was separated into the AD Bar allotment on the east side of the Coronado Scenic Byway and the Hogtrail allotment on the west side. Annual operating plan documents indicate the AD Bar and Hogtrail allotments were ran together starting in 1997. The AD Bar allotment and Hogtrail allotment were administratively combined on the 2006 term grazing permit for 335 cow/calf pair and 11 horses yearlong.

The Hogtrail allotment was established in 1927. Prior to 1927, it was part of the much larger Mud Springs allotment which had five to ten permittees running numbers between 800 to 1,000 head of livestock. From 1927 to 1940 average annual numbers were 291 cattle yearlong. Reports indicate in addition to the permitted cattle, there was an unknown number of unauthorized livestock grazed on the allotment. Permitted numbers were reduced to 153 head yearlong with natural increase privileges (calves born on the range) in 1940. The permit transferred in 1946 with no reduction in numbers. Numerous inspection reports and letters attest to the fact that the allotment was heavily overgrazed. Based on a detailed examination and analysis of the Hogtrail Allotment, a stocking rate of 75 head of cattle yearlong was recommended. For an unknown reason, yearlong grazing at higher stocking rates continued with varying numbers until 1974 when the permit was issued for 225 head of cattle from October 16th through May 15th. Records from the late 1970s through the 1980s are lacking. A term grazing permit from 1993 indicates that seasonal use continued with 219 cow/calf pair permitted October 16th through May 15th.

The AD Bar allotment was established in 1920 when the 6K6 allotment was bought out and combined with the then AD Bar allotment. Prior to 1920, records indicate that permitted numbers were from 117 to 1,027 cattle yearlong. In 1932, 319 head were permitted although 111 excess cattle were later found and removed. Permitted numbers decreased in 1935 to 287. From 1939 to 1946, 287 cattle plus natural increase were permitted year round. Temporary permits were issued from 1943 to 1946 in amounts of 10 to 25% additional head. This, in addition to natural increases, caused further deterioration of range condition. In 1947 permitted numbers were reduced to 258 cattle yearlong plus natural increase. This was further reduced in 1948 through 1950 to 245 cattle yearlong plus natural increase. When the permit transferred in 1951, the natural increase privilege was removed, and the permit was reduced to 213 cattle yearlong. This permitted number remained static from 1951 to 1979 although a few records indicate fewer cattle were authorized due to deteriorating range conditions. Records from the 1980s are scarce. One document dated from 1983 states 108 cattle and 5 horses were approved for the year. A letter from the Forest Service Range staff to the permittee dated 1988 acknowledged that the permittee was taking personal convenience non-use for the 163 head that were previously under non-use for range protection. It also stated that the Terrestrial Ecosystem Survey data showed there to be very little capacity for livestock grazing on the allotment. Annual operating plans from the early 1990's show that permitted numbers and season of use remained similar to previous numbers with 219 cattle and 6 horses authorized from October 16th through May 15th.

Vegetation cover types and slope classes

Table 2. Slope class, acres

Pasture	0 - 10%	11 - 30%	31 - 40%	41 - 60%	61%+	Total
515 Trap	92	116	17	14	4	**243**
AD Bar Trap	62	187	43	41	20	**353**
Black Mountain	1,681	3,201	638	555	391	**6,446**
Brigham Peak	2	9	4	3	4	**22**
Burns	1,715	2,314	360	289	199	**4,877**
Clear Creek Trap	81	203	53	50	45	**432**
Corner	568	865	125	91	33	**1,682**

Pasture	0 - 10%	11 - 30%	31 - 40%	41 - 60%	61%+	Total
Crowding Corral	1	3	0	0	0	**4**
Home	14	13	1	0	0	**28**
Horse	243	394	63	47	18	**765**
House	21	42	7	5	1	**76**
Loading Trap	82	162	24	21	14	**303**
Lower Squaw Creek	79	202	47	49	30	**407**
North	3,570	8,281	1,845	1,624	915	**16,235**
Pipestem	9	20	4	3	1	**37**
Riparian Exclosure	7	5	0	0	0	**12**
Rose Peak	1,829	3,452	611	519	316	**6,727**
Sheep Wash Trap	46	69	9	7	3	**134**
Small Trap	4	2	0	0	0	**6**
South	3,423	7,038	1,444	1,281	794	**13,980**
Steer Trap	65	100	14	11	5	**195**
Turkey Trap	22	51	11	12	8	**104**
Grand Total	**11,958**	**23,579**	**4,693**	**4,079**	**2,418**	**53,088**

Cover types on the AD Bar Hogtrail allotment include grass/forb, grama, pine/juniper, juniper, Gambel oak, oak/juniper/pinyon, ponderosa pine, aspen/evergreen, Douglas fir, ponderosa pine/evergreen oak, and deciduous tree as displayed in Table 3. The oak/juniper/pinyon cover type is most abundant comprising 49% of the allotment followed by the pine/juniper cover type comprising 24% of the allotment.

Table 3. Cover type, acres

Pasture	Grass-Forb	Grama	Pine-Juniper	Juniper	Gambel Oak	Oak-Juniper-Pinyon	Ponderosa Pine	Aspen-Evergreen	Douglas Fir	Ponderosa Pine – Evergreen Oak	Deciduous Tree	Total Acres by Pasture
515 Trap			169			15	5			55		**239**
AD Bar Trap			80			241				33		**354**
Black	4	287	2,270	138		3,367	2			389		**6,467**
Brigham Peak			5			13	1			1		**20**
Burns			1,149			3,135				588	5	**4,877**
Clear Creek						396					38	**434**
Corner			1,040	3		617				22		**1,682**
Crowding						5						**5**
Home				18		10						**28**
Horse			69			595	7			94		**764**
House			58			4	5			8		**76**
Loading Trap			26	66		195				16		**303**
Lower Squaw			129			256	10			13		**407**
North	16		4,062	175	2,149	6,059	2,602	20		1,138	11	**16,234**
Pipestem			7			19						**26**
Riparian			10				1			1		**12**
Rose Peak			563	425	1,506	2,038	1,739	1	79	375		**6,727**
Sheep Wash			69			52				14		**135**
Small Trap			1				2			3		**6**
South			3,093	302		8,596	213			1,756	20	**13,980**
Steer Trap			25			164				4		**194**
Turkey Trap						71					1	**72**
Total acres by cover type	**20**	**287**	**12,825**	**1,127**	**3,655**	**25,848**	**4,587**	**21**	**79**	**4,510**	**75**	

Grazing management

The existing term grazing permit for the AD Bar Hogtrail allotment is for 335 cow/calf pairs yearlong, (a total of 4,020 animal unit months), and 11 horse/mule (a total of 158 animal unit months). The allotment is divided into six main pastures: North, South (also known as Pipestem), Burns, Black Mountain, Corner, and Rose Peak. The North pasture has not been used since 2004 due to inaccessibility. The remaining pastures identified in Table 2 and Table 3 are smaller pastures used for holding or used intermittently. The rotation schedule is developed yearly during the annual operating instruction meeting. For the past several years the Black Mountain, Pipestem/South, Rose Peak, Highway, and Corner pastures have been used with each pasture receiving growing season rest at least once since 2018. The Burns pasture has been identified as an optional area depending on forage availability. In 2020, authorized numbers were reduced in response to drought conditions. Numbers in 2021 remained low in order to allow forage to recover. The Rose Peak pasture burned during the 2021 Bear Fire.

The allowable use standard for all pastures is a range of 30 percent to 40 percent.

Actual use summary

Actual use from 2003 through 2021 averaged 819AUMs or 20 percent of permitted. Recent years (2018-2021) averaged higher actual use with 1,505AUMs or 37 percent of permitted.

Cluster data

Cluster 1 (C1) – Burns pasture, TES map unit 632

Available data for Cluster 1 in the Burns pasture includes Parker 3 Step data from 1955 and dry-weight rank data from 2021. The 2021 dry-weight rank protocol data indicate the site is dominated by little bluestem with a strong sideoats grama subcomponent. Botanical composition was not recorded for the 1955 Parker data, however, hit tallies indicate that blue grama, and sideoats grama dominated the site with smaller components of curly mesquite and common wolfstail. While sideoats grama and common wolfstail appear to be consistent components of the cluster, blue grama and curly mesquite were not recorded in the 2021 data. Due to the lack of comparative data for C1-Burns, it is not possible to determine if the site has become more or less diverse.

Table 4. Cluster 1– Burns summary, botanical composition (%), dry-weight rank protocol

Growth form	Common name	Dry-weight rank protocol 2021
T	alligator juniper	2
S	oak	1
G	little bluestem	36
G	threeawn	5
G	sideoats grama	24
G	hairy grama	7
G	squirreltail	2
G	mat muhly	8
G	common wolfstail	1
F	globemallow	1
S	beargrass	8

Table 5 shows the calculated similarity to the potential natural community described for the TES map unit. The similarity index for this cluster is based on the 2021 dry-weight rank data which shows C1-Burns in the mid similarity class.

Table 5. Cluster 1 -Burns, plant community similarity to PNC as described in TES

	Similarity Index
2021 Dry-weight rank protocol	34

The 2021 points data show a strong decrease in the amount of bare soil with a corresponding increase in litter compared to 1955 data. Vegetative cover and rock cover remained fairly static from 1955 to 2021. Fluctuations in ground cover could be partially due to differences in protocols or annual precipitation which affects the amount of annual plant species contributing to litter cover. Percent frequency monitoring in 2021 shows annual grass or forb species present in 51% of the plots which is likely contributing to the increase in litter cover. When comparing current conditions to the TES reference site, we see similarities in vegetative cover, while rock, litter, and bare soil values are much higher or lower than the reference site.

Table 6. Cluster 1 – Burns pasture summary, ground cover (%)

	Parker protocol 1955	2021 Points protocol	Reference condition from TES
Vegetation	13	12	**10**
Rock	28	22	**65**
Litter	26	60	**10**
Bare soil	33	5	**20**

C1- Burns trend summary

The plant community at C1 – Burns is currently dominated by little bluestem with a strong sideoats grama subcomponent. The lack of comparative botanical composition data from the 1955 Parker readings makes it difficult to establish a long term trend, however, based on hit tally data, it appears that there has been a shift in dominance from grama grasses to little bluestem. Blue grama, the most dominant species in 1955, does not appear in the 2021 data.

Apparent trend: There is not enough information to determine a vegetative trend, however the current botanical composition of the site appears to be meeting desired conditions of stable rangeland condition. Botanical composition data shows abundant forage grasses with few undesirable species. The site protection attributes indicate an upward trend for site protection, with the amount of bare soil decreasing substantially since 1955.

Ecological Status: The similarity to PNC from the 2021 data indicate the cluster falls in the mid similarity status. At some point between 1955 and 2021 species composition shifted from predominantly sod grasses to a mixture of sod grass and bunchgrass. Because we do not have comparative botanical composition data from 1955, we are unable to determine if this caused a shift toward or away from PNC.

Cluster 1 (C1) – Black Mountain pasture, TES map unit 514

Available data for Cluster 1 in the Black Mountain pasture includes Parker 3 Step data from 1952, 1956, and 1957, and dry-weight rank data from 2021. The 2021 dry-weight rank protocol data

indicates the site is strongly dominated by purple grama. Botanical composition was not recorded for the Parker data, however, hit tallies indicate that sprucetop grama, and sideoats grama dominated the site. Neither sprucetop grama nor sideoats grama appear in the 2021 data. Due to the lack of comparative data for C1-Black Mountain, it is not possible to determine if the site has become more or less diverse.

Table 7. Cluster 1 – Black Mountain summary, botanical composition (%), dry-weight rank protocol

Growth form	Common name	Dry-weight rank protocol 2021
S	prickly pear	2
G	hairy grama	1
G	purple grama	93
F	hog potato	1
T	alligator juniper	2
S	beargrass	1

Table 8 shows the calculated similarity to the potential natural community described for the TES map unit. The similarity index for this cluster is based on the 2021 dry-weight rank data which shows C1-Black Mountain in the low similarity class. This is primarily driven by the absence of sideoats grama, the most abundant species in the TES description, and the lack of shrub cover at the site.

Table 8. Cluster 1 -Black Mountain, plant community similarity to PNC as described in TES

	Similarity Index
2021 Dry-weight rank protocol	4

Cluster data summary sheets exist for 1957 Parker data, but no individual transect sheets. The 2021 points data show a decrease in the amount of bare soil with a corresponding increase in litter compared to previous readings. Rock cover remained fairly static after 1952. Fluctuations in ground cover could be partially due to differences in protocols or annual precipitation which affect the amount of annual plant species contributing to litter cover. Percent frequency monitoring in 2021 shows annual forb species present in 44% of the plots may be contributing to the increase in litter cover. When comparing current conditions to the TES reference site, we see vegetative cover and bare soil are similar to what would be expected at the site. Rock cover is lower than expected while litter cover is higher than expected.

Table 9. Cluster 1 – Black Mountain pasture summary, ground cover (%)

	Parker protocol			2021 Points protocol	Reference condition from TES
	1952	1956	1957		
Vegetation	13	12	7	9	5
Rock	37	51	58	52	70
Litter	27	8	6	26	10
Bare soil	24	29	29	13	20

C1- Black Mountain trend summary

The plant community at C1 – Black Mountain is currently strongly dominated by purple grama. The lack of comparative botanical composition data from the 1950s Parker readings makes it difficult to establish a long term trend, however, based on hit tally data, it appears that there has been a shift in dominance from sprucetop grama and sideoats grama to purple grama by 2021. Neither sprucetop grama nor sideoats grama appear in the 2021 data.

Apparent trend: There is not enough information to determine a vegetative trend, however the current botanical composition of the site appears to be meeting desired conditions of stable rangeland condition despite the lack of grass diversity. Botanical composition data shows abundant forage grasses with few undesirable species. The site protection attributes indicate a static or slightly upward trend for site protection, with the amount of bare soil decreasing from the 1950s to 2021.

Ecological Status: The similarity to PNC from the 2021 data indicates the cluster falls in the low similarity class. This is primarily driven by the absence of sideoats grama, the most abundant species in the TES description, as well as the lack of shrub cover at the site. Although we do not have comparative botanical data from the 1950s, it is likely the similarity to PNC has decreased due to the decline in sideoats grama from 1950s data to the 2021 data. It is likely the site has crossed a threshold and will not convert back to PNC with grazing management alone.

Cluster 2 (C2) – Black Mountain pasture, TES map unit 514

Available data for Cluster 2 in the Black Mountain pasture includes Parker 3 Step data from 1952 and 1957, and Daubenmire cover class data from 2006. The 2006 Daubenmire cover class data indicate the C2- Black Mountain site is dominated by blue grama, sideoats grama, sixweeks threeawn, and undefined annual forbs. Botanical composition was not recorded for the Parker data, however, hit tallies indicate that blue grama and sideoats grama dominated the site. Due to the lack of comparative data for C2-Black Mountain, it is not possible to determine if the site has become more or less diverse.

Table 10. Cluster 2 – Black Mountain summary, botanical composition (%), Daubenmire cover class protocol

Growth form	Common name	Daubenmire Cover Class 2006
G	threeawn	1
G	sideoats grama	11
G	blue grama	27
G	squirreltail	3
G	common wolfstail	1
G	nodding brome	1
G	sixweeks threeawn	13
G	Arizona fescue	1
F	ragleaf bahia	7
F	globemallow	5
F	aster	6
F	annual forb	14
S	Wright eriogonum	4
S	broom snakeweed	3
S	beargrass	2

Growth form	Common name	Daubenmire Cover Class 2006
T	alligator juniper	2

Table 11 shows the calculated similarity to the potential natural community described for the TES map unit. The similarity index for this cluster is based on the 2006 Daubenmire cover class data which shows C2-Black Mountain in the low similarity class.

Table 11. Cluster 2 -Black Mountain, plant community similarity to PNC as described in TES

	Similarity Index
2006 Daubenmire Cover	22

The 2006 Daubenmire cover class data shows a decrease in litter cover compared with previous years. Rock cover increased in 2006 while bare soil and vegetative cover remained fairly static. When comparing the 2006 condition to the TES reference site, ground cover attributes match the reference condition fairly closely.

Table 12. Cluster 2 -Black Mountain summary, ground cover (%)

	Parker protocol		TES – Daubenmire 2006	Reference condition from TES
	1952	1957		
Vegetation	13	17	12	**10**
Rock	37	32	50	**65**
Litter	27	27	17	**10**
Bare soil	24	24	21	**20**

C2- Black Mountain trend summary

The plant community at C2 – Black Mountain is currently dominated by grama grasses and annuals such as sixweeks threeawn and undefined annual forbs. The lack of comparative botanical composition data from the 1950s Parker readings makes it difficult to establish a long term trend, however, based on hit tally data, it appears that the dominance by blue grama and sideoats grama has remained stable from the 1950s to 2006. The transects have not been re-read since 2006.

Apparent trend: There is not enough information to determine a vegetative trend, however the 2006 botanical composition of the site may indicate a degraded rangeland condition with an abundance of annual forbs and grasses present but not contributing to an increase in vegetative cover. Because the site has not been re-read since 2006, the current condition is unknown. The site protection attributes indicate a static trend for site protection, with ground cover attributes similar to previous years.

Ecological Status: The similarity to PNC for this cluster shows C2-Black Mountain in the low similarity class. This is primarily driven by the low shrub cover at the site.

Cluster 4 (C4) – South pasture, TES map unit 632

Available data for Cluster 4 in the South pasture includes Parker 3 Step data from 1955 and 2006, Daubenmire cover class data from 2006, and dry-weight rank data from 2021. Botanical composition was not recorded for the 1955 Parker data. The dry-weight rank protocol data collected in 2021 shows the site is currently dominated by hairy grama and blue grama with a strong pinyon pine overstory

component. The 2006 Parker data show blue grama dominating the site with smaller subcomponents of poverty threeawn, sideoats grama, and common wolfstail. The 2006 Parker data shows blue grama as dominant while the 2006 Daubenmire data shows hairy grama as dominant. Because the data was recorded in the same year, it is likely that lack of seed heads during the time of identification made it difficult to discern the species. The species diversity on the site appears to have remained static from 2006 to 2021, with slight variations in species composition. The main differences between the botanical composition developed using the Parker protocol and the botanical composition developed using the dry-weight rank protocol is tree cover. This difference is likely due to the broader area being sampled with the dry-weight rank protocol.

Table 13. Cluster 4 – South summary, botanical composition (%), Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker protocol	TES – Daubenmire	Dry-weight rank protocol 2021
		2006	2006	
S	prickly pear	5	0	0
G	threeawn	0	0	4
G	hairy grama	0	47	24
G	purple grama	0	0	0
G	plains lovegrass	0	0	8
G	pinyon ricegrass	0	0	1
T	pinyon pine	0	0	19
T	Emory oak	0	0	3
G	common wolfstail	6	0	0
S	Wright eriogonum	2	0	0
G	sprucetop grama	3	0	0
G	poverty threeawn	11	8	0
G	sideoats grama	6	1	8
G	blue grama	58	5	17
G	green sprangletop	6	0	0
G	squirreltail	0	0	1
G	sixweeks threeawn	0	6	0
F	wild buckwheat	0	6	0
G	muhly	0	10	0
F	annual forb	0	2	0
S	tulip pricklypear	0	1	0
T	alligator juniper	0	6	8
T	oneseed juniper	0	7	0
S	mountain mahogany	0	0	1

As displayed in Table 14, the discrepancies in botanical composition discussed above did not result in significant differences in the calculated similarity to the potential natural community described for the TES map unit. All similarity indices calculated for this cluster fall within the low similarity class.

Table 14. Cluster 4- South, plant community similarity to PNC as described in TES

	Similarity Index
2006 Parker Protocol	15

	Similarity Index
2006 Daubenmire Protocol	10
2021 Dry Weight Rank Protocol	17

Ground cover data indicate vegetative cover has increased slightly since 1955 but remains relatively low. Bare soil has decreased since 1955 with a slight increase between 2006 and 2021. Litter cover was fairly static from 1955 to 2006 when using the Parker protocol but the Daubenmire method recorded much less litter 2006. Litter cover increased to its highest amount in 2021. Rock cover fluctuated among years and data collection methods with no apparent trend. When comparing the current condition to the TES reference site, we see rock cover is lower and litter cover is higher than what would be expected at this site.

Table 15. Cluster 4 – South summary, ground cover (%)

	Parker protocol		TES – Daubenmire 2006	2021 Points protocol	Reference condition from TES
	1955	2006			
Vegetation	0	6	2	3	**10**
Rock	24	41	74	30	**65**
Litter	27	26	15	54	**10**
Bare soil	49	27	9	14	**20**

C4- South trend summary

Both the 2006 Daubenmire cover class data and the 2021 dry-weight rank data indicate that the current plant community at C4-South is strongly dominated by hairy grama, with a blue grama and sideoats grama subcomponent. The 2006 Parker data differs in showing blue grama as the dominant species with an absence of hairy grama. It is likely that the difference in species composition is due to identification error because species composition is unlikely to change dramatically within the same year. Species diversity on the site has remained static from 2006 to 2021 although species composition has fluctuated. The 2021 dry-weight rank data shows more tree cover while both the 2006 Daubenmire data and the 2006 Parker data show presence of forbs and shrubs that are scarce in 2021.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data shows abundant forage grasses with few undesirable species. Recorded tree cover has increased significantly in the 2021 data although it is unknown if this is due to encroaching trees or from differences in protocols. Overall, the preponderance of evidence suggests the overall trend is static or slightly upward due to similarities in species diversity and a slight upward trend toward PNC. The site protection attributes indicate an upward trend for site protection, with the amount of vegetative cover increasing and bare soil decreasing from 1955 to 2021.

Ecological status: The 2021 dry-weight rank data shows similarity to PNC has increased from previous years although all year's data indicate low similarity status. This is primarily due to low shrub cover and lack of forb diversity at the site.

Cluster 4 (C4) – Black Mountain, TES map unit 573

Available data for Cluster 2 in the Black Mountain pasture includes Parker 3 Step data from 1952 and 1956, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the current plant community at C4- Black Mountain is dominated by sideoats grama with a strong curly mesquite subcomponent. Botanical composition was not recorded for the Parker data, however, hit tallies indicate that blue grama and sideoats grama dominated the site with a smaller presence of curly

mesquite and threeawn. Due to the lack of comparative data for C4-Black Mountain, it is not possible to determine if the site has become more or less diverse.

Table 16. Cluster 4 – Black Mountain summary, botanical composition (%) dry-weight rank protocol

Growth form	Common name	Dry-weight rank protocol 2021
S	broom snakeweed	2
G	threeawn	2
G	cane bluestem	3
G	sideoats grama	38
G	blue grama	7
G	hairy grama	8
G	purple grama	1
G	curly mesquite	29
F	globemallow	1
F	wooly plantain	1
F	wild buckwheat	8

Table 17 shows the calculated similarity to the potential natural community described for the TES map unit. The similarity index for this cluster is based on the 2021 dry-weight rank data which shows C4-Black Mountain in the mid similarity class.

Table 17. Cluster 4 – Black Mountain plant community similarity to PNC as described in TES

	Similarity Index
2021 Dry-weight rank protocol	55

The 2021 points data show a strong decrease in the amount of bare soil and vegetative cover with a corresponding increase in litter and rock cover. Fluctuations in ground cover could be partially due to differences in protocols or annual precipitation which affect the amount of annual plant species contributing to litter cover. Percent frequency monitoring in 2021 shows annual grass or forb species present in 79% of the plots which is likely contributing to the increase in litter cover. The 2021 dry weight rank transects were read during a severe dry period (less than 75% of average annual precipitation) which likely contributed to the decrease in vegetative cover and increase in litter cover, as the live perennial vegetation transitioned to standing litter. When comparing the 2021data to the TES reference site, we see little similarity between the current condition and the reference condition.

Table 18. Cluster 4 – Black Mountain summary, ground cover (%)

	Parker protocol		2021 Points protocol	Reference condition from TES
	1952	1956		
Vegetation	12	14	5	**15**
Rock	22	19	35	**50**
Litter	9	18	50	**5**
Bare soil	57	49	9	**30**

C4 – Black Mountain trend summary

The plant community at C4 – Black Mountain is currently dominated by grama grasses and curly mesquite. The lack of comparative botanical composition data from the 1950s Parker readings makes it difficult to establish a long term trend, however, based on hit tally data, it appears that the dominance by grama grasses has remained stable from the 1950s to 2021. Both the 1950s data and the 2021 data show curly mesquite as a subcomponent.

Apparent trend: There is not enough information to determine a vegetative trend, however the current botanical composition of the site appears to be meeting desired conditions of stable rangeland condition. Botanical composition data shows abundant forage grasses with few undesirable species. The site protection attributes indicate a static or slightly downward trend for site protection primarily due to the decrease in vegetative cover that occurred as a result of apparent perennial grass die off due to drought. Litter cover increased while bare soil decreased but this appears to be due to an abundance of annual forb species.

Ecological Status: The similarity to PNC from the 2021 dry-weight rank data indicates the cluster falls in the mid similarity class. The abundance of sideoats grama, blue grama, hairy grama, and curly mesquite are contributing to a higher similarity to PNC than is seen elsewhere in the allotment.

Cluster 7 (C7) – Burns, TES map unit 632

Available data for Cluster 7 in the Burns pasture includes Parker 3 Step paced data from 1955, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the current plant community at C7- Burns site is dominated by sideoats grama, hairy grama, and cane bluestem. Botanical composition was not recorded for the Parker data, however, hit tallies indicate that sideoats grama dominated the site with a smaller presence of blue grama. Due to the lack of comparative data for C7-Burns, it is not possible to determine if the site has become more or less diverse.

Table 19. Cluster 7 – Burns summary, botanical composition (%) dry-weight rank protocol

Growth form	Common name	Dry-weight rank protocol 2021
S	buckbrush	2
S	yucca	2
G	little bluestem	5
G	threeawn	8
G	cane bluestem	19
G	sideoats grama	18
G	blue grama	3
G	hairy grama	14
G	bullgrass	1
G	mat muhly	6
G	pinyon ricegrass	1
F	globemallow	1
T	alligator juniper	11
S	beargrass	4
T	pinyon pine	6

Table 20 shows the calculated similarity to the potential natural community described for the TES map unit. The similarity index for this cluster is based on the 2021 dry-weight rank data which shows C-7 Burns in the mid similarity class.

Table 20. Cluster 7 – Burns plant community similarity to PNC as described in TES

	Similarity Index
2021 Dry Weight Rank Protocol	34

The 2021 points data shows a decrease in the amount of bare soil and vegetative cover with a corresponding increase in litter compared to previous readings. Rock cover remained fairly static from 1955 to 2021. Fluctuations in ground cover could be partially due to differences in protocols or annual precipitation which affect the amount of annual plant species contributing to litter cover. However, percent frequency monitoring in 2021 shows annual species only present in 9% of the plots which indicates the decrease in vegetation and increase in litter could be due to perennial grass die off due to drought conditions. This does not however, explain the decrease in bare soil. When comparing current conditions to the TES reference site, we see vegetative cover is similar to what would be expected at the site. Bare soil and rock cover are lower, and litter is higher than what would be expected at the site.

Table 21. Cluster 7 – Burns summary, ground cover (%)

	Parker protocol 1955	2021 Points protocol	Reference condition from TES
Vegetation	20	11	**10**
Rock	46	41	**65**
Litter	10	45	**10**
Bare soil	24	3	**20**

C7 – Burns trend summary

The plant community at C7 – Burns is currently dominated by grama grasses and cane bluestem. The lack of comparative botanical composition data from the 1950s Parker readings makes it difficult to establish a long term trend, however, based on hit tally data, it appears that the dominance by grama grasses has remained stable from the 1950s to 2021 however cane bluestem, a less desirable forage species, may have increased.

Apparent trend: There is not enough information to determine a vegetative trend, however the current botanical composition of the site appears to be meeting desired conditions of stable rangeland condition. Botanical composition data shows abundant forage grasses although less desirable grass species may have increased since the 1950s. The site protection attributes indicate a static trend for site protection primarily due to the significant decrease in bare soil from the 1950s readings offsetting the decrease in vegetative cover. When comparing vegetative cover to the reference site, we see it has decreased to what would be expected within this map unit.

Ecological Status: The similarity to PNC from the 2021 dry-weight rank data indicates the cluster falls in the mid similarity status.

Cluster 5 (C5) – Black Mountain, TES map unit 632

Available data for Cluster 5 in the Black Mountain pasture includes Parker 3 Step data from 1952, 1956, and 1957, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the current plant community is dominated by sideoats grama, hairy grama and common wolfstail with a perennial forb and shrub subcomponent. Botanical composition was not recorded for the Parker data,

however, hit tallies indicate blue grama, sideoats grama, and hairy grama dominated the site with a smaller presence of sprucetop grama and common wolfstail. Due to the lack of comparative data for C5-Black Mountain, it is not possible to determine if the site has become more or less diverse.

Table 22. Cluster 5 – Black Mountain summary, botanical composition (%) dry-weight rank protocol

Growth form	Common name	Dry-weight rank protocol 2021
G	threeawn	3
G	purple grama	7
G	sideoats grama	11
G	hairy grama	19
G	squirreltail	4
G	common wolfstail	16
F	globemallow	14
S	mountain mahogany	1
S	broom snakeweed	4
T	alligator juniper	5
S	beargrass	11
T	pinyon pine	1
S	oak	2
S	yucca	3

Table 23 shows the calculated similarity to the potential natural community described for the TES map unit. The similarity index for this cluster is based on the 2021 dry-weight rank data which shows C5-Black Mountain in the low similarity class.

Table 23. Cluster 5 – Black Mountain plant community similarity to PNC as described in TES

	Similarity Index
2021 Dry-weight rank protocol	29

The ground cover data indicate an increase in litter cover, and a decrease in the amount of bare soil. Vegetative cover remained fairly static between the 1950s and 2021. Rock cover decreased slightly between 1950s and 2021. Percent frequency monitoring in 2021 shows annual forb species present in 47% of the plots which may be to the increase in litter cover. When comparing current conditions to the TES reference site, we see bare soil is similar to what would be expected at the site. Vegetative cover and rock cover are lower, and litter is higher than what would be expected at the site.

Table 24. Cluster 5 – Black Mountain summary, ground cover (%)

	Parker protocol			2021 Points protocol	Reference condition from TES
	1952	1956	1957		
Vegetation	6	12	6	5	**10**
Rock	46	39	47	37	**65**
Litter	9	8	12	42	**10**
Bare soil	40	40	35	16	**20**

C5 – Black Mountain trend summary

The plant community at C5-Black Mountain is currently dominated by grama grasses and common wolfstail. The lack of comparative botanical composition data from the 1950s Parker readings makes it difficult to establish a long term trend, however, based on hit tally data, it appears that the dominance by grama grasses and the presence of common wolfstail has remained stable from the 1950s to 2021.

Apparent trend: There is not enough information to determine a vegetative trend, however the current botanical composition of the site appears to be meeting desired conditions of stable rangeland condition. Botanical composition data shows abundant forage grasses with few undesirable species. The site protection attributes indicate a slightly upward trend for site protection primarily due to the significant decrease in bare soil from the 1950s readings.

Ecological Status: The similarity to PNC from the 2021 dry-weight rank data indicates the cluster falls in the low similarity status. This is primarily due to low shrub cover and low cover of sideoats grama.

Cluster 5 (C5) – South, TES map unit 514

Available data for Cluster 5 in the South pasture includes Parker 3 Step data from 1955, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the current plant community at C5- South site is dominated by plains lovegrass and sideoats grama. Botanical composition was not recorded for the Parker data, however, hit tallies indicate blue grama, and sideoats grama dominated the site with a smaller presence of common wolfstail. Due to the lack of comparative data for C5-South, it is not possible to determine if the site has become more or less diverse.

Table 25. Cluster 5 – South summary, botanical composition (%) dry-weight rank protocol

Growth form	Common name	Dry-weight rank protocol 2021
S	buckbrush	4
T	alligator juniper	11
S	yucca	1
G	threeawn	1
G	sideoats grama	18
G	blue grama	9
G	purple grama	3
G	plains lovegrass	30
G	common wolfstail	3
F	globemallow	2
S	mountain mahogany	2
T	alligator juniper	5
S	beargrass	10
F	fern	3

Table 26 shows the calculated similarity to the potential natural community described for the TES map unit. The similarity index for this cluster is based on the 2021 dry-weight rank data which shows C5-South in the low similarity class.

Table 26. Cluster 5 – South plant community similarity to PNC as described in TES

	Similarity Index
2021 Dry-weight rank protocol	29

The ground cover data indicate an increase in litter cover, and a decrease in the amount of bare soil and rock cover. Vegetative cover remained fairly static between 1955 and 2021. Percent frequency monitoring in 2021 shows annual forb and grass species present in 37% of the plots which may be contributing to the increase in litter cover and decrease in bare soil. When comparing current conditions to the TES reference site, we see vegetative cover is similar to what would be expected at the site. Bare soil and rock cover are lower, and litter is higher than what would be expected at the site.

Table 27. Cluster 5 – South summary, ground cover (%)

	Parker protocol 1955	2021 Points protocol	Reference condition from TES
Vegetation	5	9	**5**
Rock	61	48	**70**
Litter	20	38	**10**
Bare soil	14	5	**20**

C5 – South trend summary

The plant community at C5-South is currently dominated by plains lovegrass and sideoats grama. The lack of comparative botanical composition data from the 1950s Parker readings makes it difficult to establish a long term trend, however, based on hit tally data, it appears there has been a shift in dominance from grama grasses to plains lovegrass. Because we do not have comparative botanical composition data from 1955, we are unable to determine if this caused a shift towards or away from PNC.

Apparent trend: There is not enough information to determine a vegetative trend, however the current botanical composition of the site appears to be meeting desired conditions of stable rangeland condition. Botanical composition data shows abundant forage grasses with few undesirable species. The site protection attributes indicate a static or slightly upward trend for site protection primarily due to the decrease in bare soil from the 1950s readings.

Ecological Status: The similarity to PNC from the 2021 dry-weight rank data indicates the cluster falls in the low similarity status. This is primarily due to low shrub cover and lack of shrub and grass diversity at the site.

Cluster 1 (C1) – VT Pasture – Sandrock Allotment, TES map unit 630

Baseline cluster data was collected in October of 2022 using the dry-weight rank protocol. The 2022 dry-weight rank data indicate the current plant community at C1- VT pasture is dominated by sideoats grama and hairy grama with an Emory oak overstory.

Table 28. Cluster 1 – VT summary, botanical composition (%) dry-weight rank protocol

Growth form	Common name	Dry-weight rank protocol 2021
T	Emory oak	17
G	threeawn	2
G	sideoats grama	51
G	hairy grama	14
G	plains lovegrass	2
G	green sprangletop	3
G	bullgrass	1
G	pinyon ricegrass	4
S	curly mesquite	4
S	beargrass	1

Table 29 shows the calculated similarity to the potential natural community described for the TES map unit. The similarity index for this cluster is based on the 2022 dry-weight rank data which shows C1-VT in the low similarity class.

Table 29. Cluster 1 – VT plant community similarity to PNC as described in TES

	Similarity Index
2022 Dry-weight rank protocol	29

Table 30 shows the current ground cover attributes. When comparing current conditions to the TES reference site, we see bare soil and rock cover are lower, and litter and vegetation cover is higher than what would be expected at the site.

Table 30. Cluster 1 – VT summary, ground cover (%)

	2022 Points protocol	Reference condition from TES
Vegetation	12	**5**
Rock	34	**50**
Litter	37	**10**
Bare soil	17	**35**

C1 – VT trend summary

Because this is baseline data, there is not enough information to determine a vegetative trend. The current botanical composition of the site appears to be meeting desired conditions of stable rangeland condition with abundant forage grasses and scattered overstory trees. The ground cover shows adequate cover of rock, vegetation and litter for site stability. The similarity to PNC from the 2022 dry-weight rank data indicates the cluster falls in the low similarity status. This is primarily due to low shrub cover and lack of plant diversity at the site.

Cluster 2 (C2) – VT Pasture – Sandrock Allotment, TES map unit 632

Baseline cluster data was collected in October of 2022 using the dry-weight rank protocol. The 2022 dry-weight rank data indicate the current plant community at C2- VT pasture is dominated by sideoats grama with an Emory oak overstory.

Table 31. Cluster 2 – VT summary, botanical composition (%) dry-weight rank protocol

Growth form	Common name	Dry-weight rank protocol 2021
T	alligator juniper	7
S	pricklypear	2
T	twoneedle pinyon pine	4
T	Emory oak	25
G	sideoats grama	57
G	blue grama	2
G	hairy grama	3

Table 32 shows the calculated similarity to the potential natural community described for the TES map unit. The similarity index for this cluster is based on the 2022 dry-weight rank data which shows C2-VT in the low similarity class.

Table 32. Cluster 2 – VT plant community similarity to PNC as described in TES

	Similarity Index
2022 Dry-weight rank protocol	25

Table 33 shows the current ground cover attributes. When comparing current conditions to the TES reference site, we see vegetative cover, bare soil and rock cover are lower, and litter is higher than what would be expected at the site.

Table 33. Cluster 2 – VT summary, ground cover (%)

	2022 Points protocol	Reference condition from TES
Vegetation	5	**10**
Rock	26	**65**
Litter	64	**10**
Bare soil	5.	**20**

C2 – VT trend summary

Because this is baseline data, there is not enough information to determine a vegetative trend. The current botanical composition of the site appears to be meeting desired conditions of stable rangeland condition with abundant forage grasses and scattered overstory trees. The ground cover shows high litter cover and low bare soil and vegetation. It was noted on the site form that much of the sideoats grama is tall and decadent. The similarity to PNC from the 2022 dry-weight rank data indicates the cluster falls in the low similarity status. This is primarily due to low shrub cover and lack of plant diversity at the site.

Utilization monitoring data

On the AD Bar Hogtrail allotment the annual operating instructions for the past several years (2018-2021) have identified allowable use standards ranging from 30 to 40 percent, allotment-wide. Prior to 2018, allowable use standards were slightly higher at 35 to 45 percent. Table 34 displays a summary of the utilization monitoring conducted on the AD Bar Hogtrail allotment since 2005. The 'percentage of permitted use' line is included in the table to display the yearly stocking level as a percentage of that identified on the term grazing permit. Utilization monitoring normally occurs within two weeks before or after pasture move dates, and after the summer growing season. All of the observations were at or below the allowable use standard.

Table 34. Utilization monitoring

Pasture	2015	2005
Percentage of permitted use, allotment-wide	**12%**	**10%**
Pipestem	5%	
Rose Peak	5%	
Horse		40%
Corner		40%

Structural improvements

Structural improvements include fences, stock tanks, wells, and corrals. The responsibility for the maintenance of these improvements is assigned to the grazing permittee in the term grazing permit. Most of these improvements on the AD Bar Hogtrail allotment are in functional condition although some may need maintenance or reconstruction in the next few years. The annual operating instructions identify which improvements need replacement or reconstruction each year.

Table 35. Range Improvement Points

Range Improvement Name	Improvement Type
Low Pipestem Corral	Corral
Summit Spring	Spring Well Development
Loading Corral	Corral
Clear Creek Corral	Corral
Bear Canyon Corral	Corral
Bear Pen Corral	Corral
Crowding Corral & Chute	Corral
Bailey Place Corral	Corral
Deer Canyon Corral	Corral
Black Mountain Tank	Intermittent Stock Tank
Deer Tank	Perennial Stock Tank
Pine Log Tank	Perennial Stock Tank
Trail Corral	Corral
Borrow Tank	Intermittent Stock Tank
Road Spg Dev	Spring Well Development
El Paso Corral	Corral
Pipestem Mtn Tank	Intermittent Stock Tank
Pine Flat Tank	Intermittent Stock Tank
Turkey Tank	Intermittent Stock Tank
Pine Spring Tank	Perennial Stock Tank

NO NAME Corral	Corral
Tinny Cabin Corral	Corral
Turkey Ck Trap Corral	Corral
Skunk Corral	Corral
Hogtrail Trap Corral	Corral
Corner Tank	Perennial Stock Tank
Dry Tank	Intermittent Stock Tank
Brigham Pk Trap Corral	Corral
Hogtrail Canyon Corral	Corral
6K6 Storage Tank	Water Storage Tank
Tinny Corral	Corral
Pasture Corral & Chute	Corral
Tinny Tank	Intermittent Stock Tank

Existing condition summary

Overall, the clusters in AD Bar Hogtrail allotment show satisfactory conditions with all meeting the desired condition of stable rangeland condition with the possible exception of C2-Black Mountain which shows an increase in annual forbs and shrubs with no corresponding increase in vegetative cover. Although C1 – Black Mountain is currently meeting desired conditions, it has likely crossed a threshold and will not convert back to PNC with grazing management alone. All clusters fall in the low or mid similarity class to potential natural community. The primary driver for those that fall in the low category is overall lack of species diversity. Recent cluster data is limited to the southern pastures in the allotment therefore conditions in the less accessible North pasture and the Rose Peak pasture are unknown. Because there is a lack of comparative data to establish a long term trend for most sites, future monitoring will be needed to determine vegetative trends.

The ground cover indicators reflect an overall static or upward trend in site protection since the 1950s primarily due to decreases in bare soil and increases in litter cover.

Table 36. AD Bar Hogtrail cluster site protection trends

Cluster	Site Protection Trend
C1 - Burns	upward
C1 - Black Mountain	static or slightly upward
C2 – Black Mountain	static
C4 – South	upward
C4 – Black Mountain	static or slightly downward
C5 – Black Mountain	slightly upward
C5 – South	static or slightly upward
C7 - Burns	static

There are limited data available recording utilization levels however, all available information shows utilization has been at or below the allowable use standards of 30 to 40 percent. However, the allotment has been stocked at levels lower than permitted levels since 2010. Actual use from 2010 through 2021 averaged 900 AUMs or 22 percent of permitted.

Structural range improvements are being maintained, replaced or reconstructed as needed (as identified in the annual operating instructions).

Baseline-Horsesprings

The Baseline-Horsesprings allotment is located approximately 22 miles north of Clifton, Arizona on the Clifton Ranger District, Apache-Sitgreaves National Forest. The allotment lies east of Eagle Creek and is bordered by gently sloping terrain. Two main drainages, North Bear Canyon and South Bear Canyon drain into Eagle Creek which flows through private land in the northern portion of the allotment and Forest Service along the southwestern edge of the allotment. Eagle Creek is located on private lands adjacent to a small portion of Forest System lands near the Eagle Creek school. The Baseline-Horsesprings allotment is comprised of seven large pastures and four smaller pastures, corrals, and traps. Vegetation is predominantly open grassland east of Eagle Creek transitioning to pinyon-juniper woodland in the eastern portions of the allotment. Figure 6 displays a general overview of the allotment. Comprised of approximately 9,897 acres of National Forest System land, the Baseline-Horsesprings allotment is located in Greenlee County, Arizona.

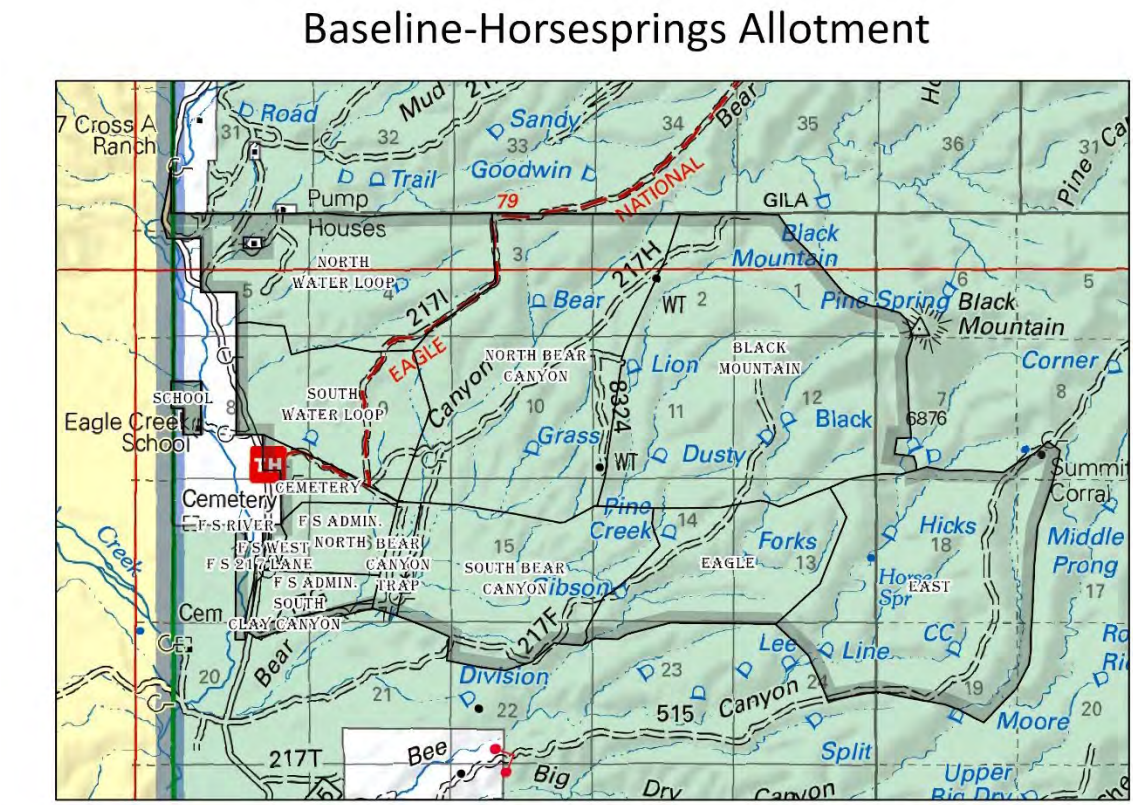

Figure 6. Baseline-Horsesprings Allotment

Historical Use

Prior to the signing of the 1997 Baseline Horsesprings Environmental Assessment (EA) Decision Notice the allotment was separated into the Baseline allotment occupying the northern portion of the now Baseline-Horsesprings allotment and the Horsesprings (sometimes written as Horse Springs) allotment in the southern portion. The EA administratively combined the two allotments and allowed up to 100 head of cow/calf pairs and up to 405 yearlings, not to exceed 3,019 animal unit months, from September 1st to May 30th annually. However, the AUM conversion factor was different in 1997. Using current AUM conversion factors the total permitted AUMs is 2,287. After the 1997 decision, Eagle Creek was fenced and excluded from livestock grazing. In the early 2000s multiple water developments were installed to better distribute livestock.

The Baseline allotment was established in the late 1920s. Prior to that, it was part of the much larger Eagle Community allotment. From establishment to 1930 the total head of permitted cattle was 145 head yearlong. When the permit transferred in 1930, the number of authorized head was reduced to 130. Numbers were further reduced in 1932 to 117 cattle yearlong, which remained the preferred number of head until 1997 when the Baseline and Horsesprings allotments were combined. Early reports indicate the western portion of the allotment was heavily utilized while the eastern portion was underutilized. The reason for this poor distribution was a lack of reliable water in the east end of the allotment, with the only permanent water being Eagle Creek.

The Horsesprings allotment was established in 1946 when it was fenced off from the Bee Springs Allotment. Prior to the 1920s, the Horsesprings allotment and the Bee Springs allotment were part of the much larger Eagle Community allotment. From about 1948 to 1976, permitted livestock numbers were fairly static with between 50 and 55 head permitted yearlong with frequent temporary permits for an additional 16 head for 10 months. Similar to the Baseline allotment, reports indicate use was concentrated along Eagle Creek. At some point between 1976 and 1998, the temporary numbers were included in the term permit for a total of 71 cattle yearlong.

Vegetation cover types and slope classes

Table 37. Slope class, acres

Pasture	0 - 10%	11 - 30%	31 - 40%	41 - 60%	61%+	**Total**
Bear Canyon Trap	62	25	0	0	0	**87**
Black Mountain	814	1,048	152	121	73	**2,208**
Cemetery	77	60	3	4	2	**146**
Clay Canyon	20	14	1	1	2	**38**
Eagle	254	325	63	62	47	**751**
East	577	740	113	97	68	**1,595**
FS 217 Lane	14	7	0	0	0	**21**
FS Admin. North	153	71	3	4	3	**234**
FS Admin South	84	56	7	7	3	**157**
FS River	32	22	0	0	0	**54**
FS West	13	10	0	0	0	**23**
North Bear Canyon	715	786	124	102	54	**1,781**
North Water Loop	458	492	67	50	27	**1,094**
School	30	9	0	1	0	**40**
South Bear Canyon	302	459	89	78	39	**967**
South Water Loop	381	284	23	15	4	**707**
Total	**4,676**	**4,408**	**645**	**542**	**322**	**9,903**

Cover types on the Baseline-Horsesprings allotment include grass-forb, grama, pine-juniper, juniper, and oak-juniper-pinyon as displayed in Table 38. The predominant vegetation type is grama grass mix comprising 49% of allotment followed by oak/juniper/pinyon mix comprising 21% of the allotment.

Table 38. Cover type, acres

Pasture	**Grass-Forb**	**Grama**	**Pine-Juniper**	**Juniper**	**Oak-Juniper-Pinyon**	**Total by pasture**
Bear Canyon Trap	3	84				87
Black Mountain	76	757	494	218	663	2,208

Pasture	Grass-Forb	Grama	Pine-Juniper	Juniper	Oak-Juniper-Pinyon	Total by pasture
Cemetery	24	110			11	145
Clay Canyon	9	26			3	38
Eagle		424	81	15	230	751
East		581	442	130	441	1,591
FS 217 Lane	5	16				21
FS Admin. North	71	162				233
FS Admin South	61	84			11	156
FS River	44	9				53
FS West		23				23
North Bear Canyon	108	1,168	252		252	1,780
North Water Loop	21	269	556		241	1,087
School	4	33	3			40
South Bear Canyon		814	12		141	966
South Water Loop	134	271	214		87	706
Total by cover type	560	4,831	2,054	363	2,080	

*FS Pastures are within the boundary of the Baseline-Horsesprings allotment but are not part of the allotment and are not included on the term grazing permit

Grazing management

The existing term grazing permit for the Baseline-Horsesprings allotment is for 0 to 100 cow/calf pairs and 0 to 405 yearlings September 1 to May 31, and 5 horses yearlong (a total of 2,287 animal unit months). The allotment is divided into seven main pastures: Black Mountain, East, Eagle, South Bear Canyon, North Bear Canyon, North Water Loop, and South Water Loop. The remaining pastures identified in Table 38 are smaller pastures used for holding or used intermittently. A rotation schedule is developed yearly during the annual operating instruction meeting. For the past several years all main pastures have been used with the exception of the School pasture which is isolated from the rest of the allotment. Rest of a main pasture has been incorporated into the annual operating instructions with North Water Loop rested in 2020, South Bear Canyon rested in 2019, and North Bear Canyon rested in 2018. The allotment was destocked after October 2020 and remained destocked during the 2021 grazing year to allow forage to recover following the 2020 drought year. Although the current permit is for seasonal use from Sept 1 to May 31, the season of use has been administratively extended to yearlong since 2011. Between 2006 and 2011, the Baseline-Horsesprings allotment was run with the Double Circle allotment.

The allowable use standard for all pastures is 20 percent to 40 percent, depending on the pasture.

Actual use summary

Actual use from 2003 through 2021 averaged 1,004 AUMs (84 head) or 44 percent of permitted. Recent years (2016 -2020) averaged higher actual use with 1,250 AUMs (104 head), 55 percent of permitted.

Long-term monitoring data

Remote sensing ground cover data

Traditionally, cluster or transect level data is used to monitor long-term trends that can be used in rangeland management and decision making. However, these clusters provide information at a specific point in space and time which may not be able to detect trends at an allotment or project level scale. Satellite -derived maps can help bridge the gap by providing more spatially and temporally continuous information (Allred et al. 2021). The Rangeland Analysis Platform (RAP) (https://rangelands.app/) provides a retrospective data set, from 1984 to 2020, mapping yearly vegetation functional groups of rangelands in the United States. The vegetation cover model uses Landsat data and field verified vegetation data to predict and quantify cover for annual forbs and grass, perennial forbs and grass, shrubs, trees, and bare ground. This data set can help identify areas that are experiencing changes in cover of various plant functional groups and ground cover. For this analysis, we look at changes in bare ground, tree, shrub, perennial forb and grass, and annual forb and grass cover at both the allotment scale and at a vegetation mapping scale (INREV vegetation mapping) to supplement the long-term trend data collected at permanently established cluster sites. By using the RAP data, we can determine trends at a larger scale and detect inter-annual variability resulting from drought. It's important to note that while this data can help detect trends over time, it does not indicate what factors contributed to long-term trends and may be influenced by factors unrelated to grazing management such as plant community shifts due to drought and fires.

The ground cover attributes measured in 2020 and 2021 for clusters B-C1, B-C3, B-C4, HS-C1, HS-C3, and HS-C4 show a strong decrease in bare soil and strong increase in litter cover compared to previous readings. It appears that drought conditions are influencing ground cover attributes with a decrease in perennial vegetation, an increase in annual species, increase in litter, and decrease in bare soil. It is well established that grass production in the Southwest United States varies greatly from year to year and is dependent upon annual precipitation (Cable 1975, Dagbegnon et al. 2015, Khumalo and Holechek 2005). Because the most recent ground cover data was collected in 2020 and 2021, RAP mapping will be used to determine broader trends than can be determined from cluster data which is limited in scale and represents specific points in time. Significant trends will be defined as mapping units with a correlation coefficient of 0.5 or higher for an increasing trend, and -0.5 or lower for a decreasing trend. Correlation coefficients are used to measure how strong a relationship is between two variables, in this case, time (measured in years) and ground cover (measured in percent cover). They show the linear relationship between the two variables with higher values showing a positive trend (an upward trend line) and lower values showing a negative trend (a downward trend line).

Allotment-wide trends

Portions of the Baseline-Horsesprings allotment show long-term trends (1988 to 2020) of increasing annual vegetation, increasing perennial vegetation, decreasing bare soil, and decreasing shrub cover (Figure 7). Perennial vegetation has increased on 1,446 acres, or 15% of the allotment, bare soil has decreased on 1,878 acres or 19% of the allotment, shrubs have decreased on 5,592 acres or 57% of the allotment, and annual vegetation has increased on 1,261 acres or 13% of the allotment. Areas showing increases in annual vegetation cover correspond to areas that have decreasing shrub cover; 89% of mapping units showing an increase in annuals also show a decrease in shrubs (Figure 8). No significant correlations were found supporting decreasing perennial vegetation cover, increasing bare soil, decreasing annual vegetation cover, increasing tree cover, or increasing shrub cover. Although the data cannot explain cause-effect relationships, broad interpretations can be drawn from the changes in functional groups and ground cover. The data indicates overall static or decreasing bare soil cover. However, the RAP data does not measure litter cover, so we are unable to determine if decreases in bare soil are due to increases in litter cover as seen in the 2020/2021 dry-weight rank data. The RAP data indicate static or increasing perennial vegetation cover rather than the decrease in perennial

vegetation cover shown in the 2020/2021 dry-weight rank data. Annual forbs have increased but this corresponds to a decrease in shrub cover rather than increases in bare soil.

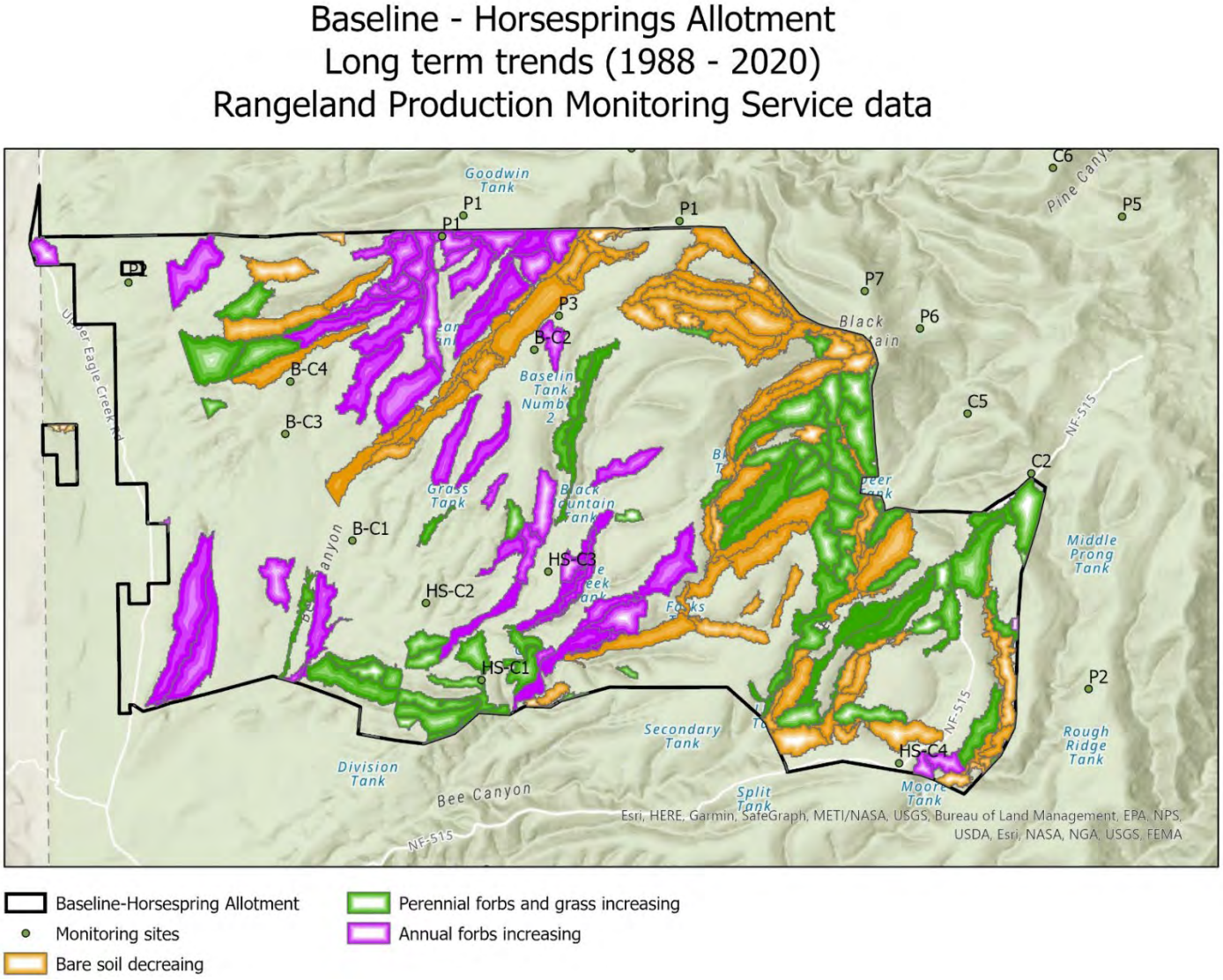

Figure 7. Long term trends on Baseline-Horsesprings allotment 1988 to 2020

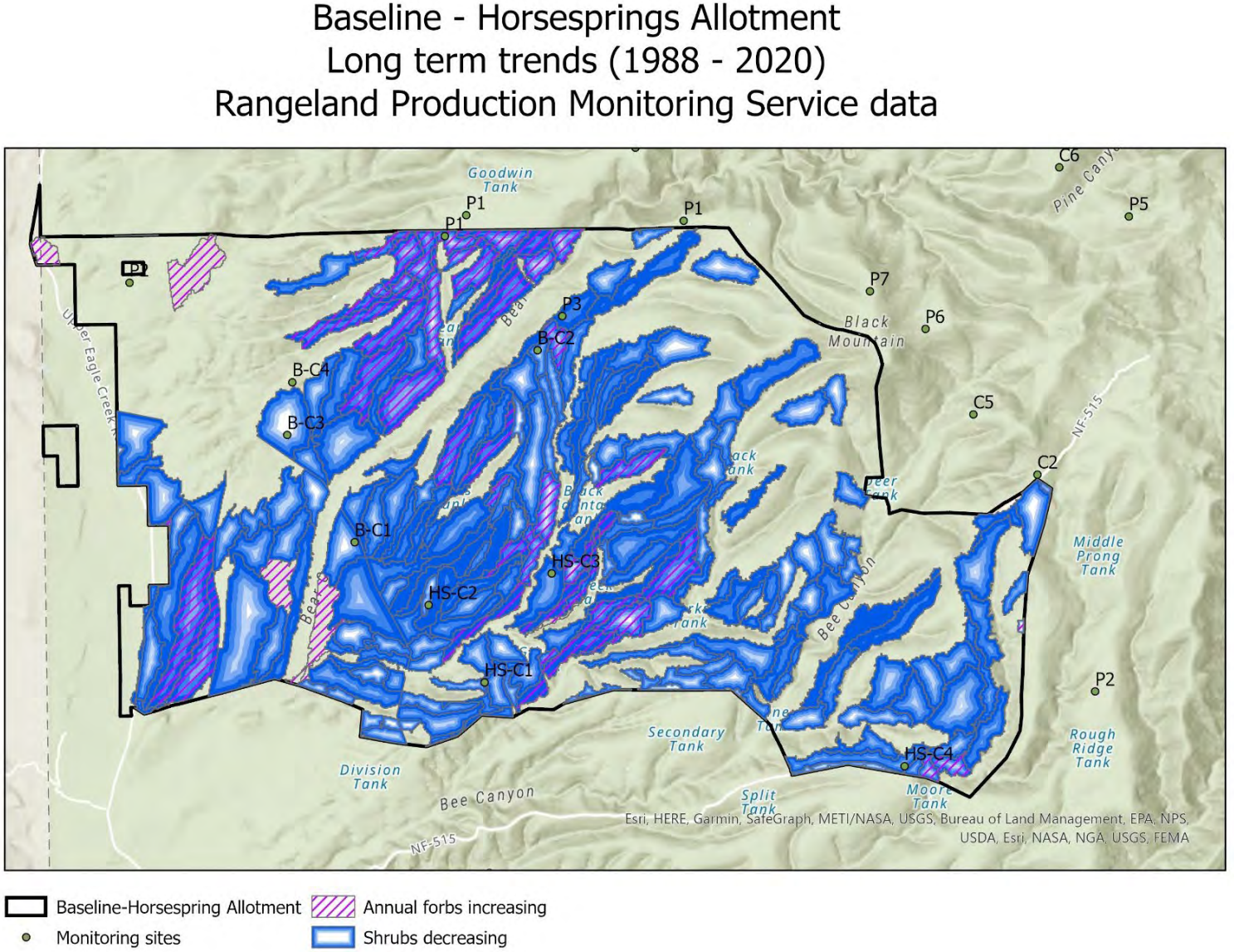

Figure 8. Long term trend of shrubs and annual forbs on Baseline-Horsesprings allotment 1988 to 2020.

Cluster data - Field sampling data

Cluster specific trends

Cluster 1 (B-C1) – North Bear Canyon pasture, TES map unit 482

Available data for Cluster 1 in the North Bear Canyon pasture includes Parker 3 Step data from 1954, 1959, and 1986, Daubenmire cover class data from 2005, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the site is currently dominated by curly mesquite with a strong black grama and beargrass subcomponent. The 2005 Daubenmire cover class data also show curly mesquite as the dominant species but differs in the subcomponent mostly composed of forbs and annual grasses. Data from the 1959 and 1986 Parker protocol also show curly mesquite as the dominant species, with blue grama and sideoats grama as the subcomponents. The 1986 Parker data show Wetherill's buckwheat, an annual forb, as a strong component in the cluster. Botanical composition data was not recorded for the 1954 Parker reading. Species diversity appears to increase with the 2005 Daubenmire data and 2020 dry-weight rank data although this could be due to differences in sampling methods rather than actual increases in plant diversity.

Table 39. Cluster 1 – North Bear Canyon summary, botanical composition (%), Parker 3 step protocol, TES Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		2005 Daubenmire Cover Class	Dry-weight rank protocol 2020
		1959	1986		
S	baccharis	0	0	0	1
S	Wright eriogonum	0	0	0	4
S	broom snakeweed	0	0	4	2
S	beargrass	0	0	0	13
S	mesquite	0	0	0	3
S	Yucca ssp.	0	0	0	4
G	threeawn	0	0	2	1
G	sideoats grama	10	7	0	4
G	black grama	0	0	5	17
G	blue grama	20	32	4	2
G	curly mesquite	70	34	35	30
F	Cooley's bundleflower	0	0	0	3
F	globemallow	0	0	0	2
	unknown	0	1	0	13
F	Wetherill's buckwheat	0	24	0	0
G	annual grass	0	0	13	0
F	late purple aster	0	0	26	0
F	annual forb	0	0	7	0
F	aster	0	0	1	0
F	wild buckwheat	0	0	1	0

Table 40 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above did not result in

differences in the calculated similarity to the potential natural community described for the TES map unit. All similarity indices calculated for this cluster fall within the low similarity class. Similarity to PNC increased from 2005 to 2020 which is primarily driven by an increase in sideoats grama and shrub species.

Table 40. Cluster 1 – North Bear Canyon, plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	18
1986 Parker protocol	24
2005 Daubenmire cover class protocol	17
2020 Dry-weight rank protocol	24

The 2020 points data show a strong decrease in the amount of bare soil compared to previous readings. The 2020 data also show vegetative cover has decreased slightly while rock and litter have increased. When looking at the data set as a whole, there is a slight downward trend in vegetative cover. Rock, litter, and bare soil fluctuate with no apparent trend. Fluctuations in ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2020 shows annual forb species present in 72% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in rock cover while vegetative cover and bare soil is lower than expected. Litter cover is higher than expected for this site.

Table 41. Cluster 1 – North Bear Canyon pasture summary, ground cover (%)

	Parker protocol			2005 Daubenmire cover class protocol	2020 Points protocol	Reference condition from TES
	1954	1959	1986			
Vegetation	12	12	16	6	5	**10**
Rock	29	12	38	24	45	**50**
Litter	16	11	5	12	29	**0**
Bare soil	44	65	41	58	20	**40**

The Rangeland Analysis Platform ground cover trends at B-C1 North Bear Canyon pasture show inter-annual variation in perennial vegetation cover with a sharp decline from 2018 to 2020. The year 2020 shows the lowest cover of perennial grasses and forbs of any year. Annual grasses and forbs, and bare soil have remained fairly static with only slight increases in cover in 2020 (not a significant trend). While the points data from 2020 shows a sharp decrease in bare soil, the RAP data does not. This may indicate that litter, which is not measured by RAP, is accounting for the decrease in bare soil seen at the cluster.

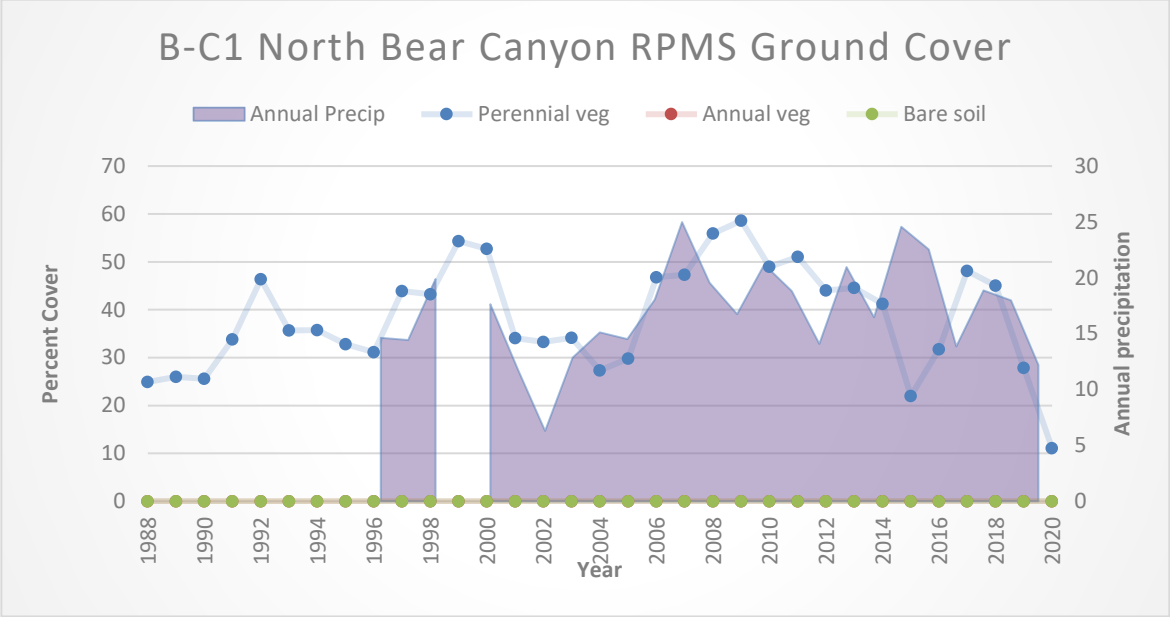

Figure 9. B-C1 North Bear Canyon RAP ground cover chart

B-C1- North Bear Canyon trend summary

The plant community at B-C1 – North Bear Canyon is currently dominated by curly mesquite with a strong black grama and beargrass subcomponent. Comparative botanical composition data from the Parker readings and Daubenmire cover class readings show curly mesquite and grama grasses have dominated the site since the late 1950s. The more recent cluster readings (2005 and 2020), show an increase in forb and shrub cover, including beargrass, with a component of annual forbs and grasses. Overall diversity at the site has increased from 1959 to 2020.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses with few undesirable species. Shrubs have increased from previous years although its unknown if this is due to differences in protocols or actual changes in botanical composition. A preponderance of evidence suggests that the overall vegetative trend is static or slightly upward due to similarities in dominant grass species and an increase in site diversity. Site protection attributes from the cluster data show low bare soil, and high litter and rock cover which are contributing to a stable site. However, the decrease in vegetative cover and increase in litter cover appears to be partially due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. This trend is also seen in the RAP data which shows a decrease in perennial vegetation cover from 2018 to 2020. The 2020 points data indicates annual species are contributing to the decrease in bare soil and increase in litter. The 2020 monitoring data does not indicate sheet erosion present at the site, however head cutting gully erosion was noted as encroaching on the site. A preponderance of evidence for site protection attributes shows a downward trend due to the decrease in vegetative cover and declines in bare soil due, in large part, to annual species abundance.

Ecological status: The 2020 dry-weight rank data show similarity to PNC has increased from the 2005 Daubenmire cover class reading, however when comparing data from all years, there is no apparent trend. All similarity indices show low similarity regardless of protocol. This is primarily due to an apparent lack of forb and grass diversity at the site.

Cluster 2 (B-C2) – North Bear Canyon pasture, TES map unit 589

Available data for Cluster 2 in the North Bear Canyon pasture includes Parker 3 Step data from 1954, 1959, and 1986, Daubenmire cover class data from 2006, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the site is strongly dominated by curly mesquite. The 2006 Daubenmire cover class data also shows curly mesquite as the dominant species with annual forbs as a subcomponent. The 1986 and 1959 Parker 3 Step data differ, showing blue grama as the dominant species with curly mesquite as a subcomponent. Botanical composition data was not recorded for the 1954 Parker reading. Species diversity recorded at the cluster appears to increase with the 2006 Daubenmire data and 2020 dry-weight rank data although this could be due to differences in sampling methods rather than actual increases in plant diversity.

Table 42. Cluster 2 – North Bear Canyon summary, botanical composition (%), Parker 3 step protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		2006 Daubenmire Cover Class	Dry-weight rank protocol 2020
		1959	1986		
G	sideoats grama	2	3	8	7
G	blue grama	51	80	2	2
G	curly mesquite	47	16	70	83
G	sixweeks fescue	0	0	1	0
G	threeawn	0	0	0	2
F	annual sunflower	0	0	1	0
F	annual forb	0	0	15	0
S	baccharis	0	0	1	6

Table 43 shows the calculated similarity to the potential natural community described for the TES map unit. The 1959 Parker data, the 2006 Daubenmire cover class data, and the 2020 dry-weight rank data show the cluster falling in the mid similarity category. The shift in dominance away from curly mesquite to blue grama indicated in the 1986 Parker data appear to have caused the cluster to fall in the low similarity category.

Table 43. Cluster 2 -North Bear Canyon, plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	37
1986 Parker protocol	27
2006 Daubenmire cover class protocol	40
2020 Dry-weight rank protocol	37

The 2020 points data is an outlier showing a strong decrease in the amount of bare soil and increase in litter compared to previous readings. When looking at the data set as a whole, it appears there is a slight upward trend (decrease in cover) in bare soil while all other attributes appear to remain fairly static. Fluctuations in ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2020 shows annual grass and forb species present in 100% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative cover while rock and bare soil are lower than expected. Litter cover is much higher than expected for this site.

Table 44. Cluster 2 – North Bear Canyon pasture summary, ground cover (%)

	Parker protocol			2006 Daubenmire cover class protocol	2020 Points protocol	Reference condition from TES
	1954	1959	1986			
Vegetation	17	35	27	7	15	**10**
Rock	32	20	37	48	20	**45**
Litter	14	10	13	16	62	**T**
Bare soil	36	34	24	30	3	**45**

The Rangeland Analysis Platform ground cover trends at B-C2 North Bear Canyon pasture show inter-annual variation in perennial vegetation cover with a decrease in cover from 2018 to 2020. The perennial vegetation cover is below average. Annual grasses and forbs, and bare soil have remained fairly static. While the points data from 2020 shows a sharp decrease in bare soil, the RAP data does not. This may indicate that litter, which is not measured by RAP, is accounting for the decrease in bare soil seen at the cluster.

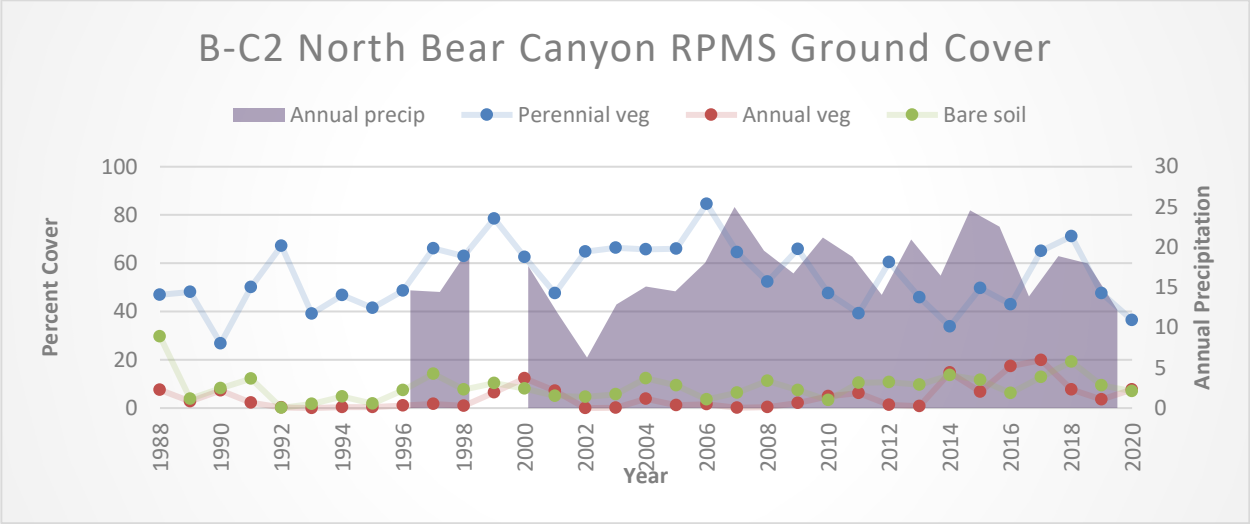

Figure 10. B-C2 North Bear Canyon RAP ground cover chart

B-C2- North Bear Canyon trend summary

The plant community at B-C2 – North Bear Canyon is currently dominated by curly mesquite. Comparative botanical composition data from the Parker readings and Daubenmire cover class readings show curly mesquite and grama grasses have dominated the site from 1959 to 1986. After 1986, grama grasses, including blue gramma and sideoats grama, decreased significantly while curly mesquite increased. It is unclear what factors contributed to this shift in species composition. Overall diversity at the site increased from 1959 to 2020.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses with few undesirable species. A preponderance of evidence suggests that the overall trend is static or slightly upward due to the apparent increase in species diversity. The 2020 points data is an outlier showing a strong decrease in the amount of bare soil and strong increase in litter compared to previous readings. The increase in litter does not correspond with a decrease in vegetation, indicating litter is likely composed of annual vegetation rather than a die off of perennial vegetation seen at other sites. A preponderance of evidence suggests

the overall site protection trend is slightly upward due to the decrease in bare soil with static vegetative cover.

Ecological status: The similarity to PNC has remained fairly static with the exception of the 1986 Parker reading where it dropped from mid similarity to low similarity before rebounding in 2006. The 1959 Parker data, the 2006 Daubenmire cover class data, and the 2020 dry-weight rank data show the cluster in the mid similarity category.

Cluster 3 (B-C3) – South Water Loop pasture, TES map unit 470

Available data for Cluster 3 in the South Water Loop pasture includes Parker 3 Step data from 1954, 1959, and 1986, Daubenmire cover class data from 2006, and dry-weight rank data from 2020. The 2020 dry-weight rank data shows the site is currently dominated by sideoats grama with a curly mesquite subcomponent. The 2006 Daubenmire cover class data indicate the site was dominated by annual Panicum grass and annual forbs. The 1986 Parker 3 step data shows co-dominance between sideoats grama and the sub-shrub Wright's buckwheat. Bare soil accounted for 14% of the 1986 Parker transect composition because there were no plants present to record. The 1959 Parker data showed vine mesquite and curly mesquite as co-dominant with a sideoats grama subcomponent. Botanical composition data was not recorded for the 1954 Parker reading. Species diversity recorded at the cluster appears to be fairly static despite the fluctuation in species.

Table 45. Cluster 3 – South Water Loop summary, botanical composition (%), Parker 3 step protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		2006 Daubenmire Cover Class	Dry-weight rank protocol 2020
		1959	1986		
F	globemallow	0	1	0	14
G	threeawn	0	5	0	0
G	sideoats grama	20	26	2	39
F	Perennial forb	16	0	0	0
G	squirreltail	0	14	0	0
F	thistle	0	1	0	0
S	prickly pear	0	0	0	5
S	Wright's buckwheat	0	26	0	3
G	vine mesquite	29	0	0	0
G	blue grama	6	8	0	1
G	curly mesquite	30	4	4	19
S	baccharis	0	0	1	13
	Bare soil*	0	14	0	0
G	annual panicum	0	0	66	0
F	desert palafox	0	0	15	0
F	silverleaf nightshade	0	0	6	0
F	annual forb	0	0	1	0
F	Evolvulus spp	0	0	0	2
T	alligator juniper	0	0	0	4

*Bare soil recorded when no plants were found within 20 feet of loop.

Table 46 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above did not result in differences in the calculated similarity to the potential natural community described for the TES map unit. All similarity indices calculated for this cluster fall within the low similarity class. Similarity to PNC increased from 2006 to 2020 which was primarily driven by the increase in sideoats grama and curly mesquite.

Table 46. Cluster 3 -South Water Loop, plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	23
1986 Parker protocol	15
2006 Daubenmire cover class protocol	7
2020 Dry-weight rank protocol	22

The 2020 points data is an outlier showing a strong decrease in the amount of bare soil and increase in litter compared to previous readings. When looking at the data set as a whole, it appears there is a slight upward trend (decrease in cover) for bare soil. The 1986 Parker data showed a rise in bare soil and a corresponding appearance of bare soil in the transect composition as shown in Table 45. Vegetative cover shows a slight downward trend. Rock cover remained fairly static while litter shows a slight upward trend (increase in cover) with the exception of 1986. Fluctuations in ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2020 shows annual grass and forb species present in 97% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative cover while rock and bare soil are lower than expected. Litter cover is much higher than expected for this site.

Table 47. Cluster 3 -South Water Loop summary, ground cover (%)

	Parker protocol			2006 Daubenmire cover class protocol	2020 Points protocol	Reference condition from TES
	1954	**1959**	**1986**			
Vegetation	7	13	2	3	1	**5**
Rock	24	16	22	25	18	**55**
Litter	8	13	1	19	77	**T**
Bare soil	61	59	76	53	3	**40**

The Rangeland Analysis Platform ground cover trends at B-C3 South Water Loop pasture show inter-annual variation in perennial vegetation cover with the 2020 cover appearing within the average range. Annual grasses and forbs, and bare soil have remained fairly static with only slight increases in cover from 1988 to 2020 (not a significant trend). While the points data from 2020 shows a sharp decrease in bare soil, the RAP data does not. This may indicate that litter, which is not measured by RAP, is accounting for the decrease in bare soil seen at the cluster.

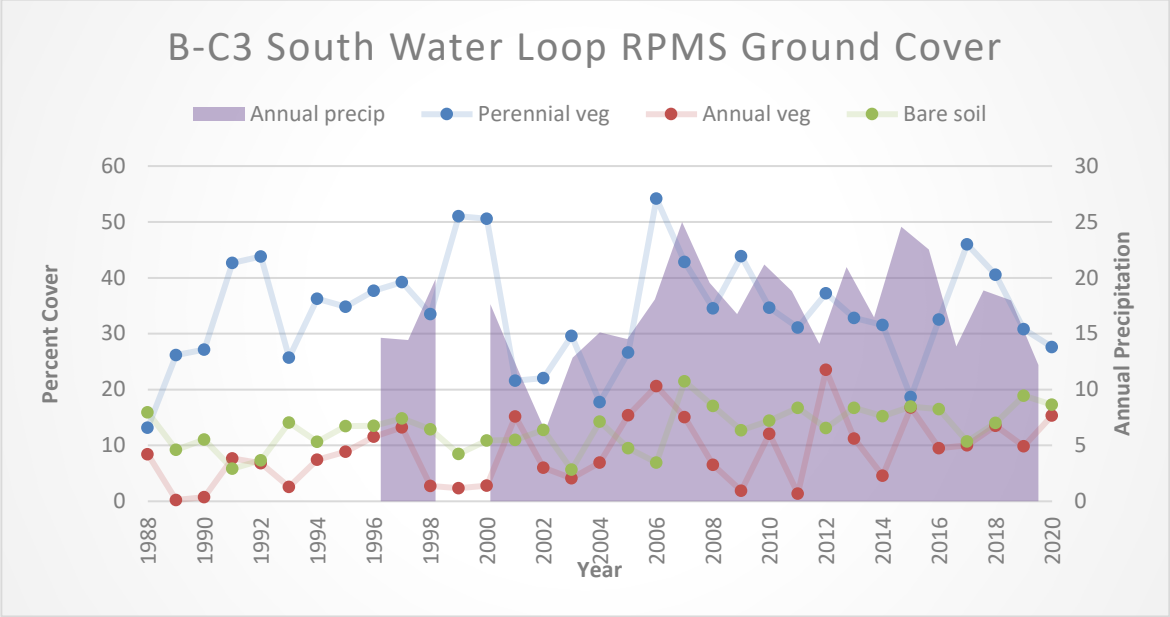

Figure 11. B-C3 South Water Loop RAP ground cover chart

B-C3- South Water Loop trend summary

The plant community at B-C3 – South Water Loop is currently dominated by sideoats grama with a curly mesquite subcomponent. Comparative botanical composition data from the Parker 3 step protocol in 1959 and 1986 show sideoats grama, curly mesquite, and vine mesquite have dominated the site since the late 1950s. In 1986 there appears to have been a sharp increase in bare soil although sideoats grama and Wright's buckwheat, a perennial sub-shrub, are still dominating the site. The 2006 Daubenmire cover class data shows a shift to an early seral stage occurred between 1986 and 2006 with annuals dominating the site in 2006. The 2020 dry-weight rank data shows the site recovering to a state more similar to the 1954 Parker reading. Overall diversity at the site has remained static, with shifts in species composition including some undesirable species after 1986.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses and undesirable species becoming less abundant. A preponderance of evidence suggests that the overall trend is upward due to the botanical composition data and similarity to PNC showing the site recovering from the 1986 and 2006 condition. Site protection from the cluster data attributes show low bare soil, and high litter and rock cover which are contributing to a stable site. However, the decrease in vegetative cover and increase in litter cover appears to be partially due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. This trend is also seen in the RAP data which shows a decrease in perennial vegetation cover from 2017 to 2020 although the 2020 data appears to be within the normal range. The 2020 points data indicates annual species are contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes shows a static trend.

Ecological status: The similarity to PNC mirrors the botanical composition data, with a decrease in similarity from 1959 to 1986 followed by a sharp decline in similarity from 1986 to 2006. The similarity to PNC from the 2020 dry-weight rank data shows the plant community returning to the 1959 level. However, all similarity indices show low similarity regardless of protocol or year. This is primarily due to an apparent lack of forb and grass diversity at the site.

Cluster 4 (B-C4) – North Water Loop pasture, TES map unit 479

Available data for Cluster 4 in the North Water Loop pasture includes Parker 3 Step data from 1954, 1959, 1986, and dry-weight rank data from 2021. The 2021 dry-weight rank data shows the site is currently dominated by curly mesquite with a blue grama subcomponent. The 1986 and 1959 Parker 3 Step data differ, showing blue grama as the dominant species with a vine mesquite or curly mesquite subcomponent. Botanical composition data was not recorded for the 1954 Parker reading. Species diversity recorded at the cluster appears to be fairly static despite the fluctuation in species.

Table 48. Cluster 4 – North Water Loop summary, botanical composition (%), Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker protocol		Dry-weight rank protocol 2021
		1959	1986	
G	blue grama	78	65	10
S	mesquite	1	6	9
G	mat muhly	1	0	0
G	sideoats grama	7	2	2
F	scaleseed	1	0	0
G	curly mesquite	9	3	54
S	false mesquite	0	1	0
T	oneseed juniper	1	3	17
G	vine mesquite	0	13	0
S	desert-thorn	0	1	0
G	common wolfstail	1	3	0
F	Perennial forb	1	0	0
S	Wright eriogonum	0	3	0
S	prickly pear	0	0	4
G	hairy grama	0	0	2
F	globemallow	0	0	1

Table 49 shows the calculated similarity to the potential natural community described for the TES map unit. The 1959 and 1986 Parker protocol data are in the low similarity class while the 2021 dry-weight rank data is in the mid similarity class. The shift in dominance away from blue grama to curly mesquite is driving the increase in similarity to PNC for the 2021 data.

Table 49. Cluster 4- North Water Loop, plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	21
1986 Parker protocol	22
2021 Dry Weight Rank Protocol	44

The 2021 points data shows a strong decrease in the amount of bare soil and increase in litter compared to previous readings. When looking at the data set as a whole, it appears there is a slight downward trend in vegetative cover though current conditions are similar to the reference site condition. Rock, litter and bare soil fluctuated, but remain fairly static between 1954 and 1986. Fluctuations in ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2020 shows annual grass and forb species present in 78% of the plots which is likely contributing to

the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative cover and rock cover. Bare soil is lower than expected and litter cover is much higher than expected for this site.

Table 50. Cluster 4 – North Water Loop summary, ground cover (%)

	Parker protocol			2021 Points protocol	Reference condition from TES
	1954	1959	1986		
Vegetation	12	9	11	4	**5**
Rock	17	8	17	30	**30**
Litter	14	17	6	43	**T**
Bare soil	57	67	67	23	**65**

The Rangeland Analysis Platform ground cover trends at B-C4 North Water Loop pasture show inter-annual variation in perennial vegetation cover with a decrease in cover from 2018 to 2020. The perennial vegetation cover is below average. Annual grasses and forbs, and bare soil have remained fairly static. While the points data from 2020 shows a sharp decrease in bare soil, the RAP data does not. This may indicate that litter, which is not measured by RAP, is accounting for the decrease in bare soil seen at the cluster.

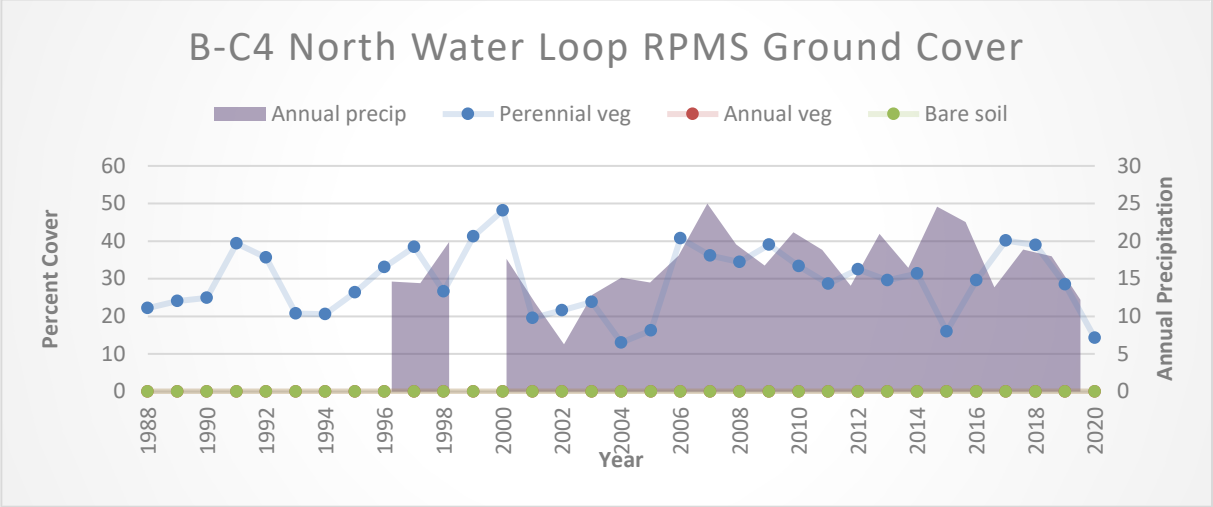

Figure 12. B-C4 North Water Loop RAP ground cover chart

C4- North Water Loop trend summary

The plant community at B-C4 – North Water Loop is currently dominated by curly mesquite with a blue grama subcomponent and a sparce juniper overstory. Comparative botanical composition data from the Parker protocol in 1959 and 1986 show blue grama dominated the site. After 1986, blue gramma decreased significantly while curly mesquite increased. It is unclear what factors contributed to this shift in species composition. Overall diversity at the site has remained static despite shifts in species composition.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses with few undesirable species. A preponderance of evidence suggests that the overall trend is static or slightly upward due to an increase in similarity to PNC. Site protection attributes from the cluster data show low bare soil, and high litter and rock cover which are contributing to a stable site. However, the decrease in vegetative cover and increase in litter

cover appears to be partially due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. This trend is also seen in the RAP data which shows a decrease in perennial vegetation cover from 2018 to 2020. The 2020 points data indicates annual species are contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes shows a slightly downward trend due to the decrease in vegetative cover and declines in bare soil due in large part to annual species abundance.

Ecological status: The similarity to PNC for the 1959 and 1986 Parker data are in the low similarity category while the 2021 dry-weight rank data is in the mid similarity category. The increase in similarity is primarily driven by an increase in curly mesquite which is the most abundant grass species in the potential natural community.

Cluster 1 (HS-C1) – South Bear Canyon pasture, TES map unit 483

Available data for Cluster 1 in the South Bear Canyon pasture includes Parker 3 Step data from 1955, 1959, 1976, and 1987, and dry-weight rank data from 2020. The 2020 dry-weight rank data shows the site is currently dominated by blue grama with a sideoats grama subcomponent. The 1987, 1975, and 1959 Parker 3 step data show curly mesquite as the dominant species with a blue grama subcomponent. Botanical composition data was not recorded for the 1955 Parker reading. Species diversity increased slightly from 1987 to 2020 although this could be due to differences in sampling methods rather than actual increases in plant diversity.

Table 51. Cluster 1 – South Bear Canyon summary, botanical composition (%) Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol			Dry-weight rank protocol 2020
		1959	1976	1987	
G	curly mesquite	70	53	51	0
G	sideoats grama	5	1	3	13
G	blue grama	20	44	28	62
G	black grama	5	0	0	0
G	hairy grama	0	0	10	0
F	wild buckwheat	0	0	9	0
S	Wright eriogonum	0	0	0	3
F	desert parsley	0	1	0	0
G	common wolfstail	0	0	0	2
F	Cooley's bundleflower	0	0	0	16
S	broom snakeweed	0	0	0	2
T	alligator juniper	0	0	0	1
S	prickly pear	0	0	0	1

Table 52 shows the calculated similarity to the potential natural community described for the TES map unit. The 1959 and 1976 Parker protocol data, and the 2020 dry-weight rank data are in the low similarity class. The 1987 Parker data falls in the mid similarity class which is mostly driven by the presence of hairy grama.

Table 52. Cluster 1 – South Bear Canyon plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	32
1976 Parker protocol	24
1987 Parker protocol	34
2020 Dry Weight Rank Protocol	25

The 2020 points data shows a strong decrease in the amount of bare soil and vegetative cover with a corresponding increase in litter cover compared to previous readings. When looking at the data set as a whole, it appears ground cover fluctuated with each reading, with no apparent trend. Fluctuations in ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2020 shows annual grass and forb species present in 100% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see little similarity between the current condition and what is expected at the site.

Table 53. Cluster 1 – South Bear Canyon summary, ground cover (%)

	Parker protocol					2020 Points protocol	Reference condition from TES
	1955	**1957**	**1959**	**1976**	**1987**		
Vegetation	29	7	12	30	18	2	**10**
Rock	25	30	12	36	29	15	**45**
Litter	13	21	11	20	7	75	**5**
Bare soil	32	42	65	14	45	8	**40**

The Rangeland Analysis Platform ground cover trends at HS-C1 South Bear Canyon pasture show inter-annual variation in perennial vegetation cover with a decrease in cover from 2018 to 2020. The year 2020 shows the lowest cover of perennial grasses and forbs of any year. Annual grasses and forbs remained fairly static from 1988 to 2020. Bare soil remained static from 1988 to 2018, then increased and remained higher than average in 2019 and 2020. While the dry-weight rank data from 2020 shows a sharp decrease in bare soil, the RAP data does not. This may indicate that litter, which is not measured by RAP, is accounting for the decrease in bare soil seen at the cluster.

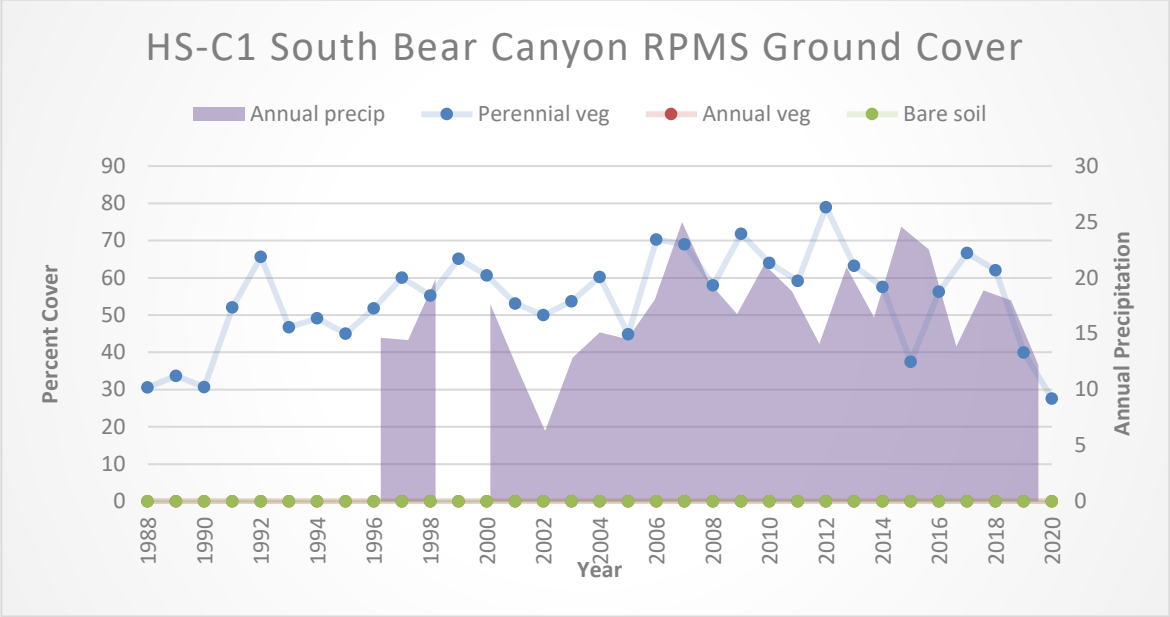

Figure 13. HS-C1 South Bear Canyon RAP ground cover chart

HS -C1 – South Bear Canyon trend summary

The plant community at HS-C1 – South Bear Canyon is currently dominated by blue grama with a sideoats grama subcomponent. Comparative botanical composition data from the Parker protocol in 1959, 1976, and 1987 show curly mesquite dominated the site. Curly mesquite was not recorded in the 2020 dry-weight rank botanical composition readings. It is unclear what factors contributed to the shift in species composition from primarily curly mesquite to blue grama. Cooley's bundleflower, a palatable legume, appears for the first time in the 2020 data. Species diversity increased slightly from 1987 to 2020 although this could be due to differences in sampling methods rather than actual increases in plant diversity.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses and few undesirable species. A preponderance of evidence suggests an overall static or slightly downward trend due to the decrease in similarity to PNC. The 2020 points data show a strong decrease in the amount of bare soil and strong increase in litter compared to previous readings which indicate the site is currently stable. However, the decrease in vegetative cover and increase in litter cover appears to be due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. This trend is also seen in the RAP data which shows a decrease in perennial vegetation cover from 2018 to 2020. The 2020 points data indicates annual species are contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes shows a slightly downward trend due to the decrease in vegetative cover and declines in bare soil due in large part to annual species abundance.

Ecological status: The similarity to PNC has fluctuated up and down within the mid similarity class with the exception of the 1987 data falling in the low similarity class. Similarity to PNC decreased from 1987 to 2020 which was primarily driven by the absence of curly mesquite in 2020.

Cluster 2 (HS-C2) – South Bear Canyon, TES map unit 482

Available data for Cluster 2 in the South Bear Canyon pasture includes Parker 3 Step data from 1955, 1959, 1975, and 1988, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the current plant community is dominated by hairy grama with a strong curly mesquite subcomponent. The 1988 and 1975 Parker 3 step data also show hairy grama as the dominant species while the 1959

data differ, showing blue grama and curly mesquite as co-dominant. Botanical composition data was not recorded for the 1955 Parker reading. Species diversity increased slightly from 1988 to 2021 although this could be due to differences in sampling methods rather than actual increases in plant diversity.

Table 54. Cluster 2 – South Bear Canyon summary, botanical composition (%) Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol			Dry-weight rank protocol 2021
		1959	1975	1988	
G	curly mesquite	47	9	19	28
G	blue grama	51	14	2	0
G	black grama	0	7	0	8
G	sideoats grama	2	5	10	11
G	hairy grama	0	54	58	35
G	common wolfstail	0	4	0	0
G	poverty threeawn	0	2	6	0
F	wild buckwheat	0	4	5	0
F	wooly plantain	0	0	0	3
G	threeawn	0	0	0	6
G	cane bluestem	0	0	0	4
S	Wright eriogonum	0	0	0	4
S	Yucca	0	0	0	1

Table 55 shows the calculated similarity to the potential natural community described for the TES map unit. The 1959 and 1988 Parker protocol data, and the 2021 dry-weight rank data are in the low similarity class. The 1975 Parker data falls in the mid similarity class which is mostly driven by the diversity of grama grasses recorded that year. Similarity to PNC increased from 1988 to 2021.

Table 55. Cluster 2 – South Bear Canyon plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	15
1975 Parker protocol	41
1988 Parker protocol	22
2021 Dry Weight Rank Protocol	31

The 2021 points data shows a strong decrease in the amount of bare soil with a corresponding increase in litter and rock cover compared to previous readings. Vegetative cover also decreased from previous readings. When looking at the data set as a whole, there is a slight upward trend (decrease in cover) in bare soil and downward trend vegetative cover. Percent frequency monitoring in 2021 show annual grass and forb species present in 51% of the plots which may be contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in rock cover, while vegetation and bare soil are much lower than what would be expected at the site.

Table 56. Cluster 2 – South Bear Canyon summary, ground cover (%)

	Parker protocol				2021 Points protocol	Reference condition from TES
	1955	1959	1975	1988		
Vegetation	18	35	23	16	**4**	**10**
Rock	21	20	35	18	**44**	**50**
Litter	17	10	14	0	**50**	**0**
Bare soil	44	34	28	66	**1**	**40**

The Rangeland Analysis Platform ground cover trends at HS-C2 South Bear Canyon pasture show inter-annual variation in perennial vegetation cover with a decrease in cover from 2018 to 2020. The perennial vegetation cover is below average. Annual grasses and forbs, and bare soil have remained fairly static. While the points data from 2020 shows a sharp decrease in bare soil, the RAP data does not. This may indicate that litter, which is not measured by RAP, is accounting for the decrease in bare soil seen at the cluster.

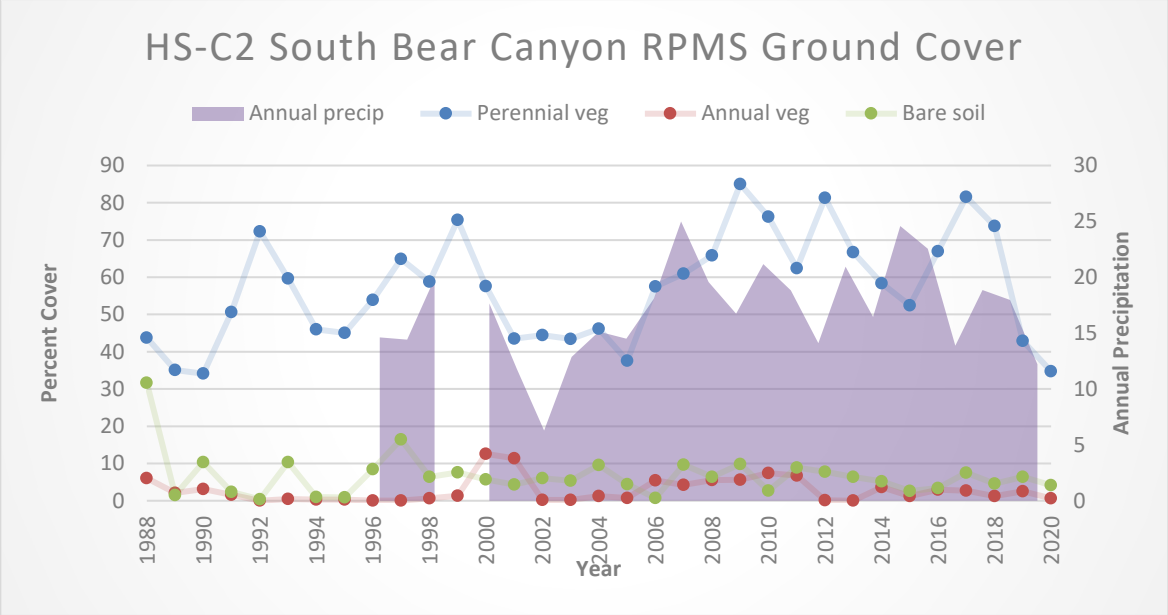

Figure 14. HS-C2 South Bear Canyon RAP ground cover chart

HS -C2 – South Bear Canyon trend summary

The plant community at HS-C2 – South Bear Canyon is currently dominated by hairy grama with a strong curly mesquite subcomponent. Comparative botanical composition data from the Parker 3 step data in 1988 and 1975 also show hairy grama as dominant while the 1959 Parker data indicate blue grama and curly mesquite were co-dominant. Curly mesquite was not recorded in the 2021 dry-weight rank botanical composition readings. Species diversity increased slightly from 1988 to 2021 although this could be due to differences in sampling methods rather than actual increases in plant diversity.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses and few undesirable species. A preponderance of evidence suggests that the overall trend is static or slightly upward due to similar species composition and increase in similarity to PNC. The 2021 dry-weight rank data shows a strong decrease in the amount of bare soil and strong increase in litter compared to previous readings which indicate the site is currently stable. However, the decrease in vegetative cover and increase in litter

cover appears to be due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2021. Annual species appear to also be contributing to the decrease in bare soil and increase in litter although 51% frequency of annuals does not entirely explain the drastic decrease from 66% bare soil in 1988 to 1% in 2021. A preponderance of evidence for site protection attributes shows a static trend with decreases in vegetation offset by a large decrease in bare soil not entirely explained by annual species.

Ecological status: The similarity to PNC has fluctuated up and down with all except the 1975 data falling in the low similarity category. Similarity to PNC increased from 1988 to 2021 which was primarily driven by the presence of black grama in 2021.

Cluster 3 (HS-C3) – South Bear Canyon, TES map unit 587

Available data for Cluster 3 in the South Bear Canyon pasture includes Parker 3 Step data from 1955, 1957, and 1988, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the current plant community is dominated by wooly plantain (annual forb) with a strong sideoats grama subcomponent. The 1988 Parker 3 step data show blue grama and sideoats grama as co-dominant species while the 1975 Parker data shows and even split among sideoats grama, blue grama, and curly mesquite. Botanical composition data was not recorded for the 1955 Parker reading. Species diversity increased from 1988 to 2021 although this could be due to differences in sampling methods rather than actual increases in plant diversity.

Table 57. Cluster 3 – South Bear Canyon summary, botanical composition (%) Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		Dry-weight rank protocol 2021
		1975	1988	
G	sideoats grama	30	39	22
G	common wolfstail	1	0	0
G	blue grama	31	47	7
G	poverty threeawn	4	4	0
G	vine mesquite	1	0	0
G	curly mesquite	30	9	6
G	hairy grama	3	0	12
T	oneseed juniper	0	0	12
G	cane bluestem	0	0	9
G	threeawn	0	0	4
F	wooly plantain	0	0	25
F	globemallow	0	0	1
S	broom snakeweed	0	0	2

Table 58 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above did not result in differences in the calculated similarity to the potential natural community described for the TES map unit. All similarity indices calculated for this cluster fall within the mid similarity class. Similarity to PNC increased from 1988 to 2021.

Table 58. Cluster 3 – South Bear Canyon plant community similarity to PNC as described in TES

	Similarity Index
1975 Parker protocol	45
1988 Parker protocol	39
2021 Dry Weight Rank Protocol	50

The 2021 points data shows a strong decrease in the amount of bare soil and vegetative cover with a corresponding increase in litter cover compared to previous readings. When looking at the data set as a whole, there is a slight downward trend in vegetative cover and upward trend in litter. Rock cover has remained fairly static since 1955 as well as bare soil with the exception of 2021 dry weight rank data showing it much lower than previous years. Percent frequency monitoring in 2021 shows annual forb species present in 94% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see few similarities between the current condition and what is expected at the site.

Table 59. Cluster 3 – South Bear Canyon summary, ground cover (%)

	Parker protocol			2021 Points Protocol	Reference condition from TES
	1955	**1975**	**1988**		
Vegetation	25	12	40	2	**10**
Rock	34	40	36	38	**65**
Litter	16	24	3	56	**5**
Bare soil	25	24	20	3	**20**

The ground cover trends at HS-C3 South Bear Canyon pasture show inter-annual variation in perennial vegetation cover with a decrease in cover from 2018 to 2020. The year 2020 shows the lowest cover of perennial grasses and forbs of any year. Annual grasses and forbs, and bare soil have remained fairly static. While the dry-weight rank data from 2020 shows a sharp decrease in bare soil, the RAP data does not. This may indicate that litter, which is not measured by RAP, is accounting for the decrease in bare soil seen at the cluster.

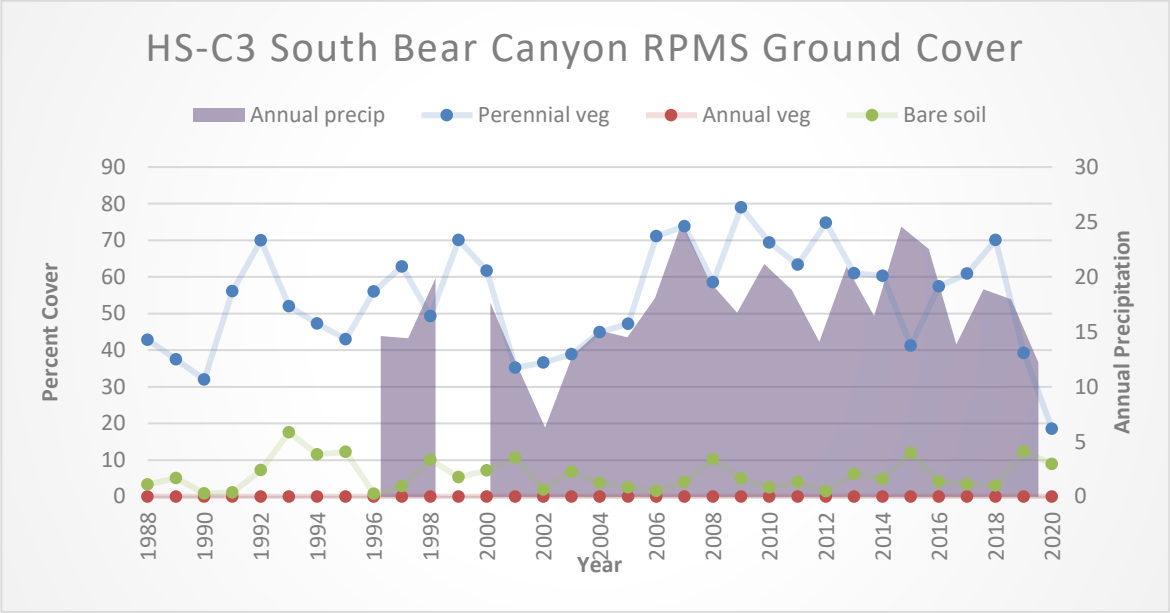

Figure 15. HS-C3 South Bear Canyon RAP ground cover chart

HS-C3 – South Bear Canyon trend summary

The plant community at HS-C3 – South Bear Canyon is currently dominated by wooly plantain with a sideoats grama subcomponent. Comparative botanical composition data from the Parker 3 step protocol in 1988 show blue grama and sideoats grama as co-dominant while the 1975 Parker data indicate blue grama, sideoats grama and curly mesquite dominated the site. The 2021 dry weight rank data also has blue grama and curly mesquite components but in smaller amounts showing fluctuation in cover rather than species composition. Species diversity increased slightly from 1988 to 2021 although this could be due to differences in sampling methods rather than actual increases in plant diversity.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses and, although annual species appear to be increasing, the similarity to PNC has also increased. A preponderance of evidence suggests that the overall trend is static or slightly upward. The 2021 points data shows a strong decrease in the amount of bare soil and vegetive cover, and strong increase in litter compared to previous readings which indicate the site is currently stable. However, the decrease in vegetative cover and increase in litter cover appears to be due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. This trend is also seen in the RAP data which shows a decrease in perennial vegetation cover from 2018 to 2020 with the 2020 perennial vegetation cover the lowest it has been since 1988. The 2020 points data indicates annual species are contributing to the decrease in bare soil and increase in litter. A preponderance of evidence suggests that the overall trend is downward due to the decrease in vegetative cover and declines in bare soil due in large part to annual species abundance.

Ecological status: The similarity to PNC has remained fairly stable with all data falling in the mid similarity category. Similarity to PNC increased from 1988 to 2021 primarily due to the presence of hairy grama.

Cluster 4 (HS-C4) – East pasture, TES map unit 589

Available data for Cluster 4 in the East pasture includes Parker 3 Step data from 1955, 1957, and 1988, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the current plant community is dominated by blue grama with a sideoats grama subcomponent. Similarly, the Parker 3 step data from 1988 and 1975 show blue grama as the dominant species with sideoats grama being the next most abundant. Botanical composition data was not recorded for the 1955 Parker reading. Species diversity increased from 1988 to 2020 although this could be due to differences in sampling methods rather than actual increases in plant diversity.

Table 60. Cluster 4 – East summary, botanical composition (%) Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		Dry-weight rank protocol 2020
		1975	1988	
G	sideoats grama	8	11	25
G	blue grama	84	85	55
G	poverty threeawn	2	4	8
F	desert parsley	2	0	0
G	squirreltail	0	1	2
G	hairy grama	6	0	0
S	baccharis	0	0	3
G	common wolfstail	0	0	8

Table 61 shows the calculated similarity to the potential natural community described for the TES map unit. All similarity indices calculated for this cluster fall within the low similarity class.

Table 61. Cluster 4 – East plant community similarity to PNC as described in TES

	Similarity Index
1975 Parker protocol	23
1988 Parker protocol	23
2021 Dry-weight rank protocol	25

The 2020 points data shows a strong decrease in the amount of bare soil and vegetative cover with a corresponding increase in litter cover compared to previous readings. When looking at the data set as a whole, there is a slight upward trend (decrease in cover) in bare soil and upward trend (increase) in litter cover. Vegetative cover shows an overall declining trend. Percent frequency monitoring in 2020 shows annual forb species present in 94% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see few similarities between the current condition and what is expected at the site.

Table 62. Cluster 4 – East summary, ground cover (%)

	Parker protocol				2020 Points Protocol	Reference condition from TES
	1955	1957	1975	1988		
Vegetation	32	36	23	25	5	**10**
Rock	23	26	36	29	18	**45**
Litter	13	15	21	10	69	**T**
Bare soil	32	23	22	37	8	**45**

The Rangeland Analysis Platform ground cover trends at HS-C4 East pasture show inter-annual variation in perennial vegetation cover with a sharp decline from 2018 to 2020. The year 2020 shows the lowest cover of perennial grasses and forbs of any year. Annual grasses and forbs, and bare soil have remained fairly static. While the dry-weight rank data from 2021 shows a sharp decrease in bare soil, the RAP data does not. This may indicate that litter, which is not measured by RAP, is accounting for the decrease in bare soil seen at the cluster.

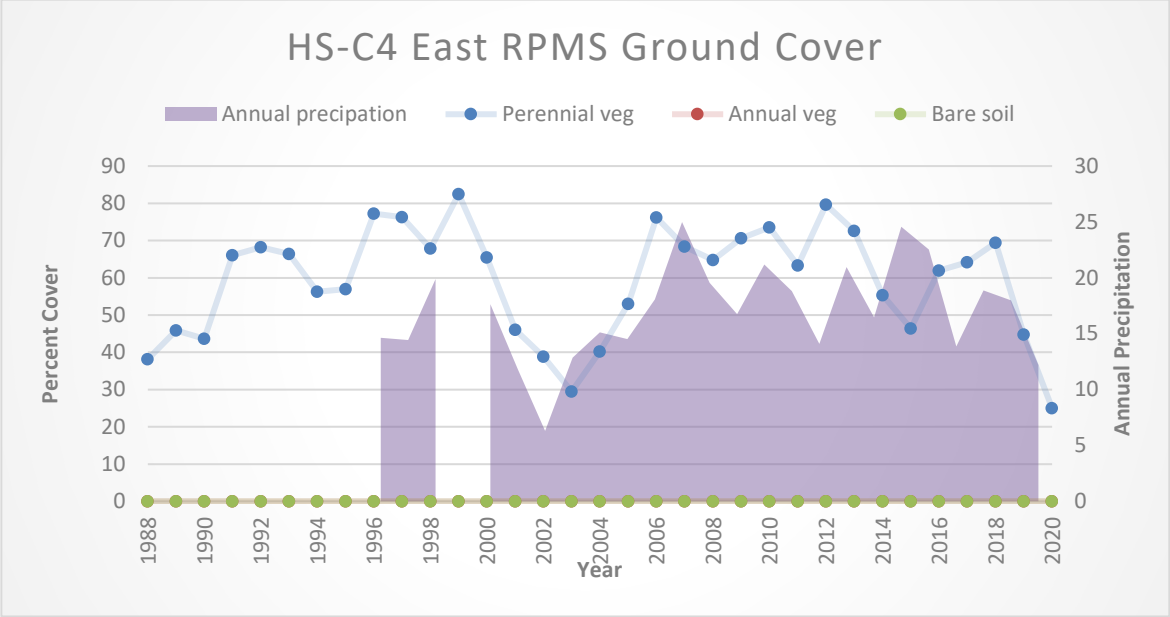

Figure 16. HS-C4 East RAP ground cover chart

HS-C4 – East trend summary

The plant community at C4-East pasture is currently dominated by blue grama with a sideoats grama subcomponent. This composition of species has remained similar since 1975 with the Parker 3 step data from 1975 and 1988 also showing blue grama and sideoats grama dominating the site. Species diversity increased slightly from 1988 to 2021 although this could be due to differences in sampling methods rather than actual increases in plant diversity.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses and few undesirable species. A preponderance of evidence suggests that the overall trend is static due to similar species composition and similarity in PNC scores. The 2021 dry-weight rank data show a strong decrease in the amount of bare soil and strong increase in litter compared to previous readings which indicate the site is currently stable. However, the decrease in vegetative cover and increase in litter cover appears to be due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. This trend is also seen in the RAP data which shows a decrease in perennial vegetation cover from 2018 to 2020 with the 2020 perennial vegetation cover the lowest it has been since 1988. The 2020 points data indicates annual species are contributing to the decrease in bare soil and increase in litter. A preponderance of evidence suggests that the overall trend is downward due to the decrease in vegetative cover and declines in bare soil due in large part to annual species abundance.

Ecological status: The similarity to PNC has remained stable with all data falling in the low similarity category. This is primarily due to the overall low plant diversity at the site and absence of curly mesquite, the most abundant species in the TES description.

Utilization monitoring data

On the Baseline-Horsesprings allotment the annual operating instructions for the past several years (2015-2021) have identified allowable use standards ranging from 20 percent to 45 percent, depending on the pasture. Allotment-wide allowable use is typically 35 to 45 percent. Table 63 displays a summary of the utilization monitoring conducted on the Baseline-Horsesprings allotment since 2003. The ‘percentage of permitted use’ line is included in the table to display the yearly stocking level as a percentage of that identified on the term grazing permit. Utilization monitoring normally occurs within

two weeks before or after pasture move dates, and after the summer growing season. All of the observations were at or below the allowable use standard with the exception of South Water Loop pasture and East pasture in 2020. The forage conditions and precipitation outlook in 2020 resulted in the removal of livestock from the allotment starting November 4th, 2020 (non-use for resource protection). The allotment remained unstocked in 2021.

Table 63. Utilization monitoring

Pasture	2020	2019	2018	2017	2016	2015	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
Percentage of permitted use, allotment-wide	**46%**	**67%**	**59%**	**57%**	**47%**	**36%**	**24%**	**23%**	**17%**	**9%**	**39%**	**74%**	**49%**	**54%**	**79%**	**84%**	**105%**
North Bear Canyon	40%*		%	6%		6%*	7%*	20%*			3%*			11%*	11%*	6%*	
South Water Loop	50%	12%		5%	1%			0%	1%*					2%	2%*		
North Water Loop							0%								6%*		
South Bear Canyon	25%*						10%	10%*			4%		0%		4%	6%*	
East	70%	15%	25%		10%		0%		16%		10%		7%*	3%	6%*		20%*
Black Mountain					1%			6%*					6%*	4%	8%*	5%*	13%*
Eagle				10%	12%		0%	15%			8%		7%			5%	
Cemetery					40%		0%	1%		5%		35%			15%		
Bear Canyon Trap						10%		1%			1%		0%	9%*	5%	6%	
Schoolhouse							0%						8%				
FS Admin North													8%				
FS Horse Pasture													16%				
Clay Canyon														9%*			

*Indicates utilization was averaged from multiple measurements

Structural improvements

Structural improvements include fences, stock tanks, wells, and corrals. The responsibility for the maintenance of these improvements is assigned to the grazing permittee in the term grazing permit. Most of these improvements on the Baseline-Horsesprings allotment are in functional condition although some may need maintenance or reconstruction in the next few years. The annual operating instructions identify which improvements need replacement or reconstruction each year. Table 64 shows named range improvements in the allotment. In addition to these, there are various unnamed water troughs that may provide water for part of the year.

Table 64. Range Improvement Points

Range Improvement Name	Improvement Type
Baseline Tank	Intermittent Stock Tank
Bear Canyon Corral	Corral
Bear Canyon Well	Well, Windmill
Bear Tank	Intermittent Stock Tank
Bench Tank	Intermittent Stock Tank
Black Tank	Intermittent Stock Tank
CC Tank	Intermittent Stock Tank
Cemetery Tanks No 1	Intermittent Stock Tank
Cemetery Tanks No 2	Intermittent Stock Tank
Cemetery Tanks No 3	Intermittent Stock Tank
Coyote Tank	Intermittent Stock Tank
Dusty Tank	Intermittent Stock Tank
Extra Tank	Intermittent Stock Tank

Flat Tank	Perennial Stock Tank
Forks Tank	Intermittent Stock Tank
Gibson Tank	Intermittent Stock Tank
Grass Tank	Intermittent Stock Tank
Hicks Tank	Intermittent Stock Tank
Hijola Tank	Intermittent Stock Tank
Line Tank	Perennial Stock Tank
Lion Tank	Intermittent Stock Tank
Low Bear Can Storage	Water Storage Tank
Pine Creek Tank	Intermittent Stock Tank
Seco Tank	Intermittent Stock Tank
Steel Rim Tank	Water Storage Tank

Existing condition summary

Long term trend data is available for the North Bear Canyon, South Bear Canyon, North Water Loop, South Water Loop, and East pastures. Overall, the clusters in Baseline-Horsesprings allotment show satisfactory conditions with seven of the eight clusters showing static or upward trends. One site in the South Bear Canyon pasture shows a slight downward trend due to changes in species composition. All clusters fall in the low or mid similarity class to potential natural community. The primary driver for those that fall in the low similarity category is a lack of overall species diversity. 2020 and 2021 data document severe drought stress and loss of perennial grass cover. Future monitoring will be needed to determine if vegetation shows long term negative effects from the drought.

Table 65. Baseline – Horsesprings cluster vegetative trends

Cluster	Vegetative Trend
B-C1 North Bear Canyon	static or upward
B-C2 North Bear Canyon	static or upward
B-C3 South Water Loop	upward
B-C4 North Water Loop	static or upward
HS-C1 South Bear Canyon	static or downward
HS-C2 South Bear Canyon	static or upward
HS-C3 South Bear Canyon	static or upward
HS-C4 East	static

Overall, the 2020 cluster site protection data are outliers showing significant decreases in bare soil and increases in litter. There is also a clear trend showing a decrease in vegetative cover across all years. The 2020/2021 clusters were read during a severe dry period (less than 75% of average annual precipitation) and the vegetation was documented as showing die off due to the drought (See Figure 17). This likely contributed to the decrease in vegetative cover and increase in litter cover, as the live perennial vegetation transitioned to standing litter. An abundance of annual forbs and grasses at the clusters appear to be influencing the significant decreases in bare soil as standing litter occupies any available soil. Trends for most five of the eight clusters were downward primarily due to decreases in vegetative cover.

The Rangeland Analysis Platform data shows allotment wide long term trends (1988 to 2020) of slight increases in perennial vegetation and annual vegetation, and decreases in bare soil. The RAP data did not support long term trends of decreasing perennial vegetation or bare soil as seen at most cluster sites. However, the RAP data showed short term inter-annual variation in perennial vegetation cover with an overall decrease in cover from 2018 to 2020. The decrease in perennial vegetation seen in

2020 and 2021 is likely due to drought conditions rather than grazing management. The long term vegetation trends for both the RAP and cluster data, as well as the existing botanical composition data, show overall satisfactory conditions on the allotment. This may indicate the 2020 and 2021 ground cover data is an anomaly and is likely to increase following one or more years of average or above average precipitation. Conversely if precipitation were to remain low, we would expect vegetation cover to continue to decrease or remain static.

Table 66. Baseline – Horsesprings ground cover trends (bare soil, vegetation, rock, litter)

Cluster	Cluster Ground Cover Trends	Remote Sensing Ground Cover Trends
B-C1 North Bear Canyon	downward	downward
B-C2 North Bear Canyon	upward	static
B-C3 South Water Loop	downward	static
B-C4 North Water Loop	downward	downward
HS-C1 South Bear Canyon	downward	downward
HS-C2 South Bear Canyon	static	downward
HS-C3 South Bear Canyon	downward	downward
HS-C4 East	downward	downward

Figure 17. BC-4 vegetation showing effects of drought.

Annual utilization has generally been well documented in main pastures since 2003. All available information shows utilization has been at or below the allowable use standards with the exception of the South Water Loop pasture and the East pasture in 2020 grazing year. However, the allotment has been stocked at levels lower than permitted levels since prior to 2003. Actual use from 2003 through 2021 averaged 1,004 AUMs (84 head) or 44 percent of permitted.

Structural range improvements are being maintained, replaced or reconstructed as needed (as identified in the annual operating instructions).

Dark Canyon

The Dark Canyon allotment is located approximately 8 miles northwest of Clifton, Arizona on the Clifton Ranger District, Apache-Sitgreaves National Forest. The allotment lies east of Eagle Creek and is bordered by the San Carlos Reservation to the west and non-forest land to the south. Main drainages include Knight Canyon, Wood Canyon, and Dark Canyon in the north which drain into Eagle Creek. Eagle Creek runs north to south along the western edge of the allotment. Eagle Creek is fenced within the Eagle pasture which allows grazing at conservative use levels. Topography is characterized by steep, rugged terrain with natural barriers to livestock movement including the Coronado Ridge in the southern portion of the allotment. The Dark Canyon allotment is comprised of four main pastures and three smaller pastures which are used intermittently. Vegetation is predominantly oak/pinyon/juniper woodland with ponderosa pine occurring at higher elevations. Figure 18 displays a general overview of the allotment. Comprised of approximately 18,520 acres of National Forest System land, the Dark Canyon allotment is located in Greenlee County, Arizona.

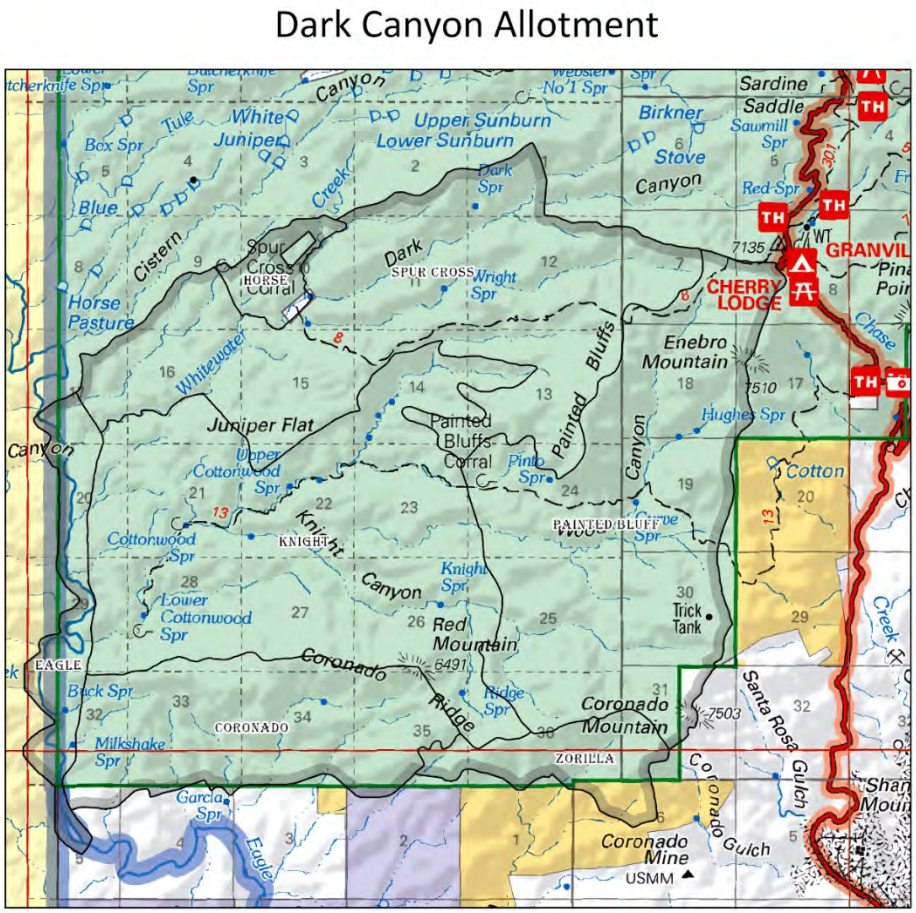

Figure 18. Dark Canyon Allotment

Historical Use

There are no records of use prior to 1946 for the Dark Canyon allotment. The first record of use indicates a term grazing permit was issued for 172 cattle yearlong in 1946. In 1950 the permit was transferred and a reduced to 131 cattle yearlong. In 1953 the permit was again re-issued with a season of use from November 1st to April 30th for 200 head plus 30 head yearlong. The 1954 Allotment Analysis determined a carrying capacity of 92 cattle yearlong and subsequently, a term permit was issued in 1958 for 90 cattle yearlong. A second allotment analysis was completed in 1972 resulting in in a reduction of permitted cattle to 57 head yearlong. From 1972 to present, varying ratios of cattle and horses were permitted with a record from 1995 showing 47 cow/calf pair and 10 horses yearlong. The current permit is for 33 cow/calf pair and 25 horses yearlong.

Vegetation cover types and slope classes

Table 67. Slope class, acres

Pasture	0 - 10%	11 - 30%	31 - 40%	41 - 60%	61%+	Total
Coronado	367	1,029	285	277	187	**2,145**
Eagle	104	286	93	121	153	**757**
Horse	42	125	49	55	54	**325**
Knight	730	2,299	718	785	699	**5,231**
Painted Bluff	671	2,117	610	603	423	**4,424**
Spur Cross	665	2,142	665	730	574	**4,776**
Zorilla	955	306	90	87	50	**1,488**
Total	**3,534**	**8,304**	**2,510**	**2,658**	**2,140**	**19,146**

Cover types on the Dark Canyon allotment include deciduous tree mix, Gambel oak, grass-forb mix, grama mix, pine-juniper, juniper, oak-juniper-pinyon, ponderosa pine/evergreen, and ponderosa pine mix as displayed in Table 68. The predominant vegetation type is oak/juniper/pinyon comprising 90% of allotment.

Table 68. Cover type, acres

Pasture	Deciduous tree mix	Gambel oak	Grass forb mix	Grama	Pine-Juniper	Juniper	Oak-Juniper-Pinyon	Ponderosa pine-evergreen	Ponderosa pine mix	Total
Coronado					15		2,119			**2,134**
Eagle	107				50		411	11		**579**
Horse	1			17			300	6		**324**
Knight	1		29	21	138	58	4,557	411	15	**5,230**
Painted Bluff		43		17	37		3,870		382	**4,349**
Spur Cross	6			1	39	20	4,497	144	61	**4,768**
Zorilla					16	43	455	25	37	**576**
Total by cover type	**115**	**43**	**29**	**56**	**295**	**121**	**16,209**	**597**	**495**	

Grazing management

The existing term grazing permit for the Dark Canyon allotment is for 33 cow/calf pair and 25 horses yearlong (a total of 756 animal unit months). Permitted animal unit months for this allotment were calculated based upon a conversion factor of 1.32 per cow/calf pair which results in fewer permitted head than the standard 1.0 conversion factor for cow/calf pair. The allotment is divided into four main pastures, Spur Cross, Knight, Eagle and Painted Bluff. Due to a lack of interior pasture fences, there is no rotation through pastures, rather, use can occur in any of the main pastures yearlong. In 2021, livestock were authorized from March 1 to May 15th to allow forage to recover following the 2020 drought year. The current permit expired December 31st, 2021. The allotment is vacant as of January 15th, 2022.

The allowable use standard for all pastures is 30 percent to 40 percent.

Actual use summary

Actual use from 2004 through 2021 averaged 450 AUMs (38 head) or 60 percent of permitted. Recent years (2015 -2020) averaged higher use with 545 AUMs, or 72 percent of permitted.

Cluster data

Pace 2 (P2) – Spur Cross pasture, TES map unit 469

Available data for Pace 1 in the Spur Cross pasture include Parker 3 Step pace data from 1970 and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the site is currently dominated by tobosa grass with a curly mesquite subcomponent. Botanical composition from the 1970 Parker data is incomplete however, available information shows curly mesquite as the dominant grass with tobosa grass as the subcomponent. Due to the lack of complete comparative data for P2-Spur Cross, it is not possible to determine if the site has become more or less diverse.

Table 69. Pace 2 – Spur Cross summary, botanical composition (%), Parker 3 step protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol 1970	Dry-weight rank protocol 2020
S	fourwing saltbush	0	3
T	oneseed juniper	0	4
S	yucca	0	3
G	curly mesquite	54	14
G	tobosa	18	65
S	mesquite	0	8

Table 70 shows the calculated similarity to the potential natural community described for the TES map unit. The similarity index for this cluster is based on the 2020 dry weight rank data which shows P2-Spur Cross in the low similarity class. Similarity was not calculated for the 1970 Parker data because of the incomplete data set. The lack of grass diversity at the site is the primary reason the cluster is in the low similarity class.

Table 70. Pace 2 –Spur Cross pasture, plant community similarity to PNC as described in TES

	Similarity Index
2020 Dry-weight rank protocol	24

The 2020 points data show a strong decrease in the amount of bare soil compared to the 1970 data. The 2020 data also show vegetative and rock cover have decreased while litter has increased. Bare soil increased slightly but is still well below the TES reference condition. Fluctuations in ground cover could be partially due to differences in protocols and precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2020 shows annual forb species present in 89% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in rock cover while vegetative cover and bare soil is lower than expected. Litter cover is much higher than expected for this site.

Table 71. Pace 2 – Spur Cross pasture summary, ground cover (%)

	Parker protocol 1970	2020 Points protocol	Reference condition from TES
Vegetation	12	1	**5**
Rock	40	30	**30**
Litter	42	62	**T**
Bare soil	6	8	**65**

P2- Spur Cross pasture trend summary

The plant community at P2–Spur Cross is currently dominated by tobosa grass with a curly mesquite subcomponent. Botanical composition data from the 1970 Parker pace transect is incomplete, however available data shows curly mesquite as the dominant species and tobosa grass as the subcomponent.

Apparent trend: The current vegetative composition of the site appears to be in marginal condition. Botanical composition shows tobosa grass, an unpalatable species, dominating the transect. Tobosa grass has increased from 1970 to 2020 with curly mesquite showing a decline. Shrubs have increased from previous years although its unknown if this is due to differences in protocols or actual changes in botanical composition. A preponderance of evidence suggests that the overall vegetative trend is downward. Site protection attributes show low bare soil, and high litter and rock cover which are contributing to a stable site. However, the decrease in vegetative cover and increase in litter cover appears to be partially due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. Annual species appear to also be contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes shows a downward trend due to the decrease in vegetative cover and declines in bare soil due, in large part, to annual species abundance.

Ecological status: The similarity to PNC from the 2020 data indicate the cluster falls in the low similarity status. This is primarily due to a lack of plant diversity at the site. Tobosa grass is not a component of the PNC description, suggesting the site has crossed a threshold and will not likely convert back to PNC with grazing management alone.

Pace 3 (P3) – Painted Bluff pasture, TES map unit 512

Available data for Pace 3 in the Painted Bluff pasture includes Parker 3 Step pace data from 1970, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the site is dominated by sideoats grama with a smaller cane bluestem and beargrass subcomponent. The 1970 Parker 3 Step

pace data show little bluestem as the dominant species with sideoats grama and southwestern needlegrass as a subcomponent. Species diversity recorded at the cluster appears to increase slightly with the 2020 dry-weight rank data although this could be due to differences in sampling methods rather than actual increases in plant diversity. There is little overlap between overall botanical composition between the 1970 data and the 2020 data.

Table 72. Pace 3 – Painted Bluff summary, botanical composition (%), Parker 3 step protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol 1970	Dry-weight rank protocol 2020
S	Fendler's ceanothus	0	1
T	pinyon pine	0	1
G	cane bluestem	3	9
G	sideoats grama	13	62
G	hairy grama	0	2
S	broom snakeweed	0	5
S	beargrass	0	11
S	mesquite	0	1
S	oak	0	8
G	little bluestem	58	0
G	bullgrass	2	0
G	sedge	2	0
G	common wolfstail	2	0
G	southwestern needlegrass	19	0

Table 73 shows the calculated similarity to the potential natural community described for the TES map unit. The 1970 Parker data and the 2020 dry-weight rank data show the cluster falling in the low similarity category. Similarity to PNC increased from 1970 to 2020 which was primarily driven by presence of beargrass.

Table 73. Pace 3 -Painted Bluff, plant community similarity to PNC as described in TES

	Similarity Index
1970 Parker protocol	19
2020 Dry-weight rank protocol	28

The 2020 points data show a decrease in the amount of bare soil and vegetative cover compared to the 1970 data. Rock cover increased slightly while litter remained fairly static. Percent frequency monitoring in 2020 shows annual forb species present in 51% of the plots which may be contributing to litter cover and the decrease in bare soil. When comparing current conditions to the TES reference site, we see few similarities between the current condition and the reference condition.

Table 74. Pace 3 – Painted Bluff pasture summary, ground cover (%)

	Parker 3 Step protocol 1970	2020 Points protocol	Reference condition from TES
Vegetation	11	2	**10**
Rock	32	48	**65**
Litter	45	48	**5**
Bare soil	12	1	**20**

P3- Painted Bluff trend summary

The plant community at P3 – Painted Bluff is currently dominated by sideoats grama with a cane bluestem and beargrass subcomponent. Comparative botanical composition data from the 1970 Parker pace transect show little bluestem as the dominant grass species with sideoats grama as a sub-component. After 1970, sideoats grama increased while little bluestem disappeared from the site. It is unclear what factors contributed to this shift in species composition. Overall diversity at the site has increased from 1970 to 2020. There is little overlap in species composition between the 1970 data and the 2020 data.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows abundant forage grasses with increasing diversity. A preponderance of evidence suggests that the overall trend is slightly upward due to the apparent increase in species diversity and increase in similarity to PNC. The site protection attributes show an overall decrease in bare soil and vegetative cover. Rock cover increased slightly while litter remained static. The decrease in vegetation does not correspond to an increase in litter cover as seen at P2, suggesting drought die off may not be a factor at this site. An increase in rock cover paired with decreases in bare soil and vegetation suggests soil may have been lost from the site at some point between 1970 and 2020. However, the differences are not extreme and could also be explained by differences in protocols. A preponderance of evidence suggests a static or slightly downward trend.

Ecological status: The similarity to PNC increased from 1970 to 2020 although both fall in the low similarity class. The lack of grass diversity at the site is the primary reason the cluster is in the low similarity class.

Utilization monitoring data

On the Dark Canyon allotment the annual operating instructions for the past two years (2020-2021) have identified allowable use standards ranging from 30 percent to 40 percent allotment-wide. Previous year's allowable use has varied between 20 and 45 percent depending on the year and pasture. Utilization data for the Dark Canyon allotment is very limited. Table 75 displays a summary of the utilization monitoring conducted on the Dark Canyon allotment since 2004. The 'percentage of permitted use' line is included in the table to display the yearly stocking level as a percentage of that identified on the term grazing permit. Utilization monitoring normally occurs within two weeks before or after pasture move dates, and after the summer growing season. All of the observations were at or below the allowable use standard.

Table 75. Utilization monitoring

Pasture	2021	2020	2004
Percentage of permitted use, allotment-wide	**11%**	**52%**	**48%**
Painted Bluff	0%	0%	
Spur Cross		0%	
Eagle	0%		
Knight			12%

Structural improvements

Structural improvements include a well, a storage tank and a trough all located in the Painted Bluff pasture. There are no mapped fences in the allotment, although some boundary fences exist. The responsibility for the maintenance of these improvements is assigned to the grazing permittee in the term grazing permit. Most of these improvements on the Dark Canyon allotment are in functional condition although some may need maintenance or reconstruction in the next few years. The annual operating instructions identify which improvements need replacement or reconstruction each year.

Existing condition summary

Long term trend data is available for the Spur Cross and Painted Bluff pasture. The Spur Cross pasture is showing a downward trend due to an increase in tobosa grass and decrease in curly mesquite. It is likely the site has crossed a threshold and will not convert back to PNC with grazing management alone. The Painted Bluff site is in satisfactory condition, showing an increase in diversity and similarity to PNC. Both sites are in the low similarity class to PNC, primarily due to a lack of species diversity.

Table 76. Dark Canyon pace transect vegetative trends

Pace transect	Vegetative Trend
P2-Spur Cross pasture	downward
P3-Painted Bluff pasture	upward

Overall, the 2020 site protection data show decreases in vegetative cover. The 2020 pace sites were read during a severe dry period (less than 75% of average annual precipitation) and the vegetation was experiencing drought stress. This likely contributed to the decrease in vegetative cover and increase in litter at P2-Spur Cross. The ground cover data from P3-Painted Bluff if difficult to interpret, showing both declines in vegetation and bare soil but no increases in litter. This suggests drought die off may not be a factor at this site. Increases in rock cover and decreases in bare soil may suggest soil has been lost from the site.

Table 77. Dark Canyon pace transect ground cover trends

Pace transect	Ground Cover Trend
P2-Spur Cross pasture	downward
P3-Painted Bluff pasture	static or downward

There are limited data available recording utilization levels however, all available information shows utilization has been at or below the allowable use standards. However, the allotment has been stocked at levels lower than permitted levels prior to 2004. Actual use from 2004 through 2021 averaged 450 AUMs (38 head) or 60 percent of permitted.

Structural range improvements are being maintained, replaced or reconstructed as needed (as identified in the annual operating instructions). Interior fences are in poor to moderate condition. Boundary fence between Tule and Dark Canyon repaired as well as Eagle pasture fence.

Double Circle

The Double Circle allotment is a large allotment located approximately 13 miles north of Clifton, Arizona on the Clifton Ranger District, Apache-Sitgreaves National Forest. The allotment lies north of Grey's Peak and east the San Carlos Reservation. Elevations ranges from 7,500 feet at Grey's Peak to 4,800 feet along Eagle Creek in the far northwestern portion of the allotment. Topography varies with relatively flat rolling high mesas in the northwest to narrow ridges and canyon bottoms in the south and the west. Main drainages include Water Canyon, Cottonwood Canyon, Big Dry Canyon, and Bee Canyon which drain into Eagle Creek. On the east side of Highway 191, Pigeon Creek and Juan Miller Creek flow east towards the Blue River. Eagle Creek flows through the northwestern portion of the allotment and is excluded from livestock grazing. The Double Circle allotment is comprised of numerous large and small pastures, corrals, and traps. Vegetation is predominantly open grassland surrounding Eagle Creek transitioning to pinyon-juniper woodland in the eastern portions of the allotment. Figure 19 displays a general overview of the allotment. Comprised of approximately 35,481 acres of National Forest System land, the Double Circle allotment is located in Greenlee County, Arizona.

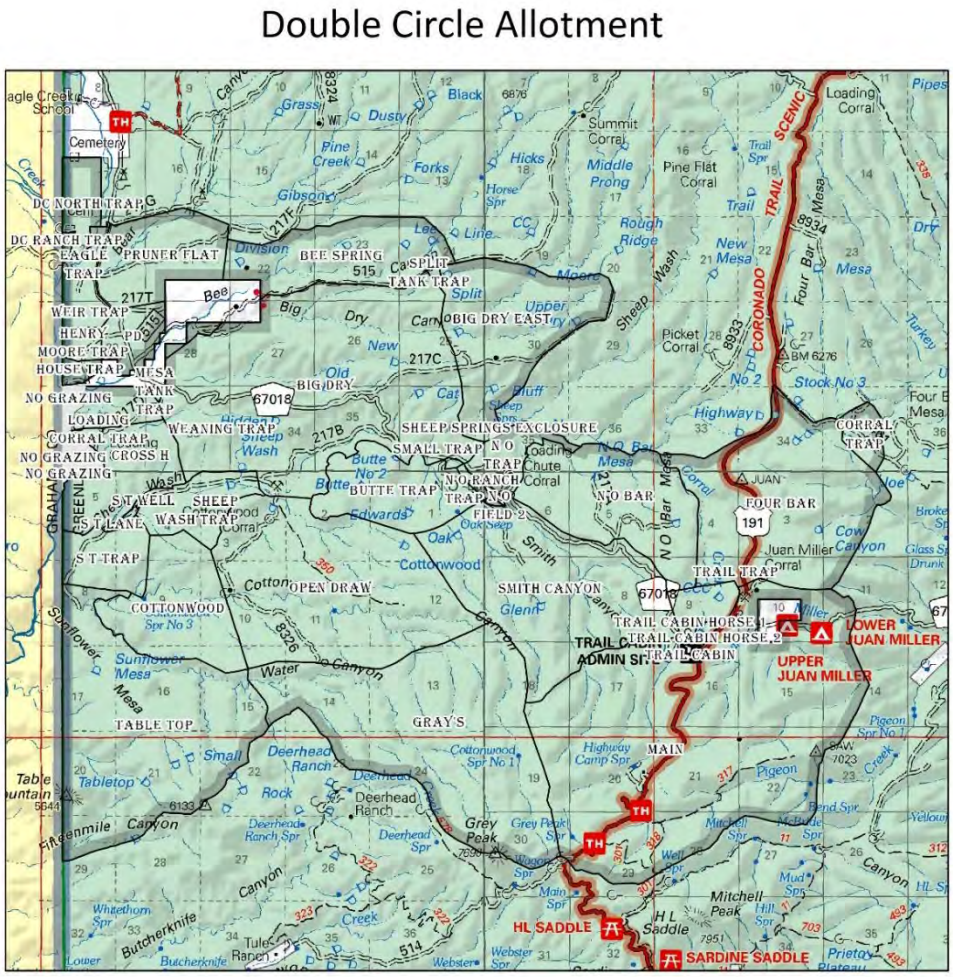

Figure 19. Double Circle Allotment

Historical Use

Prior to 1991, the Double Circle allotment was separated into the NO Bar, Water Canyon, Bee Springs, and Big Dry allotments.

The Big Dry allotment was established in 1926 and a permit was issued for 90 cattle and 40 horses yearlong. From establishment to the late 1970s the total head of permitted livestock essentially remained the same with variations in permitted ratios of cows, bulls, and horses. There are numerous reports during this time of excess livestock found on the allotment as well as deteriorating conditions along Eagle Creek. In 1978, a permit was issued for 118 head of cattle. Records documenting permitted numbers between 1978 and 1990 are not available.

The NO Bar allotment was established in 1939 when it was fenced off from the larger Cottonwood allotment. A permit was issued for 200 cattle yearlong with natural increases (calves born on the range). From 1939 to 1982 the term permit remained at 200 cattle yearlong with various numbers authorized under temporary permits. In the mid-1970s, the Double Circle Ranches Partnership was issued a term permit running the NO Bar, Water Canyon, and Bee Springs allotments together. Permitted numbers for the NO Bar allotment remained at 200 cattle yearlong until the allotment was combined into the current Double Circle allotment.

The Bee Springs allotment was established in 1946 when it was fenced off from the larger Eagle Community Allotment. A term permit for 49 cattle yearlong and an additional permit for 29 head ran in conjunction with private land, was issued to the Double Circle Ranch in 1941. In 1948 the term permit was reduced to 40 cattle yearlong. In 1957 the private land permit was reduced to 22 cattle yearlong. Records indicate the Double Circle Ranches Partnership ran the Bee Springs allotment with the Water Canyon allotment beginning in the 1950s. Records of use between 1957 and 1983 are scarce, however, the 1989 Bee Spring Allotment Analysis shows the term permit was reduced to 32 head in 1970 with 29 head on the private land permit. Permitted numbers for the Bee Springs allotment remained at 32 cattle yearlong until the allotment was combined into the current Double Circle allotment.

The Water Canyon allotment was established in the late 1930s when it was fenced off from the Cottonwood and Table Top allotments. The Double Circle Ranch held the permit which was originally for 68 cattle yearlong. From 1951 to 1984 the average permitted number was for 165 head yearlong. As noted above, the Water Canyon allotment and the Bee Springs allotment were ran together starting in the 1950s. There are no available records between 1984 and 1991 when the Water Canyon allotment was combined into the current Double Circle allotment.

An environmental assessment and decision in 1991 authorized the consolidation of allotments and reduced the permitted numbers to 400 head. Between 1991 and 2000 several practices were implemented to provide for recovery and restoration of both upland and riparian corridors. Actions included fencing of Eagle Creek, removal of a portion of the Eagle Creek corridor from the allotment to aide in recovery, prescribed rest for uplands, recovery of watersheds, and applied fire treatments in the Main, Four Bar, and Grey peak pastures to remove tree overstory and improved herbaceous and browse forage. The allotment transferred in 2000, and management quickly deteriorated to a point where administrative action was taken in the summer of 2002 that required 100% suspension of livestock numbers to allow for rest and recovery of herbaceous and riparian vegetation, and to be in compliance with the ongoing Grazing Biological Opinion issued in 2002. The current permit is for 411 cow/calf pair yearlong and 18 horses yearlong for a total of 6,769 animal unit months.

Vegetation cover types and slope classes

Table 78. Slope class, acres

Pasture	0 - 10%	11 - 30%	31 - 40%	41 - 60%	61%+	Total
Bee Spring	289	500	124	123	74	**1,110**
Big Dry	1,025	2,043	502	489	262	**4,321**
Big Dry East	505	682	138	127	87	**1,539**
Butte Trap	436	358	40	29	18	**881**
Corral Trap	94	72	5	3	3	**177**
Cottonwood	423	444	84	77	55	**1,083**
Cross H	278	318	58	52	33	**739**
DC North Trap	163	117	2	2	0	**284**
DC Ranch Trap	14	10	0	0	0	**24**
Eagle Trap	65	28	0	0	0	**93**
Four Bar	1,026	1,003	146	132	96	**2,403**
Gray's	848	1,726	344	283	206	**3,407**
Henry Moore Trap	74	37	0	0	0	**111**
House Trap	42	25	2	1	1	**71**
Loading Corral Trap	14	11	1	0	0	**26**
Main	1,428	2,874	574	509	383	**5,768**
Mesa Tank Trap	6	7	1	1	0	**15**
N O Bar	740	505	69	71	82	**1,467**
N O Field 2	3	5	1	1	0	**10**
N O Ranch Trap	9	16	4	4	1	**34**
N O Trap	83	157	28	23	15	**306**
Open Draw	1,053	1,333	218	176	127	**2,907**
PD	224	119	5	4	2	**354**
Pruner Flat	491	314	20	16	5	**846**
S T Lane	26	4	0	0	0	**30**
S T Trap	199	196	30	23	16	**464**
S T Well	2	0	0	0	0	**2**
Sheep Wash Trap	243	198	24	18	11	**494**
Small Trap	4	7	1	1	0	**13**
Smith Canyon	672	1,187	242	211	153	**2,465**
Split Tank Trap	4	6	1	1	1	**13**
Table Top	1,070	1,338	237	222	201	**3,068**
Trail Cabin	2	1	0	0	0	**3**
Trail Cabin Horse 1	17	17	1	1	0	**36**
Trail Cabin Horse 2	20	18	2	1	0	**41**
Trail Trap	95	82	11	9	4	**201**
Weaning Trap	131	118	11	9	4	**273**
Weir Trap	112	80	2	1	1	**196**
Total	**11,930**	**15,956**	**2,928**	**2,620**	**1,841**	**35,275**

Cover types on the Double Circle allotment include grass-forb, grama, pine-juniper, juniper, and oak-juniper-pinyon, deciduous tree mix, ponderosa pine, ponderosa pine-evergreen, and Gambel oak as displayed in Table 79. The predominant vegetation type is oak-juniper-pinyon mix comprising 38% of allotment followed by pine-juniper comprising 28% of the allotment.

Table 79. Cover type, acres

Pasture	Grass - Forb	Grama	Pine-Juniper	Juniper	Oak-Juniper-Pinyon	Deciduous Tree Mix	Ponderosa Pine	Ponderosa Pine Evergreen	Gambel Oak	Total by pasture
Bee Spring	14	671	99		326					**1,110**
Big Dry	81	1,477	539	15	2,210					**4,322**
Big Dry East		852	208	37	439	4				**1,540**
Butte Trap		210	238	183	250					**881**
Corral Trap		44	93	1	24			16		**178**
Cottonwood		328	489		260	7				**1,084**
Cross H		638	56		44					**738**
DC North Trap	134	147			4					**285**
DC Ranch Trap	24									**24**
Eagle Trap	53	41								**94**
Four Bar		215	1,284	114	767			22		**2,402**
Gray's		34	1,480	188	1,420		260	21	2	**3,405**
Henry Moore Trap		112								**112**
House Trap		69			3					**72**
Loading Corral Trap		26								**26**
Main			1,772	240	2,188	24	1,468	68	9	**5,769**
Mesa Tank Trap		15								**15**
N O Bar		41	138	600	679	10				**1,468**
N O Field 2			5		2	4				**11**
N O Ranch Trap		2	12		3	17				**34**
N O Trap		11	147		144	5				**307**
Open Draw		679	1,023	207	998					**2,907**
PD	14	324			16					**354**
Pruner Flat	21	791			35					**847**
S T Lane		8	23							**31**
S T Trap		315	44		100	4				**463**
S T Well		1	1							**2**
Sheep Wash Trap		73	243	5	172					**493**

Pasture	Grass - Forb	Grama	Pine-Juniper	Juniper	Oak-Juniper-Pinyon	Deciduous Tree Mix	Ponderosa Pine	Ponderosa Pine Evergreen	Gambel Oak	Total by pasture
Small Trap			6		6					**12**
Smith Canyon			1,044	119	1,271	19	11			**2,464**
Split Tank Trap		9			5					**14**
Table Top	191	405	663		1,801	8				**3,068**
Trail Cabin			1		2					**3**
Trail Cabin Horse 1		16	13		7					**36**
Trail Cabin Horse 2			24		16					**40**
Trail Trap		2	56		144					**202**
Weaning Trap	19	253			2					**274**
Weir Trap	70	127								**197**
Total by cover type	621	7,936	9,701	1,709	13,338	102	1,739	127	11	

Grazing management

The existing term grazing permit for the Double Circle allotment is for 411 cow/calf pair yearlong and 18 horses yearlong (a total of 5,191 animal unit months). The allotment is divided into eleven main pastures: Bee Spring, Big Dry, Big Dry East, Cottonwood, Four Bar, Gray's, Main, N O Bar, Open Draw, Smith Canyon, and Table Top. The remaining pastures identified in Table 79 are smaller pastures used for holding or used intermittently. In 2018 and 2019 livestock were split into four herds, each with their own rotation through various pastures while still allowing for the grazing to be rotated in a manner that allows pastures some deferment from grazing during the growing season. In 2020, livestock were split into two herds that rotated through various pastures. In 2021,cattle were split into two herds and placed in the Grey and Smith Canyon pastures while horses were placed in the Airstrip pasture from March 1 to May 15. After May 15, livestock were removed due to lack of forage. Reduced numbers were returned November 27th, 2021.

The allowable use standard for all pastures is 30 to 40 percent.

Actual use summary

Actual use from 2006 through 2021 averaged 3,284 AUMs (274 head) or 63 percent of permitted. Recent years (2015 -2020) averaged higher actual use with 4,295 AUMs or 83 percent of permitted.

Cluster data

Cluster 5 (NO-C5) – Four Bar pasture, TES map unit 630

Available data for Cluster 5 in the Four Bar pasture includes Parker 3 Step data from 1959 and 1982, Daubenmire cover class data from 2006, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the site is currently dominated by hairy grama with poverty threeawn making up a small component of the plant community. The 2006 Daubenmire cover class data and the 1982 Parker data also show hairy grama as the most abundant species with the smaller components of grama grasses. The 1959 Parker data differs with blue grama as the dominant species and hairy grama as only a small component of the site. The 2020 dry-weight rank data shows alligator juniper as the overstory species which is absent from the previous readings. This is likely due to differences in sampling methods with the dry weight rank protocol sampling a broader area rather than tree encroachment into the site. Species diversity recorded at the cluster appears to increase from 1959 to 1982 then remains similar up to 2020. There is little overlap in species composition among the protocols and year with the exception of blue grama, sideoats grama, and hairy grama which were present every year.

Table 80. Cluster 5 – Four Bar summary, botanical composition (%), Parker 3 step protocol, TES Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		2006 Daubenmire Cover Class	Dry-weight rank protocol 2020
		1959	1982		
G	blue grama	84	22	2	2
G	sideoats grama	3	1	5	3
G	vine mesquite	2	0	0	1
F	desert tobacco	0	21	0	0
S	prickly pear	0	1	0	0
S	javelina bush	0	2	0	0
F	verbena spp	0	5	0	0
G	hairy grama	9	43	82	74

Growth form	Common name	Parker 3 Step Protocol		2006 Daubenmire Cover Class	Dry-weight rank protocol 2020
		1959	1982		
G	squirreltail	1	1	0	0
G	common wolfstail	0	0	0	1
T	alligator juniper	0	0	0	9
G	poverty threeawn	0	0	1	9
F	fleabane	0	0	2	0
F	annual forb	0	0	1	0
F	hog potato	0	0	2	0
F	aster	0	0	4	0

Table 81 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above did not result in differences in the calculated similarity to the potential natural community. All four similarity indices calculated for this cluster fall within the low similarity class. With the exception of a slight decline in similarity in 1982, we see that the ecological status of the site has remained static, not moving away or towards PNC.

Table 81. Cluster 5 – Four Bar, plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	11
1982 Parker protocol	6
2006 Daubenmire cover class protocol	10
2020 Dry-weight rank protocol	10

The 2020 points data show a strong decrease in the amount of bare soil compared to previous readings with a corresponding increase in litter cover. Vegetative cover was not included on the data sheet in 2020. Whether this is because there was no live basal vegetation or whether it was an oversight in data collection is unknown. The picture taken at the sight in 2020 appears to show abundant grama seed heads which may have been counted as litter due to dormancy or drought die off. When looking at the data set as a whole, there is a slight downward trend in vegetative cover and upward trend in rock cover. Litter cover remained static from 1953 to 1982 and bare soil remained static from 1953 to 2006. Fluctuations in ground cover could be partially due to differences in protocols or precipitation which affects the amount of annuals plant species contributing to litter cover. Percent frequency monitoring conducted in 2020 shows annual forbs present in 62% of the plots which is likely contributing to the increase in litter cover and decrease in bare soil. When comparing the current condition to the reference condition from the TES inventory, there is little similarity between site conditions in 2020 and the reference state.

Table 82. Cluster 5 – Four Bar, pasture summary, ground cover (%)

	Parker protocol			2006 Daubenmire cover class protocol	2020 Points protocol	Reference condition from TES
	1953	**1959**	**1982**			
Vegetation	16	23	7	9	not recorded	**5**
Rock	12	15	22	35	19	**50**
Litter	15	15	13	4	73	**10**
Bare soil	57	47	59	52	8	**35**

NO-C5- Four Bar trend summary

The plant community at NO-C5 – Four Bar pasture is currently dominated by hairy grama with a small poverty threeawn subcomponent. Data from the Parker 3 step transects, and the 2006 Daubenmire

cover class transects show hairy grama has been the most abundant species since 1982. The 1959 Parker data differs, indicating blue grama dominated the site with hairy grama as a much smaller component. Overall diversity at the site has increased from 1959 to 2020 with more forbs appearing in 2006 and more grass species appearing in 2020.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition despite no vegetation being recorded in the ground cover readings. Botanical composition data shows abundant forage grasses with few undesirable species. A preponderance of evidence suggests a static trend due to similarities in PNC and similarities in dominant species. The site protection attributes show departures from previous conditions with a large increase in the amount of litter and a corresponding decrease in bare soil. The increase in litter cover appears to be due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. Annual species appear to also be contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes show a downward trend due to the decrease in vegetative cover and declines in bare soil due, in large part, to annual species abundance and perennial grass die off.

Ecological Status: The 2020 dry-weight rank data shows similarity to PNC has remained similar to previous readings. All similarity indices show low similarity regardless of protocol. The low similarity to the PNC is primarily due to an overall lack of species diversity and lack of shrub cover at the site.

Cluster 2 (NO-C2) – NO Bar pasture, TES map unit 589

Available data for Cluster 2 in the North Bear Canyon pasture includes Parker 3 Step data from 1958 and 1982, Daubenmire cover class data from 2006, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the site is dominated by hairy grama with a curly mesquite subcomponent. The 2006 Daubenmire cover class data differs, with no curly mesquite recorded in the transects and a three way split among hairy grama, blue grama, and sideoats grama as the most abundant species. The 1982 Parker 3 step data shows curly mesquite making up nearly 50% of the botanical composition with a large presence of perennial forb, desert tobacco, which is absent from any other years data. The 1958 Parker data shows the site dominated by blue grama with small components of vine mesquite and sideoats grama. Species diversity recorded at the cluster has increased slightly since 1958 although this could be due to differences in sampling methods rather than actual increases in plant diversity. There is little overlap in species composition among the protocols and years with the exception of sideoats grama which has been recorded every year. .

Table 83. Cluster 2 – NO Bar summary, botanical composition (%), Parker 3 step protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		2006 Daubenmire Cover Class	Dry-weight rank protocol 2021
		1958	1982		
G	vine mesquite	12	0	0	0
G	sideoats grama	13	2	25	10
G	blue grama	70	7	29	0
G	hairy grama	0	5	29	51
G	curly mesquite	0	46	0	25
F	desert tobacco	0	22	0	0
F	verbena	0	1	0	0
S	broom snakeweed	2	5	0	2
G	common wolfstail	1	0	0	0

Growth form	Common name	Parker 3 Step Protocol		2006 Daubenmire Cover Class	Dry-weight rank protocol 2021
		1958	1982		
F	annual forb	1	0	1	0
G	poverty threeawn	0	0	7	5
G	squirreltail	1	1	0	0
F	wooly plantain	0	0	6	0
S	tulip pricklypear	0	0	2	0
T	alligator juniper	0	0	0	3
G	bristly wolfstail	0	0	0	1
S	baccharis	0	0	0	2
F	caliche globemallow	0	0	0	1

Table 84 shows the calculated similarity to the potential natural community described for the TES map unit. The 2021 dry-weight rank data and the 1982 Parker data show the cluster in the mid similarity category. The 1954 Parker data and the 2006 Daubenmire cover class data show the cluster in the low similarity category. The presence of curly mesquite in 1982 and 2021 appear to be driving the shift to the mid similarity category. Curly mesquite is the most abundant species in the potential natural community description.

Table 84. Cluster 2 -NO Bar, plant community similarity to PNC as described in TES

	Similarity Index
1954 Parker protocol	25
1982 Parker protocol	45
2006 Daubenmire cover class protocol	33
2021 Dry-weight rank protocol	50

The 2021 points data show a strong decrease in the amount of bare soil compared to previous readings with a corresponding increase in litter and rock cover. Vegetative cover shows a slight decline from the previous readings but is still higher than the reference condition. When looking at the data set as a whole, there is a downward trend in vegetative cover and an upward trend in rock cover and bare soil (decrease in cover). Litter cover remained static from 1953 to 2006. Fluctuations in ground cover could be partially due to differences in protocols or precipitation which affects the amount of annuals plant species contributing to litter cover. Percent frequency monitoring conducted in 2021 shows annual forbs present in 62% of the plots which is likely contributing to the increase in litter cover and decrease in bare soil. When comparing the current condition to the reference condition from the TES inventory, we see lower bare soil and higher litter amounts than would be expected at the site.

Table 85. Cluster 2 – NO Bar pasture summary, ground cover (%)

	Parker protocol			2006 Daubenmire cover class protocol	2021 Points protocol	Reference condition from TES
	1953	1958	1982			
Vegetation	23	23	18	16	13	**10**
Rock	10	8	10	25	46	**45**
Litter	15	19	15	18	29	**T**
Bare soil	52	49	57	41	12	**45**

NO-C2- NO Bar trend summary

The plant community at NO-C2 – NO Bar pasture is currently dominated by hairy grama with a curly mesquite subcomponent. The 2006 Daubenmire cover class data and the 1958 Parker data differ with no curly mesquite recorded in the transects. Overall diversity at the site has increased slightly from 1958 although there is little overlap in species composition from year to year with the exception of blue grama, sideoats grama, and hairy grama which have been documented every year.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data shows abundant forage grasses with few undesirable species. A preponderance of evidence suggests an upward trend due to the increase in similarity to PNC. The site protection attributes show departures from previous conditions with an increase in the amount of litter and a corresponding decrease in the amount of bare soil. Site protection attributes appear to be in satisfactory condition showing similarity to the reference condition for vegetation and rock, while litter is higher, and bare soil is lower than expected for the site. A preponderance of evidence for site protection attributes show an upward trend due to the decrease in bare soil and increase in litter cover. The increase in litter does not appear to correspond to a die off of perennial vegetation seen at other sites in the allotment.

Ecological Status: The 2021 dry-weight rank data shows similarity to PNC has increased from the 2006 Daubenmire cover class data with the 2021 data showing the highest similarity of any year. The 2021 and 1982 data fall in the mid similarity class while the 1958 and 2006 data fall in the low similarity class. The movement from the low to mid similarity class appears to be driven by the presence of curly mesquite which is the most abundant species in the PNC description.

Cluster 3 (NO-C3) – Four Bar pasture, TES map unit 630

Available data for Cluster 3 in the South Water Loop pasture includes Parker 3 Step data from 1958 and 1982, and dry-weight rank data from 2020. The 2020 dry-weight rank data shows the site is currently dominated by hairy grama with a smaller sideoats grama and threeawn subcomponent. Similarly, both the 1958 and 1982 Parker data show hairy grama as a main component in the cluster, with the 1982 data showing few other perennial grasses present and the 1958 data showing an even split between hairy grama and blue grama. The 2020 dry-weight rank data show more sideoats grama than previous years and documents threeawn, common wolfstail, and pinyon ricegrass for the first time in the cluster. Species diversity has steadily increased from 1958 to 2020.

Table 86. Cluster 3 – Four Bar summary, botanical composition (%), Parker 3 step protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		Dry-weight rank protocol
		1958	1982	2020
G	hairy grama	44	70	57
G	blue grama	49	1	6
G	sideoats grama	6	1	15
F	desert tobacco	0	27	0
F	verbena spp	0	1	0
G	threeawn	0	0	13
T	alligator juniper	0	0	5
G	bristly wolfstail	0	0	2

Growth form	Common name	Parker 3 Step Protocol		Dry-weight rank protocol 2020
		1958	1982	
G	pinyon ricegrass	0	0	2

Table 87 shows the calculated similarity to the potential natural community described for the TES map unit. The differences in botanical composition resulted in fluctuations in the calculated similarity, however, all similarity indices calculated for this cluster fall within the low similarity class. The 1982 reading had the lowest similarity to PNC primarily due to the low cover of sideoats grama. The similarity to PNC increased from 1982 to 2020 which was again primarily driven by the increase in sideoats grama cover.

Table 87. Cluster 3 -Four Bar plant community similarity to PNC as described in TES

	Similarity Index
1958 Parker protocol	10
1982 Parker protocol	4
2020 Dry-weight rank protocol	21

The 2020 points data show a strong decrease in the amount of bare soil compared to previous readings with a corresponding increase in litter and rock cover. Vegetative cover shows a slight decline from the previous readings but is still higher than the reference condition. When looking at the data set as a whole, there is an upward trend in rock cover. Vegetative cover has remained fairly static with the exception of 1958 where it showed an increase. Bare soil remained static from 1953 to 1982 showing readings higher than the reference condition. Litter cover has fluctuated with no apparent trend. Percent frequency monitoring conducted in 2020 show annual forbs present in 43% of plots which may be contributing to litter cover. When comparing the current condition to the reference condition from the TES inventory, we see lower bare soil and rock, and higher litter and vegetative cover than would be expected at the site.

Table 88. Cluster 3 - Four Bar summary, ground cover (%)

	Parker protocol			2020 Points protocol	Reference condition from TES
	1953	1958	1982		
Vegetation	14	22	15	12	**5**
Rock	18	23	27	41	**50**
Litter	18	9	6	40	**10**
Bare soil	49	46	52	7	**35**

NO-C3- Four Bar trend summary

The plant community at NO-C3 – Four Bar pasture is currently dominated by hairy grama with a sideoats grama and threeawn subcomponent. Hairy grama was documented as a main component of the cluster all years. The 2020 data show an increase in species diversity with bristly wolfstail, threeawn, and pinyon ricegrass documented for the first time. Alligator juniper is documented in the 2020 dry weight rank data for the first time, although this may be due to differences in protocols rather than juniper encroaching on the site.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data show abundant forage grasses with increasing diversity. A preponderance of evidence suggests an overall upward trend. The site protection attributes show departures from previous conditions with an increase in the amount of litter and rock with a corresponding decrease in the amount of bare soil. Site protection attributes show an upward trend with higher amounts of litter and vegetation and lower amounts of bare soil than the reference condition.

Ecological Status: The 2020 dry-weight rank data shows similarity to PNC has increased from previous years with the 2020 data showing the highest similarity of any year. However, all calculated similarity indices fall in the low similarity class. This is primarily due to a lack of shrub cover and species diversity at the site. The increase in similarity to PNC calculated from the 2020 data appears to be due to the increase in sideoats grama which is the most abundant species in the PNC description.

Cluster 8 (NO-C8) – Smith Canyon pasture, TES map unit 632

Available data for Cluster 8 in the Smith Canyon pasture includes Parker 3 Step data from 1959 and 1982, and dry-weight rank data from 2021. The 2021 dry-weight rank data shows the site is currently dominated by sideoats grama with a hairy grama subcomponent. The 1959 and 1982 Parker 3 Step data differ, with blue grama as the subcomponent and hairy grama absent from the cluster. Blue grama is not documented in the 2021 data. The 1982 data has the most diversity in species with muhly, false grama, and oak present this year only. Species diversity decreased slightly from 1982 to 2021 corresponding with a decrease in overall grass cover and an increase in shrub and tree cover.

Table 89. Cluster 4 – Smith Canyon summary, botanical composition (%), Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker protocol		Dry-weight rank protocol 2021
		1959	1982	
G	blue grama	24	29	0
G	sideoats grama	48	25	51
G	vine mesquite	9	6	0
G	squirreltail	2	2	0
S	broom snakeweed	2	3	0
G	spidergrass	2	0	0
F	sulphur Indian paintbrush	2	0	0
G	muhly	0	2	0
T	Gambel oak	0	1	0
G	curly mesquite	9	11	2
G	false grama	0	17	0
S	beargrass	1	1	5
T	gray oak	0	1	0
T	pinyon pine	0	0	7
F	milkweed	0	1	0
S	skunkbush	0	1	0
G	junegrass	0	0	2
S	baccharis	0	0	2
S	yucca	0	0	2
T	alligator juniper	0	0	4

Growth form	Common name	Parker protocol		Dry-weight rank protocol 2021
		1959	1982	
G	hairy grama	0	0	21
G	threeawn	2	0	5
S	prickly pear	0	0	2

Table 90 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above did not result in differences in the calculated similarity to PNC. All similarity indices calculated for this cluster fall within the low similarity class. The ecological status of the site has remained static, not moving away or towards PNC.

Table 90. Cluster 8- Smith Canyon, plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	29
1982 Parker protocol	32
2021 Dry Weight Rank Protocol	32

The 2021 points data show a strong decrease in the amount of bare soil and increase in rock cover compared to previous years. Vegetative cover shows a slight increase from the previous years but is still lower than the reference condition. When looking at the data set as a whole, there is an upward trend in rock cover and bare soil (decrease in cover). Vegetative cover and litter cover have remained fairly static. When comparing the current condition to the reference condition from the TES inventory, we see the current condition matches the reference condition fairly closely.

Table 91. Cluster 8 – Smith Canyon summary, ground cover (%)

	Parker protocol			2021 Points protocol	Reference condition from TES
	1953	1959	1982		
Vegetation	2	3	2	7	**10**
Rock	30	43	43	67	**65**
Litter	17	17	9	19	**10**
Bare soil	50	38	47	7	**20**

NO-C8- Smith Canyon trend summary

The plant community at NO-C8 – Smith Canyon pasture is currently dominated by sideoats grama with a hairy grama subcomponent. Hairy grama was not documented at the cluster in previous years. Instead, the 1959 and 1982 Parker data show blue grama was a main component of the transect while hairy grama was absent. It's unclear what caused the shift from blue grama to hairy grama or if the differences are due to species identification issues. The 2021 data shows a slight decline in species diversity from the 1982 condition with less overall grass cover and more tree and shrub cover which is likely due to differences in the dry-weight rank protocol which looks at a broader area than the Parker 3 step transects.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data shows abundant forage grasses with increasing shrub diversity. A preponderance of evidence suggests an overall static trend for the site. Site protection attributes show an upward trend with less bare soil and more rock and vegetative cover than previous years. Ground cover has also moved closer to toward the TES reference condition for the site.

Ecological Status: The 2021 dry-weight rank data shows similarity to PNC has remained fairly static since 1959. However, all calculated similarity indices show the cluster in the low similarity class. This is primarily due to low shrub cover at the site.

Cluster 9 (NO-C9) – NO Bar pasture, TES map unit 632

Available data for Cluster 9 in the NO Bar pasture includes Parker 3 Step data from 1959 and 1982, 2005 Daubenmire cover class data, and 2021 dry-weight rank data. The 2021 dry-weight rank data shows the site is currently dominated by an even split of hairy grama, sideoats grama, and cane bluestem with a smaller blue grama subcomponent. Hairy grama, sideoats grama, and blue grama have been strong components at the site since 1959. Cane bluestem is only documented in the 2021 data. The 1982 data is an outlier showing false grama and purple grama as strong components of the cluster. These species were not documented any other years. Species diversity decreased in 1982 then increased in 2005 before declining again in 2021. Species composition has shifted away from primarily grasses in the Parker 3 step data to a mix of grasses, forbs, trees and shrubs in the 2005 and 2021 data.

Table 92. Cluster 9– NO Bar summary, botanical composition (%) Parker protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		Daubenmire Cover Class protocol 2005	Dry-weight rank protocol 2021
		1959	1982		
G	blue grama	19	23	2	8
G	hairy grama	24	28	30	25
G	sideoats grama	47	11	30	27
G	curly mesquite	1	3	0	0
G	false grama	0	18	0	0
G	purple grama	0	15	0	0
G	panicgrass	1	0	0	0
G	common wolfstail	1	0	0	0
S	beargrass	1	1	13	3
G	squirreltail	1	1	0	0
F	desert tobacco	0	1	0	0
G	green sprangletop	2	0	0	0
G	poverty threeawn	1	0	2	0
F	spurge	0	0	2	0
F	annual forb	0	0	1	0
S	catclaw acacia	0	0	8	1
T	alligator juniper	0	0	3	13
T	pinyon pine	0	0	4	0
T	gray oak	0	0	2	0
T	Ponderosa pine	0	0	1	0
S	prickly pear	1	0	0	1
G	cane bluestem	0	0	0	22

Table 93 shows the calculated similarity to the potential natural community described for the TES map unit. All calculated similarity indices fall in the low similarity category with the 1982 data showing the lowest similarity and the 2005 data showing the highest similarity. The similarity to PNC mirrors the fluctuations in species diversity described above. The primary driver for the low similarity appears to be low shrub cover at the site.

Table 93. Cluster 9 – NO Bar plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	29
1982 Parker protocol	19
2005 Daubenmire Cover Class Protocol	32
2021 Dry Weight Rank Protocol	28

The 2021 points data shows a decrease in the amount of bare soil and an increase in rock cover compared to previous years. Vegetative cover shows a slight decrease from the 2005 Daubenmire cover class data but is fairly similar to the earlier Parker 3 step readings. Litter increased from 1982 to 2005 and remained static between 2005 and 2021. When looking at the data set as a whole, there is a slight upward trend in rock and litter cover and a strong upward trend (decrease in cover) for bare soil. When comparing the current condition to the reference condition from the TES inventory, we see similarities in vegetative cover and rock cover while litter is higher and bare soil is lower than what would be expected at the site.

Table 94. Cluster 9 – NO Bar summary, ground cover (%)

	Parker protocol			2005 Daubenmire cover class protocol	2021 Points protocol	Reference condition from TES
	1953	**1959**	**1982**			
Vegetation	8	7	4	11	8	**10**
Rock	37	36	50	42	51	**65**
Litter	12	12	3	35	37	**10**
Bare soil	42	45	42	12	4	**20**

NO -C9 – NO Bar trend summary

The plant community at NO-C9 – NO Bar pasture is currently dominated by an even split of hairy grama, sideoats grama, and cane bluestem with a smaller blue grama subcomponent. Hairy grama, sideoats grama, and blue grama have been components at the site since 1959 while cane bluestem was first documented in the 2021 data. Previous years data show fluctuations in species composition and diversity with the 1959 and 1982 data showing greater diversity in grass species and the 2005 and 2021 data showing greater diversity in forb, shrub and tree species. It is unclear what factors contributed to the shift in species composition from primarily sod grasses to the current condition of a mixture of sod grass, bunchgrass, and tree cover.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data shows a shift from desirable forage grasses dominating the site to slightly less desirable species including cane bluestem and alligator juniper. A preponderance of evidence suggests a slightly downward trend due a slight decrease in diversity and similarity to PNC. Site protection attributes show an upward trend with higher amounts of litter cover and lower amounts of bare soil than the reference condition.

Ecological Status: The similarity to PNC has fluctuated up and down within the low similarity class mirroring the fluctuations in species diversity described by the botanical composition data. The 2021 dry-weight rank data shows similarity to PNC has decreased slightly from the 2005 Daubenmire cover class data. The overall low similarity to PNC is primarily due to low shrub cover at the site.

Cluster 10 (NO-C10) – Main pasture, TES map unit 632

Available data for Cluster 10 in the Main pasture includes Parker 3 Step data from 1959 and 1982, Daubenmire cover class data from 2006, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the current plant community is strongly dominated by purple grama. The large component of purple grama in 2021 is a departure from previous years, where purple grama was present as a minor component. For example, purple grama only comprised 2% of the Daubenmire cover class transects. Previous years data show blue grama, and sideoats grama have been consistent components at the site, with fluctuating abundance from year to year. Lehmann's lovegrass, bristly wolfstail, mat muhly, and beargrass appear at the cluster for the first time in 2021. Overall, there is little overlap in species composition from year to year with the exception of blue grama and sideoats grama. Species diversity increased slightly from 1959 to 2006 then decreased from 2006 to 2021.

Table 95. Cluster 10 – Main summary, botanical composition (%) Parker protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		Daubenmire cover class protocol 2006	Dry-weight rank protocol 2021
		1959	1982		
G	blue grama	17	13	19	2
G	sideoats grama	4	17	20	7
G	spidergrass	24	0	0	0
G	squirreltail	24	7	2	0
G	common wolfstail	2	0	1	0
T	gray oak	0	0	8	0
F	desert tobacco	0	27	0	0
G	false grama	0	6	0	0
S	broom snakeweed	0	7	0	0
G	sprucetop grama	26	0	0	0
G	purple grama	0	16	2	74
G	threeawn	0	4	0	0
S	mountain mahogany	0	1	0	0
S	Wright eriogonum	0	0	4	0
G	plains lovegrass	0	0	9	0
G	James' galleta	0	0	1	0
G	brome	0	0	1	0
G	annual grass	0	0	9	0
F	annual forb	0	0	4	0
S	unknown shrub	0	0	1	0
T	alligator juniper	0	0	14	5
T	pinyon pine	0	0	5	0

Growth form	Common name	Parker 3 Step Protocol		Daubenmire cover class protocol 2006	Dry-weight rank protocol 2021
		1959	1982		
G	Lehmann lovegrass	0	0	0	4
G	bristly wolfstail	0	0	0	1
G	mat muhly	0	0	0	5
S	beargrass	0	0	0	2

Table 96 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above resulted in fluctuations in the calculated similarity however, all similarity indices fall within the low similarity class. The 2021 dry-weight rank data shows a decline in similarity from both the 1982 and 2006 data which is primarily driven by the decrease in sideoats grama cover.

Table 96. Cluster 10 – Main plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	11
1982 Parker protocol	28
2006 Daubenmire cover class protocol	30
2021 Dry Weight Rank protocol	13

The 2021 points data shows a decrease in the amount of bare soil and an increase in litter and vegetative cover compared to previous readings. Rock cover shows a slight decrease from the 2006 Daubenmire cover class data but is fairly similar to the earlier Parker 3 step readings. When looking at the data set as a whole, there is a slight upward trend in vegetative cover and a strong upward trend (decrease in cover) for bare soil. When comparing the current condition to the reference condition from the TES inventory, we see similarities in vegetative cover and rock cover, while litter is higher and bare soil is lower than what would be expected at the site.

Table 97. Cluster 10 – Main summary, ground cover (%)

	Parker protocol		2006 Daubenmire cover class	2021 Point protocol	Reference condition from TES
	1959	1982			
Vegetation	2	1	4	14	**10**
Rock	45	64	72	50	**65**
Litter	16	4	15	32	**10**
Bare soil	37	31	9	5	**20**

NO -C10 – Main trend summary

The plant community at NO-C10 – Main pasture is currently dominated by purple grama which previously made up only a minor component of site. Blue grama and sideoats grama have been consistent components of the cluster with fluctuating abundance from year to year. Species diversity increased slightly from 1959 to 2006 then decreased from 2006 to 2021. Tree cover including pinyon pine and alligator juniper appear to have decreased from 2006 to 2021 although this could be due to differences in transect placement or protocol methodology rather than a die off of overstory species.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data show the cluster composed almost entirely of desirable forage grasses however species diversity has declined from previous years. The preponderance of evidence suggests that the apparent trend is slightly downward. The site protection attributes show a decrease in the amount of bare soil and an increase in litter and vegetative cover compared to previous readings. Site protection attributes show an upward trend with higher amounts of litter and vegetation and lower amounts of bare soil than previous years.

Ecological Status: The similarity to PNC has fluctuated up and down within the low similarity class mirroring the increase and subsequent decrease in species diversity described by the botanical composition data. The 2021 dry-weight rank data shows similarity to PNC has decreased slightly from the 2005 Daubenmire cover class data. The overall low similarity of the cluster to PNC is primarily due to low shrub cover at the site.

Cluster 7 (NO-C7) – NO Bar, TES map unit 589

Available data for Cluster 7 in the NO Bar pasture includes Parker 3 Step data from 1975, 1988 and 2007, and Daubenmire cover class data from 2007. The 2007 Daubenmire data show a fairly even split among hairy grama, blue grama, and curly mesquite as the most abundant species. The Parker 3 step data from 2007 differs, showing blue grama as the dominant species while hairy grama and curly mesquite make up the subcomponent. Curly mesquite, blue grama, sideoats grama, and hairy grama have been consistent components of the transect since 1975 with fluctuations in relative abundance from year to year. Species diversity was highest in 1988 then decreased for both the 2007 Parker protocol data and the 2007 Daubenmire cover class protocol data.

Table 98. Cluster 7 – NO Bar summary, botanical composition (%) Parker protocol and Daubenmire cover class protocol

Growth form	Common name	Parker 3 Step Protocol			Daubenmire cover class protocol 2007
		1975	1988	2007	
G	curly mesquite	53	39	18	24
G	blue grama	10	8	45	31
G	sideoats grama	14	5	4	7
G	hairy grama	20	14	30	26
G	vine mesquite	1	1	2	2
S	Wright eriogonum	0	2	0	1
G	panicgrass	0	2	0	0
S	broom snakeweed	0	1	0	0
F	aster	0	1	0	8
F	milkweed	0	4	0	0
G	false grama	0	11	0	0
S	cactus	1	1	0	0
F	desert tobacco	0	10	0	0

Table 99 shows the calculated similarity to the potential natural community described for the TES map unit. All calculated similarity indices are in the mid similarity class with the highest score in 1975 and the lowest in 2007 with Daubenmire cover class data. Interestingly, although species diversity increased from 1975 to 1988, the similarity to PNC did not.

Table 99. Cluster 7 – NO Bar plant community similarity to PNC as described in TES

	Similarity Index
1975 Parker protocol	56
1988 Parker protocol	51
2007 Parker protocol	40
2007 Daubenmire cover class protocol	49

The 2007 Parker 3 step data show an increase in vegetation from previous years while the Daubenmire cover class protocol shows a decrease from previous years. Litter cover was consistent between the two protocols with both having higher litter cover than previous years. Rock cover and bare soil was higher for the Daubenmire cover class protocol. When looking at the data set as a whole, there is a slight upward trend in rock and litter cover and an upward trend for bare soil (decrease in cover). When comparing the current condition to the reference condition from the TES inventory, the 2007 Daubenmire cover class protocol resulted in vegetative and rock cover values that are similar to what would be expected at the site with lower amounts of bare soil and higher amounts of litter. The 2007 Parker protocol shows higher vegetative and litter cover with lower rock and bare soil cover.

Table 100. Cluster 7 – NO Bar summary, ground cover (%)

	Parker protocol				2007 Daubenmire cover class protocol	Reference condition from TES
	1953	1975	1988	2007		
Vegetation	21	39	11	27	6	**10**
Rock	21	23	31	33	47	**45**
Litter	13	7	9	20	19	**T**
Bare soil	46	33	49	19	28	**45**

NO-C7 – NO Bar trend summary

The plant community at NO-C7 – NO Bar pasture in 2007 was dominated by blue grama with strong subcomponents of curly mesquite and hairy grama. Comparative botanical composition data from the Parker 3 step protocol in 1975 and 1988 show curly mesquite, blue grama, sideoats grama, and hairy grama have been consistent components of the site since 1975. Species diversity was highest in 1988 then decreased for both the 2007 Parker data and the 2007 Daubenmire cover class data.

Apparent Trend: The vegetative composition of the site in 2007 appeared to be in satisfactory condition with the cluster composed almost entirely of desirable forage grasses. Species diversity decreased slightly from 1988 to 2007. A preponderance of evidence suggests that the apparent trend is static due to similarities in PNC. The site protection attributes show a decrease in the amount of bare soil and increase in litter cover compared to previous readings. Differences between the 2007 Daubenmire protocol and the 2007 Parker protocol make it difficult to compare vegetative cover and rock cover. Site protection attributes show an upward trend with higher amounts of litter and vegetation, and lower amounts of bare soil than the reference condition.

Ecological Status: The similarity to PNC has fluctuated up and down within the mid similarity class with the highest score in 1975 and the lowest in 2007 for the Daubenmire cover class data. Similarity to PNC decreased slightly from 1988 to 2007 for both the Daubenmire and Parker protocol.

Cluster 1 (BD-C1) – Big Dry pasture, TES map unit 469

Available data for Cluster 1 in the Big Dry pasture include Parker 3 Step data from 1985, Daubenmire cover class data from 2006, and dry-weight rank data from 2019. The 2019 dry-weight rank data

indicate the current plant community is composed of nearly equal parts common wolfstail, blue grama, and curly mesquite. Curly mesquite, blue grama, sideoats grama, and poverty threeawn have been consistent components of the cluster since 1985. The 2019 dry-weight rank data show mesquite and oneseed juniper occupying the site for the first time. This is likely due to differences in protocols, with the dry-weight rank method sampling a larger area, rather than woody encroachment into the site. Species diversity increased from 1985 to 2006 then subsequently decreased in 2019.

Table 101. Cluster 1 – Big Dry summary, botanical composition (%) Parker protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol 1985	Daubenmire cover class protocol 2006	Dry-weight rank protocol 2019
G	sideoats grama	22	13	6
G	common wolfstail	7	0	21
G	hairy grama	25	0	5
G	blue grama	13	38	24
G	curly mesquite	23	20	18
G	vine mesquite	3	0	0
G	poverty threeawn	6	4	8
G	black grama	0	1	0
G	sixweeks fescue	0	1	0
G	James' galleta	0	2	0
S	Wright eriogonum	0	10	0
F	hog potato	0	6	0
F	aster	0	3	0
F	annual forb	0	1	0
S	mesquite	0	0	6
T	oneseed juniper	0	0	11

Table 102 shows the calculated similarity to the potential natural community described for the TES map unit. All calculated similarity indices fall in the mid similarity category with the 2006 data showing the lowest similarity and the 1985 data showing the highest similarity. The similarity to PNC increased from 2006 to 2019 which was primarily driven by the presence of mesquite in the 2019 data. Interestingly, although species diversity increased from 1975 to 1985, the similarity to PNC decreased.

Table 102. Cluster 1 – Big Dry plant community similarity to PNC as described in TES

	Similarity Index
1985 Parker protocol	46
2006 Daubenmire cover class protocol	37
2019 Dry-weight rank protocol	43

The 2019 points data show a strong decrease in the amount of bare soil compared to previous years with a corresponding increase in litter cover. Vegetative cover and rock cover both decreased. When looking at the data set as a whole, there is a downward trend in vegetative cover and a strong upward trend (decrease in cover) for bare soil. Litter cover and rock cover fluctuated with no apparent trend. Fluctuations in ground cover could be partially due to differences in protocols or precipitation which

affects the amount of annuals plant species contributing to litter cover. Percent frequency monitoring conducted in 2019 show annual forbs present in 77% of plots which is likely contributing to the higher litter cover. When comparing the current condition to the reference condition from the TES inventory, there is little similarity between site conditions in 2020 and the reference state with the exception of rock cover.

Table 103. Cluster 1 – Big Dry summary, ground cover (%)

	Parker protocol		2006 Daubenmire cover class protocol	2019 Dry Weight Rank Protocol	Reference condition from TES
	1954	1985			
Vegetation	19	22	3	1	**5**
Rock	6	6	68	29	**30**
Litter	10	4	7	66	**T**
Bare soil	65	69	22	4	**65**

BD-C1 – Big Dry trend summary

The plant community at BD-C1 Big Dry pasture is currently composed of nearly equal parts of common wolfstail, blue grama, and curly mesquite. Comparative botanical composition data from the 1985 Parker 3 step protocol and the 2006 Daubenmire cover class protocol show curly mesquite, blue grama, sideoats grama, and poverty threeawn have been consistent components of the cluster since 1985. Species diversity increased from 1985 to 2006 then subsequently decreased in 2019.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition with the cluster composed mainly of desirable forage grasses. Species diversity decreased slightly from the 2006 Daubenmire cover class data however, the similarity to PNC increased. The preponderance of evidence suggests a static or slightly upward trend. The site protection attributes show a decrease in the amount of bare soil and an increase in litter cover compared to previous readings. Vegetative cover also decreased and has been showing a long term trend of declining cover. The decrease in vegetative cover and increase in litter cover may be due to die off of perennial grass species. Annual species appear to also be contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes show a slightly downward trend due to the decrease in vegetative cover and declines in bare soil due in large part to annual species abundance.

Ecological Status: The similarity to PNC has fluctuated up and down within the mid similarity class. The 2021 dry-weight rank data shows similarity to PNC has increased slightly from the 2006 Daubenmire cover class data despite the decline in species diversity.

Cluster 2 (BD-C2) – Big Dry East pasture, TES map unit 589

Available data for Cluster 2 in the Big Dry East pasture include Parker 3 Step data from 1985, Daubenmire cover class data from 2006, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the current plant community is dominated by sideoats grama with a hairy grama subcomponent. There is little overlap in botanical composition from 1985 to 2021 with curly mesquite shown as the dominant species in 2006 and blue grama dominant in 1985. Plantain and prickly pear appear for the first time in the 2021 data while poverty threeawn, curly mesquite, and blue grama, species that were present in previous years, are absent. Species diversity is low for this site with six species recorded in 2006, the year with the highest diversity.

Table 104. Cluster 2 – Big Dry East summary, botanical composition (%) Parker protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol 1985	Daubenmire cover class protocol 2006	Dry-weight rank protocol 2021
G	poverty threeawn	0	7	0
G	blue grama	91	1	0
G	hairy grama	1	0	24
G	curly mesquite	3	84	0
G	sixweeks fescue	0	1	0
F	vetch	0	3	0
S	Wright eriogonum	0	3	0
S	prickly pear	0	0	1
G	sideoats grama	0	0	59
F	plantain	0	0	16

Table 105 shows the calculated similarity to the potential natural community described for the TES map unit. Similarity indices for the 1985 Parker data and the 2021 dry-weight rank data show the cluster in the low similarity class while the 2006 Daubenmire cover class protocol is in the mid similarity class. The movement from the low similarity class to the mid similarity class and back again appears to be driven by the presence of curly mesquite in 2006, which is the most abundant species in the PNC description.

Table 105. Cluster 2 – Big Dry East plant community similarity to PNC as described in TES

	Similarity Index
1985 Parker protocol	13
2006 Daubenmire cover class protocol	36
2019 Dry-weight rank protocol	19

The 2021 points data show a strong decrease in the amount of bare soil compared to previous readings with a corresponding increase in litter cover. Vegetative cover was not included on the data sheet in 2020. Whether this is because there was no live basal vegetation or whether it was an oversight in data collection is unknown. The picture taken at the sight in 2021 appears to show sparce sod grass which may have been counted as litter due to dormancy or drought die off. When looking at the data set as a whole, there is an upward trend in rock and litter cover as well as an upward trend (decrease in cover) for bare soil. Percent frequency monitoring conducted in 2021 shows annual forbs present in 82% of the plots which is likely contributing to the increase in litter cover. When comparing the current condition to the reference condition from the TES inventory, there is little similarity between site conditions in 2020 and the reference state.

Table 106. Cluster 2 – Big Dry East summary, ground cover (%)

	Parker protocol		2006 Daubenmire cover class protocol	2021 Points Protocol	Reference condition from TES
	1954	1985			
Vegetation	20	32	8	not recorded	**10**
Rock	7	11	35	57	**45**
Litter	6	4	19	43	**T**
Bare soil	67	53	38	1	**45**

BD-C2 – Big Dry East trend summary

The plant community at BD-C2 Big Dry East pasture is currently dominated by sideoats grama with a hairy grama subcomponent. The species composition from previous years shows little similarity to the current condition with curly mesquite shown as the dominant species in 2006 and blue grama dominant in 1985. Curly mesquite and blue grama are absent from the 2021 data. It is possible that species have been misidentified over the years contributing to the drastic fluctuations in botanical composition for the cluster. Species diversity for the site is low with only four species recorded in 2021 and 6 species recorded in 2006.

Apparent trend: The current vegetative composition of the site appears to be in marginal condition with no live vegetation being recorded in the ground cover readings. The recovery of this site will depend on the ability of the existing vegetation to rebound in a wet year. Botanical composition data shows abundant forage grasses present at the site with undesirable forbs (plantain) appearing in 2021. The preponderance of evidence suggests that the apparent trend is downward. The site protection attributes show departures from previous conditions with a large increase in the amount of litter and a corresponding decrease in the amount of bare soil and vegetative cover. The increase in litter cover appears to be due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. The site protection attributes suggest a downward trend, with decreases

in bare soil and increases in litter likely due to die off of perennial vegetation and an abundance of annual forbs.

Ecological Status: The 2021 dry-weight rank data shows similarity to PNC has decreased since 2006. This is primarily due to the absence of curly mesquite which is the most abundant grass species described in the potential natural community composition. Both the 1985 Parker data and the 2021 dry-weight rank data show the cluster in the low similarity category while the 2006 Daubenmire data show the cluster in the mid similarity category.

Cluster 3 (WC-C3) – Table Top pasture, TES map unit 479

Available data for Cluster 3 in the Table Top pasture include Parker 3 Step data from 1962 and 1983, and dry-weight rank data from 2019. The 2019 dry-weight rank data indicate the current plant community is co-dominated by hairy grama and curly mesquite with a sideoats grama subcomponent. The Parker 3 step data from 1962 and 1983 differ with blue grama being a main component of the cluster while hairy grama is absent. Blue grama only comprises 1% of the 2019 botanical composition. With the exception of hairy grama and blue grama relative cover, species composition and diversity has remained similar since 1962 with only slight variations in abundance and presence of other species.

Table 107. Cluster 3 – Table Top summary, botanical composition (%) Parker protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		Dry-weight rank protocol 2019
		1962	1983	
G	curly mesquite	28	18	35
G	blue grama	10	38	1
G	poverty threeawn	8	2	1
G	purple threeawn	1	0	0
G	sideoats grama	52	29	19
F	cinquefoil	0	2	0
G	mat muhly	1	0	0
S	broom snakeweed	0	0	5
G	hairy grama	0	0	37

Table 108 shows the calculated similarity to the potential natural community described for the TES map unit. Similarity indices for the 1962 Parker data and the 2019 dry-weight rank data show the cluster in the mid similarity class while the 1983 Parker data is in the low similarity class. The movement from the mid similarity class to the low similarity class and back again appears to be partially driven by the lower cover of curly mesquite in 1983, which is the most abundant species in the PNC description.

Table 108. Cluster 3– Table Top plant community similarity to PNC as described in TES

	Similarity Index
1962 Parker protocol	38
1983 Parker protocol	29
2019 Dry-weight rank protocol	38

The 2019 points data shows a strong decrease in the amount of bare soil and vegetative cover with a corresponding increase in litter cover compared to previous years. Percent frequency monitoring

conducted in 2020 shows annual forbs present in 83% of plots which is likely contributing to the increase in litter cover. When looking at the data set as a whole, there is a slight upward trend (decrease in cover) in bare soil and upward trend (increase) in litter cover. Vegetative cover shows an overall declining trend.

Table 109. Cluster 3 – Table Top summary, ground cover (%)

	Parker protocol		2019 Points Protocol	Reference condition from TES
	1962	1983		
Vegetation	14	14	1	**5**
Rock	15	45	53	**30**
Litter	8	2	46	**T**
Bare soil	62	39	0	**65**

WC-C3 – Table Top trend summary

The plant community at WC-C3 Table Top pasture is currently co-dominated by hairy grama and curly mesquite with a sideoats grama subcomponent. This composition of species has remained similar with the Parker 3 step data from 1962 and 1983 also showing curly mesquite and sideoats grama as main components of the site. However, the Parker 3 step readings show blue grama as an abundant species while hairy grama is absent. Species diversity has remained fairly static from 1962 to 2019 with only minor fluctuations in species abundance and presence.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition with the cluster composed entirely of desirable forage grasses. A preponderance of evidence suggests that the apparent trend is slightly upward due to the increase in similarity to PNC. The site protection attributes show a departure from previous conditions with a strong decrease in the amount of bare soil (to zero percent) and increase in litter and rock cover compared to previous years. Vegetative cover also declined from the previous years. The increase in litter cover appears to be due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. The site protection attributes suggest a downward trend, with decreases in bare soil and increases in litter likely due to die off of perennial vegetation and an abundance of annual forbs.

Ecological Status: The similarity to PNC has fluctuated with the 1962 Parker data and the 2019 dry-weight rank data showing the cluster in the mid similarity class while the 1983 Parker data shows it in the low similarity class. The shift from low to mid similarity appears to be driven by the abundance of curly mesquite which is the most abundant grass species described in the potential natural community composition.

Cluster 4 (WC-C4) – Open Draw pasture, TES map unit 630

Available data for Cluster 4 in the Open Draw pasture includes Parker 3 Step data from 1962 and 1983, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the current plant community is dominated by sideoats grama and hairy grama. The Parker 3 step data from 1962 and 1983 differ with curly mesquite shown as the dominant plant species. Curly mesquite is present in the 2021 dry-weight rank data but only comprises 4% of the botanical composition. Hairy grama, sideoats grama, and curly mesquite have been consistent components of the cluster since 1962 with varying abundance from year to year. The 2021 dry weight rank data shows an increase in tree and shrub species although this could be due to the differences in protocols, with a larger area sampled with the dry weight rank protocol. Species diversity decreased slightly from 1962 to 1983 then increased from 1983 to 2021.

Table 110. Cluster 4 – Open Draw summary, botanical composition (%) Parker protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		Dry-weight rank protocol 2021
		1962	1983	
F	Arizona rosemallow	13	0	0
G	hairy grama	8	12	26
G	sprucetop grama	2	0	0
G	poverty threeawn	1	0	0
S	desert ceanothus	1	0	0
G	sideoats grama	12	5	23
G	common wolfstail	1	1	0
G	blue grama	0	18	1
S	broom snakeweed	6	0	0
G	curly mesquite	50	57	4
G	sand dropseed	0	1	0
G	purple grama	0	4	10
S	beargrass	0	1	3
F	wild buckwheat	1	0	0
S	baccharis	0	0	1
T	alligator juniper	0	0	17
S	prickly pear	0	0	2
G	slender grama	0	0	3
T	pinyon pine	0	0	4
G	mat muhly	0	0	1
S	agave	0	0	2

Table 111 shows the calculated similarity to the potential natural community described for the TES map unit. All calculated similarity indices fall in the low similarity category with the 1983 data showing the lowest similarity and the 2021 data showing the highest similarity. The similarity to PNC increased from 1983 to 2021 which was primarily driven by the increase in sideoats grama which is the most abundant species in the potential natural community composition.

Table 111. Cluster 4– Open Draw plant community similarity to PNC as described in TES

	Similarity Index
1962 Parker protocol	18
1983 Parker protocol	14
2021 Dry-weight rank protocol	30

The 2021 points data shows a strong decrease in the amount of bare soil with a corresponding increase in litter and rock cover compared to previous readings. Vegetative cover has remained static since 1962 showing more vegetative cove than would be expected from the reference condition

Table 112. Cluster 4 – Open Draw summary, ground cover (%)

	Parker protocol		2021 Dry Weight Rank Protocol	Reference condition from TES
	1962	1983		
Vegetation	9	9	10	**5**
Rock	27	22	42	**50**
Litter	9	2	41	**10**
Bare soil	55	67	8	**35**

WC-C4 – Open Draw trend summary

The plant community at WC-C4 Open Draw pasture is currently dominated by sideoats grama and hairy grama. The Parker 3 step data from 1962 and 1983 differ with curly mesquite shown as the dominant plant species. Hairy grama, sideoats grama, and curly mesquite have been consistent components of the cluster since 1962 with varying abundance from year to year. Species diversity increased slightly from 1983 to 2021, with the 2021 data showing more tree and shrub cover than previous years.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition with the cluster showing a diversity of desirable forage species. A preponderance of evidence suggests that the apparent trend is slightly upward due to the increase species diversity and increased similarity to PNC. The site protection attributes show a departure from previous conditions with a strong decrease in the amount of bare soil and increase in litter and rock cover compared to previous readings. Vegetative cover has remained static since 1962 and shows higher cover than would be expected at the site when compared to the TES reference condition. Overall site protection attributes suggest an upward trend with decreases in both bare soil and increases in rock and litter. The decrease in bare soil and increase in litter do not appear to be due to die off of perennial vegetation or abundance of annual forbs as seen elsewhere in the allotment.

Ecological Status: The similarity to PNC has fluctuated up and down within the low similarity class, The 2021 dry-weight rank data shows similarity to PNC has increased from the 1983 Parker data primarily due to the increase in sideoats grama.

Utilization monitoring data

On the Double Circle allotment, the annual operating instructions for the past several years (2018-2021) have identified allowable use standards ranging 30 to 40 percent allotment wide. Table 113 displays a summary of the utilization monitoring conducted on the Double Circle allotment since 2015. The 'percentage of permitted use' line is included in the table to display the yearly stocking level as a percentage of that identified on the term grazing permit. Utilization monitoring normally occurs within two weeks before or after pasture move dates, and after the summer growing season. The years 2020, 2018, and 2017 recorded use levels exceeding allowable use standards within one pasture. All other observations were at or below the allowable use standard.

Table 113. Utilization monitoring

Pasture	2020	2019	2018	2017	2015	2011	2010	2009	2008	2007	2006	2005	2004
Percentage of permitted use, allotment-wide	**41%**	**77%**	**87%**	**98%**	**95%**	**No data**	**31%**	**34%**	**38%**	**40%**	**23%**	**46%**	**46%**
NO Bar	60%*					26%	1%					19%	
Lower Main			60%*										
Cottonwood				60%		25%						10%	
Big Dry				0%	5%	10%	5%			4%*			
Greys				0%					1%				

Pasture	2020	2019	2018	2017	2015	2011	2010	2009	2008	2007	2006	2005	2004
Big Dry East						20%*		8%*		10%*		20%	
Four Bar		73%	5%							5%*			
Sheep Wash						22%	1%		10%*	0%			24%
Open Draw						19%	3%*			6%		13%	3%
ST						15%							18%
Pruner Flats							10%				25%	33%	
Butte							0%		5%			5%	3%
DC Fields								5%					
Air Strip								2%		6%	26%		
Smith Canyon									5%*				
Table Top									20%				
Wier Trap											28%		
Weaning Trap											9%	12%	13%
Bee Springs											26%	8%	
NO Bar Trap											16%		
Cross H											12%		28%
PD											23%		

**averaged from 2 or more utilization readings*

Structural improvements

Structural improvements include fences, stock tanks, wells, troughs, and corrals. The responsibility for the maintenance of these improvements is assigned to the grazing permittee in the term grazing permit. Most of these improvements on the Double Circle allotment are in functional condition although some may need maintenance or reconstruction in the next few years. The annual operating instructions identify which improvements need replacement or reconstruction each year. Table 114 shows named range improvements in the allotment. In addition to these, there are various unnamed water troughs that may provide water for part of the year.

Table 114. Range Improvement Points

Range Improvement Name	Improvement Type
4Bar Mesa Corral	Corral
Bee Canyon Tank	Intermittent Stock Tank
Bee Springs Tank	Intermittent Stock Tank
Benchmark Tank #1	Trough
Benchmark Tank #2	Intermittent Stock Tank
Bluff Tank	Perennial Stock Tank
Butte Tank	Intermittent Stock Tank
Butte Tank No 2	Intermittent Stock Tank
Cabin Corral	Corral
Cat Tank	Intermittent Stock Tank
CCC Tank	Intermittent Stock Tank
Corner Corral	Corral
Cottonwood Canyon Corral	Corral
Cottonwood Canyon Tank	Intermittent Stock Tank
Cottonwood Corral	Corral
Cottonwood Spring	Trough
Cottonwood Tank	Intermittent Stock Tank
Cottonwood Trough	Trough
Cow Canyon Tank	Intermittent Stock Tank
Division Tank	Intermittent Stock Tank
Double Circle Tank	Intermittent Stock Tank
Edwards Tank	Intermittent Stock Tank

Existing Well	Well
Four Bar Mesa Tanks	Intermittent Stock Tank
Four Bar Mesa Tanks	Intermittent Stock Tank
Gate	Gate
Glenn Tank	Intermittent Stock Tank
Hidden Tank	Intermittent Stock Tank
Jackie Corral	Corral
Juan Miller Corral	Corral
Juan Miller Spring	Spring Well Development
Lee Tank	Intermittent Stock Tank
Loading Chute Corral	Corral
Loading Corral	Corral
Mesa Corral	Corral
Mesa Tank No 1	Intermittent Stock Tank
Mesa Tank Storage	Water Storage Tank
Moore Tank	Intermittent Stock Tank
N O Bar Mesa Tank	Intermittent Stock Tank
N O Bar Mesa Tank No 2	Intermittent Stock Tank
New Tank	Intermittent Stock Tank
Oak Tank	Intermittent Stock Tank
Old Tank	Intermittent Stock Tank
Open Draw #2 Tank	Intermittent Stock Tank
Open Draw #3 Tank	Intermittent Stock Tank
Open Draw Tank	Intermittent Stock Tank
part of Bee Spg Pipeline	Trough
part of Big Dry Pipeline	Trough
Pigeon Canyon Corral	Corral
Secondary Tank	Intermittent Stock Tank
Sheep Wash Tank	Intermittent Stock Tank
Small Tank	Intermittent Stock Tank
Split Tank	Intermittent Stock Tank
ST Corral	Corral
ST Windmill, Well	Well, Windmill
Sunflower Mesa Tank	Intermittent Stock Tank
Tabletop Tank	Intermittent Stock Tank
Trail Cabin Tank	Intermittent Stock Tank
Upper Big Dey Tank	Intermittent Stock Tank

Existing condition summary

Long term trend data is available for the Four Bar, NO Bar, Smith Canyon, Main, Big Dry, Big Dry East, Table Top, and Open Draw pastures. Overall, the clusters in Double Circle allotment show satisfactory conditions with eight of the eleven clusters showing static or upward trends. Three pastures, NO Bar, Main, and Big Dry East, show slight downward trends due to changes in species composition. All clusters fall in the low or mid similarity class to potential natural community. The primary driver for those that fall in the low similarity category is a lack of overall species diversity and shrub cover. 2020 and 2021 data document drought stress at some sites and loss of perennial grass cover. Future monitoring will be needed to determine if vegetation shows long tern negative effects from the drought.

Table 115. Double Circle cluster vegetative trends

Cluster	Vegetative Trend
NO – C5 Four Bar Pasture	static
NO – C2 NO Bar Pasture	upward
NO-C3 Four Bar Pasture	upward
NO-C8 Smith Canyon Pasture	static
NO-C9 NO Bar Pasture	downward
NO-C10 Main Pasture	downward
NO-C7 NO Bar Pasture	static
BD-C1 Big Dry Pasture	static or upward
BD-C2 Big Dry East Pasture	downward
WC-C3 Table Top Pasture	upward
WC-C4 Open Draw Pasture	upward

Overall, the 2019/2020/2021 site protection data are outliers showing significant decreases in bare soil and increases in litter which are contributing to upward trends at seven of the eleven sites. The downward trending sites are experiencing a decrease in vegetative cover that is likely due to die off of perennial vegetation from drought. This likely contributed to the decrease in vegetative cover and increase in litter cover, as the live perennial vegetation transitioned to standing litter. An abundance of annual forbs and grasses at the downward trending clusters also appear to be influencing the significant decreases in bare soil as standing litter occupies available soil.

Table 116. Double Circle site protection trends

Cluster	Site Protection Trend
NO – C5 Four Bar Pasture	downward
NO – C2 NO Bar Pasture	upward
NO-C3 Four Bar Pasture	upward
NO-C8 Smith Canyon Pasture	upward
NO-C9 NO Bar Pasture	upward
NO-C10 Main Pasture	upward
NO-C7 NO Bar Pasture	upward
BD-C1 Big Dry Pasture	downward
BD-C2 Big Dry East Pasture	downward
WC-C3 Table Top Pasture	downward
WC-C4 Open Draw Pasture	upward

There is limited data available recording utilization levels. Recent utilization data suggests allowable use standards have been exceeded for the NO Bar, Lower Main, and Cottonwood pastures in 2020, 2018, and 2017 respectively. All available information shows utilization has been at or below the allowable use standards. However, the allotment has typically been stocked at levels lower than permitted levels prior to 2006. Actual use from 2006 through 2021 averaged 3,284 AUMs (274 head) or 63 percent of permitted.

Structural range improvements are being maintained, replaced or reconstructed as needed (as identified in the annual operating instructions).

East Eagle

The East Eagle allotment is located approximately 30 miles north of Clifton, Arizona on the Clifton Ranger District, Apache-Sitgreaves National Forest. The allotment lies in the northwest corner of the Clifton Ranger District and is bordered on the north by the Mogollon Rim and on the west by the San

Carlos Reservation. Elevations ranges from 9,200 feet at the northeast corner of the allotment near the Blue Vista Scenic Overlook, to 5,400 feet along Eagle Creek south of the Four Drag Ranch. Topography varies with relatively flat rolling high mesas in the southwest, to broad ridges and narrow canyon bottoms running from the Mogollon Rim to East Eagle Creek. Main drainages include Warren Canyon, Squirrel Canyon, McBride Canyon, Chitty Canyon, Salt House Creek, Crabtree Creek, Dry Prong Creek, and East Eagle Creek. Dry Prong Creek and East Eagle Creek combine in the southwest portion of the allotment to form Eagle Creek. The East Eagle allotment is comprised of numerous large and small pastures, corrals, and traps. Vegetation is predominantly oak-juniper-pinyon woodland transitioning to ponderosa pine at higher elevations. Figure 20 displays a general overview of the allotment. Comprised of approximately 62,482 acres of National Forest System land, the East Eagle allotment is located in Greenlee County, Arizona.

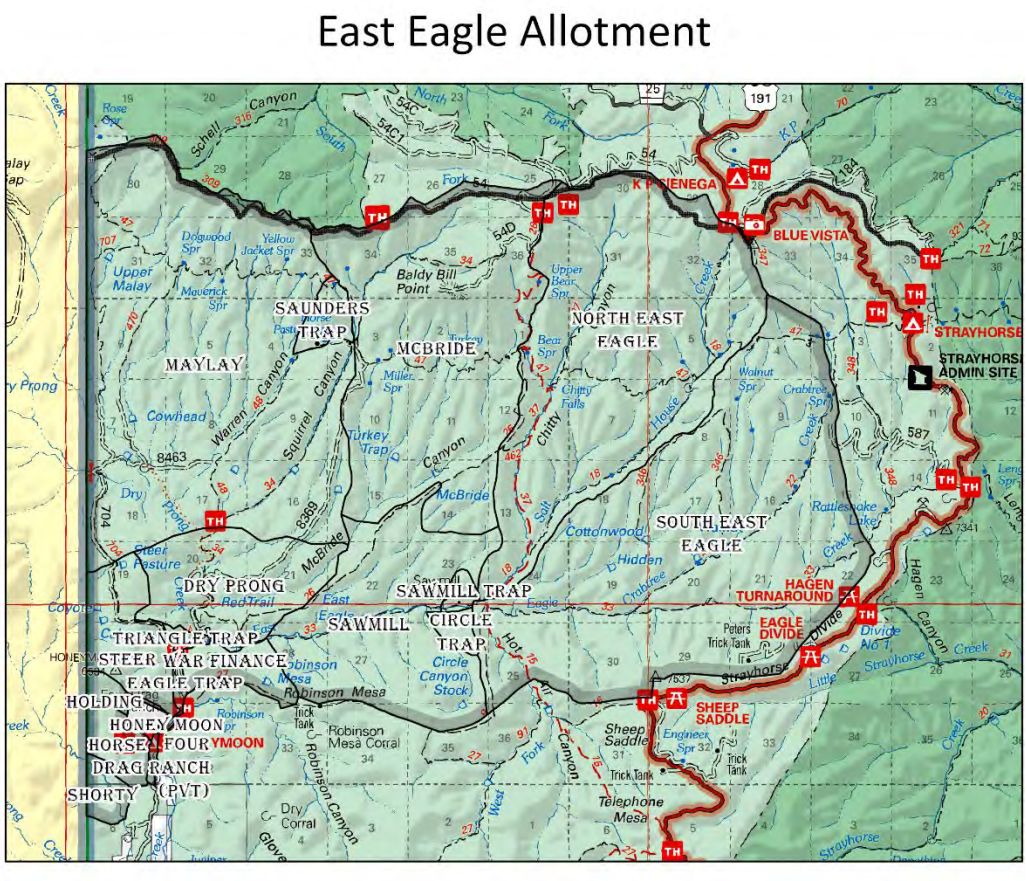

Figure 20. East Eagle Allotment

Historical Use

The East Eagle allotment was first established in the 1920s when records indicate a permit was issued for both East Eagle allotment and the adjacent Bear Wallow allotment for 627 cattle yearlong. When the permit transferred in 1941, the number of head was reduced to 564 cattle yearlong. In 1944, the permit was again reduced to 508 cattle yearlong until 1948 when it increased to 514 cattle yearlong. In 1950, the permit was reduced to 420 cattle yearlong which remained the preference through the 1980s. The 1983 East Eagle Environmental Analysis identified competition between elk and cattle for “space and forage” as a concern on the allotment and proposed combining the East Eagle Allotment with the Big Dry allotment. It was noted that elk and deer migrate off the Mogollon Rim in the winter to utilize

browse on the south facing slopes of the East Eagle allotment which resulted in deteriorating browse conditions. Deteriorating watershed condition and pinyon-juniper encroachment on ridgetops were also identified as concerns. The Environmental Analysis proposed ground application of Tordon herbicide pellets to create and maintain openings. For unknown reasons, the East Eagle allotment and the Big Dry allotment were not combined. It is unclear if the proposed application of herbicide to create openings was implemented. In the 1990s, the permit was modified for 410 cattle and 10 horses yearlong which remains the permitted numbers today.

Vegetation cover types and slope classes

Table 117. Slope class, acres

Pasture	0 - 10%	11 - 30%	31 - 40%	41 - 60%	61%+	**Total**
Circle Trap	33	70	19	17	6	**145**
Dry Prong	388	734	192	203	156	**1,673**
Eagle Trap	13	28	8	7	5	**61**
Holding	42	66	10	7	3	**128**
Honey Moon	6	9	2	2	2	**21**
Horse	95	191	34	28	12	**360**
Maylay	2,551	4,092	871	808	432	**8,754**
McBride	1,325	2,668	644	642	331	**5,610**
North East Eagle	1,218	3,035	814	808	509	**6,384**
Saunders Trap	50	131	34	31	15	**261**
Sawmill	855	1,438	302	283	205	**3,083**
Sawmill Trap	17	50	15	14	7	**103**
Shorty	78	107	18	15	6	**224**
South East Eagle	2,308	3,818	862	857	656	**8,501**
Steer	448	353	54	43	23	**921**
Triangle Trap	20	33	5	5	6	**69**
War Finance	154	196	33	28	13	**424**
Total	**9,601**	**17,019**	**3,917**	**3,798**	**2,387**	**36,722**

Cover types on the East Eagle allotment include grass-forb, grama, pine-juniper, juniper, oak-juniper-pinyon, deciduous tree mix, ponderosa pine, ponderosa pine-evergreen, Gambel oak, aspen-evergreen, Douglas fir, white fir, and upper evergreen forest as displayed in Table 118. The predominant vegetation type is oak-juniper-pinyon mix comprising 33% of allotment followed by ponderosa pine comprising 25% of the allotment.

Table 118. Cover type, acres

Pasture	Grass-Forb	Pine-Juniper	Juniper	Oak-Juniper-Pinyon	Deciduous Tree Mix	Ponderosa Pine	Ponderosa Pine Evergreen	Gambel Oak	Aspen Evergreen	Douglas Fir	White Fir	Upper evergreen forest	Total by pasture
Circle Trap			20	46	1	78		1					**146**
Dry Prong	9	639		848	98		80						**1,674**
Eagle Trap		24		5	31		2						**62**
Holding		26		99			2						**127**
Honey Moon		4		4	14								**22**
Horse		197		162	1								**360**
Maylay	15	1,015	314	4,564		1,192	289	1,339	3	13	9		**8,753**
McBride		250	94	1,261		1,585	406	1,308	152	118	100	330	**5,604**
North East Eagle		13	2	731		2,504		2,163	463	146	30	331	**6,383**
Saunders Trap				70		76		114					**260**
Sawmill		381	241	1,718	85	246	353	58					**3,082**
Sawmill Trap				75	22	6							**103**
Shorty		183		28	13								**224**
South East Eagle	37	405	43	1,720	9	3,537	123	2,525	17	17		69	**8,502**
Steer		365		541	2		14						**922**
Triangle Trap		4		40	25								**69**
War Finance		138		267	4		17						**426**
Total by cover type	**61**	**3,653**	**714**	**12,188**	**333**	**9,224**	**1,286**	**7,508**	**635**	**294**	**139**	**730**	

Grazing management

The existing term grazing permit for the East Eagle allotment is for 410 cow/calf pair and 10 horses yearlong (a total of 5,064 animal unit months). The allotment is divided into six main pastures: Dry Prong, Maylay, South East Eagle, McBride, North East Eagle, and Sawmill. The remaining pastures identified in Table 118 are smaller pastures used for holding or used intermittently. The rotation schedule is developed yearly during the annual operating instruction meeting. For the past several years the South East Eagle, McBride, North East Eagle, Maylay, and Dry Prong pastures have been used with each pasture receiving growing season rest at least once since 2018. Dry Prong was rested in 2021, McBride and Maylay were rested in 2020, North East Eagle and South East Eagle were rested in 2019, and South East Eagle, Maylay, and Dry Prong were rested in 2018. In 2021, the number of livestock were reduced due to drought conditions and wildfire. The 2021 Bear Fire burned 24% of the allotment, primarily in the South East Eagle pasture.

The allowable use standard for all pastures is 30 to 40 percent for the South East Eagle pasture, and 0 to 30 percent for the McBride, Dry Prong, and North East Eagle pastures. Recent annual operating instructions do not list allowable use for the Maylay, and Sawmill pastures.

Actual use summary

Actual use from 2003 through 2021 averaged 3,724 AUMs (310 head) or 74 percent of permitted. Recent years (2015 -2020) averaged higher actual use with 4,497 AUMs or 89 percent of permitted.

Cluster data

Cluster 1 (C1) – South East Eagle pasture, TES map unit 601

Available data for Cluster 1 in the South East Eagle pasture includes Parker 3 Step data from 1958, 1973, and 2015, Daubenmire cover class data from 2004, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the site is currently dominated by mat muhly with a ponderosa pine overstory. The 2015 Parker data and the 2004 Daubenmire cover class data also show mat muhly as the dominant species with ponderosa pine as a small component of the transects. The 1973 and 1958 Parker 3 step data differ, showing longtongue muhly and crested wheatgrass respectively as the most abundant species. The 2020 dry-weight rank data records much more overstory than previous years, which is likely due to differences in protocols, with the dry- weight rank protocol sampling the broader area. It could also indicate woody recruitment into the site. The 1958 data record a large crested wheatgrass component which could indicate the site was planted or recovering from a disturbance. The 1958 photos show

Figure 21. Cluster 1, Parker 3 Step 1958

recent logging at the site but still document a mature ponderosa pine overstory. The 2020 photo shows a denser stand of pole sized ponderosa pine. The 1973 Parker data shows introduced grass species decreasing and native species increasing. Crested wheatgrass is absent from the 2004 Daubenmire cover class data, the 2015 Parker data, and the 2020 dry weight rank data. Site diversity has remained fairly static since 1958 although there is little overlap in species among protocols and years.

Figure 22. Cluster 1, dry-weight rank 2020.

Table 119. Cluster 1 – South East Eagle summary, botanical composition (%), Parker 3 step protocol, TES Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol			2004 Daubenmire Cover Class	Dry-weight rank protocol 2020
		1958	1973	2015		
G	muhly	24	0	0	0	0
G	squirreltail		5	0	0	0
G	Arizona fescue	2	0	0	0	0
G	little bluestem	1	0	0	0	0
T	ponderosa pine	0	3	1	4	35
G	longtongue muhly	0	55	0	0	0
G	red brome	0	1	0	0	0
G	sedge	0	5	7	0	0
T	Gambel oak	0	3	5	9	8
S	Fendler's ceanothus	0	8	12	0	9
G	squirreltail	4	9	1	0	0
T	alligator juniper	0	2	0	9	0
F	American vetch	0	1	0	0	0
G	crested wheatgrass	33	11	0	0	0
S	desert ceanothus	1	0	0	0	0
G	intermediate wheatgrass	0	1	0	0	0
G	bullgrass	29	0	0	0	0
G	mat muhly	0	0	73	60	30
G	bush muhly	0	0	0	9	0
G	elk sedge	0	0	0	1	0
T	silverleaf oak	0	0	0	4	6
T	gray oak	0	0	0	1	0
F	pine dropseed	0	0	0	0	5
G	mountain muhly	0	0	0	0	6

Table 120 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above resulted in the 1958, 1973 and 2015 Parker data, and the 2004 Daubenmire data falling in the low similarity category. The 2020 dry-weight rank data falls in the mid similarity category. The similarity to PNC has increased each year from 1958 to 2020, with the largest increase from 2015 to 2020. The primary driver for the increase in similarity to PNC is due to the increase in tree and shrub species documented in the 2020 data.

Table 120. Cluster 1 – South East Eagle, plant community similarity to PNC as described in TES

	Similarity Index
1958 Parker protocol	1
1973 Parker protocol	14
2004 Daubenmire cover class protocol	15
2015 Parker protocol	14
2020 Dry-weight rank protocol	51

The 2020 points data show a decrease in rock cover compared to previous readings with a corresponding increase in litter cover. Vegetative cover shows a slight decline from the previous readings but matches the reference condition for the map unit. Bare soil increased from 2004 to 2015, then decreased from 2015 to 2020. When comparing the current condition to the reference condition from the TES inventory, we see lower bare soil and rock, and higher litter amounts than would be expected at the site. Litter appears to be comprised of ponderosa pine needle cast rather than previous year's vegetation or annual species.

Table 121. Cluster 1 – South East Eagle, pasture summary, ground cover (%)

	Parker protocol			2004 Daubenmire cover class protocol	2020 Points protocol	Reference condition from TES
	1958	1973	2015			
Vegetation	8	11	5	10	5	**5**
Rock	17	17	14	14	7	**45**
Litter	61	61	74	76	88	**65**
Bare soil	14	12	7	0	1	**15**

C1- South East Eagle pasture trend summary

The plant community at C1– South East Eagle pasture is currently dominated by mat muhly with a ponderosa pine overstory. Data from the 1958 Parker 3 step cluster show crested wheatgrass as the dominant species with a strong bullgrass subcomponent. Crested wheatgrass may have been planted at the site or invaded in response to a disturbance. The 1973 Parker data show crested wheatgrass declining and native grasses and shrubs increasing. Starting in 2004, tree species increased while muhly species remained the most abundant understory species. The 2020 dry weight rank data indicate ponderosa pine has increased and is influencing both botanical composition and site protection attributes. Overall diversity at the site remained fairly static despite the minimal overlap in species composition.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data show native species dominating the site with no undesirable species present. Tree and shrub species have increased in cover while grass species have decreased, however,

this corresponds with an increase in similarity to PNC which indicates the site is moving towards potential. A preponderance of evidence suggests an upward trend due to the increase in similarity to PNC. The site protection attributes show similar conditions to the 2015 Parker data with a slight increase in litter and slight decreases in bare soil and rock cover. Site protection attributes appear to be in satisfactory condition showing similarity to the reference condition for vegetation. Current conditions show higher amounts of litter and lower amounts of rock and bare soil than would be expected at the site. A preponderance of evidence for site protection attributes shows an upward trend due to the low bare soil and high litter cover.

Ecological Status: The 2020 dry-weight rank data shows similarity to PNC has increased compared to previous years. The 1958, 1973, and 2015 Parker data, and the 2004 Daubenmire data fall in the low similarity category while the 2020 dry-weight rank data fall in the mid similarity category. The increase in similarity to the PNC is primarily due to an increase in ponderosa pine cover.

Cluster 2 (C2) – Maylay pasture, TES map unit 573

Available data for Cluster 2 in the Maylay pasture includes Parker 3 Step data from 1959 and 1973, Daubenmire cover class data from 2006, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the site is dominated by sideoats grama with an alligator juniper overstory. The 2006 Daubenmire cover class data, and the 1959 and 1973 Parker data similarly show sideoats grama as the dominant species. Alligator juniper has been present every year although the 2020 dry-weight rank data show a strong increase in cover. This is likely due to differences in protocols, with the dry-weight rank method sampling the broader area. It could also indicate woody recruitment at the site. The 2020 dry weight rank data also documents an increase in Arizona white oak and pinyon pine. Species diversity recorded at the cluster increased from 1959 to 2006, then decreased from 2006 to 2020.

Table 122. Cluster 2 – Maylay summary, botanical composition (%), Parker 3 step protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		2006 Daubenmire Cover Class	Dry-weight rank protocol 2020
		1959	1973		
G	hairy grama	2	3	2	0
G	sideoats grama	86	75	34	29
G	blue grama	4	10	5	11
G	squirreltail	2	0	0	0
T	alligator juniper	1	1	7	32
G	sedge	0	8	3	0
G	common wolfstail	1	1	6	0
G	mat muhly	1	0	0	0
G	pinyon ricegrass	0	0	0	6
G	wheatgrass	1	0	0	0
T	gray oak	0	0	4	0
T	pinyon pine	0	0	1	10
F	euphorbia spp.	0	0	2	0
F	hog potato	0	0	5	0
F	Wild bean	0	0	14	0
F	annual forb	0	0	14	0
T	Arizona white oak	0	0	0	11

Table 123 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above resulted in the 1958 and 1973 Parker data, and the 2006 Daubenmire data falling in the low similarity category while the 2020 dry-weight rank data fall in the mid similarity category. The similarity to PNC has increased steadily each year from 1958 to 2020. The primary driver for the shift from low to mid similarity is the increase in alligator juniper documented in the 2020 data.

Table 123. Cluster 2 -Maylay, plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	26
1973 Parker protocol	29
2006 Daubenmire cover class protocol	32
2020 Dry-weight rank protocol	49

The 2020 points data show a strong decrease in the amount of bare soil compared to previous readings with a corresponding increase in litter cover. Vegetative cover and rock cover decreased from the 2006 condition. When looking at the data set as a whole, there is a downward trend in vegetative cover and an upward trend in bare soil (decrease in cover). When comparing the current condition to the reference condition from the TES inventory, we see lower bare soil, rock, and vegetation, and higher litter amounts than would be expected at the site.

Table 124. Cluster 2 – Maylay pasture summary, ground cover (%)

	Parker protocol		2006 Daubenmire cover class protocol	2020 Points protocol	Reference condition from TES
	1959	1973			
Vegetation	11	10	7	4	**15**
Rock	30	40	51	32	**50**
Litter	23	4	13	61	**5**
Bare soil	36	46	29	4	**30**

C2- Maylay pasture trend summary

The plant community at C2 – Maylay pasture is currently dominated by sideoats grama with an alligator juniper overstory. The 2006 Daubenmire cover class data, and the 1958 and 1973 Parker data similarly show sideoats grama as the most abundant species. The 2020 dry-weight rank data show an increase in tree cover with more alligator juniper, Arizona white oak, and pinyon pine than previously documented at the site. Site diversity increased from 1959 to 2006 then decreased from 2006 to 2020.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data shows abundant forage grasses with no undesirable species present. Tree and shrub species are increasing in cover while grass species have decreased, however, this corresponds with an increase in similarity to PNC which indicates the site is moving towards potential. A preponderance of evidence suggests an upward trend due to the increase in similarity to PNC. The site protection attributes show departures from previous conditions with an increase in the amount of litter and a corresponding decrease in the amount of bare soil. Site protection attributes show low bare soil, and high litter cover which are contributing to a stable site. The decrease in vegetative cover may correspond with the increase in tree cover seen in the 2020 data rather than grazing management or drought. A preponderance of evidence for site protection attributes shows an upward trend due to the low bare soil and high litter cover.

Ecological Status: The 2020 dry-weight rank data show similarity to PNC has increased steadily from 1959 to 2020. The 1959 and 1973 Parker data and the 2006 Daubenmire cover class data fall in the low similarity class while the 2020 dry-weight rank data falls in the mid similarity class. The movement from the low to mid similarity class appears to be driven by the increase in alligator juniper cover.

Cluster 3 (C3) – Maylay pasture, TES map unit 575

Available data for Cluster 3 in the Maylay pasture includes Parker 3 Step data from 1959, 1973, and 2015, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the site is dominated by vine mesquite with globemallow subcomponent. The 2015, 1973, and 1959 Parker data differs, showing the site strongly dominated by blue grama. However, both the 1959 and 1973 show a greater diversity of grass species including a strong vine mesquite component which is lacking from the 2015 data. Species diversity recorded at the cluster remained static between 1959 and 1973, decreased from 1973 to 2015, then increased from 2015 to 2021.

Table 125. Cluster 3 – Maylay summary, botanical composition (%), Parker 3 step protocol

Growth form	Common name	Parker 3 Step Protocol			
		1959	1973	2015	2021
G	vine mesquite	27	13	1	26
G	single threeawn	13	0	0	0
G	squirreltail	1	0	0	0
G	blue grama	32	48	87	2
G	hairy grama	22	4	0	4
G	weeping lovegrass	0	1	0	0
G	mat muhly	0	2	0	0
G	sedge	0	22	0	10
G	common wolfstail	1	2	5	0
G	threeawn	0	0	7	7
G	poverty threeawn	3	0	0	0
G	junegrass	0	0	0	0
F	yarrow	1	2	0	0
G	false grama	0	0	1	0
G	plains bristlegrass	0	0	0	0
F	Missouri gourd	0	0	0	3
F	globemallow	0	0	0	23

Table 126 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above did not result in differences in the calculated similarity to PNC. All similarity indices calculated for this cluster fall within the low similarity class. The similarity to PNC decreased steadily each year from 1959 to 2015, then increased slightly in 2021. The primary driver for the low similarity to PNC is lack of shrub cover and absence of sideoats grama which is the most abundant species in the PNC description.

Table 126. Cluster 3 -Maylay, plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	6
1973 Parker protocol	5
2015 Parker protocol	4
2021 Dry-weight rank protocol	5

The 2021 points data show a decrease in vegetation and bare soil, and an increase in litter compared to previous years. The 2015 Parker data show similar ground cover data compared to previous years with the exception of a slight decline in bare soil. When comparing the current condition to the reference condition from the TES inventory, we see lower bare soil, rock, and vegetation, and higher litter cover than would be expected at the site.

Table 127. Cluster 3 – Maylay pasture summary, ground cover (%)

	Parker protocol			2021 Points protocol	Reference condition from TES
	1959	**1973**	**2015**		
Vegetation	13	18	13	5	**10**
Rock	0	0	0	0	**60**
Litter	64	42	69	95	**5**
Bare soil	23	39	19	0	**25**

C3- Maylay pasture trend summary

The plant community at C3 – Maylay pasture is currently dominated by vine mesquite with a globemallow subcomponent. The 1959, 1973, and 2015 Parker data show blue grama as the most abundant species. The 2021 data show blue grama comprising only 2% of the site. Vine mesquite, only comprised 1% of the 2015 botanical composition. Site diversity remained static from 1959 to 1973, decreased from 1973 to 2015, then increased from 2015 to 2021. Cluster 3 differs from other clusters in the allotment, showing a lack of tree cover.

Apparent Trend: The 2021 vegetative composition of the site appears to be in satisfactory condition. Botanical composition data show abundant forage grasses with few undesirable species present. A preponderance of evidence suggests a static trend despite fluctuations in relative species abundance. It is likely the site has crossed a threshold and will not convert back to PNC with grazing management alone. Site protection attributes show low bare soil, and high litter cover which are contributing to a stable site. A preponderance of evidence shows a slightly downward trend due to the decrease in vegetative cover.

Ecological Status: The Parker 3 step data show similarity to PNC decreased steadily from 1959 to 2015, then increased slightly in 2021. All calculated similarity indices fall in the low similarity class. The primary driver for the low similarity to PNC is lack of shrub cover and absence of sideoats grama which is the most abundant species in the PNC description.

Cluster 4 (C4) – Maylay pasture, TES map unit 573

Available data for Cluster 4 in the Maylay pasture includes Parker 3 Step data from 1959, 1973, and 2015, Daubenmire cover class data from 2006, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the site is dominated by blue grama with a sideoats grama subcomponent.

The overstory is composed of alligator juniper and pinyon pine with smaller components of oak. The 2006 Daubenmire cover class data is similar, showing alligator juniper and pinyon pine as overstory components with blue grama in the understory. However, the 2006 data document forbs as the main component of the understory. Interestingly, the 2015 Parker data does not document alligator juniper or pinyon pine. It is unlikely these long lived species disappeared from 2006 to 2015 then reappeared in 2015. The differences in overstory recorded in the botanical composition are therefore likely due to differences in protocols. The 1959 and 1973 Parker 3 step data also show blue grama and sideoats grama as strong components of the cluster, however, alligator juniper and pinyon pine are absent, or only compose a small percentage of the cluster. Species diversity recorded at the cluster has increased slightly between 1959 and 2006, then decreased slightly from 2006 to 2021. Sideoats grama, common wolfstail, and blue grama are the only species that have been present every year.

Table 128. Cluster 4 – Maylay summary, botanical composition (%), Parker 3 step protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol			2006 Daubenmire Cover Class	Dry-weight rank protocol 2021
		1959	1973	2015		
G	sideoats grama	42	39	35	9	18
G	common wolfstail	17	2	7	3	3
G	hairy grama	5	4	0	7	2
G	blue grama	30	37	48	10	29
G	mat muhly	3	6	1	0	2
G	junegrass	0	0	0	0	0
G	squirreltail	2	1	0	0	0
G	sedge	0	5	1	0	0
T	alligator juniper	0	4	0	16	19
T	pinyon pine	0	2	0	12	15
G	pinyon ricegrass	0	0	6	4	4
G	deergrass	0	0	0	1	1
S	mountain mahogany	0	0	0	0	1
T	Emory oak	0	0	0	0	6
G	poverty threeawn	0	0	0	0	2
T	gray oak	0	0	0	1	0
F	hog potato	0	0	0	11	0
F	wild bean	0	0	0	1	0
G	nut sedge	0	0	0	2	0
F	annual forb	0	0	0	6	0
F	wild pea	0	0	0	16	0

Table 129 shows the calculated similarity to the potential natural community described for the TES map unit. The 2021 dry-weight rank data, the 1959 Parker data, and the 2006 Daubenmire cover class data show the cluster in the mid similarity category. The 1973 Parker data falls in the low similarity class primarily due to the absence of alligator juniper recorded at the cluster that year.

Table 129. Cluster 4 -Maylay, plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	32
1973 Parker protocol	35
2006 Daubenmire cover class protocol	42
2015 Parker protocol	26
2021 Dry-weight rank protocol	49

The 2021 points data show a decrease in the amount of bare soil compared to previous readings with a corresponding increase in litter cover. When looking at the data set as a whole, there is an upward trend in litter cover and bare soil (decrease in cover). Vegetative cover and rock cover have remained fairly static since 1959 although both are lower than the reference condition. When comparing the current condition to the reference condition from the TES inventory, we see lower bare soil, vegetation and rock, and higher litter amounts than would be expected at the site.

Table 130. Cluster 4 – Maylay pasture summary, ground cover (%)

	Parker protocol			2006 Daubenmire cover class protocol	2021 Points protocol	Reference condition from TES
	1959	1973	2015			
Vegetation	7	11	10	5	6	**15**
Rock	37	45	43	49	33	**50**
Litter	15	7	28	19	49	**5**
Bare soil	42	37	19	27	12	**30**

C4- Maylay pasture trend summary

The plant community at C4 – Maylay pasture is currently dominated by blue grama with a sideoats grama subcomponent. The 2006 Daubenmire cover class data and the 2021 dry weight rank data show alligator juniper and pinyon pine as overstory species. The 2006 Daubenmire protocol shows the understory composed of primarily forbs while the 1959, 1973, and 2015 Parker data show blue grama and sideoats grama as the dominant species. Species diversity recorded at the cluster has increased slightly between 1959 and 2006, then decreased slightly from 2006 to 2021. Sideoats grama, common wolfstail, and blue grama are the only species that have been present every year.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data shows abundant forage grasses and browse species. A preponderance of evidence suggests an upward trend due to the increase in similarity to PNC. Site protection attributes show low bare soil, and high litter cover which are contributing to a stable site. Vegetative cover has remained fairly static while rock cover decreased slightly from 2015. A preponderance of evidence for site protection attributes shows a static or slightly upward trend.

Ecological Status: The 2021 dry-weight rank data show similarity to PNC has increased from the 2015 Parker data with the 2021 data showing the highest similarity of any year. The 1973 Parker data, the 2006 Daubenmire data, and the 2021 dry-weight rank data fall in the mid similarity class while the 1959 and 2015 Parker data fall in the low similarity class. The primary reason the 1959 and 2015 clusters are in the low similarity class is the absence of alligator juniper recorded at the cluster that year.

Cluster 5 (C5) – Steer pasture, TES map unit 573

Available data for Cluster 5 in the Steer pasture includes Parker 3 Step data from 1959, 1973, and 2015, Daubenmire cover class data from 2006, and dry-weight rank data from 2020 and 2021. The 2021 dry-weight rank data show the site is currently dominated by sideoats grama and hairy grama with an alligator juniper overstory. The 2020 dry-weight rank data, the 2006 Daubenmire data, and the 1959, 1973 and 2015 Parker data show hairy grama, blue grama, and sideoats grama as the main components of the cluster. Blue grama, which was the dominant species in 2020, is absent from the 2021 dry-weight rank data. Alligator juniper is absent from the 1959, 1973, and 2015 Parker data and only comprises 3% of the Daubenmire cover class data from 2006. Both alligator juniper and pinyon pine increased slightly from 2020 to 201. Species diversity decreased from 2006 to 2015,then increased from 2015 to 2021.

Table 131. Cluster 5 – Steer summary, botanical composition (%), Parker 3 step protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol			Daubenmire cover class 2006	Dry-weight rank protocol	
		1959	1973	2015		2020	2021
G	hairy grama	42	46	26	37	12	17
G	sideoats grama	20	10	31	18	17	17
G	blue grama	38	41	32	0	20	0
G	common wolfstail	1	2	3	0	0	2
G	mat muhly	1	1	0	0	0	0
G	needle and thread	0	1	0	0	0	0
T	alligator juniper	0	0	0	3	33	41
F	hog potato	0	0	0	22	0	0
F	wild bean	0	0	0	8	0	0
F	annual forb	0	0	0	4	0	0
G	unknown grass	0	0	0	3	0	0
F	Cooley's bundleflower	0	0	0	0	2	7
G	pinyon ricegrass	0	0	0	0	10	4
T	pinyon pine	0	0	0	0	4	7
G	plains lovegrass	0	0	0	0	1	0
G	muhly	0	0	0	3	0	0
G	spike muhly	0	0	2	0	0	0
G	false grama	0	0	8	0	0	0
F	perennial forb	0	0	0	0	0	5

Table 132 shows the calculated similarity to the potential natural community described for the TES map unit. The differences in botanical composition resulted in fluctuations in the calculated similarity, however, all similarity indices calculated for this cluster fall within the mid similarity class. The similarity to PNC decreased from 1959 to 1973, then steadily increased from 1973 to 2020, before decreasing again in 2021. The decrease in similarity to PNC from 2020 to 2021 appears to be due to the decrease in blue grama cover.

Table 132. Cluster 5 -Steer plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	40
1973 Parker protocol	35
2006 Daubenmire cover class protocol	36
2015 Parker protocol	41
2020 Dry-weight rank protocol	61
2021 Dry-weight rank protocol	57

The 2021 and 2020 points data show a strong decrease in the amount of bare soil compared to previous readings with a corresponding increase in litter cover. Vegetative and litter cover show an increase from 2020 to 2021. Fluctuations in ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring conducted in 2021 show annual forbs present in 91% of plots which may be contributing to litter cover. When comparing the current condition to the reference condition from the TES inventory, we see lower bare soil, rock and vegetation, and higher litter cover than would be expected at the site.

Table 133. Cluster 5 -Steer summary, ground cover (%)

	Parker protocol			2006 Daubenmire cover class protocol	2020 Points protocol	2021 Points protocol	Reference condition from TES
	1953	1958	2015				
Vegetation	18	14	7	6	3	9	**15**
Rock	26	56	48	62	38	20	**50**
Litter	4	2	8	9	55	66	**5**
Bare soil	53	29	38	23	4	5	**30**

C5- Steer pasture trend summary

The plant community at C5 – Steer pasture is currently dominated by sideoats grama and hairy grama with an alligator juniper overstory. Hairy grama and sideoats grama were documented as a main component of the cluster all years. Blue grama was also a main component of the cluster for all years except 2021, and 2006 when it was absent. The overstory is currently composed primarily of alligator juniper with a small component of pinyon pine; both have increased from 2020 to 2021. The 2006 Daubenmire data shows alligator juniper comprising just 3% of the transect. Alligator juniper was absent from the 1959, 1973, and 2015 Parker transects. Pinyon pine is documented in the 2020 dry-weight rank data for the first time. Species diversity decreased from 2006 to 2015 before increasing again from 2015 to 2021.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data show abundant forage grasses with no undesirable species present. Tree and shrub species are increasing in cover while grass species have decreased, however, this corresponds with an increase in similarity to PNC which indicates the site is moving towards potential. Although similarity to PNC decreased slightly from 2020 to 2021, a preponderance of evidence suggests an overall upward trend. Site protection attributes show low bare soil, and high litter cover which are contributing to a stable site. A preponderance of evidence for site protection attributes shows an upward trend due to low bare soil, high litter cover, and increased vegetative cover.

Ecological Status: The 2021 dry-weight rank data shows similarity to PNC has decreased slightly from 2020 but shows an overall upward trend. However, all calculated similarity indices fall in the mid similarity class. The decrease in similarity to PNC from 2020 to 2021 appears to be due to the decrease in blue grama cover.

Pace 10 (P10) – South East Eagle pasture, TES map unit 573

Available data for Pace 10 in the South East Eagle pasture includes Parker 3 Step pace data from 1958 and dry-weight rank data from 2020. The 2020 dry-weight rank data show the site is currently dominated by mat muhly with a ponderosa pine and alligator juniper overstory. The 1958 Parker data differ, showing the pace transect comprised primarily of smooth brome and ceanothus with a mat muhly and sedge subcomponent. The 1958 Parker pace data does not document any overstory species which may be due to differences in protocols, with the dry weight rank protocol sampling the broader area. It could also indicate woody recruitment into the site. Smooth brome, an introduced grass species, is absent from the 2020 data. Species diversity remained fairly static between 1958 and 2020. With the exception of mat muhly, there is no overlap in species presence from 1958 to 2020.

Table 134. Pace 10 – South East Eagle summary, botanical composition (%), Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker protocol 1958	Dry-weight rank protocol 2020
G	mat muhly	17	20
G	sedge	13	0
S	ceanothus spp	28	0
G	threeawn	1	0
T	oak	1	0
G	smooth brome	20	0
G	brome	4	0
F	yarrow	7	0
S	Fendler's ceanothus	0	10
T	alligator juniper	0	16
T	ponderosa pine	0	30
T	Arizona white oak	0	9
T	silverleaf oak	0	1
G	pinyon ricegrass	0	12

Table 135 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition between protocols discussed above did not result in differences in the calculated similarity to PNC. All similarity indices calculated for this cluster fall within the low similarity class. The similarity to PNC increased from 1958 to 2020 due to presence of alligator juniper. The TES map unit does not appear to reflect the current conditions at the site. Ponderosa pine, the most dominant species, is not a component of the PNC description.

Table 135. Pace 10- South East Eagle, plant community similarity to PNC as described in TES

	Similarity Index
1958 Parker protocol	2
2020 Dry Weight Rank Protocol	17

The 2020 points data show a strong decrease in the amount of bare soil and increase in litter cover compared to previous years. Vegetative cover and rock cover have remained fairly static. When comparing the current condition to the reference condition from the TES inventory, we see lower bare soil, vegetation, and rock, and much higher litter than would be expected at the site.

Table 136. Pace 10 – South East Eagle summary, ground cover (%)

	Parker protocol 1958	2020 Points protocol	Reference condition from TES
Vegetation	1	2	**15**
Rock	8	9	**50**
Litter	53	87	**5**
Bare soil	38	2	**30**

P10- South East Eagle pasture trend summary

The plant community at Pace 10 – South East Eagle pasture is currently dominated by mat muhly with a ponderosa pine and alligator juniper overstory. The 1958 Parker pace data differs, showing no overstory species and the transect composed of smooth brome, ceanothus, mat muhly, and sedge. With the exception of mat muhly, there is no overlap in species presence from 1958 to 2020. It's unclear what caused the shift in botanical composition. It is possible that differences in protocols could account for some species differences, or the transects may not have been read in the same general location.

Apparent Trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data shows the understory composed of native grass and shrub species. Tree and shrub species are increasing in cover while grass species have decreased, however, this corresponds with an increase in similarity to PNC. A preponderance of evidence suggests an overall upward trend for the site. Site protection attributes show an upward trend with less bare soil and more litter, rock and vegetation cover than 1958.

Ecological Status: The 2020 dry-weight rank data shows similarity to PNC has increased since 1958, however, both years show the cluster in the low similarity class. This is primarily due to a lack of grass diversity at the site. The TES map unit does not appear to reflect the current conditions at the site. The TES botanical composition description indicates the site should be dominated by alligator juniper, hairy grama, and sideoats grama. Instead, the 2020 data show the site dominated by ponderosa pine and mat muhly, suggesting the community type is ponderosa pine forest with shade tolerant understory species, rather than a juniper and grama community more indicative of a savannah or open woodland type ecosystem.

Utilization monitoring data

On the East Eagle allotment, the annual operating instructions for the past two years (2020-2021) have identified allowable use standards ranging 0 to 30 percent in the McBride, North East Eagle, and Dry Prong pastures, and 31 to 40 percent in the South East Eagle pasture. Prior to 2020 allowable use standards were 35 to 45 percent allotment wide. Utilization monitoring for the East Eagle allotment is limited. Table 137 displays a summary of the utilization monitoring conducted on the East Eagle allotment since 2003. The 'percentage of permitted use' line is included in the table to display the yearly stocking level as a percentage of that identified on the term grazing permit. Utilization monitoring normally occurs within two weeks before or after pasture move dates, and after the

summer growing season. Allowable use standards were exceeded for the Maylay, Steer and Dry Prong pastures in 2020, the Maylay pasture in 2019, and the Maylay and Dry Prong pastures in 2008.

Table 137. Utilization monitoring

Pasture	2020	2019	2015	2011	2009	2008	2007	2006	2005	2004	2003
Percentage of permitted use, allotment-wide	**81%**	**77%**	**98%**	**96%**	**70%**	**73%**	**5%**	**28%**	**56%**	**72%**	**48%**
South East Eagle	12%*		5%							23%	
Maylay	59%*	45%				60+	29%*	19%	24%*		19%*
Steer	45%*				18%*			33%*	25%	34%*	19%*
Dry Prong	70%			40%		60+	30%	24%	24%		30%*
North East Eagle			5%						23%*	33%*	35%*
East									23%*	23%	
McBride								13%*	10%	29%	
War Finance									35%		
Shorty					42%						

* averaged from 2 or more utilization estimates

Structural improvements

Structural improvements include fences, stock tanks, wells, spring developments, troughs, and corrals. The responsibility for the maintenance of these improvements is assigned to the grazing permittee in the term grazing permit. Most of these improvements on the East Eagle allotment are in functional condition although some may need maintenance or reconstruction in the next few years. The annual operating instructions identify which improvements need replacement or reconstruction each year. Table 138 shows named range improvements in the allotment.

Table 138. Range Improvement Points

Range Improvement Name	Improvement Type
Honeymoon Cutting Pen	Corral
Chitty Trap Corral	Corral
Corner Corral	Corral
Squirrel Trap Corral	Corral
Yellow Jack Tank Corral	Corral
Walnut Canyon Trap Corral	Corral
Saunders Trap Corral	Corral
McBride Trap Corral	Corral
Warren Trap Corral	Corral
Bull Basin Trap Corral	Corral
Wagon Wheel Trap Corral	Corral
Steer Pasture Corral	Corral
Salthouse Trap Corral	Corral
Dogwood Trap Corral	Corral
Coyote Tank	Intermittent Stock Tank
Warren Tank	Intermittent Stock Tank
Turkey Trap Tank	Intermittent Stock Tank
Hidden Tank	Intermittent Stock Tank
Cottonwood Tank	Intermittent Stock Tank
Caborne Tank	Intermittent Stock Tank
Squirrel Canyon Tank	Intermittent Stock Tank
East Eagle Tank	Intermittent Stock Tank

Circle Canyon Stock Tank	Intermittent Stock Tank
Robinson Mesa Tank	Intermittent Stock Tank
Corner Stock Tank	Intermittent Stock Tank
Peters Tank	Intermittent Stock Tank
Walnut Tank	Intermittent Stock Tank
Cowhead Tank	Perennial Stock Tank
Eagle Tank	Perennial Stock Tank
Long Canyon Tank	Perennial Stock Tank
Red Tail Tank	Perennial Stock Tank
Steer Pasture Tank	Perennial Stock Tank
Upper Malay Tank	Perennial Stock Tank
Malay Tank	Perennial Stock Tank
Peters Spring	Spring Well Development
AL Spring Dev	Spring Well Development
McBride Spring	Spring Well Development
McBride Springbox Dev	Spring Well Development
Squirrel Springs Dev	Spring Well Development
Peters Trick Tank	Trick Tank
AL Spring Trough	Trough
Peters Trick Tank Trough	Trough
Warren Pipeline Trough	Trough
Warren Pipeline Trough	Trough

Existing condition summary

Long term trend data is available for the South East Eagle, Maylay, and Steer pastures. Overall, the clusters in the East Eagle allotment show satisfactory conditions with five of the six clusters showing upward trends. Cluster 3 is showing a static trend. It is likely Cluster 3 has crossed a threshold and will not convert back to PNC with grazing management alone. All clusters fall in the low or mid similarity class to potential natural community. The primary driver for those that fall in the low similarity category is a lack of tree and shrub cover. However, most clusters show an increase in tree cover compared to previous readings. This could be a result of differences in protocols, with the dry-weight rank method sampling a broader area, or this could be a result of woody encroachment into the cluster sites. Although the increase in tree cover is moving most sites toward their potential natural community, the increase in tree cover and corresponding decrease in grass cover may not be desirable from a range management standpoint.

Table 139. East Eagle cluster vegetative trends

Cluster	Vegetative Trend
C1 – South East Eagle	upward
C2 – Maylay	upward
C3 – Maylay	static
C4 – Maylay	upward
C5 – Steer	upward
P10 – South East Eagle	upward

Overall, the 2020 site protection data are outliers showing significant decreases in bare soil and increases in litter which are contributing to upward trends at four of the six sites. Cluster 4 has a static trend due to similarities in ground cover to previous years data. Cluster 3 is showing a downward trend due to a decrease in vegetative cover.

Table 140. East Eagle site protection trends

Cluster	Site Protection Trend
C1 – South East Eagle	upward
C2 – Maylay	upward
C3 – Maylay	downward
C4 – Maylay	static or upward
C5 – Steer	upward
P10 – South East Eagle	upward

Recent utilization data suggests allowable use standards have been exceeded in the Maylay, Steer, and Dry Prong pastures in 2020, and the Maylay pasture in 2019. Only two of the six utilization measurements have been within the allowable use. It is unknown if this is due to overstocking or if utilization was only documented when a problem was detected. However, the allotment has been stocked at levels lower than permitted levels prior to 2003. Actual use from 2003 through 2021 averaged 3,724 AUMs (310 head) or 74 percent of permitted.

Structural range improvements are being maintained, replaced or reconstructed as needed (as identified in the annual operating instructions).

Mesa

The Mesa allotment is located approximately18 miles north of Clifton, Arizona on the Clifton Ranger District, Apache-Sitgreaves National Forest. The allotment is bisected by the Coronado Trail Scenic Byway (Highway 191) which runs north to south. The area immediately surrounding the highway is characterized by a high mesa with gently sloping terrain. The high mesa gives way to steep slopes and canyons in the western portion of the allotment with the Sheep Wash drainage running north to south and eventually draining into Eagle Creek. Turkey Creek lies east of Highway 191 running north to south and eventually draining into the Blue River. North Corral Creek drainage lies along the southern edge of the allotment. Elevations range from 6,400 feet along Highway 191, to 5,200 feet where Sheep Wash creek exits the allotment. The Mesa allotment is comprised of six main pastures. Vegetation is predominantly open grassland surrounding Highway 191 and transitioning to oak-pinyon-juniper woodland in the eastern and western portions of the allotment. Figure 23 displays a general overview of the allotment. Comprised of approximately 8,980 acres of National Forest System land, the Mesa allotment is located in Greenlee County, Arizona.

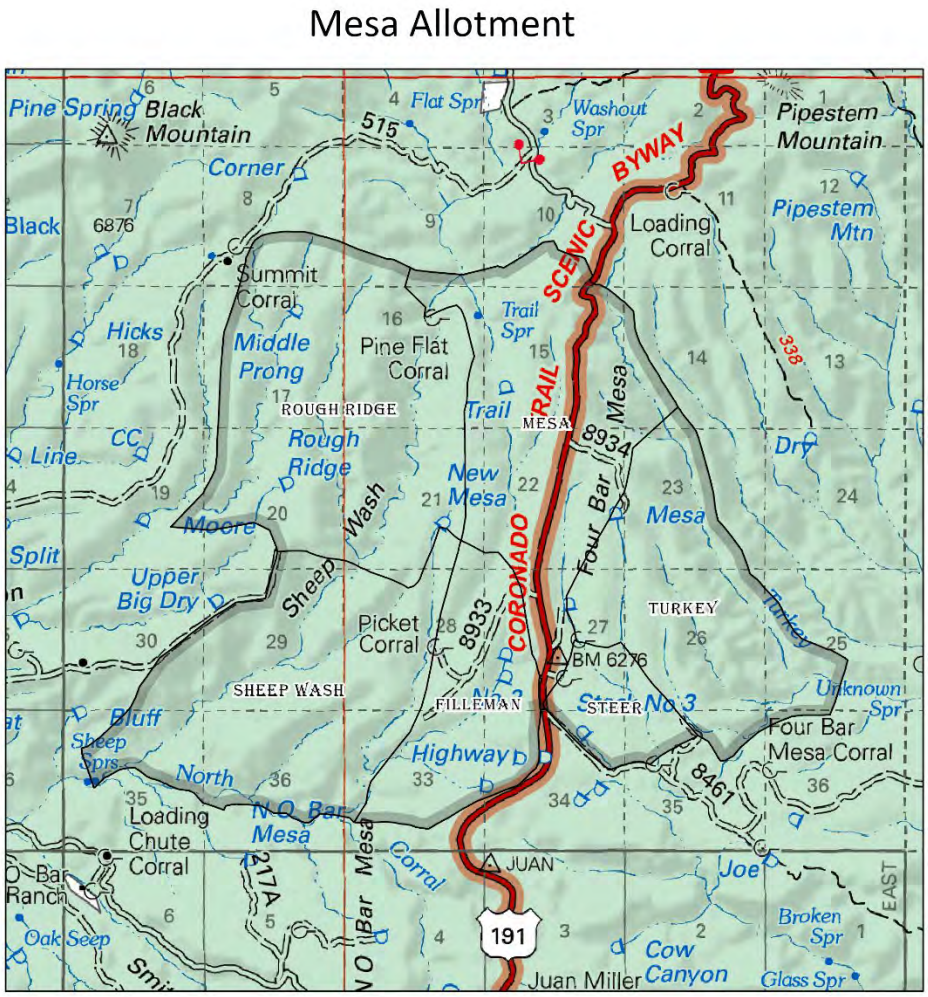

Figure 23. Mesa Allotment

Historical Use

The Mesa allotment was first fenced in 1946 and a term permit was issued for 166 cattle yearlong. Prior to the allotment being fenced, records indicate a permit was issued in 1910 for 272 cattle yearlong although we are unable to determine what the boundary of the allotment may have been. The permit remained at 166 head yearlong from 1946 to present with only slight variations in ratios of cows, horses, and bulls. The current permit is for 162 cow/calf pair and 4 horses yearlong for a total of 2,002 animal unit months.

Vegetation cover types and slope classes

Table 141. Slope class, acres

Pasture	0 - 10%	11 - 30%	31 - 40%	41 - 60%	61%+	Total
Filleman	444	382	47	39	25	**937**
Mesa	849	743	102	86	53	**1,833**
Rough Ridge	654	1,136	226	200	123	**2,339**
Sheep Wash	508	964	211	193	132	**2,008**
Steer	241	145	8	3	0	**397**
Turkey	402	623	149	169	141	**1,484**

Pasture	0 - 10%	11 - 30%	31 - 40%	41 - 60%	61%+	Total
Total	**3,098**	**3,993**	**743**	**690**	**474**	**8,998**

Cover types on the Mesa allotment include grass-forb, grama, pine-juniper, juniper, oak-juniper-pinyon, ponderosa pine-evergreen, and deciduous tree mix as displayed in Table 142. The predominant vegetation type is oak-juniper-pinyon comprising 51% of allotment followed by pine-juniper mix comprising 26% of the allotment.

Table 142. Cover type, acres

Pasture	Grass-Forb	Grama	Pine-Juniper	Juniper	Oak-Juniper-Pinyon	Ponderosa Pine Evergreen	Deciduous Tree mix	Total by pasture
Filleman	9	207	387	63	273			**939**
Mesa	1	359	446	297	714	17		**1,834**
Rough Ridge		31	821	78	1,394	16		**2,340**
Sheep Wash		267	521	35	1,172		13	**2,008**
Steer		255	40	16	66			**377**
Turkey		302	108	79	930	21	45	**1,485**
Total by cover type	**10**	**1,421**	**2,323**	**568**	**4,549**	**54**	**58**	

Grazing management

The existing term grazing permit for the Mesa allotment is for 162 cow/calf pair and 4 horses yearlong for a total of 2,002 animal unit months. The allotment is divided into six main pastures: Filleman, Mesa, Rough Ridge, Sheep Wash, Steer, and Turkey. Turkey, Mesa, Rough Ridge, Filleman, and Sheep Wash pastures have been used yearly though changes in entry dates allow for growing season rest periodically. The allotment was destocked after November 2020 due to drought conditions and remained destocked for the entire 2021 grazing year.

The allowable use standard for all pastures is 30 to 40 percent.

Actual use summary

Actual use from 2003 through 2021 averaged 582 AUMs (49 head) or 29 percent of permitted. Recent years (2015 -2020) averaged higher actual use with 1,405 AUMs or 70 percent of permitted.

Cluster data

Cluster 2 (C2) – Mesa pasture, TES map unit 573

Available data for Cluster 2 in the Mesa pasture includes Parker 3 Step data from 1958, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the site is currently dominated by sideoats grama with a hairy grama subcomponent. Data from the 1958 Parker protocol differs, showing blue grama as the dominant species while sideoats grama and hairy grama make up only a small component of the cluster. Despite the differences in relative cover, blue grama, hairy grama and sideoats grama have been consistent components of the site since 1958. Threeawn and Wright eriogonum appear for the first time in the 2021 data. Species diversity appears to have remained fairly static with low diversity at the site both years.

Table 143. Cluster 2 – Mesa summary, botanical composition (%), Parker 3 step protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step protocol 1958	Dry-weight rank protocol 2021
G	blue grama	93	3
G	hairy grama	3	36
G	sideoats grama	4	52
T	juniper	1	0
G	threeawn	0	6
S	Wright eriogonum	0	3

Table 144 shows the calculated similarity to the potential natural community described for the TES map unit. The 2021 data fall in the mid similarity category while the 1958 Parker data fall in the low similarity class. The shift from low to mid similarity appears to be driven by the increase in hairy grama and sideoats grama cover.

Table 144. Cluster 2 – Mesa, plant community similarity to PNC as described in TES

	Similarity Index
1958 Parker 3 Step protocol	17
2021 Dry-weight rank protocol	52

The 2021 points data show a strong decrease in the amount of bare soil compared to the 1958 condition. The 2021 data also show vegetative cover has decreased while rock and litter have increased. Fluctuations in ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2021 shows annual forb species present in 98% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative cover and bare soil while rock is lower, and litter is higher than expected for this site.

Table 145. Cluster 2 – Mesa pasture summary, ground cover (%)

	1958 Parker 3 Step protocol	2021 Points protocol	Reference condition from TES
Vegetation	15	5	**5**
Rock	23	35	**50**
Litter	21	34	**10**
Bare soil	42	27	**35**

C2- Mesa pasture trend summary

The plant community at C2 – Mesa pasture is currently dominated by sideoats grama with a strong hairy grama subcomponent. Comparative botanical composition data from the 1958 Parker reading differs with blue grama shown as the dominant species. Blue grama, hairy grama, and sideoats grama have been consistent components of the cluster since 1958. Species diversity at the site remains low with 5 species recorded in 1958 and 6 recorded in 2021.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses with few undesirable species. A preponderance of evidence suggests that the overall vegetative trend is upward due to the increase in similarity to PNC. Site protection attributes show lower bare soil, and higher litter cover than the reference condition. However, the decrease in vegetative cover and increase in litter cover appears to be partially due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. Annual species appear to also be contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes show a downward trend due to the decrease in vegetative cover and declines in bare soil due, in large part, to annual species abundance.

Ecological status: The 2021 dry-weight rank data show similarity to PNC has increased from the 1958 Parker reading, though both were in the low similarity category. The increase in similarity to PNC is driven by an increase in sideoats grama and hairy grama which are co-dominant grass species in the PNC description.

Cluster 4 (C4) – Mesa pasture, TES map unit 630

Available data for Cluster 4 in the Mesa pasture includes Parker 3 Step data from 1958, Daubenmire cover class data from 2006, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the site is dominated by plains lovegrass with a hairy grama, sideoats grama and threeawn subcomponent. The 2006 Daubenmire cover class data and the 1958 Parker data differ, showing hairy grama and blue grama respectively as the dominant species. Blue grama, hairy grama, and sideoats grama have been consistent components of the site, occurring every year. Alligator juniper and little bluestem appear for the first time in the 2021 data. Species diversity increased from 1958 to 2006 then remained fairly static from 2006 to 2021.

Table 146. Cluster 4 – Mesa summary, botanical composition (%), Parker 3 step protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	1958 Parker 3 Step protocol	2006 Daubenmire cover class protocol	2021 Dry-weight rank protocol
G	blue grama	61	21	8
G	hairy grama	23	27	20
G	sideoats grama	11	14	13
G	sprucetop grama	5	0	0
G	threeawn	0	6	13
G	common wolfstail	0	16	2
G	vine mesquite	0	4	0
G	plains lovegrass	0	9	30
S	Wright eriogonum	0	1	0
F	hog potato	0	1	0
T	alligator juniper	0	0	7
G	little bluestem	0	0	8

Table 147 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above did not result in differences in the calculated similarity to the potential natural community described for the TES

map unit. All calculated similarities fall in the low similarity class with the 1958 Parker data having the lowest similarity and the 2006 Daubenmire data having the highest similarity.

Table 147. Cluster 4 -Mesa, plant community similarity to PNC as described in TES

	Similarity Index
1958 Parker protocol	15
2006 Daubenmire cover class protocol	25
2021 Dry-weight rank protocol	23

The 2021 points data show a slight decrease in the amount of bare soil, rock and vegetation compared to the 2006 Daubenmire data. Litter cover is higher than previous years. Fluctuations in ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2021 shows annual forb species present in 96% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative cover while rock and bare soil are lower, and litter is higher than expected for this site. Although vegetative cover decreased from 2006 to 2021, it is still higher than the reference site.

Table 148. Cluster 4 – Mesa pasture summary, ground cover (%)

	1958 Parker 3 step protocol	2006 Daubenmire cover class protocol	2021 Points protocol	Reference condition from TES
Vegetation	10	14	8	**5**
Rock	35	40	35	**50**
Litter	12	24	41	**10**
Bare soil	44	22	16	**35**

C4- Mesa pasture trend summary

The plant community at C4 – Mesa is currently dominated by plains lovegrass with a hairy grama, sideoats grama and threeawn subcomponent. Comparative botanical composition data from the Parker protocol and Daubenmire cover class protocol show blue grama, hairy grama, and sideoats grama have been consistent components of the site since 1958. Plains lovegrass first appeared in the 2006 Daubenmire data and has increased in abundance while blue grama has decreased. Because plains lovegrass decreases with grazing pressure, pasture rest or changes to season of use may have contributed to the increase from 2006 to 2021. Overall diversity at the site has increased from 1958 to 2021.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses with few undesirable species. A preponderance of evidence suggests that the overall trend is static or slightly upward due to similarities in PNC and species diversity from 2006 to 2021. The increase in plains lovegrass may suggest the site has benefitted from rest or a change in season of use. The 2021 dry-weight rank data shows a slight decline in the amount of bare soil and vegetative cover with a corresponding increase in litter cover. The decrease in vegetative cover and increase in litter could be due to vegetative die off due to the drought conditions in 2020. When compared to the TES reference condition there is still higher vegetative cover and lower bare soil than would be expected at the site. Annual forbs appear to also be

influencing the increase in litter and decrease in bare soil. A preponderance of evidence suggests the overall site protection trend is static.

Ecological status: The similarity to PNC increased from 1958 to 2006 then remained stable from 2006 to 2021. All calculated similarity indices fall in the low similarity category. This is primarily due to the overall low plant diversity and lack of shrub cover at the site.

Pace 2 (P2) – Rough Ridge pasture, TES map unit 630

Available data for Pace transect 2 in the Rough Ridge pasture includes Parker 3 Step pace data from 1958, and dry-weight rank data from 2021. The 2021 dry-weight rank data shows the site is currently dominated by sideoats grama with a little bluestem subcomponent. The 1958 Parker data differ, showing hairy grama as the main component with a blue grama and sideoats grama subcomponent. Little bluestem was present in 1958, but only comprised 1% of the cluster. Alligator juniper and pinyon pine appear as overstory species in the 2021 dry-weight rank data, which could be due to differences in protocols or could indicate encroachment into the site. Species diversity increased slightly from 1958 to 2021.

Table 149. Pace 2 – Rough Ridge summary, botanical composition (%), Parker 3 step protocol, and dry-weight rank protocol

Growth form	Common name	1958 Parker 3 Step protocol	Dry-weight rank protocol 2021
G	little bluestem	1	22
G	sideoats grama	21	33
G	blue grama	33	2
G	hairy grama	38	2
G	curly mesquite	0	7
T	alligator juniper	0	21
S	beargrass	1	1
T	oak	0	1
T	pinyon pine	0	10
G	common wolfstail	5	0
S	broom snakeweed	1	0

Table 150 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition between protocols discussed above resulted in differences in the calculated similarity to the potential natural community described for the TES map unit. However, both similarity indices calculated for this cluster fall within the mid similarity class. Similarity to PNC decreased from 1958 to 2021 which was primarily driven by the decrease in blue grama and hairy grama.

Table 150. Pace 2 -Rough Ridge, plant community similarity to PNC as described in TES

	Similarity Index
1958 Parker protocol	56
2021 Dry-weight rank protocol	35

The 2021 points data show a strong decrease in the amount of bare soil and vegetation with a corresponding increase in litter and rock cover compared to the 1958 Parker data. Fluctuations in

ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2021 shows annual grass and forb species present in 90% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative and rock cover while litter is higher and bare soil is lower than expected for the site.

Table 151. Pace 2 -Rough Ridge summary, ground cover (%)

	1958 Parker protocol	2021 Points protocol	Reference condition from TES
Vegetation	22	7	**5**
Rock	27	45	**50**
Litter	18	40	**10**
Bare soil	33	8	**35**

P2- Rough Ridge pasture trend summary

The plant community at P2 – Rough Ridge pasture is currently dominated by sideoats grama with a little bluestem subcomponent. Comparative botanical composition data from the Parker 3 step pace transect in 1958 differ, showing hairy grama dominating the site with a strong blue grama and sideoats grama subcomponent. Overstory species, including alligator juniper and pinyon pine, appear for the first time in 2021. This could be due to differences in protocols, with the dry-weight rank method sampling a broader area, or it could indicate woody encroachment into the site. Species diversity increased slightly from 1958 to 2021.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses with few undesirable species. At some point, species composition shifted from predominantly grama grasses, to a mixture of grama grass and little bluestem. The reason for this shift in species composition is unknown. A preponderance of evidence suggests that the overall trend is downward due to the decrease in similarity to PNC.
Site protection attributes show low bare soil, and high litter and rock cover which are contributing to a stable site. However, the decrease in vegetative cover and increase in litter cover appears to be partially due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. When compared to the TES reference condition there is still higher vegetative cover and lower bare soil than would be expected at the site. Annual forbs appear to also be influencing the increase in litter and decrease in bare soil. A preponderance of evidence suggests the overall site protection trend is static.

Ecological status: The similarity to PNC shows a decline in similarity from 1958 to 2021 which is primarily driven be the decrease in hairy grama and sideoats grama. However, both similarity indices fall in the mid similarity class.

Utilization monitoring data

On the Mesa allotment the annual operating instructions for the past several years (2019-2020) have identified allowable use standards ranging of 30 to 40 percent, allotment wide. Prior to 2019, allowable use standards were 35 to 45 percent allotment wide. Table 152 displays a summary of the utilization monitoring conducted on the Mesa allotment since 2015. The ‘percentage of permitted use’ line is included in the table to display the yearly stocking level as a percentage of that identified on the

term grazing permit. Utilization monitoring normally occurs within two weeks before or after pasture move dates, and after the summer growing season. All of the observations were at or below the allowable use standard with the exception of Rough Ridge and Sheep Wash pasture in 2019.

Table 152. Utilization monitoring

Pasture	2020	2019	2018	2017	2015
Percentage of permitted use, allotment-wide	**32%**	**97%**	**94%**	**92%**	**28%**
Mesa	28%*			11*	5%
Rough Ridge		60+		0%	
Sheep Wash		60+			
Steer			35%		
Filleman				0-5%	5%

*averaged from 2 or more utilization readings

Structural improvements

Structural improvements include fences, stock tanks, gates, and corrals. The responsibility for the maintenance of these improvements is assigned to the grazing permittee in the term grazing permit. Most of these improvements on the Mesa allotment are in functional condition although some may need maintenance or reconstruction in the next few years. The annual operating instructions identify which improvements need replacement or reconstruction each year. Table 153 shows named range improvements in the allotment.

Table 153. Range Improvement Points

Range Improvement Name	Improvement Type
Corral Load Chute	Corral
Double Tank	Intermittent Stock Tank
Filleman Tank	Intermittent Stock Tank
Four Bar Tank	Intermittent Stock Tank
Gate	Gate
Highway Tank	Intermittent Stock Tank
Mesa Tank	Intermittent Stock Tank
Middle Prong Tank	Intermittent Stock Tank
New Mesa Tank	Intermittent Stock Tank
No 2 Tank	Intermittent Stock Tank
Pickett Corral	Corral
Pine Flat Corral	Corral
Rough Ride Tank	Intermittent Stock Tank
Stock Tank No 3	Intermittent Stock Tank
Trail Tank	Intermittent Stock Tank

Existing condition summary

Long term trend data is available for the Mesa, and Rough Ridge pastures. Overall, the clusters in the Mesa allotment show satisfactory conditions with two of the three clusters showing static or upward trends. The cluster in the Rough Ridge pasture is showing a downward trend due to a shift in species composition that moved the site further from the potential natural community. All clusters fall in the low or mid similarity class to potential natural community. The primary driver for those that fall in the low similarity category is a lack of overall species diversity or low shrub cover. Vegetation appears to show some die off due to lingering effects of the 2020 drought. Future monitoring will be needed to determine if vegetation shows long term negative effects from the drought.

Table 154. Mesa cluster vegetative trends

Cluster	Vegetative Trend
C2 – Mesa	upward
C4 – Mesa	static or upward
P2 – Rough Ridge	downward

Overall, the 2021 site protection data show decreases in vegetative cover and bare soil. The 2020 drought (with less than 75% of average annual precipitation) likely contributed to the decrease in vegetative cover and increase in litter cover at the cluster sites. An abundance of annual species also appears to be driving the increase in litter and decrease in bare soil.

Table 155. Mesa cluster site protection trends

Cluster	Site Protection Trend
C2 – Mesa	downward
C4 – Mesa	static
P2 – Rough Ridge	static

There is limited data available recording utilization levels however, all available information shows utilization has been at or below the allowable use standards with the exception of the Rough Ridge pasture and the Sheep Wash pasture in the 2019 grazing year. However, the allotment has been stocked at levels lower than permitted levels prior to 2012. Actual use from 2012 through 2021 averaged 1,051 AUMs (88 head) or 52 percent of permitted.

Structural range improvements are being maintained, replaced or reconstructed as needed (as identified in the annual operating instructions).

Mud Springs

The Mud Springs allotment is located approximately 24 miles north of Clifton, Arizona on the Clifton Ranger District, Apache-Sitgreaves National Forest. The allotment lies east of Eagle Creek and is bordered by the San Carlos Reservation to the west, Bear Canyon to the southeast, and Rose Peak to the east. Elevations range from 8,400 feet near Rose Peak to 5,000 feet where Eagle Creek exits the allotment in the southwest. Topography varies with rolling mesas in the southwest to broad ridges and narrow canyons in the north and east. Main drainages include Mud Springs Canyon, Bear Canyon, Robinson Canyon, and West Fork Canyon. Eagle Creek flows primarily through private land with portions flowing through various small pastures and traps along the western edge of the allotment. The Mud Springs allotment is comprised of four large pastures and numerous smaller pastures, corrals, and traps. Vegetation is predominantly oak-juniper-pinyon woodland transitioning to pine-juniper at higher elevations. Figure 24 displays a general overview of the allotment. Comprised of approximately 24,685 acres of National Forest System land, the Mud Springs allotment is located in Greenlee County, Arizona.

Mud Springs Allotment

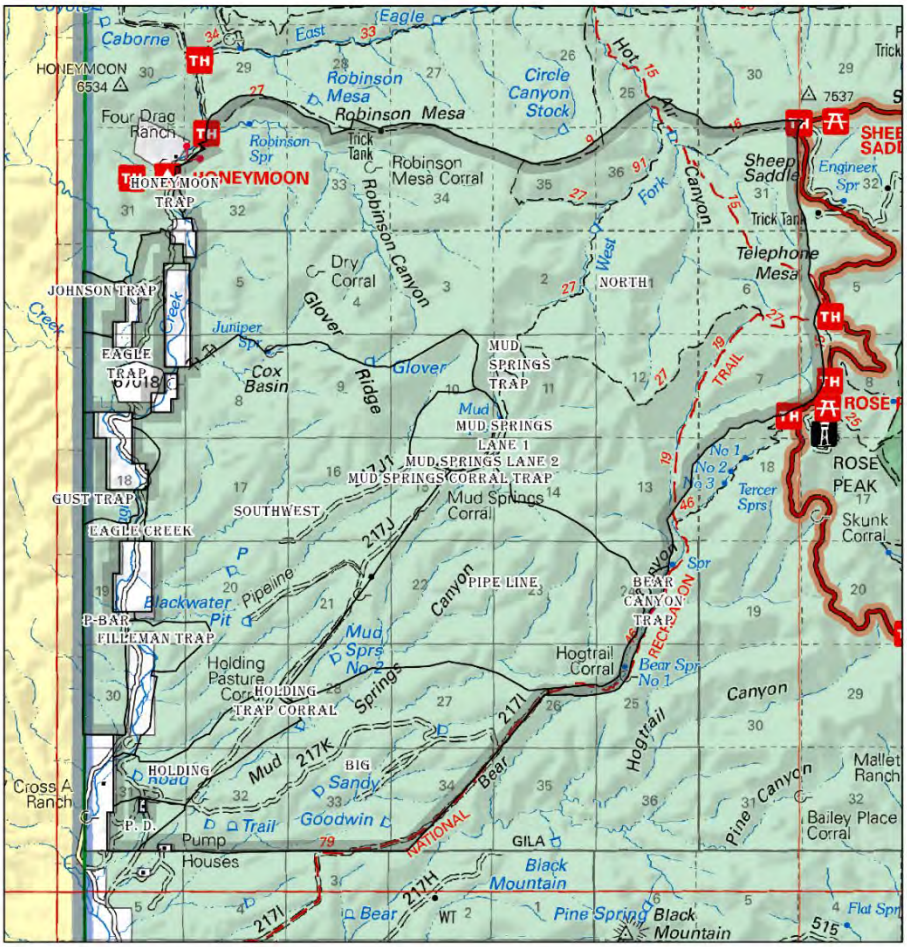

Figure 24. Mud Springs Allotment

Historical Use

The Mud Springs allotment was first established in 1909 when records indicate a permit was issued for 15 cattle. In 1913 numbers were increased to 140 cattle yearlong with a temporary permit for 10 additional head. The temporary permit numbers increased to 125 in 1916. From 1916 to 1922, permitted numbers steadily increased culminating in a permit for 573 cattle and 19 horses in 1922. Records indicate the permit transferred in 1923 and the number of head was reduced to 392 cattle yearlong and 79 cattle on a temporary permit. When the permit was transferred in 1928, the number of permitted head increased to 454 cattle and 7 horses yearlong, with an additional 193 cattle on a temporary permit. The ratio of term to temporary permitted cattle fluctuated from 1928 to 1934 when the preference was established at 354 cattle. In 1941, preference was increased to 386 then subsequently reduced to 312 in 1948. In 1950 preference was again established at 386 cattle yearlong. An allotment analysis was completed in 1962 which indicated the grazing capacity of the allotment to be 284 cattle yearlong. There are no available permit records between 1950 and 1979 so it is unknown if numbers were reduced to reflect the grazing capacity determination from the 1962 analysis. The next available record is a term permit from 1979 which shows 365 cattle yearlong. In 1994, a term permit was issued for 360 cow/calf pair yearlong and 5 horses yearlong which remains the permitted numbers today.

Vegetation cover types and slope classes

Table 156. Slope class, acres

Pasture	0 - 10%	11 - 30%	31 - 40%	41 - 60%	61%+	**Total**
Bear Canyon Trap	21	53	17	18	14	**123**
Big	965	1,207	205	183	119	**2,679**
Eagle Creek	7	20	6	6	6	**45**
Eagle Trap	171	297	49	36	12	**565**
Filleman Trap	160	137	17	15	9	**338**
Gust Trap	41	123	31	28	19	**242**
Holding	227	229	28	19	5	**508**
Holding Trap Corral	2	1	0	0	0	**3**
Honeymoon Trap	8	8	1	0	0	**17**
Johnson Trap	55	66	10	8	2	**141**
Mud Springs Corral Trap	2	4	1	0	0	**7**
Mud Springs Lane 1	7	14	2	2	1	**26**
Mud Springs Lane 2	6	4	0	0	0	**10**
Mud Springs Trap	108	182	23	14	3	**330**
North	3,070	5,459	1,043	902	577	**11,051**
P. D.	101	53	3	3	1	**161**
P-Bar	227	202	33	32	24	**518**
Pipe Line	864	1,372	249	219	149	**2,853**
Southwest	1,556	2,427	454	396	235	**5,068**
Total	**7,598**	**11,858**	**2,172**	**1,881**	**1,176**	**24,685**

Cover types on the Mud Springs allotment include grass-forb, grama, pine-juniper, juniper, oak-juniper-pinyon, ponderosa pine-evergreen, ponderosa pine mix, deciduous tree mix, Douglas fir, and Gambel oak as displayed in Table 157. The predominant vegetation type is oak-juniper-pinyon comprising 35% of allotment followed by pine-juniper comprising 24% of the allotment.

Table 157. Cover type, acres

Pasture	Grass- Forb	Grama	Pine-Juniper	Juniper	Oak-Juniper-Pinyon	Ponderosa Pine-Evergreen	Ponderosa Pine Mix	Deciduous Tree Mix	Douglas fir	Gambel oak	Total by pasture
Bear Canyon Trap			18		63	31	10				**122**
Big	39	1,068	491		1,024	55					**2,677**
Eagle Creek		2	8		34						**44**
Eagle Trap	5		430		97	9		23			**564**
Filleman Trap	6	17	187		101			28			**339**
Gust Trap			166		75						**241**
Holding	23	239	152		85	4		7			**510**
Holding Trap Corral		802	17								**819**
Honeymoon Trap			15					3			**18**
Johnson Trap		10	124		5			2			**141**
Mud Springs Corral					7						**7**
Mud Springs Lane 1			7		19						**26**
Mud Springs Lane 2					10						**10**
Mud Springs Trap			84		245						**329**
North		16	1,463	583	3,180	462	3,761	22	81	1,484	**11,052**
P. D.		44	79		9	31					**163**
P-Bar		186	189		124			19			**518**
Pipe Line		355	838	71	1,488	99	1				**2,852**
Southwest	9	659	1,809	40	2,325	208	15	2		1	**5,068**
Total by cover type	**82**	**3,398**	**6,077**	**694**	**8,891**	**899**	**3,787**	**106**	**81**	**1,485**	

Grazing management

The existing term grazing permit for the Mud Springs allotment is for 365 cow/calf pairs and 5 horses yearlong (a total of 4,392 animal unit months). The allotment is divided into four main pastures: North, Southwest, Pipe Line, and Big. The remaining pastures identified in Table 156 are smaller pastures used for holding or used intermittently. The rotation schedule is developed yearly during the annual operation instruction meeting. The main pastures including Holding, Pipe Line, Big, Southwest and North have been used at least once since 2018. The Southwest pasture was rested in 2021, the Pipeline pasture rested in 2020 and 2019, and the Holding pasture was rested in 2018. The smaller pastures and traps are used for holding or gathering. The large North pasture has not been used, with the exception of 2021, due to lack of water infrastructure and inaccessibility. The 2021 Bear Fire burned approximately 26% of the allotment, primarily within the North pasture.

The allowable use standard is currently 0 to 30 percent for the Southwest pasture, and 30 to 40 percent for all other pastures.

Actual use summary

Actual use from 2003 through 2021 averaged 2,412 AUMs (200 head) or 54 percent of permitted. Recent years (2017 -2021) averaged lower actual use with 1,378 AUMs or 31 percent of permitted.

Cluster data

Cluster 1 (C1) – Big pasture, TES map unit 573

Available data for Cluster 1 in the Big pasture includes Parker 3 Step data from 1984, Daubenmire cover class data from 2005, and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the site is currently dominated by curly mesquite with a hairy grama subcomponent. Similarly, the 2005 Daubenmire cover class data also show curly mesquite and hairy grama as dominant species. Data from the 1984 Daubenmire cluster differs, with blue grama strongly dominating the site. Species diversity appears to increase with the 2005 Daubenmire data and 2021 dry-weight rank data although this could be due to differences in sampling methods rather than actual increases in plant diversity. Sideoats grama, hairy grama, curly mesquite, and broom snakeweed have been consistently present, in various amounts, at the cluster.

Table 158. Cluster 1 – Big pasture summary, botanical composition (%), Parker 3 step protocol, TES Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol 1984	Daubenmire Cover Class 2005	Dry-weight rank protocol 2021
G	blue grama	75	4	0
G	sideoats grama	8	4	7
G	threeawn	6	0	2
G	squirreltail	2	0	0
F	false mesquite	4	0	0
G	hairy grama	3	22	16
S	Wright eriogonum	1	0	7
G	curly mesquite	1	24	54
S	broom snakeweed	2	2	2

Growth form	Common name	Parker 3 Step Protocol 1984	Daubenmire Cover Class 2005	Dry-weight rank protocol 2021
G	sixweeks threeawn	0	8	0
G	elk sedge	0	1	0
G	galleta	0	11	0
G	smooth barley	0	1	0
F	wooly plantain	0	6	3
F	hog potato	0	1	0
F	globemallow	0	3	5
F	annual forb	0	13	0
S	cholla	0	0	1
G	junegrass	0	0	2
T	alligator juniper	0	0	4

Table 159 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above resulted in the 1984 Parker data falling in the low similarity category. The 2005 Daubenmire data and the 2021 dry-weight rank data fall in the mid similarity category. The primary driver for the increase in similarity to PNC is due to the increase in hairy grama documented in the 2005 and 2021 data.

Table 159. Cluster 1 – Big pasture, plant community similarity to PNC as described in TES

	Similarity Index
1984 Parker protocol	31
2005 Daubenmire cover class protocol	41
2021 Dry-weight rank protocol	40

The 2021 points data show a decrease in bare soil compared to previous readings with a corresponding increase in litter cover. Vegetative cover decreased from the 1957 and 1984 Parker readings but remained similar to the 2005 Daubenmire data. Rock cover declined from 2005 to 2021 but is similar to the 1957 and 1984 Parker data. When looking at the data set as a whole, ground cover attributes fluctuate with no apparent trend. Fluctuations in ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2021 shows annual forbs present in 70% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative cover while bare soil and rock cover are lower than expected. Litter cover is much higher than expected for this site.

Table 160. Cluster 1 –Big pasture summary, ground cover (%)

	Parker protocol		2005 Daubenmire cover class protocol	2021 Points protocol	Reference condition from TES
	1957	1984			
Vegetation	21	23	13	12	**15**
Rock	20	29	41	24	**50**
Litter	23	9	9	58	**5**

	Parker protocol		2005 Daubenmire cover class protocol	2021 Points protocol	Reference condition from TES
	1957	1984			
Bare soil	37	40	37	7	**30**

C1- Big pasture trend summary

The plant community at C1 – Big pasture is currently dominated by curly mesquite with a hairy grama subcomponent. Comparative botanical composition data from the Parker protocol and Daubenmire cover class protocol show curly mesquite and grama grasses have dominated the site since 1984. At some point between 1984 and 2005, the site transitioned from being dominated by blue grama, to curly mesquite. Blue grama was not recorded in the 2021 data. Site diversity increased from 1984 to 2005, then decreased slightly from 2005 to 2021.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses with few undesirable species. A preponderance of evidence suggests the overall vegetative trend is static due to similarities in site diversity, and similarity to PNC. Site protection attributes show low bare soil, and high litter cover which are contributing to a stable site. However, the decrease in bare soil and increase in litter appears to be partially due to an abundance of annual forb cover. A preponderance of evidence for site protection attributes shows a static trend due to similarities in vegetative cover and the decrease in bare soil due to annul forb abundance

Ecological status: The 2021 dry-weight rank data show similarity to PNC has remained static from 2005 to 2021. The 2005 Daubenmire cover class data and the 2021 dry-weight rank data fall in the mid similarity class while the 1984 Parker data falls in the low similarity class. The shift in dominance from blue grama to curly mesquite is the primary driver for the increase in similarity to PNC from 1984 to 2005 and 2005 to 2021.

Cluster 2 (C2) – Southwest pasture, TES map unit 479

Available data for Cluster 2 in the Southwest pasture includes Parker 3 Step data from 1959 and 1984, Daubenmire cover class data from 2005, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the site is strongly dominated by curly mesquite. Similarly, the 1959 and 1984 Parker data, as well as the 2005 Daubenmire data, show curly mesquite as the dominant species. The 2020 data differs from previous years with the absence of hairy grama. Mesquite shrub appears for the first time in the cluster in 2005. Species diversity increased from the 1959 and 1984 Parker data to the2005 Daubenmire data then decreased slightly from 2005 to 2020.

Table 161. Cluster 2 – Southwest pasture summary, botanical composition (%), Parker 3 step protocol, Daubenmire cover class protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		2005 Daubenmire Cover Class	Dry-weight rank protocol 2020
		1959	1984		
G	curly mesquite	56	42	36	60
G	hairy grama	25	26	13	0
G	sideoats grama	8	24	6	5
G	blue grama	7	0	0	6
G	vine mesquite	2	1	0	0
S	broom snakeweed	0	4	3	5

Growth form	Common name	Parker 3 Step Protocol		2005 Daubenmire Cover Class	Dry-weight rank protocol 2020
		1959	1984		
F	verbena spp	0	1	0	0
S	cactus	1	3	0	0
G	squirreltail	0	0	2	1
G	pinyon ricegrass	0	0	2	0
G	smooth barley	0	0	1	0
G	sixweeks threeawn	0	0	2	0
F	wooly plantain	0	0	1	0
F	globemallow	0	0	0	2
F	Engelmann daisy	0	0	13	0
F	cold-desert phlox	0	0	1	0
F	mullein	0	0	1	0
S	Wright eriogonum	0	0	0	2
T	alligator juniper	0	0	8	1
T	pinyon pine	0	0	2	1
S	mesquite	0	0	8	0
G	common wolfstail	0	0	0	2
S	mesquite	0	0	0	10
G	threeawn	0	0	0	1
F	flameflower	0	0	0	3

Table 162 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above did not result in differences in the calculated similarity to PNC. All similarity indices calculated for this cluster fall within the mid similarity class. Similarity to PNC decreased slightly from 2005 to 2020 primarily due to the absence of hairy grama in the 2020 dry-weight rank data.

Table 162. Cluster 2 -Southwest pasture, plant community similarity to PNC as described in TES

	Similarity Index
1959 Parker protocol	40
1984 Parker protocol	36
2005 Daubenmire cover class protocol	46
2020 Dry-weight rank protocol	40

The 2020 points data is an outlier showing a strong decrease in the amount of bare soil and a corresponding increase in litter compared to previous readings. When looking at the data set as a whole, it appears there is a slight upward trend (decrease in cover) in bare soil and litter, and a downward trend in vegetative cover. Fluctuations in ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2020 shows annual forb species present in 90% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative and rock cover while bare soil is much lower than expected. Litter cover is much higher than expected for this site.

Table 163. Cluster 2 – Southwest pasture summary, ground cover (%)

	Parker protocol		2005 Daubenmire cover class protocol	2020 Points protocol	Reference condition from TES
	1959	1984			
Vegetation	26	18	13	4	**5**
Rock	33	39	40	38	**30**
Litter	10	9	24	51	**T**
Bare soil	31	35	23	7	**65**

C2- Southwest pasture trend summary

The plant community at C2 – Southwest pasture is currently dominated by curly mesquite. Comparative botanical composition data from the Parker protocol and Daubenmire cover class protocol show curly mesquite and grama grasses have dominated the site since 1959. The 2020 dry-weight rank data shows an absence of hairy grama with a corresponding increase in curly mesquite compared to previous data. A mesquite shrub component was recorded for the first time in 2005. Species diversity recorded at the cluster increased from the 1959 and 1984 Parker data to the 2005 Daubenmire data, then decreased slightly from 2005 to 2020.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses with few undesirable species. A preponderance of evidence suggests that the overall trend is static. The 2020 dry-weight rank data is an outlier showing a strong decrease in the amount of bare soil and strong increase in litter compared to previous readings. However, the decrease in bare soil and increase in litter cover appears to be partially due to an abundance of annual forb cover. A preponderance of evidence suggests the overall site protection trend is slightly downward trend due to the steady decrease in vegetative cover.

Ecological status: The similarity to PNC has remained fairly stable with all data falling in the mid similarity category. Similarity to PNC decreased slightly from 2005 to 2020 primarily due to the absence of hairy grama.

Cluster 5 (C5) – North pasture, TES map unit 236

Available data for Cluster 5 in the North pasture includes Parker 3 Step data from 1962 and 1984, and dry-weight rank data from 2013 and 2021. The 2021 dry-weight rank data shows the site is currently dominated by a fairly even split of hairy grama, sideoats grama, and curly mesquite. Similarly, the 1962 and 1984 Parker data show hairy grama, sideoats grama, and curly mesquite as strong components of the cluster. The 2013 dry-weight rank data shows hairy grama, sideoats grama, and common wolfstail as the most abundant species. The 2021 dry-weight rank data show an increase in juniper cover which could be due differences in protocols, with the dry-weight rank method sampling the broader area. However, the 2013 dry-weight rank data only documents 3% alligator juniper. With the exception of hairy grama, sideoats grama, pinyon pine, and curly mesquite, there is little overlap in species composition among years. Species diversity has fluctuated year to year, with 2013 recording the highest number of species and 2021 recording the lowest number.

Table 164. Cluster 5 – North pasture summary, botanical composition (%), Parker 3 step protocol, and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol		Dry-weight rank protocol	
		1962	1984	2013	2021
G	vine mesquite	19	4	0	0

Growth form	Common name	Parker 3 Step Protocol		Dry-weight rank protocol	
		1962	1984	2013	2021
G	hairy grama	13	35	26	29
G	sideoats grama	16	19	18	24
T	pinyon pine	2	1	4	1
G	squirreltail	1	1	0	0
G	sand dropseed	3	1	0	0
G	blue grama	1	1	0	0
G	green sprangletop	2	6	0	0
T	alligator juniper	1	0	3	14
G	curly mesquite	29	31	1	24
S	broom snakeweed	7	1	0	0
S	catclaw mimosa	1	0	0	0
T	oneseed juniper	0	0	2	3
G	threeawn	0	0	0	1
G	cane bluestem	0	0	0	1
G	bristly wolfstail	0	0	0	1
G	pinyon ricegrass	1	0	0	2
S	shrub live oak	0	0	3	0
G	slender grama	0	0	1	0
G	common wolfstail	0	0	12	0
G	Halls panicum	0	0	2	0
F	perennial forb	0	0	2	0
F	Chinese lantern	0	0	1	0
F	field goldeneye	0	0	2	0
F	devil's horsewhip	0	0	1	0
F	wild buckwheat	0	0	1	0

Table 165 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above did not result in differences in the calculated similarity to the potential natural community described for the TES map unit. All similarity indices calculated for this cluster fall within the low similarity class. Similarity to PNC has decreased slightly from 1962 to 2021.

Table 165. Cluster 5 -North pasture, plant community similarity to PNC as described in TES

	Similarity Index
1962 Parker protocol	27
1984 Parker protocol	25
2013 Dry-weight rank protocol	26
2021 Dry-weight rank protocol	23

The 2021 points data shows a decrease in the amount of bare soil and rock and increase in litter compared to previous readings. When looking at the data set as a whole, it appears there is a slight upward trend (decrease in cover) for bare soil. Vegetative cover decreased from 2013 to 2021 but is

still higher than the reference condition for the site. When comparing current conditions to the TES reference site, we see similarities in vegetative cover while rock and bare soil are lower than expected. Litter cover is much higher than expected for this site.

Table 166. Cluster 5 – North pasture summary, ground cover (%)

	Parker protocol		Points protocol		Reference condition from TES
	1962	1984	2013	2021	
Vegetation	12	17	12	7	**5**
Rock	27	33	32	9	**50**
Litter	15	12	37	72	**5**
Bare soil	47	38	20	11	**40**

C5- North pasture trend summary

The plant community at C5 – North pasture is currently dominated by an even split of hairy grama, sideoats grama, and curly mesquite. Comparative botanical composition data from the Parker 3 step protocol in 1962 and 1984 show hairy grama, sideoats grama and curly mesquite have dominated the site since the early 1960s. The 2013 dry-weight rank differs slightly, showing common wolfstail as more abundant than curly mesquite. The 2021 dry-weight rank data shows an increase in juniper cover which could indicate woody encroachment into the site.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses with few undesirable species. A preponderance of evidence suggests that the overall vegetative trend is static due to similarities in dominant grass species, site diversity, and similarity to PNC. The 2021 dry-weight rank data shows a decrease in the amount of bare soil and rock, and strong increase in litter compared to previous readings. Unlike other clusters in the allotment, the increase in litter cover does not appear to be due to an abundance of annual forb cover. A preponderance of evidence suggests the overall site protection trend is static due to the decrease in vegetative cover offsetting the decreases in bare soil.

Ecological status: The similarity to PNC has remained fairly stable with all data falling in the low similarity category. This is primarily due to the lack of shrub cover at the site. Similarity to PNC has decreased slightly from 1962 to 2021.

Cluster 6 (C6) – North pasture, TES map unit 632

Available data for Cluster 6 in the North pasture includes Parker 3 Step data from 1962 and dry-weight rank data from 2020. The 2020 dry-weight rank data shows the site is currently dominated by Hall's panicum with a sideoats grama and blue grama subcomponent. The 1962 Parker data differs, showing the cluster dominated by sideoats grama and blue grama with no Hall's panicum present. It is unclear what caused the shift from grama grasses to Hall's panicum. Species diversity increased from 1962 to 2020.

Table 167. Cluster 6 – North pasture summary, botanical composition (%), Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker protocol 1962	Dry-weight rank protocol 2020
G	blue grama	34	16

Growth form	Common name	Parker protocol 1962	Dry-weight rank protocol 2020
G	sideoats grama	42	10
G	spidergrass	3	0
G	common wolfstail	4	0
G	purple threeawn	6	0
F	globemallow	3	7
G	squirreltail	2	5
G	hairy grama	3	1
G	pinyon ricegrass	1	4
G	muhly	1	0
S	Wright's silktassel	0	1
T	pinyon pine	0	4
S	skunkbush	0	1
G	threeawn	0	6
G	cane bluestem	0	1
G	plains lovegrass	0	1
G	curly mesquite	0	1
G	Halls panicum	0	39
G	vine mesquite	0	4

Table 168 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above did not result in differences in the calculated similarity to PNC. Both the 1962 Parker data and the 2020 dry-weight rank data fall in the low similarity class. The decrease in similarity to PNC appears to be driven by the decline in sideoats grama from 1962 to 2020.

Table 168. Cluster 6 - North pasture, plant community similarity to PNC as described in TES

	Similarity Index
1962 Parker protocol	28
2020 Dry Weight Rank Protocol	22

The 2020 points data shows a strong decrease in the amount of bare soil and increase in litter compared to the 1962 Parker data. Vegetative cover decreased slightly and remains lower than the reference condition. Fluctuations in ground cover could be partially due to differences in protocols and annual precipitation which affects the amount of annual plant species contributing to litter. Percent frequency monitoring in 2020 shows annual grass and forb species present in 77% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current ground cover to the TES reference site, we few similarities between the current condition and the reference condition.

Table 169. Cluster 6 – North pasture summary, ground cover (%)

	Parker protocol 1962	2020 Points protocol	Reference condition from TES
Vegetation	9	4	**10**

	Parker protocol 1962	2020 Points protocol	Reference condition from TES
Rock	32	30	**65**
Litter	18	60	**10**
Bare soil	41	6	**20**

C6- North pasture trend summary

The plant community at C6 – North pasture is currently dominated by Hall's panicum with a sideoats grama and blue grama subcomponent. Comparative botanical composition data from the 1962 Parker protocol show the cluster dominated by sideoats grama and blue grama with no Hall's panicum present It is unclear what factors contributed to this shift in species composition. Overall diversity at the site has increased from 1962 to 2020.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. However, the shift from grama grasses to the short lived Hall's panicum indicates a decline in forage quality. A preponderance of evidence suggests that the overall trend is downward due to a decrease in similarity to PNC and shift in botanical composition from desirable forage grasses to less desirable forage grasses. Site protection attributes show low bare soil, and high litter and rock cover which are contributing to a stable site. However, the decrease in vegetative cover and increase in litter cover appears to be partially due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. Annual species appear to also be contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes shows a downward trend due to the decrease in vegetative cover and declines in bare soil due, in large part to annual species abundance.

Ecological status: Both the 1962 Parker data and the 2020 dry-weight rank data fall in the low similarity class. This is primarily due to the lack of shrub cover at the site. The decrease in similarity to PNC from 1962 to 2020 appears to be driven by the decline in sideoats grama.

Cluster 7 (C7) – Southwest pasture, TES map unit 589

Available data for Cluster 7 in the Southwest pasture includes Parker 3 Step data from 1962 and dry-weight rank data from 2020. The 2020 dry-weight rank data shows the site is currently dominated by blue grama with a sideoats grama and hairy grama subcomponent. Similarly, the 1962 Parker data show the cluster dominated by sideoats grama, blue grama, and hairy grama. Trees and shrubs appear for the first time in the 2020 data. The overstory is composed of alligator juniper and oneseed juniper and a strong beargrass component in the cluster. This could be due to differences in protocols, with the dry-weight rank method sampling the broader area. It could also indicate woody recruitment at the site. Species diversity increased from 1962 to 2020.

Table 170. Cluster 7 – Southwest pasture summary, botanical composition (%) Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol 1962	Dry-weight rank protocol 2020
G	sideoats grama	37	17
G	common wolfstail	3	8
G	blue grama	32	21
S	broom snakeweed	0	1

Growth form	Common name	Parker 3 Step Protocol 1962	Dry-weight rank protocol 2020
F	Sego lily	1	0
F	unknown perennial	1	0
S	baccharis	1	0
G	hairy grama	23	11
G	curly mesquite	1	0
S	Wright eriogonum	0	2
T	alligator juniper	0	8
T	oneseed juniper	0	6
S	beargrass	0	10
G	threeawn	0	2
G	cane bluestem	0	5
G	purple grama	0	1
G	bullgrass	0	7
F	Cooley's bundleflower	0	2

Table 171 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above resulted in the 1962 Parker data falling in the low similarity class, while the 2020 dry-weight rank data falls in the mid similarity class. The increase in similarity to PNC is primarily driven by the increase in shrub cover from 1962 to 2020.

Table 171. Cluster 7 – Southwest pasture plant community similarity to PNC as described in TES

	Similarity Index
1962 Parker protocol	29
2020 Dry Weight Rank Protocol	36

The 2020 points data shows a strong decrease in the amount of bare soil with a corresponding increase in litter cover compared to the 1962 Parker data. Vegetative cover and rock cover have remained fairly static. Percent frequency monitoring in 2020 shows annual grass and forb species present in 79% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative cover and rock cover while litter is much higher and bare soil is much lower than would be expected for the site.

Table 172. Cluster 7 – Southwest pasture summary, ground cover (%)

	Parker protocol 1962	2020 Points protocol	Reference condition from TES
Vegetation	10	11	**10**
Rock	38	37	**45**
Litter	19	48	**T**
Bare soil	32	4	**45**

C7 –Southwest pasture trend summary

The plant community at C7 – Southwest pasture is currently dominated by blue grama with a sideoats grama and hairy grama subcomponent. Comparative botanical composition data from the Parker protocol in 1962 similarly show blue grama, sideoats grama, and hairy grama dominating the site. Alligator juniper, oneseed juniper and beargrass appear for the first time in the 2020 dry-weight rank data which may indicate woody encroachment into the site or could be due to differences in protocols, with the dry-weight rank protocol sampling a broader area.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses and few undesirable species. A preponderance of evidence suggests a slightly upward trend due to the increase in similarity to PNC. The 2020 dry-weight rank data show a strong decrease in the amount of bare soil and strong increase in litter compared to previous readings which indicate the site is currently stable. Annual species appear to also be contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes shows a static trend due to similarities in vegetative and rock cover and declines in bare soil due in large part to annual species abundance.

Ecological status: The 2020 dry-weight rank data show similarity to PNC has increased since 1962. The 2020 dry-weight rank data falls in the mid similarity class while the 1962 Parker data falls in the low similarity class. The shift from the low similarity class to the mid similarity class is primarily driven by the increase in shrub cover in the 2020 data.

Pace 1 (P1) – Big pasture, TES map unit 589

Available data for Pace 1 in the Big pasture includes Parker 3 Step pace data from 1962 and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the current plant community is strongly dominated by curly mesquite with a blue grama and sideoats grama subcomponent. The 1962 Parker 3 step pace data show an even split among blue grama, sideoats grama, and curly mesquite. Species diversity decreased slightly between 1962 and 2020. Squirreltail, vine mesquite, hairy grama, and threeawn were recorded in the 1962 data and were subsequently absent from the 2020 data.

Table 173. Pace 1 – Big pasture summary, botanical composition (%) Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol 1962	Dry-weight rank protocol 2020
G	blue grama	26	10
G	sideoats grama	28	11
G	squirreltail	7	0
G	curly mesquite	22	76
G	vine mesquite	7	0
G	hairy grama	6	0
G	ring muhly	1	0
S	broom snakeweed	1	0
G	threeawn	2	0
S	baccharis	0	2
S	hedgehog cactus	0	0
S	prickly pear	0	1

Table 174 shows the calculated similarity to the potential natural community described for the TES map unit. The discrepancies in botanical composition among protocols discussed above did not result in differences in the calculated similarity to PNC. Both the 1962 Parker data and the 2020 dry-weight rank data fall in the mid similarity class. Similarity to PNC decreased from 1962 to 2020 primarily due to the decrease in grass diversity at the site.

Table 174. Pace 1 – Big pasture plant community similarity to PNC as described in TES

	Similarity Index
1962 Parker protocol	57
2020 Dry Weight Rank Protocol	47

The 2020 points data shows a strong decrease in the amount of bare soil with a corresponding increase in litter and rock cover compared to the 1962 Parker pace data. Vegetative cover also decreased from the 1962 Parker pace reading. Percent frequency monitoring in 2020 show annual forbs present in 100% of the plots which is likely contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative and rock cover, while bare soil is much lower, and litter is much higher than would be expected at the site.

Table 175. Pace 1 – Big pasture summary, ground cover (%)

	Parker protocol 1962	2020 Points protocol	Reference condition from TES
Vegetation	19	9	**10**
Rock	12	31	**45**
Litter	10	58	**T**
Bare soil	59	2	**45**

P1 – Big pasture trend summary

The plant community at P1 – Big pasture is currently dominated by curly mesquite with a blue grama and sideoats grama subcomponent. Comparative botanical composition data from the Parker 3 step data in 1962 also show curly mesquite, sideoats grama, and blue grama as main components of the cluster. Although species composition remains similar, at some point between 1962 and 2020, curly mesquite increased while blue grama and sideoats grama decreased. Species diversity, including grass diversity, decreased from 1962 to 2020.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses and few undesirable species. A preponderance of evidence suggests the overall trend is slightly downward due to a decrease in similarity to PNC and a decrease in species diversity. The 2020 dry-weight rank data shows a strong decrease in the amount of bare soil and strong increase in litter compared to previous readings which indicate the site is currently stable. However, the decrease in vegetative cover and increase in litter cover may be due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. Annual species appear to also be contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes shows a static trend or slightly downward trend due to the decrease in vegetative cover and declines in bare soil due in large part to annual species abundance. It should be noted that trends are based upon available data which was collected 58 years apart. The trend determination looks at two single points in time and does not capture all ecological and management changes that have occurred between readings.

Ecological status: Both the 1962 Parker data and the 2020 dry-weight rank data fall in the mid similarity class. Similarity to PNC decreased from 1962 to 2020 which was primarily driven by a decline in grass diversity.

Pace 2 (P2) – Pipe Line pasture, TES map unit 632

Available data for Pace 2 in the Pipe Line pasture includes Parker 3 Step data from 1962 and dry-weight rank data from 2013 and 2020. The 2020 dry-weight rank data indicate the current plant community is dominated by sideoats grama with an overstory of pinyon pine and alligator juniper. The 2013 dry-weight rank data also shows sideoats grama as the dominant species but shows common wolfstail and desert threeawn as the subcomponent. The 1962 Parker pace data show sideoats grama dominating the site with a strong blue grama subcomponent. The 1962 data recorded very little overstory with no pinyon pine and only 2% alligator juniper in the cluster. Tree cover increased in 2013 and again in 2020, with the 2020 data documenting pinyon pine in the overstory for the first time. The increase in tree cover could be due to differences in protocols, with the dry-weight rank method sampling the broader area, or it could indicate woody recruitment at the site. With the exception of alligator juniper and sideoats grama, there is little overlap in species composition among years. Species diversity increased from 1962 to 2013, then remained fairly static between 2013 and 2020.

Table 176. Pace 2 – Pipe Line pasture summary, botanical composition (%) Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol 1962	Dry-weight rank protocol	
			2013	2020
S	mountain mahogany	0	0	3
S	Wright's silktassel	0	0	1
T	alligator juniper	2	14	14
S	beargrass	0	0	1
T	pinyon pine	0	0	16
S	skunkbush	2	0	1
S	yucca	0	0	1
G	threeawn	0	0	3
G	sideoats grama	34	30	46
G	blue grama	21	0	5
G	squirreltail	11	0	0
G	junegrass	0	0	4
G	common wolfstail	0	12	3
F	globemallow	0	6	0
F	fern	0	0	2
F/S	sage	4	0	0
T	unknown tree	0	3	0
G	desert threeawn	0	12	0
G	hairy grama	0	3	0
G	sedge	0	1	0
G	green sprangletop	0	2	0
G	vine mesquite	0	1	0

Growth form	Common name	Parker 3 Step Protocol 1962	Dry-weight rank protocol	
			2013	2020
G	poverty threeawn	0	1	0
G	stinkgrass	0	2	0
G	annual muhly	0	1	0
G	panicgrass	0	4	0

Table 177 shows the calculated similarity to the potential natural community described for the TES map unit. All calculated similarities fall in the low similarity class. Similarity to PNC remained static from 1962 to 2013, then increased from 2013 to 2020 which was primarily driven by the increase in shrub cover.

Table 177. Pace 2 – Pipe Line pasture plant community similarity to PNC as described in TES

	Similarity Index
1962 Parker protocol	25
2013 Dry Weight Rank Protocol	25
2020 Dry Weight Rank Protocol	32

The 2020 points data shows a strong decrease in the amount of bare soil with a corresponding increase in litter and rock cover compared to the 1962 Parker pace data. Ground cover data remained fairly static between 2013 and 2020 with a slight decrease in vegetative and litter cover, and slight increases in rock and bare soil. When comparing current conditions to the TES reference site, we see similarities in rock cover while vegetation and bare soil are lower, and litter is higher than what would be expected at the site.

Table 178. Pace 2 – Pipe Line pasture summary, ground cover (%)

	Parker protocol 1962	Points Protocol		Reference condition from TES
		2013	2020	
Vegetation	7	9	1	**10**
Rock	32	54	65	**65**
Litter	6	34	28	**10**
Bare soil	55	3	6	**20**

P2 – Pipe Line pasture trend summary

The plant community at P2 – Pipe Line pasture is currently dominated by sideoats grama with an overstory of pinyon pine and alligator juniper. Comparative botanical composition data from the Parker 3 step pace protocol in 1962 show sideoats grama dominating the site with a strong blue grama subcomponent. The 2013 dry-weight rank data also shows sideoats grama as the dominant species but shows common wolfstail and desert threeawn as the subcomponent. The dry weight rank data in 2013 and 2020 record a much stronger overstory component than the 1962 Parker data which only showed 2% alligator juniper. The increase in tree cover could be due to differences in protocols, with the dry-weight rank method sampling the broader area or it could indicate woody recruitment at the site. While alligator juniper cover remained the same from 2013 to 2020, 16% pinyon pine, which was previously absent, was recorded in 2020. Species diversity increased from 1962 to 2013, then remained fairly static between 2013 and 2020.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data shows available forage grasses and few undesirable species. While overstory species have increased, so has species diversity and similarity to PNC. A preponderance of evidence suggests an upward trend. The 2020 dry-weight rank data shows a slight increase in the amount of bare soil and rock cover, and a decrease in litter and vegetative compared to the 2013 dry-weight rank data. A preponderance of evidence for site protection attributes suggests the overall trend is static or slightly downward due the slight decrease in vegetation and increase in bare soil.

Ecological status: The 1962 Parker data and the 2013 and 2020 dry-weight rank data fall in the low similarity class. Similarity to PNC increased from 1962 to 2020 which was primarily driven by an increase in shrub cover.

Pace 7 (P7) – Big pasture, TES map unit 573

Available data for Pace 7 in the Big pasture includes Parker 3 Step pace data from 1960 and dry-weight rank data from 2021. The 2021 dry-weight rank data indicate the current plant community is strongly dominated by curly mesquite with a sideoats grama and hairy grama subcomponent. The 1960 Parker 3 step pace data differs, showing curly mesquite as only a small component of the cluster and blue grama as the dominant species. With the exception of sideoats grama, blue grama, hairy grama, and curly mesquite, there is little overlap in species composition between 1960 to 2021. Species diversity increased slightly from 1960 to 2021.

Table 179. Pace 7 – Big pasture summary, botanical composition (%) Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol 1960	Dry-weight rank protocol 2021
S	Wright eriogonum	0	4
S	prickly pear	0	1
G	sideoats grama	22	11
G	blue grama	58	1
G	hairy grama	8	8
G	squirreltail	0	3
G	curly mesquite	4	67
G	common wolfstail	3	0
G	slim tridens	0	2
F	globemallow	0	2
F	silverleaf nightshade	0	1
G	vine mesquite	3	0
G	threeawn	1	0
F	wild onion	1	0

Table 180 shows the calculated similarity to the potential natural community described for the TES map unit. Both the 1960 Parker pace data and the 2021 dry-weight rank data fall in the mid similarity class. Although species diversity increased, similarity to PNC decreased from 1960 to 2021 which was primarily driven by the decrease in blue grama and sideoats grama cover.

Table 180. Pace 7 –Big pasture plant community similarity to PNC as described in TES

	Similarity Index
1960 Parker protocol	48
2021 Dry-weight rank protocol	35

The 2021 points data shows a decrease in the amount of bare soil and vegetative cover with corresponding increases in litter and rock cover compared to the 1960 Parker pace data. Percent frequency monitoring in 2020 shows annual forb species present in 52% of the plots which may be contributing to the increased litter cover and decreased bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetation, rock and bare soil cover, while litter is higher than would be expected for the site.

Table 181. Pace 7 – Big pasture summary, ground cover (%)

	Parker protocol 1960	2021 Points Protocol	Reference condition from TES
Vegetation	20	9	**15**
Rock	19	43	**50**
Litter	15	28	**5**
Bare soil	46	20	**30**

P7 – Big pasture trend summary

The plant community at P7- Big pasture is currently dominated by curly mesquite with a sideoats grama and hairy grama subcomponent. The 1960 data differs, showing blue grama as the main component of the cluster. However, sideoats grama, hairy grama, blue grama, and curly mesquite were present both in 1960 and in 2021. Species diversity increased slightly from the 1960 Parker pace data to the 2021 dry-weight rank data.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses and few undesirable species. A preponderance of evidence suggests that the overall trend is static or slightly downward due to a decline in similarity to PNC. The 2021 dry-weight rank data show a decrease in the amount of bare soil and vegetation with an increase in litter and rock compared to the 1960 Parker pace data. Annual species appear to be contributing to the increase in litter and subsequent decrease in bare soil but not to the extent seen in other clusters in the allotment. A preponderance of evidence suggests that the overall trend is static due or slightly downward due to the decrease in vegetative cover and decrease in bare soil partially due to annual forb cover. It should be noted that trends are based upon available data which was collected 61 years apart. The trend determination looks at two single points in time and does not capture all ecological and management changes that have occurred between readings.

Ecological status: Both the 1960 Parker data and the 2021 dry-weight rank data fall in the mid similarity class. Similarity to PNC decreased from 1960 to 2021 which was primarily driven be a decrease in blue grama and sideoats grama cover.

Pace 10 (P10) – North pasture, TES map unit 538

Available data for Pace 10 in the North pasture includes Parker 3 Step pace data from 1960 and dry-weight rank data from 2021. The 2021 dry-weight rank data indicates the current plant community is strongly dominated by mat muhly. Similarly, the Parker 3 step pace data from 1960 shows the cluster composed almost entirely of mat muhly. The 2021 dry-weight rank shows an increase in overstory

species including oak and juniper. The increase in tree cover could be due to differences in protocols, with the dry-weight rank method sampling the broader area, or it could indicate woody recruitment at the site. Species diversity is low for this site and has remained fairly static from 1960 to 2021.

Table 182. Pace 10 – North pasture summary, botanical composition (%) Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker 3 Step Protocol 1960	Dry-weight rank protocol 2021
S	Fendler's ceanothus	0	7
T	alligator juniper	0	6
T	silverleaf oak	0	10
G	mat muhly	88	71
S	oak	0	6
G	mutton bluegrass	5	0
F	yarrow	3	0
G	mountain muhly	1	0

Table 183 shows the calculated similarity to the potential natural community described for the TES map unit. Both the 1960 Parker pace data and the 2021 dry-weight rank data fall within the low similarity class with a notable 0% similarity for the 2021 dry weight rank data. The TES map unit does not appear to reflect the current conditions at the site. The lack of species diversity and the strong dominance of mat muhly, which is not a component of the PNC description, are the primary drivers for the low similarity. The Hot Air fire of 1993 burned through the monitoring site which may have altered the plant community, the effects of which are still being seen in 2021.

Table 183. Pace 10 –North pasture plant community similarity to PNC as described in TES

	Similarity Index
1960 Parker protocol	9
2021 Dry-weight rank protocol	0

The 2021 points data shows a slight decrease in the amount of bare soil and increase in vegetative cover compared to the 1960 Parker pace data. Rock and litter cover remained fairly static between 1960 and 2021. When comparing current conditions to the TES reference site, we see similarities in vegetative and litter cover, while rock and bare soil cover is lower than expected at the site.

Table 184. Pace 10 – North pasture summary, ground cover (%)

	Parker protocol 1960	2021 Points Protocol	Reference condition from TES
Vegetation	8	13	**10**
Rock	27	26	**40**
Litter	53	58	**45**
Bare soil	12	2	**10**

P10 – North pasture trend summary

The plant community at P10 - North pasture is currently dominated by mat muhly. This composition of species has remained similar since 1960 with the Parker 3 step pace data also showing mat muhly

dominating the site. The 2021 dry-weight rank shows an increase in overstory species including oak and juniper. The increase in tree cover could be due to differences in protocols, with the dry-weight rank method sampling the broader area, or it could indicate woody recruitment at the site. Species diversity is low for this site but has remained fairly static from 1960 to 2021.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition shows available forage grasses and few undesirable species. A preponderance of evidence suggests that the overall vegetative trend is static or slightly downward due to the decrease in similarity to PNC. Site protection attributes show the site is currently stable and trending upward due to the increase in vegetative cover and decrease in bare soil.

Ecological status: The 1960 Parker pace data and the 2021 dry-weight rank data fall in the low similarity category. The lack of species diversity and the strong dominance of mat muhly, which is not a component of the PNC description, are the primary drivers for the low similarity. The TES map unit does not appear to reflect the current conditions at the site. The TES botanical composition description indicates the site should be dominated by ponderosa pine and Gambel oak with a bearberry, lupine, yarrow and festuca understory. Instead, the 2021 data show the site dominated by juniper, oak and mat muhly, suggesting the community type is an oak-juniper woodland rather than a closed canopy ponderosa pine forest. The Hot Air fire of 1993 burned through the monitoring site which may have altered the plant community, the effects of which are still being seen in 2021.

Utilization monitoring data

On the Mud Springs allotment the annual operating instructions for the past two years (2020-2021) have identified allowable use standards ranging 0% to 30% in the Southwest pasture, and 30% to 40% in the remaining pastures. Prior to 2020 allowable use standards were 35% to 45% allotment wide. Utilization monitoring for the Mud Springs allotment is limited. Table 185 displays a summary of the utilization monitoring conducted on the Mud Springs allotment since 2004. The 'percentage of permitted use' line is included in the table to display the yearly stocking level as a percentage of that identified on the term grazing permit. Utilization monitoring normally occurs within two weeks before or after pasture move dates, and after the summer growing season. All of the observations were at or below the allowable use standard with the exception of the Big pasture in 2009.

Table 185. Utilization monitoring

Pasture	2020/2021	2015	2010	2009	2008	2006	2004
Percentage of permitted use, allotment-wide	**33%**	**120%**	**119%**	**42%**	**61%**	**98%**	**82%**
Southwest	20%*	22%*	14%*		5%	22%	
North	0%	5%					
Big	30%			50%*	39%*		
Pipeline	10%				5%		
Holding						30%	
Mud Springs Trap							10%

Structural improvements

Structural improvements include fences, stock tanks, wells, troughs and corrals. The responsibility for the maintenance of these improvements is assigned to the grazing permittee in the term grazing permit. Most of these improvements on the Mud Springs allotment are in functional condition although some may need maintenance or reconstruction in the next few years. The annual operating instructions identify which improvements need replacement or reconstruction each year. Table 186 shows named range improvements in the allotment. In addition to these, there are various unnamed water troughs that may provide water for part of the year.

Table 186. Range Improvement Points

Range Improvement Name	Improvement Type
Bear Canyon Corral	Corral
Dry Corral	Corral
Hogtrail Corral	Corral
Holding Pasture Corral	Corral
Holding Pasture Corral 2	Corral
Juniper Spgs Corral	Corral
Mud Springs Corral	Corral
Mud Springs Road Corral	Corral
Ranch Corral and Chute	Corral
Robinson Mesa Corral	Corral
W Fork Hot Air Corral	Corral
Big Pasture Tank	Intermittent Stock Tank
Blackwater Pit Tank	Intermittent Stock Tank
Cholla Tank	Intermittent Stock Tank
Glover Tank	Intermittent Stock Tank
Goodwin Tank	Intermittent Stock Tank
Hot Air Tank	Intermittent Stock Tank
Mud Springs Canyon Tank	Intermittent Stock Tank
Mud Springs Tank No 1	Intermittent Stock Tank
Mud Springs Tank No 2	Intermittent Stock Tank
P Tank	Intermittent Stock Tank
Pit Stock Tank	Intermittent Stock Tank
Sandy Tank	Intermittent Stock Tank
Stocktank	Intermittent Stock Tank
Stocktank	Intermittent Stock Tank
Trail Tank	Intermittent Stock Tank
Water Tank	Intermittent Stock Tank
Road Tank	Perennial Stock Tank
Trough	Trough
Trough w Mud Spgs Pipelin	Trough
Trough w Mud Spgs Pipelin	Trough
Trough w Mud Spgs Pipelin	Trough
Trough w Mud Spgs Pipelin	Trough
Trough w Mud Spgs Pipelin	Trough
Trough w Mud Spgs Pipelin	Trough
Trough w Mud Spgs Pipelin	Trough
Trough w Mud Spgs Pipelin	Trough
Trough w Mud Spgs Pipelin	Trough
Steel Rim Tank	Water Storage Tank
Upper Bear Canyon Storage	Water Storage Tank
Well	Well

Existing condition summary

Long term trend data is available for the North, Southwest, Big, and Pipe Line pastures. Overall, the clusters in Mud Springs allotment show satisfactory conditions but declining trends. Four of the nine

clusters show downward trends, three show static trends, and two show upward trends. Primary reasons for downward trending clusters include decreases in species diversity, movement away from the potential natural community, and undesirable changes in species composition. Vegetation at lower elevations appear to be showing drought stress from the abnormally dry period in 2020. Future monitoring will be needed to determine if vegetation shows long term negative effects from the drought. It should be noted that trends are based upon available data which was collected up to 61 years apart at some clusters. The trend determinations look at single points in time and do not capture all ecological and management changes that have occurred between readings.

The TES map unit for Pace 10 does not appear to reflect the current conditions at the site. It is possible that the map unit boundaries are inaccurate, or it could indicate that the site has crossed a threshold and will not convert back to PNC with grazing management alone.

Table 187. Mud Springs cluster vegetative trends

Cluster	Vegetative Trend
C1 – Big	static
C2 – Southwest	static
C5 – North	static
C6 - North	downward
C7 – Southwest	upward
P1 – Big	downward
P2 – Pipe Line	upward
P7 – Big	downward
P10 - North	static or downward

Overall, the 2020/2021 site protection data show significant decreases in bare soil and increases in litter. The majority of cluster also show declining vegetative cover. The 2020/2021 clusters were read during a severe dry period (less than 75% of average annual precipitation) and the vegetation was documented as showing die off due to the drought. This likely contributed to the decrease in vegetative cover and increase in litter cover, as the live perennial vegetation transitioned to standing litter. An abundance of annual forbs at some clusters appears to be influencing the significant decreases in bare soil as standing litter occupies any available soil. Trends for eight of the nine clusters were static or downward primarily due to decreases in vegetative cover. P10 is the only site showing an upward trend for site protection.

Table 188. Mud Springs cluster site protection trends

Cluster	Vegetative Trend
C1 – Big	static
C2 – Southwest	downward
C5 – North	static
C6 - North	downward
C7 – Southwest	static
P1 – Big	static or downward
P2 – Pipe Line	static or downward
P7 – Big	static or downward
P10 - North	upward

There are limited data available recording utilization levels however, all available information shows utilization has been at or below the allowable use standards with the exception of the Big pasture in the 2009 grazing year. However, the allotment has been stocked at levels lower than permitted levels prior

to 2009. Actual use from 2009 through 2021 averaged 1,779 AUMs (148 head) or 40 percent of permitted.

Structural range improvements are being maintained, replaced or reconstructed as needed (as identified in the annual operating instructions).

Tule

The Tule allotment is located approximately 11 miles north of Clifton, Arizona on the Clifton Ranger District, Apache-Sitgreaves National Forest. The allotment is near the southwest corner of the Clifton Ranger District and is bordered by the San Carlos Reservation to the west, Highway 191 to the east, the Dark Canyon allotment to the south, and the Double Circle allotment to the north. Elevations range from 7,698 feet at Grey Peak to 4,200 feet where Cistern Canyon exits the allotment. The Tule allotment is comprised of four large pastures and various smaller pastures and traps. Vegetation is predominantly oak/pinyon/juniper woodlands with an understory of grama grasses. The allotment is characterized by steep terrain and narrow canyons in the south to gently rolling terrain in the west and far north. Major drainages including Cistern Canyon, Butcherknife Canyon, Tule Creek, Deerhead Creek and Dark Canyon. Figure 25 displays a general overview of the allotment. Comprised of approximately 14,208 acres of National Forest System land, the Tule allotment is located in Greenlee County, Arizona.

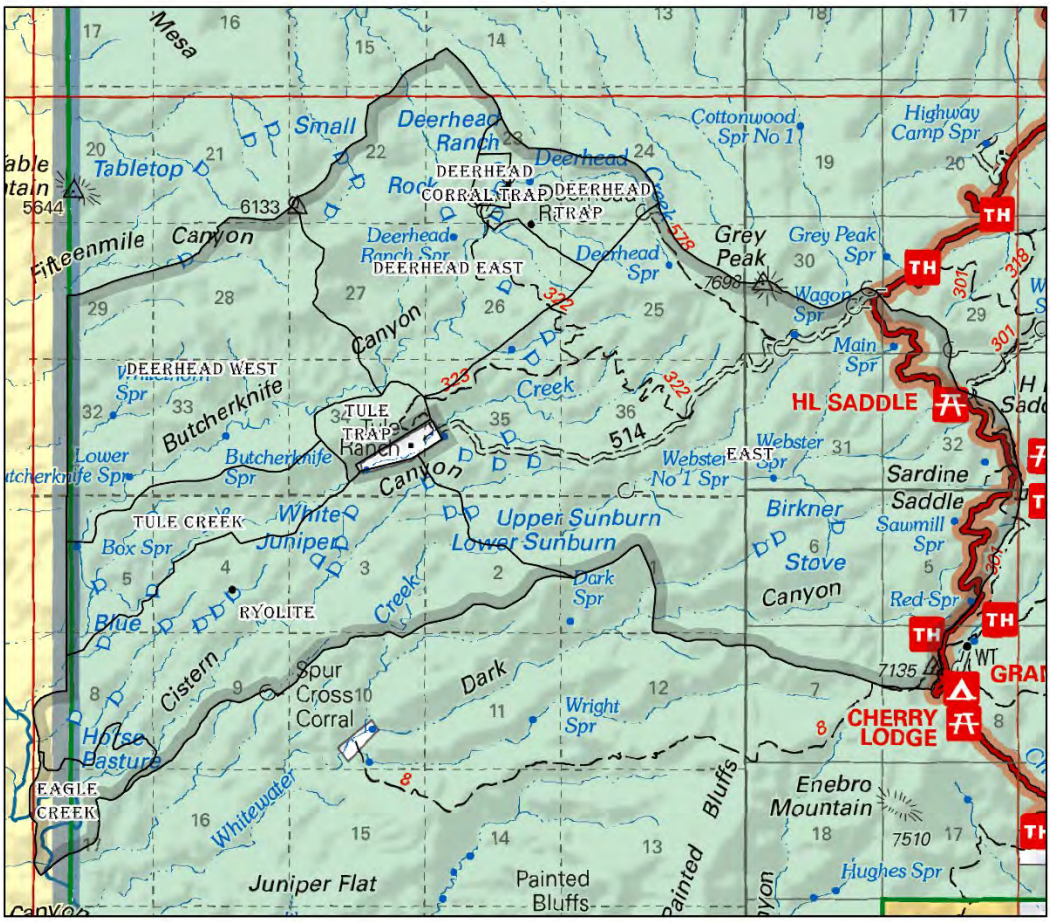

Figure 25. Tule Allotment

Historical Use

The Tule allotment was established in 1914 when the Tule Spring Allotment Number 6 was split from the larger South Eagle Community Allotment. The permittee started with 40 head of cattle and steadily increased numbers until the herd reached a peak of 336 cattle yearlong in 1918. The first permit was issued for the Tule allotment in 1918, authorizing 282 cattle yearlong. Numbers were reduced to 220 cattle yearlong plus natural increase (calves born on the range) in 1930. When the permit transferred in 1950, numbers were further reduced to 198 cattle yearlong with natural increase. Because there were no boundary fences separating the Tule allotment from adjacent allotments, cattle from the Dark Canyon allotment frequently grazed the southern portion of the Tule allotment and cattle from the Table Top allotment grazed in the northwest portion of the allotment. Reports from the late 1920s to the mid-1960s indicate the allotment was overgrazed and erosion was occurring. As a result of these reports, a boundary fence was constructed between the Dark Canyon allotment and the Tule allotment in 1950. In 1967 a cross fence was constructed and a two pasture rotation was implemented. Tanks and water systems were constructed in the 1950s and 1960s which further that improved the distribution of cattle.

The 1974 Tule Allotment Analysis indicated 58% of the allotment was unsuitable for grazing and revised the estimated grazing capacity to be 90 head yearlong for a total of 1,080 animal unit months. As a result of this analysis, the term permit was reduced to 125 cow/calf pair which was further

reduced to 90 cow/calf pair in 1979. In 1986, the permit was modified based upon the request of the permittee, to 60 cow/calf pair. When the permit transferred in 1989 the permit was re-issued for 60 cow/calf pair yearlong. For unclear reasons, in 1990 the Clifton District Ranger issued a decision memo setting the estimated carrying capacity at 10 head of cattle and 4 horses. The permittee was also directed to take two years of non-use while a new allotment plan was being developed. When the non-use period expired in 1993 a permit was issued for 14 cattle. The permit remained at 14 head from 1993 until 2002 when a Memorandum of Understanding was established increasing the number of head in stages to a variable number of 58 to 117 head yearlong which remains the permitted numbers today.

Vegetation cover types and slope classes

Table 189. Slope class, acres

Pasture	0 - 10%	11 - 30%	31 - 40%	41 - 60%	61%+	Total
Deerhead Corral Trap	28	27	4	4	1	**64**
Deerhead East	452	930	199	177	95	**1853**
Deerhead Trap	91	228	57	55	46	**477**
Deerhead West	371	1,032	272	274	210	**2,159**
East	941	2,893	810	815	613	**6,072**
Ryolite	332	999	306	334	262	**2,233**
Tule Creek	97	326	105	123	127	**778**
Tule Trap	34	104	28	26	11	**203**
Total	**2,346**	**6,539**	**1,781**	**1,808**	**1,365**	**13,839**

Cover types on the Tule allotment include grama, pine-juniper, juniper, Gambel oak, oak-juniper-pinyon, ponderosa pine, and ponderosa pine-evergreen oak as displayed in Table 190. The oak/juniper/pinyon cover type is most abundant comprising 79% of the allotment followed by the pine/juniper cover type comprising 7% of the allotment.

Table 190. Cover type, acres

Pasture	Grama	Pine-Juniper	Juniper	Gambel Oak	Oak-Juniper-Pinyon	Ponderosa Pine	Ponderosa Pine – Evergreen Oak	Total Acres by Pasture
Deerhead Corral Trap		5	9		50			**64**
Deerhead East		133	35		1,685			**1,853**
Deerhead Trap		70			406			**476**
Deerhead West	4	279	14		1,792		69	**2,158**
East		491	91	301	4,211	774	205	**6,073**
Ryolite					2,045		187	**2,232**
Tule Creek	103	15			647		13	**778**
Tule Trap			24		102		77	**203**
Total acres by cover type	**107**	**993**	**173**	**301**	**10,938**	**774**	**551**	

Grazing management

The existing term grazing permit for the Tule allotment is for 50 to 117 cow/calf pairs or equivalent yearlong for up to 1,404 animal unit months. The allotment is divided into four main pastures: Deerhead East, Deerhead West, East, and Ryolite. The remaining pastures identified in Table 189 and Table 190 are smaller pastures used for holding or used intermittently. The rotation schedule is developed yearly during the annual operating instruction meeting. East, Ryolite, Tule Creek, Deerhead West, Deerhead East, and East pastures have been used yearly though changes in entry dates allow for growing season rest periodically. Pastures are occasionally rested for the grazing year including the East pasture in 2021, and the Deerhead West pasture in 2020.

The allowable use standard for all pastures is a range of 30 to 40 percent.

Actual use summary

Actual use from 2004 through 2021 averaged 1,102 AUMs or 79 percent of permitted.

Cluster data

Cluster 1 (C1) – East pasture, TES map unit 632

Available data for Cluster 1 in the East pasture includes Parker 3 Step data from 1969, 1974, 1999, and 2010, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the site is dominated by purple grama and sideoats grama with a hairy grama subcomponent. Similarly, the 2010, 1999, and 1974 Parker data indicate purple grama, sideoats grama, and hairy grama were main components of the cluster. The 1969 data differs, showing a strong blue grama component not seen in subsequent years. Wright eriogonum was the main shrub component of the 1969 and 1974 Parker data but was absent from the 1999 and 2010 Parker data. Wright eriogonum appears again in the 2020 dry-weight rank data as well as various other trees and shrubs that were not previously recorded including shrub live oak, mountain mahogany, and Emory oak. The increase in tree and shrub cover could be due to differences in protocols, with the dry-weight rank method sampling the broader area. It could also indicate woody recruitment at the site. Species diversity remained fairly static from 1969 to 2010, then increased from 2010 to 2020.

Table 191. Cluster 1– East summary, botanical composition (%), Parker 2 Step protocol, and dry-weight rank protocol

Growth form	Common name	Parker protocol				Dry-weight rank protocol 2020
		1969	1974	1999	2010	
G	White Mountain sedge	5	5	7	0	0
G	green sprangletop	5	1	2	1	0
G	blue grama	19	3	0	2	0
G	Halls panicum	11	0	0	0	0
S	Wright eriogonum	10	16	0	0	4
G	curly mesquite	1	1	0	0	0
S	beargrass	1	1	0	3	0
T	alligator juniper	4	0	0	0	2
F	wild buckwheat	7	0	10	0	0
G	hairy grama	0	24	37	2	15
G	common wolfstail	0	1	0	2	1

Growth form	Common name	Parker protocol				Dry-weight rank protocol 2020
		1969	1974	1999	2010	
S	broom snakeweed	0	1	0	0	0
G	purple grama	6	13	2	35	25
G	panicgrass	0	1	6	0	0
F	globemallow	1	0	1	0	3
G	little bluestem	0	0	1	0	0
G	sideoats grama	26	30	21	32	24
G	threeawn	0	0	3	9	6
T	Utah juniper	0	3	0	0	0
G	cane bluestem	0	0	1	0	5
G	plains lovegrass	0	0	0	3	0
G	sand dropseed	0	0	0	1	0
G	junegrass	0	0	0	1	0
G	bullgrass	0	0	0	2	0
G	mountain muhly	0	0	0	3	0
T	pinyon pine	0	0	0	1	0
S	shrub live oak	0	0	0	0	3
S	mountain mahogany	0	0	0	0	2
S	hedgehog cactus	0	0	0	0	1
S	cholla	0	0	0	0	1
T	Emory oak	0	0	0	0	6
G	slender grama	0	0	0	0	1
G	squirreltail	0	0	0	0	1

Table 192 shows the calculated similarity to the potential natural community described for the TES map unit. Despite the similarities in dominant grass species, the similarity to PNC has fluctuated between the low and mid similarity category with the 1969, 1974, and 1999 Parker data as well as the 2020 dry-weight rank data falling in the low similarity class while the 2010 Parker data fall in the mid similarity class. The primary driver for the increase in similarity to PNC in 2010 appears to be an increase in grass diversity recorded that year.

Table 192. Cluster 1 -East, plant community similarity to PNC as described in TES

	Similarity Index
1969 Parker Protocol	28
1974 Parker Protocol	33
1999 Parker Protocol	29
2010 Parker Protocol	38
2020 Dry-weight rank protocol	31

The 2020 points data show a decrease in the amount of bare soil and vegetation with a corresponding increase in litter cover compared to previous years data. Rock cover increased from the 2010 Parker data but remain in within historical levels. Percent frequency monitoring in 2020 shows annual grass or forb species present in 66% of the plots which is likely contributing to the increase in litter cover.

When comparing current conditions to the TES reference site, we see similarities in rock cover, while vegetation and bare soil are lower than expected and litter is higher than expected for the site.

Table 193. Cluster 1 – East pasture summary, ground cover (%)

	Parker protocol					2020 Points protocol	Reference condition from TES
	1954	1969	1974	1999	2010		
Vegetation	5	10	12	10	15	1	**10**
Rock	49	62	45	36	26	57	**65**
Litter	8	14	4	23	31	37	**10**
Bare soil	38	14	40	31	29	5	**20**

C1- East pasture trend summary

The plant community at C1 – East pasture is currently dominated by purple grama and sideoats grama with a hairy grama subcomponent. Comparative botanical composition data from 1969, 1974, 1999, and 2010 indicate that grama grasses have been main components of the cluster since the late 1960s. It appears blue grama cover decreased after 1969 and was replaced by hairy grama and purple grama. The 2020 dry-weight rank data shows an increase in tree and shrub cover which could be due to differences in protocols, with the dry-weight rank method sampling the broader area. It could also indicate woody recruitment at the site. Species diversity remained fairly static from 1969 to 2010, then increased from 2010 to 2020.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data shows abundant forage grasses and browse species with few undesirable species. A preponderance of evidence suggests a static trend due to similarities in dominant grass species as well as only slight fluctuations in similarity to PNC. Site protection attributes show low bare soil, and high rock cover which are contributing to a stable site. However, the decrease in vegetative cover and increase in rock cover appears to be partially due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. Annual species appear to also be contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes shows a slightly downward trend due to the decrease in vegetative cover.

Ecological Status: The 2020 dry-weight rank data as well as the 1969, 1974, and 1999 Parker 3 step data fall in the low similarity class while the 2010 Parker 3 step data fall in the mid similarity class. The fluctuation in similarity to PNC appears to be driven by grass diversity.

Cluster 2 (C2) – East pasture, TES map unit 480

Available data for Cluster 2 in the East pasture includes Parker 3 Step data from 1969, 1974, 1999, and 2010, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the site is strongly dominated by curly mesquite. The 1969, 1974, 1999, and 2010 Parker 3 step data also show curly mesquite as the dominant species. Sideoats grama has been present at the site all years. Wright eriogonum and blue grama have been present all years except 1999. The 2020 dry-weight rank data show an increase in shrub cover compared to previous years. Species diversity remained fairly static from 1969 to 1999, increased from 1999 to 2010, then remained static from 2010 to 2020.

Table 194. Cluster 2 – East summary, botanical composition (%), Parker 3 Step protocol, and dry-weight rank protocol

Growth form	Common name	Parker protocol				Dry-weight rank protocol 2020
		1969	1974	1999	2010	
G	curly mesquite	62	72	59	61	48
G	sideoats grama	8	12	1	15	3
G	blue grama	15	0	0	1	1
S	Wright eriogonum	4	2	0	3	13
S	agave	1	1	0	0	1
S	beargrass	4	1	0	1	12
S	broom snakeweed	6	3	0	0	1
G	hairy grama	0	9	10	7	0
F	wild buckwheat	0	0	26	0	0
G	panicgrass	0	0	1	0	0
S	prickly pear	0	1	0	0	0
G	common wolfstail	0	0	0	1	0
G	squirreltail	0	0	0	1	0
G	Halls panicum	0	0	0	3	0
G	bullgrass	0	0	0	1	0
G	green sprangletop	0	0	0	2	0
G	threeawn	0	0	3	3	0
T	oneseed juniper	0	0	0	1	2
S	shrub live oak	0	0	0	0	1
S	skunkbush	0	0	0	0	1
F	Cooley's bundleflower	0	0	0	0	1
F	globemallow	0	0	0	0	16

Table 195 shows the calculated similarity to the potential natural community described for the TES map unit. Despite the similarities in dominant grass species, the similarity to PNC has fluctuated between the low and mid similarity category with the 1974, and 2010 Parker 3 step data falling in the mid similarity class. The 1969 and 1999 Parker data, and the 2020 dry-weight rank data fall in the low similarity class. The fluctuation between the mid similarity class and the low similarity class appears to be driven by grama grass cover.

Table 195. Cluster 2 -East, plant community similarity to PNC as described in TES

	Similarity Index
1969 Parker Protocol	33
1974 Parker Protocol	38
1999 Parker Protocol	27
2010 Parker Protocol	45
2020 Dry-weight rank protocol	23

The 2020 points data shows a decrease in the amount of bare soil and vegetation with a corresponding increase in litter cover compared to previous years. Rock cover remained fairly static from 1954 to 2020. Fluctuations in ground cover could be partially due to differences in protocols or annual

precipitation which affect the amount of annual plant species contributing to litter cover. Percent frequency monitoring in 2020 shows annual forb species present in 99% of the plots which are likely contributing to the increase in litter cover and decrease in bare soil. When comparing current conditions to the TES reference site, we see similarities in bare soil cover, while vegetation and rock are lower than expected, and litter is higher than expected for the site.

Table 196. Cluster 2 – East pasture summary, ground cover (%)

	Parker protocol					2020 Points protocol	Reference condition from TES
	1954	1969	1974	1999	2010		
Vegetation	26	42	12	16	22	3	**10**
Rock	25	35	31	15	22	26	**65**
Litter	10	13	15	50	29	57	**5**
Bare soil	40	10	42	19	27	14	**20**

C2- East pasture trend summary

The plant community at C2 – East pasture is currently strongly dominated by curly mesquite. Comparative botanical composition data from 1969, 1974, 1999, and 2010 Parker 3 step protocol indicate that curly mesquite has dominated the site since the late 1960s. The 2020 dry-weight rank data indicates shrub and forb cover has increased from previous years. The increase in shrub cover could be due to differences in protocols, with the dry-weight rank method sampling the broader area. It could also indicate woody recruitment at the site. Species diversity remained fairly static from 1969 to 1999, increased from 1999 to 2010, then remained static from 2010 to 2020.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition although the data shows a decline in forage grasses and an increase in forb and shrub cover. A preponderance of evidence suggests a static or downward trend due to similarities in dominant grass species and diversity coupled with a decline in similarity to PNC. Site protection attributes show low bare soil, and high litter cover which are contributing to a stable site. However, the decrease in vegetative cover and increase in rock cover appears to be partially due to die off of perennial grass species from the dry period (less than 75% of average annual precipitation) in 2020. Annual species appear to also be contributing to the decrease in bare soil and increase in litter. A preponderance of evidence for site protection attributes shows a slightly downward trend due to the decrease in vegetative cover.

Ecological Status: The 2020 dry-weight rank data as well as the 1969 and 1999 Parker 3 step data fall in the low similarity class while the 1974 and 2010 Parker 3 step data fall in the mid similarity class. The decrease in similarity to PNC from 2010 to 2020 appears to be driven by the decrease in sideoats grama cover.

Cluster 3 (C3) – Deerhead East pasture, TES map unit 582

Available data for Cluster 3 in the East pasture includes Parker 3 Step data from 1969 and 1974, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicates the site is currently dominated by sideoats grama with a beargrass subcomponent. The 1969 and 1974 Parker 3 Step data differ, showing curly mesquite as the dominant species with only small components of sideoats grama. With the exception of sideoats grama and beargrass, there is little overlap in botanical composition among years. The 2020 data shows an increase in tree and shrub cover with beargrass and alligator juniper appearing for the first time. The increase in tree and shrub cover could be due to differences in protocols, with the dry-weight rank method sampling the broader area. It could also indicate woody

recruitment at the site. Species diversity remained fairly static from 1969 to 1974 then increased from 1974 to 2020.

Table 197. Cluster 3 – Deerhead East summary, botanical composition (%), Parker protocol and dry-weight rank protocol

Growth form	Common name	Parker protocol		Dry-weight rank protocol 2020
		1969	1974	
G	sideoats grama	6	16	38
G	hairy grama	2	2	0
S	desert ceanothus	1	0	0
G	curly mesquite	76	63	0
S	broom snakeweed	9	12	3
G	threeawn	0	1	4
G	common wolfstail	0	0	1
S	Wright eriogonum	1	2	0
S	honey mesquite	0	0	0
G	sprucetop grama	1	0	0
G	false grama	1	0	0
S	beargrass	1	1	15
T	alligator juniper	0	0	5
S	skunkbush	0	0	2
S	yucca	0	0	3
G	blue grama	0	0	4
G	squirreltail	0	0	6
G	junegrass	0	0	3
G	green sprangletop	0	0	1
G	bullgrass	0	0	3
G	Halls panicum	0	0	7
G	vine mesquite	0	0	3
F	Louisiana wormwood	0	0	3

Table 198 shows the calculated similarity to the potential natural community described for the TES map unit. Although the similarity to PNC has steadily increased, all similarity indices calculated for this cluster fall within the low similarity class. The increase in similarity to PNC appears to be driven by the increase in sideoats grama cover and the overall increase in species diversity.

Table 198. Cluster 3- Deerhead East, plant community similarity to PNC as described in TES

	Similarity Index
1969 Parker protocol	18
19774 Parker protocol	26
2020 Dry Weight Rank Protocol	31

The 2020 points data shows a strong decrease in the amount of bare soil with a corresponding increase in litter cover compared to previous years. Vegetative cover remained static from 1974 to 2020 while rock cover decreased slightly. Fluctuations in ground cover could be partially due to differences in protocols or annual precipitation which affect the amount of annual plant species contributing to litter

cover. Percent frequency monitoring in 2020 shows annual forb species present in 68% of the plots which is likely contributing to the increase in litter cover and decrease in bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative cover, while bare soil and rock are lower than expected, and litter is higher than expected for the site.

Table 199. Cluster 3 – Deerhead East summary, ground cover (%)

	Parker protocol		2020 Points protocol	Reference condition from TES
	1969	1974		
Vegetation	28	10	10	**15**
Rock	33	35	25	**65**
Litter	24	17	65	**5**
Bare soil	15	38	0	**20**

C3- Deerhead East pasture trend summary

The 2020 dry-weight rank data indicate that the current plant community at C3 – Deerhead East pastures is dominated by sideoats grama with a beargrass subcomponent. Comparative botanical composition data from the 1969 and 1974 Parker 3 step protocol show the cluster strongly dominated by curly mesquite. At some point between 1974 and 2020, species composition shifted away from curly mesquite to sideoats grama which was previously a smaller component of the cluster.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data shows abundant forage grasses with few undesirable species. Species composition has shifted from mostly curly mesquite dominated to a more diverse mixture of grasses. Overall, the preponderance of evidence suggests the overall trend is slightly upward due to an increase in species diversity and increase in similarity to PNC. The site protection attributes indicate an upward trend for site protection, with the amount of vegetative cover remaining similar to 1974 and bare soil decreasing.

Ecological status: The 2020 dry-weight rank data shows similarity to PNC has steadily increased from 1969 to 2020 although all indices fall in the low similarity class. This is primarily due to low grass diversity.

Pace 2 (P2) – Deerhead East pasture, TES map unit 130

Available data for Pace 2 in the Deerhead East pasture includes Parker 3 Step data from 1973 and 1999, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the site is dominated by sideoats grama and black grama, with a shrub live oak overstory. The 1999 Parker 3 step data also show sideoats grama as the dominant species with black grama and hairy grama as the subcomponent. The 1973 data differs slightly, showing sideoats grama as dominant, with hairy grama as the subcomponent. With the exception of sideoats grama, there is little overlap in species composition among years. The 2020 dry-weight rank data shows an increase in tree and shrub cover with shrub live oak, oneseed juniper, and pinyon pine occurring for the first time at the cluster. Species diversity has increased steadily from 1973 to 2020.

Table 200. Pace 2 – Deerhead East summary, botanical composition (%), Parker 3 Step protocol, and dry-weight rank protocol

Growth form	Common name	Parker Protocol		2020 Points protocol
		1973	1999	
G	sideoats grama	32	52	18

Growth form	Common name	Parker Protocol		2020 Points protocol
		1973	1999	
G	black grama	0	14	12
G	green sprangletop	0	3	0
G	curly mesquite	0	4	0
G	hairy grama	26	11	0
G	threeawn	0	6	1
S	beargrass	0	4	4
S	broom snakeweed	0	2	5
G	panicgrass	0	2	0
G	cane bluestem	0	2	0
G	plains lovegrass	8	0	0
G	little bluestem	2	0	0
G	blue grama	12	0	0
T	Utah juniper	4	0	0
S	mountain mahogany	0	0	3
F	dalea spp.	0	0	10
S	broom snakeweed	0	0	5
T	oneseed juniper	0	0	6
S	catclaw mimosa	0	0	3
T	pinyon pine	0	0	7
S	shrub live oak	0	0	23
S	skunkbush	0	0	2
S	yucca	0	0	2

Table 201 shows the calculated similarity to the potential natural community described for the TES map unit. All calculated similarity indices fall in the low similarity class. Similarity to PNC decreased from 1999 to 2020 which is primarily due to the absence of hairy grama in the 2020 data.

Table 201. Pace 2 – Deerhead East, plant community similarity to PNC as described in TES

	Similarity Index
1973 Parker protocol	29
1999 Parker protocol	30
2020 Points protocol	24

The 2020 points data shows a strong decrease in the amount of bare soil with a corresponding increase in litter cover compared to previous years. Rock cover remained fairly similar to the 1999 Parker data while vegetation decreased slightly. Fluctuations in ground cover could be partially due to differences in protocols or annual precipitation which affect the amount of annual plant species contributing to litter cover. Percent frequency monitoring in 2020 shows annual forb species present in 45% of the plots which may be contributing to the increase in litter cover and decrease in bare soil. When comparing current conditions to the TES reference site, we see similarities in vegetative cover, while bare soil and rock are lower than expected, and litter is higher than expected for the site.

Table 202. Pace 2 – Deerhead East summary, ground cover (%)

	Parker protocol			Points protocol 2020	Reference condition from TES
	1954	1973	1999		
Vegetation	16	4	8	2	**5**
Rock	17	64	28	22	**65**
Litter	6	0	27	74	**5**
Bare soil	61	32	37	3	**25**

P2 – Deerhead East pasture trend summary

The plant community at P2 – Deerhead East pasture is currently dominated by sideoats grama and black grama, with a shrub live oak overstory. Comparative botanical composition data from the 1999 and 1973 Parker 3 step protocol also show sideoats grama as the dominant species. While the 1999 data shows black grama as the subcomponent, the 1974 data shows hairy grama as the subcomponent. The 2020 dry-weight rank data shows a strong increase in tree and shrub cover. This could be due to differences in protocols, with the dry-weight rank method sampling the broader area, or it could indicate woody recruitment at the site. Species diversity has increased steadily from 1973 to 2020.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition although forage grasses appear to be decreasing while overstory species are increasing. Overall, the preponderance of evidence suggests the overall trend is slightly downward due to the decrease in grass cover and decrease in similarity to PNC. The site protection attributes show low bare soil and high litter cover which are contributing to a stable site. The decrease in vegetation and increase in litter may be due to annual forbs or could indicate die off of perennial vegetation. However, annual forbs are not as abundant in P2 than seen elsewhere in the allotment. The site protection attributes indicate a slightly downward trend due to the decrease in vegetative cover.

Ecological Status: All calculated similarity indices fall in the low similarity class. Similarity to PNC has decreased from 1999 to 2020 which is primarily due to the absence of hairy grama in the 2020 data.

Pace 4 (P4) – Ryolite pasture, TES map unit 130

Available data for Pace 4 in the Ryolite pasture includes Parker 3 Step data from 1973 and 1999, and dry-weight rank data from 2020. The 2020 dry-weight rank data indicate the current plant community is dominated by curly mesquite with a sideoats grama subcomponent. The 1999 and 1973 Parker 3 step data differ, showing sideoats grama as the most abundant species. Curly mesquite does not appear in the 1999 data but was 12% of the cluster in 1973. The 2020 dry-weight rank data shows an increase in mesquite shrub cover. Species diversity has remained fairly static between 1973 and 2020.

Table 203. Pace 4 – Ryolite summary, botanical composition (%) Parker 3 Step protocol, and dry-weight rank protocol

Growth form	Common name	Parker protocol		Dry-weight rank protocol 2020
		1973	1999	
T	oneseed juniper	0	0	3
S	cholla	4	0	1
G	threeawn	0	24	0
G	sideoats grama	32	42	13
G	blue grama	0	6	8
G	purple grama	0	0	1

Growth form	Common name	Parker protocol		Dry-weight rank protocol 2020
		1973	1999	
G	curly mesquite	12	0	54
S	mesquite	4	0	20
G	common wolfstail	0	1	0
G	hairy grama	0	8	0
G	sand dropseed	0	2	0
G	mat muhly	0	7	0
G	White Mountain sedge	0	9	0
S	prickly pear	8	1	0
G	cane bluestem	8	0	0
S	Wright's beebrush	8	0	0
S	broom snakeweed	8	0	0

Table 204 shows the calculated similarity to the potential natural community described for the TES map unit. All calculated similarity indices fall in the low similarity class. Similarity to PNC increased from 1973 to 1999 then subsequently decreased from 1999 to 2020. The decrease in similarity from 1999 to 2020 is primarily driven by the absence of hairy grama.

Table 204. Pace 4 – Ryolite plant community similarity to PNC as described in TES

	Similarity Index
1973 Parker protocol	17
1999 Parker protocol	29
2020 Dry-weight rank protocol	22

The 2020 dry-weight rank data show a decrease in the amount of bare soil and vegetative cover with a corresponding increase in rock cover. Litter decreased slightly from 1999 to 2020. Percent frequency monitoring in 2020 shows annual grass or forb species present in 97% of the plots which may be contributing to the decrease in bare soil. However, we do not see the corresponding increase in litter cover seen at other clusters in the allotment. When comparing the 2020 data to the TES reference site, we see similarities in vegetative cover and rock cover, while litter is higher and bare soil is lower than expected for the site.

Table 205. Pace 4 – Ryolite summary, ground cover (%)

	Parker protocol		2020 Points protocol	Reference condition from TES
	1973	1999		
Vegetation	4	10	2	**5**
Rock	60	26	50	**65**
Litter	4	49	40	**5**
Bare soil	32	15	8	**25**

P4 – Ryolite pasture trend summary

The plant community at P4 – Ryolite pasture is currently dominated by curly mesquite with a sideoats grama subcomponent. The 1973 and the 1999 Parker 3 step data differ, showing sideoats grama as the dominant species. At some point between 1999 and 2020 sideoats grama decreased while curly

mesquite increased. It's unclear what caused this shift in species composition. The 2020 data shows an increase in mesquite shrub cover. Species diversity remained fairly static between 1973 and 2020.

Apparent trend: The current vegetative composition of the site appears to be in satisfactory condition. Botanical composition data shows abundant forage grasses and browse species with few undesirable species. A preponderance of evidence suggests a static trend due to similarities species diversity as well as only slight fluctuations in similarity to PNC. Site protection attributes show low bare soil, and high rock cover which are contributing to a stable site. Annual species appear to be contributing to the decrease in bare soil. However, we do not see the corresponding increase in litter cover seen at other clusters in the allotment. A preponderance of evidence for site protection attributes shows a slightly downward trend due to the decrease in vegetative cover.

Ecological Status: All calculated similarity indices fall in the low similarity class. Similarity to PNC has decreased from 1999 to 2020 which is primarily due to the absence of hairy grama in the 2020 data.

Utilization monitoring data

On the Tule allotment the annual operating instructions for the past two years (2020-2021) have identified allowable use standards ranging from 30 to 40 percent, allotment-wide except for the Deerhead East pasture in 2020 which was had an allowable use of 0 to 30 percent. Prior to 2020, allowable use standards were slightly higher at 35 to 45 percent allotment-wide. Table 206 displays a summary of the utilization monitoring conducted on the Tule allotment since 2010. The 'percentage of permitted use' line is included in the table to display the yearly stocking level as a percentage of that identified on the term grazing permit. Utilization monitoring normally occurs within two weeks before or after pasture move dates, and after the summer growing season. All of the observations were at or below the allowable use standard with the exception of the Ryolite pasture in 2011.

Table 206. Utilization monitoring

Pasture	2020	2019	2015	2012	2011	2010	2007	2006	2005	2004	2003
Percentage of permitted use, allotment-wide	**64%**	**100%**	**86%**	**92%**	**94%**	**87%**	**74%**	**68%**	**60%**	**47%**	**26%**
Deerhead East	10%*	23%*			17%*	23%*	13%*	29%*	25%*	14%*	16%*
Deerhead West				11%*		10%*	10%*	24%*	13%*	16%*	7%*
Deerhead Trap		40%				15%	5%	12%		27%	8%
East	15%*	36%*	30%*			15%*	10%*	19%*	20%*		28%*
Ryolite		30%	35%*	45%*	48%*	26%	21%*	37%*	17%*	24%*	16%*
Tule Creek		15%	20%	25%	35%						

Structural improvements

Structural improvements include fences, stock tanks, wells, troughs and corrals. The responsibility for the maintenance of these improvements is assigned to the grazing permittee in the term grazing permit. Most of these improvements on the Tule allotment are in functional condition although some may need maintenance or reconstruction in the next few years. The annual operating instructions identify which improvements need replacement or reconstruction each year.

Table 207. Range Improvement Points

Range Improvement Name	Improvement Type
Deerhead Corral	Corral
Greys Peak Corral	Corral
HL Corral	Corral
Saddle Corral	Corral
Salt Ground Corral	Corral
Sawmill Chute Corral	Corral
Wagon Corral	Corral
Ben Tank	Intermittent Stock Tank
Butcherknife Tank	Intermittent Stock Tank
Cistern Tank	Intermittent Stock Tank
Cragget Dam	Intermittent Stock Tank
Deerhead Ranch Tanks	Intermittent Stock Tank
Deerhead Ranch Tanks	Intermittent Stock Tank
Deerhead Tank #2	Intermittent Stock Tank
Deerhead Tank 2	Intermittent Stock Tank
HL Saddle Tank	Intermittent Stock Tank
Horse Pasture Tank	Intermittent Stock Tank
Lower Cistern Dam	Intermittent Stock Tank
Lower Sunburn Tank	Intermittent Stock Tank
Pot Tank	Intermittent Stock Tank
Rattlesnake Tank	Intermittent Stock Tank
Red Tank	Intermittent Stock Tank
Stove Tanks	Intermittent Stock Tank
Stove Tanks	Intermittent Stock Tank
Trade 1	Intermittent Stock Tank
Trade 2	Intermittent Stock Tank
Trade 3	Intermittent Stock Tank
Trap Tanks	Intermittent Stock Tank
Tule Tank	Intermittent Stock Tank
Tule Tank #1	Intermittent Stock Tank
Upper Open Draw Tanks	Intermittent Stock Tank
Upper Open Draw Tanks	Intermittent Stock Tank
Upper Sunburn Tank	Intermittent Stock Tank
Webster Tank 2	Intermittent Stock Tank
Willow Tank	Intermittent Stock Tank
Benchmark Tank #1	Perennial Stock Tank
Blue Tank	Perennial Stock Tank
Cistern Canyon Tank	Perennial Stock Tank
Distill Tank	Perennial Stock Tank
Javelina Tank	Perennial Stock Tank

Juniper Tank	Perennial Stock Tank
Mule Canyon Tank	Perennial Stock Tank
Rock Tank	Perennial Stock Tank
Saltground tank	Perennial Stock Tank
Slide-In Tank	Perennial Stock Tank
Tule Tank	Perennial Stock Tank
Tule Tank #2	Perennial Stock Tank
White Tank	Perennial Stock Tank
Cottonwood Spring	Spring Well Development
Lower Distill Spring	Spring Well Development
Tom Spring	Spring Well Development
Upper Distill Spring	Spring Well Development

Existing condition summary

Long term trend data is available for the East, Deerhead East, and Ryolite pastures. Overall, the clusters in the Tule allotment show satisfactory conditions with three of the five clusters showing static or upward trends. Cluster 2 in the East pasture and Pace 2 in the Deerhead East pasture are showing slight downward trends due to a decrease in grass cover and decrease in similarity to PNC. All clusters fall in the low or mid similarity class to potential natural community. The primary driver for those that fall in the low similarity category is low grass diversity. Most clusters show an increase in tree cover compared to previous readings which could be contributing to decreases in grass cover.

Table 208. Tule cluster vegetative trends

Cluster	Vegetative Trend
C1 - East	static
C2 - East	static or downward
C3 – Deerhead East	upward
P2 – Deerhead East	downward
P4 - Ryolite	static

Overall, the 2020 site protection data show significant decreases in bare soil and increases in litter. The majority of cluster also show declining vegetative cover. The 2020 clusters were read during a severe dry period (less than 75% of average annual precipitation) and the vegetation was documented as showing die off due to the drought. This likely contributed to the decrease in vegetative cover and increase in litter cover, as the live perennial vegetation transitioned to standing litter. An abundance of annual forbs at some clusters appears to be influencing the significant decreases in bare soil as standing litter occupies any available soil. Trends for four of the five clusters were static or downward primarily due to decreases in vegetative cover. C3 is the only site showing an upward trend for site protection.

Table 209. Tule cluster site protection trends

Cluster	Site Protection Trend
C1 - East	downward
C2 - East	downward
C3 – Deerhead East	upward
P2 – Deerhead East	downward
P4 - Ryolite	downward

Monitoring shows utilization has been at or below the allowable use standard of 30 to 40 percent with the exception of the Ryolite pasture in 2011 which was only slightly over. However, the allotment has

been stocked at levels slightly lower than permitted levels since 2010. Actual use from 2010 through 2021 averaged 1,142 AUMs or 81 percent of permitted.

Structural range improvements are being maintained, replaced or reconstructed as needed (as identified in the annual operating instructions).

Desired Conditions

Forest-wide Direction

Livestock Grazing

The following are the broad, overarching desired conditions for livestock grazing identified in the Land Management Plan for the Apache-Sitgreaves National Forests (USDA FS 2015):

- Livestock grazing contributes to the social, economic, and cultural diversity and stability of rural communities.
- Livestock grazing and associated activities occur such that healthy, diverse plant communities, satisfactory condition soils, and wildlife habitat are maintained or improved.
- Range developments for livestock minimize impacts to wildlife and blend with the natural environment.
- Livestock grazing is in balance with available forage (i.e., grazing and browsing by authorized livestock, wild horses, and wildlife do not exceed available forage production within established use levels).
- Livestock grazing and associated activities do not negatively impact cultural resources.

In addition to desired conditions, standards for livestock grazing identified in the Land Management Plan for the Apache-Sitgreaves

- New or reconstructed fencing shall allow for wildlife passage, except where specifically intended to exclude wildlife (e.g., elk fencing)
- New livestock watering facilities shall be designed to allow wildlife access and escape

Guidelines for Livestock Grazing

- During maintenance of existing watering facilities, escape ramps that are ineffective or missing should be replaced.
- Critical areas should be managed to address the inherent or unique site factors, condition, values, or potential conflicts associated with them.
- Grazing use on seasonal allotments should be timed to the appropriate plant growth stage and soil moisture.
- New livestock troughs, tanks, and holding facilities should be located out of riparian areas to reduce concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.

- As areas are mechanically treated or burned, or after large disturbances, timing of livestock grazing should be modified as needed, in order to move toward desired conditions and to accomplish the objectives for the treatment or disturbed area.

- Forage, browse, and cover needs of wildlife, authorized livestock, and wild horses should be managed in balance with available forage so that plants providing for these needs remain at or move toward a healthy, persistent state.

- Efforts (e.g., temporary fencing, increased herding, herding dogs) should be made to prevent transfer of disease from domestic sheep and goats to bighorn sheep wherever bighorn sheep occur. Permit conversions to domestic sheep or goats should not be allowed in areas adjacent to or inhabited by bighorn sheep.

- To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones.

- To prevent resource damage (e.g., stream banks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time).

- Constructed features should be maintained to support the purpose(s) for which they were built. Constructed features should be removed when no longer needed.

- New range developments should be located to minimize impacts to scenic resources and reduce the potential for vandalism and livestock-vehicle conflicts. Range developments should be designed in consideration of public safety, especially in areas of concentrated recreation use.

Management Direction

The Land Management Plan for the Apache-Sitgreaves National Forests (USDA FS 2015) expresses desired conditions in broad, general terms that are timeless in that there is no specific date by which they are to be completed. It also notes that desired conditions may only be achievable over a long timeframe (in some cases, several hundred years). In some cases, a desired condition matches the current condition, so the goal is to maintain the existing condition. Desired conditions as identified in the Land Management Plan are aspirations and are not commitments or final decisions approving projects.

To be consistent with the desired conditions of the Land Management Plan, a project or activity, when assessed at the appropriate spatial scale described in the plan (e.g., landscape scale), must be designed to meet one or more of the following conditions:

- Maintain or make progress toward one or more of the desired conditions of a plan without adversely affecting progress toward, or maintenance of, other desired conditions; or

- Be neutral with regard to progress toward plan desired conditions; or

- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward or maintenance of one or more desired conditions in the short term; or

The following are the broad, overarching desired conditions for livestock grazing identified in the Land Management Plan for the Apache-Sitgreaves National Forests (USDA FS 2015):

- Livestock grazing contributes to the social, economic, and cultural diversity and stability of rural communities.
- Livestock grazing and associated activities occur such that healthy, diverse plant communities, satisfactory condition soils, and wildlife habitat are maintained or improved.
- Range developments for livestock minimize impacts to wildlife and blend with the natural environment.
- Livestock grazing is in balance with available forage (i.e., grazing and browsing by authorized livestock, wild horses, and wildlife do not exceed available forage production within established use levels).
- Livestock grazing and associated activities do not negatively impact cultural resources.

Management Areas

The allotments in this project area fall into four management areas: General Forest, Natural Landscape, Wilderness, and Primitive Area. The Land Management Plan (USDA FS 2015) identifies the following applicable desired conditions for these management areas:

General Forest (applicable to AD Bar Hogtrail, Baseline-Horsesprings, Double Circle, East Eagle, Mesa, and Mud Springs allotments)

- Watershed condition rating is at satisfactory.
- Landscapes in the General Forest Management Area vary from moderately altered where human activities are evident (low scenic integrity) to natural where generally only ecological changes occur (very high scenic integrity).

Natural Landscape (applicable to all allotments)

- Succession, fire, insects, disease, floods, and other natural processes and disturbance events primarily shape the composition, structure, and landscape patterns of the vegetation (although management activities may also have a minor influence).
- These areas contribute to ecosystem and species diversity and sustainability; serve as habitat for plants and animals; and offer wildlife corridors, reference areas, primitive and semi primitive nonmotorized recreation opportunities, and places for people seeking natural scenery and solitude.
- Landscapes vary from natural appearing where human activities do not stand out (high scenic integrity) to natural where generally only ecological changes occur (very high scenic integrity), except as described below.

Primitive Area (applicable to AD Bar Hogtrail allotment)

- The Blue Range Primitive Area and presidential recommended additions maintain natural landscapes where generally only ecological changes occur (very high scenic integrity) and provide primitive recreation opportunities, except along the designated road (36 CFR § 293.17(a)).

- All wilderness desired conditions also apply to the entire Blue Range Primitive Area until congressional action has been taken.

Wilderness(applicable to East Eagle allotment)

- Ecological conditions are affected primarily by natural ecological processes, with the appearance of little or no human intervention.
- Fire functions as a natural ecological process.
- There is little evidence of human developments and little or no evidence of camping activity, unauthorized trails, trash, or other human impacts on the environment.
- Visitor use does not affect wilderness characteristics.
- Wilderness boundaries are posted and visible to visitors.
- There are unconfined opportunities for exploration, solitude, risk, and challenge. The nonmotorized trail system enhances the wilderness character. Where there is public demand, outfitters and guides provide services to visitors seeking a wilderness experience.
- Bear Wallow Wilderness provides outstanding opportunities for solitude and isolation. Encounters with small groups or individuals are infrequent.
- Within Mount Baldy and Escudilla Wilderness areas, trails concentrate use and provide access to popular destinations. Encounters with other users may occur.
- Wilderness areas maintain natural landscapes where generally only ecological changes occur (very high scenic integrity) and provide primitive and/or semi primitive nonmotorized recreation opportunities.
- Wilderness contributes to preserving natural behaviors and processes that sustain wildlife populations.

Potential Management Opportunities

To move the existing conditions towards the desired conditions an adaptive management strategy for livestock grazing should be used. This would be in compliance with Regional Forester direction provided in FSH R3-2209.13, Chapter 90 (USDA FS 2016). The following are suggested as initial actions of that strategy:

- Incorporate an allowable use standard of conservative, 31-40 percent, as defined in FSH R3-2209.13 (USDA FS 2016);
- Continue the existing grazing management of rotating the cattle grazing through the pastures in a manner that allows growing season deferment for each pasture, with a rotation schedule that allows for flexible use in response to resource conditions, management needs, and monitoring results;
- Continue periodic allotment inspections and utilization monitoring;
- Conduct long-term trend monitoring every 7 to 10 years, incorporating site potential data (i.e. Terrestrial Ecosystem Unit Inventory or Ecological Site Descriptions) as they become available.
- Improve livestock distribution by adding water systems to existing developments.
- Add capacity to existing allotments by modifying allotment or pasture boundaries

Project-specific desired conditions

The overarching desired condition for the Eagle Creek allotments is rangeland conditions that are stable or improving. Rangeland conditions are considered stable or improving when species composition and site protection indicators (such as ground cover) are similar to what is expected for the site based on the current understanding of plant community dynamics, or are trending upwards.

Additional desired conditions specific to livestock grazing on the allotments:

- Forage utilization is at a level that indicates the allotment is stocked within its inherent capacity, allowing for the maintenance of stable or improving rangeland conditions.
- Grazing management is flexible enough to allow for adjustments based on the availability of forage and water, while incorporating grazing deferment during the growing season.
- Range structural improvements are maintained in functioning condition. Any additional range structural improvements needed for improved grazing management are constructed as funds are available.

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Appendix A – Scientific names

Common name	Scientific name	Growth form*
agave	Agave spp.	S
alligator juniper	Juniperus deppeana	T
American vetch	Vicia americana	F
annual brome	Bromus spp.	G
annual forb		F
annual muhly	Muhlenbergia minutissima	G
annual panicum	Panicum ssp	G
annual sunflower	Helianthus annuus	F
Arizona fescue	Festuca arizonica	G
Arizona rosemallow	Hibiscus biseptus	F
Arizona white oak	Quercus arizonica	T
aster	Aster spp	F
aster	Aster spp	F
beargrass	Nolina sp	S
big bluestem	Andropogon gerardii	G
big squirreltail	Elymus multisetus	G
black grama	Boutloua eripoda	G
blue grama	Bouteloua gracilis	G
bluestem	Andropogon spp	G
bristly wolfstail	Lycurus setosus	G
broom snakeweed	Gutierrezia sarothrae	S
brome	Broumus spp.	G
buckbrush	Ceanothus cuneatus	S
bullgrass	Muhlenbergia emersleyi	G
bush muhly	Muhlenbergia porteri	G
caliche globemallow	Sphaeralcea laxa	F
cane bluestem	Bothriochloa barbinodis	G
catclaw acacia	Acacia greggii	S
catclaw mimosa	Mimosa biunicifera	S
Chinese lantern	Quincula lobata	F
cholla	Cylindropuntia spp	S
cinquefoil	Potentilla spp.	F
cold-desert phlox	Phlox stanbergii	F
common wolfstail	Lycurus phleoides	G
Cooley's bundleflower	Desmanthus cooleyi	F
creeping muhly	Muhlenbergia repens	G
crested wheatgrass	Agropyron cristatum	G
curly mesquite	Hilaria belangeri	G
daisy desertstar	Monoptilon bellidiforme	F

deergrass	Muhlenbergia rigens	G
desert ceanothus	Ceanothus greggii	S
desert palafox	Palafoxia arida	F
desert parsley	Lomatium spp.	F
desert-thorn	Lycium brevipes	S
desert threeawn	Aristida hamulosa	G
desert tobacco	Nicotiana obtusifolia	F
devil's horsewhip	Achyranthes aspera	F
dropseed	Sporobolus spp	G
ear muhly	Muhlenbergia arenacea	G
elk sedge	Carex garberi	G
Emory oak	Quercus emoryi	T
Engelmann daisy	Engelmannia peristenia	F
euphorbia	Euphorbia spp	F
evolvulus	Evolvulus spp	F
false grama	Cathestecum erectum	G
false mesquite	Calliandra spp	F
featherplume	Dalea formosa	S
Fendlers ceanothus	Ceanothus fendleri	S
field goldeneye	Viguiera phenas	F
flame flower	Talium spp.	F
fleabane	Erigeron spp	F
fluffgrass	Tridens buckleyanus	G
fourwing saltbrush	Atriplex canescnes	S
Gambel oak	Quercus gambelii	T
galleta	Hilaria jamesii	G
globemallow	Sphaeralcea angustiolia	F
globemallow	Sphaeralcea spp	F
gray oak	Quercus grisea	T
green sprangletop	Leptochloa dubia	G
hairy grama	Bouteloua hirsuta	G
Halls panicum	Panicum hallii	G
hedgehog cactus	Echinocereus spp.	S
hog potato	Hoffmannseggia glauca	F
honey mesquite	Prosopis velutina	T
hymenopappus	Hymenopappus sp	F
intermediate wheatgrass	Thinopyrum intermedium	G
James galleta	Hilaria jamesii	G
javenlina bush	Condalia ericoides	S
junegrass	Koeleria macrantha	G
juniper	Juniperus spp	T
juniper	Juniperus spp	T

late purple aster	Symphyotrichum patens	S
Lehmann lovegrass	Eragrostis lehmanniana	G
little bluestem	Schizachyrium scoparium	G
little bluestem	Schizachyrium scoparium	G
longtongue muhly	Muhlenbergia longiligula	G
Louisiana wormwood	Artemisa ludoviciana	F
mat muhly	Muhlenbergia richardsonis	G
mesquite	Prosopis glandulosa	S
mesquite	Prosopis velutina	S
milkweed	Asclepias spp.	F
mountain mahogany	Cercocarpus montanus	S
mountain muhly	Muhlenbergia montana	G
muhly	Muhlenbergia spp	G
muhly	Muhlenbergia spp	G
mullein	Verbascum thapsus	F
mutton bluegrass	Poa fendleriana	G
needlegrass	Stipa spp	G
needle and thread	Hesperostipa comata	G
New Mexican muhly	Muhlenbergia pauciflora	G
nightshade	Solanum spp	F
nodding brome	Bromus anomalus	G
nut sedge	Cyperus spp.	G
oak	Quercus spp	S
oneseed juniper	Juniperus monosperma	T
panicgrass	Panicum spp.	G
pine dropseed	Blepharoneuron tricholepsis	G
pinyon pine	Pinus edulis	T
pinyon ricegrass	Piptochaetium fimbriatum	G
plains lovegrass	Eragrostis intermedia	G
ponderosa pine	Pinus ponderosa	T
poverty threeawn	Aristida divaricata	G
prickly pear	Opuntia spp	S
purple grama	Boutloua radicosa	G
purple threeawn	Aristida purpurea	G
rabbitbrush	Chrysthamnus spp	S
ragleaf bahia	Bahia dissecta	F
red brome	Bromus madritensis	G
red threeawn	Aristida longespica	G
ring muhly	Muhlenbergia torreyi	G
rose heath	Chaetopappa ericoides	F
sage	Artemisia	S
sand dropseed	Sporobolus cryptandrus	G

scarlet gaura	Gaura coccinea	F
sedge	Carex spp.	G
sego lily	Calochortus spp	F
shrub live oak	Quercus turbinella	S
sideoats grama	Bouteloua curtipendula	G
silver bluestem	Andropogon saccharoides	G
silverleaf nightshade	Solanum elaeagnifolium	F
silverleaf oak	Quercus hypoleucoides	T
single threeawn	Aristida orcuttiana	G
sixweeks threeawn	Aristida adscensionis	G
skunkbush	Rhus trilobata	S
slender grama	Bouteloua repens	G
slender sagebrush	Artemisia bigelovli	S
slim tridens	Tridens muticus	G
slimflower scurfpea	Psoralidium tenuiflorum	F
smooth brome	Bromus inermis	G
smooth barley	Hordeum murinum	G
soaptree yucca	Yucca elata	S
sotol	Dasylirion spp	S
southwestern needlegrass	Achnatherum eminens	G
spidergrass	Aristida ternipes	G
spike dropseed	Sporobolus contractus	G
spike muhly	Muhlenbergia wrightii	G
sprucetop grama	Bouteloua chondrosioides	G
spurge	Euphorbia spp.	F
squirreltail	Elymus elymoides	G
squirreltail	Sitanion hystrix	G
stinkgrass	Eragrostis cilianensis	G
sulphur Indian paintbrush	Castilleja sulphurea	F
sumac	Rhus spp	S
switchgrass	Panicum virgatum	G
Texas bluestem	Andropogon cirratus	G
thistle	Cirsium spp	F
threeawn	Aristida spp	G
tickclover	Desmodium spp.	F
tobosa	Hilaria mutica	G
trailing fleabane	Erigeron flagellaris	F
tulip pricklypear	Opuntia phaeacantha	S
turpentine bush	Isocoma	S
unidentified		
Utah juniper	Juniperus osteosperma	T
vetch	Astragalus spp.	F

vine mesquite	Panicum obtusum	G
weeping lovegrass	Eragrostis curvula	G
Wetherill’s buckwheat	Eriogonum wetherillii	F
wheatgrass	Elymus spp.	G
white arrowleaf aster	Symphyotrichum urophyllum	F
White Mountain sedge	Carex geophila	G
wild buckwheat	Eriogonum spp	F
wild onion	Allium spp.	F
wooly plantain	Plantago patagonica	F
Wright eriogonum	Eriogonum wrightii	S
Wright's globemallow	Sphaeralcea wrightii	F
Wright's silktassel	Garrya wrightii	S
yerba de pasmo	Baccharis pteronioides	S
yarrow	Achillea millefolium	F
yucca	Yucca spp	S

*S=shrub, F=forb, G=graminoid, T=tree