To: Matthew Betenson[mbetenso@blm.gov]
From: Backer, Dana
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SciPlan_1-3_combined_8.30.17.docx
Section 3_Table_8.31.17v2.xlsx

Matt,
Please take a look at the two documents. If this is what you are looking for then please send onto MLT (and cc me). What I am looking for is mostly input on Section 2 - management decisions that need to be made in next 5-10 years that need science to support them.

Reviewers can comment on other areas but not to focus on missing figures/dates, punctuation, etc. This is big picture review. Too premature to combine the excel table into the word document.

If this is not what you are looking for then we better meet soon. I will go back to working on cultural and archaeological Section 2 drafts.

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I.   INTRODUCTION AND SCIENTIFIC MISSION

I.A PURPOSE OF NATIONAL CONSERVATION LANDS SCIENCE PLAN
1. Introduce National Conservation Lands
2. Objectives of plan (living document)
3. Define science (see Advancing Science in the BLM, Science Strategy, BLM UT)

The National Landscape Conservation System (NLCS) was administratively established in 2000 and legislatively codified in the Omnibus Public Land Management Act of 2009 (PL 111-11). This system encompasses over 900 units spread across approximately 36 million acres of public lands managed by the Bureau of Land Management (BLM). These diverse areas consist of National Monuments, National Conservation Areas, Wilderness Areas, Wilderness Study Areas, Wild and Scenic Rivers, National Scenic and Historic Trails, and Conservation Lands of the California Desert. The BLM is mandated to conserve, protect and restore the outstanding cultural, ecological, and scientific values of NLCS units. Scientific investigation can aid in the conservation, protection, and restoration of these lands, and therefore, science is strategically planned and organized within NLCS units.

The objectives of NLCS units' science plans are to:
- Identify the scientific mission of the unit;
- Summarize past scientific efforts in the unit, i.e. the scientific background of the unit;
- Identify the priority needs and management issues within the unit that can be addressed by scientific inquiry;
- Define a strategy for accomplishing the scientific goals of the unit;
- Develop science protocols to, for example, ensure that scientific inquiry does not negatively impact the long term sustainability of the unit and its resources;
- Create a system to organize scientific reports; and,
- Help and promote the integration of science into management.

The science plans of NLCS units are considered 'living' documents and should be revised and updated frequently (e.g. 5-10 years). Scientific needs that emerge during the course of implementing a science plan can be added to the plan as needed.

Science has been defined within the BLM several times (e.g. BLM 2007, BLM 2008a – McGinnis Sci Plan), but is essentially the study of natural and social phenomena using repeatable observations or experiments. In the context of land management, scientific data are collected, analyzed, or synthesized to increase knowledge and support decision-making. Within NLCS units there is an expectation for 'identifying science needed to address management issues, communicating those needs to science providers, and incorporating the results into the decision making process' (BLM 2007).

I.B. UNIT AND GEOGRAPHIC AREA DESCRIPTION
1. GSENM resources, objects, and values reference to the designating language
2. MMP, Amends, other legislation

The Grand Staircase-Escalante National Monument (GSENM) at almost 1.9 million acres, was created under the authority of the 1906 Antiquities Act by President Bill Clinton in 1996 and was the first national monument to be managed by the BLM. The Monument is divided into three distinct physiographic provinces: Grand Staircase, Kaiparowits Plateau and Escalante Canyons. GSENM is located within the Colorado Plateau ecoregion and Kane and Garfield Counties in south-central Utah (Figure 1 – map). Encompassed within the Monument are sixteen Wilderness Study Areas, a portion of the Old Spanish National Historic Trail, and Dance Hall Rock Historic Site.

GSENM is primarily surrounded by federal lands managed by the BLM Kanab Field Office, USFS Dixie National Forest, and National Park Service units Capitol Reef National Park, Bryce Canyon National Park, and Glen Canyon National Recreation Area. Communities on the periphery of the Monument include Escalante, Boulder, Kanab, Cannonville, Big Water, Henriville, and Tropic.

In designating the GSENM, the Presidential Proclamation identified over 120 specific objects and values (Appendix). The Proclamation commences with describing the vast and austere landscape, the rugged and remote unspoiled natural areas, the spectacular array of scientific and historic resources, and the frontier character of the landscape that is rich for scientific study. The objects or resources that make the area so magnificent include diverse geological features, world class paleontology (Late Cretaceous fossils), outstanding archeological and historic sites, scarce water resources, and diverse biological resources.

The GSENM Management Plan (MMP) was implemented in 2000 and provides specific management decisions and objectives. Science is integrated throughout the MMP and some of the major management emphases as it relates to scientific study and resource management include:

- Manage multiple uses to protect and prevent damage to Monument resources (archaeological, geological, biological, paleontological, and physical resources).
- Identify protection measures for special status plant and animal species, riparian areas, and other special resources.
- Identify measures to ensure water is available for the proper care and management of objects in the Monument.
- Expand knowledge of interactions between humans and their environment.
- Develop improved and innovative land management, restoration, and rehabilitation practices.
- Manage recreation and other uses to complement science and research objectives.
- Emphasize the communication of science through education, outreach and interpretation.

I.C. SCIENTIFIC MISSION
1. science to inform management;
2. science to understand or protect the resources, objects, and values

The Proclamation and MMP place a very strong emphasis on opportunities for the study of scientific and historic resources. Furthermore, facilitate research such that the Monument is recognized as an outdoor classroom and laboratory. To support these goals, approximately $1M

annually from 1998 to 2002 was budgeted to conduct baseline inventories and research. Many of the early inventories were focused on resources that are most at-risk of being lost through disturbance and the passage of time. This included inventory, collection, and the study of paleontological and archaeological resources that could be subject to loss through erosion and looting, and the collection of oral histories and ethnologies that would otherwise be lost as populations change. Other basic inventories and baseline data were collected on biological, physical, and geological resources, recreational uses, and visual resources.

II. SCIENTIFIC BACKGROUND Of GSENM
(provide clear, concise, current summary of research and sci info)

Notes from template
- Provide the current scientific baseline of the unit

- Provide brief background, purpose, and summary of findings and several citations to relevant reports or articles for each subject

- Include distinct discussion of the resources, objects, and values for which the unit was designated and describe the scientific understanding we have of these resources, objects, and values (e.g. status, trend, other research results)

- Include discussion of the understanding gained from landscape-scale assessments that include the National Conservation Lands unit (e.g. Rapid Ecoregional Assessments). For example, what do landscape-scale assessments tells us about: integrity, threats, landscape role

- Identify ongoing inventory and monitoring efforts (e.g. land health evaluations, Assessment, Inventory, and Monitoring (AIM) Strategy implementation)

The scientific research, exploration, and documentation that preceded the creation of the Monument lead to a Proclamation that exemplified the resources, objects and values. Much of the background information was already identified but it wasn't until the Monument was established that the true value of the objects and resources would be discovered and recorded. Since the creation of the Monument, annual NLCS Monument Manager's reports and science symposium (1997, 2006, 2016), have summarized the breadth and depth of scientific discoveries, applied and theoretic research, and baseline inventories. Ongoing monitoring reports, annual science permit reports, and various types of publications have all contributed to a wealth of knowledge and scientific understanding of the GSENM. There are over 600 records of publications related to the Monument. Information gathered from these studies helps inform management decision-making for the protection of the objects and values for which the Monument was designated.

It is outside the scope of this science plan to reiterate all of the decades of scientific endeavors on the Monument. A summary (abstracts and papers) of the research can be found in the symposium proceedings. These proceedings, other research conducted in or near the Monument (when copyright permission is granted), and a collection of oral histories are available at the Southern Utah University digital library (http://library.suu.edu/c.php?g=611406&p=4244775).

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A brief summary of resources, objects, and values identified in the Proclamation are discussed below and include general information, current status and trends, and ongoing monitoring.

II.A. PHYSICAL RESOURCE

II.A.1 Geology

The Proclamation addresses the uniquely beautiful "…geologic treasure of clearly exposed stratigraphy and structures". Significant geologic features are prominent throughout the entire monument including world renowned cliffs that form the Grand Staircase, the Vermillion Cliffs and Circle Cliffs, the unique East Kaibab Monocline, the 1,600 square miles of the Kaiparawits Plateau, a rare double arch – Grosvenor Arch, and the 130 foot high Escalante Natural Bridge. The sedimentary strata range in age from Permian to Holocene. One hundred percent of the Monument's geology has been inventoried and mapped at a scale of 1:100,000. Geological features mostly exist in an undisturbed state and free from extensive human impact. Geological objects and resources are in good status and trends are stable. Some recreational use and vandalism have the potential to adversely affect geological resources.

II.A.2 Soil

The MMP calls for soil resources to be managed to prevent damage, accelerated, or unnatural erosion, and promote health and distribution of biological soil crusts. In a multi-year effort beginning in 2003, National Resource Conservation Service conducted a soil survey of the entire Monument (NRCS 2007). The soil survey provides information to influence land use planning, highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses. The soil survey is the foundation for ecological site descriptions and provides critical information for understanding rangeland health.

Saline soils exist throughout the Monument, in large part salts originate from the natural weathering of minerals and from salt deposits left from ancient sea beds (e.g., Tropic Shale) (Cardon et al., 2007). In arid soils, soluble salts accumulate in soils due to low precipitation and higher evaporation rates. In general, saline soils can be highly susceptible to erosion and are major sources of salinity to surface and ground water. Saline springs and seeps, erosion of marine geologic formations, groundwater discharge to streams, and surface runoff combine to contribute to natural sources of salt loading on the Monument.

USDA defines five classes of soil salinity based on the electrical conductivity of soils measured in a saturated paste. Table X.X shows the percentages of soils on the Monument within the five USDA salinity classes.

Table X.X. GSENM Saline Soil by USDA Salinity Class

Salinity Class	Electrical Conductivity (dS/m*)	Monument Area (%)
Non-saline	0 < 2	83.7
Very slightly saline	2 < 4	6.5
Slightly saline	4 < 8	1.5
Moderately saline	8 < 16	1.8
Strongly saline	≥ 16	0.8

*dS/m = decisiemens

Under the 1974 Colorado River Basin Salinity Control Act, the Monument is required to develop and maintain sediment retention structures to minimize erosion and sediment loading; salt loading is closely associated with sediment loading.

In 1987, the Colorado River Salinity Control Act was amended and directed the Secretary of the Interior to develop a program to minimize salt contributions to the Colorado River from lands administered by the Bureau of Land Management. Controlling salinity in surface runoff is closely related to controlling sediment yields. A technique the Monument uses to control sediment transport from surface runoff are water retention and detention structures. These structures function by reducing the energy of water and allowing sediment, and thus salt, to settle out of the water, thereby reducing sediment and salinity loading. These structures also provide local benefits such as supplying water for livestock and wildlife for part of the year.

II.A.3 Biological Soil Crusts
The Proclamation acknowledges the significance of cryptobiotic or biological soil crusts and the critical role they play in stabilizing highly erodible soils and providing nutrients to plants. The MMP states that prior to ground disturbing activities with the potential to impact biological soil crusts, sites will be inventoried, alternative activities evaluated, and mitigation measures developed.

Since the establishment of GSENM, researchers Bowker (dates), Belnap (dates), and others have done extensive research on biological soil crusts. In addition, a spatially explicit predictive model was developed for potential cover and composition of biological soil crusts in the Monument. The Monument has plans to collaborate with USGS scientists to develop research studies that look at restoring biological soil crusts on degraded rangelands.

II.A.4 Air Quality
The Monument is managed as a Prevention of Significant Deterioration Class II area as designated by the Clean Air Act. BLM actions and use authorizations are designed or stipulated to protect Class II air quality within the Monument and Class I air quality on surrounding federal lands.

II.A.5 Minerals

Of the minerals in the Monument, the MMP only refers to oil and gas leases. However, there are various types of metallic-mineral deposits known to be present. Most of these are small and low-grade with an uncertain likelihood of significant development. Several areas contain known or potential deposits that might be of developable size and grade. Several of these deposits contain minerals or commodities, such as rutile and zirconium. Minor occurrences of other minerals such as manganese, copper, gold, alabaster, and uranium are also present in the Monument but are probably not commercial quality due to low, often sub-economic grades and limited tonnage (Allison 1997). These resources are in good status and no new mining claims can be issued.

II.A.6 Water Resources

The MMP identifies the assurance that "appropriate quality and quantity of water resources are available for the proper care and management of the Monument objects…". The MMP provides clear direction to "monitor to ensure water flowing into the Monument is adequate to support resources", with the purpose of protecting water that originates within or enters the Monument boundary. There are four broad watersheds within the Monument and all contribute to the Colorado River: the Kanab watershed (HUC-8 No. 14070005), the Paria watershed (HUC-8 No. 14070007), the Lower Lake Powell watershed (HUC-8 No. 14070006), and the Escalante watershed (HUC-8 No. 14070005). There are several regional aquifers that underlie GSENM with the major aquifer system, Glen Canyon, contained within the Navajo Sandstone (Heilweil and Freethey 1992) which is recharged with precipitation. To date, many of the perennial streams that flow into and through the Monument have not been instrumented for long-term monitoring needed to effectively track the quantity of water flow. Currently, there are only three long-term gaging stations tracking the surface water flows: 1) Station USGS 09381800—Paria River near Kanab; 2) Station USGS 09337500—Escalante River near Escalante; and 3) Station USGS 09337000—Pine Creek near Escalante.

The Escalante Watershed, with its headwaters in Dixie National Forest and outflow into Lake Powell in Glen Canyon National Recreation Area, has objects and values that are dependent on groundwater supplied base flows that support aquatic and riparian ecosystems. Groundwater is an important source of water for the Monument. USGS created a geodatabase of wells on the Monument

In conjunction with Utah's Division of Water Quality (UDWQ), regularly monitor surface water quality and quantity are monitored regularly at twelve sites. Some parameters are measured in the field and other parameters – chemistry and macroinvertebrates are done in laboratories. The Ambient Water Quality Monitoring System stores the data for all of Utah.

Seeps and springs are scarce, yet serve as an important refugee for biodiversity, many endemic species, wildlife, and livestock. In addition, they harbor significant cultural artifacts and important plants to the Paiute, Navajo and Hopi. Proper Functioning Condition monitoring is ongoing and occurs on a schedule. When sites are categorized as

Functioning-At-Risk, sites are revisited more frequently to establish trend.

II.A.7 Night Sky

The MMP states that BLM will seek ways to prevent light pollution within the Monument. Night skies are important to people, wildlife and ecosystems. In 2016, the International Dark Sky Association, local universities, volunteers, and Monument staff started collecting dark sky measurements at locations throughout the Monument. The Monument interior is as dark as can be measured and more than 90% of the Monument consists of 'pristine sky,' which is basically unprecedented in the continental U.S. Pristine sky means that observers would see no indication of artificial skyglow anywhere in the night sky, from the zenith down to the horizon. In such conditions only natural sources of light are visible to the human eye.

BLM is working toward an application for International Dark Sky Sanctuary designation. There are potential economic and/or tourism benefits to communities from Dark Sky Sanctuary recognition.

II.A.8 Soundscape

The MMP identifies natural ambient sound as an important component of resource objects and visitor experience. Soundscape is defined as the human perception of physical sound resource, including ambient natural and anthropogenic noise. From baseline data gathered in 2015, the Monument is one of the quietest places in the country. Highest percentages of anthropogenic noise are high altitude jets and popular visitor locations.

II.B SOCIAL SCIENCE RESOURCES

Social sciences and recreation resources were not specifically identified in the Proclamation, however, recreation resources, special designations and visitor services were addressed in the MMP. It is the objects and resources identified in the Proclamation that draw visitors to recreate in the Monument. The Monument has built a strong social science research base on recreational use, visitor experience, wilderness and backcountry impacts, and socio-economics. Managers use this research for a variety of activities such as recreation planning, mitigating visitor impacts, developing outdoor education programs, and improving visitor infrastructure, while protecting the resources and values. The most common reasons people visit the Monument is because of the "wild and unspoiled natural character" and the "scenic quality" (CMU 2015 report- Recreational Experience Baseline).

II.B.1 Recreation Resources and Visitor Management

There are numerous special designations within the Monument to help protect the resources. There are 16 Wilderness Study Areas (WSAs) totaling 881,997 acres (47% of the Monument) that are under review of Congress to determine if they qualify for Wilderness designation. Until that time, WSAs are managed in a manner that does not impair their suitability for designation as Wilderness by Congress. WSAs are monitored regularly by staff and observations and associated information are managed in a database.

The Recreation Management and Information System (RMIS) database tracks visitor numbers and days by location, guests accompanied with outfitters and guides, individuals associated with Recreational Use Permits and more. In 2016, there were approximately 926,000 documented visits.

Visitor impacts from backcountry and dispersed camping have been monitored since 1998 by universities and staff. Over the course of these studies, the majority of the sites ranked slightly to moderately impacted. Findings help inform management of areas needing rehabilitation, needs for improving visitor education, areas to patrol, and information for recreational allocation decisions. In addition, several universities have conducted a variety of visitor surveys and focus group discussions to understand the public's interest in the Monument while other surveys focused on visitor demographics, visitor expectations and satisfaction, visitor use, how visitors obtained information, and local community services. Other studies focused on impacts from specific user groups such as wilderness therapy programs, outfitters/guides, front country visitors, and back country users.

II.B.2 Visual Resources

The Proclamation clearly identified the significance of the visual resources contained within the Monument. "The wealth of landforms, geology, colors, elevation changes, and vegetation types in the Monument contribute to its outstanding scenery." One of BLM's objective is to preserve these spectacular scenic assets in "this high, rugged, remote region, where bold plateaus and multi-hued cliffs run for distances that defy human perspective...". Inventory of the Monument visual resources formally began in 2012 and are slated to be completed in 2017. Per BLM policy, visual resource inventories include three components: scenic quality (measure of the relative worth of a landscape's intrinsic natural beauty), sensitivity levels (measure of public concern for the maintenance of scenic quality), and distance zones (subdivisions of the landscape as viewed from an observer's position – foreground/middle ground, background, and seldom seen). Roads, linear features (e.g. power lines, off road vehicle tracks), and routes affect visual resources. Upon adjudication of Revised Statute 2477 (RS2477), the status of the roads may impact visual resources, visitor use, and the resources for which the Monument was designated.

Land use designations are made for BLM lands within four Visual Resource Management (VRM) objective classes that range from preserving the existing character of the landscape (VRM Class I) to allowing major modifications (VRM Class IV).

Class I Objective. The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

Class II Objective. The objective to this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low.

Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III Objective. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV Objectives. The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Within the Monument, 47% of the lands are VRM Class I, 21% are VRM Class II, and 32% are Class III, and there are no VRM Class IV areas. Visual resources or viewsheds are a component of both the National Wilderness Preservation System and National Wild and Scenic River System. The Monument has 881,997 acres of Wilderness Study Areas to protect potential wilderness values that are managed as VRM Class I and 252 miles of river segments determined suitable for Wild and Scenic River designation where management of visual resources is specifically addressed.

II.B. 3 Socio-economic Resources

In 2012- 2013, stakeholder surveys were conducted in sixteen GSENM gateway communities with the goal to understand the relationships among conservation, livelihood, and sustainable tourism. The results of this study have been used to inform cooperative efforts and raise public awareness of the Monument's resources and values while promoting it as a tourism destination and the important multi-use economic opportunities the Monument provides.

In preparation of the Livestock Grazing Plan Amendment and EIS, BLM compiled a socioeconomic baseline report for Kane and Garfield counties in Utah and Coconino County in Arizona (Suhr-Pierce 2015). The demographics of the three counties differed substantially from the U.S. for most variables. As with the U.S. labor data, service sector jobs grew since 1970 while non-service and government sectors barely grew. Within the study area during the period from 1970 to 2012, Kane County experienced the highest rates of growth in population, employment, and personal income. In addition, Kane County had the lowest unemployment rate of the three counties, with unemployment at 5.4% in 2012. Agriculture employment was greatest in Garfield County, making up 7.8% of all employment in 2012.

In 2012, the most important industries, in terms of total employment were: arts, entertainment, recreation, accommodation, and food; education, health care, and social assistance; and retail trade. While agriculture, forestry, fishing and hunting, and mining provided nearly 9% of all employment in Garfield County and 3% of employment in Kane County as a percentage of all employment.

It is well documented that the designation of the Monument, the renowned All-American Road - Scenic Byway 12, and the marketing campaigns of the Utah Office of Tourism focused on the Might Five National Parks that surround the Monument, have contributed to increased visitation to the area. One of the major attractions is the scenic nature of the geology and viewsheds, and the expansive opportunities for recreation, exploration, and leisure activities in the Monument.

II.C VEGETATION

The Proclamation identified unique and abundant communities including hanging gardens, dunal communities, relict grasslands, and riparian corridors, as well as numerous endemic species. The MMP further identified protection of special status plants including the three threatened and endangered plants, the need for restoration and revegetation, and management of invasive plants.

Baseline flora inventories began prior to the establishment of the Monument and continue through present time. The Monument has a unique floral diversity. There are approximately 1,180 species as of 2016, with an estimated 174 local or regional endemics (Fertig et al. 2002). The Monument contains about 50% of the Colorado Plateau's floral diversity and approximately 40% of its rare flora (Shultz 1997). The plant diversity comes from the vast geographic, topological, and climatic extent of the Monument. Four major floras exist and overlap within the Monument, including those of Arizona, the Great Basin, the Mojave Desert, and the Great Plains (Belnap 1997). New species continue to be discovered for example, UNLV started an inventory of bryophytes (liverworts, mosses, and hornworts) in 2016 and have identified 86 species to date.

Plant assemblages form vegetation community types and soils play a significant role in the vegetation communities. The vegetation classification used today is based on the NRCS Soil Survey with the related Ecological Site Description for each soil type. Miller et al. (citation) further refined this into thirteen vegetation classifications. These are listed below (Table XX) with the dominate and some associated species. Because of the simplification of the vegetation classification, communities with very small acres such as aspen, hanging gardens and wet meadows are incorporated into other vegetation communities.

Table XX.X: GSENM Vegetation Classification

Vegetation Type	Definitions	Acres	% of GSENM
Barren Rock Outcrop	Sand, rock, salt flats, playas, and lava fields largely devoid of vegetation.		
Blackbrush	Shrubland dominated by blackbrush.		

	Associated species include Mormon tea, shadscale, fourwing saltbush, Indian ricegrass, galleta grass, Fremont's indigo-bush, and broom snakeweed.		
Badland gypsiferous shrubland	Torrey's Mormon tea, Mormon tea, Indian ricegrass, broom snakeweed, yellow cryptantha, cliff-rose, Utah juniper, squirrel tail, sulfur buckwheat, galleta grass, and two-needle pinyon.		
Big sagebrush	Basin big sagebrush, Wyoming big sagebrush, Mountain big sagebrush, Indian ricegrass, squirrel-tail, winterfat, Gambel's oak, and antelope bitterbrush.		
Low sagebrush	Black sagebrush, low sagebrush western wheat grass, Indian ricegrass, Utah juniper, cliff-rose, blue grama grass, squirrel-tail, broom snakeweed, fourwing saltbush, and galleta grass.		
Salt desert scrub	Greasewood, Castle Valley saltbush, mat saltbush, shadscale, bud sagebrush, spiny hopsage, alkali sacaton, Torrey's seepweed, squirrel-tail, sand dropseed.		
Sand scrub	Sand sagebrush, blackbrush, Indian ricegrass, Culter Morman tea, needle and thread grass, fourwing saltbush, gooseberryleaf, galleta grass, Bigelow sagebrush, globemallow, sand buckwheat, and sandhill muhly.		
Semi-desert grassland	Four-wing saltbush, Galleta grass, Indian ricegrass, blue grama grass, needle and thread grass, sand dropseed, Cutler Mormon tea, gooseberry, leaf globemallow, sand buckwheat, sand sagebrush, Cutler Mormon tea, and winterfat.		
Mountain Shrub	Deciduous shrubland dominated by Alder leaf mountain mahogany, cliff-rose, bitterbrush, Gambel's oak, Utah serviceberry, chokecherry, snowberry , Sandberg bluegrass, and manzanita.		
Pinyon-Juniper	Low to medium elevation conifer woodlands dominated by pinyon pine Utah juniper. Associated shrubs include little leaf mountain mahogany, big sagebrush, blackbrush, shadscale, black sagebrush,		

	cliffrose, two needle pinyon, green Morman tea*, shrub live oak and Gambel oak.		
Juniper- Pinyon	Low to medium elevation conifer woodlands dominated Utah juniper and pinyon pine, broom snakeweed, galleta grass, Torrey's Mormon tea, Mormon tea, Indian ricegrass, cliff-rose, two-needle pinyon, yellow rabbitbrush, Bigelow sagebrush, roundleaf buffaloberry, and Indian ricegrass		
Ponderosa Pine	Medium to high elevation conifer forests dominated by ponderosa pine and douglas-fir, manzanita, and Utah service berry.		
Riparian	Dominant trees and shrubs include Fremont cottonwood, several species of willow, water birch, Box-elder, salt-cedar, Russian olive, and skunk bush Dominant herbaceous and graminoid species plus sedges, carex and rushes.		

Most all of the vegetation communities serve as rangelands for livestock grazing. Maintaining, improving, and monitoring these communities facilitates rangeland health standards and proper functioning conditions. Various vegetation communities support threatened, endangered, and sensitive wildlife (See Wildlife Section). Prior to Monument designation and continuing to the present, rangeland monitoring includes rangeland health, utilization, trend, and actual use. In 2001, Proper Functioning Condition inventories associated with aquatic features were initiated and continue today. In 2009, the Monument implemented BLM Utah Monitoring for Upland Rangelands (citation) and in 2013 the Assessment, Inventory and Monitoring Strategy (AIM) (Citation). The latter two monitoring efforts are ongoing. The Standards for Rangeland Health Standard Indicators include qualitative and quantitative measures of soils, riparian and wetland characteristics, desired plant characteristics, and water quality (BLM Manual Handbook H-4400-1). Soil/site stability, hydrological function, and biotic integrity (includes vegetation, animals, and micro-organisms) are the key ecosystem attributes of the AIM protocols (Toevs et al 2011).

Past and present vegetation restoration projects including invasive non-native plant control, seeding, mechanized treatment of woody plant species encroachment, and prescribed fire, for the purpose of habitat improvements, fuel reduction, and rangeland health conditions. Fuelwood and tree cutting are allowed in two designated areas (Rock Spring Bench and Buckskin Mountain) by permit only.

Not all of the vegetation communities, like aspen and ponderosa pine, are well studied. Riparian communities are the most sensitive to livestock grazing. All community types are at risk by natural and anthropogenic disturbances such as drought, non-native plant invasion, fire, climate change, off road vehicle use, and high visitor impacts.

II.C.1 Threatened, Endangered and Special Status Plants

There are three plants species Listed as threatened (T) or endangered (E) under the Endangered Species Act of 1973. All three species have USFWS draft recovery plans but none have been finalized (https://www.fws.gov/mountain-prairie/es/plants.php, accessed May 2017). The plant species are:

Jones' Cycladenia (*Cycladenia humilis* var. *jonesii*), (T). A baseline study was conducted in 2002 and from 2008-2014 annual visual observations of individual numbers and condition of populations in the Monument were reported.

Kodachrome Bladderpod (*Lesquerella tumulosa*), (E). Ninety percent of species' known range occurs in Monument. In 2006, baseline monitoring plots were established and annual monitoring has been conducted between 2008-2014 and 2016.

Ute Ladies'-tresses (*Spiranthes diluvialis*), (T). First inventoried in 1999 and monitored annually 2002-2013. A new population was discovered in the Henriville Creek region. The USFWS has determined that a petition to remove the orchid from Federal protection under ESA (https://www.fws.gov/mountain-prairie/es/uteLadiestress.php, accessed May 2017)

Currently, there is some location information and annual numbers of individuals however, the status and trend data is lacking.

II.C.2 Non-native Plants

The flora contains approximately 95 non-native species (Stohlgren et al. 2005, Welsh and Atwood 2001, Fertzig DATE) some of which are invasive. BLM places emphasis on Utah Noxious Weed List species (http://ag.utah.gov/documents/UtahNoxiousWeeds.pdf). The Monument was part of a 1997 state wide effort to survey noxious weeds along major roads, one mile up each wash that encountered roads, and one mile up each trail.

The Monument contains nine Utah noxious weeds and is actively managing four species (salt cedar, Russian knapweed, Scotch thistle, and white top). In 2009, the Escalante River Watershed Partnership was established and efforts were initiated to remove salt cedar and Russian olive in the Escalante River Watershed. This effort reached beyond the Monument and included private land owners, Dixie National Forest and Glen Canyon National Recreation Area. To date 80% of Escalante River corridor and its side canyons have been cleared of Russian olive (Spencer 2016 Crossroads in Science) and salt cedar. For the past several years, annual treatment of herbaceous noxious weeds is approximately 45 acres of Russian knapweed and white top and approximately 350 acres scotch thistle. Some species such as cheat grass and Russian thistle are too widespread to manage.

II.D WILDLIFE

The Proclamation highlights the diversity of the wildlife species in part because of the elevation gradient and variable climatic zones. Large roaming mammals such as mountain lion and bear

inhabit the upper elevations while trophy mule deer herds are widespread throughout the Monument. Species and populations are managed primarily by the Utah Division of Wildlife Resources (UDWR) and include all game species (black bear, cougar, bighorn sheep, mule deer, elk, pronghorn, upland game birds, and waterfowl) and non-game wildlife species (small mammals, reptiles, amphibians). Species protected by acts of Congress or international treaty (threatened or endangered, migratory birds, eagles) are managed by the United States Fish and Wildlife Service (USFWS). GSENM's role is to manage the landscape for an array of healthy ecosystems capable of supporting the many species of fish and wildlife inhabiting the Monument. GSENM's objective is to maintain and reestablish natural populations, maintain and restore habitat, prevent disturbance to wildlife, and preserve the integrity of corridors, nesting, and spawning areas.

Desert bighorn sheep, wild turkey, American pronghorn, and river otter have been re-established or augmented within the Monument. Several species have been extirpated from the Monument like the grizzy bear and gray wolf. Riparian corridors host neotropical birds, slot canyons have bat roosts, migratory butterflies visit the cooler climes of the Monument, and bees number over 600 species. Inventories for all taxa have been conducted however some inventories are incomplete such as invertebrates (Table x). Only species with actual records are included while other lists include species that are predicted to be in or near the Monument. During the preparation of this document, a new species to the Monument was identified, the western skink (*Eumeces skiltonianus*).

Across much of the west, there has been considerable emphasis and effort on protecting and enhancing Greater sage-grouse (GRSG) and its habitat. On March 23, 2010, the U. S. Fish and Wildlife Service (FWS) determined that the GRSG warranted the protection of the Endangered Species Act of 1973, but adding it to the Endangered Species List was precluded by higher priority listings. The FWS required BLM offices in 10 western states to include GRSG conservation measures in resource management plans and to incorporate with specific language to protect or enhance GRSG populations and habitats using the best available science. After an unprecedented planning effort, the BLM published the Greater Sage-Grouse Approved Resource Management Plan Amendments (ARMPA) for the 10 western states including Utah. The MMP was amended at that time to include conservation measures for GRSG. Due to the ARMPA and the associated protection measures, the FWS concluded in September 2015 that the GRSG no longer warranted listing under the ESA. However, the future of the GRSG depends on the successful implementation of the ARMPA across the west, as well as state management plans and the actions of private landowners. The FWS has committed to monitoring all efforts and population trends. FWS will re-evaluate the status in 2020.

Besides monitoring the threatened and endangered species, discussed below, there is ongoing monitoring and research on hummingbirds, bats, mule deer, American black bears, reptiles, amphibians, American pronghorn, and turkeys.

TABLE XX.X Taxa, numbers species, and date of inventory inventories

Taxa	Number Species Identified	Date of Inventory & Last Updates
Mammals	60	2003, 2004, 2017
Birds	254	2017

Reptiles & Amphibians	28	2003 and 2017
Invertebrates	1112 (MMP, 2012 doc)	
Fish	23	2017

II.D.1 Threatened and Endangered Species

The Monument has several threatened (T) and endangered (E) species under the Endangered Species Act. They include the Mexican spotted owl (T), southwestern willow flycatcher (E), yellow-billed cuckoo (T), and California condor (E). The Mexican spotted owl is a resident in the Monument and there are successful breeding pairs. The southwestern willow flycatcher (SWWF) are migratory and nesting pairs have not been documented in the Monument. The California condor was reintroduced on Vermilion Cliffs National Monument (VCNM) to the south. Confirmed nesting pairs are found in VCNM, Zion and Grand Canyon National Parks. Although condors are occasionally seen within the Monument, there are no nesting pairs.

II.D.2 Non-native Animals

No invasive non-native animals are currently known to be present in the Monument, except for 17 non-native fish in the Escalante River Watershed but not all are invasive. Most of these fish were intentionally put into the creeks to support hobby fishing. Quagga mussels, a non-native and highly disruptive mussel, are present in Lake Powell and the potential exists for them to travel into the Escalante River Watershed. White-nose syndrome is an introduced fungal growth that can kill bats. While it is not currently known to be affecting bats in the Monument, the disease is spreading throughout the US.

II.E CULTURAL RESOURCES

II.F PALEONTOLOGICAL RESOURCES

III. MANAGEMENT DECISIONS AND SCIENCE NEEDS

(Identify and prioritize management questions and science needs)

Notes from template…Science needs should:
- Be kept up-to-date and responsive to changing priorities
- Consider both local and landscape-level issues
- Build from information provided in Section 2
- Prioritize the science needs - TABLE,
- Describe the prioritization criteria (see VCNM)
- Acknowledge that science needs can change in priority, when appropriate
- Display the prioritized science needs in a concise and clear format, accessible to both internal and external audiences

A. **Describe the management decisions that the BLM expects to make in the next**

five-plus years for the unit

B. Describe the scientific knowledge needed to support those management decisions

C. Of the scientific knowledge needed, identify which knowledge is already accessible and which knowledge needs more scientific effort. The latter are the unit's science needs

Over the next five plus years, several management decisions will be addressed and require the use of existing research studies; synthesizing information from resource specialist, outside experts, and published literature; and additional scientific studies. In general, the decisions that are expected to be made relate to the following issues:

- Livestock grazing management and permit renewal
- Response to RS2477 route designations
- Greater sage grouse habitat improvements
- Habitat restoration
- Adjustments to recreation management and special uses
- Management and protection of wilderness characteristics

Table XX contains a list of management decisions, status of knowledge, and scientific needs and opportunities within GSENM. This list is not meant to be exhaustive or static. The scientific needs of GSENM are based on pressing management questions and continually change as management decisions are made and new concerns arise. Thus, the scientific needs will remain fluid and opportunities for research will be open and inclusive.

Science needs are prioritized to reflect the needs identified in the MMP, needs identified by resource specialists, needs that reflect management and leadership concerns, as well as public concerns. These prioritizations can change based on changing conditions and are not meant to be static. Science needs are categorized as high, medium, or low priorities within topic areas; even low priority science needs are important