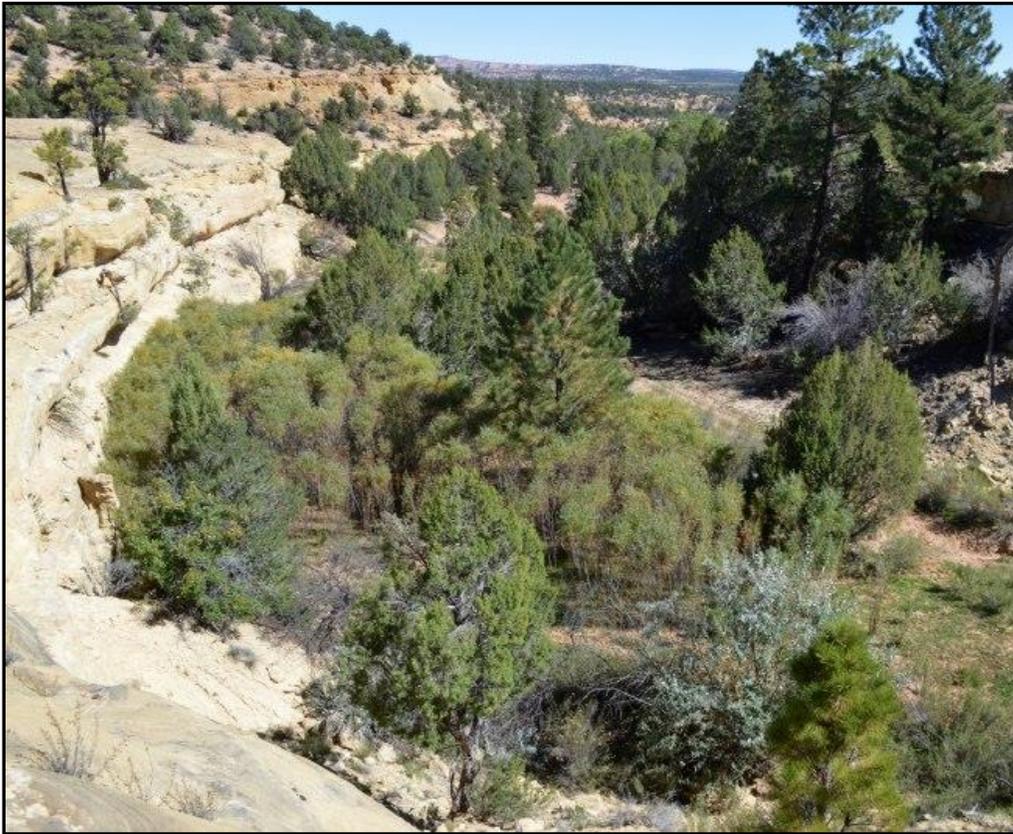


GRAND STAIRCASE-ESCALANTE NATIONAL MONUMENT (GSENM) ENCLOSURE REPORT

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Grand Canyon Trust
12/23/2013



I. GSENM and BLM Policies Regarding the Use of Reference Areas

Reference areas, for the purpose of this report, are described as areas that have been free from livestock grazing for at least ten years. Thus, a given reference area may never have been grazed by livestock, or may be changing after recent livestock grazing. Similarly, a given reference area may be accessible or inaccessible to wild ungulate grazing/browsing. There is no implication that reference areas are “pristine,” or that they are in better ecological condition than the surrounding lands currently grazed. The purpose of reference areas within GSENM is to compare ecological conditions in areas grazed by livestock with those not recently grazed by livestock in light of Bureau of Land Management (BLM) desired conditions for grazed lands.

Following direction within *Rangeland Reform '94; Final Environmental Impact Statement* (1994), the BLM developed and adopted *Fundamentals of Rangeland Health and Rangeland Health Standards* as mandatory requirements for livestock grazing management. The fundamentals of rangeland health are found at 43 CFR § 4180.1 and define desired conditions for BLM grazed lands:

- (a) Watersheds are in, or are making significant progress toward, properly functioning physical condition, including their upland, riparian-wetland, and aquatic components; soil and plant conditions support infiltration, soil moisture storage, and the release of water that are in balance with climate and landform and maintain or improve water quality, water quantity, and timing and duration of flow.
- (b) Ecological processes, including the hydrologic cycle, nutrient cycle, and energy flow, are maintained, or there is significant progress toward their attainment, in order to support healthy biotic populations and communities.
- (c) Water quality complies with State water quality standards and achieves, or is making significant progress toward achieving, established BLM management objectives such as meeting wildlife needs.
- (d) Habitats are, or are making significant progress toward being, restored or maintained for Federal threatened and endangered species, Federal proposed or candidate threatened and endangered species, and other special status species.

Standards and guidelines for grazing administration are designed to result in grazing meeting the Fundamentals of Rangeland Health. The standards and guidelines are found at 43 CFR § 4180.2 and in the BLM *Handbook* at H-4180-1. The BLM *Handbook* at I-7 describes “reference condition”:

In the context of an ecological site, reference condition is the condition which meets, or comes close to meeting, all relevant land health standards. In addition, the reference condition provides a set of indicators (and their appropriate range of values) to be used for the assessment of an equivalent ecological site (which will not necessarily be in reference condition). Reference conditions are provided in published Ecological Site Descriptions or in the records of Ecological Site Inventories and Soil Surveys.

In a more general multi-scale context, a reference condition will reflect and lie within the historic range of variability for environmental conditions, processes and functions, generally considered to have operated during the 1,000 year period immediately preceding Euro-American settlement. These environmental conditions, processes, and functions can be operative at different scales, from the fine-scale (e.g., organic matter content at the site specific scale) to the large-scale (e.g., plant community composition at the watershed or subbasin scale). [Emphasis added].

The BLM *Handbook* outlines the assessment, evaluation and determination process used to measure land health on BLM lands. Chapter III-4(b) describes the importance and need for identifying and using “reference conditions” when preparing for a rangeland health assessment. The handbook states,

“Reference conditions help you understand the rate, direction or magnitude of change occurring within a watershed. The known, or inferred, history of the landscape should be described in sufficient detail to determine what existed in the past and what changes have occurred that may affect current capabilities.”

Due to the history of over a hundred years of intense grazing and soil disturbance and the likely loss of particular species and species distributions, there is a lack of untouched, ungrazed, and undisturbed landscapes. Thus “pristine” reference areas can be difficult or impossible to locate and use. No Man’s Mesa within the GSENM is a relict area only grazed by goats for two seasons in the early 1920. Sites like these may not reflect the current potential for recovery in the absence of continued livestock grazing. However, recently ungrazed reference areas, even if grazed as recently as ten years ago, allow separation of impacts of drought and climate change (operating both within the reference area and in the grazed lands) from current livestock grazing, and from wild ungulate grazing in those reference areas that exclude wild ungulate.

Thus, in the absence of large areas of ungrazed lands in which to identify current potential conditions in the absence of livestock grazing, permanent exclosures that exclude livestock grazing are a partial substitute. They lack the size to allow for diverse habitats and species diversity recovery; they lack the ability to demonstrate ecosystem functions; they are subject to immediate seed dispersal, for instance of exotics, from the grazed site that surrounds the exclosure; and when poorly maintained, they are subject to trespass because of lack of attention, their small size, and lack of geographic barriers (e.g., a cliff) from the surrounding site. However, their small size can allow for multiple reference areas for certain features (e.g., ground cover, plant health, seedhead production) within an allotment, pasture or habitat type.

This report offers a brief inventory of the 2013 condition of 20 GSENM exclosure sites as documented by the Grand Canyon Trust (“Trust”). The BLM currently does not use GSENM exclosures to understand or gauge impacts from current livestock management practices. The only apparent use of livestock exclosures is for research purposes, generally by independent researchers, with the exception of the exclosure on the Five-Mile Mountain Allotment, which is being used to examine trends inside and outside the exclosure of a 2006 sagebrush treatment.

II. Methods of Exclosure Documentation

Exclosure sites with the Object ID 1-10 and 15 were taken from the rangeland improvements (RIP) GIS layer obtained from GSENM GIS specialist Eric Matranga. Exclosures 11, 12, 13 and 16 were identified through the assistance of Western Watersheds Ecosystems Specialist Laura Welp. Exclosures 17, 18 and 20 were found through field visits while looking for other exclosures, and exclosure 19 was described by Sean Stewart (Senior Range Conservationist, GSENM). Exclosure 14 was found while driving through Last Chance allotment on November

26, 2012. Exclosures were visited by Grand Canyon Trust employees and interns on eight field trips between November 26, 2012 and September 29, 2013.

A GPS Garmin 62sc unit was used to measure each exclosure from corner to corner with the exception of sites 1, 11, 13, and 14. Site 1 was measured with a 100' tape. Sites 13 and 14 were estimated for size on site and site 11 was measured using the ArcGIS measure tool. Exclosure fences were examined for places where the exclosure fence is no longer intact.

At each exclosure site, representative differences between conditions inside and outside the exclosure were documented and photographed including:

- Presence or absence of physical and biological soil crusts
- Presence or absence of seedheads and/or grass and forb inflorescences
- Pedestaling of grasses and shrubs
- Evidence or absence of erosion including water flow patterns, gullyng, rilling and debris flow
- Diversity of plant species (i.e., grasses, forbs and shrubs)
- Notable geographic or anthropogenic features in or near the exclosure area
- Indications of a past vegetation treatment or seeding (e.g., large amounts of woody debris, monoculture of crested wheat grass, disturbed soils)

III. GSENM Exclosure Inventory

A. Map of GSENM Exclosures

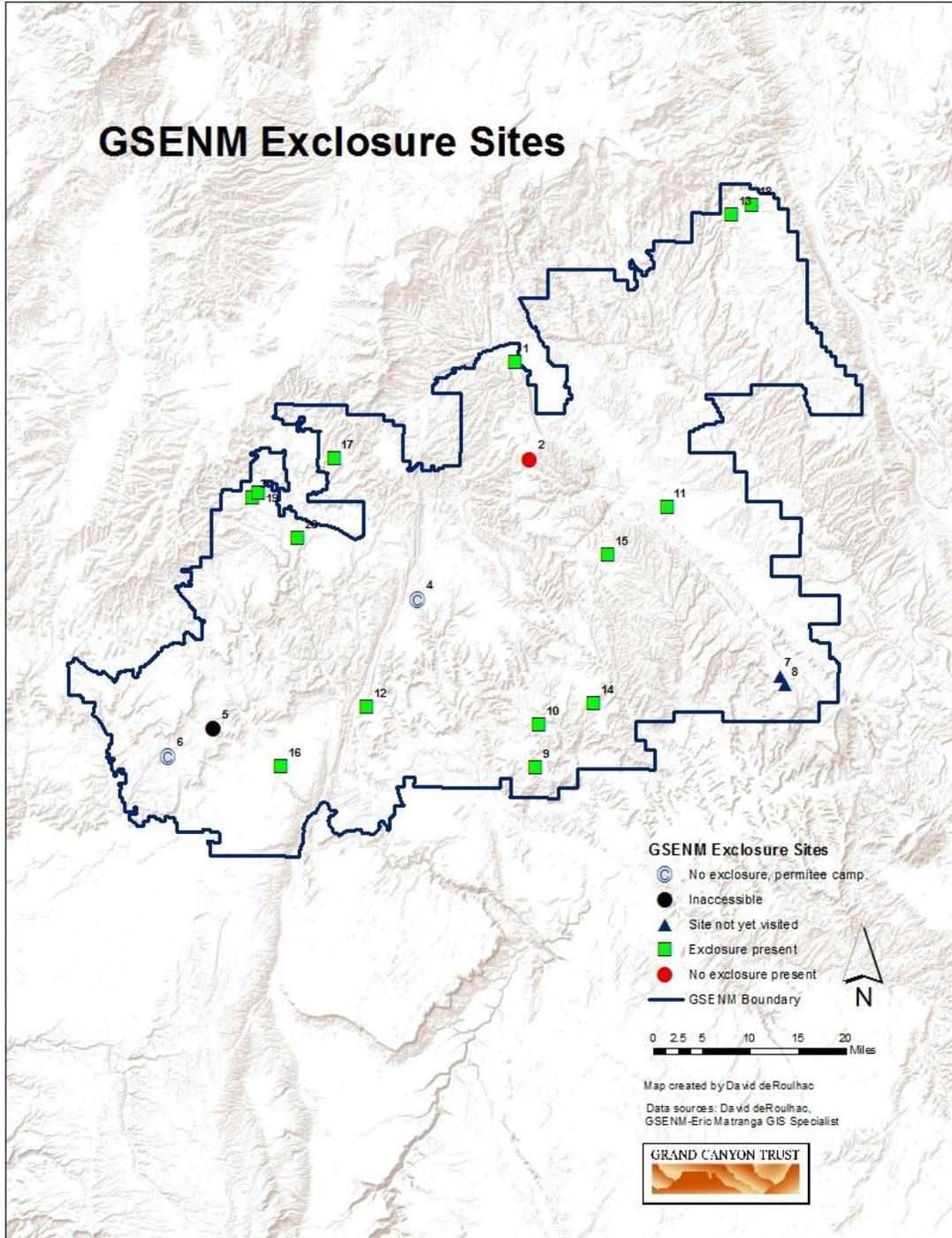


Fig. 1: Map of GSENM sites indicated as potentially having an exclosure.

B. Inventory of GSENM Exclosure Sites

Object ID^a	Exclosure present (Yes/NO)	Exclosure intact (Yes/No)	Allotment	Pasture	NAD 83 Easting	NAD 83 Northing	Estimated age of exclosure
01	Yes	Yes	Alvey Wash	Little Desert	444568	4178007	Unknown
02	No	N/A	Alvey Wash	Camp Flat	446991	4161768	Unknown
03	Yes	No. The exclosure appears to be in an old seeding and only one post is present.	Upper Paria	Mudholes	400704	4155389	Unknown
04	No	N/A	Headwaters	Wahweap Native	428282	4138365	Unknown
05	Inaccessible	N/A	Vermillion	Nephi Pasture	394223	4116773	Unknown
06	No, this a pernitee corral and camp.	N/A	Johnson Lakes	N/A	386739	4111984	Unknown
07	Not yet visited	N/A	Lake	Lake	488785	4125667	Unknown
08	Not yet visited	N/A	Lake	Lake	489544	4124144	Unknown
09	Yes	Yes	Nipple Bench	Nipple	447876	4110351	Unknown
10	Yes	Yes	Nipple Bench	Tibbet Bench	448526	4117470	Unknown
11	Yes	The fence is broken on the west side and the exclosure was grazed by cattle during the	Lower Cattle	Sunset Bench	469940	4153655	Unknown

		2013 season.					
12	Yes	Yes	Cottonwood	Brigham Plains	419730	4120446	Unknown
13	Yes	Yes	Circle Cliffs	Prospect	480655	4202631	Unknown
14	Yes	Yes	Last Chance	Winter	457600	4121088	Unknown
15	Yes	Yes, At least one cow was able to jump down into the exclosure this year as evidence by a single cowpie documented within the exclosure. However, minimal impacts were observed.	Last Chance	Summer	460146	4145764	Unknown
16	Yes	Yes	Five Mile Mountain	N/A	405548	4110424	Unknown
17	Yes	Yes	Upper Paria	Henrieville Creek	414339	4161829	Unknown
18	Yes	Yes	Circle Cliffs	Prospect	484164	4204159	Unknown
19	Yes	Yes. The exclosure is functional with no breaches. However, a pony was inside the exclosure on Sept. 27., 2013. The pony jumped the fence and ran	Upper Paria	Mudholes	401829	4156025	Unknown

		upon arrival and no photos were taken. Browse and trampling were photographed within the enclosure.					
20	Yes	Yes, but both gates were left open on Sept.28 when visited by the Trust and grazing had been occurring.	Upper Paria	Between the Creeks	408350	4148605	Unknown

Fig. 2: Exclosure sites identified within GSENM

^a Object ID is a list developed for this report.

C. Exclosure Site Documentation (December 15, 2013)

Exclosure Site 01			
Allotment: Alvey Wash	Pasture: Little Desert	Vegetation Type¹: Intermountain basin big sagebrush shrubland	Ecological Site Description²: Alkali Fan (Castle Valley saltbush)
Function and Size: The Alvey Wash exclosure is approximately 300' x 300'. The age of the exclosure is unknown. The exclosure is intact with no breaches. The exclosure is constructed of barbed wire and metal fence posts.	Interior Conditions: Soils inside the exclosure are not disturbed. The exclosure is dominated by squirrel tail and broom snakeweed. There is a cluster of diverse grass species in the NE corner comprised mostly of blue grama with scattered sand dropseed and alkali sacaton. Other species inside the exclosure include four-wing saltbush and Russian thistle.	Exterior Conditions: Soils outside the exclosure are trampled and disturbed. The outside of the exclosure is dominated by broom snakeweed, squirrel tail and to a lesser extent Russian thistle. The native sand dropseed, blue grama, and alkali sacaton grasses are non-existent outside the exclosure. Four-wing saltbush outside the exclosure is heavily browsed. Bare soils are increased outside of the exclosure.	

¹ [USGS] U.S. Geological Survey National Gap Analysis Program. 2004. Provisional Digital Land Cover Map for the Southwestern United States. Version 1.0. RS/GIS Laboratory, College of Natural Resources, Utah State University.

² United States Department of Agriculture. Natural Resource Conservation Service. Ecological Site Description for Rangeland and Forest Data. 2012. <https://esis.sc.egov.usda.gov/Welcome/pgApprovedSelect.aspx?type=ESD> [Accessed December 23rd, 2013]



Fig. 3: The highest amount of vegetation cover in the enclosure is found in the NW quadrant, where blue grama dominates. Blue grama, one of the last native grasses to remain with over-grazing, is almost completely absent outside the enclosure.

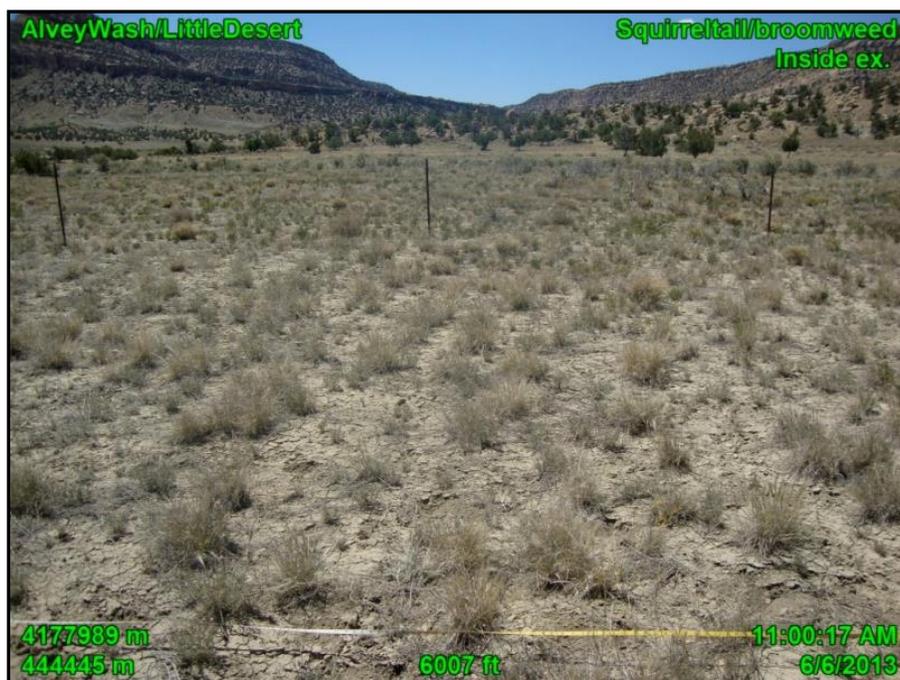


Fig. 4: Bare soils and squirrel tail dominate this area surrounding the enclosure in the northern part of Alvey Wash Allotment.



Fig. 5: Large patches of bare soil and broom snakeweed are present outside the enclosure.

Site 02			
Allotment: Alvey Wash	Pasture: Camp Flat	Vegetation Type: Recently- chained pinyon-juniper	Ecological Site Description: Upland shallow loam (Utah pinyon juniper)
Function and Size: No exclosure was located at this site identified by the BLM. The photos taken are from approximately 500 feet south of the coordinates given by the BLM because the coordinates for the site were on the edge of a pinyon-juniper woodland and big sagebrush.	Interior Conditions: N/A	Exterior Conditions: The site is a former pinyon-juniper vegetation treatment. The sagebrush understory is depauperate with excessive bare soils and pedestaled shrubs. Biological soil crust was absent at this site and dry compacted soils were widespread. The site is dominated by older, single age class sagebrush, broom snakeweed and occasional crested wheatgrass.	

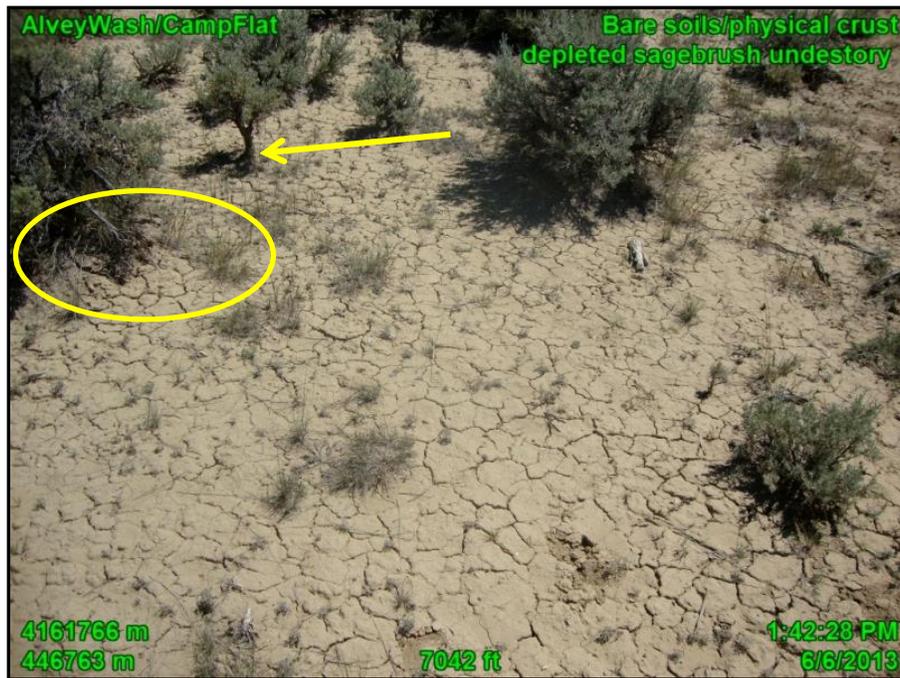


Fig. 6: A lack of diverse plant species; and physical crust that reduces infiltration and increases erosional runoff. Pedestaled sagebrush (arrow) and erosion under a sagebrush (oval) show soil loss due to erosion.

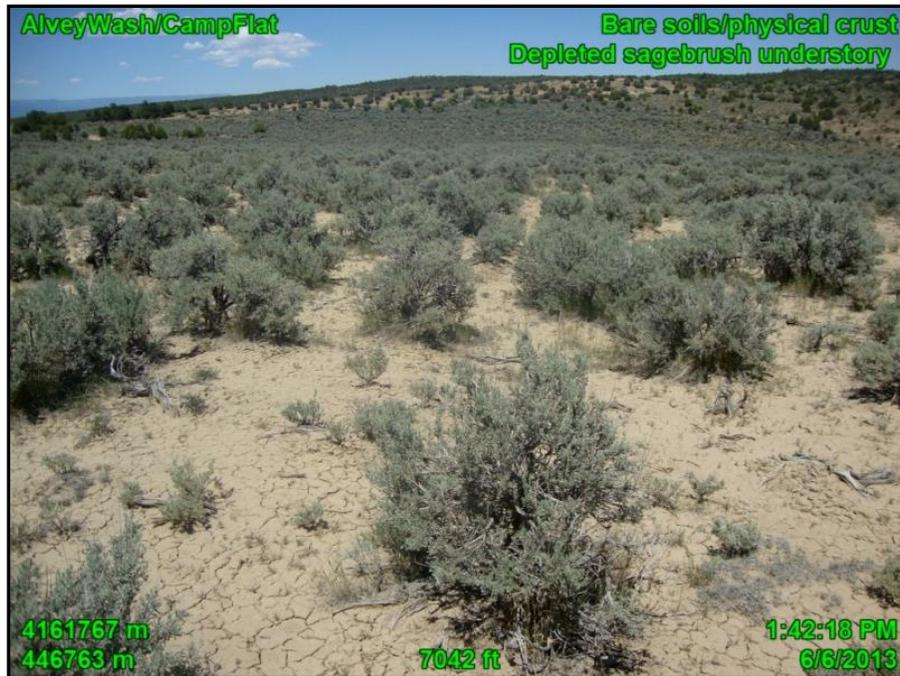


Fig. 7: Absence of plant diversity beneath and between sagebrush. Excessive physical soil crust was observed. Biological soil crust was not seen.

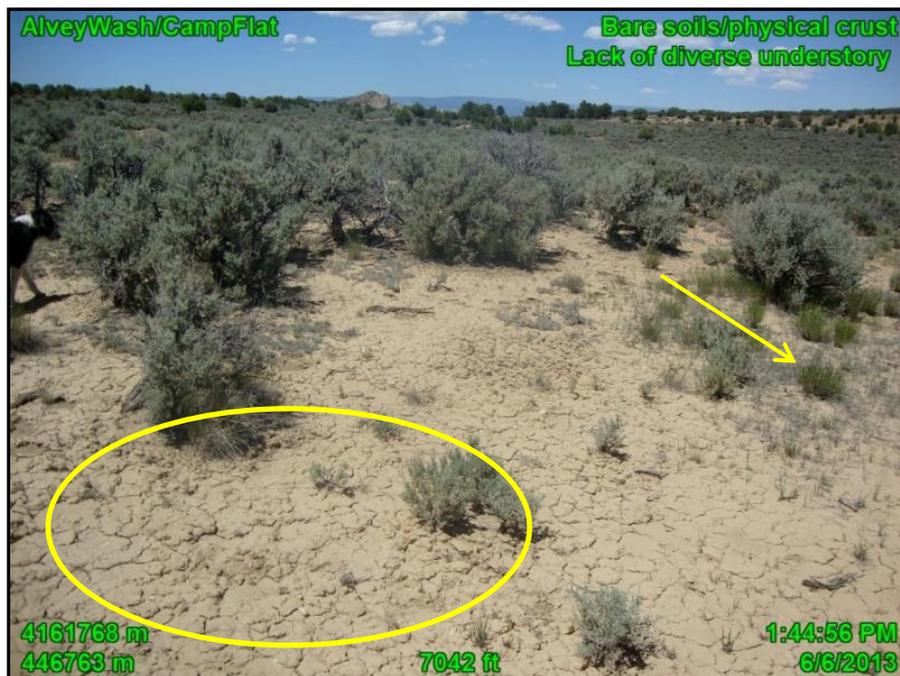


Fig. 8: Excessive bare soil with physical crust (oval). Broom snakeweed is in the right hand side of the picture (arrow).

Site 03			
Allotment: Upper Paria	Pasture: Mudholes	Vegetation Type: Agriculture	Ecological Site Description: 5195 (Ecological Site Description has not been developed)
Function and Size: This former enclosure, identified by the BLM, was approximately 500' x 500', covering approximately 5.7 acres. The age of the enclosure is unknown. All the wire has been torn down and approximately 200 posts remain.	Interior Conditions: The inside of the former enclosure is heavily grazed and approximately 10-20 cattle were observed within the perimeter. The vegetation inside the old enclosure boundaries is almost exclusively crested wheatgrass and big sagebrush.	Exterior Conditions: The surrounding landscape is pinyon-juniper and big sagebrush. The area around this former enclosure is heavily utilized with large areas of high disturbance, bare soils, and excessive utilization. A water development is approximately 250' SE of the enclosure boundary which is likely responsible for the excessive utilization.	



Fig. 9: Cattle grazing inside enclosure perimeter. One of the perimeter fence posts can be seen on the left (arrow).

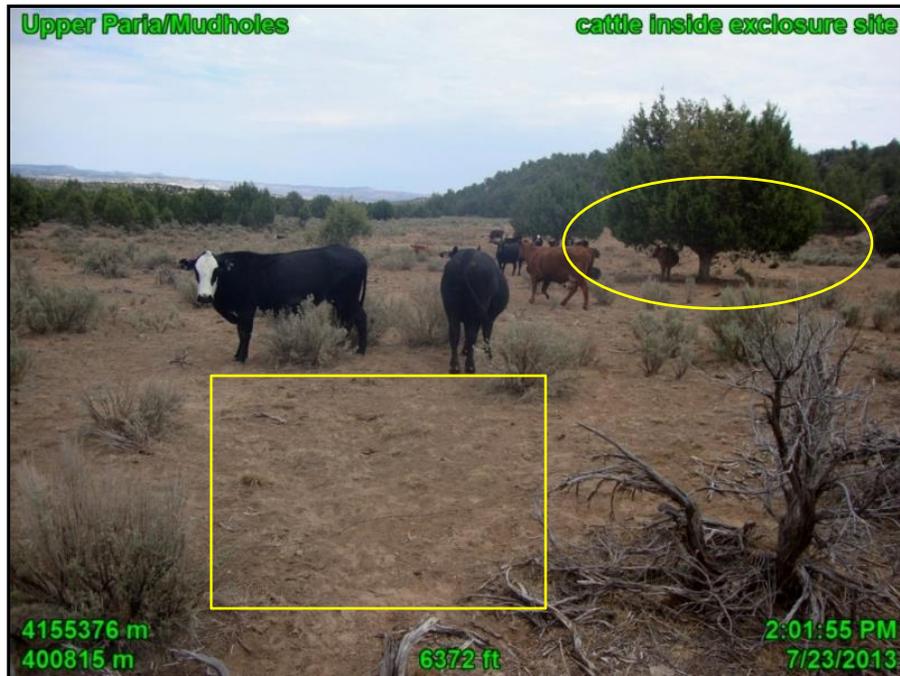


Fig. 10: Bare soils and excessive utilization (square) inside the exclosure perimeter. Note the juniper tree high-lined by browsing (circle).



Fig. 11: Sagebrush is scattered and younger within the exclosure perimeter (to the right of the fence.). The site is a former sagebrush removal and crested wheat grass seeding.

Site 04			
Allotment: Headwaters	Pasture: Wahweap	Vegetation Type: Colorado Plateau pinyon-juniper woodland-Rocky Mountain lower montane riparian woodland	Ecological Site Description: Loamy bottom (Greasewood)
Function and Size: No enclosure was present at the coordinate site provided by the BLM. An old cabin in the area is likely a permittee camp; a spring and riparian area are directly south of the site.	Interior Conditions: N/A	Exterior Conditions: Approximately 0.1 mile S of the cabin (down the wash) is a cottonwood gallery with moderate recruitment and a riparian area approximately 10-20 acres in size. The riparian area has been grazed within the last few seasons (presence of cow patties) and some bare soils are present. A variety of species is present with light browse on the cottonwood and patches of bare soils in the wetland. Species found in and around the wetland include Kentucky blue grass, fleabane, squirrel tail, and western wheatgrass with a variety of sedge and rush species.	



Fig. 12: Willow recruitment (oval) along Wahweap Creek south of the enclosure site.



Fig. 13: Large riparian area along Wahweap creek. There is a diversity of wetland species including sedge and rush species with moderate browse.

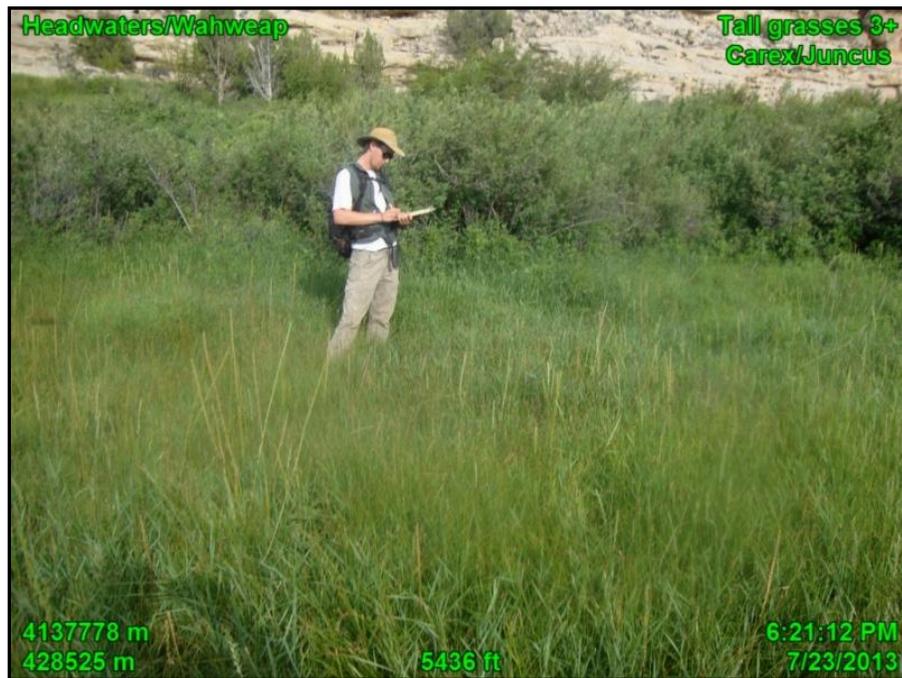


Fig. 14: Tall riparian graminoids along Wahweap Wash.

Site 06			
Allotment: Johnson Lakes	Pasture: N/A	Vegetation Type: Intermountain basin big sagebrush shrubland	Ecological Site Description: Upland sand Utah pinyon-juniper
Size and Function: No enclosure was found at the coordinates provided by the BLM. The coordinates identified a site approximately 500 feet east of a cabin and corral.	Interior Conditions: N/A	Exterior Conditions: The site for which coordinates were given is in a pinyon-juniper treatment with large woody debris still present and what appears to be a wheatgrass seeding. Other species in the area include broom snakeweed, globemallow, Russian thistle, and sand sage. Photos were taken approximately 0.25 miles north of the cabin.. Biological soil crust is lacking and heavy sheet erosion and pedestaling of vegetation are present	



Fig. 15: Crested wheatgrass pedestaled $\geq 2''$.



Fig. 36: Broom snakeweed inside an old pinyon-juniper/sagebrush treatment. Large amounts of woody debris and occasional crested wheat grass.



Fig. 47: Sheet erosion in an area with very little slope is the result of bare soils and a lack of biological soil crust and/or reduced vegetation cover.

Exclosure Site 09			
Allotment : Nipple Bench	Pasture: Nipple Bench	Vegetation Type: Blackbrush-Mormon tea shrubland	Ecological Site Description: Semi-desert sandy loam (blackbrush)
Size and Function: This exclosure is 25' x 60' with a 4' tall fence. The age of the exclosure is unknown. The exclosure has wires extending from the corner post to additional stakes outside the exclosure. Markers for two old transects are within the exclosure.	Interior Conditions: This site is one of the more productive blackbrush-Mormon tea communities observed on the GSENM. There is a diversity of grass, forbs, and shrubs, with areas of bare soil inside and outside the exclosure. There are bare soils and an absence of biological soil crust within the exclosure. There are no signs of trampling and soil disturbance inside the exclosure. The inside of the exclosure has more vigorous grasses than areas outside the exclosure. Large areas of bare soil are common for blackbrush-Mormon tea communities.	Exterior Conditions: There are signs of trampling and soil disturbance outside the exclosure. Areas of bare soil and absence of biological soil crusts and lack of diverse native grasses such as black grama, galleta, blue grama, sand dropseed, and Indian rice grass. Despite similar soils, vegetation community, elevation and precipitation, plant diversity and vigor are significantly greater within this exclosure than in the Tibbett pasture exclosure site (site # 10)	

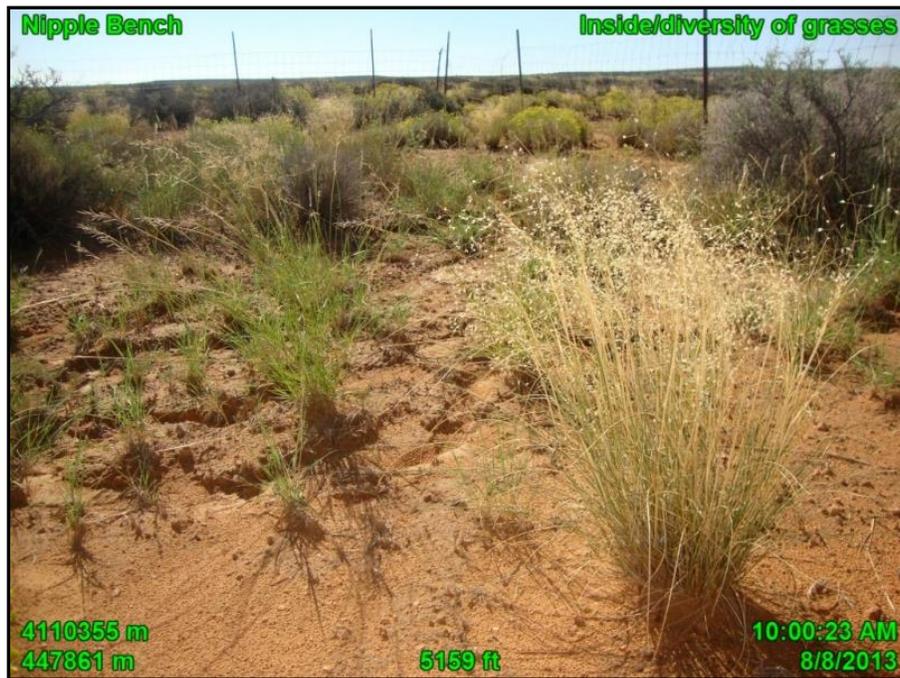


Fig. 18: A vigorous Indian rice grass with a variety of grasses and shrubs inside

exclosure 09.

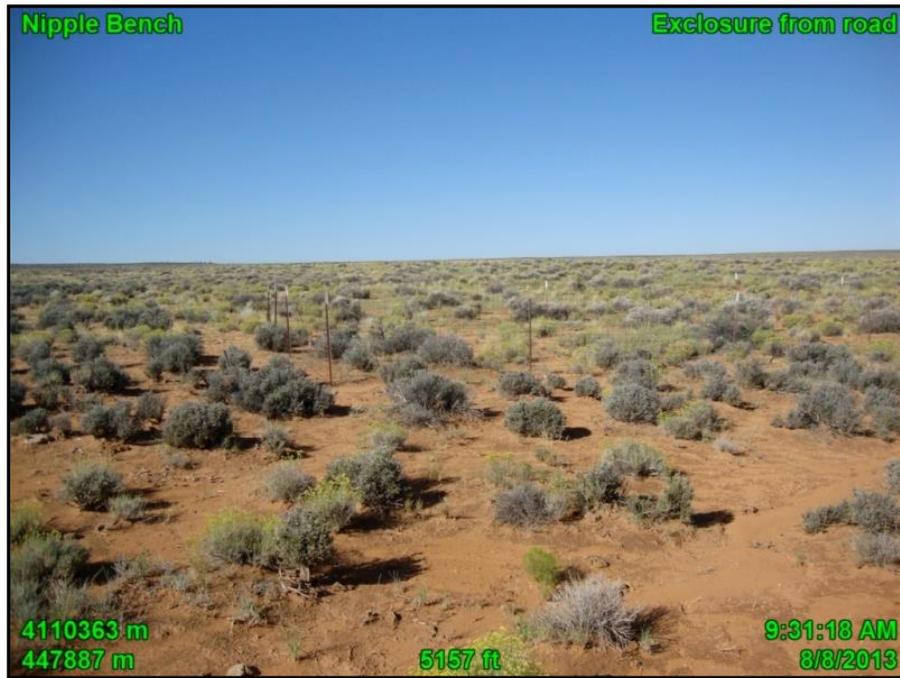


Fig. 19: Exclosure 09 can be seen from the road. Some bare soils exist, both inside and outside exclosure. Grass is more robust inside exclosure.



Fig. 20: Black grama, Mormon tea and Indian rice grass outside the exclosure provide increased ground cover compared to the Tibbet Bench exclosure site (See Exclosure Site 10).

Exclosure 10			
Allotment: Nipple Bench	Pasture: Tibbet Bench	Vegetation Type: Blackbrush- Mormon tea shrubland	Ecological Site Description Near border between semi-desert shallow loam (Utah pinyon-juniper) and Semidesert sandy loam (blackbrush)
Size and Function: The age of the exclosure is unknown. The exclosure is approximately 25' x 60' with a 4' tall fence. An additional stake and wire tie down outside of the exclosure are connected to each corner, as with Exclosure Site 09.	Interior Conditions: Blackbrush and Mormon tea are nearly the only species inside the exclosure. Bare soils and erosion are occurring inside. Biological soil crust and grasses are lacking. Other plants found inside include rabbitbrush and globemallow. This site has far less grass and forb diversity than the site of Exclosure 09 on the Nipple Bench pasture despite similar elevation, ecological site description, topography and precipitation.	Exterior Conditions: There are not obvious differences outside in species diversity, area of bare soils and pedestalling; however there is increased soil disturbance and some signs of trampling outside the exclosure. The lack of differences inside and outside the exclosure may be due to length of time arid ecosystems take to recover from historic grazing practices, and past history of possible trespass of the exclosure is unknown. The sparse nature of blackbrush understories may make differences (canopy gaps, percent cover) more difficult to detect without quantitative transects.	

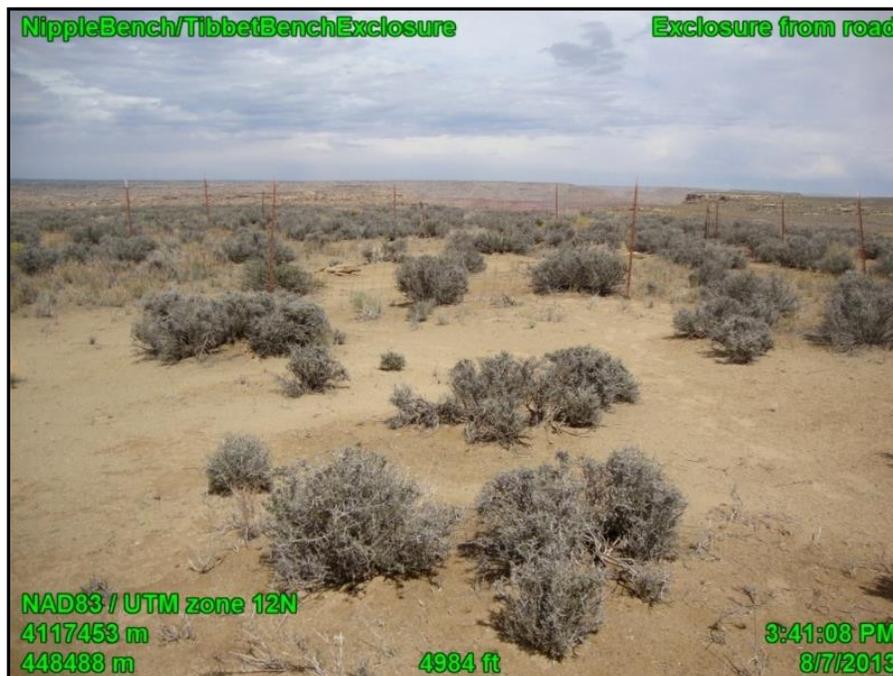


Fig. 21: Large areas of bare soils outside of exclosure are present at this site; blackbrush and Mormon tea are the main species. Biological crust is almost completely

absent with only small fragments of moss and lichen directly under blackbrush and Mormon tea shrubs.



Fig. 22: Blackbrush and Mormon tea outside the enclosure, facing east.



Fig. 23: Bare soil between blackbrush and Mormon tea inside enclosure.



Fig. 24: Large areas of bare soil within exclosure; only blackbrush and Mormon tea present.

Exclosure Site 11 (Sunset Bench)			
Allotment: Lower Cattle	Pasture: Lower Cattle	Vegetation Type: Inter-mountain basin semi-desert grassland	Ecological Site Description: Semi-desert sandy loam(four-wing saltbush)
Function and Size: The exclosure is approximately 680' x 350'. Cattle trespassed the exclosure in 2013; some of the boundary fence is broken. The GSENM range staff and Wild Utah Project worked to repair the exclosure in September of 2013. The age of the exclosure is unknown.		Interior Conditions: Vegetation within the exclosure is significantly more productive and vigorous with a greater diversity and a higher canopy and basal cover. Species observed inside the exclosure include blue grama, Mormon tea, Indian rice grass, four-wing saltbush and sand dropseed.	Exterior Conditions: The area surrounding the exclosure is heavily utilized, with excessive bare soils, pedestalling of grasses, and heavily-browsed four-wing saltbush



Fig. 55: Increased grass vigor inside the exclosure.



Fig. 26: Heavy utilization outside the enclosure vs. the mature grasses and shrubs inside the enclosure. This difference is visible even though cattle trespassed extensively within the enclosure during 2013.

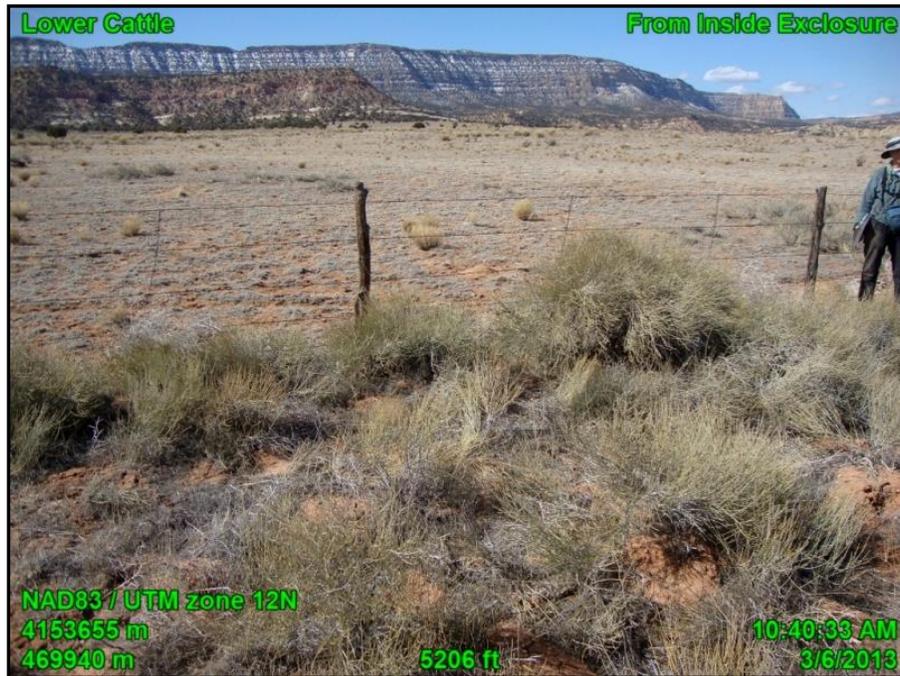


Fig. 27: Mormon tea inside the border of Sunset Bench enclosure. Excessive utilization can be seen outside the enclosure into the distance.



Fig. 28: Aerial image of the lack of vegetation cover and structure can be seen at the landscape level outside of the enclosure.

Exclosure Site 12			
Allotment: Cottonwood	Pasture: Brigham Plains	Vegetation Type: Inter-mountain basin semi-desert shrub steppe	Ecological Site Description: Semi-desert sandy loam (Wyoming big sagebrush)
Size and Function: The exclosure is intact and functional but of unknown age. The exclosure is partitioned into four sections. Inside the larger exclosure are two smaller exclosures. The outside exclosure is approximately 50' x 50' and the interior exclosure is bisected and approximately 20' x 20'. The interior exclosures appear to be rodent or rabbit exclosures with sheet metal and wire screen that are buried into the ground. The exclosure is on the site of a former vegetation treatment.		Interior Conditions: Inside the exclosure, vegetation ground cover and seedheads are increased, compared with outside the exclosure. There is still an absence of biological soil crust. However, there are no signs of trampling and disturbance within the exclosure.	Exterior Conditions: Outside the exclosure, greater bare and disturbed soils are present. Pedestaled blue grama grass was observed outside the exclosure. Single age class sagebrush with depauperate understory is in the vicinity. An absence of biological soil crust was observed.



Fig. 29: Indian rice grass, Mormon tea, and a forb with flowers inside the two smaller livestock and rodent exclosures.



Fig. 30: Mormon tea and blue grama inside enclosure provide increased ground cover and reduce rain and wind erosion.



Fig. 31: Excessive utilization and bare soils outside the enclosure. Grass and shrub species seedheads are essentially absent.

Exclosure Site 13			
Allotment: Circle Cliffs	Pasture: Prospect	Vegetation Type: Inter-mountain basin semi-desert grassland	Ecological Site Description: Semi-desert loam (Wyoming big sagebrush)
Size and Function: The exclosure is approximately 12' x 12' and was likely built in or near 2005 (conversation with Sean Stewart, lead GSENM Range Specialist). The exclosure is intact and functional.	Interior Conditions: The exclosure is inside a crested wheat grass seeding. Crested wheat grass and four wing saltbush are dominant with occasional Indian rice grass and sand dropseed. Physical crust and an absence of biological soil crust were observed.	Exterior Conditions: The area outside the exclosure is dominated by crested wheatgrass with occasional Indian rice grass and sand dropseed.. Bare disturbed and compacted soils, absence of biological soil crusts and depauperate sagebrush understory were observed. The outside vicinity is largely similar to the inside of the exclosure aside from the lack of recent soil disturbance inside the exclosure. This is likely due to the young age of the exclosure and lack of recovery time combined with the seeding of crested wheatgrass that has led to a monoculture system both inside and outside the exclosure. However, greater ground cover was observed here than in seedings within Circle Cliffs allotment such as the Brinkerhoff Spring area.	



Fig. 32: Crested wheatgrass and four-wing saltbush inside enclosure.

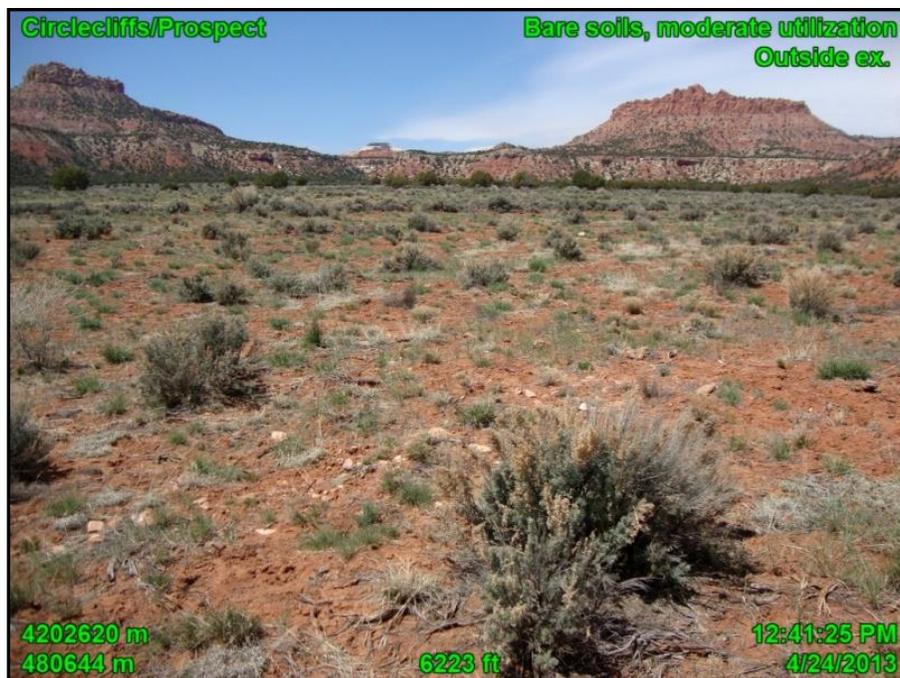


Fig. 33: Outside enclosure grasses are moderately to heavily utilized and bare soil is increased.



Fig. 34: Outside the exclosure, this portion of Circle Cliffs allotment is not as heavily utilized as most other areas in the allotment and in GSENM. However, bare and disturbed soils are present and increased outside the exclosure.

Enclosure Site 14			
Allotment: Last Chance	Pasture: Winter	Vegetation Type: Inter-mountain basins semi-desert shrub steppe	Ecological Site Description: Semi-desert sandy loam (blackbrush)
Size and Function: The enclosure is approximately 10' by 10' and is intact. The enclosure age is unknown.	Interior Conditions: Plant species inside the enclosure include blue grama, blackbrush, Mormon tea, galleta grass and three-awn. Plant vigor and seedhead maturation were visible within the enclosure.	Exterior Conditions: Depleted blackbrush understory, and disturbed and bare soils were greater outside the enclosure. Less ground and canopy cover were visible outside the enclosure.	



Fig. 35: Trampled crust and bare soils outside enclosure.



Fig. 36: Blue grama, Mormon tea, and galleta grass are greater inside the enclosure.

Exclosure Site 15 (Circle Spring)			
<p>Allotment: Last Chance</p>	<p>Pasture: Summer</p>	<p>Vegetation Type: The location is riparian woodland but it identifies as pinyon-juniper woodland vegetation type due to the coarse scale of Southwest ReGAP data.</p>	<p>Ecological Site Description: Semi-desert steep shallow loam (Utah pinyon-juniper)</p>
<p>Size and Function: The exclosure is approximately 100' long and 30' wide. A rocky escarpment forms three sides of the exclosure, while a 4' tall wood fence forms the southern edge. The exclosure was constructed in 2003 or 2004 (personal communication, with Sean Stewart, GSENM Head Range Conservation Specialist). The exclosure is functional but may be occasionally accessed by cattle that jump the short distance off the sandstone escarpment. This may occasionally happen, as evidenced by a single cowpie within exclosure, but it does not appear to have had noticeable impacts to vegetation inside the exclosure.</p>		<p>Interior Conditions: Geyer willow is 7' to 8' tall within the exclosure. A variety of sedge and rush species are present within the exclosure. Seedhead maturation was observed within the exclosure. Much less bare soil was observed within the exclosure compared to directly outside the exclosure.</p>	<p>Exterior Conditions: Vegetation in the wash outside the exclosure is heavily grazed down to 1'' and less. A headcut is forming directly in front of the exclosure fence. A single browsed cottonwood ($\leq 20''$) was identified 250-300' down the wash from the exclosure. Intermittent riparian zones down the wash 250-300' are excessively grazed. Increased bare soil and erosion are occurring outside the exclosure.</p>



Fig. 37: Geyer willow inside the enclosure provides a stark comparison to grazed riparian areas directly outside the enclosure.



Fig. 38: Bare soils in this heavily grazed area of Circle Spring directly adjacent to the enclosure in Fig. 37.



Fig. 39: Willow, $\geq 6'$ with a variety of wetland plants inside the exclosure.

Exclosure Site 16			
Allotment: Five Mile Mountain	Pasture: N/A	Vegetation Type: Colorado Plateau pinyon-juniper shrubland	Ecological Site Description: Semidesert loam (Wyoming big sagebrush)
Size and Function: Five Mile Mountain exclosure is a 4-way exclosure that includes a rodent and rabbit/livestock exclosure, a livestock exclosure, a wild and domestic ungulate exclosure and an all-ungulate/rodent and rabbit exclosure. Each individual exclosure is approximately 150' x 150'. The exclosure was constructed after a 2005 sagebrush and seeding treatment. The seeding treatment included crested wheatgrass and a mix of native grasses including Indian rice grass, sand dropseed, galleta grass and blue grama. It is constructed with both metal and wood fence post. The livestock/rodent and rabbit exclosure and livestock exclosures are 4' tall and the all-ungulate exclosures are 8' in height.		Interior Conditions: Smaller amounts of Russian thistle were observed in the all-ungulate/rodent and rabbit exclosure than outside the exclosure and Russian thistle was observed piling up against and outside the bottom of the fences. Native grasses were most vigorous and seedhead maturation was evident in the all ungulate/rodent exclosure. Moderate amounts of Russian thistle are inside the livestock exclosure. The lower rodent fencing appears to be stopping the distribution of Russian thistle in the rodent exclosures due to the lower wire (under 2 feet) fencing on the rodent exclosures.	Exterior Conditions: The treatment was part of the Five Mile Mountain restoration project, which covers 32,000 acres and includes numerous separate treatment sites. Bare soils and Russian thistle are significantly increased outside all the exclosures.



Fig. 40: Four-way enclosure with treatment area in the foreground.

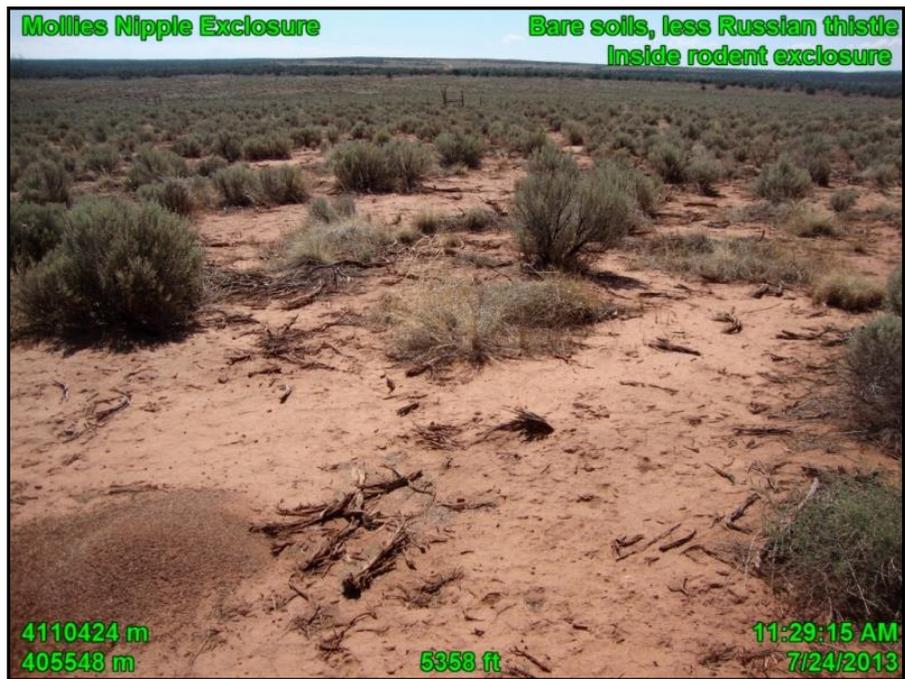


Fig. 41: Bare soils, Indian rice grass and sagebrush inside rodent/rabbit exclosure.



Fig. 42: Bare soils, Russian thistle and sagebrush outside the exclosures.

Exclosure Site 17			
Allotment: Upper Paria	Pasture: Henrieville Creek	Vegetation Type: Inter-mountain basin big sagebrush shrubland	Ecological Site Description: Alkali fan (Castle valley saltbush)
Size and Function: This is a very small (12' X 12') exclosure which is dilapidated with loose wires and old rotting posts. The exclosure age is unknown.	Interior Conditions: Ground cover appears greater than outside the exclosure. Physical crust and bare soils are present inside the exclosure. Crested wheatgrass is virtually the only species inside the exclosure except for a single rabbitbrush.		Exterior Conditions: Crested wheatgrass, sagebrush, rabbitbrush and four-wing saltbush are the dominant vegetation. Bare soils are greater outside of the exclosure and large areas of bare, compacted soil are common.



Fig. 43: Inside the exclosure is almost exclusively crested wheat grass and bare physical crust.

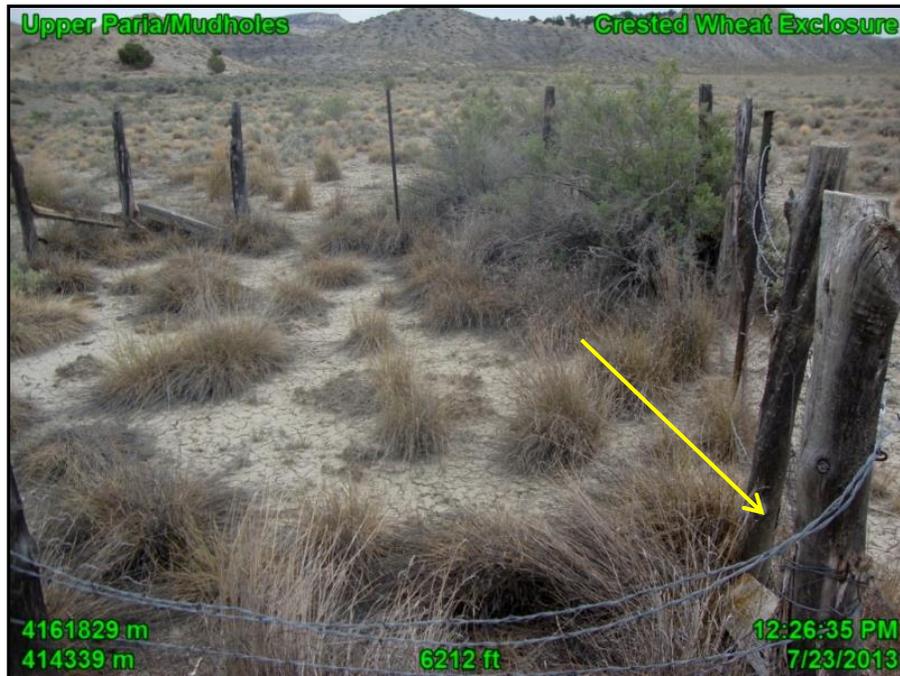


Fig. 44: Loose fencing (arrow) and old post surround crested wheatgrass and four-wing saltbush.



Fig. 45: Large areas of bare soils and physical crust outside the exclosure.

Exclosure Site 18			
Allotment: Circle Cliffs	Pasture: Prospect	Vegetation Type: Colorado Plateau pinyon-juniper woodland	Ecological Site Description: Semi desert loam (Wyoming big sagebrush)
Size and Function: This exclosure consists of an inner rodent/rabbit and livestock exclosure and an outer livestock exclosure. The outer exclosure is approximately 200' x 200' and is intact and functional; the inner livestock-and-rodent/rabbit exclosure is approximately 12' x 12'. The exclosure was likely constructed between 2004 and 2006 after a crested wheatgrass maintenance seeding (conversation with Sean Stewart, Lead GSENM Range Specialist).	Interior Conditions: Plant species found on the site include Indian rice grass, big sagebrush, blue grama, galleta grass, broom snakeweed and globemallow. There appears to be greater ground cover compared to exterior conditions and plants have greater vigor within the exclosure. There are no signs of soil trampling inside the exclosure. This diversity of plant species is greater than some other crested wheatgrass sites such as the Upper Paria/Mudholes exclosure (# 19). There are no apparent differences between the primary exclosure and the interior rodent/rabbit exclosure.		Exterior Conditions: There is an absence of biological crust and presence of large areas of bare soil and physical crust. Pedestalling of grasses and shrubs is present. Overland water flow and sheet erosion patterns are present. A large area of Russian thistle, approximately 2 acres in size, was noted approximately 150 feet north of the exclosure (Fig. 47).



Fig. 46: Robust Indian rice grasses and crested wheatgrass within exclosure.

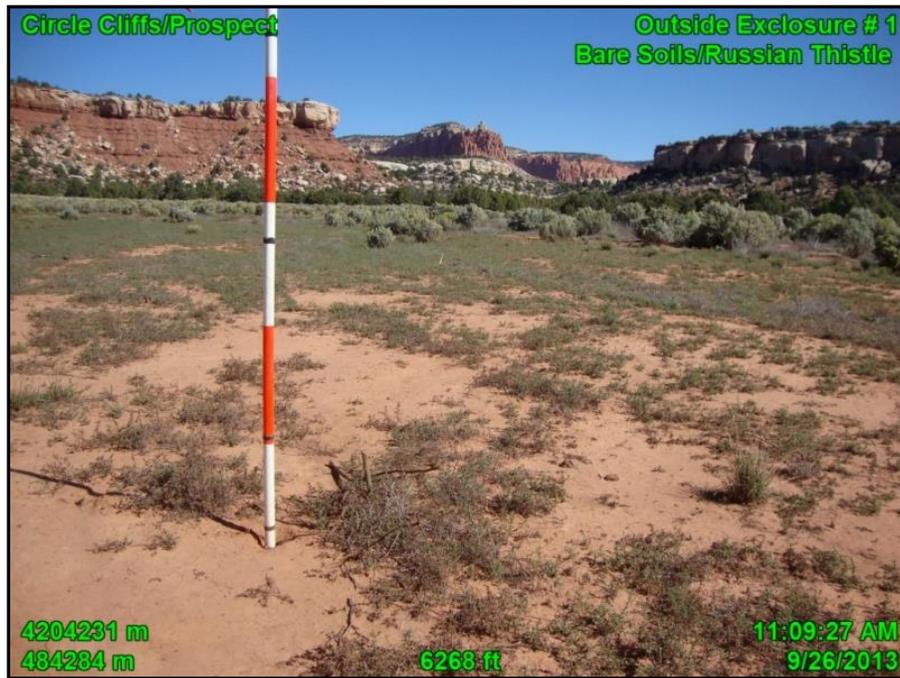


Fig. 47: Approximately 2 acre site near-monoculture of Russian thistle 150' north of the exclosure

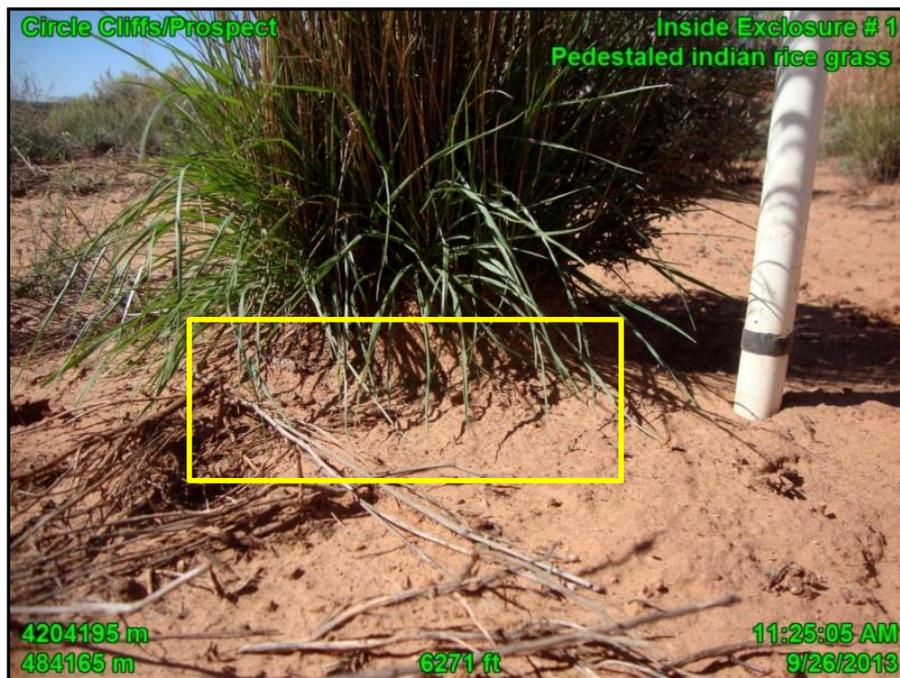


Fig. 48: A pedestaled Indian rice grass inside the exclosure.

Exclosure Site 19			
Allotment: Upper Paria	Pasture: Mudholes	Vegetation Type: Inter-mountain basin big sagebrush shrubland	Ecological Site Description: Upland clay loam(low sagebrush)
Size and Function: This intact exclosure was constructed between 2004 and 2006 (conversation with Sean Stewart, Lead GSENM Range Specialist). The exclosure is approximately 450' x 450' and is constructed with metal posts and barb wire. The exclosure is inside a crested wheatgrass seeding and sagebrush reduction treatment. The exclosure is located between two large erosion control dams that are part of a complex of approximately 4-5 dams oriented north to south across the allotment.	Interior Conditions: On Sept. 27, a pony was inside the exclosure. It jumped the fence and ran when we arrived. Grazing, trampling and trails (Fig. 49) worn alongside the fence inside the exclosure were noted and photographed. The exclosure is exclusively limited to crested wheatgrass, sagebrush, a few juniper trees and bare soils. The apparent lack of difference between interior and exterior conditions is likely due to a number of factors; 1) The pony had been impacting the exclosure, grazing, trampling and trailing the fences; 2) the exclosure is relatively recent and there has not been enough time to allow for recovery or changes due to absence of grazing; and 3) the exclosure is on a piece of land that has been converted to a crested wheat monoculture	Exterior Conditions: Much of the landscape surrounding the exclosure, and the area inside the exclosure is almost exclusively crested wheatgrass and sagebrush with bare soils and physical crust between plants. Two large washes incised approximately 16'-18' deep are oriented east to west across the allotment. Tamarisk has completely filled in the southern wash. The allotment is part of a large network of erosion control dams that are meant to prevent further erosion down to Sheep Creek. Crested wheatgrass dominates the sagebrush understory and in large expanses is the only plant species, with tamarisk occupying the washes and wet areas.	



Fig.49: Crested wheatgrass, sagebrush and 3 juniper trees are nearly the only vegetation within the exclosure.

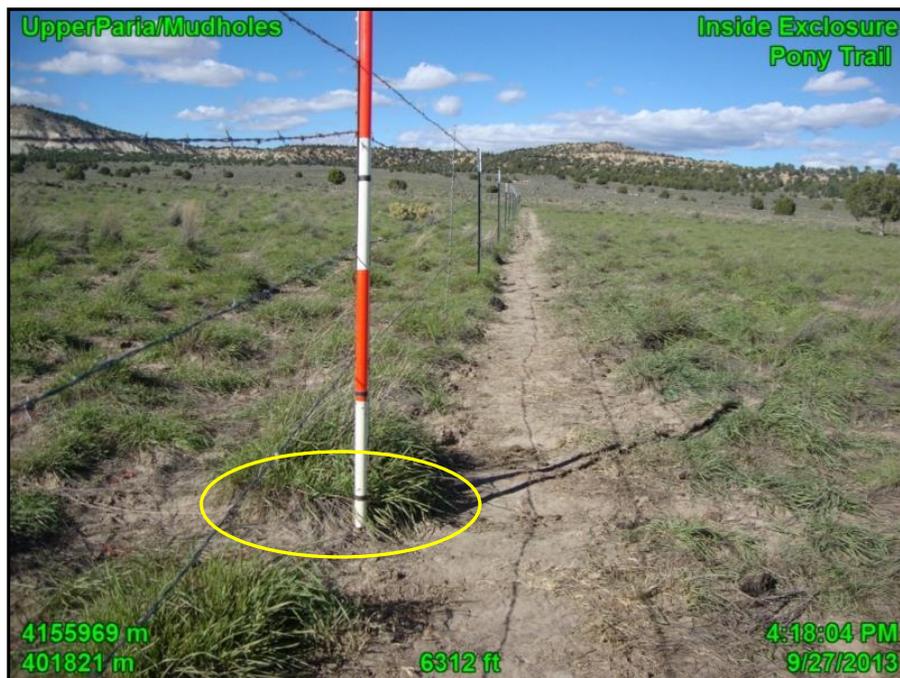


Fig. 50: A trail worn inside the exclosure (right) by a pony that jumped the fence upon our arrival. Pony manure and extensive pony tracks were inside the exclosure. Note the pedestaled crested wheatgrass (circle).



Fig. 51: Incised wash below erosion control dams, approximately 300' south of the exclosure.

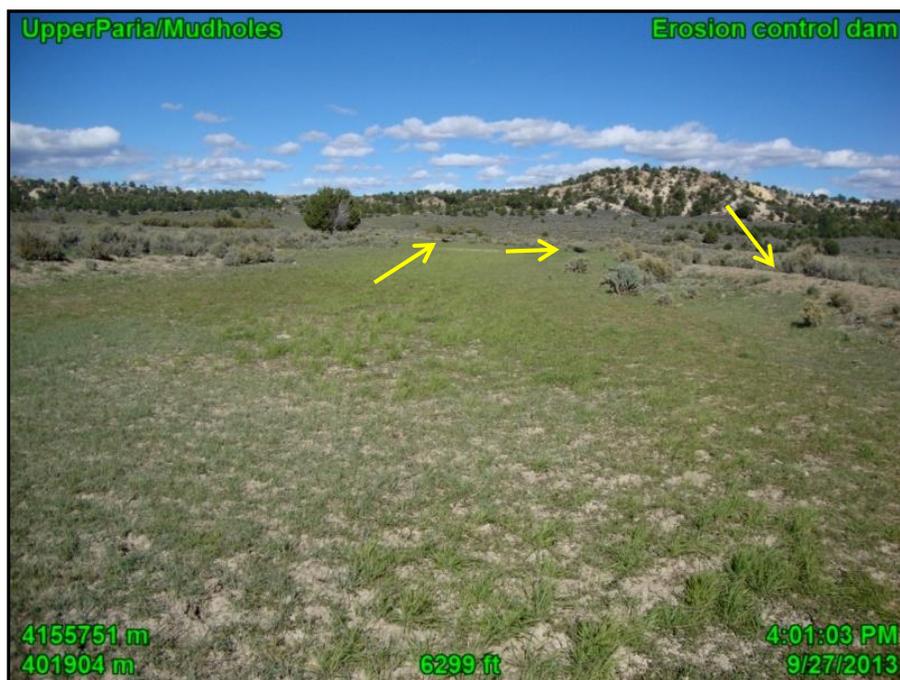


Fig. 52: Erosion control dam with inserted culverts (arrows) and a large expanse of crested wheatgrass outside the exclosure.

Exclosure Site 20			
Allotment: Upper Paria	Pasture: Between the Creeks	Vegetation Type: Identifies as Colorado Plateau pinyon-juniper shrubland	Ecological Site Description: Upland shallow sand (pinyon-Utah juniper)
Size and Function: This exclosure surrounds a riparian area which is site LE00 514 in the GSENM rangeland health evaluations. The rocky edge of the wash forms the northern boundary and it is fenced across the southern boundary. It is irregular in shape, approximately 6-8 acres in size, and intact. Both gates on the exclosure were left open and trampling of the riparian area and cowpies were inside.	Interior Conditions: A variety of riparian species are inside the exclosure, including coyote willow, grasses, sedges and rushes. Russian olive and tamarisk are both within the exclosure. Excessively browsed willow, bank shearing and spring trampling were observed inside the exclosure. A patch of recruiting coyote willow is approximately 25' X 40'. The riparian area continues at least 0.5 miles down the wash.	Exterior Conditions: The surrounding landscape is pinyon-juniper upland and is not a good comparison for a riparian area exclosure. A water trough directly outside the exclosure is being fed by the riparian spring. The area directly around the water trough is highly impacted.	



Fig. 53: Trampled riparian area within exclosure.



Fig. 54: Fouled riparian area within the enclosure



Fig. 55: Excessively utilized area outside the enclosure.

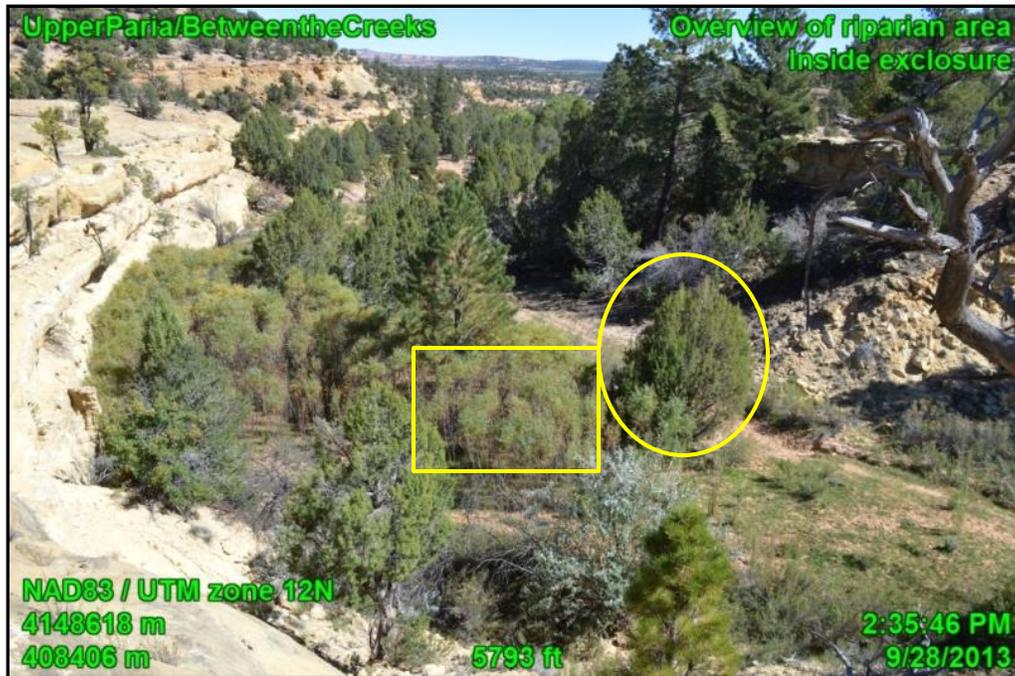


Fig. 56: Overview of riparian enclosure. Recruitment of upland species (oval) can be seen competing with coyote willow (rectangle).

D. Results and Discussion

Of the 20 GSENM enclosure sites of which Grand Canyon Trust is aware, 17 were visited between November 2012 and September 2013.

Of the eight sites identified by GSENM data and visited, only three (Sites 01, 09, 10) had intact and functional enclosures, Two (Sites 04, 06) were near permittee camps and likely represented the permittee camps with no enclosure. One (Site 02) was not near a permittee camp but no enclosure existed. One enclosure (Site 19) was intact but had a pony inside it, and one (Site 03) was a former enclosure with the wire ripped down and only the posts remaining. Site 20 is a good demonstration of a riparian enclosure (6-8 acres), but the gates were left open and grazing has been occurring within the enclosure and further down the wash within the riparian zones.

Site 05 could not be accessed via the Blue Spring Road. There is potential to access it through Sand Road on Nephi Pasture. Sites 08 and 09 are on the Lake allotment, and require a very long day of hiking or an overnight trip. These sites may be visited in the near future.

This results in 12 intact enclosures 3 of which that have been compromised by cattle in the 2013 season and 5 of which are within vegetation treatments. Thus, only seven intact enclosures Sites 1, 9, 10, 11, 14, 15 and 20) are actually capable, if they continue to be maintained, of providing information about an ungrazed native GSENM plant community compared to a grazed plant

community. As noted in the November 2013 Trust report, [Vegetation Representations in Grazed and Ungrazed Lands in Grand Staircase-Escalante National Monument](#), there are at least 21 plant communities within the 1.8 million-acre GSENM that would be expected to be used by livestock.

Summary of 17 Exclosure Sites Visited	
Number	Description
17	Exclosure sites visited
3	Sites visited, but with no sign of exclosure having existed
14	Exclosures that exist or formerly existed (visited)
12	Intact exclosures
3	Intact exclosures that were breached in 2013
5	Intact exclosures placed within vegetation treatments
9	Intact exclosures that showed no sign of compromise, breaching, or trespass
7	Intact exclosures that showed no sign of compromise, breaching, or trespass and which are not inside vegetation treatments

This report does not quantify landscape condition as no quantitative data were collected, e.g., on bare soils, plant species cover, biological crust cover, or cover of native vs. non-native species. However the following differences between interior and exterior conditions common to most sites included:

- Increased bare and eroding soils outside of exclosures.
- An absence of biological crust and presence of physical crust across most sites. Though fragments of biological soil crust was observed in areas where ungulates could not reach and were protected from disturbances (e.g. under shrub canopies inside cactus patches).
- Highly disturbed soils and trampling were more common outside of exclosures and were not inside exclosures.
- Presence of seedhead maturation and increased plant vigor was commonly observed inside exclosure sites when compared with exterior conditions.
- Increased erosion was outside exclosure sites particularly in the riparian site 15 (Circle Spring).

Conditions common to many sites outside of exclosures included:

- Lack of a diversity of grass and forb species.
- Lack of seedhead maturation and biological soil crusts.
- Rills, overland water flows, headcuts and incised washes.
- Pedestaled grasses and shrubs.
- Absence of grass diversity and presence of exotic species.
- Absence of a varied age class structure within shrub species.
- Depauperate sagebrush understory communities.
- Degraded and trampled riparian areas.
- Monoculture and exclusivity crested wheat grass (especially on Upper Paria and Circle Cliff allotments).

A. Recommendations and Management Implications

GSENM covers roughly 1.8 million acres and contains some of the most diverse vegetation communities and highest rates of endemism in the Intermountain West (Fertig, 2009). Given the few and small size of exclosures that exist on the GSENM and the compromised status of many of these exclosures, combined with 96.4 percent of the GSENM in actively grazed allotments, both the GSENM staff and the public have almost no ability to understand the degree and types of impacts of current grazing management. It appears that as few as 9 exclosures are actually functional and not recently trespassed in the 1.8 million acres (three more exclosure sites have not yet been visited). The area of these 9 exclosures is approximately 15 acres.

Moreover, neither the GSENM staff nor the public are being provided into a glimpse of what recovery or conditions could exist in various plant communities if more acres were ungrazed within the GSENM.

An organized system of exclosures and areas not grazed by livestock should be established throughout the GSENM. The following are recommended for inclusion within the system:

- A. Exclosures > 100 acres is size.
- B. A variety of large areas not grazed by livestock, at the landscape scale, that include a proper representation of GSENM soil and vegetation types including upland and riparian areas, and rare and common vegetation types.
- C. Areas not grazed by livestock that reflect a broad spectrum of landscape conditions and landscape actions (e.g., sites recovering from historical overgrazing, current grazing levels, past vegetation treatments, past restoration treatments and areas with unique soil types or disturbed soils).

Providing ungrazed examples of each vegetation type will give researchers and managers the ability to better understand vegetation and ecosystem potentials as well as recovery from

previous grazing practices. As arid ecosystems are expected to be experiencing some of the largest impacts due to climate change, ungrazed areas allow the separation of climate change-impacts and drought from current grazing practices. Ungrazed and reference areas at the landscape scale are critical to making informed land use decisions.

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Appendix A

Common and Species Names of Plants

Blackbrush	<i>Coleogyne ramosissima</i>
Blue grama	<i>Bouteloua gracilis</i>
Big sagebrush	<i>Artemesia tridentada</i>
Broom snakeweed	<i>Gutierrezia sorothrae</i>
Crested Wheatgrass	<i>Agropyron cristatum</i>
Fremont's mahonia	<i>Mahonia Fremontii</i>
Galleta grass	<i>Pleuraphis jamesii</i>
Geyer willow	<i>Salix geyeriana</i>
Globemallow	<i>Sphaeralcea coccinea</i>
Indian rice grass	<i>Achnatherum hymenoides</i>
Mormon tea	<i>Ephedra viridis</i>
Rabbitbrush	<i>Ericameria spp.(nauseosa)</i>
Russian thistle	<i>Salsola spp.</i>
Sand dropseed	<i>Sporobolous contractus</i>
Squirrel tail	<i>Elymus elymoides</i>