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From: Backer, Dana
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[PhysicalRes_NLCStempoutline_6.2.17.docx](#)

Hi folks

Attached is a draft of the physical resources section of the science plan. It includes write-ups on: geology, soil/salinity, biological soil crusts, air quality, minerals, water resources, night sky, soundscape and visual resources. The other sections of the NLCS template with notes are included in the draft (highlighted in gray) so you can see the context of the document but these sections do not need editing.

Yellow highlights are questions for the respective specialist. Blue highlights are notes to me. There are only four pages to review and at a minimum, you can just focus on the sections within your area of expertise. This will NOT be a time sink I guarantee.

If I could please get comments back by **June 21th**, I would be delighted and you will avoid wrangling. If there are others who I should send this to, please let me know.

Thanks in advance.

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GSENM (NLCS) SCIENCE PLAN – OUTLINE (5/31/17)

(b)(5) DPP

I INTRODUCTION AND SCIENTIFIC MISSION

A. Purpose of National Conservation Lands science plans

1. Introduce National Conservation Lands
2. Objectives of plan (living document)
3. Define science (see Advancing Science in the BLM, Science Strategy, BLM UT)

B. Unit and geographic area description (surrounding neighbors, incl. map)

1. GSENM resources, objects, and values reference to the designating language
2. MMP, Amends, other legislation

C. Scientific mission

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

II. SCIENTIFIC BACKGROUND of GSENM

(provide clear, concise, current summary of research and sci info)

Notes from template

(b) (5) DPP

Physical Resources

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. 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.

Soil (salinity)

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, NRCS 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. This soil survey is the foundation for ecological site descriptions and provides critical information for understanding rangeland health.

Point and non-point sources of salt exist throughout the Monument, in large part from marine shales and poorly vegetated geological units that are highly susceptible to erosion and major sources of salinity. 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.

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, Belnap, 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.

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 air quality.

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. However, 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. (Circular 93 A Preliminary Assessment of Energy and Mineral Resources within the Grand Staircase - Escalante National Monument Z:\Planning\GSENM Proclamation.Objects&Values\Energy mineral assessment). These resources are in good status and no mining claims can be issued.

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...”. Due to the scarcity of water on the Monument, protecting water resources are a priority. There are four broad watersheds within the Monument and all contribute to the Colorado River. There are several regional aquifers that underlie GSENM with the major aquifer system, Glen Canyon, contained within the Navajo Sandstone (Freethey 1997) which is recharged with precipitation.

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.

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 uncommon yet serve as an important refuge for biodiversity and many endemic species. In addition, they harbor significant cultural artifacts and important plants to the Paiute, Navajo and Hopi. Proper Functioning Condition monitoring is ongoing.

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 and Monument staff started collecting measurements of night skies 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 has applied for International Dark Sky Sanctuary designation. There are potential economic and/or tourism benefits to communities from Dark Sky Sanctuary recognition.

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.

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. The BLM’s objective will be 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...” (Proclamation 1996). Visual resource inventories have been conducted after Monument designation, 2012 and 2016. 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 252 miles of river segments determined suitable for Wild and Scenic River designation.

III. MANAGEMENT DECISIONS AND SCIENCE NEEDS (see VCNM for this section)
(Identify and prioritize management questions and science needs)

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(b) (5) DPP

A. Describe the management decisions that the BLM expects to make in the next five-plus years for the unit (Need MLT input)

Livestock Grazing permit renewal.

As new information about springs becomes available through current research, coupled with the biological importance, threatened status, and potential resilience, the protection, restoration and monitoring of spring ecosystems is a high priority. (b) (5)

As part of soil salinity program, the Monument has to regularly maintain and reconstruct sediment retention basins. Each year, the Monument needs to determine which sediment basins need reconstruction.

(b) (5) DPP

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

As part of the livestock grazing permit renewal process, data on soils, biological soil crusts, and water resources (include the other components when write this section, just addressing the physical components here) will need to be analyzed and summarized.

Construct and maintain livestock enclosures around springs and develop a long-term monitoring program for seeps, springs and wells.

Restoration treatments could have unintended consequences on biological soil crusts, short-term limited availability of forage, water availability, and stream morphology. It will be important to continue documentation and data collection and analysis for restoration projects.

Having additional information on surface and ground water quantity and quality would be valuable to future water claims by private entities.

Determining the condition and sediment yield in each of the sediment basins and develop estimates of

annual sediment retention. Develop method to estimate sediment basin life cycle and maintenance requirements.

(b) (5) DPP

With the exponential growth in visitation, many of the valued physical, biological, paleo, and cultural resources are at risk. Having comprehensive baseline data and inventories will help support management decisions in regards to visitor management.

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

(b) (5) DPP

Much of the data for permit renewal is readily available and monitoring will continue on an annual basis.

Collaborate with BLM UT State hydrologist, Spring Stewardship Institute, and spring experts to develop a long-term monitoring protocol for springs, seeps and wells.

Analyze the restoration treatment monitoring data that has already been collected on the Monument to inform future restoration treatments. Design future monitoring protocols that are statistically robust, include controls and/or exclosures and provide means for data analysis and interpretation. Expand and maintain a network climate stations, analyze data and use as covariates when analyzing restoration treatments. (this will be joined with vegetation needs)

Proposed research is underway to evaluate sediment yields using repeat topographic surveys and new photogrammetric techniques (Structure from Motion photogrammetry). This will help inform maintenance needs for salinity retention ponds.

(b) (5) DPP

IV. MEETING SCIENCE NEEDS

(Develop a clear plan to meet priority science needs)

(b) (5) DPP

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DPP

V. SCIENCE PROTOCOLS
(Develop clear and consistent science protocols, scientific method)

(b) (5) DPP

VI. ORGANIZATION AND COMMUNICATION OF COMPLETED SCIENCE
(Create a system for organizing and communicating completed scientific efforts)

Notes from template

(b) (5) DPP

VII. INTEGRATING SCIENCE INTO MANAGEMENT
(Create a process to make relevant science easily available during the decision- making process)

(b) (5) DPP

VIII: SCIENCE PLAN REVIEW AND APPROVAL

(b) (5) DPP

IX: BIBLIOGRAPHY

A bibliography for citations from the science plan

A bibliographic list of completed science reports from the units

X: UNIT'S LEGISLATION

Include a copy of the unit's designating legislation

Ensure decision-makers have access to relevant science and are familiar with the format, applicability, and limitations

Take all opportunities to share science results in a variety of mediums (e.g. email newsletters, presentations, seminars)

The process of using science in decision-making should provide an opportunity to identify further science needs

The unit science point-of-contact should strive to communicate scientific results with other staff

SECTION 8: SCIENCE PLAN REVIEW AND APPROVAL

Purpose: Ensure a quality product that has been well-reviewed

Reviewers can include all appropriate parties, both internal and external to the BLM

Signers on the Science Plan should include, but are not limited to:

Unit Manager, Field Manager, State National Conservation Lands Lead, National Conservation Lands Science Advisor, National Conservation Lands Division Chief

SECTION 9: BIBLIOGRAPHY

A bibliography for citations from the science plan

A bibliographic list of completed science reports from the units

SECTION 10: UNIT'S LEGISLATION

Include a copy of the unit's designating legislation