

SCIENCE PLAN
FOR
GUNNISON GORGE NATIONAL CONSERVATION
AREA
JULY 2013



Table of Contents

- 1. Introduction And Scientific Mission 1
 - a. Purpose of NLCS Science Plans 1
 - b. Unit and Geographic Area Description 1
 - c. Unit’s Resource Management Plan 2
 - d. Scientific Mission 5
- 2. Scientific Background..... 6
 - a. Background information and Scientific Investigations 6
 - i. Vegetation 8
 - ii. Wildlife 11
 - iii. Hydrology and Water Flow 11
 - iv. Soils 11
 - v. Geology and Paleontology 12
 - vi. Cultural Resources/ Archaeology 12
 - vii. Recreation 13
 - viii. Management Projects 14
- 3. Identification and Prioritization of Management Questions and Science Needs 16
- 4. Meeting Science Needs..... 22
 - a. Internal Organization 22
 - b. Collaboration and Partners 22
- 5. Science Protocols 24
 - a. Guidelines for Scientific Research..... 24
 - b. Science Authorizations..... 24
- 6. Organization and Communication of Completed Science 27
 - a. Internal Organization of Completed Science 27
 - b. Contributions to Broader BLM Organizations of Completed Science..... 27
 - c. Communicating about Science with the Public 27
- 7. Integrating Science into Management 28
- 8. Science Plan Review and Approval 29
 - a. Signature Page 29
- 9. Bibliography 30
 - a. Research in GGNCA 30
 - b. General Bibliography 32
- 10. Unit’s Legislation..... 35

Tables and Figures

- Table 1 – GGNCA management zones identified in the RMP (BLM 2004). 3
- Table 2 – Prioritized Science Needs, by Topic Area 17
- Figure 1 – Map of Gunnison Gorge National Conservation Area and surrounding area 4

SECTION 1– INTRODUCTION AND SCIENTIFIC MISSION

PURPOSE OF NLCS SCIENCE PLANS

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 nearly 900 units spread across approximately 27 million acres of public lands managed by the Bureau of Land Management (BLM). 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. 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).

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. 3-5 years). Scientific needs that emerge during the course of implementing a science plan may be added to the plan on an as-needed basis to meet the unit’s scientific mission.

UNIT DESCRIPTION

Gunnison Gorge National Conservation Area and Wilderness (GGNCA) was designated by Congress in 1999 in recognition of its outstanding geologic, scenic, wilderness, recreational, and scientific resources. GGNCA is located approximately 10 miles northeast of Montrose, Colorado within the boundaries of the BLM Uncompahgre Field Office (UFO). GGNCA is bordered by the Black Canyon of the Gunnison National Park and originally encompassed 57,725 acres of public land as designated in the Black Canyon of the Gunnison National Park and Gunnison Gorge National Conservation Area Act of 1999 (Public Law 106-76). However, GGNCA expanded to 62,844 acres with the Black Canyon of the Gunnison Boundary Revision Act of 2003 (PL 108-78). GGNCA includes the Gunnison Gorge Wilderness (17,784 acres) and 22 river miles of the Gunnison River. Fourteen of these river miles pass through the wilderness (Figure 1).

GGNCA is composed of adobe badlands formations, sagebrush flats, oakbrush parks, piñon-juniper slopes, river canyons, and mesas, along with the plants and animals found in these habitats. Elevations

range from 5,000ft to 9,000ft and are part of the Gunnison uplift, cut by the Gunnison and Uncompahgre Rivers (BLM 2001). The climate is semi-arid to arid with variable precipitation, ranging from approximately 9 to 14 inches annually (Colorado Climate Center 2010). Temperatures also vary but range from near 0°F in January to approaching 90°F in July (Colorado Climate Center 2010). GGNCA has significant cultural resources and recreational value.

UNIT'S RESOURCE MANAGEMENT PLAN (RMP)

The GGNCA RMP was completed in 2004 and included the NCA as well as additional public, private, and state lands totaling 196,000 acres of land (BLM 2004, Appendix A). The following mission statement from the RMP provides an underlying vision for managing GGNCA and the associated planning area:

“The BLM will manage the NCA to protect the resources in accordance with the designating legislation, FLPMA, the Wilderness Act of 1964, as amended, and other applicable provisions of the law. The BLM will incorporate multiple uses to the extent that important resources are protected and the combination of uses takes into account the long-term needs of future generations for renewable and nonrenewable resources. The purpose of the planning effort is to establish an integrated guiding plan for future site-specific analysis and decisions that maintains or improves existing conditions to meet or exceed Colorado BLM Land Health Standards (BLM 2004).”

The RMP focuses management on ecosystem management; that is management based on the ecological system instead of a single species or resource. Morrissey et al. (1994) defines ecosystem-based management as “the integration of ecological, economic, and social principles to manage biological and physical systems in a manner safeguarding the long-term ecological sustainability, natural diversity, and productivity of the landscape.” The goal of BLM ecosystem management is “to develop and implement management that conserves, restores, and maintains the ecological integrity, productivity, and biological diversity of public lands” (Morrissey et al. 1994). One mechanism to achieve integrated, ecosystem-based management is to utilize an adaptive approach to management (defined by, for example, Noss and Cooperider 1994, Reever Morghan et al. 2006, Williams et al. 2007), where management actions are treated as scientific experiments. In doing so, assumptions are tested, actions and outcomes are monitored, and future management actions are refined based on the results.

The Gunnison Gorge RMP was the first BLM plan to incorporate the Benefits-Based Management (BBM) approach for recreation management in a RMP-level document. The BLM partnered with Arizona State University on the development of BBM visitor surveys that were used to gather information on visitor profiles prior to the start of the planning process. In general, this approach requires managers, to consider the benefits to users in balance with resource protection.

The RMP designated six management zones based on ‘a particular geographic area’s public land resources, uses, and values relative to the goals and objectives of the RMP’ (BLM 2004, Table 1). The plan designated three Areas of Critical Environmental Concern (ACEC): the Native Plant Community

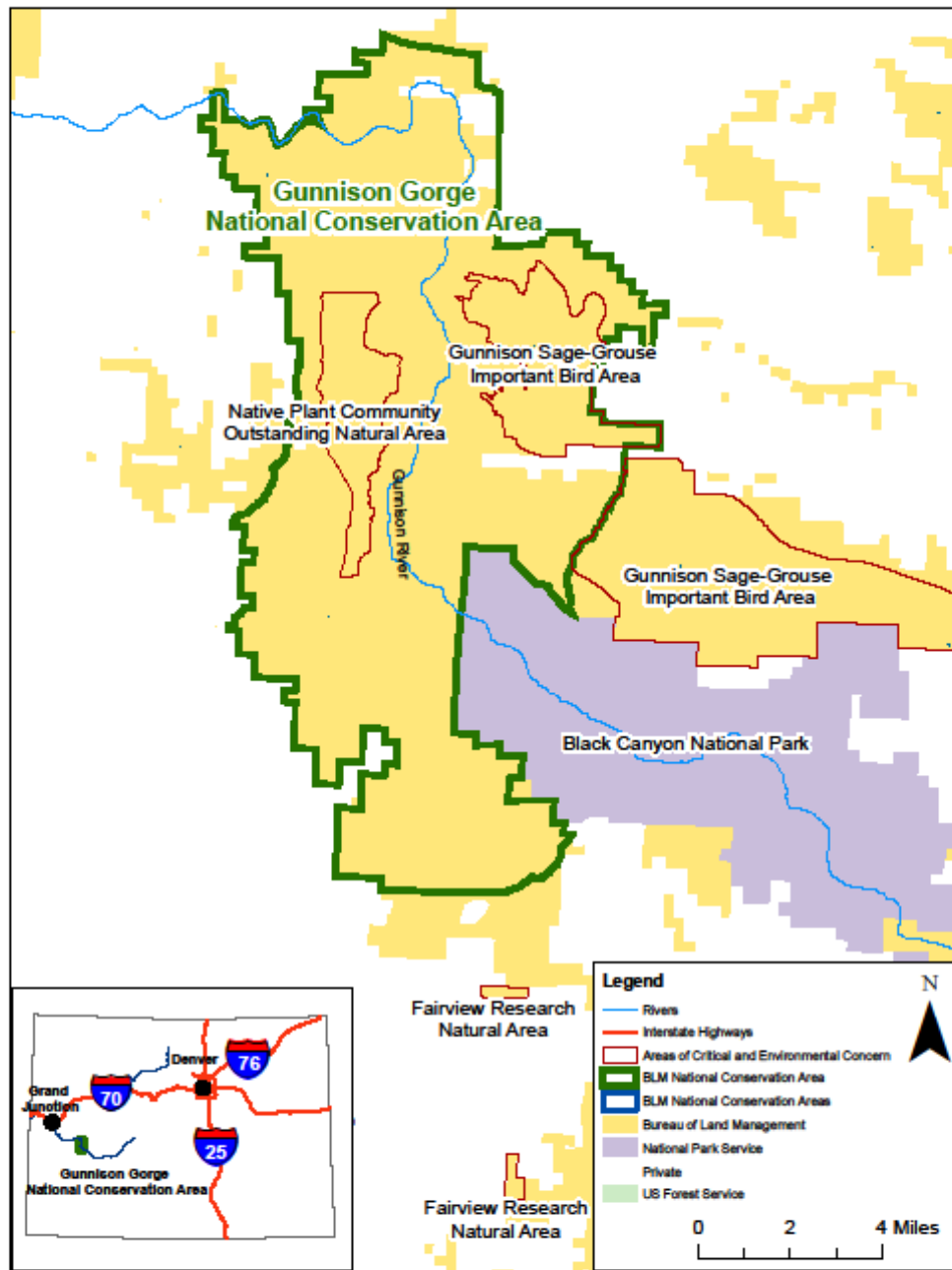
ACEC and Outstanding Natural Area (3,800 acres), the Gunnison Sage Grouse ACEC/Important Bird Area (22,200 acres), which also has a portion outside of GGNCA, and the Fairview Native Plant ACEC (160 acres) (Figure 1). The RMP also identified three Special Recreation Management Areas (SRMA's): the Gunnison Gorge Wilderness SRMA (17,784 acres), the Flat Top-Peach Valley OHV SRMA (9,754 acres), and the Gunnison and North Fork River SMRA (13,502 acres) which was designated to enhance riparian and recreation resources.

GGNCA receives approximately 90,000 visitors a year, 17,700 of which visit the Wilderness. There are four major vehicle entrances to GGNCA and four major wilderness trailheads. There are over 60 dispersed campsites, trailheads, overlooks, and other high-use areas. GGNCA has over 65 miles of designated roads and over 126 miles of designated trails. In 2005, an assessment of use allocation was conducted in the Wilderness area, including feedback from Gunnison Gorge commercial outfitters, in order to begin development of the RMP's Wilderness Recreation Strategy (BLM 2005).

Table 1 – GGNCA management zones identified in the RMP (BLM 2004).

Management Unit	Acres of Public Land	Percentage of Planning Area	Important Values, Resources, or Land Uses
1	17,784	19	Protect Wilderness (Gunnison Gorge Wilderness)
2	9,754	10	Enhance natural, scenic, and recreational values (Flat Top-Peach Valley OHV Recreation Area)
3	13,502	14	Protect and enhance riparian and recreation resources (Gunnison and North Fork Rivers Special Recreation Management Area (SRMA))
4	22,200	23	Protect Gunnison sage grouse (<i>Centrocercus minimus</i>), elk (<i>Cervus elaphus</i>), and mule deer (<i>Odocoileus hemionus</i>) winter concentration (Gunnison Sage-Grouse Area of Critical Environmental Concern (ACEC)/ Important Bird Area (IBA))
5	3,785	4	Protect native plants (Native Plant Community ACEC/Outstanding Natural Area (ONA))
6	28,755	30	Provide for multiple use under common management

Figure 1 – Map of Gunnison Gorge National Conservation Area and surrounding area.



This map was produced by the Grand Junction Field Office September 2012

SCIENTIFIC MISSION

Science in National Landscape Conservation System (NLCS) units is defined broadly as ‘including basic and applied research in natural and social science, as well as inventory and monitoring initiatives’ (BLM 2007). In addition, 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).

Science has been defined within the BLM several times (e.g. BLM 2007, BLM 2008); it 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.

This science plan will be used as the basis for conducting science in GGNCA. Scientific efforts within GGNCA should support the conservation, protection, and restoration values identified in the designating language, such as ecosystem resiliency and function, land health, diversity and viability of plant and animal populations, and cultural and paleontological sites. Since GGNCA is managed for multiple-use, some level of resource disturbance is inevitable (e.g. from grazing and recreational use). Scientific knowledge can provide information to ensure the authorized uses do not negatively impact GGNCA’s conservation mission.

Specifically, it is the scientific mission of GGNCA to:

- 1) Allow and encourage pertinent science that can directly or indirectly:
 - a. inform management decisions and evaluate management methods;
 - b. improve and maintain GGNCA’s resources, objects, and values;
 - c. improve and maintain ecosystem resiliency and function;
 - d. improve and maintain land health, and address land health concerns;
 - e. maintain diversity and viability of plant and animal populations;
 - f. preserve and understand socio-cultural and paleontological sites;
 - g. improve understanding of the impacts of authorized uses; and,
 - h. improve understanding, development, and implementation of best management practices.
- 2) Allow and encourage:
 - a. long term and short term investigations;
 - b. internal and external scientific investigations; and,
 - c. scientific inquiry across diverse disciplines, as appropriate.
- 3) Serve as a model system for surrounding areas, so that scientific findings can be exported to other federal and non-federal lands.

SECTION 2 – SCIENTIFIC BACKGROUND

Past and present research in GGNCA is abundant and has covered a diverse array of topics, including studies on vegetation, wildlife, paleontology, archaeology, and the impacts of recreation (Section 9 - Bibliography of published studies related to GGNCA). The following is a brief review of subjects, topics, and areas of research that have been published about GGNCA, or that are directly relevant to GGNCA. Some of the research is also linked with the bordering Black Canyon of the Gunnison National Park.

In addition to the scientific research above, ongoing monitoring of resources is a large portion of the science conducted in GGNCA. Monitoring in GGNCA is used to ‘assess resource conditions, identify resource conflicts, and determine if resource objectives are being met, and periodically refine and update desired conditions and management strategies’ (BLM 2004). Monitoring can be useful for determining: areas of resource decline, background information for scientific inquiries, early indicators of invasive weeds, stability of cultural and paleontological resources, effectiveness of management activities, and the identification of new concerns and needs for scientific research.

VEGETATION

GGNCA is home to several distinct vegetation communities including salt-desert shrublands, semi-desert grasslands on sandstone derived soils, piñon-juniper woodlands on shallow soils, big sagebrush flats on deeper soils, and oakbrush dominated sites at higher elevations (BLM 2001). In addition, pockets of aspen can be found at the highest elevations and riparian vegetation along river corridors (BLM 2001). Numerous sensitive plant species and communities exist in GGNCA (BLM 2013).

Vegetation research efforts in GGNCA include:

The Colorado Natural Heritage Program's (CNHP; www.cnhp.colostate.edu) studies in GGNCA on sensitive and rare species (Decker 2005, Panjabi and Anderson 2004, Lyon and Denslow 2001, Lyon et al. 1999). CNHP projects included:

- establishing permanent monitoring plots for endangered clay-loving wild buckwheat (*Eriogonum pelinophilum*);
- designing rapid, cost efficient monitoring programs for four additional rare species: Uinta Basin hookless cactus (*Sclerocactus wetlandicus*), Delta lomatium (*Lomatium concinnum*), Rocky Mountain thistle (*Cirsium perplexans*), and good neighbor bladderpod (*Lesquerella vicina*);
- mapping the extent of sensitive native plant communities in the Native Plant ACEC; and,
- conducting inventories for endangered and rare plants on 5,700 acres of the conservation area (report available upon request, Uncompahgre Field Office, UFO).

Internal BLM research has examined the effectiveness of planting cottonwood poles and willow cuttings at eleven sites in GGNCA (BLM 2008).

Pinyon woodland stand structure-historic range of variation research was conducted by the University of Colorado, Boulder (Eisenhart 2004).

USGS research examined the tie between plant community condition, rare plants, and mancos shale-derived soils (USGS unpublished report).

General vegetation monitoring efforts within GGNCA include:

- The BLM monitors land health at 33 sites (evaluated every 10 years) in GGNCA, beginning in 2001. As one aspect of land health monitoring, the status and trend of vegetation is measured and analyzed to determine if established land health standards are being met. This information is then used to rate landscapes as 'meeting', 'meeting with problems', or 'not meeting' land health standards. These ratings are used to inform management actions.
- The effects of vegetation treatments (e.g. burned area rehabilitation projects, tree or shrub removal plus seeding, typically implemented to improve habitat for deer, elk or sage grouse, or reduce fuels) are monitored at 2, 5, and 10 year intervals following the treatment.

Invasive plants are present throughout GGNCA and are actively managed. Annual inventories of invasive plants and noxious weeds, via photo points and field inspections, are conducted in partnership with Delta and Montrose counties. The following list provides some details on the non-native plants present and management responses:

- Tamarisk (*Tamarix spp.*) is an invasive shrub that can exclude native riparian vegetation and alter native systems through changes to water flow, wildlife habitat, and soil properties (Di Tomasso 1998). A biological control agent, the tamarisk beetle (*Diorhabda carinulata*) was released in Colorado in 2005 to control this species. Research is on-going to test its efficacy (Palisade Insectory; Colorado State University). In GGNCA, numerous projects and partner groups have worked on Tamarisk control, including: Delta County's tamarisk/noxious weed eradication program, the Tamarisk Coalition, and the Denver Botanic Gardens.
- Russian knapweed (*Acroptilon repens*) is an aggressive weed which competes with native vegetation in several ways, including the production of allelopathic substances and an ability to grow from seed or hearty root masses (Maddox et al. 1985). Control of this weed can be difficult and biological agents may increase chances of longer term suppression.
- Hoary cress, also known as whitetop (*Cardaria draba*), is a rhizomatous perennial plant that invades rangelands and can be abundant on alkali soils (Jacobs 2007). This species spreads by rhizomes, which can be extensive, as well as seed, and produces allelopathic chemicals that may inhibit the growth of other plant species (Jacobs 2007).
- The invasive species cheatgrass (*Bromus tectorum*) is an aggressive invader present throughout much of the arid west (Pellant 1996). Cheatgrass has changed historic fire regimes and increased the likelihood of more frequent fires (Pellant 1996). Managers have often tried to mitigate the spread of cheatgrass by reseeding after fires; however, there is uncertainty as to this method's effectiveness (Getz and Baker 2008).

- Halogeton (*Halogeton glomeratus*) is a native of China that was introduced to the United States in the early 1900s and rapidly spread throughout the west (Davis et al. 2009). Halogeton usually invades previously disturbed communities, but once established may out-compete native vegetation. Halogeton can rapidly use summer rainfall for growth and seed production, produces seeds that can germinate anytime and seeds that can survive for long periods, which make it well adapted to the erratic desert weather (Davis et al 2009). It does well on alkaline soils and can be toxic to livestock (Whitson et al. 2009).
- To control yellow toadflax (*Lunaria vulgaris*) and dalmation toadflax (*Linaria genistifloia spp. dalmatica*), a noctuid moth (*Calophasia lunula*) has been released, with limited success. A new agent (*Mecinus janthinus*) may be released for control of yellow toadflax (Colorado Department of Agriculture 2011).
- Invasive thistles in and around GGNCA include: musk thistle (*Carduus nutans*), Canada thistle (*Cirsium arvense*), Scotch thistle (*Onopordum acanthium*), and bull thistle (*Cirsium vulgare*). The thistle seed weevil (*Rhinocyllus conicus*) was released to control Musk thistle (*Carduus nutans*) in the late 1960's. While this biological agent provides some control of this species it also feeds on native thistles and is no longer released. This weevil is established throughout Colorado and likely offers some control of non-native thistles in GGNCA. This weevil may also be found on Canada thistle, but is not as effective in controlling this species (Wiggins et al 2010).
- Field bindweed (*Convolvulus arvensis*) is typically found in croplands. A small eriophyid mite (*Aceria malherbae*) was released in 1987 in the west to control this invasive species and is established in Colorado and GGNCA (Colorado Department of Agriculture Insectory 2011, Boydston and Williams 2004). Another biological control agent, the bindweed moth (*Tyta luctuosa*) is also being released in Colorado and has been found to overwinter in Mesa county, this first place of documented establishment in the US (Colorado Department of Agriculture Insectory 2011).
- Additionally, several 'early detection, rapid response' invasive plants exist in small populations in GGNCA and surroundings areas. These species are not yet a substantial problem, but should be treated whenever they are found and include: spotted knapweed (*Centaurea stoebe*), diffuse knapweed (*Centaurea diffusa*), leafy spurge (*Euphorbia esula*), and yellow starthistle (*Centaurea solstitialis*).

WILDLIFE

GGNCA houses a variety of upland, riparian, and aquatic species, as well as year-round and migrant bird species, and listed and threatened species. Wildlife serves as one of the main attractions of GGNCA (e.g. parts of the Gunnison River are considered 'gold medal trout waters' by Colorado Parks and Wildlife).

Birds

Gunnison sage grouse (*Centrocercus minimus*; USFWS candidate species for endangered status) are dependent on sagebrush and their population declines have been attributed to decreasing overall habitat and increasing fragmentation of remaining habitat (Oyler-McCance et al. 2001). Within GGNCA the Gunnison Sage Grouse Important Bird Area/ Area of Critical Environmental Concern encompasses

approximately 22,000 acres of sage grouse habitat. This area is home to the Crawford population of Gunnison sage grouse, which occupies both Montrose and Delta Counties. Conservation plans have been published for the Crawford population (BLM 2004, Appendix H; Crawford Area Gunnison sage-grouse conservation plan, 2011; available upon request, UFO).

An ongoing project with the USGS has fitted Gunnison sage grouse and elk (*Cervus elaphus*) with GPS transmitters to determine traffic effects on Gunnison sage grouse, habitat use and population dynamics, and elk migration routes (Ouren and Watts 2005a, b). A climate monitoring station was installed on the east side of GGNCA to track weather conditions, which is used to monitor Gunnison sage grouse habitat.

Between 2011 and 2013, 60 sage grouse were captured in the Gunnison Basin and translocated into the Crawford area population in and adjacent to GGNCA. Some birds were fitted with radio collars or GPS transmitters by Colorado Parks and Wildlife (Crawford Area Gunnison Sage-grouse Conservation Plan, 2011). Yearly Gunnison sage grouse lek counts are performed by Colorado Parks and Wildlife and Crawford Working Group in GGNCA.

Vegetation surveys are completed within the ACEC every 10 years by the BLM, results of these are incorporated into BLM land health reports.

An inventory of bird species, relative abundance, and breeding status was conducted within GGNCA in 2011. Prominent habitat types were surveyed. A total of 91 native bird species and 5 non-native bird species were found (Dunne 2011, report available upon request). More broadly, the Colorado Breeding Bird Atlas gives habitat, breeding, and distribution information on bird species found in Colorado, including in GGNCA (Kingery 1998). Information is currently being collected for an updated version.

Raptors, including bald eagles (*Haliaeetus leucocephalus*; USFWS delisted species), peregrine falcons (*Falco peregrines anatum*; USFWS delisted species), and golden eagles (*Aquila chrysaetos*; USFWS species of concern) inhabit GGNCA and locations of some nesting pairs is known.

Burrowing owls (*Athene cunicularia hypugea*; State of Colorado species of concern) are found within GGNCA. Burrowing owls are closely linked to active prairie dog towns and use prairie dog burrows for breeding. Burrowing owl populations decline with declining prairie dog populations (Desmond, Savidge et al. 2000).

The yellow-billed cuckoo (*Coccyzus americanus*; USFWS candidate species for endangered status; Federal Register 2012)). This species may breed in riparian areas in Western Colorado (Laymon 1998), and while it has not been documented within GGNCA, breeding pairs have been documented near the town of Paonia (about 15 miles of GGNCA; Rocky Mountain Bird Observatory, Black Canyon Audubon unpublished data).

Mammals

White-tailed prairie dogs (*Cynomys leucurus*), a keystone species (Kotliar et al. 1999), are found in many areas within GGNCA . Prairie dog towns were mapped by BLM in Peach Valley in 1978-1979 (BLM 2001).

There are numerous threats to prairie dog populations in GGNCA including decreasing habitat and sylvatic plague (*Yersinia pestis*); however it is unknown how these factors affect long term prairie dog populations (Federal Register 2010).

Recent inventory has used both mist netting and acoustic surveys to determine the presence of bats in GGNCA and throughout the Uncompahgre Field Office (Hayes et al. 2009, as well as reports available on request, UFO). Five of the 17 bat species found in western Colorado are considered sensitive wildlife species by the BLM UFO in GGNCA: Townsend's big-eared bat (*Corynorhinus townsendii*), spotted bat (*Euderma maculatum*), Allen's big-eared bat (*Idionycteris phyllotis*), fringed myotis (*Myotis thysanodes*), and Yuma myotis (*Myotis yumanensis*). For over two decades, Colorado Parks and Wildlife has conducted bat surveys at abandoned mines. While white-nosed syndrome has not been found in GGNCA or in Colorado, its spread westward is of concern. Research is ongoing.

Kit fox status in GGNCA is uncertain (*Vulpes macrotis*; State of Colorado endangered species), but their populations may have declined from historic levels. A recent study modeled kit fox habitat in Western Colorado (Reed-Eckert 2010). Ongoing research by Colorado Parks and Wildlife in GGNCA and elsewhere utilizes trapping and hair snares.

Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) are an iconic animal in Colorado and in GGNCA. Between 1947 and 2007 bighorns were released in Colorado to establish new populations or supplement existing populations (George et al. 2009). Concerns with bighorns include disease, overgrazing, plant community succession and forestation of native ranges, human development, and competition with livestock (George et al. 2009).

Elk (*Cervus elaphis*) and mule deer (*Odocoileus hemionus*) use habitat within GGNCA, especially in winter, and may impact other species (e.g. sage grouse) and habitat (e.g. shrub use). Research by USGS scientists had addressed elk migration routes (Ouren and Watts 2005a, b).

Fish, reptiles, and amphibians

The midget faded rattlesnake (*Crotalus viridis concolor*; BLM sensitive species) is a subspecies of western rattlesnake that ranges from eastern Utah to the Four Corners area, within a range of dry habitats (Stevens 2004). A few individuals have been detected within GGNCA as part of an ongoing research project (Parker and Spear 2013, unpublished data), but accurate population estimates have not been determined, this species may be decreasing with decreasing prairie dog populations (Stevens 2004).

Amphibian species are present within GGNCA, but a baseline has not been scientifically established. Amphibian species have been in decline throughout the world, with poorly understood causal factors (Stuart et al. 2004).

The introduction of whirling disease in the 1990's caused declines in the rainbow trout population of the Gunnison River and stocking of these fish has occurred since 2004 in an attempt to increase populations (Hebein et al. 1998, Schiesler and Fetherman 2010). Research with Colorado Parks and Wildlife is

ongoing and these species may be found within GGNCA. In 2009, BLM researchers surveyed the fish population at the Smith Fork, a perennial tributary to the Gunnison River in the Gunnison Gorge Wilderness. The survey found limited fish, likely attributed to a steep stream gradient and high water temperatures (Fresques unpublished data, report available upon request, UFO).

The bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), and roundtail chub (*Gila robusta*) are listed as BLM sensitive fish species. These species may be present within GGNCA. Threats to these fish include water diversion and changes to flow regimes and competition with non-native fish (e.g. Rees et al 2005, Bezzerides and Bestgen 2002).

HYDROLOGY AND WATER FLOW

Hydrologic resources include the Gunnison River, North Fork of the Gunnison, and Smith Fork of the Gunnison, as well as other intermittent streams and springs.

Research has addressed sediment distribution and movement within the Gunnison River, especially as it pertains to regulated flows (Dubinski and Wohl 2006, Elliott and Parker 1997). Related research has addressed flows and uses of the Dolores River (Vandas et al 1990), which is a nearby western river.

Baseline surveys of macro-invertebrates have been completed in some perennial streams within GGNCA (information available on request from UFO). Currently surveys follow protocols outlined by the Utah State University National Aquatic Monitoring Center.

Riparian monitoring includes:

- BLM's Proper Functioning Condition (PFC) monitoring (a qualitative assessment) and,
- ground water monitoring wells to track changing water levels and salinity levels (installed in 2009 and 2012).

SOILS

Soils within GGNCA are variable, generally have low potential for plant production, and are susceptible to erosion (BLM 2001).

Research has addressed basic information about the stability of Mancos Shale soils (one of the soil types found within GGNCA, and links between biological soil crusts and soil stability (Carpenter and Chong 2010, Carpenter 2008).

Some research has been done on the composition of Mancos Shale soils especially as it pertains to potential salt run-off into the Colorado River (Whittig et al 1982). Internal research details a study of salinity of the Elephant Skin Wash area of GGNCA (Murphy 1990, Available upon request, UFO).

From 2003 to 2008 the BLM participated in the 'Mancos Shale Landscape Project'. This project involved studies in regional geochemistry, geologic and soil mapping, digital elevation and GIS modeling, soil and rock mineralogy, remote sensing, landscape classifications, erosion processes, and inventories of

Mancos vegetation communities. The U. S. Geological Survey (USGS) website provides information on this project including data, research updates, summaries, maps, Landsat and LIDAR imagery, and scientist contact information (USGS 2013).

In 2006, the BLM tested the feasibility of using close-range photogrammetry to collect three-dimensional data to detect and monitor hill slope erosion processes and the effects of surface disturbance in Mancos Shale soils (report available on request from UFO).

From 2007 to 2011, the USGS used ground-based LIDAR imagery to measure disturbed and undisturbed Mancos Shale hill slopes in the GGNCA and to detect and quantify changes in surface soil elevations (information available on request, UFO).

In 2008 and 2009, seasonal GeoCorps interns inventoried, mapped, and documented erosion and invasive weed areas on over 1,200 salinity control check dam structures in GGNCA's Mancos Shale areas (data available on request from UFO).

In 2010, BLM, USGS, and NPS hydrologists conducted preliminary hydrologic function assessments and water testing on the network of irrigation canals and natural arroyos in a newly acquired GGNCA inholding. Water in these channels cuts through highly erosive Mancos Shale soils picking up increasingly higher loads of salinity and selenium, which can cause water quality and fish toxicity problems in the lower Gunnison and Colorado River systems (Grand Basin and Grand Valley selenium task forces 2013).

GEOLOGY AND PALEONTOLOGY

The geologic history of western Colorado (Kirkham et al 2002, O'Sullivan 1992) in general, and Gunnison Gorge in particular (Kellog 2004, Aslan et al. 2008) have been extensively studied including: how rock layers were formed, uplifted, and eroded, as well as information on fault-lines in the area and the geologic history of the Gunnison River.

In 2002, a BLM report provided an overview and analysis of the paleontological resources and known fossil localities of the GGNCA (Armstrong 2002, report available on request from UFO). A subsequent study documented the Molluscan fossils in GGNCA (Merewether et al. 2006).

Jurassic and Cretaceous paleontological localities have been identified by BLM seasonal GeoCorps interns. Cretaceous age dinosaur trackways (including dinosaur skin imprints), particularly the Suncliff Canyon trackway, have been studied in GGNCA, information available upon request UFO.

CULTURAL RESOURCES AND ARCHAEOLOGY

The archaeological record of the GGNCA spans the known pre-history of North America.

Ongoing research at the Eagle Rock shelter in the northern extent of the gorge has discovered human occupational deposits dating back as far as 12,880 years ago, making the site one of the oldest known Clovis occupation sites in the nation (more information available, UFO). Since 2006, Western Wyoming

College has worked closely with the BLM on excavations of prehistoric deposits and documentation of rock art at the site (research is ongoing, more information available from UFO). Analysis and reporting of this project is in progress.

Other known cultural sites in GGNCA include: archaic period rock art, campsites and hunting stands, formative era occupations and evidence of corn horticulture, late prehistoric and historic period Ute occupations and rock art, historic European homesteading, mining and ranching operations, including Howell Village and the “Stemwinder” cattle trail (unpublished data, UFO).

Ongoing research in the GGNCA has been focusing on a discovery of Ute map rocks in the gorge. Sometime between ca. 1600 AD and 1800 AD, Ute people left detailed maps of trails, wildlife and hunting areas inscribed on rock panels in the area. The rock art maps have recently been interpreted with the help of elders from the Ute tribes, and a series of archaeological surveys have been implemented. The trails depicted on these “map rocks” can still be found, and in many cases can provide information valuable to other research. For example, the Smith Canyon map rock shows detailed renderings of a trail system leading through more inaccessible areas of the canyon to areas on the upland benches where figures of sage grouse are depicted. These mapped renderings on the rock panel coincide quite closely with areas that wildlife researchers are examining for their historic and current sage grouse populations. Likewise, the mapped trails with figures of elk closely match locales currently identified by wildlife professionals as elk migration and wintering ranges (unpublished data, UFO). Archaeological survey of these trails and hunting areas is ongoing and may serve to inform current research.

Cultural site inventory and monitoring are performed with volunteers as part of the GGNCA Volunteer Site Steward program.

- Stewards are trained by the BLM archaeologist during an annual training course emphasizing regional cultural history, archaeological ethics, impact assessment, photo-documentation, and record keeping. Site stewards visit their assigned sites on at least a quarterly basis, photograph the site from pre-established points, and keep a regular site assessment log. These logs and photos are kept at the GGNCA cultural resources office and are tracked on the GGNCA site monitor log. In addition to site monitoring, protection and management, volunteers also assist in inventory, site stabilization, and data recovery projects. As of 2012, there were four monitoring teams (eight people) responsible for monitoring six cultural sites eligible for the National Register of Historic Places.

RECREATION

As part of GGNCA’s RMP development, researchers at the BLM partnered with Arizona State University at Tempe on a study of GGNCA visitors to determine their attitudes and preferences in order to help implement benefits-based management (BBM). The study identified baseline visitor profiles and increased understanding of desired user activities, experiences, and benefits derived from recreating in GGNCA. These results informed the development of GGNCA’s fifteen recreation management zones, including identification of the zones’ management objectives and prescriptions (BLM 2004). BLM

managers use this information to inform decisions and balance benefits to users with resource protection.

In 2008, researchers from the University of Idaho examined visitor satisfaction at GGNCA's Chukar Trailhead, following protocols used throughout several western states, and found overall visitor satisfaction to be good (University of Idaho 2008, available on request, UFO).

In 2008, Northern Arizona University developed a human-impact monitoring program that used several impact indicators to rapidly assess recreation areas and recreational impacts. The method was designed to analyze trends in site conditions, determine landscape-level problems versus site-specific problems, and identify key sites for further monitoring. This method involves inventory of riparian and upland recreation sites and cultural sites. These monitoring data can be used to inform the management of designated campsites and implementation of the Gunnison Gorge Wilderness use allocation plan (information available upon request, UFO).

The effects of OHV's (off-highway vehicles, where they are used) on natural resources and socioeconomics were examined by USGS scientists. The project identified mitigation and restoration techniques, in addition to further research and monitoring needs (Ouren et al. 2007).

Ongoing recreation monitoring in GGNCA includes:

- Wilderness and riparian campsite monitoring is performed based on monitoring protocols developed by Northern Arizona University faculty, including the 2008 project described above (protocol available on request, UFO). Data are used to determine visitor use trends, carrying capacities, and resource protection and regulatory needs.
- Visitor use data is collected annually using the Wilderness self-issuing permit program, trailhead registration forms, law enforcement and seasonal river ranger patrol logs, photos and videos, outfitter trip logs, trail counters, and visitor contacts.
- Motorized and mechanized use on trails, roads, and in designated open areas is tracked via trail counters, law enforcement patrols, and contacts by BLM staff and the public. Helmet cams record trail and riding conditions, safety hazards, and maintenance needs.

MANAGEMENT PROJECTS

While land management actions are not typically scientific experiments, their implementation and the monitoring of their outcomes can be used for adaptive management purposes and can identify science needs. A list of management projects can be found in the Manager's reports, beginning in 2006 and published annually (reports available upon request, UFO). Management projects can include habitat treatments, cottonwood plantings, rehabilitation of closed routes, etc. Many times these projects are done with uncertainty in a difficult, arid environment with limited resources. Therefore research, especially in an adaptive management framework, is needed to improve the success of these projects.

Historic grazing and fire, or lack thereof, may have dramatically altered vegetation conditions within GGNCA. Therefore, it is difficult to accurately determine historic conditions. With that in mind reference conditions are not always available, and managers and specialists may need to define what 'restoration' should look like in GGNCA and what will constitute restoration success to have measurable targets.

SECTION 3 – IDENTIFICATION AND PRIORITIZATION OF MANAGEMENT QUESTIONS AND SCIENCE NEEDS

The following is a list of scientific needs, questions, and opportunities within GGNCA. However, this list is not meant to be exhaustive or static. The scientific needs of GGNCA 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 should remain open and inclusive. GGNCA’s current science needs are listed in Table 2.

Science needs are prioritized to reflect the needs identified in the Resource Management Plan, 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 steadfast or static. Science needs are categorized as high, medium, or low priorities within topic areas (Table 2). These are pragmatic decisions: even low priority science needs are important.

Table 2 – Prioritized science needs by topic area.

TOPIC	PRIORITY	FOCUS AREA	QUESTIONS
Vegetation and Soils	High	Sensitive plants	Genetic studies of Clay-loving wild buckwheat (<i>Eriogonum pelinophilum</i>) to determine species, and the feasibility of population augmentation. What are the habitat requirements of this plant and what are minimum viable populations? What are the effects of human activities, including grazing, on this plant?
			How do sensitive native plants, from the BLM sensitive species list, respond to disturbance and other stressors (recreation, off highway vehicles, livestock use, etc.)?
			What are population trends of sensitive native plant species (upward or downward) and what are the driving factors for these trends?
			What management decisions can influence trends in sensitive native plant populations?
			Where are populations of sensitive plants?
			What are the effects of human activities on hookless cacti populations?
		Riparian communities	What are effective means of restoring and managing degraded riparian communities in altered river systems?
			What are the relationships between river flows, riparian vegetation and riparian weeds?
		Salt Desert shrub community	What methods can be used to successfully restore and manage degraded salt desert shrub sites?
			What restoration techniques are effective in restoring native diversity of grasses (both warm and cool season) and forbs?
		Russian knapweed (non-native)	If biological agents are used, what is their effectiveness in terms of suppression and removal of the target species?
			Do management activities (e.g. chemical or mechanical) significantly decrease the cover of this non-native in the presence of the biological agent?
			What is the recovery, in terms of cover and diversity of native plants, when this species is suppressed or removed? What variables influence native plant recovery?
			Does active restoration significantly increase native plant diversity or cover, when Russian knapweed is removed?
			How likely is reinvasion after removal of this species, and what factors influence whether a site is re-invaded or not?
			What native species can compete with this species and under what circumstances (seeding time or method, pre-treatments, mix of species, etc.)?
		Soils/ Hydrology	What are the impacts from multiple uses, for example OHV use, livestock grazing, mountain biking, and other surface-disturbing uses, on Mancos shale soils? Specifically what are impacts to sediment, selenium, and salinity production? How can these be mitigated?
			What are the contributions to soil erosion, salt and selenium loading, sedimentation and dust from OHV use, livestock grazing, mountain biking, and other surface-disturbing uses? How can these be mitigated?
	Medium	Tamarisk (non-native)	How effective are biological controls at long term reduction and suppression this species?
			Are native species able to increase in cover in areas where biological controls have suppressed this species?
			Does mechanical removal of this species provide a significant increase in native species cover and survival?

TOPIC	PRIORITY	FOCUS AREA	QUESTIONS
			When tamarisk is removed, can native plant species recover without active restoration, if so under what circumstances?
			Does percent cover of other invasive or non-native species increase with this species' suppression or removal, under what conditions?
			How are ecosystem processes effected by this species' suppression and removal including: food webs (for example migratory bird diversity and abundance, insect diversity and abundance, native fish abundance and reproduction, etc.), evapotranspiration and water use, nutrient cycling?
		Cheat grass (non-native)	Can inter-seeding native species with this species increase diversity and cover of native plants?
		Halogeton (non-native)	What seeded species, and under what circumstances, can prevent this species' domination after fire?
			How are ecosystem processes affected by this species' invasion including: fire regimes, insect and animal diversity and abundance, soil nutrient cycling, soil crust abundance, and soil microbial communities?
			How can establishment and cover of desirable native plant species be increased in areas currently dominated by halogeton (interseeding, transplants, etc.)?
			After disturbance, how can domination by halogeton be prevented (appropriate seed mixes, measures to help establishment of native species)?
	LOW	Ecosystem function	When is piñon-juniper expansion 'encroachment' and when is it a more natural process?
			What role does fire play in piñon-juniper expansion?
			What are appropriate dynamics for native shrub communities (age class structure)?
			What is the likely local fire history?
		Biocontrol agents	How effective are bio-control agents at controlling the target plant (yellow toadflax, Canada and musk thistle, field bindweed)?
			How are the bio-control agents for the species mentioned above affecting native systems and non-target species?
		Whitetop	How well do native species recover after this species' removal?
			Is active restoration necessary to increase native plant cover and diversity?

TOPIC	PRIORITY	FOCUS AREA	QUESTIONS	
		(non-native)	How likely is reinvasion after removal of this species and what factors influence whether a site is reinvaded or not?	
Wildlife	High	Gunnison sage grouse	How does traffic effect migration patterns and habitat use by sage grouse?	
			How are sage grouse using habitat in GGNCA and the surrounding areas?	
			How is collecting of antler sheds effecting sage grouse habitat use and at what time of year might this be an issue?	
			How effective have habitat treatments been at improving sage grouse habitat? Are sage grouse using treated areas?	
		Bats	What are the locations and uses (e.g. roosting, reproduction) of bat inhabited caves and roosts, and which species of bats are present?	
			How to gain early detection of the presence of white-nosed syndrome?	
		Midget faded rattlesnake	What are the occupied or otherwise important habitats for midget faded rattlesnake populations?	
			What is the relationship, if any, between midget faded rattlesnakes and prairie dog towns?	
			What are the population dynamics of midget faded rattlesnakes within GGNCA and what factors contribute to population fluctuations?	
		Reintroduction	What is the feasibility of reintroduction of native wildlife species, such as kitfox, pronghorn, bighorn sheep? What are the implications for habitat?	
		Medium	Raptors	Where are breeding pairs of bald eagles, peregrine falcons, and golden eagles, how many are there, and what are the habitat types where they are found?
				What is the status and trend of habitat used by bald eagles, peregrine falcons, and golden eagles in GGNCA?
	Burrowing Owls		How many burrowing owls are present within GGNCA, including where they are present and in what habitat types?	
			What are the population dynamics of burrowing owls within GGNCA and what factors, especially as related to habitat, contribute to population fluctuations?	
			How do population dynamics of prairie dogs influence population dynamics of burrowing owls?	
			What are the effects of OHV recreation on nest site selection?	
	Amphibians		What species of amphibians are present within GGNCA? Where are important habitats and what are the characteristics of important habitats?	
			Are populations of amphibians growing, in decline, or stable?	
	Medium	Recreation	What are the effects of the open use areas on land health, noise, dust, user conflicts, and safety?	

TOPIC	PRIORITY	FOCUS AREA	QUESTIONS
Paleontology	Medium	Paleontology	Identification and interpretation, when appropriate, of known and unknown paleontological sites.

SECTION 4 – MEETING SCIENCE NEEDS

INTERNAL ORGANIZATION

Internal organization is necessary to strategically identify and address science in GGNCA. An NLCS science coordinator has been established for the Dominguez-Escalante, McInnis Canyons, and Gunnison Gorge NCAs to assist in coordination of scientific efforts in these units. The UFO ecologist serves as the GGNCA unit science coordinator, and works with appropriate specialists as needed to address GGNCA science needs. The NLCS and GGNCA science coordinators and the GGNCA manager make up the GGNCA science coordination team.

The role of the coordination team is to:

- 1) Coordinate and collaborate to identify and prioritize GGNCA's science needs;
- 2) Ensure that partners and collaborators are familiar and engaged with GGNCA's documented science needs;
- 3) Coordinate with staff to approve science proposals;
- 4) Engage and remain engaged with partners and collaborators working within GGNCA;
- 5) Ensure that results of scientific inquiries are available to BLM staff, in appropriate formats, including progress and final reports;
- 6) Communicate results of scientific inquiries to researchers, staff, and managers both within and outside of the BLM, and to the general public when appropriate; and,
- 7) As necessary, coordinate and collaborate to update and revise the GGNCA science plan.

Additionally, the GGNCA science coordinator will:

- 8) Conduct needed monitoring and scientific inquiries, as time permits, within GGNCA;
- 9) Interpret long term data and periodically publish results; and,
- 10) Serve as the contact person for scientific inquiries within GGCNA.

COLLABORATION AND PARTNERS

It is imperative that GGNCA have good working relationships with a variety of partners that can assist in the diverse scientific needs of GGNCA. Scientific study is generally not part of the work that BLM field staff performs. However, this type of study can greatly improve the ability of managers to effectively manage these special areas. By partnering with numerous outside entities, the BLM can greatly increase its ability to use science to improve management decisions and actions.

Collaboration between BLM offices, other government agencies, and local universities can help scientists and managers better understand the needs of the area and ongoing science, and can provide opportunities to share information. Management issues are not defined by office boundaries and by sharing knowledge, management outcomes can be improved on larger and larger scales. Also, the success of management efforts in one geographical area will often be dependent on management efforts in another area. Regular conversations between local scientists and managers can help foster these relationships and collaborative opportunities.

GGNCA is part of the Southern Rockies eco-region as defined by the Environmental Protection Agency, and GGNCA will coordinate research needs through Rocky Mountain Cooperative Ecosystem Studies Unit, Uncompahgre Plateau Partnership, North Rim Landscape Strategy, and others as appropriate.

GGNCA has a history of partnering with varied organizations for scientific research and outreach, for example universities, private organizations, community groups, and local, state and other federal agencies. For a more complete list of past and present partners see the GGNCA Manager's reports (reports available upon request, UFO).

SECTION 5 – SCIENCE PROTOCOLS

GUIDELINES FOR SCIENTIFIC RESEARCH

It is anticipated that three main types of research are most likely to occur within GGNCA:

- 1) Assessment, inventory, and monitoring;
- 2) Solicited research addressing management questions and science needs;
- 3) Unsolicited contributed scientific studies.

There are numerous topics of research that may be addressed by these three types of inquiries including but not limited to: botany, ecology, hydrology, geology, wildlife studies, paleontology, recreation, and archaeology.

There are some general guidelines that apply to all of these types of research.

- 1) All scientific investigation must comply with relevant laws, regulations, and policies, including any permit needs.
- 2) All non-permitted external scientific investigations must be authorized by the GGNCA manager (or the manager's designee), according to the procedures described below.
- 3) Science should not impact the long term health or sustainability of the resources of GGNCA, especially the resources, objects, and values for which GGNCA was designated.
 - a. If impacts are anticipated, appropriate protocols should be followed and the potential gains should be carefully considered and weighed against potential impacts.
- 4) A balance must be maintained between research and education, and preservation and protection of GGNCA resources, objects, and values.
- 5) Scientists initiating research projects within GGNCA should be aware of existing data within the BLM and should incorporate these data into projects whenever possible.
- 6) Proposed research within the Gunnison Gorge Wilderness Area should comply with appropriate laws and regulations including the Wilderness Act of 1964 and BLM wilderness policy (Manual 6340).
 - a. Proposals must be carefully evaluated for legal and policy compliance, scientific merit, and impacts and benefits (Landres 2000). A set of worksheets may be used by GGNCA to ensure that scientific proposals in Wilderness are evaluated in a consistent way (found here: <http://www.wilderness.net/index.cfm?fuse=toolboxes&sec=resSciAct>).
- 7) GGNCA staff should use all available monitoring protocols to achieve adequate monitoring of the resources of GGNCA (e.g. land health assessments), especially with consideration to the national Assessment, Inventory, and Monitoring Strategy (AIM; BLM 2011).
 - a. For example, staff should use the AIM Strategy's sampling techniques and key ecosystem attributes, as feasible (BLM 2011).

SCIENCE AUTHORIZATIONS

Currently, there is no formal process for scientific authorizations within GGNCA outside of the state-wide process for permitting paleontological and archaeological research. The process described below is not meant to replace or duplicate these processes. When a prior process is already in place, it will take

precedence and researchers will only need to complete one permitting process. The process outlined below will only take effect when no other permitting process applies (e.g. non-paleontological or archeological projects). Permits and authorization projects will be shared between appropriate state and field office staff for research taking place within GGNCA.

All requests should be carefully considered, weighing potential benefits and costs. The following process has been adapted from other NLCS units.

1. Scientist submits proposal to GGNCA science coordinator.
 - a. Proposals must include:
 - i. Contact information for the principal investigator
 - ii. Summary of proposed research (not to exceed 3 pages) including
 1. A brief explanation of background information;
 2. Rationale for research;
 3. Research methods;
 4. Timeline for field work; and,
 5. Outline of public outreach effort, if appropriate.
2. The proposal will be considered by the GGNCA science coordinator for completeness. The coordinator will consult with the Colorado State Science Coordinator and staff specialists, as appropriate, to determine if the proposal is:
 - a. Complete;
 - b. Conforms to the GGNCA Science Guidelines (including all relevant laws and regulations);
 - c. Conforms to the GGNCA Resource Management Plan;
 - d. Meets the GGNCA scientific mission.
3. The science coordinator will brief the GGNCA manager on the review of the science proposal. Subsequently, the GGNCA manager (or the manager's designee) will grant or deny authorization to conduct the scientific investigation.
4. If a proposal is denied authorization:
 - a. A letter of denial will be provided to the scientist, and will include justification for the denial.
5. If a proposal is granted authorization:
 - a. A determination will be made as to what, if any, NEPA analysis is necessary.
 - b. A letter of authorization will be provided to the scientist, signed by the GGNCA manager (or the manager's designee). The authorization may include stipulations such as NEPA analysis requirements, time limits, geographic limits, reporting requirements, and public outreach requirements.
 - c. The proposal will be added to an internal tracking document of on-going scientific investigations in GGNCA, accessible by all GGNCA staff.
 - d. Minimum reporting requirements for all scientific investigations will include:
 - i. Progress reports (at least annually), filed with the science coordinator.

1. Progress reports should include status of the investigation, areas studied, approximate dates of fieldwork, partners involved, and preliminary findings when possible.
 - ii. Final reports, filed with the science coordinator.
 1. Final reports should include:
 - a. Research background and results;
 - b. Discussion of the results including how the results are relevant to the NLCS unit and potential management decisions;
 - c. A summary of the public outreach effort if appropriate;
 - d. Raw data where appropriate; and,
 - e. Electronic copies of any published papers resulting from the scientific investigation.
 - iii. Manager's summary report
 1. Manager's summary reports are brief presentations (in any appropriate format) of research results to BLM managers, which ensure that:
 - a. Management questions are answered;
 - b. Managers have a full understanding of scientific findings; and,
 - c. Managers can incorporate these findings into their management decisions.
 - iv. If results of research are not sensitive material (for example some cultural and paleontological studies), a public outreach component.
6. The authorization is routed to GGNCA and UFO staff.
 - a. Copies of the authorization will be made available to BLM staff, for example on the shared drive.
 - b. Short descriptions of ongoing research will be made available to the general public, for example on the GGNCA webpage.
 - i. Sensitive topics, for example location of specific cultural or paleontological sites, should be excluded from public information for protection of resources.
7. Research is initiated.
 - a. Research must be conducted according to the stipulations outlined in the authorization.
8. Research is completed, and final report is filed with the science coordinator.

SECTION 6 – ORGANIZATION AND COMMUNICATION OF COMPLETED SCIENCE

INTERNAL ORGANIZATION OF COMPLETED SCIENCE

Section 2 of this report provides a brief summary of the scientific background of the unit, and provides citations to the relevant reports and publications in the bibliography (Section 9) of this science plan. At every revision of the science plan, these sections will be updated.

All reports, as described in Section 5, submitted to the GGNCA science coordinator will be stored and organized on a shared drive, or via a similar medium (e.g. a Sharepoint site), accessible by all GGNCA staff. The science coordinator should aim to organize periodic presentations of scientific results to GGNCA staff.

CONTRIBUTIONS TO BROADER BLM ORGANIZATIONS OF COMPLETED SCIENCE

The GGNCA science coordinator will comply, in a timely manner, with all requests for completed scientific investigations' information/reports from BLM Field Offices, District Offices, State Offices, and the Washington D.C. Office.

COMMUNICATING SCIENTIFIC RESULTS TO THE PUBLIC

The science coordinator or coordination team will strive to make information on science projects within GGNCA accessible to the general public, and the GGNCA webpage is a logical place for dissemination of this type of information. GGNCA has a history of communicating with the public about topics of importance to GGNCA through brochures, maps, and other materials. In addition to these types of materials, information may be presented by: links to short informational videos, written descriptions of scientific inquiries occurring within GGNCA, public presentations, and citations of published research papers.

The general public has a vested interest in GGNCA which is heavily utilized by varied outdoor enthusiasts. Sharing what research is occurring (or has occurred) within GGNCA and why it is occurring (or has occurred) should be a priority, and can help avoid confusion and discontent that can stem from misunderstandings about the nature of scientific inquiries. However, while communication with the public is important, sensitive information about certain scientific projects may need to be kept confidential to ensure the protection of these resources.

SECTION 7 – INTEGRATING SCIENCE INTO MANAGEMENT

It is the responsibility of the science coordinator or coordinating team to ensure that scientific findings are communicated to managers. Managers can then use scientific information as they deem appropriate.

Written progress reports, final reports, published papers, and manager's summary will all be available to decision-makers, as described in Section 6, to help inform decisions. Furthermore, direct dialogue between scientists and managers will be encouraged.

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SECTION 8 - SCIENCE PLAN REVIEW AND APPROVAL

SIGNATURE PAGE

I approve the Gunnison Gorge National Conservation Area Science Plan.

This plan will be used as the basis for conducting science in the Gunnison Gorge NCA. "Science" is defined in Section 1 of this plan.

As a living and working document, this plan will be updated no less than every five years, preferably more frequently. Scientific needs that emerge during the course of implementing this plan may be added to the plan on an as-needed basis to meet the unit's scientific mission.



Amanda Clements, Science Coordinator
Gunnison Gorge National Conservation Area

7/23/13

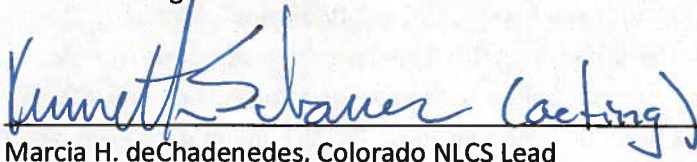
Date



Karen Tucker, Manager
Gunnison Gorge National Conservation Area

7/22/13

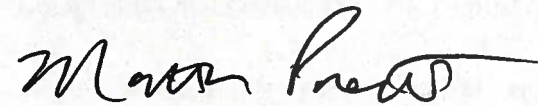
Date



Marcia H. deChadenes, Colorado NLCS Lead
Colorado State Office

9/26/2013

Date



Matt Preston, NLCS Science Coordinator
Washington, D.C.

10/22/13

Date

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SECTION 10 – UNIT’S LEGISLATION: BLACK CANYON OF THE GUNNISON NATIONAL PARK AND GUNNISON GORGE NATIONAL CONSERVATION AREA ACT OF 1999



113 STAT. 1126

PUBLIC LAW 106–76—OCT. 21, 1999

PUBLIC LAW 106–76—OCT. 21, 1999

Public Law 106–76
106th Congress

An Act

Oct. 21, 1999
[S. 323]

To redesignate the Black Canyon of the Gunnison National Monument as a national park and establish the Gunnison Gorge National Conservation Area, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the “Black Canyon of the Gunnison National Park and Gunnison Gorge National Conservation Area Act of 1999”.

SEC. 2. FINDINGS.

Congress finds that—

(1) Black Canyon of the Gunnison National Monument was established for the preservation of its spectacular gorges and additional features of scenic, scientific, and educational interest;

(2) the Black Canyon of the Gunnison and adjacent upland include a variety of unique ecological, geological, scenic, historical, and wildlife components enhanced by the serenity and rural western setting of the area;

(3) the Black Canyon of the Gunnison and adjacent land provide extensive opportunities for educational and recreational activities, and are publicly used for hiking, camping, and fishing, and for wilderness value, including solitude;

(4) adjacent public land downstream of the Black Canyon of the Gunnison National Monument has wilderness value and offers unique geological, paleontological, scientific, educational, and recreational resources;

(5) public land adjacent to the Black Canyon of the Gunnison National Monument contributes to the protection of the wildlife, viewshed, and scenic qualities of the Black Canyon;

(6) some private land adjacent to the Black Canyon of the Gunnison National Monument has exceptional natural and scenic value that would be threatened by future development pressures;

(7) the benefits of designating public and private land surrounding the national monument as a national park include greater long-term protection of the resources and expanded visitor use opportunities; and

(8) land in and adjacent to the Black Canyon of the Gunnison Gorge is—

(A) recognized for offering exceptional multiple use opportunities;

Black Canyon of the Gunnison National Park and Gunnison Gorge National Conservation Area Act of 1999. Colorado. 16 USC 410fff note. 16 USC 410fff.

BLACK CANYON OF THE GUNNISON NATIONAL PARK AND GUNNISON GORGE NATIONAL CONSERVATION AREA ACT OF 1999

(B) recognized for offering natural, cultural, scenic, wilderness, and recreational resources; and

(C) worthy of additional protection as a national conservation area, and with respect to the Gunnison Gorge itself, as a component of the national wilderness system.

SEC. 3. DEFINITIONS.

In this Act:

(1) **CONSERVATION AREA.**—The term “Conservation Area” means the Gunnison Gorge National Conservation Area, consisting of approximately 57,725 acres surrounding the Gunnison Gorge as depicted on the Map.

(2) **MAP.**—The term “Map” means the map entitled “Black Canyon of the Gunnison National Park and Gunnison Gorge NCA—1/22/99”. The map shall be on file and available for public inspection in the offices of the Department of the Interior.

(3) **PARK.**—The term “Park” means the Black Canyon of the Gunnison National Park established under section 4 and depicted on the Map.

(4) **SECRETARY.**—The term “Secretary” means the Secretary of the Interior.

SEC. 4. ESTABLISHMENT OF BLACK CANYON OF THE GUNNISON NATIONAL PARK.

(a) **ESTABLISHMENT.**—There is hereby established the Black Canyon of the Gunnison National Park in the State of Colorado as generally depicted on the map identified in section 3. The Black Canyon of the Gunnison National Monument is hereby abolished as such, the lands and interests therein are incorporated within and made part of the new Black Canyon of the Gunnison National Park, and any funds available for purposes of the monument shall be available for purposes of the park.

(b) **ADMINISTRATION.**—Upon enactment of this title, the Secretary shall transfer the lands under the jurisdiction of the Bureau of Land Management which are identified on the map for inclusion in the park to the administrative jurisdiction of the National Park Service. The Secretary shall administer the park in accordance with this Act and laws generally applicable to units of the National Park System, including the Act entitled “An Act to establish a National Park Service, and for other purposes”, approved August 25, 1916 (16 U.S.C. 1, 2–4), and the Act entitled “An Act to provide for the preservation of historic American sites, buildings, objects, and antiquities of national significance, and for other purposes, approved August 21, 1935 (16 U.S.C. 461 et seq.).

(c) **MAPS AND LEGAL DESCRIPTION.**—As soon as practicable after the date of the enactment of this Act, the Secretary shall file maps and a legal description of the park with the Committee on Energy and Natural Resources of the United States Senate and the Committee on Resources of the United States House of Representatives. Such maps and legal description shall have the same force and effect as if included in this Act, except that the Secretary may correct clerical and typographical errors in such legal description and maps. The maps and legal description shall be on file and available for public inspection in the appropriate offices of the National Park Service.

(d) **WITHDRAWAL.**—Subject to valid existing rights, all Federal lands within the park are hereby withdrawn from all forms of entry, appropriation, or disposal under the public land laws; from

location, entry, and patent under the mining laws; and from disposition under all laws relating to mineral and geothermal leasing, and all amendments thereto.

(e) **GRAZING.**—(1)(A) Consistent with the requirements of this subsection, including the limitation in paragraph (3), the Secretary shall allow the grazing of livestock within the park to continue where authorized under permits or leases in existence as of the date of the enactment of this Act. Grazing shall be at no more than the current level, and subject to applicable laws and National Park Service regulations.

(B) Nothing in this subsection shall be construed as extending grazing privileges for any party or their assignee in any area of the park where, prior to the date of the enactment of this Act, such use was scheduled to expire according to the terms of a settlement by the United States Claims Court affecting property incorporated into the boundary of the Black Canyon of the Gunnison National Monument.

(C) Nothing in this subsection shall prohibit the Secretary from accepting the voluntary termination of leases or permits for grazing within the park.

(2) Within areas of the park designated as wilderness, the grazing of livestock, where authorized under permits in existence as of the date of the enactment of this Act, shall be permitted to continue subject to such reasonable regulations, policies, and practices as the Secretary deems necessary, consistent with this Act, the Wilderness Act, and other applicable laws and National Park Service regulations.

(3) With respect to the grazing permits and leases referenced in this subsection, the Secretary shall allow grazing to continue, subject to periodic renewal—

(A) with respect to a permit or lease issued to an individual, for the lifetime of the individual who was the holder of the permit or lease on the date of the enactment of this Act; and

(B) with respect to a permit or lease issued to a partnership, corporation, or other legal entity, for a period which shall terminate on the same date that the last permit or lease held under subparagraph (A) terminates, unless the partnership, corporation, or legal entity dissolves or terminates before such time, in which case the permit or lease shall terminate with the partnership, corporation, or legal entity.

16 USC 410fff-3.

SEC. 5. ACQUISITION OF PROPERTY AND MINOR BOUNDARY ADJUSTMENTS.

(a) **ADDITIONAL ACQUISITIONS.**—

(1) **IN GENERAL.**—The Secretary may acquire land or interests in land depicted on the Map as proposed additions.

(2) **METHOD OF ACQUISITION.**—

(A) **IN GENERAL.**—Land or interests in land may be acquired by—

- (i) donation;
- (ii) transfer;
- (iii) purchase with donated or appropriated funds;

or

(iv) exchange.

(B) **CONSENT.**—No land or interest in land may be acquired without the consent of the owner of the land.

(b) **BOUNDARY REVISION.**—After acquiring land for the Park, the Secretary shall—

- (1) revise the boundary of the Park to include newly-acquired land within the boundary; and
- (2) administer newly-acquired land subject to applicable laws (including regulations).

(c) **BOUNDARY SURVEY.**—As soon as practicable and subject to the availability of funds the Secretary shall complete an official boundary survey of the Park.

(d) **HUNTING ON PRIVATELY OWNED LANDS.**—

(1) **IN GENERAL.**—The Secretary may permit hunting on privately owned land added to the Park under this Act, subject to limitations, conditions, or regulations that may be prescribed by the Secretary.

(2) **TERMINATION OF AUTHORITY.**—On the date that the Secretary acquires fee ownership of any privately owned land added to the Park under this Act, the authority under paragraph (1) shall terminate with respect to the privately owned land acquired.

SEC. 6. EXPANSION OF THE BLACK CANYON OF THE GUNNISON WILDERNESS.

16 USC 410fff-4,
1132 note.

(a) **EXPANSION OF BLACK CANYON OF THE GUNNISON WILDERNESS.**—The Black Canyon of the Gunnison Wilderness, as established by subsection (b) of the first section of Public Law 94-567 (90 Stat. 2692), is expanded to include the parcel of land depicted on the Map as “Tract A” and consisting of approximately 4,419 acres.

(b) **ADMINISTRATION.**—The Black Canyon of the Gunnison Wilderness shall be administered as a component of the Park.

SEC. 7. ESTABLISHMENT OF THE GUNNISON GORGE NATIONAL CONSERVATION AREA.

16 USC 410fff-5.

(a) **IN GENERAL.**—There is established the Gunnison Gorge National Conservation Area, consisting of approximately 57,725 acres as generally depicted on the Map.

(b) **MANAGEMENT OF CONSERVATION AREA.**—The Secretary, acting through the Director of the Bureau of Land Management, shall manage the Conservation Area to protect the resources of the Conservation Area in accordance with—

- (1) this Act;
- (2) the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.); and
- (3) other applicable provisions of law.

(c) **WITHDRAWAL.**—Subject to valid existing rights, all Federal lands within the Conservation Area are hereby withdrawn from all forms of entry, appropriation or disposal under the public land laws; from location, entry, and patent under the mining laws; and from disposition under all laws relating to mineral and geothermal leasing, and all amendments thereto.

(d) **HUNTING, TRAPPING, AND FISHING.**—

(1) **IN GENERAL.**—The Secretary shall permit hunting, trapping, and fishing within the Conservation Area in accordance with applicable laws (including regulations) of the United States and the State of Colorado.

(2) **EXCEPTION.**—The Secretary, after consultation with the Colorado Division of Wildlife, may issue regulations designating

zones where and establishing periods when no hunting or trapping shall be permitted for reasons concerning—

- (A) public safety;
- (B) administration; or
- (C) public use and enjoyment.

(e) **USE OF MOTORIZED VEHICLES.**—In addition to the use of motorized vehicles on established roadways, the use of motorized vehicles in the Conservation Area shall be allowed to the extent the use is compatible with off-highway vehicle designations as described in the management plan in effect on the date of the enactment of this Act.

(f) **CONSERVATION AREA MANAGEMENT PLAN.**—

(1) **IN GENERAL.**—Not later than 4 years after the date of the enactment of this Act, the Secretary shall—

(A) develop a comprehensive plan for the long-range protection and management of the Conservation Area; and

(B) transmit the plan to—

- (i) the Committee on Energy and Natural Resources of the Senate; and
- (ii) the Committee on Resources of the House of Representatives.

(2) **CONTENTS OF PLAN.**—The plan—

(A) shall describe the appropriate uses and management of the Conservation Area in accordance with this Act;

(B) may incorporate appropriate decisions contained in any management or activity plan for the area completed prior to the date of the enactment of this Act;

(C) may incorporate appropriate wildlife habitat management plans or other plans prepared for the land within or adjacent to the Conservation Area prior to the date of the enactment of this Act;

(D) shall be prepared in close consultation with appropriate Federal, State, county, and local agencies; and

(E) may use information developed prior to the date of the enactment of this Act in studies of the land within or adjacent to the Conservation Area.

(g) **BOUNDARY REVISIONS.**—The Secretary may make revisions to the boundary of the Conservation Area following acquisition of land necessary to accomplish the purposes for which the Conservation Area was designated.

16 USC 410fff-6,
1132 note.

SEC. 8. DESIGNATION OF WILDERNESS WITHIN THE CONSERVATION AREA.

(a) **GUNNISON GORGE WILDERNESS.**—

(1) **IN GENERAL.**—Within the Conservation Area, there is designated as wilderness, and as a component of the National Wilderness Preservation System, the Gunnison Gorge Wilderness, consisting of approximately 17,700 acres, as generally depicted on the Map.

(2) **ADMINISTRATION.**—

(A) **WILDERNESS STUDY AREA EXEMPTION.**—The approximately 300-acre portion of the wilderness study area depicted on the Map for release from section 603 of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1782) shall not be subject to section 603(c) of that Act.

Deadline.

(B) INCORPORATION INTO NATIONAL CONSERVATION AREA.—The portion of the wilderness study area described in subparagraph (A) shall be incorporated into the Conservation Area.

(b) ADMINISTRATION.—Subject to valid rights in existence on the date of the enactment of this Act, the wilderness areas designated under this Act shall be administered by the Secretary in accordance with the Wilderness Act (16 U.S.C. 1131 et seq.) except that any reference in such provisions to the effective date of the Wilderness Act shall be deemed to be a reference to the effective date of this Act and any reference to the Secretary of Agriculture shall be deemed to be a reference to the Secretary of the Interior.

(c) STATE RESPONSIBILITY.—As provided in section 4(d)(7) of the Wilderness Act (16 U.S.C. 1133(d)(7)), nothing in this Act or in the Wilderness Act shall affect the jurisdiction or responsibilities of the State of Colorado with respect to wildlife and fish on the public land located in that State.

(d) MAPS AND LEGAL DESCRIPTIONS.—As soon as practicable after the date of the enactment of this section, the Secretary of the Interior shall file a map and a legal description of the Gunnison Gorge Wilderness with the Committee on Energy and Natural Resources of the United States Senate and the Committee on Resources of the United States House of Representatives. This map and description shall have the same force and effect as if included in this Act. The Secretary of the Interior may correct clerical and typographical errors in the map and legal description. The map and legal description shall be on file and available in the office of the Director of the Bureau of Land Management (BLM).

SEC. 9. WITHDRAWAL.

16 USC 410fff-7.

Subject to valid existing rights, the Federal lands identified on the Map as “BLM Withdrawal (Tract B)” (comprising approximately 1,154 acres) are hereby withdrawn from all forms of entry, appropriation or disposal under the public land laws; from location, entry, and patent under the mining laws; and from disposition under all laws relating to mineral and geothermal leasing, and all amendments thereto.

SEC. 10. WATER RIGHTS.

16 USC 410fff-8.

(a) EFFECT ON WATER RIGHTS.—Nothing in this Act shall—
(1) constitute an express or implied reservation of water for any purpose; or

(2) affect any water rights in existence prior to the date of the enactment of this Act, including any water rights held by the United States.

(b) ADDITIONAL WATER RIGHTS.—Any new water right that the Secretary determines is necessary for the purposes of this Act shall be established in accordance with the procedural and substantive requirements of the laws of the State of Colorado.

SEC. 11. STUDY OF LANDS WITHIN AND ADJACENT TO CURECANTI NATIONAL RECREATION AREA.

16 USC 410fff-9.

(a) IN GENERAL.—Not later than 3 years after the date of the enactment of this Act, the Secretary, acting through the Director of the National Park Service, shall conduct a study concerning land protection and open space within and adjacent to the area administered as the Curecanti National Recreation Area.

Deadline.

(b) PURPOSE OF STUDY.—The study required to be completed under subsection (a) shall—

(1) assess the natural, cultural, recreational and scenic resource value and character of the land within and surrounding the Curecanti National Recreation Area (including open vistas, wildlife habitat, and other public benefits);

(2) identify practicable alternatives that protect the resource value and character of the land within and surrounding the Curecanti National Recreation Area;

(3) recommend a variety of economically feasible and viable tools to achieve the purposes described in paragraphs (1) and (2); and

(4) estimate the costs of implementing the approaches recommended by the study.

(c) SUBMISSION OF REPORT.—Not later than 3 years from the date of the enactment of this Act, the Secretary shall submit a report to Congress that—

(1) contains the findings of the study required by subsection (a);

(2) makes recommendations to Congress with respect to the findings of the study required by subsection (a); and

(3) makes recommendations to Congress regarding action that may be taken with respect to the land described in the report.

(d) ACQUISITION OF ADDITIONAL LAND AND INTERESTS IN LAND.—

(1) IN GENERAL.—Prior to the completion of the study required by subsection (a), the Secretary may acquire certain private land or interests in land as depicted on the Map entitled “Proposed Additions to the Curecanti National Recreation Area”, dated 01/25/99, totaling approximately 1,065 acres and entitled “Hall and Fitti properties”.

(2) METHOD OF ACQUISITION.—

(A) IN GENERAL.—Land or an interest in land under paragraph (1) may be acquired by—

(i) donation;

(ii) purchase with donated or appropriated funds;

or

(iii) exchange.

(B) CONSENT.—No land or interest in land may be acquired without the consent of the owner of the land.

(C) BOUNDARY REVISIONS FOLLOWING ACQUISITION.—Following the acquisition of land under paragraph (1), the Secretary shall—

(i) revise the boundary of the Curecanti National Recreation Area to include newly-acquired land; and

(ii) administer newly-acquired land according to applicable laws (including regulations).

SEC. 12. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated such sums as are necessary to carry out this Act.

16 USC 410fff-
10.

Approved October 21, 1999.

LEGISLATIVE HISTORY—S. 323:

HOUSE REPORTS: No. 106-307 (Comm. on Resources).
SENATE REPORTS: No. 106-69 (Comm. on Energy and Natural Resources).
CONGRESSIONAL RECORD, Vol. 145 (1999):
July 1, considered and passed Senate.
Sept. 27, considered and passed House, amended.
Oct. 1, Senate concurred in House amendment.
WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS, Vol. 35 (1999):
Oct. 21, Presidential statement.

Desmond, M., J. Savidge, et al. (2000). "Correlations between burrowing owl and black-tailed prairie dog declines: a 7-year analysis." The Journal of Wildlife Management 64(4): 1067-1075.

Jacobs, J. (2007). "Ecology and management of Whitetop (*Cardaria draba* (L.) Desv.)." United States Department of Agriculture Natural Resources Conservation Service: Invasive Species Technical Note No. MT 12.