GRAND COUNTY

RESOURCE MANAGEMENT PLAN, 2017

ACKNOWLEDGEMENTS

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GRAND COUNTY, UTAH
ORDINANCE 564 (2017)

APPROVING A RESOURCE MANAGEMENT PLAN (RMP) AS PART OF THE GRAND COUNTY GENERAL PLAN

WHEREAS, the Grand County Council (County Council) adopted the *Grand County General Plan Update* (General Plan) on February 7, 2012 with Resolution No. 2976;

WHEREAS, House Bill 323 (2015) and House Bill 219 (2016) direct all counties in the state of Utah to adopt resource management plans (RMPs) as elements of their general plan prior to August 1, 2017; and,

WHEREAS, House Bill 219 enumerates 28 resource areas that must be addressed in each county's RMP including findings of fact, goals, and management objectives; and,

WHEREAS, the Grand County Council and Planning Commission have engaged the citizens of Moab and various resource experts on their knowledge, goals, and management objectives for the 28 resources described in the proposed RMP through online surveys, public workshops, focus group meetings, and public hearings; and,

WHEREAS, in a public hearing on April 26, 2017 the Grand County Planning Commission considered all evidence and testimony presented with respect to the subject application and forwarded a favorable recommendation to the Grand County Council, stating a desire to comply with the May 1, 2017 deadline established for Planning Commission review in House Bill 219; and,

WHEREAS, due notice was given that the Grand County Council would meet to hear and consider the proposed ordinance and general plan update in a public hearing on July 5, 2017;

WHEREAS, the County Council has heard and considered all evidence and testimony presented with respect to the subject application and has determined that the adoption of this ordinance is in the best interests of the citizens of Grand County, Utah;

NOW, THEREFORE, BE IT ORDAINED by the County Council that the General Plan is hereby amended by Ordinance 564.

PASSED, ADOPTED, AND APPROVED by the Grand County Council in open session this 18th day of July 2017 by the following vote:

Those voting aye: Clapper, Halliday, McGann, Paxman, Trim, Wells
Those voting nay: _____
Those absent: Hawks

ATTEST:

Diana Carroll, Clerk/Auditor

Grand County Council

Mary McGann, Vice – Chair

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INTRODUCTION

Background & Purpose

Utah State Statute provides for the development and adoption of county-level plans under Title 17-27a-401. Components that are required to be addressed within these plans include: land use, transportation, environmental issues, public services and facilities, rehabilitation and redevelopment, economic concerns, recommendations for plan implementation, and "any other elements that the county considers appropriate".

In 2015, the Utah Legislature amended Title 17-27a-401 to also require that county general plans include a "resource management plan" to provide a basis for communicating and coordinating with the federal government on land and resource management issues.

The economic, social-political, and environmental characteristics of Grand County are, in many ways, heavily influenced by the public lands within its borders and in surrounding regions. The County's clear preference is that public lands remain owned and managed for public purposes and ecological integrity. For this reason, Grand County will continue to encourage monitoring, policy-making, and plan implementation related to the responsible use and development of its natural resources. Decisions affecting resource use and development on public lands directly impact the County. In this regard, it is in the County's interest, and their expectation, that federal and state resource management planning efforts provide the County with every opportunity to proactively participate in all relevant public land and resource planning processes.

Development of This Plan

Grand County Councilmembers placed a high priority on data quality and public involvement for the development of this plan. This was gathered through four different avenues:

- **Natural resource issue database**. Information on current local policy and on environmental conditions was gathered and compiled into a database. This information can be found online at (http://gis.bio-west.com/seualgresources/).
- **Online public surveys**. A website was created for the initiative (http://www.grandrmp.org/). It was advertised through the County's website, social media channels, and direct mail invitations to municipalities and other land management entities.
- **State Agency review**. As drafts were developed for each issue, they were reviewed and edited by state agency subject matter experts.
- **Public meetings**. The Planning Commission and County Commission held properly notified public hearings and meetings that followed standard noticing protocol.

Although the population of Grand County is largely consolidated in one area, residents exhibit a variety of sociocultural, political, and economic perspectives. The seven-member Grand County Council is the local land use authority and legislative body, and each member is elected every four years. This body seeks to represent as many voices as possible, and members change according to the will of the voters. Policy and management decisions may change over time to reflect changes in community perspectives and new scientific data. Indeed, there have been significant changes in Grand County's electorate over the last few decades, and it now includes meaningful diversity. Stakeholders of diverse ideologies are needed in planning and policy development processes and will always be invited to participate in defining objectives for local resources.

Plan Organization & Maintenance

In order to convey the County's desired future conditions, each resource discussed in this plan includes:

1. Issue definition
2. References to related resources
3. Listing of best available data sources
4. Findings of historic and current conditions
5. County policy for the resource/issue

For this document to function as a valuable decision-making tool, it should be reviewed and amended as necessary to address County issues and interests as they develop. It is anticipated that future County planning efforts will expand on the "values and objectives" identified in the County's General Plan. With respect to this purpose, County priorities and the issues facing the County will most likely change over time.

Statement on Community Perspectives

There are any number of unique and amazing things in Grand County, and there are just as many perspectives and opinions on how these things should be managed. As explained in the introduction of the General Plan, the purpose of this document is an attempt to integrate authentic and diverse interests into an advisory document that will serve as the County's position on public land issues. It is hoped that residents will be able to recognize their voice as well as the voices of their neighbors in this plan.

Statement on Climate Change

Grand County acknowledges that the Earth's climate has changed naturally throughout history. However, it is now suggested that anthropogenic factors have very likely contributed to the rapidity, breadth, and scale of changes that have occurred since the mid-20th century. Satellites and other technologies have enabled researchers and scientists to examine and interpret large-scale changes, collecting various types of data about Earth and its climate on a planetary scale. Compiled over many years, this collection of information reveals the signals of a dynamic climate.

Most climate scientists agree that the primary causes of climate change are now the continuous, expanding, and multitudinous impacts of the "greenhouse effect", that is, warming created when the atmosphere traps heat radiating from Earth outward. Some gases in the atmosphere keep heat from escaping. Long-lived gases that do not respond to changes in temperature and that remain in the atmosphere for long periods of time are described as "forcing" climate change.

Human activities are altering the natural greenhouse. The burning of fossil fuels is increasing atmospheric carbon dioxide (CO2) concentrations. Increasing, to a lesser extent, concentrations of

greenhouse gases is the clearing of land for industry, agriculture, and urbanizing activities. Climate change has already had verifiable effects on the natural environment.

There are climate change models that suggest that Grand County's climate, including temperature fluctuations and annual precipitation rates, will continue to change in the coming decades. Grand County acknowledges that such changes will have significant impacts on the resources addressed within this plan. It is imperative that the County's monitoring, policy-making, and implementation programs reflect the need to prepare for and adapt to changing climate conditions.

LAND USES

LAND USE POLICY

Definition

The designation, modification and management of land for agricultural, environmental, industrial, recreational, residential, or any other purposes.

Related Resources

Wilderness; Recreation and Tourism; Energy; Land Access; Wild and Scenic Rivers; Law Enforcement; Water Quality and Hydrology; Threatened, Endangered, and Sensitive Species; Cultural, Historical, Geological, and Paleontological

Best Available Data Sources

a. Grand County Resource Needs Assessment (2012)
b. Headwaters: Economic Value of Public Lands in Grand County (2015)
c. BLM: Moab Master Leasing Plan (2008)
d. BLM: Moab Master Leasing Plan summary (2016)
e. Arches National Park Management Website
f. A History of Grand County (1996)

- *Full works cited page available here*

Findings

a. Overview

i. "Grand County is located in the middle-eastern part of Utah, stretching from the eastern bank of the Green River to the edge of the state of Colorado. The Colorado River runs across the southeastern portion of the county. Grand County is approximately 3,694 square miles and is situated on the Colorado Plateau which is largely composed of sandstone and limestone. Erosion by wind and water has created large canyons and formations, making the region rugged but amazingly scenic" (Grand Conservation District 2012).

ii. Grand County consists largely of public lands—87 percent of the county is a mix of state and federal lands managed by different agencies for a range of users and purposes (Headwaters Economics 2017). These lands and the associated resources are managed by federal agencies including the U.S. Forest Service (USFS), Bureau of Land Management (BLM), Bureau of Reclamation (BOR), U.S. Fish and Wildlife Service (FWS), and National Park Service (NPS). Traditionally, the residents of the County have used public lands and resources for economic

growth and stability. These local associations with, and dependence on, public lands continues today. Specifically, local use of public lands and resources include, but are not limited to minerals, recreation, oil and gas, timber, water, agriculture, fisheries and wildlife.

iii. Grand County supports the spirit and use of National Environmental Policy Act (NEPA) public procedures, consideration of alternatives, and commitments to scientific integrity in consideration of management of natural resources in Grand County.

b. Private Property

i. Private lands are regulated by land use ordinances and zoning districts, as approved by local and county governments. Zoning districts, and the regulations established within the zoning districts, are authorized by Utah State Code 17-27a-505 and municipalities 10-9a-505.

c. U.S. Bureau of Land Management (BLM)

i. US Bureau of Land Management (BLM): The Moab Field Office manages BLM lands in Grand County. Land use decisions for all BLM lands are made according to mandates defined by the Federal Land Policy and Management Act (FLPMA) of 1976. FLPMA requires the BLM to manage lands under multiple-use philosophy. A component of FLPMA is the requirement for an open and public land use planning process in the development of resource management plans (RMP). Each BLM Field Office must develop a RMP to guide future land use activities on public lands. The RMP defines goals, objectives, and rules for commercial and extractives industries, transportation, recreation, and conservation. To complete an RMP, the BLM follows planning procedures outlined in the National Environmental Policy Act (NEPA).

ii. The *Moab Field Office Record of Decision and Approved Resource Management Plan* (2008) currently guides land use on BLM lands within the county. "The Approved Master Leasing Plan, a first for Utah, considers future leasing of oil, gas, and potash decisions on approximately 785,000 acres of public lands within Grand and San Juan Counties," (Bureau of Land Management 2016).

d. U.S. Forest Service (USFS)

i. The only national forest in the region is the Manti-La Sal National Forest (MLS).

ii. The US Forest Service (USFS) manages land use decisions by developing forest plans under the National Forest Management Act of 1976 (P.L. 94-588). Forest plans provide strategic direction for management of all resources on a National Forest for ten to fifteen years. Forest plans require consideration of alternatives and public input under the National Environmental Policy Act (NEPA) process. Forest plans describe the desired conditions and provide guidance for projects. They do not make site-specific decisions or require any specific actions, but all projects conducted on a National Forest must be consistent with the strategic direction in its forest plan.

e. National Park Service (NPS)

i. Unlike lands managed by the BLM and USFS, these lands are managed by NPS exclusively to protect and preserve the natural and cultural resources within

their boundaries. These lands are bound by Federal Statute (36 CFR Chapter 1-7).

ii. The National Park Service prepares a variety of planning and environmental documents to help guide management of park resources and visitor use and activity. Most plans follow planning procedures outlined in the National Environmental Policy Act (NEPA).

iii. Arches National Park has a general management plan in place, written in 1989. "The primary purpose of the plan is to provide a foundation from which to protect park resources while providing for meaningful visitor experiences," (National Park Service n.d.).

iv. "In 2013, the park developed a Foundation Statement to update a shared understanding of the park's purpose, significance, resources and values. This document can serve as a foundation for future planning and management decisions," (National Park Service n.d.).

f. State Institutional Trust Lands Administration (SITLA)

i. State Institutional Trust Lands Administration (SITLA): Trust lands are parcels of land throughout our state that were granted by Congress to Utah at the time of statehood. Although trust lands support select public institutions, they are not public lands. Trust lands were allocated specifically to generate revenue to support designated state institutions, including public schools, hospitals, teaching colleges, and universities.

ii. There are 330,138 acres of SITLA trust lands in Grand County. SITLA is directed by Utah Administrative Code to maximize commercial gain from these properties through sale, lease, or exchange. These transactions occur through sales and leases of individual properties but also through large-scale land and mineral right consolidations (CRMP Toolkit).

g. Sovereign Lands

i. The State of Utah recognizes and declares that the beds of navigable waters within the state are owned by the state and are among the basic resources of the state, and that there exists, and has existed since statehood, a public trust over and upon the beds of these waters. It is also recognized that the public health, interest, safety and welfare require that all uses on, beneath or above the beds of navigable lakes and streams of the state be regulated, so that the protection of navigation, fish and wildlife habitat, aquatic beauty, public recreation and water quality will be given due consideration and balanced against the navigational or economic necessity or justification for, or benefit to be derived from, any proposed use (Awake Utah Lake 2009).

ii. The Equal Footing Doctrine serves as the basis for Utah's claim to fee title ownership of sovereign lands (more widely known as submerged lands). The Equal Footing Doctrine is a principle of Constitutional law that requires that states admitted to the Union after 1789 be admitted as equals to the Original Thirteen Colonies in terms of power, rights, and sovereignty including sovereign rights over submerged lands. The Utah Enabling Act, enacted by the U.S. Congress on July 16, 1894, officially declared Utah as a state "to be admitted

to the Union on an equal footing with the original States" (Awake Utah Lake 2009).

iii. The Utah State Legislature has designated the Division of Forestry, Fire & State Lands as the executive authority for the management of sovereign lands, and the state's mineral estates on lands other than school and institutional trust lands. Sovereign lands are defined by the Utah State Legislature as "those lands lying below the ordinary high water mark of navigable bodies of water at the date of statehood and owned by the state by virtue of its sovereignty" (Awake Utah Lake 2009).

h. Other Federal Lands

i. A few miles south of Green River in Grand County lies within the 2,535-acre White Sands Launch Complex, also known as Utah Launch Complex and Green River Launch Complex. This area is owned by the federal government (CRMP Toolkit).

i. Tribal Lands

i. Tribal lands are sovereign lands not subject to local or state governments. However, tribal governments must be consulted during planning processes involving lands with historical Native American uses.

ii. The Ute Indian Tribe owns land in Grand County as part of the Uintah and Ouray Indian Reservation.

j. Local Communities

i. Castle Valley is an integral part of Grand County. The Town has an extensive set of ordinances that seek to sustain and protect its semi-rural character. Additionally, the town has developed and approved a Hazard Mitigation Plan, as well a report on the status of the local aquifer and its dependence of the La Sal Mountains.

k. Economic Considerations

i. "Land use" is not a resource in the same sense as most other resources to be considered in county resource management plans. In this case, land use is the designated, preferred, or allowable uses of a given piece of land based on the planning preferences of the landowner or jurisdiction responsible for the land. The implementation and management of those uses, such as for agriculture, wildlife, motorized recreation, wilderness, etc., are examined and discussed in their own respective resource planning sections.

ii. "Looking at federal public lands specifically, a 2007 analysis shows that area BLM lands supported 2,447 direct jobs that year. For the National Park Service, the agency's economic modeling shows that area national parks supported 2,103 direct jobs in 2013. (Note: these data should not be added together.) To put this in perspective, the U.S. Department of Commerce reports that in 2013 there were 7,143 total jobs in Grand County in 2013," (Headwaters Economics 2015).

iii. Based on sales tax information from 2016, it is estimated that tourism and mining activities constitute almost 80% of all economic activity in Grand County. Most of this activity is done on public lands.

iv. "New employment growth is not just tied to the tourism and recreation sectors. Grand County's picturesque and high-profile public lands—and the environmental and recreational amenities they provide—are closely linked to population growth and other economic benefits. From 2001 to 2013, Grand County employment in finance and insurance (+61%), health care (+56%), and professional and technical services (+32%), for example, all grew faster than the overall increase in employment (+25%)," (Headwaters Economics 2015).

v. "'Payments in Lieu of Taxes' (PILT) are Federal payments to local governments that help offset losses in property taxes due to non-taxable Federal lands within their boundaries. PILT payments help local governments carry out such vital services as firefighting and police protection, construction of public schools and roads, and search-and-rescue operations. The payments are made annually for tax-exempt Federal lands" (U.S. Department of the Interior 2016).

vi. In FY 2015, Grand County received $1,255,931 in PILT payments. 96.7% of this was made available as unrestricted funds, and the rest was designated for improvement of schools and roads (U.S. Department of the Interior 2016).

l. **Custom + Culture**

i. Before the first white settlers arrived in Grand County in the 1800's, native peoples used the land for hunting, gathering, and agriculture. The original white settlers farmed and ranched, bringing livestock to the valley for grazing

ii. "Arches National Park was officially dedicated on 13 May 1972, and Bates Wilson retired as superintendent of the park that year. It was a fitting end to his years of service and dedication to the lands of southeastern Utah. Within a month, the Grand County Travel Council was formed to enhance and coordinate tourism promotion in the county. In June a new BLM policy of requiring land-use permits costing ten dollars for commercial tour guides upset local outfitters; however, as recreational use of the land and the waterways increased, the government found it necessary to charge fees for maintenance and reclamation purposes as well as to regulate and restrict the use of popular areas. Fees for national and state parks were also becoming more common during the period" (Firmage 1996).

Land Use Policies

a. Grand County encourages federal and state land managers to implement the spirit and law of the coordination clauses of the current National Environmental Policy Act. In every situation, Grand County requests that all new development be required to coordinate with existing uses.

b. Within the scope of the County's authority, Grand County will require best available technology and management practices during planning, development, implementation, closure, post-closure, and restoration phases.

c. Purpose of General Plan Public Lands Policies: This set of policy statements is intended to act as a bridge between Grand County and federal and state land-management agencies. The Federal Lands Policy and Management Act calls for some decisions by

federal agencies to be reviewed for consistency with plans adopted by local governments. The Public Lands section of the general plan provides guidance for some public lands decisions.

i. Economic Use of Public Lands (Public Lands Policy 1.) Encourage the expeditious processing of permits for the economic use of public lands that benefit the local economy and are consistent with the policies of this plan, especially permits for the film industry, mineral extraction and recreation.

ii. Watershed Management (Public Lands Policy 2.) Public lands agencies are encouraged to adopt policies that enhance or restore watersheds for Moab, Spanish Valley, Castle Valley and Thompson Springs. The county supports classification of these aquifers to the highest quality standard. Grand County will follow all state and federal water protection laws and actively engage local, regional, and federal land management agencies in discussing risks to aquifers and aquifer recharge areas in Grand County.

iii. Public Lands Ownership and Exchanges (Public Lands Policy 3.) Support BLM-SITLA exchanges that are advantageous to Grand County residents for reasons such as: (a) protection of community watersheds; (b) protection of lands that are important to county residents for recreational or other economic values; (c) protection of lands from developments that might otherwise lead to a net increase in county costs for infrastructure and public services; or (d) consolidation of land-ownership patterns to reduce fragmentation.

iv. Travel Management (Public Lands Policy 4.) Encourage federal and state land-management agencies to develop, maintain and implement travel management plans that include designated roads, official trails and approved motor-vehicle open areas. The plans should address types and seasons of permitted uses, maintenance levels, public education strategies and enforcement.

v. Travel Management (Public Lands Policy 5.) Travel management regulations and policies will continue to be publicly available on a countywide roads map maintained jointly by the county and federal/state land-management agencies. This comprehensive roads map will show the current travel-management designations of Class B county roads (maintained) and Class D county roads (not maintained) alongside public land-management agency travel-management road designations.

vi. User Group Conflicts (Public Lands Policy 6.) Encourage public land-management agencies to continue to work to resolve conflicts between user groups. In doing so, the guiding principle is that residents and visitors have a right to enjoy use of the public lands, but they need to do so while minimizing impacts on the land and on each other's public lands experiences.

vii. Land Restoration (Public Lands Policy 7.) Encourages public land-management agencies to restore damaged areas.

viii. Special Areas (Public Lands Policy 8.) Grand County contains many areas with special and unique character. The county supports the special areas identified in the 2008 BLM Resource Management Plan and will participate in considering the designation of and planning for future special areas.

ix. Wilderness (Public Lands Policy 9.) The Grand County Wilderness Plan adopted as an amendment to the General Plan in 1995 is the county's policy document for the designation of wilderness on federal lands.

x. Special Uses, Events and Activities (Public Lands Policy 10.) Work in cooperation with public land-management agencies to permit and promote special uses, events and activities, that support the local economy. Special uses, events and activities should mitigate adverse impacts.

xi. High-Use Areas (Public Lands Policy 11.) Promote cooperation with federal and state agencies to identify and implement appropriate management of high-use and special-value areas, including areas such as: Sand Flats, Mill Creek, Potato Salad Hill, the Highway 128 corridor, the Kane Creek corridor, and Moab Rim Trail.

xii. Illegal Dumping (Public Lands Policy 12.) Promote cooperation with federal and state agencies and neighboring counties to implement special control measures on public lands where illegal dumping and littering are occurring.

xiii. Unsafe Firearm Practices (Public Lands Policy 13.) Support creation and maintenance of a public shooting range at an appropriate location in order to encourage firearm safety and minimize safety risks to the public and the environment.

xiv. Reintroduction of Species (Public Lands Policy 14.) Participate with land management agencies in evaluating the impacts on county residents and businesses of species reintroduction on public lands.

xv. Economic Study (Public Lands Policy 15.) Support the BLM and other organizations in conducting a study detailing the economic benefits of recreation on public lands in Grand County.

xvi. Dark Night Skies (Public Lands Policy 16.) Work with public land-management agencies to ensure dark skies are not compromised on public lands.

xvii. Natural Quiet (Public Lands Policy 17.) Encourage public lands agencies to implement measures to ensure natural quiet is not degraded.

xviii. Uranium Mill Tailings Remediation Action (UMTRA) (Project Public Lands Policy 18.) The county will continue to be an active participant in planning for the future use of the UMTRA site.

xix. Wildfire Management (Public Lands Policy 19.) Continue to work with the State of Utah Division of Forestry Fire and State Lands to implement the Wildland Fire Plan and to reduce wildfire hazard of fire in the wildland-urban interface.

xx. Campgrounds (Public Lands Policy 20.) Encourage federal land agencies to continue to coordinate with the County on proposed campground development and expansion, specifically for areas within close proximity to Moab.

d. Grand County General Plan (2012) Chapter 4: The Future Land Use Plan

i. This section of the Grand County General Plan contains a detailed plan for future growth, development, and land use. For more information, please see the associated chapter.

LAND ACCESS

Definition

Access to public and private lands.

Related Resources

Recreation & Tourism, Land Use, Livestock & Grazing, Energy, Law Enforcement, Fire Management

Priority Data Sources

a. Grand County Master Plan (2012)
b. Moab field office ROD and approved resource management plan (2008)
c. Manti-La Sal land and resource management plan (1986)
d. *Full works cited page available here*

Findings

a. Overview

i. Grand County land ownership pattern is largely federal land with state lands checkerboarded within. Tribal and private lands tend to be in chunks. Concerns arise where recreational users once had access but now do not, or where land owned by an entity is surrounded by or accessible only by crossing land owned by a different entity.

ii. Access to land for recreational travelling is especially important. Motorized and non-motorized vehicle access, as well as pedestrian and equestrian access is an issue on and between, private, state, and federal lands.

iii. Gaining or maintaining access to lands is typically accomplished through right-of-way (ROW) acquisition. The process for obtaining a right-of-way is different for each land owner or management agency as each has unique administrative procedures and objectives.

b. US Bureau of Land Management (BLM)

i. The BLM manages ROWs through resource management plans authorized by the Federal Lands Policy and Management Act (FLPMA) established in 1976. Prior to FLMPA, ROWs on BLM lands were enabled by Revised Statute 2477 (Section 8 of the Mining Act of 1866) and are generally considered to be available for accessing property within and across US Bureau of Land Management (BLM) property, though this is not always the case. The Moab Field Office manages the BLM land within Grand County.

ii. "Within the existing RMP (1985), the Western Regional Corridor Study Committee (most recent version 1999) recommended that utility corridors run along I-70 and U.S. 191. The 1985 RMP Management Action Decision for Utility Corridors established corridors along I-70, U.S. 191, the MAPCO route between I-70 and U.S. 191, and the Pacific Corporation transmission line route between U.S. 191 and the Green River" (BLM 2008).

iii. "The increase in the use of OHVs has created several issues for the Moab FO area. First, the speed and increasing capability of OHVs allows easier access to remote parts of the Moab FO area, making management of this activity more difficult, and increasing the potential range of impacts. Second, the popularity of this activity continues to grow, both in private use and in more special events taking place. Planning for areas in which OHVs can be used continues to receive national and local attention. Cross-country OHV use, both legal and illegal, is creating additional resource damage and is a real and important issue in the Moab FO area" (BLM 2008).

iv. Portions of the county overlap with the planning area of the BLM Moab Master Leasing Plan (MLP). Finalized in 2016, the MLP contains goals and objectives to maintain generally undeveloped landscapes in the background of popular filming locations, ensure adequate protection of the recreational value along major rivers, and protect federal investment in scenic highways (M. McGann, Bureau of Land Management, personal communication).

c. US Forest Service

i. Roads (USFS): Right of ways on USFS lands are managed through the Forest Planning and National Environmental Policy Act (NEPA) processes.

ii. "Historically, the Forest has encouraged access development for administration and use of Forest resources. This had led to environmental and administrative problems. In recent years, there have been attempts made to reduce unplanned roading and improve the needed system roads. This direction would be continued since the road density is in excess of that needed to provide for the resource activities and uses on the Forest. About 1,280 miles of roads would be included on the Forest transportation system, a reduction of approximately 200 miles. In addition, many of the nonsystem four-wheel drive ways will be closed through area closures. The trail system would remain approximately the same in mileage, but may change in location" (U.S. Forest Service 1986).

iii. "Through travel restrictions, the acreage closed to vehicle use would increase from 83,740 to 110,720 acres. However, the areas with restricted vehicle use would drop from 170,000 acres to 74,980 acres, leaving a net gain in areas with unrestricted vehicle use. The Management Direction is written so that these travel restrictions apply to general administration as well as recreation use. Where access is needed for a specific resource activity or use, entry may be permitted by the Forest Supervisor on a case-by-case basis, and after thorough assessment of the implications of such action" (U.S. Forest Service 1986).

d. State of Utah

i. School and Institutional Trust Lands Administration (SITLA): SITLA is mandated by state law to maximize financial gain from their properties through sale, lease,

or exchange. Originally allocated to western states upon statehood by the federal government to support state institutions like schools and hospitals. Utah was given sections 2, 16, 32, and 36 in each township. The resulting checkerboard pattern of ownership means many SITLA parcels are surrounded by federal lands with limited or no access. Land transfers are a solution to this situation. SITLA has a successful track record of working with the BLM, US Forest Service, and private landholders to enable mutually beneficial consolidations of property.

e. Private Property

i. Counties can establish new ROWs through private lands in three ways. First, for developing lands, counties can identify ROWs on the transportation component of the General Plan. With ROW's identified, counties can work with developers to construct ROWs as the land develops over time. Second, counties can work with willing landowners to negotiate a mutually beneficial solution to purchase a public ROW or easement across property. Finally, in cases where landowners do not want a public ROW or easement across their property, counties can use eminent domain to condemn private property. State law enables the right of eminent domain for roadways for public vehicles but not for recreational uses (78B-6-501 3f).

f. Scenic Byway Corridors

i. "Scenic byways are highways and their adjacent lands that the state or federal government has recognized as having outstanding intrinsic qualities worthy of special attention. Scenic byways are often designated in honor of their scenic qualities, but can also be recognized for other qualities such as their recreational resources, natural qualities, historical resources, or cultural significance. The byways of Grand County are significant in all of these respects" (Grand County 2008).

ii. Grand County has published a corridor management plan that serves as the guiding advisory document that is considered during decision making by various managing agencies.

g. Broadband Internet

i. As high speed Internet connections become an increasingly critical asset for economic development, education, healthcare, public safety, and general quality of life, the tech industry and governments must work collaboratively to prepare for the growing need. Zoning laws, right-of-ways, preferred corridors and infrastructure requirements, and coordination with federal land agencies will likely all need to be analyzed in the coming years to maximize this utility. The Utah Broadband Outreach Center in the Governor's Office of Economic Development is a state program focused on mapping available broadband services and promoting the development of additional infrastructure in Utah (K. Cole, Governor's Office of Economic Development, unpublished report).

h. Control v Influence

i. The Grand County Road Department is responsible for maintaining public infrastructure, which facilitates land access. The County may also acquire and

enforce access by participating in planning processes of federal and state agencies and via litigation.

i. **Economic Considerations**

i. Grand County's economy is closely tied to accessing public lands for recreation and resource development. Physical access via roadways, especially for motorized vehicles, is required for the development and utilization of energy, mineral, recreation areas, or other resources. Of special concern are state inholdings managed by SITLA, and private lands surrounded by BLM properties.

ii. Based on sales tax information from 2016, it is estimated that tourism and mining activities constitute almost 80% of all economic activity in Grand County. Most of this activity is done on public lands.

j. **Custom + Culture**

i. It is the custom and culture of Grand County to support and protect private property rights, including access to public and private lands.

Land Access Policies

1. Grand County recognizes the need to develop new solutions for transportation in Moab.
2. *(Relevant existing policies found in the 2012 General Plan)*

k. **Goal 3 -** Support the development and maintenance of infrastructure necessary for a sustainable local economy.

i. Strategy A - Continue to coordinate with the City of Moab and special service districts to provide sewer, water, solid waste, communication, utility, and transportation infrastructure to accommodate efficient growth in appropriate areas.

ii. Strategy B - Continue to coordinate with the City of Moab on annexation of efficient and appropriate growth areas accommodating both residential and non-residential development.

iii. Strategy C - Continue to coordinate with the City of Moab to create and implement County and City land use regulations that are compatible in the municipal periphery/transition areas.

iv. Strategy D - Support and participate in planning to upgrade the capacity of existing electrical infrastructure in the Spanish Valley, Castle Valley, Cisco, and along the I-70 corridor.

v. Strategy E - Support and participate in planning for locally produced sustainable energy and its local consumption and transport.

vi. Strategy F - Support balanced and responsible natural-resource development that benefits the public and generates revenues for public service providers to help pay for public infrastructure improvements needed to achieve economic diversity.

l. **Public Lands Policy 4**. Encourage federal and state land-management agencies to develop, maintain and implement travel management plans that include

designated roads, official trails and approved motor-vehicle open areas. The plans should address types and seasons of permitted uses, maintenance levels, public education strategies and enforcement.

m. **Public Lands Policy 5**. Travel management regulations and policies will continue to be publicly available on a countywide roads map maintained jointly by the county and federal/state land-management agencies. This comprehensive roads map will show the current travel-management designations of Class B county roads (maintained) and Class D county roads (not maintained) alongside public land-management agency travel-management road designations.

n. **3.2 Vision: Transportation**

   i. Goal 1- Continue to focus county transportation infrastructure improvements on Moab as the heart of the community

   ii. Goal 2- Continue to work in partnership with the Utah Department of Transportation and the City of Moab to improve US Highway 191 and its intersections south of Moab to balance the need for safe local access with the need to accommodate through traffic.

   iii. Goal 3 - Facilitate planning and coordination of regional multi-modal transportation.

o. **3.2 Vision: Recreation and Access**

   i. Goal 1 - Support and participate in the Trail Mix Committee and the implementation of the Grand County Non-Motorized Trails Plan.

   ii. Goal 2 - Identify special places unique to Grand County in close proximity to Moab where public access should be established and maintained, including areas such as Mill Creek and Pritchett Canyon.

WILDERNESS

Definition

Wilderness areas are special places where the earth and interconnected communities of life have been left relatively undisturbed, *Bureau of Land Management website*. According to the Wilderness Act of 1964, federal lands must have specific characteristics to be considered by Congress for wilderness preservation:

a. They must be in a generally natural condition. The Wilderness Act defines "natural condition" as, "generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable."

b. They must have outstanding opportunities for solitude or a primitive and unconfined type of recreation.

c. They must be at least "… five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition"

d. They may also contain ecological, geological, or other features of scientific, scenic, or historical value.

Related Resources

Recreation & Tourism, Land Use, Livestock & Grazing, Fire Management, Noxious Weeds, Water Quality & Hydrology, Forest Management

Best Available Data Sources

a. Southern Utah Wilderness Alliance

b. Bureau of Land Management

c. Grand County Wilderness Plan (1999)

d. Arches National Park Management Website

- *Full works cited page available here*

Findings

a. **Overview**

i. Many people use "wilderness" to describe any remote, rugged and undeveloped land. The term "wilderness" is a legal definition created under the Wilderness Act of 1964 applied to specific parcels of public lands with certain characteristics, as designated by an Act of Congress. Wilderness designation enables preservation and protection of "Federal lands retaining primeval character and influence" and as such severely limits consumptive, motorized,

and mechanized uses. To qualify for wilderness designation, lands must be at least 5,000 acres of contiguous roadless area, or of sufficient size as to make practicable its preservation and use in an unimpaired condition, primarily natural in character with human impacts substantially unnoticeable, provide opportunities for solitude, and after the first three criteria are met, may contain other supplemental values such as ecological, educational, geological, historical, scenic, or scientific values.

ii. Other federal lands, not officially designated as wilderness, may be managed under similarly restrictive objectives. These include lands recommended for wilderness designation by the US Forest Service (USFS) as Recommended Wilderness Areas and the Bureau of Land Management (BLM) as Wilderness Study Areas (WSA). These lands are managed to protect their wilderness character until Congress can act. Other non-wilderness management prescriptions which have restrictive management objectives include USFS Roadless Areas and BLM wilderness character areas, natural areas, and Areas of Critical Environmental Concern (ACEC) and Special Recreation Management Areas (SRMA). Each of these management prescriptions has their own set of definitions and management guidelines, and are all significantly less restrictive than designated wilderness.

iii. Grand County has published a Wilderness Plan as an amendment to the County General Plan in 1999. This plan recommends 251,841 acres within the county to be designated as wilderness. The plan was created recognizing, "the need to adopt sub-area plans areas outside of Spanish Valley as a priority" (Grand County 1999). It also included local citizen preferences with regard to wilderness designations in the county. This recommendation was praised by conservation groups, and condemned by proponents of extractive use.

iv. The majority of land in Arches National Park (73,312 acres of the 76,680 total acres) has been recommended for wilderness designation. "Although the recommendation, first submitted in 1974, has yet to be approved by Congress, the park is required to manage this area as though it were formally designated wilderness" (National Park Service n.d.).

b. Control v Influence

i. Federal wilderness designation is a legislative action by Congress that sometimes follows a recommendation made by a comprehensive National Environmental Policy Act (NEPA) land management planning process, though wilderness designations may be citizen or legislator driven. Wilderness areas are designated by Congress and managed by federal land managers. While counties may have wilderness areas within their borders, they are not responsible for administration.

ii. According to the BLM, the best way for counties to influence future wilderness designation is to enter into a memorandum of understanding with the agency. Counties cannot influence current wilderness study areas except by contacting their congressional representative (P. Jarnecke, Bureau of Land Management, personal communication).

c. Economic Considerations

i. The economic effect of wilderness designation is the subject of ongoing debate. For example, when several proposals were made in the early 1990s to increase acres of wilderness in Utah, a 1992 Government Accountability Office (GAO) study investigated a claim that designating 3.2 million acres of land as wilderness in Utah would cost the state $9.2 billion annually in future earnings. The GAO study countered the claim made by a 1990 study that had cited adverse economic effects of wilderness designation in Utah. The debate over the economic impact of designating wilderness areas continues in Utah.

ii. "Rural counties in the West with more federal lands or protected federal lands performed better on average than their peers with less federal lands or protected federal lands in four key economic measures. Population, employment, and personal income on average all grew significantly faster—three times more rapidly or more—in western rural counties with the highest share of federal lands compared to counties with the lowest share of federal lands" (Economic Profile System 2016).

iii. In addition to job creation, (peer-reviewed studies found) a similar relationship between the amount of protected public land and higher per capita income levels" (Economic Profile System 2016).

iv. "Protected lands, and creating new visibility for them through designations, also helps safeguard and highlight the amenities that attract people and businesses" (Economic Profile System 2016).

v. Economic considerations of wilderness designation should include:

1. Mineral and energy development potential
2. Logging and forest products
3. Livestock Grazing - grazing is allowed in wilderness areas but must meet wilderness guidelines established by Congress.

    a. Congressional direction on grazing in wilderness areas is very well established. The Wilderness Act permits grazing to continue in wilderness areas, and committee reports have established guidelines for managing grazing in wilderness. Today, most wilderness legislation includes language directing that grazing management should follow the Congressional guidelines.

    b. Section 4(d)(4)(2) of the Wilderness Act states that "the grazing of livestock, where established prior to the effective date of this Act, shall be permitted to continue subject to such reasonable regulations as are deemed necessary by the Secretary of Agriculture."

    c. In the committee report accompanying 1980 legislation designating wilderness in several western states (PL 96-560), the House Interior and Insular Affairs Committee developed comprehensive guidance on grazing in national forest wilderness. Identical guidance for Bureau of Land Management

wilderness areas was included in the report accompanying the Arizona Desert Wilderness Act of 1990 (PL 101-628).

d. Congressional guidance emphasizes that grazing should not be curtailed simply because an area is wilderness; facilities may be maintained (including, if necessary, by using motorized vehicles); new improvements and facilities should be focused on resource protection; and motorized equipment should be used sparingly, and mostly in emergency situations or where permitted prior to designation.

4. Benefits to local communities offered by protected land status

   a. A study of 250 non-metro counties in the Rocky Mountains found no evidence of job losses associated with Wilderness and no evidence that local economies more dependent on logging, mining, and oil and gas suffered job losses as a result of Wilderness designation (Duffy-Deno 1998).

5. Adjacent private and state land inholdings

6. Benefits afforded the Permanent Utah School Trust Fund by land exchange

7. Recreational uses

vi. Wilderness designation on public lands has positive effects on:

1. non-motorized and non-mechanized recreation
2. wildlife habitat
3. drinking water source protection
4. watershed/water quality protection
5. refuge for imperiled species in the face of climate change
6. native species biodiversity
7. economic prosperity and quality of life for adjacent communities
8. flood mitigation
9. carbon sequestration

vii. Federal wilderness designation is a legislative action by Congress that may or may not follow a comprehensive National Environmental Policy Act (NEPA) planning process. In theory, wilderness designation begins with the adoption of agency planning documents and a subsequent recommendation for action by Congress, but often results from citizen advocacy advancing legislation through Congress, as with the designation of Utah's first wilderness area at Lone Peak by the Endangered American Wilderness Act of 1978 (Scott 2004).

d. Custom + Culture

i. Many people of Grand County value wilderness spaces for their cultural and ecological importance. At the same time, many residents value motorized and

mechanized land accessibility and sustained extractive use. The issue of new wilderness areas remains open to public debate.

ii. It is a priority of Grand County to be an active participant regarding proposals of new wilderness.

iii. Wilderness and other protective land designations have been shown to be popular with much of the public. In a study of people living in nine states in the mountain west region, about two in three (65%) voters said that permanently protecting and conserving public lands for future generations is very important to them personally (Hart Research Associates 2013).

Wilderness Policies

1. *(Relevant existing policies found in the 2012 Grand County General Plan)*

   i. The Grand County Wilderness Plan adopted as an amendment to the General Plan in 1995 is the County's policy document for the designation of wilderness on federal lands.

FOREST MANAGEMENT

Definition

The actions for the regeneration, use, and conservation of forests.

Related Resources

Fire Management, Noxious Weeds, Wilderness, Wildlife, Water Quality & Hydrology, Livestock & Grazing, Recreation & Tourism, Agriculture

Best Available Information Sources

a. A History of Grand County

b. Utah Forest Health Highlights

c. The Utah Forest Action Plan (2016) - DNR

a. *Full works cited page available here*

Findings

a. Overview

i. Utah forests are as diverse as the landscape itself. Over 15.1 million acres of forests are administered by federal, state, and local agencies. Another 3 million acres are privately owned. Utah Forest Health Highlights (2014) Several factors have contributed to the decline in forest health including a decline in historic logging, grazing patterns, fire exclusion, and invasive or noxious weeds. Drought conditions can negatively affect forest health causing detrimental changes in vegetative conditions, especially if combined with these other management practices (Utah Division of Forestry, Fire & State Lands 2014).

ii. "Forest stands in Grand County are largely composed of quaking aspen (Populus tremuloides), Douglas-fir (Pseudotsuga menziesii), Engelmann spruce (Picea engelmannii), blue spruce (Picea pungens), subalpine fir (Abies lasiocarpa), and Ponderosa pine (Pinus ponderosa). The combinations of different forest types and exposures provide for diverse wildlife habitat. At lower eleva-tions, woodland tree species include Gamble oak, mahogany, pinyon pine, and juniper. Although there are relatively low levels (compared to other areas of the state) of bark beetle populations in this area of Utah, annual aerial surveys indicate that they are spreading. The high density of many forest stands may increase the susceptibility of trees to future beetle infestations" (Grand Conservation District 2012).

iii. "Currently, aspen stands are declining due to lack of disturbance, including the exclusion of natural, low-intensity wildfire, and are being replaced by shade tolerant conifers. Aspen provides biological diversity and numerous resource benefits including wildlife habitat, forage, water retention, wood resources, and scenic beauty" (Grand Conservation District 2012).

iv. "As homes and communities continue to push further into the forests they have created a zone known as the wildland urban interface (WUI). This close interaction between structures and wildlands has increased the need for firefighting resources to protect lives and property. It has become necessary to employ other management techniques, such as forest thinning, to deal with the increased threat of wildfire" (Grand Conservation District 2012).

v. "Rural forest landowners, ranchers and farmers have many opportunities to improve forest lands through the wise use of this resource, conservation plantings, and following best management practices" (Grand Conservation District 2012).

vi. The Utah Forest Action Plan (2016) identifies the La Sal region as a priority for managing various aspects such as fire risk, wildlife, water quality, forest health, and urban and community forestry.

b. Control v Influence

i. The National Forest administers lands within its jurisdiction including the Manti-La Sal National Forest. Forestry, Fire, and State Lands manages state lands and forests in Utah, while Utah State University contributes forestry research and the developing best practices for private landowners.

c. Economic Considerations

i. Visitors from around the world, together with Utah locals, enjoy Utah's renowned forests that span from Canyonlands to the alpine zone. While Utah is only 29% forested, these forests have high scenic, recreation, wildlife and other forest use values that make forest health very important (Utah Division of Forestry, Fire & State Lands 2014).

ii. The market for forest products is very small in Utah, but it does exist. Forest products may be sold by board feet, by volume, or by piecemeal depending upon the product and the buyer. A professional forester can assist the seller in choosing the correct unit of measure and in determining value of the product.

iii. The non-extractive products and benefits that come from Utah's forests, such as recreation, water quality, wildlife habitat, and aesthetics are valuable. These contribute to the quality of life in Utah and should be considered valuable.

d. Custom + Culture

i. It is the custom and culture of Grand County to use and manage landscapes and resources, including forests, for multiple uses. Logging has been a part of the custom and culture of the County.

ii. It has been estimated that a half-million board feet of lumber was cut annually in the La Sal Forest in the years prior to World War I (Firmage 1996).

iii. Livestock and grazing in forests has long been part of the tradition of Grand County.

Forest Management Policies

1. Grand County's priority is to participate in collaborative relationships with state and federal land management agencies.
2. Support federal agencies in vegetative management treatments in forested cover types that provide for a full range of seral stages, by forested cover type, which achieve a mosaic of habitat conditions and diversity. Each seral stage should contain a strong representation of early seral tree species. Recruitment and sustainability of early seral tree species in the landscape is needed to maintain ecosystem resilience to disturbance.
3. Support the removal conifers as determined appropriate, and manage land to promote the establishment of aspen cover and attendant grass, brush and forbs.
4. Encourage the USFS to adequately update and identify the need for adaptive forest vegetation management in Forest Plans.
5. Encourage the USFS to prioritize and actively suppress noxious weeds which threaten forested Terrestrial Key Habitats.

FIRE MANAGEMENT

Definition

The actions to control, extinguish, use, prevent, or influence fire for the protection or enhancement of resources as it pertains to wildlands.

Related Resources

Recreation & Tourism, Land Use, Land Access, Energy, Law Enforcement, Air Quality, Floodplains & River Terraces, Water Quality & Hydrology, Wildlife, Noxious Weeds, Forest Management

Best Available Information Sources

a. Utah State University - Watershed Basins of Utah
b. DNR - Forestry, Fire, and State Lands
c. SEUALG Natural Hazard - Pre-disaster Mitigation Plan
d. *Full works cited page available here*

Findings

a. Overview

i. Wildfire is the most prevalent natural disturbance in the State of Utah, and it affects biotic communities statewide. It is an integral component of our forest, range, and desert lands and affects thousands of acres on an annual basis.

ii. While primarily responsible for structure and accident response, city and town fire departments also provide wildland training and are often the first responders to fires in the urban-interface within incorporated municipalities. These resources are often prioritized to structure protection operations.

iii. In less developed areas at lower elevations, a key management concern is the spread of cheatgrass that predominantly invades semi-desert shrub communities. Cheatgrass has been blamed for much of the reduction of fire return intervals and the occurrence of larger fires (Utah State University 2009).

iv. Response to fire incidents, especially wildland fires, relies on proper oversight, guidance, and partnership among a variety of trained professional organizations. Establishing a fire management system is a critical step to the protection of both urban and rural communities. Fire management refers to the principles and actions to control, extinguish, use, or influence fire for the protection or enhancement of resources as it pertains to wildlands. It involves a multiple-objective approach strategy including ecosystem restoration,

community preparedness, and wildfire response. Response to a wildland fire can involve a basic monitoring status placed on a remote wilderness fire, or involve multiple agencies overseen by an incident-management team encompassing hundreds of firefighters to manage. Numerous personnel are trained to respond to wildfires throughout Utah and the services they provide are dependent upon the role of their organization as assigned during an incident. At a basic level, firefighting resources can be grouped into two broad categories: ground resources and air resources. Often times, both types of resources are dispatched to a fire.

v. There are two main firefighting groups that fall within the "ground resources" category; they include handcrews and engines. Handcrews are specifically trained to fight wildfires. Wildland engines are specially equipped fire engines, often with all-terrain capabilities, to transport water to firelines. Both handcrews and engine crews are sponsored by federal land management agencies such as the Forest Service, BLM, National Park Service, US Fish and Wildlife Service, and the US Bureau of Indian Affairs. In addition to having access to federal crews, the State of Utah trains and provides both handcrews and engine crews.

b. Control v Influence

i. In Utah, the State Legislature tasked the Utah Division of Forestry, Fire, and State Lands to devise a comprehensive statewide wildland fire prevention, preparedness, and suppression policy, which is now known as SB56, 2015. Under this plan, a master cooperative wildland fire management and Stafford Act response agreement is signed each year between numerous federal land management agencies and the State of Utah for cooperation during wildland fire incidents that occur throughout the state (Utah Division of Forestry, Fire, & State Lands 2013).

c. Economic Considerations

i. Fire suppression is expensive to taxpayers. In the past 30 years, money spent by federal agencies nationwide on firefighting has increased from $2.5 million in 1985 to well over $2 billion in 2015 (National Interagency Fire Center 2015). With climate change and expected increase in temperatures and drought periods, fires suppression costs are projected to rise. In Utah, fire suppression costs averaged $33.4 million per year during the 10-year period of 2003–2012 (University of Utah, Bureau of Economic and Business Research 2014).

ii. One area of major concern is the wildland-urban interface. As development in this interface continues, firefighting costs will increase (Utah Division of Forestry, Fire, & State Lands 2013).

iii. Wildfires come with serious costs; the cost of fire suppression is only a fraction of the true, total costs associated with a wildfire event. Some of the costs associated with wildfire suppression include the direct costs (resources lost and structures burned), rehabilitation costs (post-fire floods and land restoration), indirect costs (lost sales and county taxes), and additional costs (loss of life and damage to air quality). A synthesis of case studies reveals a range of total wildfire costs anywhere from 2- to 30-times greater than the reported suppression costs (Western Forestry Leadership Coalition 2009).

iv. The 2003 hazard mitigation plan created by SEUALG inventoried the number of properties located in a wildfire risk area inside the county. The 659 identified homes would cost over $81.5 million to replace, and the 56 businesses would cost over $42 million, based on the annual sales figures (Southeastern Utah Association of Local Governments 2003).

d. Custom + Culture

i. Wildfire has always been an environmental hazard. In the last 30 years, there have been six fires that burned over 1,000 acres. The Diamond Peak, Ryan Creek, Thompson, and Little Hole fires have all emphasized the need for communities to remain prepared (Southeastern Utah Association of Local Governments 2003).

ii. Firefighting and management is, and always has been, important to citizens in Grand County. Proper fire prevention, management, and mitigation is critical to protecting the health, safety, welfare of the County and its residents. As evidenced in historic photos, people in Grand County have been training and preparing for structure and wildland fires for decades.

Fire Management Policies

1. *(Relevant existing policies found in the 2012 Grand County General Plan)*

i. Continue to work with the State of Utah Division of Forestry Fire and State Lands to implement the Wildland Fire Plan and to reduce wildfire hazard of fire in the wildland-urban interface.

ii. There are four primary agencies that provide emergency services for the residents of Grand County. Fire protection services are provided by the Moab Valley Fire Protection District, Castle Valley Fire Protection District and the Thompson Springs Special Service Fire District.

WILDLIFE

WILDLIFE

Definition

Undomesticated animals usually living in a natural environment, including both game and nongame species.

Related Resources

Threatened Endangered & Sensitive Species, Predator Control, Agriculture, Livestock & Grazing, Land Use, Fisheries, Forest Management, Recreation & Tourism

Best Available Data Sources

a. Utah Wildlife Action Plan (A plan to keep native species off the threatened and endangered species list)

b. National Survey of Fishing, Hunting, and Wildlife and Associated Recreation (2014)

c. *Full works cited page available here*

Findings

a. **Overview**

i. "The complexities of Utah's topography and climate result in biologically diverse habitats. Important habitat types in Utah include a diversity of wetlands, sagebrush steppe and shrublands, mountain shrub and pinyon-juniper woodlands, aspen-conifer forests, and desert grasslands and shrublands. Riparian areas are the richest habitat type in terms of species diversity and wildlife abundance. Aspen-conifer communities are second to riparian areas in wildlife species diversity and abundance. Utah's habitats support approximately 920 species and subspecies of vertebrates, and thousands of species of invertebrates, all organized into diverse animal communities occupying the habitats mentioned above" (UDWR 2015).

ii. "Among the 50 states, Utah ranks 10th in overall biological diversity and 5th for endemism (species found only in one state). Unfortunately, it also ranked 5th in terms of species extinction risk, mainly among its fishes, and 17th in actual extinctions. Utah's diversity of life is derived from its physical geography and its geologic history" (UDWR 2015).

iii. Populations of many species of wildlife have declined over the past 30 years due to a variety of manmade and natural factors. Unless adequate measures are taken to recover and conserve species populations and habitats, some of these species may become federally listed in the future.

iv. Best management practices for wildlife focus on principles and actions that allow people and wildlife to coexist, and on creating or maintaining healthy wildlife populations and habitat.

v. "Grand County has a vast resource of big game. The La Sal Mountains are home to large elk and mule deer herds, as well as the state's largest bear population. People from all over the western U.S. visit the La Sal's to observe and hunt the bears that inhabit the area. Mountain lion or cougars are also abundant in Grand County and also draw many hunters to the area. The Bookcliff Mountains are home to one of the state's trophy mule deer herds as well as large populations of elk and bear. The Book Cliffs serve as prime hunting terrain for avid hunters" (Grand Conservation District 2012).

vi. "Grand County is also home to pronghorn antelope as well as one of the premier herds of Rocky Mountain bighorn sheep in the Rattlesnake area of the Book Cliffs. The high cliffs around Moab and the surrounding areas are inhabited with one of the area's native herds of desert bighorn sheep. Small predators found in the county include bobcats, coyotes, red fox and kit fox, as well as many raptors including the red-tailed hawk and golden eagle" (Grand Conservation District 2012).

vii. "Many upland game species are also found in Grand County. Cottontail rabbits, grouse, chukars, wild turkey, and mourning doves are found through the county. During their yearly migration, many waterfowl species can be found in the area including mallards, pintails, widgeons, and Canada geese" (Grand Conservation District 2012).

viii. "Cooperative wildlife management units," (CWMU) can be created by the state as contiguous areas of land open for "hunting small game, waterfowl, cougar, turkey, or big game which is registered in accordance with...the Wildlife Board." These units can span over private, public, and state land, in an effort to manage based on an animal's range, rather than man-made borders. There are two CWMUs in the county, J.B. Ranch, and Redd Ranches (Utah Division of Wildlife Resources 2015).

a. Deer and Elk

i. In the case of mule deer (Odocoileus hemionus) and elk (Cervus canadensis nelsoni), in addition to the statewide plans required by state law, herd unit plans also have been developed for each mule deer and elk herd unit across the state. Each of these unit plans have been reviewed and approved by the Utah Wildlife Board. In many cases, herd unit plans have been revised multiple times since their initial development in the mid-1990s. The plans establish target herd-size objectives for each herd unit, which DWR and the Utah Wildlife Board then strive to meet through harvest adjustment and other mechanisms. Habitat needs and other local management considerations are also addressed in these unit plans. Grand County is a part of the Book Cliffs, La Sal, and San Juan deer herd management plans. The goals of these plans include things such as "Maintain a healthy mule deer population within the long term carrying capacity of the available habitat, based on winter range trend studies conducted by the DWR every five years," and "Balance deer herd goals and objectives with impacts on

human needs, such as private property rights, agricultural crops and local economies" (UDWR 2015).

ii. On a seasonal basis, big-game animals migrate among public, and private, lands. These movements create game management issues as a result of damage to private property and consumption of livestock feed by wildlife. To address these issues, the DWR plan seeks to enhance forage production through prescribed fire, pinion-juniper chaining, and conifer thinning and to protect habitat using tools such as conservation easements, conservation agreements, and cooperative wildlife management units. Utah Code 23-21-2.5 (2) states that "When changing any existing right to use the land, the division shall seek to make uses of division-owned land compatible with local government general plans and zoning and land use ordinances."

b. Pronghorn Antelope

i. DWR administers a Pronghorn Herd Management Plan for non- tribal lands. It is the purpose of this plan to "Manage for a population of healthy animals capable of providing a broad range of recreational opportunities, to include hunting and viewing. Balance the pronghorn population with human needs, such as authorized livestock grazing rights, private land development rights, and local economies. Maintain the population at a level that is within the long term habitat capability" (Utah Division of Wildlife Resources 2009).

c. Bighorn Sheep

i. DWR through its Utah Wildlife Board adopted a Utah Bighorn Sheep Statewide Management Plan on June 4, 2013 (Utah Division of Wildlife Resources 2013). This plan is effective for 5 years. The plan notes that bighorn sheep are one of the most sought-after and highly prized big-game animals in North America. Demand for hunting opportunities far exceeds the supply of hunting permits. There is also great demand for bighorn sheep viewing opportunities (Utah Division of Wildlife Resources 2013).

e. Control v Influence

i. Primary control of wildlife management and planning is given to the State of Utah. The Utah Division of Wildlife Resources conducts wildlife studies and issues hunting permits. The federal government issues permits for areas in Grand County where grazing and wildlife compete for forage.

ii. State species management plans provide guidance and direction for a number of species in Utah. These plans are taken through a public process to gather input from interested constituents and then presented to the Utah Wildlife Board for approval. Species covered by statewide plans include wild turkey, chukar, greater sage-grouse, mule deer, elk, moose, pronghorn, mountain goat, bighorn sheep, Utah prairie dog, beaver, northern river otter, black bear, cougar, bobcat, and wolf.

f. Economic Considerations

i. The US Fish and Wildlife Service found that Utah residents and non-residents spent over $1.5 billion dollars in 2011 in Utah on recreation activities associated

with wildlife (U.S. Fish and Wildlife Service, U.S. Department of Commerce, and U.S. Census Bureau 2011).

g. Custom + Culture

i. Managing and respecting the wildlife of Grand County has been a tradition for hundreds of years, and will continue into the future.

Wildlife Policies

1. The County supports wildlife management that seeks an optimal balance between wildlife populations and human needs.
2. All federal and state land management agencies should coordinate with the County before eliminating, introducing or reintroducing any species onto public lands and address potential impacts of such an action on private lands, customary use and private property interests in the public land, and the local economy.

FISHERIES

Definition

The places where fish breed and live, or where people hunt for fish. The term also includes game and nongame fish species.

Related Resources

Canals & Ditches, Irrigation, Floodplains & River Terraces, Riparian Areas, Water Quality & Hydrology, Water Rights, Wetlands, Wild & Scenic Rivers, Wildlife, Recreation & Tourism

Best Available Information Sources

a. Utah Division of Wildlife Resources
b. *The Economic Contribution and Benefits of Utah's Blue Ribbon Fisheries (2013)*
c. Wildlife Management in Utah - Utah Education Network
d. *Full works cited page available here*

Findings

a. Overview

i. Statewide Utah's current fish and wildlife resource is highly diverse. Approximately 647 vertebrate species inhabit the state; of these, 381 are considered permanent residents, including 78 species of fish (Powell 1994).

ii. "Grand County is home to many species of aquatic life. The Colorado River is home to a large supply of catfish. The high mountain lakes of the La Sal Mountains are home to brook trout, rainbow trout, and brown trout. The Utah Division of Wildlife Resources stocked tiger trout in the recent years in a few select lakes; some of which may still be caught by anglers" (Grand Conservation District 2012).

iii. Sport Fishing

1. Sport or recreational fishing is an important part of the outdoor recreation industry. The Utah Division of Wildlife Resources (UDWR) is responsible for managing fisheries in Utah with the primary goal of providing quality recreational fishing opportunities. Assisting the UDWR in decision making and establishing management priorities are five Regional Advisory Councils (RACs) who provide local input on fisheries-related issues. Rivers, lakes, and reservoirs that provide

exceptional angling experiences are given Blue Ribbon Fisheries (BRF) status (Utah Code § 23-14-2.6).

2. Currently, the only BRF in Grand County is West Willow Creek, located in a remote area accessible by foot or by horse only (Utah Division of Wildlife Resources 2015).

3. The Utah Division of Wildlife maintains community fisheries such as ponds and reservoirs that are stocked with fish. The Green River Golf Course Pond within Green River State Park is one such urban fishery (Utah Division of Wildlife Resources 2016).

iv. Threatened and Endangered Species

1. "The Colorado River system, including the Green and San Juan rivers, contains four endangered fish. These are the Colorado pikeminnow, humpback chub, bonytail chub and razorback sucker. Efforts to recover these species are overseen by the Recovery Implementation Program (RIP) for Endangered Fishes of the Upper Colorado River Basin" (Utah Division of Water Resources 2000). For more information, see the Threatened & Endangered Species section of this plan.

v. Aquatic Invasive Species

1. Aquatic Invasive Species (AIS), also referred to as Aquatic Nuisance Species, are defined by the UDWR as nonnative species of aquatic plants and animals that cause harm to natural systems and/or human infrastructure. Not all nonnative fish species are considered AIS, such as those that are desirable for sport fishing. These may include nonnative Rainbow Trout, Largemouth Bass, and catfish (Utah Division of Wildlife Resources 2009).

2. Invasive mussels in Utah waters have no natural competitors, so once they are established, they spread quickly, colonizing nearly any and all underwater surfaces. They are currently impossible to remove from contaminated water bodies and are easily spread to other waterbodies. The mussels can clog water transmission and power generation infrastructure, harm water- based recreational equipment, and outcompete both native and nonnative game species for nutrients. All these impacts can have profound impacts on sportfish populations (Utah Division of Wildlife Resources 2009).

3. Preventing the spread of AIS is currently the most effective management action. The UDWR has a statewide system of boat cleaning/decontamination stations, inspection check-points, and angler education efforts.

b. Control v Influence

i. The Utah Division of Wildlife Resources (UDWR) is responsible for managing fisheries in Utah.

c. Economic Considerations

i. "Recreational fishing provides a significant economic impact to the Utah economy and economic benefit to anglers" (Kim and Jakus 2013).

ii. "Economic impacts or contributions are based on anglers' expenditures associated with the fishing trips. Expenditures affect the local and regional economy through the interrelationships among different sectors of the economy. Input-output (IO) analysis of expenditure patterns traces the effects "upstream" and "downstream" through the economy, resulting in the multiplier effects. The angler survey, conducted in the months of March, April and May of 2012, revealed that a typical angler spent $84 per trip on a fishing trip in Utah in 2011. Average expenditure to visit a BRF was estimated to be $90 per trip" (Kim and Jakus 2013).

iii. Fishing of over 78 species in Utah represents a significant sector of Utah's tourism economy. Almost $400 million was spent in association with fishing, hunting, and wildlife appreciation activities in 1985 (Powell 1994).

d. Custom + Culture

i. Recreational fishing has been part of the local custom and culture for more than one hundred years.

ii. "Channel catfish were introduced into the Colorado River near Moab in 1919 through the efforts of county resident Horace S. Rutledge. By 1927 fishing for catfish was sufficiently good in the area that the sport was mentioned in an article in the Salt Lake Tribune. Catfish continue to flourish in both the Green and Colorado rivers at the present time. Another introduced sportfish is largemouth bass; other introduced fish in the county's waters include carp, red shiner, fathead minnow, black bullhead, and green sunfish" (Firmage 1996).

Fishery Policies

1. Support natural resource management entities within Utah to prevent invasion of Aquatic Invasive Species (AIS) into the state and to contain AIS through accepted management practices to areas that are either already infested or become infested.

PREDATOR CONTROL

Definition

The strategies and practices to control the actions of predators, or bringing into natural ecological balance predator populations, or reduce the number of conflicts with predator animals.

Related Resources

Agriculture, Livestock & Grazing, Threatened Endangered Sensitive Species, Wildlife, Land Use, Forest Management, Wilderness

Best Available Information Sources

a. 2015 Predator Program Summary (UDWR)

b. Wildlife Management in Utah (UEN.org)

- *Full works cited page available here*

Findings

a. Overview

i. Predators in Utah include raptors, mountain lions, bears, wolves, foxes, and weasels in addition to some domesticated and feral animals.

ii. "Small predators found in the county include bobcats, coyotes, red fox and kit fox, as well as many raptors including the red-tailed hawk and golden eagle" (Grand Conservation District 2012).

iii. In Utah, the primary agent for predator control is the Division of Wildlife Resources. They manage predator populations through hunting permits and reimbursement for livestock damaged by predators. The UDWR also manages ravens, coyotes, raccoons, cougars and red foxes (UDWR 2012).

iv. The USDA established a program in 1895 called Wildlife Services (WS) to assist land managers. WS focuses on predator control activities for the protection of livestock. "Currently, WS operational activities include conducting rabies control and eradication efforts, managing invasive species, completing wildlife disease surveillance, reducing the impact of predation on livestock, preventing wildlife strikes at airports, protecting transportation infrastructure, and protecting threatened/endangered species, rare habitats, and ecosystems" (Animal and Plant Health Inspection Service 2009).

v. One primary focus of predator control in Utah is aimed at increasing the fawn-to-mule deer ratio by removal of coyotes. In 2012, the State established the

Mule Deer Protection Act which pays hunters a bounty fee of $50 for each coyote that is killed. The coyote bounty program is supported by some Utahns, and opposed by others (Bruskotter et al. 2007). One reason for opposition is research evidence that coyote removal programs do not alter mule deer population trends (Hurley, et al. 2011). Predators can also be a significant threat to endangered species, and counties often support open hunting and taking by other means of predators as a support to other protection efforts.

vi. The reduction of predators can result in an imbalance of prey species, as when excessive populations of ungulates whose numbers would otherwise be limited by predators prevents the recruitment of favored ungulate browse such as native willows, cottonwoods, and aspen (e.g., Utah Forests Restoration Working Group 2010). Coyote control can increase the predation of feral cats which prey on native birds (Soule 2005).

vii. Grand County has black bear and cougar habitat. Cougar and black bear harvesting and pursuit (chasing, no-kill) are permitted in Utah and are managed by the Division of Wildlife Resources.

viii. The recreational chasing of black bear and the hunting of cougar are supported by some Grand County residents, opposed by others, in part because black bear pursuit in Spring occurs when bear females are raising young; and cougar hunting can result in greater conflicts of young cougar due to human conflicts and increased livestock predation (Hoffman 2012).

ix. Domestic, feral, and stray cats are a significant predator of native birds. Predation by domestic cats is likely the single greatest source of anthropogenic mortality for US birds (Loss, et al. 2013). Cats also prey on lizards.

x. The Animal and Plant Health Inspection Service (APHIS) Wildlife Services (WS) also contributes to livestock resource protection. "WS personnel recommend and conduct wildlife damage management activities to protect many types of resources… WS personnel use an integrated wildlife damage management approach, in response to requests for assistance to protecting agriculture, natural resources, property, and human health & safety" (USDA 2015).

xi. All over the West, crows and ravens have affected sage-grouse populations by finding their nests and preying on their chicks. The amount of sage-grouse habitat in Grand County is limited, but certain areas of the Book Cliffs are considered crucial brooding habitat (UDWR 2015). "Direct effects of nest predation on nesting productivity of birds are widely recognized, and even in high-quality sage-grouse habitat, most sage-grouse nests are lost to predators" (Dinkins et al. 2012).

b. Economic Considerations

i. Utah cattle are killed by predators, though not in as many numbers as sheep and other animals. According to the APHIS (USDA 2011), in Utah, 300 head of cattle and 2,300 calves were killed by predators for a total value loss of $1.1 million

1. Coyotes are responsible for the majority of cattle predation, including 58% of calf losses and 44% of cows.

2. Bears were responsible for 43% of the cow losses.

ii. Using funds generated from grazing fees, the BLM made payments of $56,000 in Grand County in FY 2010, $55,000 of which is from the Taylor Grazing Act and restricted to range improvements (e.g., predator control, noxious weed programs) in cooperation with the BLM or livestock organizations (US Dept of Interior, 2016).

iii. Predator control is typically managed by the Utah Division of Wildlife Resources (DWR). Most of DWR's revenue is generated from the sale of hunting and fishing licenses and permits. (Funds are also generated at a rate of $0.25 per head for brand inspection). These funds are restricted for use by the DWR only. All license dollars collected stay within the DWR to execute the division's mission to protect and conserve the wildlife and their habitat in Utah. Utah spends >$700,000 per year, on predator control, far more than neighboring states (UDWR 2012).

c. Custom + Culture

i. When the pioneers arrived in Utah, wildlife represented both benefits and problems. Fish became a significant part of the pioneer diet, particularly when crop failures occurred. At other times, hunting parties were formed to rid the early settlers of "pest" species. One such hunting company reported the killing of "2 bears, 2 wolverines, 2 wild cats (bobcat), 783 wolves (probably both coyotes and wolves), 400 foxes, 31 mink, 9 eagles, 530 magpies, hawks, owls, and 1626 ravens" (Powell 1994).

ii. Two of the principles that drove the establishment of the Forest Reserve Act (1891) and Taylor Grazing Act (1934) were to address predator control and overgrazing.

iii. There is no one "culture and custom" in Grand County for predator reduction. Instead, there are differing perceptions and values placed on predators and their interactions with prey and the interaction of ungulate prey with forest health.

iv. Grand County supports the Utah Department of Wildlife Resources in their efforts to effectively manage wildlife numbers to match their desired population goals.

Predator Control Policies

1. County supports the responsible maintenance of domestic animals.
2. Encourage BLM law enforcement to enforce animal control on federal lands.
3. Encourage and provide information support for non-lethal means of predator management on private and public lands in Grand County.
4. The County supports a healthy ecosystem for all species.

THREATENED, ENDANGERED, and SPECIAL STATUS SPECIES

Definition

Species of plants, animals, and other living organisms which are, to different degrees, threatened by extinction.

Related Resources

Wildlife, Land Use, Fisheries, Livestock & Grazing, Noxious Weeds, Fire Management, Mining, Energy, Riparian Areas, Mineral Resources, Recreation and Tourism, Agriculture, Land Access

Best Available Information Sources

a. US Fish & Wildlife Service
b. Utah Wildlife Action Plan (2015)
c. Bureau of Land Management
d. *Full works cited page available here*

Findings

a. Overview

i. The Endangered Species Act (ESA) directs all federal agencies to work to conserve endangered and threatened species and to use their authorities to further the purposes of the ESA. Animal or plant species are classified as endangered, threatened, candidate, or study species. Other special statuses that species may fall under include species of conservation concern, rare, sensitive, and endemic.

ii. "Among the 50 states, Utah ranks 10th in overall biological diversity and 5th for endemism (species found only in one state). Unfortunately, it also ranked 5th in terms of species extinction risk, mainly among its fishes, and 17th in actual extinctions. Utah's diversity of life is derived from its physical geography and its geologic history" (Utah Division of Wildlife Resources 2015).

iii. Populations of many species of wildlife and plants have declined over the past 30 years due to a variety of human-caused and natural factors. Unless adequate measures are taken to recover and conserve species populations and habitats, some of these species may become federally listed in the future.

iv. By Administrative Rule R657-48, the Utah Division of Wildlife Resource maintains the Utah Sensitive Species List which contains wildlife species that are federally listed, candidates for federal listing, or for which a conservation agreement is in place. Additional species are added to the list as "wildlife species of concern" where there is credible scientific evidence to substantiate a threat to continued viability of populations of such species. It is anticipated that wildlife species of concern designations will identify species for which conservation actions are needed, and that timely and appropriate conservation actions implemented on their behalf will preclude the need to list these species under the provisions of the federal Endangered Species Act.

v. In 1997, as part of the state water tax, the Utah Legislature created the Endangered Species Mitigation Fund (ESMF) which significantly expanded the funding base for conservation of wildlife species which are designated as Utah Sensitive Species or are ESA-listed. The purpose of this fund is to avoid, reduce, and/or mitigate impacts of ESA listings on the people of Utah (Utah Division of Wildlife Resources 2015).

b. Animal Species in Grand County with Special Status

i. "White-tailed prairie dogs are widely distributed and abundant within their range in Utah. Occupancy has remained relatively stable since 2008 survey efforts. White-tailed prairie dogs are found in eastern Utah, northwestern Colorado, Wyoming, and a small area in southern Montana. Though the species' current range is similar to its historic range, there is evidence that the species abundance has declined as a result of control efforts and plague. In Utah active colonies are found in Rich, Summit, Daggett, Uintah, Duchesne, Carbon, Emery, and Grand Counties with 473,843 ha considered suitable for prairie dogs" (Utah Division of Wildlife Resources 2015).

ii. Grand County's Federally Listed Threatened (T), Endangered (E), and Candidate (C) Animal Species:

Greater Sage-grouse	C
Gunnison Sage-grouse	C
Mexican Spotted Owl	T
Yellow-billed Cuckoo	C
Black-footed Ferret	E Extirpated

Source: Utah Division of Wildlife Resources 2015

iii. Included on Utah's State Listed Conservation Species Agreement with the U.S. Fish and Wildlife Service and Species of Concern in Grand County:

1. Allen's big-eared bat
2. American white pelican
3. Bald eagle
4. Big free-tailed bat
5. Bluehead sucker*
6. Burrowing owl
7. Cornsnake
8. Eureka mountain snail
9. Ferruginous hawk
10. Flannelmouth Sucker*
11. Fringed Myotis
12. Great Plains Toad
13. Gunnison's Prairie-Dog
14. Kit Fox
15. Lewis's Woodpecker
16. Mountain Plover
17. Northern Goshawk*
18. Roundtail Chub*
19. Smooth Greensnake
20. Spotted Bat
21. Three-Toed Woodpecker
22. Townsend's Big-Eared Bat

*Species receiving special management under a Conservation Agreement in order to preclude the need for Federal listing.

Source (Utah Division of Wildlife Resources 2015 and Grand County Conservation District 2012)

c. Aquatic Species

i. Grand County's Federally Listed Threatened (T), Endangered (E), and Candidate (C) Aquatic Species

Humpback Chub	E
Bonytail	E

Colorado Pikeminnow	E
Razorback Sucker	E

ii. Other aquatic species considered sensitive by the State of Utah are:

1. Bluehead sucker
2. Flannelmouth sucker
3. Roundtail chub
4. Hayden gilia
5. Cataract gilia
6. Speckled dace

Source: (Utah Division of Wildlife Resources 2015)

iii. Many sensitive aquatic species are part of the Utah Wildlife Action Plan. Efforts to recover these species are also overseen by the Recovery Implementation Program (RIP) for Endangered Fishes of the Upper Colorado River Basin.

iv. "The Upper Colorado River Basin RIP is a 15- year, interagency partnership aimed at recovering these four endangered fishes. The program was launched in 1988 when the governors of Colorado, Utah and Wyoming, the Secretary of the Interior, and the Administrator of Western Area Power Administration signed a cooperative agreement committing each participant to implementing the program's elements. The recovery program elements include: habitat management; habitat development; native fish propagation and genetic management; non-native species and sport fishing; research, monitoring, and data management; and public information and involvement" (Utah Division of Water Resources 2000).

v. "Recovery efforts for native Colorado River cutthroat trout are needed to expand the range of the species and prevent federal listing as a threatened or endangered species. A Conservation Agreement and Strategy have been formulated to aid those efforts" (Utah Division of Water Resources 2000).

d. Plant Species

i. Grand County's Federally Listed Threatened (T), Endangered (E), and Candidate (C) Plant Species

Jones Cycladenia	T

ii. "Utah is home to at least 600 rare vascular native plant species (and subspecies/varieties) including some 25 species that are federally listed as endangered or threatened under the Endangered Species Act of 1973. The 600 taxa represent almost 19% of our currently known flora. Of those, some 180 or almost 6% have been ranked by our rare plant committee as of "extremely high"

or "high" concern. Many of these are highly restricted endemics (Utah has 475 endemics, i.e. geographically restricted, with 420 of those only occurring in Utah). Only a handful of states (Hawaii, California, Arizona, Florida, Texas and Oregon) are believed to have as many or more rare plant species as Utah. And this number is growing, since every year new species are still being discovered or recognized" (Utah Native Plant Society n.d.).

iii. Because of its unique biome, Grand County is home to a wide variety of plant species. The following are rare plants found in the County as listed by the Utah Native Plant Society (2010):

- Androsace chamaejasme var. carinata
- Asclepias cutleri
- Astragalus iselyi
- Astragalus musiniensis
- Astragalus piscator
- Astragalus pubentissimus var. peabodianus
- Astragalus sabulosus var. sabulosus
- Astragalus sabulosus var. vehiculus
- Caesalpinia repens
- Carex curatorum
- Ceanothus greggii var. franklinii
- Cryptantha osterhoutii
- Cycladenia humilis var. jonesii
- Cystopteris utahensis
- Dalea flavescens var. epica
- Epipactis gigantea
- Erigeron mancus
- Gilia latifolia var. imperialis
- Lomatium latilobum
- Lygodesmia grandiflora var. doloresensis
- Lygodesmia grandiflora var. entrada
- Mentzelia shultziorum
- Oreoxis trotteri
- Perityle specuicola
- Phacelia howelliana
- Platanthera zothecina
- Podistera eastwoodiae
- Potentilla pensylvanica var. paucijuga
- Psorothamnus polydenius var. jonesii
- Senecio fremontii var. inexpectatus
- Xylorhiza glabriuscula var. linearifolia
- Zigadenus vaginatus

e. Control v Influence

i. "Under the Endangered Species Act, the U.S. Fish and Wildlife Service is required to identify species of plants and animals that are endangered of becoming extinct or threatened by their potential for becoming endangered... BLM is required to manage habitats for such species in a manner that would promote their recovery" (U.S. Fish & Wildlife Service 2015).

ii. The Forest Service also maintains its own list of sensitive species that occur on any given National Forest. The Manti-La Sal National Forest is in the process of revising its 31-year-old forest plan, and will be designating Species of Conservation Concern in the Grand County portion of the forest, for which efforts will be made to insure that such species are protected from a slide toward listing under the Endangered Species Act.

iii. The ESA does not protect listed plant species that occur on private lands.

f. Economic Considerations

i. In Grand County, much of the funding for conservation activities comes from hunter and angler license fees and habitat stamps, as well as federal excise taxes on shooting, boating, and fishing equipment. "These excise taxes are collected at the point of sale, deposited into a dedicated trust fund, and distributed annually to the states in a formula-based process which is off-limits to annual Congressional appropriation. . .While a few states have chosen to use these federal excise taxes to directly fund the management of diverse wildlife species, in general most wildlife species have not been the direct beneficiaries of this reliable funding mechanism (though they have often benefitted indirectly from such activities as habitat acquisition and management)" (Utah Division of Wildlife Resources 2015).

ii. The ESA prohibits consideration of economic impacts when determining whether to list a species, but it does require consideration of economic impacts when designating critical habitat.

g. Custom + Culture

i. Species extinctions in the late 19th century and early 20th century triggered national awareness and response in the form of active wildlife management.

ii. With climate change, including increasing air and water temperatures, increased force of precipitation when it occurs, earlier snowmelt, and predicted increased severity of drought, there is rising cultural awareness of potential species extirpations from Grand County, and potential extinctions.

Threatened, Endangered, and Special Status Species Policies

1. Grand County supports the careful utilization of data in any planning for threatened, sensitive, or endangered species.
2. *(Relevant existing policies found in the 2012 Grand County General Plan)*

i. **Reintroduction of Species - Public Lands Policy 14:** Participate with land management agencies in evaluating the impacts on county residents and businesses of species introduction and reintroduction on public lands.

ii. **3.2 Vision: Ecology, Water, and Air**: Wildlife and plant habitat, including for pollinators, is preserved and restored. Invasive weeds are reduced and native species thrive. Wildlife corridors connect natural areas throughout the county, creating ecosystem linkages and improving wildlife, and native plant vitality. Wetlands and riparian habitats are intact.

WATER RESOURCES

WATER QUALITY & HYDROLOGY

Definition

Water quality is the condition of water based on biological, chemical, and physical properties.

Hydrology is the science dealing with continental waters, their occurrence, distribution and movements through the entire cycle of precipitation, evapotranspiration, atmospheric circulation, surface flow, and subsurface flow.

Related Resources

Land Use, Fire Management, Wild & Scenic Rivers, Wetlands, Water Rights, Canals & Ditches, Irrigation, Livestock & Grazing, Riparian Areas, Recreation & Tourism, Fisheries, Threatened Endangered & Sensitive Species, Agriculture

Best Available Data Sources

a. Environmental Protection Agency
b. *A History of Grand County - Utah Centennial County History Series*
c. Utah State Water Plan - Southeast Colorado River Basin
- *Full works cited page available here*

Findings

a. Hydrology

i. The hydrologic cycle describes movement of water on earth. Some of the processes by which water moves include: precipitation, infiltration (soil moisture and groundwater), and streamflow. In order to account for the distribution of water within a specific area, it is necessary to consider these processes. The watershed is one measure used to quantify and analyze water and its effects at a specific location. A watershed, or drainage basin, is an area of land in which all water within drains to the same outlet. Watersheds are home to a variety of plant life including: bacteria, grasses, forbs, shrubs, and trees. Additionally, the watershed ecosystems in Utah support protozoa, invertebrates, amphibians, reptiles, fish, birds and mammals.

ii. "Water has been and still is a scarce resource in the area. Grand County's existing lakes and reservoirs are Crescent Lake, Hidden Lake, Oowah, and Pace Lake, and total 613 acre-feet of storage capacity. Most of the water in Ken's Lake, although located in San Juan County, is used in Grand County and has a storage capacity of 2,820 acre-feet. Uses of Grand County lakes and reservoirs include irrigation, recreation, and flood control, with the majority of the water being used for irrigation" (Grand Conservation District

2012). Water scarcity in both surface and groundwater might influence the amount of expansion Grand County can feasibly undergo while ensuring water is available for riparian areas, agriculture, and wildlife.

iii. As water enters and flows through a watershed, a fraction of the water infiltrates into the ground and recharges underground aquifers. Groundwater from wells is also a critical resource for culinary and agricultural water supplies.

iv. The watersheds for Moab and Castle Valley are about 3.5% of the land mass of Grand County, and they support well-over 90% of the county's population.

v. "The average annual precipitation of the non-mountainous areas of the county is less than ten inches of water. The average annual precipitation at Moab this century has been slightly above eight inches; wet years may have some sixteen inches, dry years have been as low as three inches. The average annual precipitation a few miles away at the 11,000-foot level of the La Sal Mountains has been estimated to be almost twenty-nine inches" (Firmage 1996).

vi. Green River, the largest tributary of the Colorado River, forms the western edge of the county. Originating in the Wind River Range of Wyoming, the Green River drains an area of some 44,400 square miles, which is about 1.7 times the area of 25,900 square miles drained by the Colorado River above the confluence of the two mighty waterways, at which junction the combined flow was historically known as the Colorado River (Firmage 1996).

vii. At an annual average of 6.7 million acre-feet of water, the Colorado above the confluence usually produces a slightly greater volume of water than does the Green with its 5.6 million acre-feet average; however, the Green River's length of 730 miles is much greater than the 423 miles of the Colorado (Firmage 1996).

viii. While the amount of surface water flowing through or along the borders of the County may seem high, there is absolute certainty that this surface water is unavailable for beneficial use to Grand County, unless complex contracts and payments are made for water transfers from senior water right holders (J. Weisheit, Living Rivers, personal communication). Any projects involving further diversion of water from the Colorado River basin would add to the hydrological debt that these water sources are being strained by. The County will work with the DWR to address surface water rights and availability.

b. The Colorado River Basin

i. Since 1906, when USGS gage reports were considered to be reasonably accurate, the Colorado River's natural annual average supply has been losing 1 million acre-feet (MAF) every 50 years (Webb 2005). Since 2000, the natural supply has dropped an unprecedented 20%, or 3 MAF per year on average (Webb 2005). A 2017 study explains that as average temperatures rise, the reduction of flow in the Colorado could be as high as 50% by the end of the century (Udall and Overpeck 2017). The downward trend in natural flow is not expected to reverse itself in the planning period of this document and all future developments should in the planning period of this document. (J. Weisheit, Living Rivers, personal communication).

c. Groundwater

i. Since Grand County is fast approaching the safe yield of its groundwater resources, all future planning must initiate and enforce, groundwater monitoring programs. Monitoring is crucial to ensure that the supply can cope with maximum demand, especially in an arid climate such as Grand County, where the water supply has been shown to be generally trending downward.

d. Water Quality

i. In Utah, water quality is regulated by the state based on the source of pollutants entering waterways, defined as either "point source" or "nonpoint source" pollution. Point sources (PS) discharge pollutants directly into a waterbody, usually through pipes or ditches originating from industries or waste treatment plants. Nonpoint sources (NPS) are pollution sources that do not originate from distinct locations and tend to vary in time and space. Nonpoint source pollution occurs when runoff from rainfall or snowmelt pick up pollutants from the human and natural landscape and transport them indirectly to a waterbody. Both the State and the federal government have regulations designed to prevent pollution.

ii. The County will work with the DWR to implement a groundwater management plan that will monitor groundwater levels in both Grand and San Juan Counties.

iii. Water quality characteristics include:

1. Conductivity
2. Dissolved oxygen
3. Nutrients
4. pH
5. Suspended sediment
6. Water temperature
7. Turbidity

iv. "Grand County is within the Southeast Colorado River Basin watershed. The Utah Division of Water Quality (UDWQ) has listed several water bodies in Grand County on the EPA 303d list for water quality impairment." These include Castle Creek, Mill Creek, Onion Creek, Pack Creek, and portions of the Colorado River (Grand Conservation District 2012).

v. "The region has supported a significant mining industry, especially for uranium ore. The processing of raw ore typically required significant quantities of water and generated large tonnages of spent or processed ore in stockpiles near local processing plants. Contamination of groundwater from the infiltration of process water from lagoons and the infiltration of leachate from spent ore piles are serious concerns. The Division of Water Quality has measured increased concentrations of various contaminants in the regional aquifer around Moab (Utah Division of Water Resources 2000).

vi. While there are regulations in place for many contaminants, there are new types of potentially harmful substances being sampled along the Colorado River. These "contaminants of emerging concern" include "nutrients, pharmaceuticals and drugs, personal care products, pesticides and pesticide degradation products, hormones and

phytosterols, and other wastewater indicators" (NPS 2015). In recent years, the National Parks Service has been sampling just below the Moab sewer outlet on the Colorado River, as well as other downstream sites. These contaminants do not have regulations yet, and there are only the beginnings of understanding of toxicity levels. A final report, with information from the USGS is expected to be published in 2017.

vii. Water quality is a critical resource, and the county continues to work to restore impaired waters as well as to prevent any potential future impairment. For example, in response to the listing of Onion Creek for temperature impairment, "projects were implemented using 319 funding to increase bank stabilization and riparian shading" (Grand Conservation District 2012). These type of projects continue today.

e. Control v Influence

i. Point source pollutants are highly regulated under the Clean Water Act of 1972 and Water Quality Act of 1987 through the issuance of permits and possible fines if permit requirements are not met. The United States Environmental Protection Agency (EPA) issues discharge permits within the National Pollutant Discharge Elimination System (NPDES). In Utah, the State of Utah was granted primacy by EPA to manage the NPDES permitting program as the Utah Pollution Discharge and Elimination System (UPDES) and is operated by the Utah Department of Environmental Quality (DEQ) Division of Water Quality (DWQ).

ii. "The Moab Area Watershed Partnership (MAWP) is a collaboration of diverse stakeholders who share knowledge and develop, and facilitate implementation of, a holistic watershed plan that conserves and enhances water quality and quantity in the Mill Creek (including Pack Creek) and Castle Creek watersheds" (MAWP 2014). The Moab Area Watershed Partnership has created a "Comprehensive Watershed Management Plan for the Moab Area" which identifies and characterizes local watersheds, compiles comprehensive water quality data, analyzes the chemical and physical water quality issues, and identifies resource concerns as well as opportunities to address those concerns (MAWP 2014). It is a working and living document that the MAWP has agreed to review and revise on an annual basis.

iii. In December of 2016, the City of Moab published a water conservation plan, which recommends that, "the City aim for a 25% reduction in per capita water consumption over the next five years, and that the City reduce outdoor usage of culinary water by 25% in the same time period" (City of Moab 2016).

iv. An important report from the USGS regarding the quality and quantity of Grand County aquifers and surface water data, as well as a water budget report, is expected to be published during 2017. Additionally, the City of Moab is currently in the process of updating their Drinking Water Protection Plans.

f. Economic Considerations

i. In 2011, recreational fishing in Utah's lakes, streams, and rivers brought in $259 million. This includes the cost of equipment and multipliers like lodging, retail purchases, and dining in restaurants. Fishing relies on good water quality and hydrology. In 2012, a study of outdoor recreation found that $1.2 billion was spent for water related activities in Utah. It is more cost effective to protect the water resource at its source and prevent contamination than to treat it in a wastewater treatment plant. "Nationwide, every $1

spent on source water protection saves an average of $27 in wastewater treatment costs" (Utah Division of Water Quality 2013).

ii. Prepare60, a center established by four water conservancy districts in Utah, published a 2014 report illustrating that $17.9 billion spent on water infrastructure maintenance alone enables $5.4 trillion in ongoing economic activity. An investment in water resources of $15 billion would create 930,000 new jobs, $93 billion in incremental economic output, and $71 billion in additional personal income (Aguero 2014).

g. Custom + Culture

i. The two largest communities in Grand County, Moab and Castle Valley, were not placed by accident. These population centers were able to grow because they were sustained by reliable watersheds coming from the La Sal Mountains. Early settlers used this water for agriculture, grazing, and drinking. More recent settlers and more transient tourists depend upon clean and relatively plentiful water. The Green and Colorado rivers are not only water sources, but also sources of recreation, as are Mill Creek and Granstaff Canyon.

ii. Water quality, hydrology, and watershed systems are essential to sustain life, and industry, as well as the built and natural environments in Grand County. This precious resource has been, and always will be, the lifeblood of the County.

Water Quality & Hydrology Policies

1. Grand County supports the development of groundwater management plans in the County.
2. County generally supports the study and development of greywater systems.
3. Groundwater management plans should address safe yield. Grand County's policy is that the safe yield not be considered at the maximum level, since the precipitation trend of the basin is declining and the evaporation rate is increasing. It is recommended that the safe yield be 25% lower than the maximum yield.
4. The County land use regulations will support the sustainable use and management of groundwater consumption in order to prevent depletion of groundwater resources.
5. Grand County will support the conservation of groundwater, and will support limiting the use of groundwater beyond State groundwater management plans.
6. Grand County supports maintaining in-stream flows to establish the proper functioning condition of streams and maintain their biological integrity.
7. The County's land use regulations shall protect current and future sole-source aquifer designations.
8. *(Relevant existing policies found in the 2012 Grand County General Plan)*

ii. **Goal 1-** Mitigate potential risks to the drinking-water supply.

1. **Strategy D** - Protect against contamination of the Glen Canyon and Castle Valley aquifers by hazardous materials with land use standards and procedures

that align with state and federal water-quality regulations designed to mobilize state and federal water-quality enforcement.

2. **Strategy E** - Participate in the Moab Area Watershed Partnership to work on comprehensive watershed planning and restoration.
3. **Strategy F** - Increase water conservation in agricultural and residential areas by encouraging secondary water systems for irrigation in new residential subdivisions.
4. **Strategy G** - Municipalities, water districts and public water suppliers are encouraged to work in partnership with the agencies that govern land use in their drinking watersheds to enact agreements for long-term watershed management.

iii. **Goal 2** - Support efforts to understand water quantity and quality dynamics of the Glen Canyon, Spanish Valley fill, Castle Valley and Thompson aquifers.

1. **Strategy C** - Collaborate with the Moab Area Watershed Partnership to consider the creation of an aquifer priority recharge overlay to prevent contamination of culinary water supplies, based on the results of bona fide studies and comparison of policies used in other communities.
2. **Strategy D** - Consider adopting an incentive-based water conservation program for residential and non-residential land uses

iv. **Watershed Management - Public Lands Policy 2**: Public lands agencies are encouraged to adopt policies that enhance or restore watersheds for Moab, Spanish Valley, Castle Valley and Thompson Springs. The County supports classification of these aquifers to the highest quality standard. Grand County will follow all state and federal water protection laws and actively engage local, regional, and federal land management agencies in discussing risks to aquifers and aquifer recharge areas in Grand County.

WATER RIGHTS

Definition

The legal right to make use of water from a stream, lake, canal, impoundment, or groundwater.

Related Resources

Water Quality & Hydrology, Canals & Ditches, Irrigation

Best Available Data Sources

a. Utah Division of Water Rights (DWR)

b. *Full works cited page available here*

Findings

a. Overview

i. Water is a finite, but renewable resource, and because of varying annual supplies of water, its availability is subject to competition between stakeholders. The coordination of demand to supply water to Grand County's various interests is expected to always be a complex issue for stakeholders. Water is a resource taken from a dynamic, natural system resulting from a fluctuating cycle. Networks of moving water, above and below ground, extend beyond obvious topographic or political boundaries. Therefore, management and use of water supplies requires coordination between the various jurisdictions of local, state, and federal entities.

ii. Watersheds shared with other states provide a portion of the water available to Grand County because rivers flow into Utah from those states. The Colorado River Compact (1922) and the Upper Colorado River Basin Compact (1948) define the relative volume of water for use in Utah and each surrounding state, and these compacts also define how much water must remain in the Colorado River as it leaves Utah's borders.

iii. "All waters in Utah are public property. A "water right" is a right to divert (remove from its natural source) and beneficially use water. The defining elements of a typical water right will include:

1. A defined nature and extent of beneficial use;
2. A priority date;
3. A defined quantity of water allowed for diversion by flow rate (cfs) and/or by volume (acre-feet);
4. A specified point of diversion and source of water;

5. A specified place of beneficial use."

Source: (Utah Division of Water Rights 2011)

iv. "Rights for water diversion and use established prior to 1903 for surface water or prior to 1935 for ground water can be established by filing a "diligence claim" with the Division. Such claims are subject to public notice and judicial review and may be barred by court decree in some areas of the state" (Utah Division of Water Rights 2011).

v. "All other rights to the use of water in the State of Utah must be established through the appropriation process administered by the Division of Water Rights. The steps to this process for an "Application to Appropriate Water" are as follows:

1. An Application to Appropriate Water is filed with the Division.
2. The application is advertised and protests may be received and a hearing may be held.
3. The State Engineer renders a decision on the application based upon principles established in statute and by prior court decisions.
4. If the application is approved, the applicant is allowed a set period of time within which to develop the proposed diversion and use water. When the diversion and use are fully developed, the applicant retains the services of a professional engineer or land surveyor who files "proof" documentation with the Division showing the details of the development.
5. Upon verification of acceptably complete proof documentation, the State Engineer issues a Certificate of Appropriation, thus "perfecting" the water right."

Source: (Utah Division of Water Rights 2011)

vi. "Many areas of the state are administratively "closed" to new appropriations of water. In those areas, new diversions and uses of water are established by the modification of existing water rights. Such modifications are accomplished by the filing of "change applications." These applications are filed and processed in a manner very similar to that described above for Applications to Appropriate Water (Utah Division of Water Rights 2011).

vii. "Water appropriation issues in specific geographic areas of the state are often administered using policies and guidelines designed to address local conditions. These policies and guidelines are generally developed for all or part of a defined Drainage Basin (Utah Division of Water Rights 2011).

viii. As water supplies fluctuate from year to year, any water right is subject to available supply. The State of Utah follows the Prior Appropriation System, which grants priority to water rights based upon that water right's chronologic seniority.

b. Control v Influence

i. "The State Engineer has adopted procedures for enforcing water rights violations. Under the new enforcement procedure, an action is initiated by the Division of Water Rights (DWR) after a violation has been observed by an official working in the DWR or another capacity for the state, or after a complaint is received from a water user,

government agency, or other interested party. Private water users can report violations" (Donaldson, F. J. 2007).

c. **Economic Considerations**

   i. Although water rights are the right to use appropriated water within the requirements of a given beneficial use, water rights are classified as "real property" in the State of Utah and are bought and sold much like real estate.

d. **Custom + Culture**

   i. "The Utah pioneers, in the late 1840's, were the first Anglo- Saxons to practice irrigation on an extensive scale in the United States. Being a desert, Utah contained much more cultivable land than could be watered from the incoming mountain streams. The principle was established that those who first made beneficial use of water should be entitled to continued use in preference to those who came later. This fundamental principle was later sanctioned in law, and is known as the Doctrine of Prior Appropriation. This means those holding water rights with the earliest priority dates, and who have continued beneficial use of the water, have the right to water from a certain source before others with water rights having later priority dates" (Utah Division of Water Rights 2011).

   ii. "In the early territorial days, rights to the use of public streams of water were acquired by physical diversion and application of water to beneficial use, or by legislative grant. A "county courts" water allocation system was enacted in 1852 and was in effect until 1880 when it was replaced by a statute providing for county water commissioners" (Utah Division of Water Rights 2011).

   iii. It is the custom and culture of Grand County to protect and preserve water rights.

Water Rights Policies

1. Grand County supports water right utilization that prioritizes public health and safety in emergency situations. For example, during drought situations agricultural water may temporarily divert to municipal uses.
2. *(Relevant existing policies found in the 2012 Grand County General Plan)*
   a. Mitigate potential risks to the drinking-water supply
   b. Increase water conservation in agricultural and residential areas by encouraging secondary water systems for irrigation in new residential subdivisions.
   c. Municipalities, water districts and public water suppliers are encouraged to work in partnership with the agencies that govern land use in their drinking watersheds to enact agreements for long-term watershed management.
   d. Support efforts to understand water quantity and quality dynamics.
   e. Collaborate with the Moab Area Watershed Partnership to consider the creation of an aquifer priority recharge overlay to prevent contamination of culinary water supplies, based on the results of bona fide studies and comparison of policies used in other communities.

WETLANDS

Definition

A wetland is a land area that is saturated with water, permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem.

Related Resources

Livestock & Grazing, Land Use, Noxious Weeds, Wildlife, Water Quality & Hydrology, Wetlands, Wild & Scenic Rivers, Canals & Ditches, Irrigation, Riparian Areas, Recreation & Tourism, Agriculture, Water Rights

Best Available Data Sources

a. US Environmental Protection Agency
b. Army Corps of Engineers
c. National Wetlands Inventory - US Fish and Wildlife Service
d. Utah State Water Plan - Southeast Colorado River Basin
e. *Full works cited page available here*

Findings

a. Overview

i. Most of the wetland areas are found along the rivers and streams. They also occur near springs, reservoirs, bogs, wet meadows, lakes and ponds. Wetlands and riparian vegetation are varied and support a wide diversity of wildlife species.

ii. Wetlands have been defined in different ways by numerous entities and agencies. However, the US Army Corps of Engineers (Corps) and the US Environmental Protection Agency (EPA) jointly define wetlands as: "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that do under normal circumstances support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." This definition of wetlands is perhaps the most relevant to local land managers and planners because the Corps and the EPA are the agencies that have legal jurisdiction over wetlands, including those wetlands on private property. Wetlands provide numerous benefits including wildlife habitat, aquifer recharge, and water quality improvements (U.S. Environmental Protection Agency 2015).

iii. According to the Utah Wetland Information Center, 1% of Utah's landscape is wetlands (Utah Geological Survey. n.d.). Wetlands are among the most productive ecosystems in

the world, comparable to rainforests (U.S. Environmental Protection Agency 2015). The primary factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation of aquatic plants, adapted to the unique hydric soil. Wetlands have the ability to improve water quality by acting as filters. In addition, wetlands can lessen the effects of flooding by containing stormwater and releasing it gradually. Because these critically productive systems are a scarcity in the region, special emphasis is necessary for their management.

iv. "Wetland" is a generic term used to describe a diverse array of aquatic habitats, including marine, riverine, and vegetated wetlands like marshes, ponds, and forested wetlands. Grand County has a total of 12,715 acres of wetland area, making up less than .05% of land cover (U.S. Fish & Wildlife Service 2016).

v. "The Matheson Wetland Preserve near Moab has been established as a managed wetlands area. This 896-acre area provides habitat for waterfowl and wildlife in a region where this is a scarce resource. The Matheson Wetland Preserve is owned equally by The Nature Conservancy and the Division of Wildlife Resources" (Utah Division of Water Resources 2000).

vi. Best management practices for wetlands include protection of existing wetlands through zoning and other land-use designations, restoration of historic wetlands, proper management of wetlands, creation of new wetlands in appropriate areas.

b. Control v Influence

i. The Army Corps of Engineers and the EPA have strict guidelines for any activities occurring on or near a wetland. Impacts to wetlands can require permits from federal, state, and local agencies.

c. Economic Considerations

i. Wetlands provide recreational value as well as ecological, social or economic value. Possibly the most significant economic and social benefit of wetlands is flood control, but wetlands also provide essential functions in filtering water/improving water quality and providing habitat for waterfowl and other wildlife (World Wildlife Fund 2004). Wetlands also recharge aquifers.

ii. From a regulatory standpoint, certain bodies of water and associated wetlands are regulated by the EPA and the US Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act (1972), even on private property. Activities that involve excavation or placement of fill in jurisdictional waters or wetlands require a permit issued by the Corps and may be reviewed by EPA. The extent of jurisdiction is determined on a project-by-project basis in consultation with the Corps.

d. Custom + Culture

i. Wetlands are an integral part of Grand County. Culturally wetlands are important beyond these traditions for the ecological and water quality value they add to the environment.

Wetlands Policies

1. *(Relevant existing policies found in the 2012 Grand County General Plan)*
    i. **Goal 3** - Preserve wetlands and riparian habitats
        1. **Strategy B** - Focus on riparian and wetland areas as high-priority open space in the land use code
        2. **Strategy C** - Develop a fee-in-lieu of the voluntary open-space incentives offered in the land use code. Use revenues to acquire land and/or easements in order to acquire riparian property and/or easements from willing landowners
        3. **Strategy D** - Establish trail design standards that minimize impacts on sensitive riparian corridors.
        4. **Strategy E** - Support the establishment of a local land trust to acquire land and facilitate the establishment of conservation easements

RIPARIAN AREAS

Definition

Riparian areas are ecosystems formed between the land and a stream or river, often composed of dense vegetation.

Related Resources

Livestock & Grazing, Wild & Scenic Rivers, Canals & Ditches, Irrigation, Agriculture, Water Rights, Water Quality & Hydrology, Wetlands, Floodplains & River Terraces, Wildlife, Noxious Weeds, Fisheries, Recreation & Tourism, Fire Management, Land Use

Best Available Data Sources

a. Utah Wildlife Action Plan 2015
b. Natural Resource Conservation Service, Utah
c. Utah Department of Environmental Quality
d. *Full works cited page available here*

Findings

a. Overview

i. Riparian zones are important in ecology, environmental management, and civil engineering because of their role in soil conservation, their habitat biodiversity, and the influence they have on fauna and aquatic ecosystems, including grasslands, woodlands, wetlands, or even non-vegetative areas.

ii. According to the Utah Wildlife Action Plan (2015), "riparian areas are the richest habitat type in terms of species diversity and wildlife abundance". These areas provide habitat to a range of wildlife including amphibians, birds, mammals, fish, and insects. Riparian areas also play a significant role in the erosion processes by slowing water, trapping sediment, and stabilizing banks. Finally, riparian areas provide quality forage for livestock and are valued within grazing allotments.

iii. The Colorado and Green rivers are major resources in Grand County. The largest is the Colorado, which flows along the edge of Arches National Park. All of these rivers systems and their associated tributaries have adjacent riparian zones that must be managed.

iv. "Riparian areas generally offer all four major habitat components needed by wildlife: food, water, cover and living space. Where there is adequate water and deep soils, production of plant and animal biomass increases. The contrast with the surrounding

desert-like vegetation in much of the basin increases the habitat diversity. Linear riparian zones increase the "edge" and serve as connectors between habitat types and provide travel lanes and migration routes for such animals as birds, bats, deer and elk" (Utah Division of Water Resources 2000).

v. "Along streams, riparian vegetation is used by a variety of wildlife for nesting, feeding and hiding. These plants also provide the shade needed to keep water temperatures suitable for coldwater species of fish and aquatic invertebrates. Riparian zones increase habitat diversity and are used by wildlife as travel and migration corridors" (Utah Division of Water Resources 2000).

vi. Riparian areas should be managed to protect vegetation characteristics. Conservation efforts include preserving existing riparian areas as well as restoring damaged ones. Preservation should also include the dedication of sufficient water and groundwater to support vegetation. Limiting the removal of water from the system is essential in maintaining the integrity of the riparian area. Restoration efforts must consider factors like hydrology, floodplain, and adjacent land use. Restoration design of riparian areas should follow a protocol that accounts for stream hydrology, soil characteristics, vegetation, adjacent land use, recreation, and other influences. Stream or river modifications may require permits.

b. Control v Influence

i. Federal agencies manage riparian areas and floodplains under Executive Orders 11988 and 11990, Sections 303 and 404 of the Clean Water Act, and also the Endangered Species Act. Riparian areas are also managed under individual resource management plans and other agency policies and guidelines, such as the US Bureau of Land Management's Riparian Area Management Policy.

ii. The Utah Comprehensive Wildlife Conservation Strategy prioritizes habitat categories based on several habitat criteria important to the species of greatest conservation need. The top key habitat statewide is Lowland Riparian (characterized by riparian areas <5,500 ft elevation; principal vegetation: Fremont cottonwood and willow), while the third most key habitat is Mountain Riparian (characterized by riparian areas >5,500 ft elevation; principal vegetation: narrowleaf cottonwood, willow, alder, birch and dogwood) (Sutter et al. 2005).

iii. The Utah Division of Water Rights processes stream alteration permits in conjunction with the US Army Corps of Engineers.

c. Economic Considerations

i. It is difficult to quantify the economic benefits of riparian areas. They are intertwined with nonmarket ecosystems and services like clean water, wildlife habitat, recreation, and tourism. Pre- or post-water treatment methods that utilize passive bioengineering techniques, including riparian area management, can significantly reduce water treatment costs, thereby avoiding some of the costs associated with engineered water treatment plants, which are extremely expensive.

ii. The Southeastern Utah Riparian Partnership, which operates in Grand and San Juan counties, has successfully brought common interests and resources together to improve 4,500 acres of riparian area (Tamarisk Coalition. n.d.).

d. Custom + Culture

i. It is the custom of the people in Grand County to conserve riparian areas for the good of natural ecosystems, and for the people that use and enjoy them.

Riparian Area Policies

1. *(Relevant existing policies found in the 2012 Grand County General Plan)*

ii. **Goal 3** - Preserve and restore wetlands and riparian habitats

1. **Strategy A** - Map riparian habitat using the best available data.
2. **Strategy B** - Focus on riparian and wetland areas as high-priority open space in the land use code
3. **Strategy D** - Establish trail design standards that minimize impacts on sensitive riparian corridors.
4. Identify priority riparian public trail corridors and acquire property and/or easements from willing landowners as opportunities arise.

FLOODPLAINS & TERRACES

Definition

A floodplain is the low-lying area near a river, stream, or drainage which floods when the water level reaches flood stage. A river terrace is the bench or step that extends along the side of a valley and represents a former floodplain.

Related Resources

Fire Management, Livestock & Grazing, Land Use, Noxious Weeds, Fisheries, Wildlife, Water Quality & Hydrology, Wetlands, Wild & Scenic Rivers, Canals & Ditches, Irrigation, Riparian Areas, Recreation & Tourism, Agriculture

Best Available Information Sources

a. County Floodplain Administration
b. SEUALG Natural Hazard - Pre-disaster Mitigation Plan
c. DNR: Geologic Hazards of Moab-Spanish Valley
d. Full works cited page available here

Findings

a. Overview

i. Rivers are dynamic systems. River channels can migrate laterally as a result of bank erosion and deposition, and vertically as a result of bed aggradation or degradation. Floodplains, terraces, and other features are formed by these processes, and are therefore part of the river system.

ii. When a river channel reaches its maximum capacity, often during times of heavy rain or snow melt, water overflows the river's streambanks and floods into nearby areas that would otherwise remain dry land. This is especially true when water is delivered at a rate faster than the associated soils can absorb. Floods also occur when a bank or dam gives way and large amounts of water are released. Under most circumstances, flooding is a natural process. Floodplains are considered a type of riparian zone, supporting rich ecosystems in both quantity and biodiversity. The overflowing water bringing nutrients to the soil along the river bank, creating a fertile zone ideal for agriculture. Nevertheless, these areas must be included in resource planning conditions because floods can cause severe human impacts.

iii. Flooding most often occurs from two distinct event types: (1) spring runoff from melting snowpack at high elevations (both local and regional), and (2) summer rainstorms (Hylland and Mulvey 2003). While either event can trigger flooding, the dynamics of

each are different. Snowmelt is a relatively predictable occurrence dependent on the amounts of winter snowpack and rising spring temperatures. Snowpack melting in spring contributes to some localized flooding, but more commonly flooding happens along the region's larger rivers. In contrast, summer cloudburst events cause sporadic flooding events on otherwise dry washes. Both kinds of events can have impacts on the communities within the area (Southeastern Utah Association of Local Governments 2003).

iv. At the federal level, the Federal Emergency Management Agency (FEMA) provides flood data that classifies areas based on their different flood hazards through the National Flood Hazard Layer (NFHL) and National Flood Insurance Program (NFIP). This enables elected officials, emergency responders, and the public to be informed and to reduce, or avoid altogether, impacts from floods, guide development, and reduce risk of floods.

v. Sections of the city of Moab are within the 100-year floodplain of the Colorado River. This means that hydrologists predict the largest flow, statistically likely to occur every 100 years, could create flooding problems for the people and structures inside the floodplain zone (Hylland and Mulvey 2003).

vi. "Moab is the only community in Grand County participating in the NFIP. There are about 56 flood insurance policies with a total coverage of over $3.8 million" (Utah Division of Water Resources 2000).

vii. Grand County currently provides its citizens with maps, available on their website, to help determine if they are near floodplains.

viii. "The City of Moab recorded 29 of 36 total flood events. Because of its location with streams and rivers, Moab has a very high flood threat. Moab City is the county seat and the largest community in the county and has been designated as a Project Impact Community. ... Over half of the community is in a floodplain. Moab is subject to flash flooding mainly from the frequent thunderstorms and cloudbursts that occur in the steep slickrock canyons" (Southeastern Utah Association of Local Governments 2003).

b. Control v Influence

i. Flooding along major rivers is sometimes controlled at the discretion of the dam operators. Individual cities have floodplain ordinances that are supported by the county.

c. Economic Considerations

i. Best floodplain and river terrace management practices typically focus on avoiding structures and other development within these dynamic and sensitive areas. For flood hazards in these areas, officials often resort to designating setbacks between potential floodplains and the built environment.

ii. Higher development costs to mitigate flood risks are the major economic consideration for floodplains. Flood-control costs may be passed on to municipal and county governments during emergencies. Another economic consideration is the cost of floodplain insurance to homeowners. Floods also have the potential to cause severe financial impacts in the form of damages to structures, transportation systems, and other infrastructure.

d. **Custom + Culture**

i. Preventing floods and mitigating natural disasters has always been a priority for landowners in Grand County. The custom and culture of the area is to be responsible about structure and infrastructure placement, and respect the inevitable changes in flowing water.

Floodplain and River Terrace Policies

1. Post-development stormwater flows will not exceed pre-development flows.
2. *(Relevant existing policies found in the 2012 Grand County General Plan)*
   i. **Goal 5** - Minimize impacts of natural hazards on properties and people.
      1. **Strategy B** - A top priority is to keep development out of the 100-year floodplain or major drainages unless there is no other option on the property

   ii. **Goal 3** - Preserve and restore wetlands and riparian habitats
      1. **Strategy B -** Focus on riparian and wetland areas as high-priority open space in the land use code.

WILD & SCENIC RIVERS

Definition

An administrative designation created under the National Wild and Scenic Rivers Act of 1968 applied to preserve certain free-flowing rivers that "possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values".

Related Resources

Recreation & Tourism, Land Use, Livestock & Grazing, Irrigation, Canals & Ditches, Water Rights, Water Quality & Hydrology, Wetlands, Floodplains & River Terraces, Riparian Area, Fisheries, Wildlife, Threatened Endangered Sensitive Species

Priority Data Sources

a. Impacts of Wild and Scenic Rivers Designation - Utah State University
b. Forest Service Determination of Wild and Scenic Rivers
c. *Full works cited page available here*

Findings

a. Overview

i. The Wild and Scenic Rivers Act is notable for preserving the special character of rivers, while also recognizing the potential for their appropriate use and development. It encourages river management that crosses political boundaries and promotes public participation in developing goals for river protection (Bureau of Land Management 2012).

ii. Under the Wild and Scenic Rivers Act, rivers are classified into three categories:

1. Wild rivers represent "vestiges of primitive America" in that they are free-flowing segments of rivers with undeveloped shorelines that typically can only be accessed via trail.
2. Scenic rivers are dam-free river segments with undeveloped shorelines but accessible in places by roads.
3. Recreational rivers are more developed than Wild or Scenic river segments and can be accessed by roads.

Source: (Bureau of Land Management 2012).

iii. Section 5(d)(1) of the Wild and Scenic Rivers Act directs federal agencies to identify potential additions to the National Wild and Scenic Rivers System through federal agency plans. Under these provisions, federal agencies study the suitability of river sections they manage for designation under the Wild and Scenic Rivers Act. Sections that are determined to be suitable can be managed to preserve their suitability by an agency land management plan while awaiting congressional designation (National Wild and Scenic Rivers System 2016*).*

iv. The Bureau of Land Management and US Forest Service have determined that several segments of waterways in Grand County are suitable for Wild and Scenic designations. Several portions of the Green River, totalling 78.2 miles, have been classified as either suitable for wild or scenic designation. Portions of the Dolores and Colorado river, in the southeastern section of the state, are also considered suitable for either a wild or scenic designation.

1. Portions of the Manti-La Sal National Forest that are eligible for special status include two miles along Miners Basin (Placer Creek) for recreational designation, and three miles along Mill Creek Gorge for wild designation (U.S. Forest Service 2008).

2. The remaining 73.2 miles of river have been determined by the BLM to be suitable for wild, scenic, or recreational status. These segments make up portions of the Green and Colorado river (Bureau of Land Management 2012).

v. Designating river segments as wild, scenic, or recreational could restrict many activities related to the stream and other uses within 0.25 mile of it, and in some cases, these designations could be detrimental to users' ability to develop and manage water resources necessary to meet future growth needs. The ability to obtain approval for water right change applications on, or upstream of, designated streams by existing water users may also be limited. Similarly, federal permits cannot be issued for uses on a stream segment that would be in conflict with the wild and scenic designation.

vi. Designation of wild and scenic rivers may result in non-use, restricted use, or environmental impacts on public and private lands. These restrictions may prohibit future uses that are necessary to continue to assure economic prosperity or may adversely affect the operation, management, and maintenance of existing facilities.

vii. Healthy rivers provide essential ecological services which would otherwise be engineered and paid for. These services include purification of water, nutrient banking in floodplains, unpolluted fisheries, flood protection, and groundwater recharge. Preserving certain stretches of a river as wild or scenic can "lock-in" these essential services for the good of the people.

b. Control v Influence

i. Wild and Scenic Rivers are designated by Congress or the US Secretary of the Interior. To be eligible for designation, a river must be free-flowing and contain at least one "outstandingly remarkable" value (scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar value). Designated rivers are typically managed by federal agencies, but can also be managed by partnerships of adjacent communities, state governments and the National Park Service allowing communities to protect their

own outstanding rivers and river-related resources (Partnership Wild and Scenic Rivers 2016).

ii. Designated rivers are typically managed by federal agencies, but can also be managed by partnerships of adjacent communities, state governments and the National Park Service allowing communities to protect their own outstanding rivers and river-related resources

c. Economic Considerations

i. At present the economic implications of Wild and Scenic River designation are not totally understood, nor quantifiable. The tradeoff between increases in recreation and tourism sectors and the potential economic loss of future river development should be considered. An analysis of Wild and Scenic River designation done by Utah State University, made some observations: primary impacts of designation relate to a reduction in the grazing in riparian areas; and other impacts include further regulations on adjacent public and private land uses (Keith J., et al. 2008).

d. Custom + Culture

i. Where citizens of Grand County are not responsible for the designation or management of Wild and Scenic Rivers, and as there is only a short history (since 1968) of this designation in the US, no custom or culture can be associated with the federal designation "Wild and Scenic Rivers" at this time; however, county residents maintain that rivers in general are an integral element of sustaining and improving the health of the regional economy and ecology. Citizens of Grand County have always prized rivers for their aesthetic, ecological, recreational, and hydropower value. Managing rivers for multiple uses has historically been, and continues to be, a tradition based on facilitating many users and values.

Wild + Scenic River Policies

1. *(Relevant existing policies found in the 2012 Grand County General Plan)*

ii. "Success in water resource planning requires far more than the county alone. Grand County plays a relatively narrow role in the regulation of water resources. In addition to the county, there are at least five state agencies and two federal agencies that set policy and regulate water quality in Grand County. The primary purpose of water planning at the local level is to protect health and achieve outcomes for water resources that align with the values of the community. In order to achieve this, Grand County will need to align with government agencies and local watershed groups and utilize generally accepted science."

DITCHES & CANALS

Definition

A human-made depression created to channel water where there is lack of water.

Related Resources

Land Use, Livestock and Grazing, Irrigation, Agriculture, Water Rights, Water Quality and Hydrology, Wetlands, Riparian Areas, Fisheries, Recreation and Tourism, Wild and Scenic Rivers, Wildlife, Fire Management, Threatened, Endangered, and Sensitive Species.

Best Available Information Sources

a. Utah Open Data Portal

- *Full works cited page available here*

Findings

a. Overview

i. Water deliveries are an essential component of agricultural production, and may also be relied upon for urban landscape watering and gardens.

ii. The shift from crop irrigation to landscape irrigation can help water rights holders maintain beneficial use and avoid forfeiture of water rights.

iii. In addition to the many drainages that supply irrigation water, the majority (about 85%) of the irrigation water available in Grand County is from Ken's Lake. The other 15% that comes from the Colorado River flows into small irrigation ponds (Utah Division of Water Rights 2015).

iv. Canal and irrigation companies are outside of the County's control but could be influenced by private shareholders. Four canal companies operate in Grand county and are responsible for irrigation, as well as water and sewer service:

1. Castle Valley Irrigation Co.
2. East Side Irrigation Company
3. Grand Water & Sewer Service Agency
4. Moab Irrigation Company

Source: (Utah Division of Water Rights 2014).

b. Storm Water

i. "Storm water runoff is a difficult resource to manage. In a dry climate such as Utah's, existing drainage ways are often dry and, to the inexperienced, may appear to be prime places to construct buildings. Unlike sanitary sewers and culinary water systems, there are no clearly defined minimum service requirements for stormwater systems. Stormwater flows are dependent on many complex time and spatially varied factors. Even a natural, undeveloped drainage system is not static. Urbanization compounds the problem and creates a need for a new drainage system with the basic goals of managing nuisance water, protecting development from damage, and protecting downstream waters from adverse quality and quantity impacts" (Grand County 2011).

c. Economic Considerations

i. Water deliveries are an essential component of agricultural production, and may also be relied upon for urban landscape watering and gardens. The potential exists for water deliveries for agricultural production to conflict with Mill Creek instream water.

ii. Without ditches, canals and irrigation pipelines, the county would have very little irrigated agriculture.

iii. Many organizations holding water rights operate on finite budgets for which regular available funding is limited. These funds typically cover only basic maintenance and intermittent or minor upgrades. Occasionally, such organizations can apply for and receive funding to accommodate more extensive upgrades. However, those opportunities are often rare and the resources required to obtain such funding is likewise limited. Funding sources are available for water delivery systems to pay for post-break repairs, maintenance, or the capital upgrades that are necessary to preserve public safety.

iv. The Utah Legislature has made funding available to assist canal companies to develop and implement a safety management plans.

d. Custom + Culture

i. To sustain early farmers and settlers, canals and ditches were constructed throughout Utah making agriculture possible despite the semi-arid climate. Subsequent development of agriculture brought further expansion of ditches and canals. Traditionally, irrigation water has been distributed via a network of canals and ditches from rivers and streams; but with time and circumstances dictating, many have been piped. Additionally, because of the extensive conversion of agricultural lands to urban development, some irrigation water is now distributed through secondary irrigation supply lines that parallel the municipal culinary water supply allowing people to irrigate residential lawns using water previously allocated to farming.

ii. Historically, ditches and canals have been a crucial infrastructure consideration. "In the 14 May 1897 edition of the paper the call was made to develop plans to irrigate the great Green River Desert area. On 21 December 1900 two different irrigation schemes were mentioned: one was for a canal originating on the Grand River near Grand Junction, Colorado, which would be cut and routed into Grand County, where it would irrigate more than 500,000 acres in the Cisco Desert and Westwater regions; the other was for a canal cut in the east bank of the Green River to irrigate Grand County land nearby. Although neither of these schemes was brought to fruition, some of the ideas were developed on a limited scale at Elgin and in the Westwater area" (Firmage 1996).

iii. The use, upgrade, and maintenance of Utah's network of canals, ditches, and dams continues today.

Ditches + Canals Policies

1. Ensure the existence of adequate safety management plans and conditions for canals and ditches.
2. Establish minimum service requirements for stormwater systems.
3. Before mandating the lining of ditches and canals, the groundwater recharge impacts need to be understood.

IRRIGATION

Definition

Irrigation is the process in which water is supplied to plants at intervals for agriculture.

Related Resources

Land Use, Agriculture, Water Quality & Hydrology, Wilderness, Water Rights, Forest Management, Predator Control, Noxious Weeds, Canals & Ditches

Best Available Information Sources

a. A History of Grand County
b. USU Grand County Agricultural Profile
c. Utah Open Data Portal
d. *Full works cited page available here*

Findings

a. Overview

i. Irrigation is the practice of supplemental application of water to land (beyond that water which is directly received by the land from naturally occurring precipitation) for the purpose of increasing the agricultural output of cropland and to sustain additional vegetation growth throughout the landscape. Much of Utah's agriculture would not be possible if not for irrigation. Utah's arid climate provides limited and frequently unreliable annual rainfalls. Many of the canals and ditches remain open, but over time many have been lined or piped to improve operational efficiency.

ii. Dams, canals, and pipelines are constructed to take advantage of the topography of each watershed and redistribute water from rivers and streams outward to lower elevation lands, which are more suitable for crop production.

iii. Within each watershed, various entities or individuals have legal claims (i.e., water rights) to use the water for "beneficial use" and are permitted to divert waters from streams into the storage dams, canals, and pipelines. The distribution of water is governed by state law and is based largely on geographic proximity, available supply, and ownership of the water rights.

iv. In addition to the many drainages that provide irrigation water, "...approximately 85% of the irrigation water available in Grand County is from Ken's Lake. The other 15% comes from the Colorado River flow into small irrigation ponds. There is 1,580 acre-feet

of water pumped from the Colorado River for irrigation in the Castle Valley area. Approximately 2,780 acres of cropland are irrigated in Grand County, with a total annual diversion of 13,800 acre-feet. Two irrigation companies exist in the county. Castle Valley Irrigation Company, supplied by Castle Creek, serves approximately 400 to 500 acres. Moab Irrigation Company, supplied by Mill Creek, serves approximately 1,100 acres" (Grand Conservation District 2012).

v. According to the 2012 General Plan, "Grand County has 3,859 acres of irrigated land that utilizes 19,808 acre feet per year. Seventy-nine percent of municipal, culinary and industrial supply water originates from groundwater sources. 4,534 acre feet of potable water is distributed in the following manner:

1. 2,776 for residential use
2. 818 acre feet/year commercial use
3. 940 acre feet/year industrial purposes
4. 704 acre feet/year secondary uses"

vi. "Improvement of water use efficiency is one way to realize additional monetary benefits from an existing supply. Delivery systems can be upgraded by lining high-seepage areas in canals with concrete or plastic lining and by installing pipelines. Improving or rebuilding diversion structures and installing effective measurement and management controls can also increase efficient use of water. On-farm irrigation efficiency improvements can make the water go further. This can be done by installing sprinklers or improving existing flood irrigation methods" (Division of Water Resources 2000).

b. Secondary Water Systems

i. "Secondary systems allow the use of lower quality water for irrigation of gardens, parks, golf courses and other large grass areas. This will save water meeting culinary standards for drinking and other related-water uses" (Division of Water Resources 2000).

ii. Secondary water systems provide irrigation water for residential and municipal areas. This water is also used for other miscellaneous outside uses." Current secondary water use in Grand County is 700 acre-feet (Division of Water Resources 2000).

c. Control v Influence

i. Irrigation and other water services in Grand County are controlled by four companies and their associated shareholders:

1. Castle Valley Irrigation Co.
2. East Side Irrigation Company
3. Grand Water & Sewer Service Agency
4. Moab Irrigation Company

Source: (Utah Division of Water Rights 2014).

d. Economic Considerations

i. Without irrigation, the agriculture in Grand County would be almost nonexistent.

ii. Data from the Utah Department of Workforce Services indicates that over the last five years, there were less than five firms that provided support services directly to the agriculture and forestry industry. The jobs in that sector typically paid wages ($3,176/mo) that were 127% of the county average ($2,495/mo).

e. Custom + Culture

i. The Desert Land Act of 1877 allowed settlers to purchase up to 640 acres of land for $1.25 per acre, provided that some irrigation structures were developed (Utah State University 2005).

ii. "When the "Hole in the Rock" expedition settled Bluff in 1880, they built riprap diversions and canals to get water from the San Juan River to their crops. The same year, some of them moved on to their original destination at Montezuma Creek where they constructed a waterwheel to divert water from the San Juan River to irrigate their crops. In 1884, floods raised havoc with the irrigation systems in both Montezuma Creek and Bluff" (Utah Division of Water Resources 2000).

iii. In the early 1900s, plans were made to build a canal cut in the east bank of the Green River to irrigate Grand County land nearby. Although the scheme was never brought to fruition, some of the ideas were developed on a limited scale at Elgin and in the Westwater area. Prominent area fruit growers used that water to ship railroad carloads of apples and pears to distant markets—even as far as England (Firmage 1996).

Irrigation Policies

1. Grand County encourages low-water landscaping of developed areas. The County also encourages water providers to implement conservation pricing.
2. Grand County should commission a surface water management study as well as a study to determine the impact visitation has on the County's water.
3. *(Relevant existing policies found in the 2012 Grand County General Plan)*
    a. "Goal 1- Mitigate potential risks to the drinking-water supply."
        i. "Strategy F - Increase water conservation in agricultural and residential areas by encouraging secondary water systems for irrigation in new residential subdivisions."
    b. "Goal 4 -Support the continuance of agriculture with incentives and land use flexibility."
        i. Strategy D - Continue to offer increased residential density as an incentive for developers to set aside irrigated agricultural land voluntarily as open space and keep some of the property in agricultural production."

MINERAL RESOURCES

MINERAL RESOURCES

Definition

Natural resources in the form of minerals (solid inorganic substances).

Related Resources

Water Rights, Land Use, Air Quality, Water Quality & Hydrology, Energy, Mining, Cultural Historical Geological & Paleontological, Land Access

Best Available Information Sources

a. Utah History Encyclopedia
b. Bureau of Land Management Reports
c. Utah's Extractive Resource Industries 2014
d. Economic Value of Public Lands in Grand County
e. Manti-LaSal National Forest RMP (1986)

- *Full works cited page available here*

Findings

a. Overview

i. Mineral resources are deposits or occurrences of inorganic materials with intrinsic economic value (such as ore, aggregate, oil, and gas) that may be extracted from the earth's crust. Mineral resources are regulated and managed based on type, and are grouped into three categories: locatable, leasable, and saleable. The primary minerals that are being withdrawn include potash and fossil fuels.

ii. The Utah Legislature has assigned the Utah Division of Oil, Gas, and Mining (DOGM) responsibility for regulating mineral exploration, development, extraction, and reclamation on “all lands in the state of Utah lawfully subject to its police power. No political subdivision of this state shall enact laws, regulations, or ordinances which are inconsistent with this act." This includes federal, state, and private lands, but it does not include land on Indian Reservations (P. Baker, DOGM, personal communication). These regulations are spelled out by The Mined Land Reclamation Act (1975). The BLM and Forest Service have their own regulations which may vary slightly from those of the state. On public land, mineral surveying and extraction is subject to "dual regulation" meaning both DOGM regulations, and the regulations set by the BLM or Forest Service must be followed.

iii. Locatable Minerals

1. This category includes high-value minerals such as gold, silver, and copper that are subject to the Mining Law of 1872 as amended by 30 USC 2. Under the Mining Law, mining claims can be filed for these minerals. The category also includes certain industrial minerals such as gypsum, chemical grade limestone, and chemical grade silica sand. Uncommon varieties of mineral materials such as pozzolan, pumice, decorative rock, and cinders may also be regulated as locatable minerals if demonstrated to have unique market value.

iv. Leasable Minerals

1. This category includes gas, oil, oil shale, coal, oil sands, phosphate, and geothermal resources, and are subject to the Mineral Leasing Act of 1920, as amended and supplemented (30 USC 181, et. seq.), the Mineral Leasing Act for Acquired Lands as amended (30 USC 351-359), and the Geothermal Steam Act of 1970 (30 USC 1001-1025).

2. For more information on minerals with an energy potential (oil, coal, uranium etc.), see the "Energy" section of this RMP.

v. Saleable Minerals

1. This category includes more common mineral resources including sand, stone, gravel, pumice, clay, and petrified wood. Regulation of these minerals on public lands is authorized by 30 USC 601. State and private lands are regulated by state, county, and local jurisdiction and land use codes.

2. "In 2010, exploration for industrial minerals, principally for potash, increased in Utah. Several companies acquired parcels totaling over 50,000 ha of ground and explored for potash brines in the Paradox Basin of southeastern Utah, primarily in Grand and San Juan Counties" (U.S. Geological Survey 2010).

3. Potash

a. "Potash minerals, which are water-soluble potassium salts (typically potassium chloride), are commonly used as fertilizer and by the chemical industry for various products including glass, ceramics, and soap. Economically viable deposits of these minerals are rare, the [County] being one of the few producers in the state and the nation" (BLM 2012).

b. Paradox Basin has an estimated 2.0 billion tons of potash. The Intrepid Potash-Moab mine extracts this resource to produce the associated product, potassium chloride (Boden et al. 2014).

c. Portions of the county overlap with the planning area of the BLM Moab Master Leasing Plan (MLP). Finalized in 2016, the MLP contains goals and objectives to "provide opportunities for environmentally responsible exploration and development of potash resources subject to appropriate BLM policies, laws, and regulations" (M. McGann, Bureau of Land Management, personal communication).

b. Economic Considerations

i. Natural resources and mining account for nine percent of all property taxes and one percent of total sales taxes in Grand County. In sum, taxes on minerals and mining activities account for three percent of total local revenue collected by the county government (Headwaters Economics 2011).

ii. "Industrial-minerals production, with an estimated value of $955 million was the second-largest contributor to the value of minerals produced [in Utah] in 2009. . . Industrial-mineral values have grown substantially over the past 10 years, increasing from $500 million in 2000 to a record high of $1053 million in 2008, a 97% increase. Commodities or commodity groups that have realized the majority of these gains include sand and gravel and crushed stone; Portland cement and lime; salines, including salt, magnesium chloride, potash (potassium chloride), and sulfate of potash (SOP); and phosphate rock. These commodities account for about 90% of the total value of Utah's industrial-minerals production" (Bon and Krahulec 2010).

iii. "The natural resource and extraction component of the Grand County economy is relatively small. Mining supported jobs actually dropped from an estimate of 101 jobs in 2009 to 80 jobs in 2012 (the latest year available), representing 2.2% of total private wage and salary employment. That same year, fossil fuel development (coal, oil, natural gas), a subset of mining, supported 45 jobs, representing 1.3% of total private wage and salary employment" (Headwaters Economics 2011).

iv. The Intrepid Potash company, based in Denver, CO, is a major producer of potash products in the United States. The Kane Creek mine, located about 20 miles west of Moab provides these minerals, and although "there is sufficient potash to meet near-term demand, the large marine-type deposits are either geographically restricted to a few areas or are too deep to easily mine. Other regions lack sources of potash brine from groundwater or surface water. Thus, some areas of the world rely heavily on potash imports" (USGS 2016).

v. All mineral resources have a large impact on our economy. State and Federal Government have control over the majority of these minerals, so how they manage them can affect the economy.

vi. Data from the Utah Department of Workforce Services indicates that over the last five years, there were on average 13 firms classified as mining, oil/gas extraction, or support activities for mining in Grand County. On average, these firms provided 106 jobs, and wages in that sector ($5,833/mo) were over 230% better than the county average ($2,495/mo). The mining industry provided the highest average wages of any sector in the county.

vii. Data from the Utah Tax Commission indicates that the mining sector generated $431,282 in sales tax revenue for Grand County in 2016. This represents 0.1% of all activity in the County.

viii. According to the Utah Department of Workforce Services, Grand County generated $1,871,879 in mineral lease funds (tax revenue from mining activity that goes to the State) in FY2016.

c. Custom + Culture

i. The eastern and southeastern regions near the margins of the Green, Grand, and Colorado rivers in Utah contain deposits of uranium. In 1898 the Welsh-Lofftus Uranium

and Rare Metals Company operated in Richardson, Grand County. The San Rafael deposits were found about fifteen miles southwest of the Green River. Other areas where uranium was found were west of the La Sal Mountains, south of Richardson, at Mill Creek, north of Moab, at Cold Creek, and at Temple Mountain (Powell 1994).

ii. In the 1950s, Moab became the uranium capitol of the world, producing 95% of the uranium ore used in the U.S. at the time. All of Utah's numerous uranium mines closed prior to 2000, because of low uranium prices (Firmage 1996).

Mineral Policies

1. The County will continue to be an active participant in planning for the future use of the UMTRA site.
2. *(Relevant existing policies found in the 2012 Grand County General Plan)*
   iii. **"Goal 5** - Minimize impacts to ecology and scenery from fluid and solid mineral development while still allowing such development to continue to benefit the economy."
      1. **Strategy A** - Encourage oil, gas and mining companies to use the best technology and mitigation techniques to protect natural amenities and natural resources.

   iv. **Goal 1** - Make the County attractive for a wide range of economic sectors.
      1. **Strategy G** - Encourage businesses to develop solid and fluid mineral resources while using the best technology and mitigation techniques to protect natural amenities and natural resources.

MINING

Definition

The process or industry of extracting minerals or other geological materials from the earth using a mine or other extractive process.

Related Resources

Water Rights, Land Use, Air Quality, Water Quality, Energy, Mineral Resources, Cultural & Paleontological, Land Access

Best Available Information Sources

a. Utah's Extractive Resource Industries (2014)

b. "...Economic impact of Utah's oil and gas..." (2009) Bureau of Economic and Business Research - Univ. Utah.

c. The Economic Value of Public Land in Grand County (2015)

- *Full works cited page available here*

Findings

a. Overview

i. Mineral resources are deposits or occurrences of inorganic materials with intrinsic economic value (such as ore, aggregate, oil, and gas) that may be extracted from the earth's crust. Mineral resources are regulated and managed based on type, and are grouped into three categories: locatable, leasable, and saleable. The primary minerals that are being withdrawn include potash and fossil fuels.

ii. Paradox Basin has an estimated 2.0 billion tons of potash. The Intrepid Potash-Moab mine extracts this resource to produce the associated product, potassium chloride (Boden et al. 2014).

iii. Utah salt production in 2014 increased to 3.65 million st, and has a production value estimated at $209 million. The 22% increase in value from 2013 was due to an increase in salt market price and more accurate reporting of production. Some 83% of the salt was produced from Great Salt Lake. The remaining 17% came from Redmond Minerals, Inc., near Redmond in Sanpete County, Intrepid Potash-Wendover near Wendover in Tooele County, and Intrepid Potash-Moab near Moab in Grand County (in descending production order) (Downen et al. 2009).

iv. In the 1950s, Moab became the uranium capitol of the world, producing 95% of the uranium ore used in the U.S. at the time. All of Utah's numerous uranium mines closed prior to 2000, because of low uranium prices (Firmage 1996).

v. Dealing with the legacy of large scale uranium mining is a challenge. Hundreds of abandoned uranium mines in the four-corners states must be reclaimed to ensure public health and environmental protection. The Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), administered by the Department of Energy (DOE), has licensed five sites in Utah for reclamation. The closest two to Grand County are the Green River Disposal Site, and the Monticello Disposal and Processing sites (Office of Legacy Management 2017). The Environmental Protection Agency (EPA) also tracks abandoned uranium mines, and has been working with members of the Navajo Nation to clean up abandoned mines (EPA 2016). Reclamation activities funded by the federal government could be a benefit to the environmental restoration sector of Grand County's economy. The issue of unreclaimed or inadequately reclaimed mines of all types remains an issue today.

vi. Uranium mining in SE Utah (but not in Grand County) restarted from 2007 to about 2012. "Energy Fuels Resources' (EFR) Daneros Mine, located in a narrow canyon spilling off the west side of Cedar Mesa, began producing uranium ore in 2010 and yielded 123,000 tons before shutting down in October 2012, when the price of uranium oxide slid in the wake of the Fukushima meltdown" (Maffly 2016). Several mines in nearby San Juan County operated and are still permitted. The nearest uranium mines, near La Sal, operated from 2007 to 2012 and are on standby (Sarah Fields, personal communication).

b. Control v Influence

i. The Utah Legislature has assigned the Utah Division of Oil, Gas, and Mining (DOGM) responsibility for regulating mineral exploration, development, extraction, and reclamation on "all lands in the state of Utah lawfully subject to its police power. No political subdivision of this state shall enact laws, regulations, or ordinances which are inconsistent with this act." This includes federal, state, and private lands, but it does not include land on Indian Reservations (P. Baker, DOGM, personal communication). These regulations are spelled out by The Mined Land Reclamation Act (1975). The BLM and Forest Service have their own regulations which may vary slightly from those of the state. On public land, mineral surveying and extraction is subject to "dual regulation," meaning both DOGM regulations, and the regulations set by the BLM or Forest Service must be followed.

ii. For regulation of mineral ore mining, the DOGM administers permitting, inspection, and enforcement procedures under the Utah Mined Land Reclamation Act (1975). All large mining operations within the state are required to have an approved notice of intention with the Minerals Program prior to beginning operations. Mining operations are broken up into the three categories: (1) large mine, (2) small mine, and (3) exploration under the Minerals Rules. The DOGM maintains a permit database of active and reclaimed mine sites. The DOGM Minerals Program regulates all mining operations as defined in the Utah Mined Land Reclamation Act.

iii. Mining on public lands administered by the Forest Service, on the eastern edge of the county, are subject to federal regulations, as well as DOGM regulations. "The Mining Law of 1872, as amended, governs the prospecting for and the appropriation of metallic and most nonmetallic minerals on the 140 million acres of National Forest set up by proclamation from the public domain. . .In the Mining and Minerals Policy Act of 1970, Congress declared that it is the continuing policy of the Federal Government, in the national interest, to foster and encourage private enterprise in (among other goals) the development of domestic mineral resources and the reclamation of mined land" (U.S. Forest Service n.d.).

iv. The state of Utah, the Forest Service, and the BLM require land reclamation bonds on mining operations. The purpose of these bonds is to create a financial surety that the State or land management agency can use to reclaim the land if the operator is unable or unwilling. Disturbances caused by the mining operation must be rehabilitated to either the original state, or a degree agreed upon by the company and the agency. Mining operations on public land need a bond which may be held by either the federal agency or the State (P. Baker, DOGM, personal communication).

v. The Mine Safety and Health Administration (MSHA) has jurisdiction over underground mine health and safety. The agency administers the provisions of the Federal Mine Safety and Health Act of 1977 "to prevent death, illness, and injury from mining and promote safe and healthful workplaces for U.S. miners" (MSHA).

c. Economic Considerations

i. Over time, Grand County's public lands have supported economic growth in a variety of ways. In the second half of the 20th century, mining activities played a significant role in the region's economy. Since peaking in 1981, however, the share of Grand County residents employed in mining fell rapidly and plateaued at two to three percent of total employment for the past fifteen years (Headwaters Economics 2011).

ii. "The natural resource and extraction component of the Grand County economy is relatively small. Mining supported jobs actually dropped from an estimate of 101 jobs in 2009 to 80 jobs in 2012 (the latest year available), representing 2.2% of total private wage and salary employment. That same year, fossil fuel development (coal, oil, natural gas), a subset of mining, supported 45 jobs, representing 1.3% of total private wage and salary employment" (Headwaters Economics 2011).

iii. From 1969 through 2000, mining was *the* basic industry in Grand County, though the county's specialization declined over the period. Employment shares for the sector went from almost 32 times the national share in 1969 to more than four times in 2000. The only other industries to show any above-average concentrations were construction, which reached slightly more than twice the national employment share in 1976–77 and 1980; retail trade, which made it as high as 1.91 times the national share in 1996; and transportation and utilities, which never had more than 1.5 times the national share and by 1990 was below the national share.

iv. "Natural resources including agriculture and mining account for 22% of all property taxes and less than 2% of total sales taxes in Grand County. In sum, taxes on minerals and mining activities account for roughly 3% of total local revenue collected by the county government" (Headwaters Economics 2011).

v. "Local governments receive natural resources revenue from two basic types: local taxation of the natural resources industries, and payments from the federal government based on the value of resources extracted from public lands. The largest natural resource revenue source is property taxes ($3.2 million), followed by distributions to local governments of federal mineral royalties ($1.2 million), and Payments in Lieu of Taxes ($1.1 million)" (Headwaters Economics 2011). The federal government does not collect royalties for hard rock mining (GAO 2017).

vi. Data from the Utah Department of Workforce Services indicates that over the last five years, there were on average 13 firms classified as mining, oil/gas extraction, or support activities for mining in Grand County. On average, these firms provided 106 jobs, and wages in that sector ($5,833/mo) were over 230% better than the county average ($2,495/mo). The mining industry provided the highest average wages of any sector in the county.

vii. Data from the Utah Tax Commission indicates that the mining sector generated $431,282 in sales tax revenue for Grand County in 2016. This represents 0.1% of all activity in the County.

viii. According to the Utah Department of Workforce Services, Grand County generated $1,871,879 in mineral lease funds (tax revenue from mining activity that goes to the State) in FY2016.

d. Custom + Culture

i. "New towns and settlements, created or rapidly expanding in the 1890s, were generally either mining towns or agricultural developments. . .Miner's Basin was the principal mining camp in the county. It flourished from the late 1880s to 1907, at which time the mines were closed due to the repercussions of a national financial panic. . .The Miner's Basin Mining District was organized on 27 May 1898 by George Hepburn and other area miners, ten years after the first claims were staked in the area" (Firmage 1996).

ii. "The most successful mining activity of the era involved the newly discovered element uranium and other elements associated with it. . .The great discovery of uranium pitchblende ore that helped turn mining activity into a frenzy was made by an unemployed geologist from Texas, Charlie Steen, who was living with his family in the Cisco area of Grand County, after having spent the winter of 1950-51 in the Yellow Cat Flat area north of Arches National Monument. Steen had been staking claims in the area since 1950, but was on the verge of having to discontinue his mining activity when he made his great strike at his "Mi Vida" claim in the Big Indian Mining District, south of La Sal in San Juan County, on 6 July 1952" (Firmage 1996).

iii. "The year 1955 was in many respects the high (or low) point of Moab as a boom town: a time when explosive growth was continuing unabated, but where a supporting service and facilities infrastructure was not yet in place, and in which the actual construction and establishment of such an infrastructure actually added to the turmoil" (Firmage 1996).

iv. "Historian Gary Shumway suggests that 1956 marks the second phase of the boom - the phase of consolidation after the wild days of exploration. The AEC had made the major commitment to support the nuclear industry by continuing to purchase uranium ore, even with its massive stockpiles, until private enterprise with its associated plans for

domestic nuclear-generated power plants became a major factor-something the government calculated would occur in the mid- 1960s. The weeding out of the small producers as well as fraudulent and mismanaged companies also allowed for the consolidation of the uranium mining industry with only a handful of important players, including UTEX and URECO" (Firmage 1996).

v. "On 17 May the [Times-Independent] paper announced an area-wide competition for "Miss Atomic Energy of 1956 of the Colorado Plateau," and in mid-August the town of Moab celebrated "Uranium Days" - a two-day festival" (Firmage 1996).

vi. "One lasting result of the uranium boom years was the greatly enlarged network of roads and jeep trails throughout the region carved by prospectors and their machines as they scattered over the land seeking mineral wealth. In part, this was another legacy of World War II, with the development of jeeps and other four-wheel drive vehicles that became useful and popular in the rugged landscapes of the county in the post-war years. In Desert Solitaire Edward Abbey lamented the scarring of the landscape, writing that "the ethical and political implications of uranium exploitation are simply unknown in these parts," but his views were in the minority." (Firmage 1996).

vii. On the State scale, "Utah contains a remarkable variety of energy and mineral resources. The development of these resources for over 165 years has been important to Utah and the United States. Mining plays a vital role in Utah's economy and is the oldest nonagricultural industry in the state, employing thousands directly in mining, processing, and transportation, and indirectly in supporting occupations. The recorded mining history of Utah began in 1847. Soon after their arrival, Latter-day Saint pioneers began developing mineral resources. Their early efforts included recovering salt from Great Salt Lake, coal mining (near the communities of Coalville, Wales, and Cedar City), quarrying building stone, and production of clay and lime products" (Boden et al. 2014).

Mining Policies

1. Grand County encourages the federal land agencies to ensure that there are adequate remediation plans, including bonding.
2. *(Updated, relevant existing policies found in the 2012 Grand County General Plan)*

viii. "Goal 5 - Minimize socio-economic and environmental impacts from fluid and solid mineral development while still allowing such development to continue to benefit the economy."

1. Strategy A - Encourage developers and operators to use the best technology and mitigation techniques to protect natural amenities and natural resources.

ix. "The County will continue to be an active participant in planning for the future use of the UMTRA site."

ENERGY RESOURCES

Definition

Renewable or nonrenewable resources used to obtain energy.

Related Resources

Mining, Mineral Resources, Cultural, Geological, Paleontological, Land Access, Water Quality & Hydrology, Water Rights, Air Quality, Land Use

Best Available Information Sources

a. Bureau of Economic and Business Research
b. Rangeland Resources for Utah
c. Utah's 10-Year Strategic Energy Plan
d. Utah's Extractive Resource Industries 2014
e. Role of Oil and Gas and Amenities in County Economic Development

- *Full works cited page available here*

Findings

a. Overview

i. "The unique geologic history, geography, and climate of Utah have resulted in an abundance of nonrenewable and renewable energy resources. Nonrenewable energy resources include fossil fuels, such as oil, coal, and natural gas, as well as naturally occurring elements, such as uranium. Renewable energy resources are those that are replenished by natural processes and include geothermal, solar, and wind energy" (Utah State University 2009).

ii. Historically, the Grand County economy has been dominated by uranium, oil, and potash. The economy then diversified with the growth of world-class tourist and recreation areas.

iii. Development of the renewable energy resources in Grand County has the potential to be an important contributor to the economy of the county. Wind and solar resource development costs have dropped dramatically in the last several years. In many places, electricity from wind and solar resources is now cost competitive with all other sources of new electricity generation, and many existing sources of generation. Due to advancements in technology, better forecasting, and better controls, wind and solar energy can be economically developed in areas not previously thought possible.

b. Oil

i. "Utah contains three of the 100 largest oil fields in the United States and five petroleum refineries. Currently, there are 355 million barrels of proven oil reserves in the state. Crude oil production in Utah has seen a substantial resurgence over the past 5 years with the discovery of the Covenant Field in central Utah and increased exploration and drilling in the Uinta Basin. Crude oil production increased to 21.3 million barrels in 2008, up 9.1 percent from 2007 and up 63 percent from 2003. The value of extracted crude oil in Utah for 2007 was more than $1.2 billion" (Utah State University 2009).

ii. In 2016, Grand County produced 435,000+ barrels of oil, making it the fifth highest producer in the state. Cumulatively, the County has produced a total of 12,820,000+ barrels in cumulative lifetime production (DOGM 2017).

c. Natural Gas

i. "The Uncompahgre Uplift produces primarily natural gas while the Paradox Basin produces mostly crude oil. Almost all of the natural gas produced in Grand County comes from the fields in the Book Cliffs and the Greater Cisco Field, while 80 percent of the crude oil production is from five fields west of Moab in the Paradox Basin. In fact, the majority of total oil and gas production in the county (measured in barrels of oil equivalent) occurs in the Book Cliffs and Greater Cisco Field with the remainder coming from the fields in the Paradox Basin" (Downen et al. 2009).

ii. The most recent statistics from the Division of Oil, Gas, and Mining indicate that in 2016, Grand County had the 7th highest amount of natural gas production in the state, at 3,366,000+ MCF. The County also has a cumulative lifetime production amount of 406,675,000+ MCF (DOGM 2017).

iii. Natural gas operations come with inherent inefficiencies such as gas that escapes from wells without being captured, or gas that must be flared into the atmosphere. Data on how much gas is captured and transported versus flared or released, varies over time, and data on this difference is not well documented.

iv. Monitoring natural gas wells and pipelines is an important way to limit air pollution. Certain wells in the Book Cliffs and Cisco fields are not producing or producing at very low levels (DOGM 2017). One option is to close down and cap these wells while also removing associated infrastructure.

v. In 2014, mining supported 160 jobs representing 4.2 percent of total private wage and salary employment in the County. Fossil fuel development (coal, oil, natural gas), a subset of mining, supported 55 jobs representing 1.6 percent of total private wage and salary employment (Economic Profile System 2016).

vi. "In 2012, Utah ranked as the 10th largest onshore producer of natural gas in the country. In 2012, Utah's natural gas was mostly used for home heating (nearly 33%) and by the electric utility sector (nearly 26%). Natural gas makes up approximately 44% of Utah's total produced energy resources. Natural gas also accounts for 25% of the energy consumed by Utahns. In 2012 there were estimated to be over 9,322 jobs in Utah's oil and gas industries, including direct and related support jobs of extraction, wells operations, distribution, transportation, refining, construction and manufacturing (this figure does not include induced jobs in electricity generation and other industries that

exist because of natural gas production)" (Governor's Office of Energy Development 2014).

vii. Utah ranked 9th in the United States in crude oil proved reserves and 11th in natural gas proved reserves (not including Federal Offshore areas) in 2013 (DOGM 2017). Utah has approximately 5,100 producing oil wells and 7,200 producing natural gas wells (DOGM 2017).

d. **Nuclear**

i. Historically, Utah is the third most productive uranium state, with the majority of its production from the Colorado Plateau. The spot price of U3 O8 has been especially volatile over the last decade with spikes to $136/lb in June 2007 and lows less than $45/lb in 2009–2010. The spot price rebounded to $73/lb in early 2011, but fell below $50/lb after the March 2011 Fukushima nuclear power plant disaster in Japan. Uranium prices have remained low (generally less than $45/lb) throughout 2012, 2013, and 2014 (Boden et al. 2014). "Uranium does not trade on an open market like other commodities. Buyers and sellers negotiate contracts privately" (Cameco 2017). In February of 2017, the spot price of uranium was down to $23/lb.

ii. In the 1950s, Moab became the uranium capitol of the world, producing 95% of the uranium ore used in the U.S. at the time. All of Utah's numerous uranium mines closed prior to 2000, because of low uranium prices (Boden et al. 2014).

iii. Uranium mining in SE Utah (but not in Grand County) restarted from 2007 to about 2012. "Energy Fuels Resources' (EFR) Daneros Mine, located in a narrow canyon spilling off the west side of Cedar Mesa, began producing uranium ore in 2010 and yielded 123,000 tons before shutting down in October 2012, when the price of uranium oxide slid in the wake of the Fukushima meltdown" (Maffly 2016). Several mines in nearby San Juan County operated and are still permitted. The nearest uranium mines, near La Sal, operated from 2007 to 2012 and are on standby (Sarah Fields, personal communication).

iv. Grand County has no nuclear power generation facilities, however, there is an initiative to build the state's first nuclear power plant. As of spring 2017, the proposed Blue Castle Nuclear Reactor near Green River is in the process of evaluating sites, obtaining licenses, and consulting contractors. According to the company, the construction phase would not begin until 2023 (Stoddard 2017). While it would not be located in the county, it could affect the price of uranium, as well as the region's recreation economy. Proponents see the plant as a viable replacement for the coal power plants soon to be retired, while opponents point to issues such as hazardous waste disposal, the potential for catastrophic accidents, and impacts to the local economy. The issue of nuclear power as an energy source remains an issue of debate.

e. **Geothermal**

i. "Exploitable geothermal resources come from the transport of heat to the surface through several geological and hydrological processes. Geothermal resources commonly have three components: 1) a heat source, 2) relatively high permeability reservoir rock, and 3) water to transfer the heat. Numerous high temperature resources occur in the Basin and Range Province of the western United States as the result of deep circulation along major faults in a region of high heat flow. Utah has high- temperature

resources that are suitable for electricity generation, as well as direct use and heat pump applications, and is one of only four states with geothermal electric power plants" (Utah State University 2009).

ii. Three geothermal wells have been identified near Dewey and Moab that maintain greater than 77 degrees fahrenheit. These sites could be explored for their energy producing potential (Utah State University 2009).

f. Solar

i. Grand County has large swaths of land that are designated "solar energy zones," which could produce between 6-7 kilowatt hours per square meter per day. These areas are generally the flatter valleys along I-70 (Utah State University 2009).

ii. "The Renewable Energy Atlas of the West (Nielsen et al., 2006) estimated the annual solar electricity generation potential in Utah to be 69 billion kWh (kilowatt-hours), based on the following assumptions: 1) rooftop and open space installed systems represent 0.5 percent of the total area of the state, 2) solar panels occupy 30 percent of the area set aside for solar equipment, and 3) the average system efficiency is 10 percent" (Utah State University 2009).

iii. "Utah has about 16,500 km2 (6,370 square miles) of land that, at least technically, could support utility-scale solar power. A rule of-thumb for CSP is that the field of solar collectors required for a 50 MW plant is one square kilometer (0.39 square mile, or 247 acres). Therefore, Utah contains about 16,500 sites of sufficient contiguous size for a 50-MW CSP installation" (Berry et al. 2009).

iv. The cost of solar photovoltaic installations has fallen dramatically in recent years and continues to decline, making solar an increasingly economically attractive source of electricity (Four Corners Wind Resource Center, unpublished report).

g. Wind

i. Grand County has areas with average wind speeds high enough for wind energy production (DOE 2015). Several areas along the northern edge of the county have been identified by the Utah Renewable Energy Zones Report (2009) as having over 250 MW of potentially capturable energy. The Hill Creek Extension and Horse Point Ridge sites are both at around 8,000 feet of elevation in the Book Cliffs mountain range (Berry et al. 2009).

ii. Wind turbine technologies continue to improve and turbines are now able to generate economically competitive electricity in lower wind speed areas through the use of longer turbine blades, taller hub heights, and advanced controls. Also, improvements in wind resource forecasting, wind plant control technologies, and energy storage now allow wind plants to generate electricity at a smoother, more consistent rate than in the past. These factors enable more accurate predictions of output for management by the electric utilities that generate and/or purchase the power generated by wind projects (Four Corners Wind Resource Center, unpublished report).

iii. "Site evaluation for wind projects should be coordinated with appropriate authorities and should consider potential effects on local resources and land uses, including but not limited to impacts to wildlife, sound, the visual environment, radar, aviation, safety and other local priorities" (DOE 2015).

h. Potential Indirect Costs

i. While certain energy development projects can create measurable economic growth, there can be indirect costs and risks such as:

1. Potential oil spills or natural gas leaks can have major impacts of soil and water resources and on the resources of private citizens and emergency response agencies.
2. Gas leaks/releases that can add to CO2 and methane pollution.
3. Flaring of natural gas at well sites can represent lost revenue and impacts air quality and night-sky visibility.
4. Potential for fracking chemicals to contaminate land and water.
5. Need for on-going monitoring of waste water wells and other disposable sites.
6. Cost of reclamation of abandoned wells and access roads.
7. Energy companies often have generic emergency response plans, but do not provide resources for initial and ongoing training for local emergency responders. That burden, if implemented, falls to local jurisdictions.
8. Swings in energy prices and investments constrain the ability of local jurisdictions to construct credible long-term development plans.
9. Development of a skilled local workforce for energy development cannot occur when employment is dependent on fluctuating energy prices, a given for this sector.
10. Use of local water resources in desert communities by energy companies is likely to have short and longer-term implications on water availability for local use.
11. New or upgrades to access roads often becomes a local jurisdiction responsibility or subsidy. The repair of existing roads due to their deterioration caused by increased heavy truck traffic is usually borne by local jurisdictions or state taxpayers. Public safety is at risk by increased truck traffic along regularly used roads.
12. Overall air quality impacts from new and existing wells and from increased heavy and pick-up truck traffic.
13. Fragmentation of land disrupts flora, fauna, and use by other economic and social sectors.
14. Weed invasions of disrupted land.

i. Control v Influence

i. Development of energy resources is largely regulated by the entity that has jurisdiction over the land where they are found. Both the federal government and the State of Utah have jurisdiction over many of the energy resources in Grand County.

ii. Portions of the county overlap with the planning area of the BLM Moab Master Leasing Plan (MLP). Finalized in 2016, the MLP contains goals and objectives to provide

opportunities for environmentally responsible exploration and development of oil and gas resources subject to appropriate BLM policies, laws, and regulations (M. McGann, Bureau of Land Management, personal communication). It is important to note that the Moab MLP addressed the leasable minerals oil, gas, and potash only. Wind, solar, nuclear, and geothermal were not addressed in the Moab MLP.

j. Economic Considerations

i. Increasing commitments to renewable energy in states throughout the west could drive demand and create competition for development of renewable resources.

ii. With the expansion of the Energy Imbalance Market in the West, higher levels of renewable energy can be managed by participating utility electrical systems. Thus, geographically dispersed renewable energy development, such as Utah based projects, can more easily contribute to local and regional energy needs and clean energy goals.

iii. Data from the Utah Department of Workforce Services indicates that over the last five years, there were on average 13 firms classified as mining, oil/gas extraction, or support activities for mining in Grand County. On average, these firms provided 106 jobs, and wages in that sector ($5,833/mo) were over 230% better than the county average ($2,495/mo). The mining industry provided the highest average wages of any sector in the county.

iv. Data from the Utah Tax Commission indicates that the mining sector generated $431,282 in sales tax revenue for Grand County in 2016. This represents 0.1% of all activity in the County.

v. According to the Utah Department of Workforce Services, activity in Grand County generated $1,871,879 in mineral lease funds (tax revenue from mining activity that goes to the State) in FY2016. These revenues fluctuate with market changes.

k. Custom + Culture

i. "Initial oil and gas activity in the county occurred in the 1890s and sporadic drilling occurred over the next 25 years. There were scattered reports of successful oil wells in the early 1920s, but the first commercial discovery was the Cisco Dome Field in 1925. The Crystal Carbon Oil Company of Charleston, West Virginia constructed a plant northwest of Cisco that manufactured carbon black from natural gas in the area. The post– World War II uranium boom stimulated additional oil exploration in the county and additional wells were drilled at Cisco and at Kane Creek west of Moab. One well at Kane Creek reportedly produced 2,666 barrels per day. This era is also when many of the producing fields in the Book Cliffs were established. Uranium production came to an end in the area in the mid-1980s due to low prices, but several mines have recently reopened in surrounding counties. Currently, the largest mining operation located in Grand County is the Intrepid Moab–Potash LLC in-situ leach operation. This mine employs an estimated 50 persons" (Downen et al. 2009).

ii. Unlike many areas known for oil and gas production, the Grand County economy is not based on energy production but on tourism. Arches National Park is located just north of Moab, while Canyonlands National Park is located just south of the county line in San Juan County. River rafting and mountain biking also contribute to the tourism-based economy. The presence of these tourist attractions, coupled with many of the workers involved in the local oil and gas industry working out of Colorado, results in Grand

County being more economically dependent on tourism than on oil and gas extraction (Downen et al. 2009).

iii. There are areas in the County where demands for energy development and for recreation uses are beginning to conflict. Grand County has always believed in multiple uses for land and feels that a diverse economy and ecosystem is stronger than one, dominating homogenous influence.

Energy Policies

1. Grand County supports detailed planning processes that consider conflicting uses.
2. Expand the role of the County's Technical Inspector to address other public lands issues.
3. Where practical, the County encourages the development of renewable energy resources.
4. Grand County shall consider the relationship between the individual energy-related projects and the cumulative social, environmental, and economic effects through a thorough cost-benefit analysis of all energy production in the County.
5. Within the scope of the County's authority, Grand County will require best available technology and management practices during planning, development, implementation, closure, post-closure, and restoration phases.
6. Grand County encourages federal and state land managers to implement the spirit and law of the coordination clauses of the current National Environmental Policy Act.
7. Reference and adopt a goal regarding renewable energy that is similar in intent and implementation as Moab City Council.
8. Grand County wants to maintain a collaborative partnership with state and federal land agencies, including the potential dedication of staff resources if/when necessary.
9. Encourage oil, gas and mining companies to use the best technology and mitigation techniques to protect natural amenities and natural resources.

AGRICULTURAL RESOURCES

AGRICULTURE

Definition

Agriculture is the cultivation of plants or animals for fiber, food, fuel, or other products.

Related Resources

Ditches and Canals, Irrigation, Water Quality, Water Rights, Livestock and Grazing, Land Use, Land Access, Noxious Weeds, Riparian Areas, Floodplains and River Terraces, Wetlands

Best Available Information Sources

a. A History of Grand County

b. Utah State University County Agricultural Profiles

c. USDA Census of Agriculture

d. USDA County Resource Assessment

e. Utah Agriculture Sustainability Task Force

f. The Economic Value of Public Land in Grand County (2015)

g. *Full works cited page available here*

Findings

a. Overview

i. Agriculture in Grand County has been practiced at different scales throughout its history. While the number of formal farming operations has declined over the years (Economic Profile System 2017), some residents still practice farming for economic and cultural reasons. The issue of agriculture is a sensitive topic for residents, with many stakeholders holding different views on the practice.

ii. As of 2012, there were 81 farms in Grand county, totaling 6,300 acres, with 1,595 acres in farmsteads and buildings (EPS 2017). "The main crops grown in Grand County are alfalfa, grass pasture, melons and organic vegetables harvested for sale. Small organic farms are becoming common in the Moab area. Grapes are also grown and help supply local wineries. Producers typically get 3 to 4 cuttings of alfalfa hay each growing season" (Grand Conservation District 2012).

iii. Some Grand County residents consider agriculture to be an important investment, but operators come up against multiple challenges. "Water constraints, limited land suitable for crop production and increased development and expansion of communities all contribute to this limitation. Although water and arable land availability are elements of the problem for which little can be done, urban development is one element that can be controlled" (Grand Conservation District 2012).

iv. "Grand County's unique culture, extended growing season, and long distances to markets provide small-scale agricultural producers a unique opportunity to market their goods locally. Many small-scale farms in Grand County market to consumers of organic goods" (Grand Conservation District 2012).

v. The average age of farmers continues to increase nationally and in Utah. Current farmers are aging while still working to maintain their lands. The average age of a Utah farmer is 57, and in Grand County, the average is 59. Farming is losing its successors as many children are choosing other occupations (U.S. Department of Agriculture 2012).

b. Soils

i. "Grand County soils are typical of those found within the Colorado Plateau, which has unique geological formations and a large variety of soils. Geologic activity long ago created the unique desert and mountain regions which include rivers that cut deep into bedrock making spectacular canyons. The soils are derived from sandstone and limestone parent material. Soils of the Colorado Plateau will vary from loamy to clay and will also have areas of sand and gravel. It is rare to see large areas with one texture of soil and common to detect different textures intertwined throughout the region. Soil in this area can be very shallow or very deep and are typically well drained or excessively drained. The region also has numerous areas in which bare sandstone can be found. The dominant soil orders in the area are Alfisols, Aridisols, Entisols, and Mollisols" (Grand Conservation District 2012).

ii. Erosion is a common problem for the Grand County area due to the sandy and clay texture of many of the soils. Little rainfall and resulting limited vegetation growth contribute to erosion, as soils are exposed to natural erosion. Runoff from intense summer thunderstorms rapidly sheds from barren rock outcrops and produces flash floods in the dry washes and canyon bottoms, increasing sediment in streams and reservoirs, and ultimately causing water quality and water storage capacity issues (M. Ure, Utah Department of Agriculture and Food, unpublished report).

iii. "Prime Farmland is a national designation for land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. There are potentially 6,524 acres of prime farmland in Grand County; however, these must be irrigated to qualify for this designation.

Irrigated lands that do qualify as Prime farmland amount to about 1,885 acres" (Grand Conservation District 2012).

iv. "Land identified by state agencies as important for agricultural use, but not of national significance can be designated as statewide important farmland. Grand County has approximately 122,843 acres of potentially statewide important farmland, but the actual is less due to a requirement for irrigation" (Grand Conservation District 2012).

c. Economic Considerations

i. According to data from the U.S. Department of Commerce, U.S. Department of Labor, USDA and others, agriculture currently represents a relatively minor impact. From 1970 to 2015, Grand County farm employment grew from 78 to 89 jobs, a 14.1% increase, while non-farm employment grew from 2,645 to 7,480 jobs, a 182.8% increase. Total farm employment in Grand County accounts for 1.2% of all employment (EPS 2017).

ii. In 1970, Grand County farm proprietors' income represented 50.5% of all farm earnings. By 2015, farm proprietors' income represented -28.1% of all farm earnings. This means that farm proprietors total a net loss in income. From 1970 to 2015, Grand County farm earnings shrank from $1.3 million to $0.8 million, a 40.4% decrease (EPS 2017).

iii. Livestock grazing is decreasing, and crop farming is increasing: From 1970 to 2015, cash receipts from livestock and products shrank from $3.9 million to $2.9 million, a 26.3% decrease. From 1970 to 2015, cash receipts from crops grew from $0.5 million to $1.7 million, a 246.3% increase (EPS 2017).

iv. In 2015, the market value of the crop sales from Grand county was over $1.6 million. The vast majority of this came from hay and livestock feed.

v. While not as large of an economic driver as tourism, agriculture is an important contributor to the economic vitality of the county because of the year-round diversity in employment it creates.

vi. Because of the rising land values across the County, many residents should theoretically be incentivized to sell their land. Nevertheless, agricultural operations continue in the County, indicating that agriculturalists in the area are genuinely passionate about farming.

vii. Data from the Utah Department of Workforce Services indicates that over the last five years, there were less than five firms that provided support services directly to the agriculture and forestry industry. The jobs in that sector typically paid wages ($3,176/mo) that were 127% of the county average ($2,495/mo).

d. Custom + Culture

i. Traditional socio-economic indicators don't accurately measure all agricultural activity. Furthermore, economic trends in agriculture are difficult to plan due to the cyclical nature of commodity agricultural markets.

ii. Historically, Grand County has had the smallest number of farms in the state, but some residents consider it a way of life and an important part of the local character. Regulations in the Castle Valley area, for example, puts a limit on lot sizes (5 acres/lot) to encourage open space.

iii. The *History of Grand County (1996)* describes how at the beginning of the 20th century, many people were enthusiastic about agriculture production in Grand County, but the excitement was short lived. "Although the area had many natural advantages with its fertile soil and generally long growing season... even if a climate is generally favorable, a rare frost, if it occurs at a crucial time in the maturation of blossom or bud, can destroy an entire crop. Such devastating freezes occurred all too frequently in the first years of the century, crippling the local fruit-growing industry and making the pumping of irrigation water from the region's great rivers prohibitively expensive for most growers" (Firmage 1996).

e. Control v Influence

i. "Grand County covers 2,355,743 acres. Eighty-seven percent of the land is publicly owned, and is managed by state and federal agencies. Tribal and private lands cover 8.4% (197,882 acres) and 4.3% (101,297 acres), respectively, of the land area in the county" (EPS 2011). Rules and regulations are tied to this ownership pattern. As a result, the actions of public agencies have a large impact on Grand County.

ii. In Grand County, private property owners and farm operators control this resource. Most crop farming happens on private land with little outside influence. The agency with the most influence on agriculture in the County is the Natural Resources Conservation Service. The County and municipalities have influence over land uses and zoning which will impact agriculture.

Agriculture Policies

1. Encourage businesses and residents to purchase local and organic agricultural products
2. Encourage water conservation by agricultural producers.
3. The County encourages community-supported agriculture as an option for underutilized lands.
4. The County will convene a working group to evaluate the situation and future options for agriculture in all areas of the Grand County.
5. *(Relevant existing policies found in the 2012 Grand County General Plan)*
   i. "Support the continuance of agriculture with incentives and land use flexibility."
   ii. "Support voluntary efforts initiated by agricultural landowners to enact Agriculture Protection Areas covering their properties per Utah State Code (UCA Title 17 Section 41)."

iii. “Encourage interested agricultural landowners to take advantage of voluntary tax incentives by placing agricultural conservation easements on property that they own and wish to keep in agriculture."

iv. "Engage the community in revising the land use code to identify and reduce barriers to agriculture and value-added agricultural production such as building setbacks, food stand regulations and/or home occupations standards."

v. "Continue to offer increased residential density as an incentive for developers to set aside irrigated agricultural land voluntarily as open space and keep some of the property in agricultural production."

NOXIOUS WEEDS

Definition

Noxious weeds are plants that are considered harmful to agricultural or horticultural crops, natural habitats or ecosystems, or humans or livestock. Often times they are non-native species, which spread rapidly due to habitat disruption or poor land management.

Related Resources

Forest Management, Fire Management, Agriculture, Livestock & Grazing, Riparian Areas

Best Available Information Sources

a. Rangeland Resources of Utah
b. Utah Noxious Weed Act (Utah Agricultural Code)
c. Grand County Weed Department
d. *Full works cited page available here*

Findings

a. Overview

i. "Noxious and invasive weeds are a threat to Grand County ecosystems, waterways, and agricultural production. The areas of most concern are riparian areas, cropland, forestland and rangeland. Development and various recreational activities tend to spread weeds into new areas annually. Tamarisk, Russian olive, and Russian knapweed are species of particular concern in the county" (Grand Conservation District 2012).

ii. "Utah's top weed scientist says Moab and much of Grand County could become infested with foreign weeds never seen here, but which have swept over millions of acres in other parts of the country. . .Native to south Europe, yellow starthistle arrived in the state of Washington in the early 1900s as a contaminant in alfalfa seed. Since then it has spread across rangeland in the West at astonishing rates as infestations of the weed crowd out other plants" (Papich n.d.).

iii. "Colorado has large infestations of leafy spurge and the seeds could arrive in southeast Utah in the Colorado and Green rivers, on seed stuck to vehicles coming out of Colorado or in hay from Colorado. Leafy spurge seed also could arrive from other states. Though the heavy infestations of leafy spurge are in Wyoming, the Dakotas and Montana, all the western states except Texas and Oklahoma have been invaded by the weed" (Papich n.d.).

iv. "So many thousand of acres in Grand County already are covered with Russian knapweed and salt cedar— choking out native vegetation and damaging wildlife habitat— that eradication of the weed is unthinkable. Spread of the weeds can be controlled, however, with herbicide applications and by exposing the weeds to exotic bugs from the same countries the weeds come from that eats the plants" (Papich n.d.).

v. There are many species of exotic and invasive weeds in the Utah. Some species, however, have more potential to be "injurious to public health, crops, livestock, land, or other property" (Utah Administrative Code R89-9). The Utah Noxious Weed Act of 2008 defined 28 noxious weed species in three prioritization categories. In 2015 the official State Noxious Weed list was updated to include 54 species and prioritization categories were modified.

vi. "An increasing threat to rangeland biodiversity and health is the invasion by non-native plant species. Some of the most prevalent and problematic invasive plants include diffuse knapweed (Centaurea diffusa), spotted knapweed (Centaurea maculosa), yellow starthistle (Centaurea solstitialis), leafy spurge (Euphorbia esula), and cheatgrass (Bromus tectorum). The vast majority of invasive plants have been introduced from other continents. Cheatgrass, the most widespread and dominant invasive plant in the Intermountain West, was introduced during the mid- to late-1800s by means of imported grain from Eurasia. The first records of cheatgrass in the Great Basin came from Provo, Utah, in 1894; Elko, Nevada, in 1905; and Reno, Nevada, in 1906" (Utah State University 2009).

vii. According to the Noxious Weeds Field Guide of Utah, "Noxious weeds are currently spreading at a rate of more than 4,600 acres per day on federal lands in the United States" (Bellison et al. 2009).

viii. "Invasive plants can have a significant impact on an array of ecological facets. Invasive plants have reduced species richness, plant diversity, and community productivity. Wildlife habitat and forage have been degraded; soil erosion and stream sedimentation have increased; soil moisture and nutrient levels have been depleted; and fire regimes have been altered. As cheatgrass has become a common component of sagebrush steppe vegetation communities, the nutritional quality of forage has been reduced, the intensity and frequency of fires have changed, and water cycles have been altered. Although many factors are involved, several native animals, such as sage grouse, may have declined as a result of these changes" (Utah State University 2009).

ix. "Attempts to manage and eradicate invasive plant species have been made utilizing various control methods. Historically, mechanical and chemical control techniques were the predominant invasive plant management methods; however, biological and cultural control techniques have been implemented and integrated with other practices. Mechanical control techniques include hand-pulling, hoeing, mowing, tilling, chaining, and bulldozing. Hand-pulling and hoeing are effective in controlling small infestations of shallow-rooted weeds in loose, moist soils. Mowing is commonly used to control invasive range annuals and some perennials; however, the success of mowing is highly dependent on timing. Annuals and some perennials can be suppressed and controlled if mowing occurs before viable seeds form. If not properly timed, mowing can promote the spread of invasive plants by encouraging the spread of seeds and stimulating the production of new stems from vegetative buds. Tilling practices can

control annual species, but they rarely provide control of perennial species... More expensive mechanical control techniques, such as chaining and bulldozing, are effective in controlling invasive shrub and tree species. Although these methods require gentler terrain and are becoming increasingly expensive, they are effective in controlling shrubs and trees that do not readily resprout from root systems" (Utah State University 2009).

b. Managing Agencies

i. The Grand County Noxious Weed Control Board, in conjunction with the Weed Department, locates patches of noxious plants throughout the county, controls for them, and notifies private landowners when the plants are present on their lands. The board also issues educational materials and meets with stakeholders in an effort to control the spread of weeds in the County.

ii. In February of 2015, the county published a directive in the *Times Independent*, requiring landowners in Grand County to control and prevent the spreading of noxious weeds by physical or chemical methods, approved by the County Weed Supervisor. Those who fail to comply may be, "deemed negligent, and enforced control measures may be imposed at the discretion of county authorities."

iii. Cooperative weed management areas (CWMAs) can be an effective resource in the prevention, detection, and suppression of noxious and invasive weeds. The Middle Colorado River Watershed CWMA covers portions of both Grand and Uintah counties. Coordinated mechanical, chemical, and biological control over large areas by multiple stakeholders has proven successful for a variety of weed species. These areas replace jurisdictional boundaries in favor of natural boundaries that facilitate cooperation, coordination, and implementation of effective integrated weed management programs for listed noxious weeds (Utah Division of Wildlife Resources n.d.).

iv. The Utah Noxious Weed Act (Title 4, Chapter 17, Rule R68-09) provides for the control and management of noxious weeds in Utah. Private property owners, municipalities, and state agencies are all subject to the provisions of the Utah Noxious Weed Act. Federal agencies are subject to the provisions of the Federal Noxious Weed Act of 1974 (P.L. 93-629) as amended in 1990 (Section 15, Management of Undesirable Plants on Federal Lands). Under the 1990 amendment to the Federal Noxious Weed Act, federal agencies are directed to enter into agreements with appropriate state and local agencies to coordinate the management of noxious weeds.

v. The USDA is a primary leader involved in preventing the introduction of invasive species on a national level, largely through the Animal and Plant Health Inspection Service (APHIS). The Natural Resource Conservation Service (NRCS) also contributes to preventative measures and education on plants that may pose a risk to cropland, rangeland, or wildlands.

vi. The Grand County Weed Department manages state and county declared noxious weeds by informing landowners when these plants are on their land. The department also works with state and federal agencies to manage noxious weeds on land administered by them.

c. Economic Considerations

i. "The invasion of non-native plant species not only produces various ecological modifications, but also results in substantial socioeconomic impacts, particularly to the livestock industry and land management agencies responsible for fire suppression. Invasive plant species cause more economic loss on rangeland than all other pests combined. Invasive plants reduce the carrying capacity for livestock by lowering the forage yield. Consequently, the costs of managing and producing livestock increase" (Utah State University 2009).

ii. "The importance of herbicides in modern weed management is underscored by estimates that losses in the agricultural sector would increase about 500% from $4.1 billion to $20 billion per year without the use of herbicides" (Whitesides 2004).

iii. "The implementation of one control method is rarely effective in achieving the desired results for curtailing the spread of invasive plants. Successful long-term and cost-effective management programs should integrate a variety of mechanical, chemical, biological, and cultural control techniques. Integrated management involves the deliberate selection, combination, and implementation of effective invasive plant management strategies with due consideration of economic, ecological, and sociological consequences... Presently, there are several examples of integrated strategies used to manage invasive plants and improve rangeland communities. Much attention has been focused on the integration of targeted or prescription grazing with other control methods, as the incorporation of grazing management is an essential component in successfully addressing invasive plant problems" (Utah State University 2009).

iv. The BLM made payments of $56,000 in Grand County in FY 2010, $55,000 of which is from the Taylor Grazing Act and restricted to range improvements (e.g., predator control, noxious weed programs) in cooperation with the BLM or livestock organizations (Economic Profile System 2016).

d. Custom + Culture

i. "The Civilian Conservation Corps was not officially so designated until 1937 but had its beginnings in 1933. (The Grand County camp at Warner Lake was among the first of the nation's CCC camps.). . .The work was predominantly conservation- or reclamation-oriented. After constructing their camps and associated roads, the crews would work on local projects deemed important: these could involve planting trees, constructing firebreaks and trails, reclaiming damaged land, or repairing watercourses and working on flood-control measures. Fire-fighting was a major responsibility, but crews also worked on rangeland improvements, including road and trail construction, fencing, weed eradication and pest control, and development of wells, springs, and other water sources" (Firmage 1996).

ii. Because ranching and farming is a custom and part of the culture of the County, it is important to maintain ecological integrity in order to support and protect agricultural industries.

Noxious Weed Policies

1. Grand County calls on state and federal land management agencies to improve their management of noxious weeds on public lands.
2. *(Relevant existing policies found in the 2012 Grand County General Plan)*
    iii. Goal 3 - Minimize impacts of development on scenic resources.
        1. Strategy C - Consider amending the land use code to require the re-vegetation of disturbed areas and fallow agricultural land in developments prone to invasive plant species.

LIVESTOCK AND GRAZING

Definition

Livestock: domesticated animals raised in an agricultural setting to create food, fiber, labor, or other products.

Grazing: a method of feeding whereby domestic livestock consumes plant material and then convert it into meat, milk and other products

Related Resources

Land Use, Agriculture, Water Quality & Hydrology, Wilderness, Water Rights, Forest Management, Predator Control, Noxious Weeds, Wildlife, Threatened Endangered & Sensitive Species

Best Available Information Sources

a. A History of Grand County
b. Utah Agriculture Sustainability Task Force (2012)
c. The Livestock Grazing in Utah: History and Status (2008)
d. Rural Utah Economic Survival -- Federal Land Grazing (1991)
e. USDA National Agriculture Statistics Service

- *Full works cited page available here*

Findings

a. Overview

i. Livestock and grazing in Grand County has been practiced at different scales throughout its history. While the number of ranches and other livestock operations has declined over the years (Economic Profile System 2017), some residents maintain herds for economic and cultural reasons. The issue of livestock grazing is a sensitive topic for residents, with many stakeholders holding different views on the practice. Although the practices of raising livestock and grazing animals is commonly considered part of agriculture, this planning document addresses both issues separately. (Please refer to the agriculture section in this plan for more information on farming in general).

ii. "Historically, large cattle and sheep companies utilized the abundant forage of the La Sal Mountains in Grand County. Today the county is still home to cattle, sheep, horses, and other livestock, but ranks lower in overall numbers compared to other counties. Beef cow numbers in the county continue to decline in comparison to other counties in Utah. This trend of voluntary and mandatory reductions are most likely due to relatively small amounts of private land in the area, which has a direct effect on how many cattle

can be supported. Continually increasing wildlife numbers may also be a factor in the decline of cattle numbers" (Grand Conservation District 2012).

iii. The multiple and ever-changing cultures of Grand County create a situation where some residents value and rely on the practice, and others critique the environmental impact such practices can have if managed incorrectly.

iv. The 2016 Census of Agriculture estimated the total number of cows within Grand County's boundary to be just under 3,600 (NASS 2017). This count is marginally accurate since many animals come from out of the county or even out of the state and will be counted elsewhere at different periods of the year, and some other data was withheld to avoid disclosing information of individual operations.

b. Rangeland and Ecology

i. "Grand County is located within the Colorado Plateau ecoregion. The unique climate and geology of the Colorado Plateau allow for a substantial amount of biodiversity. Cover types in the Colorado Plateau consist of desert shrub, sagebrush and perennial grasslands, oak/mountain shrub, pinion-juniper woodland, and conifer and mountain shrub. Dominant shrub species include shadscale, sagebrush, greasewood, blackbrush, four-wing saltbush, Nuttall's saltbush, winterfat, Mormon tea, and rabbitbrush. Dominant grass species include saline wildrye, galleta, Indian ricegrass, western wheatgrass, needle, and thread grass and sand dropseed. Tree species include pinyon, Utah juniper, ponderosa pine, and Douglas fir" (Grand Conservation District 2012). Grand County contains numerous plant species that are endemic to the region, or even a particular site in the County, meaning that is the only place they grow.

ii. In addition to native vegetation, a number of non-native invasive species exist in the county. Federal, state and county agencies work to control and eradicate species such as salt cedar, cheatgrass, Russian knapweed, and Russian olive (M. Ure, Utah Department of Agriculture and Food, unpublished report).

iii. Some studies suggest that the ecological effects of ungulate grazing (including both domesticated, wild, and feral herds) can become compounded (Beschta et al. 2012; USFS 2014). For instance, livestock grazing and trampling can impact biological soil crusts which, in turn, protect against wind-driven erosion and dust emission which are exacerbated by drought. Ungulate herbivory can also impact riparian vegetation which can compound the stresses of increased aridity on riparian ecosystems (Beschta et al. 2012).

iv. In a recent 2014 analysis, the U.S. Forest Service "reviewed concerns related to range management and potential deficiencies in their forest plans" for the Dixie, Fishlake, and Manti-La Sal National Forests. Some resource concerns for various habitats include maintaining forage productivity, soil compaction, increase in invasive species, lack of diversity in plant species, and others.

c. Utah Context

i. *The Livestock Grazing in Utah: History and Status* report (2008) states, "Rangelands in Utah are primarily administered by the Bureau of Land Management (BLM) and Forest Service (FS). Data from the BLM indicate that use by domestic livestock has declined more than two-thirds over time. Most of this decline has been associated with the

reduction of the sheep industry. Similar data for the FS indicate that declines in the use of FS lands have not been as dramatic as on BLM lands, but usage of FS lands today is about half what it was 60 years ago" (Godfrey 2008).

ii. The 2008 report continues, "Every Utah livestock producer identified by the Utah office of the National Agricultural Statistics Service (NASS), as well as out-of-state operators with permits to graze public lands in Utah, were sent a survey that was designed to obtain information not available elsewhere. Analyses of these data indicate the following:

1. The number of animals owned by permittees is much larger than those owned by non-permittees.
2. Permittee operations are generally more dependent on livestock production than are non-permittees.
3. Most livestock operations have been owned by the same family for many years (commonly more than 50 years), and a large portion plan to have a family member operate the ranch in the future. This was especially true of permittee ranches.
4. A large portion of livestock producer sales are made to local firms, but an even larger percentage of their purchase are from local firms. As a result, firms in communities where livestock production is a large portion of the area's economic activity are intimately concerned with the health of the livestock industry.
5. Pasture is the primary source of feed for non-permittee livestock operators when they are not being fed hay (winter), while forage from public lands is the most important source of feed for permittee operators. Pasturelands are an important source of feed for all operators, but use of federal lands allows permittees to reduce their dependency on hay as a source of feed.
6. The market for grazing permits is poorly understood and not well defined. As a result, little is known about the economic demand for grazing permits.
7. Actual use of permits was generally less than permitted use in 2006, but this is not unusual. Many permittees have and continue to take voluntary non-use of federal lands as a result of reduced forage availability (primarily associated with drought).
8. Lands administered by the BLM provide the largest percentage of grazed forage by those having permits to graze federal or state administered lands. However, the percentage varies in the regions outlined in the study.
9. The most critical period of use of public lands for most permittees was during the summer.

Source: (Godfrey 2008)

d. Control v Influence

i. In large part Grand County private property owners and farm operators control this resource when occurring on private property. Where grazing takes place on public

lands, federal entities are responsible for land regulations. Because of the land ownership patterns, the vast majority of livestock proprietors rely on public land for grazing.

ii. Most of the land in Grand County is managed by federal land agencies. These agencies are bound to statutes intended to guarantee "multiple use and sustained yield".

e. Economic Considerations

i. According to data from the U.S. Department of Commerce, U.S. Department of Labor, USDA, there is evidence that farming and ranching have become much smaller drivers of the Grand County economy. In 2015, all agricultural employment (including farms and ranches) represented 1.2% of the total county employment. A total of 89 jobs were counted, 57 of which were considered "proprietors". In the same year, farm earnings represented 0.3% of the total amount earned by residents. The report shows that from 1970 to 2015, Grand County farm earnings shrank from $1.3 million to $0.8 million, a 40.4 percent decrease, while non-farm earnings grew from $123.0 million to $262.7 million, a 113.5 percent increase. The 2012 Census of Agriculture (the most recent data available) found that farms in Grand County were operating at an average loss of -$3,725. The average annual wages for those employed in farm jobs is roughly $5,000 higher than non-farm employment. (NASS 2017).

ii. Data from the Utah Department of Workforce Services indicates that over the last five years, there were less than five firms that provided support services directly to the agriculture and forestry industry. The jobs in that sector typically paid wages ($3,176/mo) that were 127% of the county average ($2,495/mo).

f. Custom + Culture

i. "[In the late 1800s] Utah's population also continued to grow rapidly; pressure to expand the ranges increased as available grazing, farming, and timber lands were appropriated and/or depleted. The Great Basin was rapidly becoming overstocked. Enterprising cattlemen in central Utah and western Colorado began to be curious about the land between, and, with the increased demand from the miners of western Colorado, beef prices rose, a fact that soon tempted Utahns. The creation of new laws and tighter regulations regarding the use of public lands were among the most important developments affecting Grand County in the years preceding the Great Depression, although the major changes brought by the Taylor Grazing Act (1934) and the creation of the Bureau of Land Management (1946) did not happen until later. The Forest Service was still the main government agency in regard to restrictions and regulations applied to county land" (Firmage 1996).

ii. "Despite the increased regulation, the livestock industry remained a dominant economic force in Grand County. Area woolgrowers applauded government policies such as protective tariffs on wool sponsored by Utah Republican Senator Reed Smoot, among others. The 24 April 1930 issue of the Times-Independent reported that 234,000 sheep had been sheared that season in southeastern Utah" (Firmage 1996).

iii. By the end of the century, grazing on federal lands had declined significantly. A report on rural Utah economics published by Utah State University estimated that 3,500 beef cows existed in 1988, and only 500 stock sheep and lambs were roaming public lands (Neilson 1991).

iv. Today, there is not one singular, dominant custom or culture, but rather a diversity of cultures and viewpoints that are changing and being added-to over time. Federal lands are mandated to be managed under multiple use and sustained yield, which requires that multiple interested parties work together to maximize the sustainable production of public lands. These interactions are best achieved when differing stakeholders work together.

Livestock + Grazing Policies

1. It is the policy of Grand County to encourage the BLM and the Forest Service to allow voluntary reductions in the number of livestock grazed in allotments and to allow voluntary non-use for conservation purposes.
2. *(Relevant existing policies found in the 2012 Grand County General Plan)*
    a. **Goal 4.** Support the continuance of agriculture with incentives and land use flexibility.
        i. Strategy A - Support voluntary efforts initiated by agricultural landowners to create Agriculture Protection Areas covering their properties per state code (Utah Code Title 17/Chapter 41).
        ii. Strategy B - Encourage interested agricultural landowners to take advantage of voluntary tax incentives by placing agricultural conservation easements on property that they own and wish to keep in agriculture.
        iii. Strategy C - Engage the community in revising the land use code to identify and reduce barriers to agriculture and value-added agricultural production such as building setbacks, food stand regulations and/or home occupations standards.
        iv. Strategy D - Continue to offer increased residential density as an incentive for developers to set aside irrigated agricultural land voluntarily as open space and keep some of the property in agricultural production.
        v. Strategy E - Educate the public regarding the needs of agriculture, grazing, and ranching enterprises.

ECONOMICS + SOCIETY

ECONOMIC CONSIDERATIONS

Vision

Grand County communities thrive and are sustainable due to a healthy balance between man, development, natural resources, and land health.

Economic Impact of Public Lands

Grand County has two distinct economic regions. The urban corridor focused on Moab City and the remaining rural area. The urban region has a robust and diversified economy, and the rural region has a natural resource based economy.

Grand County's natural resources and amenities are almost exclusively on federal and state lands. Therefore, how these resources are managed determines the long run sustainability of Grand County.

Note: An extensive description of Grand County's economic and demographic trends is found in Chapter 2 of the General Plan. An updated socioeconomic snapshot is available in Part 8, and each chapter of Grand County's Resource Management Plan includes a section on the economic impact of that resource using the best available information.

Objectives

1. The County has a strong and diverse tax base.
2. The County has low unemployment and residents are self-sufficient.
3. The County retains and preserves quality jobs.
4. The County is business-friendly and supports improved education, training, and advancing employment opportunities for people who choose to work in Grand County.
5. Quality jobs in Grand County are those that are full-time, year-round, and could support a household.

Policies

1. The County will promote economic development by coordinating with the State and neighboring jurisdictions.
2. The County does not support burdensome business regulations that could negatively impact quality employment opportunities.

RECREATION & TOURISM

Definition

Recreation is an activity done for enjoyment. Tourism is the social, cultural, and economic phenomenon of visiting places for pleasure.

Related Resources

Land access, Land Use, Cultural Historical Geological Paleontological, Wilderness

Best Available Information Sources

a. Utah Travel and Tourism Profile
b. Headwaters Economics: "The Economic Value of Public Land in Grand County" (2015)
c. U.S. Department of Labor (2015)
d. National Park Service Visitor Use Statistics
e. BLM Public Land Statistics
f. *Full works cited page available here*

Findings

a. Overview

i. Grand County is a rugged landscape of redrock canyons, mesas, busses, mountains, petrified sand dunes, variegated sandstone spires and other diverse erosional formations that beg to be explored. "Moab, Grand County's largest town and tourism hub, serves as a convenient launching pad to Arches National Park, Canyonlands National Park, the Colorado River, and Dead Horse Point State Park. Outdoor activities in Moab include river running, mountain biking, four-wheel driving, rock climbing, athletic events, art and music festivals, and many other local seasonal attractions" (Kem 2016). Visitors spend money on a variety of items, including hotels, restaurants, bars, sporting goods stores, gasoline, and other goods and services (Kem 2016). Moab draws a large number of international visitors during the tourist season and is also home to the world-famous Slickrock Trail (Kem 2016).

ii. "Tourists come from around the world and enjoy hiking, mountain biking, golfing, horseback riding, extreme sports, photography, four wheeling, rafting, canoeing, kayaking, jet boating, museum hopping, swimming, canyoneering, rock hounding, sightseeing, guided tours, and more" (Grand Conservation District 2012).

iii. Visitation to National Parks

1. "Arches National Park and Canyonlands National Park are both important to Grand County. National Park Service lands (i.e., Arches National Park) constitute only 3.3 percent of the land base in the county (76,600 acres), but Moab is the principal gateway to both national parks.
2. National parks bring outside money to local economies in two ways: visitor spending and payroll impacts generated primarily through park employment. The NPS reported that, in 2015, there were 1,399,247 visitors to Arches National Park. This represented an increase of over 384,000 new visitors per year compared to 2010. In the same year, the NPS reported 634,607 visits to Canyonlands National Park, up 46 percent from 2010 (National Parks Service n.d.).
3. In 2015, travel and tourism made up 36% of the total employment in Grand County, 32% of of which was from accommodation and food service businesses (Economic Profile System 2016).
4. "In fiscal year 2013, national park visitor spending contributed to 2,103 jobs and resulted in $146.5 million in spending. By comparison, total employment in Grand County for 2013 was 7,143" (Headwaters Economics 2015).

iv. Visitation to BLM Lands

1. "BLM lands constitute 66 percent of the land base in Grand County (1,554,471 acres) and the agency estimates that in fiscal year 2007 there were 1,179,500 visits to BLM Moab Field Office lands" (Economic Profile System, 2015).
2. Between Fall 2015 and Fall 2016, the BLM recorded 2,499,289 visits to the scenic canyon country, managed by the Moab Field Office. These comprised 1.6 million visitor days, an increase of 26% from 2010. Sites such as the Colorado Riverway, Canyon Rims, and the Sand Flats Area SRMA are especially popular (J. Jones, Bureau of Land Management, personal communication).
3. Mountain biking is a common recreation activity on BLM land and elsewhere. "A survey conducted by the Institute of Outdoor Recreation and Tourism discussed mountain bike use. Although this survey is not indicative of the entire mountain biking community, it does shed light on attitudes and perceptions of mountain bikers, particularly tourists, visiting the area. The typical mountain biker at Slickrock is either a college student or a well-established professional. This study suggests that on the whole, mountain bikers are typically well educated, and have disposable income" (BLM 2008).
4. Portions of the county overlap with the planning area of the BLM Moab Master Leasing Plan (MLP). Finalized in 2016, the MLP contains goals and objectives to provide for multiple recreational uses of the public lands and sustain a wide-range of recreation opportunities and potential experiences for visitors and residents, while supporting local economic stability and sustaining the recreation resource base and sensitive resource values (M. McGann, Bureau of Land Management, personal communication).

v. Visitation to Forest Service Lands

1. "U.S. Forest Service (Manti-La Sal National Forest) lands constitute 2.4 percent of the land base in Grand County (57,21 acres)" (Headwaters Economics 2015).
2. According to a visitor use report by the U.S. Forest Service (2016), there were an estimated 387,000 site visits to the Manti-La Sal NF in FY2011. For comparison, the BLM estimated 1,834,724 visits in 2010 to BLM lands in Grand County and visits to Arches and Canyonlands National Parks totaled more than 1.4 million in 2009) (Headwaters Economics 2015).
3. "The majority of visits (47%) to the Manti-La Sal National Forest were by locals. Non-local visits made up another 40 percent. The remainder of visitors were people for whom the forest was not their primary destination" (Headwaters Economics 2015).

vi. Visitation to State Lands

1. "State lands constitute 15.5 percent of the land base in Grand County (365,342 acres).
2. "SITLA lands are used in a number of ways, from grazing and mineral development to telecommunications sites, sightseeing, and recreation" (Headwaters Economics 2015).
3. Dead Horse Point State Park offers a visual experience overlooking where "immense vertical cliffs meet with canyons carved by ice, water and wind" (Utah State Parks n.d.). This park hosted over 400,000 visitors in 2015.
4. "In 2010 the new Intrepid Trail System for hikers and mountain bikers was established. This amenity is already drawing new users to the park. In part because gate staffing hours were expanded, park revenues are on the rise, and in FY 2011 were $710,000. Revenues now exceed operating costs almost two to one" (Headwaters Economics 2015).

vii. Attendance has spiked, partially because of the Utah Office of Tourism spending millions annually on an advertising campaign for the state's national parks. This has put stresses on the infrastructure of gateway communities such as Moab (Headwaters Economics 2015).

viii. Grand County recognizes the value of coordination with local municipalities.

b. Control v Influence

i. The County can influence recreation by providing adequate recreation infrastructure (showers, campsites, trails, etc) and advertising recreation resources. The County can not control consumers nor influence competing destinations.

c. Economic Considerations

i. "Grand County's economy has evolved from agriculture and uranium mining to outdoor recreation. Tourism is currently the main element of the county's economy. Interestingly, the performance of Grand County's economy is closely tied to that of the state. As the U.S. entered the Great Recession in 2009, the economies of the State of Utah and Grand County contracted nearly in unison and at similar rates. While the State of Utah experienced a 5.1 percent year-over drop in employment in 2009, the job losses

were not as severe in Grand County as its labor market only contracted 3.5 percent" (Grand Conservation District 2012).

ii. Today, tourism and recreation on public lands are the largest economic sector in Grand County. Businesses operating in these areas are the main drivers of the local economy and also produce a significant amount of tax revenue. Within this sector, accommodation and food services and retail trade are the dominant businesses, accounting for nearly all tourism and recreation jobs (Economic Profile System 2016).

iii. "Looking at federal public lands specifically, a 2007 analysis shows that area BLM lands supported 2,447 direct jobs that year. For the National Park Service, the agency's economic modeling shows that area national parks supported 2,103 direct jobs in 2013. (Note: these data should not be added together.) To put this in perspective, the U.S. Department of Commerce reports that in 2013 there were 7,143 total jobs in Grand County in 2013" (Headwaters Economics 2015).

iv. "Travel and tourism-related industries supported 1,792 private wage and salary jobs, or 47 percent of total employment in the county, as of 2014. These sectors provide goods and services to visitors to the local economy, as well as to the local population. These industries are: retail trade; passenger transportation; arts, entertainment, and recreation; and accommodation and food services" (Economic Profile System 2016).

v. "In 2014, the largest component of travel and tourism-related industries was accommodation and food services (i.e., hotels, restaurants, bars, etc.), which supported 1,474 private wage and salary jobs, representing 82 percent of travel and tourism-related jobs" (Economic Profile System 2016).

vi. "In 2013, area national park visitor spending contributed to an estimated $55.7 million in labor income. To put this in perspective, total labor earnings in Grand County for 2013 were $246 million" (Headwaters Economics 2015).

vii. "Local governments in Grand County collected more than $55 million to fund schools, public safety, roads, and other governmental services in 2013. Of the total revenue, about $9.8 million was generated from travel and tourism industries, or 18 percent of total revenue. This is an increase from 2009 which was $7.4 million in travel and tourism industry collections, or 16 percent of total revenue that year" (Headwaters Economics 2015).

viii. "Travel and tourism taxes bring in significant revenue to local governments, including Moab's resort community sales tax ($2.8 million), the county-wide transient room tax ($2.1 million), and the restaurant tax ($390,121). Local sales taxes on travel and tourism related industries also generate revenue. Food services and accommodations generated taxable sales of more $101 million in 2013. According to the Utah Department of Tourism, direct local tax collections (including sales taxes) related to tourism spending totaled $7.4 million in FY 2013" (Headwaters Economics 2015).

ix. Data from the Utah Department of Workforce Services indicates that over the last five years, there were on average 130 firms classified as "arts/entertainment/recreation" or "accommodation/food services" in Grand County. On average these firms provided just over 2,000 jobs, which equates to 40% of all jobs in the County. Wages in arts/entertainment/recreation ($5,833/mo) were 122% better than the county average

($2,495/mo). Wages in accommodation/food sector ($1,604/mo) were only 64% of the county average ($2,495/mo), and were among the lowest paid jobs in Grand County.

x. Data from the Utah Tax Commission indicates that the "arts/entertainment/recreation" and "accommodation/food services" sectors generated $167,336,343 in sales tax revenue for Grand County in 2016. This represents 45% of all activity in the County.

xi. The "retail trade" sector in Grand County is heavily influenced by tourism. DWS estimates that there are 81 firms that employ almost 800 people. The average wage for these employees ($2,232) is almost 90% of the county average ($2,495). This sector generated one-third of all sales tax in 2016 ($123,015,204).

d. Custom + Culture

i. "Grand County residents have embraced their public lands. More than one-third of families have a member that works in a tourism and recreation business related to public lands, and nearly two-thirds of local residents indicate that public lands are "extremely important" to their business (Headwaters Economics 2015).

ii. "In addition to the economic benefits of tourism and recreation, Grand County's picturesque and high profile public lands—and the environmental and recreational amenities they provide—are closely linked to population growth and other economic benefits. The county, for example, has had success attracting new residents who find the communities and surrounding public lands in the area compelling—almost one-third of net population growth in the last decade resulted from in-migration" (Headwaters Economics 2015).

iii. For more than a century, citizens and visitors have been taking advantage of the unique landscape in Grand County for recreation. Enjoyment of the natural features adds to the quality of life for those living in the county, and are essential for attracting new residents and visitors.

iv. Grand County recognizes the different management needs of frontcountry (developed, day-use, accessible), and backcountry (unimproved, wilderness) opportunities in the area.

Recreation + Tourism Policies

1. The Grand County economy is heavily influenced by public lands. The County's clear preference is that public lands remain owned and managed for public purposes.
2. Grand County seeks to coordinate local branding and advertising with the State Office of Tourism and other entities trying to attract tourism to the County.
3. Maintaining the quality of all resources and the quality of the visitor experience is a priority of the County.
4. When making decisions regarding recreation infrastructure, the County will ensure that some areas of limited accessibility are preserved.
5. Grand County encourages the utilization of technology to manage visitation.
6. Develop the County's ability to determine the capacity, number, and scope of events that can impact residents, visitors, and the resources.

7. The County supports gathering and filming events that are organized locally, and that meet operational expectations.
8. *(Updated, relevant existing policies that are found in the 2012 Grand County General Plan)*
    v. **Goal 1** - Make the County attractive for a wide range of economic sectors.
        1. **Strategy E** - Maintain and enhance the recreational, scenic, and cultural amenities unique to Grand County to attract and sustain economic activity.
    vi. **Public Lands Policy 15**. Support the BLM, Forest Service, and other organizations in studying and monitoring the socio-economic and environmental benefits and costs of recreation on public lands in Grand County.
    vii. **Public Lands Policy 20.** Encourage federal land agencies to continue to coordinate with the County on proposed campground development and expansion, specifically for areas within close proximity to Moab.
    viii. **Goal 1** - Support and participate in the Trail Mix Committee and the implementation of the Grand County Non-Motorized Trails Plan.
        1. **Strategy C** - Develop a fee-in-lieu of the voluntary open space incentives offered in the land use code. Use revenues to acquire land and/or easements in order to construct high-priority public trails and/or pathways.
        2. **Strategy D** - Classify public trail corridors and access to public lands as primary open space (top-priority to set-aside) within the voluntary open-space provisions of the land use code.

AIR QUALITY

Definition

The degree to which the ambient air is pollution-free, measured by a number of indicators of pollution.

Related Resources

Fire Management, Energy, Mining

Best Available Information Sources

a. U.S. Environmental Protection Agency
b. Utah Division of Air Quality 2015 Report
c. US Department of the Interior, National Park Service. 2004. Air Resources Management, RM #77
d. Stewart, H. 2012. "Air Quality is Important for a Healthy Economy". Utah Business, March 1

- *Full works cited page available here*

Findings

a. Overview

i. Air pollutants are those substances present in ambient air that negatively affect human health and welfare, animal and plant life, property, and the enjoyment of life or use of property. Ambient pollutant concentrations result from interaction between pollutant emissions. Because meteorology can't be controlled, emissions must be managed to control pollutant concentrations.

ii. "Grand County air quality is generally very good and is classified by the United States Environmental Protection Agency (EPA) as an attainment area for air quality. This means that the county's air meets the National Ambient Air Quality Standards (NAAQS) set forth by the EPA. The county has few negative impacts from industry and auto emissions. There are windows, mainly in the spring when wind erosion increases particulates during wind events to unacceptable levels. Herbicides and other pesticides are used very sparingly and contribute little to air and climate degradation. Air quality may be affected during nearby wildland fires. The county has very few confined animal feeding operations and limited complaints about odors. Winter temperature inversions can cause air quality issues for short periods" (Grand Conservation District 2012).

iii. "Because of its national parks and scenic vistas, Grand County is also designated as a Class 1 air quality area. This classification is meant to protect visual vistas from air quality impacts. 40 CFR Section 51.307 of the Clean Air Act requires the operator of any new

major stationary source of emissions or major modification located within 100 kilometers of a Class I area to contact the Federal Land Managers for that area in order to provide information about the emissions from the source and any possible impact on visibility in the Class 1 area" (Grand Conservation District 2012).

iv. Arches National Park falls under the Prevention of Significant Deterioration (PSD) program, which regulates the amount of pollution added to the airshed in the future. The park is Class I, which is the strictest designation. New development adjacent to the park must enact pollution controls, or change the rate of production to meet these standards.

v. "The Clean Air Act (CAA) requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The CAA establishes two types of air quality standards: primary and secondary. Primary standards are set to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. Secondary standards are set to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. . .The EPA has established health-based NAAQS for six pollutants known as criteria pollutants. These are carbon monoxide, nitrogen dioxide, ozone, particulate matter, sulfur dioxide, and lead. The DAQ monitors each of these criteria pollutants, as well as several non-criteria pollutants for special studies at various monitoring sites throughout the state" (Utah Division of Air Quality 2015).

b. Control v Influence

i. The Clean Air Act (1970) and its amendments set the laws and regulations regarding air quality, give authority to the US Environmental Protection Agency to set standards and rules, and delegate regulatory authority to individual states with EPA oversight, provided certain standards are met. The purpose of air quality conformity regulations, enforced by the EPA and the Utah Division of Air Quality (DAQ) in Utah, are to protect public health and welfare by decreasing pollutant concentrations through emissions reduction. Construction and mining projects require assessment of air quality impacts and may require an emissions permit and/or a fugitive dust control plan from the DAQ. Fines of up to $10,000 per day may be issued if rules/laws are not properly followed.

ii. Perhaps the most significant impact on the region is the Prevention of Significant Deterioration (PSD) program, which was established to keep areas with clean air clean by regulating the amount of pollution that could be added to these airsheds in the future. Three classes (I, II, and III) were created; Class I areas have the lowest allowed future emissions increase, Class II a moderate increase, and Class III have the largest increase (U.S. Environmental Protection Agency 2016).. Areas established as Class I were larger national parks, national monuments, and wilderness areas, all areas in which a clean atmosphere with good visibility is important (National Park Service 2004). All other federally protected areas with clean air were categorized as Class II. Arches National Park in Grand County and Canyonlands National Park in Grand, San Juan, Garfield, and Wayne counties are among the five Class I areas in Utah. Proposed new pollutant sources or changes to existing sources must demonstrate increases in pollutant concentrations within the allowable limit. This is more difficult near a Class I area due to a lower allowed pollutant increase. This requires greater pollution controls,

a decrease in production, and/or an increase in production per unit of pollutant emissions to meet lower emission limits (U.S. Environmental Protection Agency 2016).

c. **Economic Considerations**

i. Economic consequences of poor air quality may include:

1. Increased time away from work and health care costs associated with stroke, heart disease, chronic and acute respiratory diseases, including asthma, and premature death.
2. Decreased appeal of tourism.
3. Deterring new businesses and industries from moving to the area.
4. Increased operating expenses for significant pollutant sources due to pollution control measures as required by air quality management plans.
5. Stunted growth and yield of agricultural crops.
6. Threat of additional federal regulation and potentially reduced highway funding.
7. Dust-on-snow that hastens spring snowmelt, leading to late season depletion of streamflow, adversely affecting agriculture and other water users, and fish *(World Health Organization 2014, Pope et al. 1992, Utah Economic Council 2014, UDAQ 2012, NOAA 2009).*

d. **Custom + Culture**

i. Grand county residents and visitors alike value clean air.

Air Quality Policies

1. Grand County opposes any reduction in the protection, monitoring, and/or enforcement of air quality regulations.
2. The County will consider incentives and goals for renewables use.
3. Grand County supports air quality monitoring, particularly in the developed areas of the County.
4. The County supports opportunities and options for reducing its vulnerability to dust storm events.
5. Minimize health risks from air pollution and sustain the county's Class I air quality status.
6. *(Relevant existing policies found in the 2012 Grand County General Plan)*

ii. Encourage the National Park Service to continue monitoring air quality at Island in the Sky, to expand its air quality monitoring program and to notify the county of trends and potential air quality issues.

iii. Align development permit standards and review procedures with state and federal air-quality rules and regulations and mobilize state and federal air-quality agencies for enforcement.

iv. Enforce dust regulations in the Land Use Code.

v. Support efforts to establish an air quality committee to compile and share data with local and regional agencies and maintain relations with state and federal air-quality agencies.

LAW ENFORCEMENT

Definition

The designated personnel group who has federal, state, or local authority within a jurisdiction to enforce the law or respond to an emergency.

Related Resources

Recreation & Tourism, Land Use, Land Access, Fire Management, Water Rights

Best Available Information Sources

a. A History of Grand County

b. *Full works cited page available here*

Findings

a. Overview

i. Law enforcement goals in Grand County address public safety, property protection, and interagency coordination policies. County search and rescue teams are another important component of public safety related to public lands.

ii. An example of law enforcement coordination involving public lands is livestock theft. The Livestock Inspection Bureau at the Utah Department of Agriculture and Food deals with cases of livestock theft, in close coordination with county sheriff's offices. Cases of livestock theft are eventually prosecuted through the county attorney. Additionally, in situations of disease outbreak, the Livestock Inspection Bureau works with Sheriff's offices to help enforce livestock quarantines. Brand Inspection and Registration Program, Livestock Inspection Bureau Information (UDAF 2017)

b. Best Management Practices may include:

i. Coordinate interagency law enforcement (civil, wildlife resources, and recreation public use regulations) between the County, cities, tribes, Utah Division of Wildlife Resources, BLM, Forest Service, and the Utah Division of State Parks.

ii. Maintain law and order [on public lands] to protect the health and safety of persons using the area.

iii. Control litter, discourage vandalism, and perform search and rescue operations as appropriate.

iv. Designate areas where discharge of firearms, bow and arrow, or air and gas weapons is not appropriate.

v. Provide emergency communication and coordinate with local law enforcement.

vi. Ensure that appropriate fire management regulations and procedures are in place and enforced in [appropriate areas].

vii. Assess ways to financially support search and rescue operations in the county.

c. Sheriff's Office

i. The office of Sheriff is a constitutionally created office with duties prescribed by the Utah legislature. The Sheriff is the chief law enforcement officer for the county and is elected every 4 years. The sheriff has county-wide jurisdiction, but in practice, mostly concentrates activities outside city limits where municipal officers cannot operate. The Sheriff has been charged with the responsibility to maintain the public peace and protecting life and property of all citizens of Grand County. Obligations and responsibilities have continuously grown throughout the years (Grand County n.d.).

ii. The duties of the Sheriff's Office have increased as administrative procedures, court decisions, and requirements of the laws have brought about sophisticated and technical advancements to law enforcement (Grand County n.d.).

d. Economic Considerations

i. An appropriate level of service for law enforcement is essential for all levels of government to protect the health, safety, and welfare of the County, which will in turn positively impact the local industry. Benefits are direct and indirect.

ii. Annual operating costs for local law enforcement (County Sheriff's departments) are influenced by public lands law enforcement activities, including coordination activities with state and federal law enforcement agencies. Costs associated with search and rescue operations are increasing in many areas of the state, particularly with increased recreation use of remote lands. Utah counties have the option to charge people who are rescued and/or can receive reimbursement through the state's Search and Rescue Financial Assistance Program.

iii. The Utah Search and Rescue Assistance Card (USARA Card) offers expense-paid rescue to individuals (hunters, hikers, other backcountry enthusiasts) for an annual fee. Money raised by the program will support the State's Search and Rescue Financial Assistance Program. County Search and Rescue teams will receive reimbursement for equipment, training and rentals from the program. Such expenses are often borne by the counties.

e. Custom + Culture

i. Law enforcement has always been important to citizens in Grand County for the safety, protection, and security it provides

Law Enforcement Policy

1. Grand County citizens expect that county, state, and federal agencies will cooperate and coordinate their actions with each other where appropriate.

CULTURAL, HISTORICAL, GEOLOGICAL, + PALEONTOLOGICAL RESOURCES

Definition

In general terms, this refers to human and natural resources which have intrinsic value because of their age, anthropological, heritage, scientific or other intangible significance.

1. Cultural: of or relating to culture; societal concern for what is regarded as important in arts
2. Historic: of, or pertaining to, history or past events
3. Geological: the study of the Earth, its rocks, and their changes
4. Paleontological: includes the study of non-human fossils to determine organisms' evolution and interactions with each other and their environments

Related Resources

Land Access, Land Use, Energy, Air Quality, Law Enforcement, Mineral Resources, Mining, Recreation and Tourism, and Water Quality and Hydrology

Best Available Information Sources

a. A History of Grand County
b. National Parks Service - Arches NP
c. The Utah Antiquities Act
d. Utah Centennial County History Series
e. Utah Division of State History
f. Utah Heritage Foundation
g. Ringholz, R.C., 1991. Uranium frenzy: boom and bust on the Colorado Plateau. University of New Mexico Press.

- *Full works cited page available here*

Findings

a. Overview

i. Cultural and historical

1. Cultural resources include archaeological sites, standing structures (e.g., buildings, bridges), and even places of importance that are more than 50 years of age. Many historical and cultural resources are very sensitive and protected by law.

2. Prehistoric traces of the well-known Anasazi culture have been found in the area surrounding Arches National Park. Baskets, clay figurines, and other relics found in caves near Moab, indicate the Anasazi lived "a settled village life in valleys and highlands suited for agriculture." Grand County was far from the centers of Anasazi culture, so the indigenous people were likely influenced by the Fremont people to the north. Hundreds of traces of habitation like weapon fragments, pottery and basketry, and exquisite rock art along the Colorado River come from the Fremont people (Firmage 1996).

3. After the abandonment of the area by the Fremont and Anasazi around 700 BCE, linguistic and archaeological evidence indicates that early Numic speakers, such as the Ute and Southern Paiute, had become the primary occupants of southeastern Utah. By this time, the Navajo were also located in southeast Utah (Tipps et al. 1996).

4. As Spain's New World empire expanded, they searched for travel routes across the deserts to their California missions. One of these routes, called the Old Spanish Trail, linked Santa Fe and Los Angeles along the same path that Highway 191 takes today. The first reliable date for explorers appearing in the area is 1844, determined from an etching made by a fur trapper. In the 1880s and 1890s, Moab was settled permanently by a mix of ranchers, prospectors, and farmers (U.S. National Parks Travel Guide n.d).

5. Many of the local communities were heavily influenced economically by mining activities throughout the region. Mining began with the discovery of small amounts of gold along the Colorado and Little Dolores rivers, though most of the larger projects were located near the head of Westwater Canyon. Most of the mining took place between the 1880s and 1920s, with some sporadic attempts in later years (Horn et al.1994). In the early 1900s, uranium and radium mining had become profitable and there was a surge of prospecting and claim filing south of Moab. In 1915 Charles Snell found the Yellow Circle Mine near Upper Kane Springs, and the initial uranium ore shipments were used in coloring agents for ceramics (Tanner 1976 and Ringholz 1991).

6. A number of permits for oil and gas exploration were issued between Moab and US Interstate 70, starting in the 1920s. Large oil-producing fields were discovered in the late 1940s and 1950s in both the northern and southern parts of Grand County, increasing oil production in the area (Horn et al. 1994).

7. Many historical and cultural resources are fragile and are protected by law. The Antiquities Act (1906) was the first law that provided general

protection of cultural resources. The Archaeological Resources Protection Act (1979) provided for more effective enforcement of protection. The National Historic Preservation Act, as amended, expanded protection of historic and archaeological properties to include those of national, state, and local significance, and directed federal agencies to consider the effects of proposed actions on properties eligible for or included in the National Register of Historic Places.

8. The National Historic Preservation Act (1966) created the National Register of Historic Places, the list of National Historic Landmarks, and the State Historic Preservation Offices (SHPO). The National Register of Historic Places, managed by the National Park Service, is the nation's official list of buildings, districts, sites, structures, and objects worthy of preservation, and are officially designated "historic properties", either archaeological or historic (National Parks Service n.d.). The State Historic Preservation Office (SHPO) and Officer was created in order to coordinate a statewide inventory of historic properties, nominate properties to the National Register, manage the statewide preservation plan, and educate and consult locals (Utah Division of State History 2016).
9. In 2016, San Juan County had 20 sites listed on the National Register of Historic Places, including historic cabins, pioneer homes, prehistoric ruins, pictograph sites, and historic districts (National Parks Service n.d.).

ii. Geology

1. Geological features or resources can be defined as any physical feature of the earth's surface - or of the rocks exposed at the surface - that is formed by a geologic process (erosion and seismic movements).
2. Geology is another important part of planning because of the area's unique geologic features and sights, as well as identify potential development hazards, including faults, landslides/rockfall potential, and soil liquefaction potential (Hylland and Mulvey 2003).
3. Grand County is in the heart of the Colorado Plateau, characterized by large expanses of arid, largely rocky land carved by great river-cut canyons. This remarkable land is famous throughout the world for its spectacular beauty. While it offers great variety to the hiker and sightseer, it can become a series of impassable mazes to ranchers, mine developers, and road builders, among others (Firmage 1996).

iii. Soils

1. Much of the soil of the county is thin and/or alkaline, and bare rock is also common. However, there are good soils found in some of the benches, draws, and valleys of the county—soil that can nourish vital plant life (Firmage 1996).

2. "Erosion is a common problem for the Grand County area due to the sandy and clay texture of many of the soils. Little rainfall and resulting limited vegetation growth contribute to erosion, as soils are exposed to natural erosion. Runoff from intense summer thunderstorms rapidly sheds from barren rock outcrops and produces flash floods in the dry washes and canyon bottoms, increasing sediment in streams and reservoirs, and ultimately causing water quality and water storage capacity issues" (Grand Conservation District 2012).

iv. Seismicity

1. "Utah straddles the boundary between the extending Basin and Range Province to the west and the relatively more stable Rocky Mountains and Colorado Plateau to the east. This boundary coincides with an area of earthquake activity called the Intermountain Seismic Belt (ISB). Utah's longest and most active fault, the Wasatch fault, lies within the ISB. Unfortunately, the heavily populated Wasatch Front (Ogden – Salt Lake City – Provo urban corridor) and the rapidly growing St. George and Cedar City areas are also within the ISB, putting most of Utah's residents at risk" (Utah Seismic Safety Commission 2008).

2. "The Moab-Spanish Valley area is one of low historical earthquake activity. In general, earthquakes in the area are infrequent and of small to moderate magnitude (Wong and Humphrey, 1989; Wong and others, 1996). If a significant earthquake were to occur in the Moab-Spanish Valley area, potential geologic hazards would include ground shaking and possibly surface fault rupture, liquefaction, landslides, and rock falls. As discussed below, however, the possibility of any of these potential earthquake hazards causing appreciable damage is low" (Hylland and Mulvey 2003).

3. Earthquakes in the state could certainly impact the people, economy, and infrastructure of Grand County. Roads, pipelines, power lines, water resources, telecommunications, and food systems could all be disrupted in the event of a natural disaster.

4. Building codes that meet seismic standards are controlled by the County, and in some places the individual municipalities.

v. Archeological

1. Paleontological resources are the fossilized remains of animals (vertebrates and invertebrates) and plants, or traces or evidence of prehistoric animals.

2. "There have been extensive fossil remains of animals found in Grand County. For example, at Yellow Cat Flat northeast of Arches National Park two tons of dinosaur bones were found on the surface by the Beckwith expedition of the 1920s" (Firmage 1996).

3. "Laws are in place to make sure that federal and state projects don't carelessly destroy cultural resources... State and federal agencies that

undertake projects must "take into account" how their project activities will affect historic and archaeological resources. Common projects include construction, rehabilitation, demolition, licensing, permitting, or transfer of public lands...The State Historic Preservation Office (SHPO) provides guidance to agencies and governments who are affected by these laws" (Utah Division of State History n.d.).

4. The National Historic Preservation Act is legislation intended to preserve archaeological and historical sites in the US. The act created the National Register of Historic Places, the list of National Historic Landmarks, and the State Historic Preservation Offices (SHPO). The National Register of Historic Places, managed by the National Park Service, is the nation's official list of buildings, districts, sites, structures, and objects worthy of preservation, and are officially designated "historic properties", either archaeological or historic. The State Historic Preservation Office (SHPO) and Officer was created in order to coordinate a statewide inventory of historic properties, nominate properties to the National Register, manage the statewide preservation plan, and educate and consult locals.

5. Portions of the county overlap with the planning area of the BLM Moab Master Leasing Plan (MLP). Finalized in 2016, the MLP contains goals and objectives to identify, preserve, and protect significant cultural resources and ensure that they are available for appropriate uses for present and future generations. Additionally, to seek to reduce imminent threats and resolve potential conflicts from natural or human-caused deterioration or potential conflict with other resource uses by ensuring that all authorizations will comply with the National Historic Preservation Act Section 106. (M. McGann, Bureau of Land Management, personal communication).

6. The Utah Antiquities Act (UCA 9-8-404 et seq.) protects significant paleontological resources and applies to all paleontological resources that are on or eligible for inclusion in the State Paleontological Register.

b. Economic Considerations

i. The value of cultural, historical, geological and paleontological resources is difficult to quantify. However, there is intrinsic value to each resource for its contribution to the shaping of our current civilization, culture and lifestyle.

ii. Earthquakes in the Wasatch Front will certainly impact the people, economy, and infrastructure of Grand County. Roads, pipelines, power lines, water resources, telecommunications, and food systems could all be disrupted in the event of a natural disaster in Utah or western Colorado.

iii. Cultural, historical, geological, and paleontological resources are often connected with tourism and recreation.

iv. Historic buildings and districts provide character, a sense of stability, and a unique marketing angle for businesses; thus, community planners can draw upon local historic resources to stimulate economic development. A study by

the Utah Heritage Foundation found that, "Utah benefited by $717,811,000 in direct and indirect spending by visitors to Utah heritage sites and special events, and $35,455,268 in investment that stayed in Utah rather then sent to Washington, D.C. because of projects that utilized the Federal Rehabilitation Tax Credit" (Utah Heritage Foundation 2013).

v. Many individuals travel to experience someone else's landscape, heritage, and way of life. The Utah Department of Community and Economic Development (DCED) defines these individuals as "cultural heritage tourists". Cultural heritage tourism is a growing segment of the traveling public and often provides local communities with travel-related economic development while perpetuating local lifestyles and quality of life.

c. Custom + Culture

i. The custom and culture of Grand County is to respect all cultures and preserve or honor significant historical stories, figures, objects, structures, or events. It is the custom of the County and its residents to rely on the land and geology for fuel, fiber, food, and minerals. Mining, mineral extraction, and ranching have been a way of life for more than a century.

Cultural, Historical, Geological, and Paleontological Policies

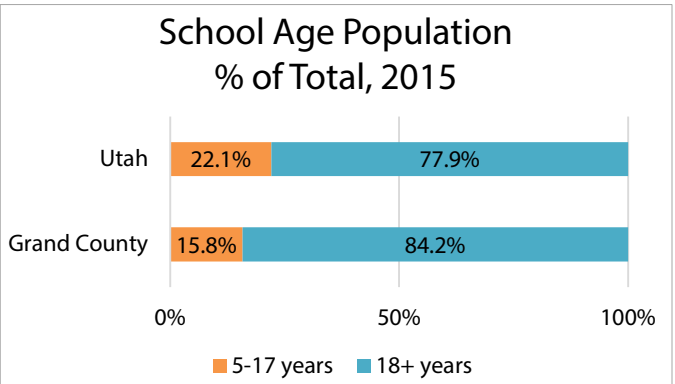
1. *(Relevant existing policies found in the 2012 Grand County General Plan)*

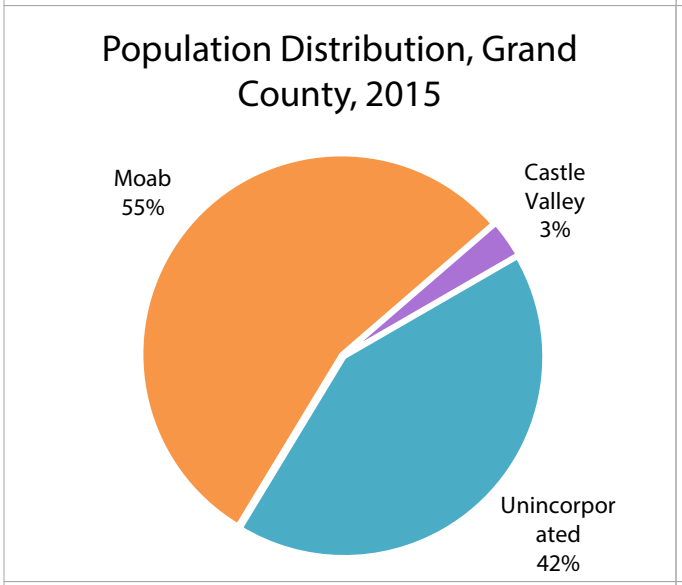
   a. It is the policy of Grand County to preserve and enhance designated significant historic and/or prehistoric assets and other structures and amenities which provide focal points and which broaden the cultural and preservation opportunities within the County.

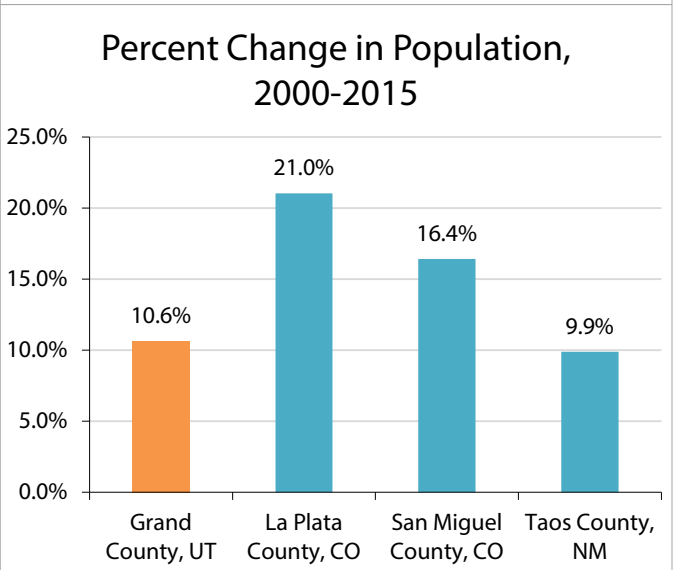
SOCIOECONOMIC SNAPSHOT

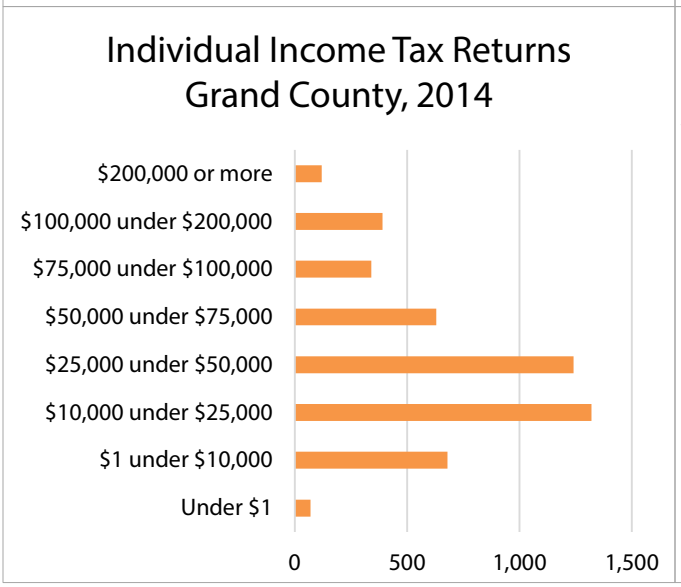
POPULATION + INCOME

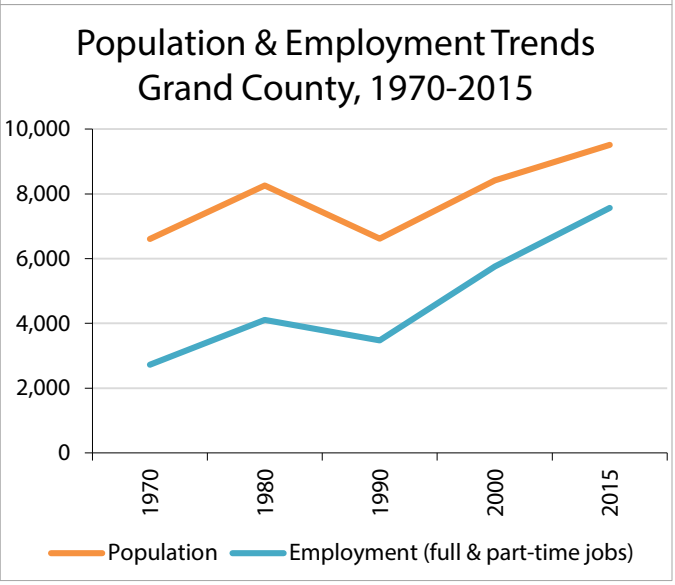
Grand County's population is difficult to estimate accurately. There are a large number of part-time residents and tourist visitors who's impact on local infrastructure and services isn't measured. The overwhelming majority of area residents are concentrated in the Moab area. has experienced growth in recent decades at the rate of around 1-3%. This rate of growth is slower than comparable areas in the West.





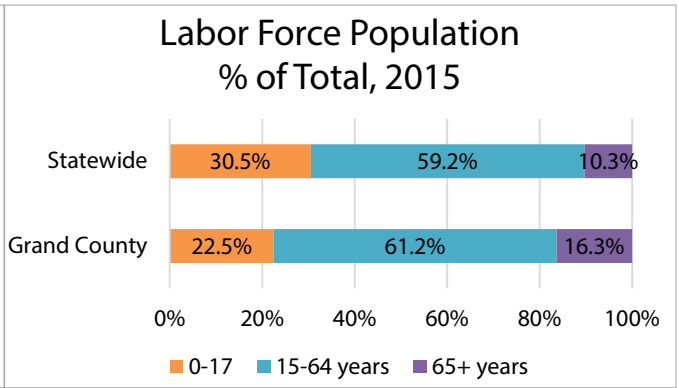


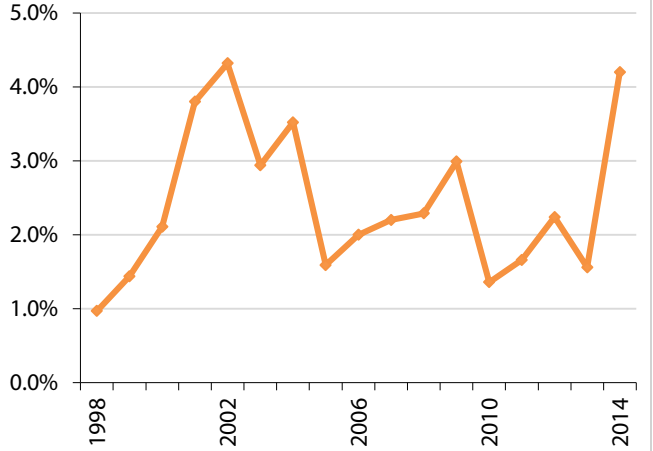


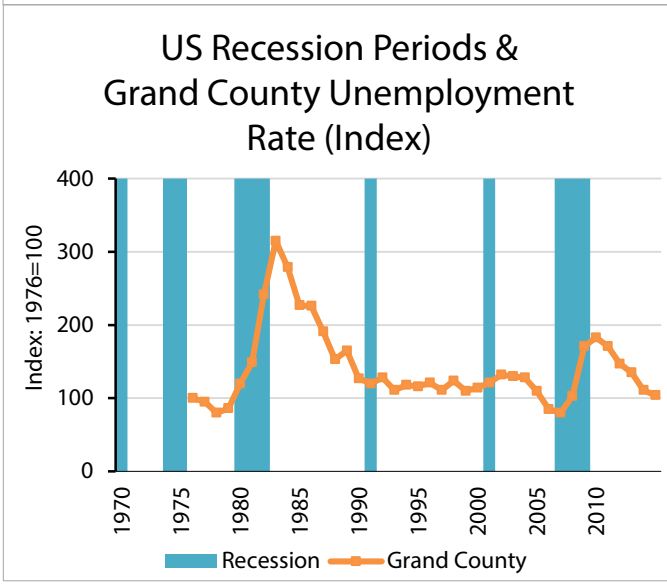


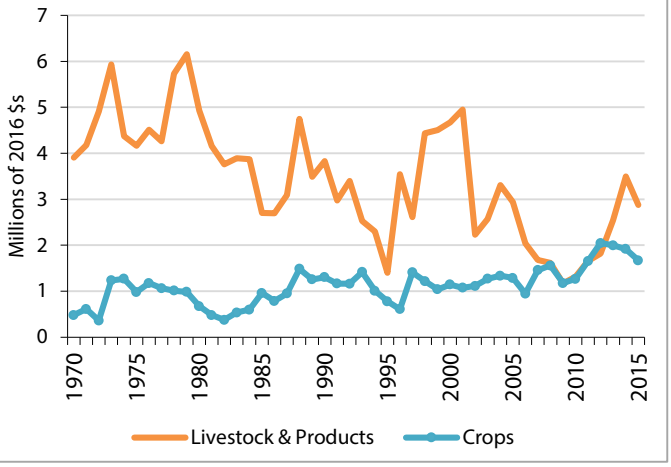
ECONOMY

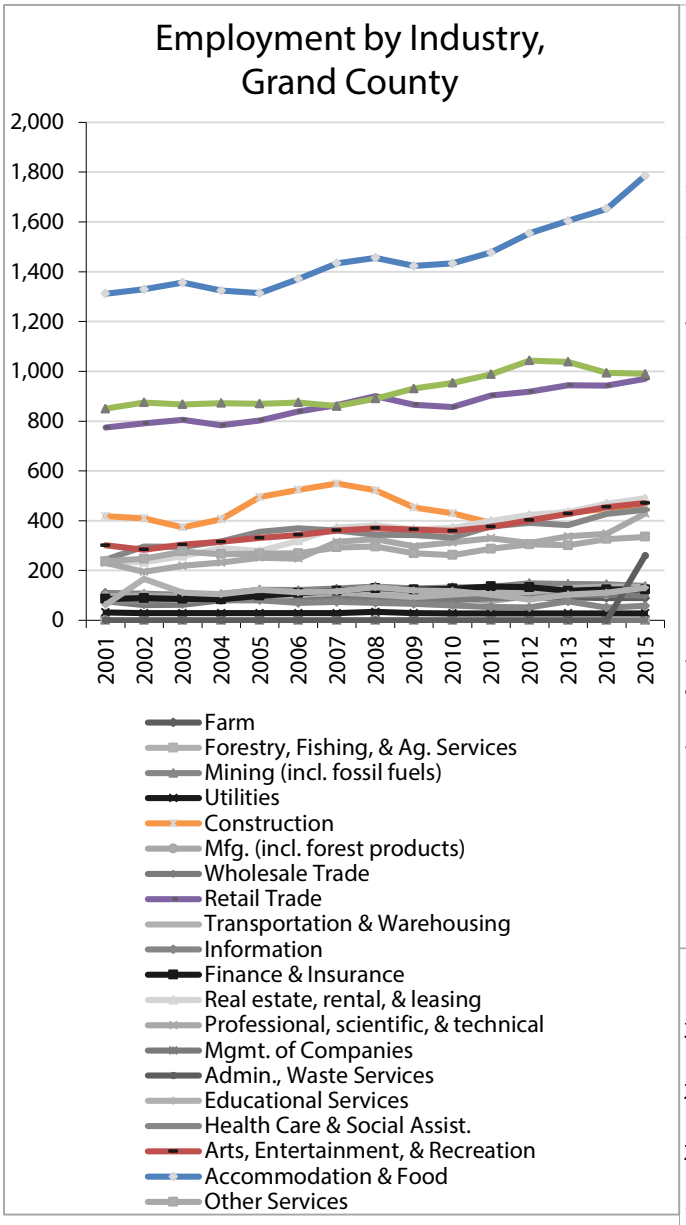
Grand County's economy is largely based on four main sectors: tourism and accommodation, professional services, government, and retail. Tourism is clearly the most dominant sector, and there are significant questions about what the County can do to influence it positively. There are growing concerns about the impact of tourism on the local natural resource amenities and infrastructure capacities.

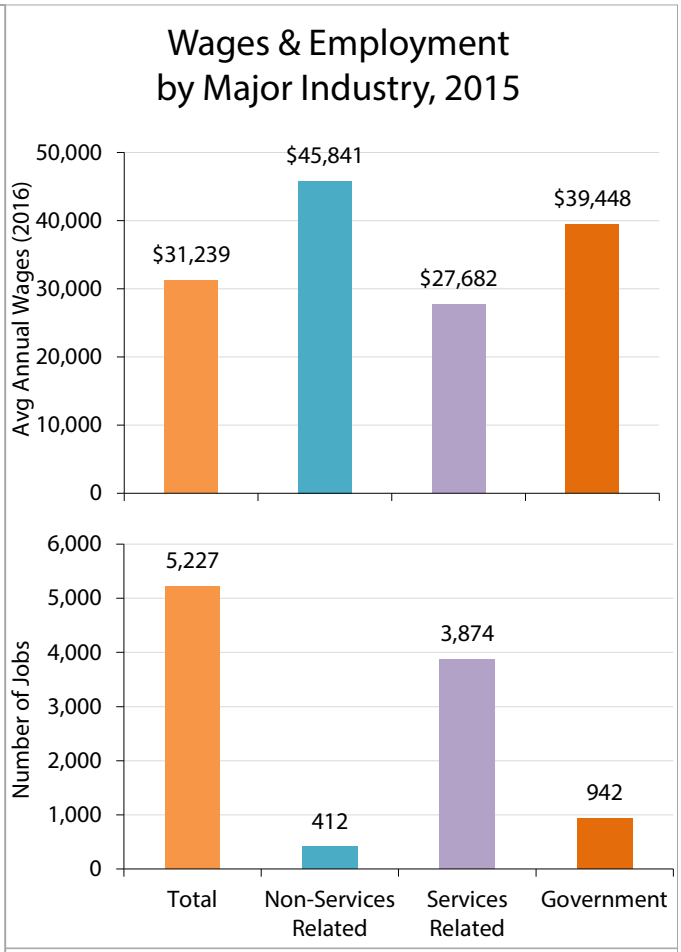


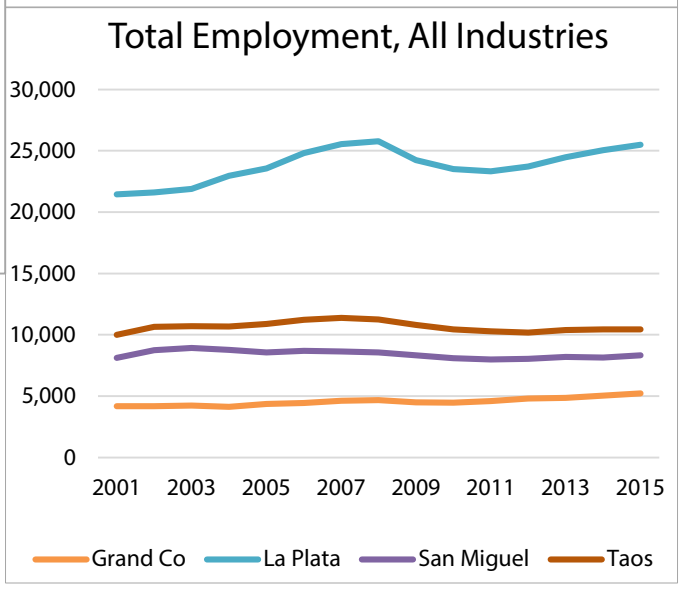







Employment by Industry, Grand County
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Farm
Forestry, Fishing, & Ag. Services
Mining (incl. fossil fuels)
Utilities
Construction
Mfg. (incl. forest products)
Wholesale Trade
Retail Trade
Transportation & Warehousing
Information
Finance & Insurance
Real estate, rental, & leasing
Professional, scientific, & technical
Mgmt. of Companies
Admin., Waste Services
Educational Services
Health Care & Social Assist.
Arts, Entertainment, & Recreation
Accommodation & Food
Other Services


Wages & Employment by Major Industry, 2015
Avg Annual Wages (2016)
50,000
40,000
30,000
20,000
10,000
0
$31,239
$45,841
$27,682
$39,448
Number of Jobs
6,000
5,000
4,000
3,000
2,000
1,000
0
5,227
412
3,874
942
Total
Non-Services Related
Services Related
Government


Total Employment, All Industries
30,000
25,000
20,000
15,000
10,000
5,000
0
2001
2003
2005
2007
2009
2011
2013
2015
Grand Co
La Plata
San Miguel
Taos

INFORMATION SOURCES & MAPS

INFORMATION SOURCES

Aguero, J. 2014. Utah's water dependent economy. Prepare60. <http://prepare60.com/Content/EconomicsWater.pdf>. Accessed 5 Jan 2017.

Animal and Plant Health Inspection Service [APHIS]. 2009. Partnerships and progress. U.S. Department of Agriculture. <https://www.aphis.usda.gov/wildlife_damage/downloads/partnerships%20in%20progress.pdf>. Accessed 5 Jan 2017.

Awake Utah Lake. 2009. Procedures of sovereign land management. Utah Lake Master Plan. Utah Lake Commission. <http://www.ffsl.utah.gov/images/statelands/utahlake/ProceduresOfSovereignLandMgmt.pdf>. Accessed 7 Jan 2017.

Bellison, N., R. Whitesides, S. Dewey, J. Merritt, S. Burningham. 2009. Noxious weed field guide for Utah. Utah State University Cooperative Extension. <http://extension.usu.edu/files/publications/publication/pub__8746541.pdf>. Accessed 9 Jan 2017.

Berry, J., D. Hurlbut, R. Simon, J. Moore, and R. Blackett. 2009. Utah renewable energy zones task force phase I report. Utah Geological Survey Miscellaneous publication 09-1. <https://energy.utah.gov/wp-content/uploads/UREZ-Phase-I.pdf>. Accessed 15 Oct 2016.

Beschta, R. L., D. L. Donahue, D. A. DellaSalla, J. J. Rhodes, J. R. Karr, M. H. O'Brien, TL Fleischner, and CD Williams. 2012. Adapting to climate change on western public lands: addressing the ecological effects of domestic, wild, and feral ungulates. Environmental Management 51(2):474-491.

Boden, T., K. Krahulec, D. Tabet, A. Rupke, and M. Vanden Berg. 2014. Utah's extractive resource industries. Utah Geological Society Circular 120. <http://files.geology.utah.gov/online/c/c-120.pdf>. Accessed 3 Nov 2016.

Bon, R. L., and K. Krahulec. 2010. Summary of mineral activity in Utah. Utah Geological Survey. Circular 111. <http://files.geology.utah.gov/online/c/c-111.pdf>. Accessed 28 Jan 2017.

Bruskotter, J. T., R. H. Schmidt, T. L. Teel. 2007. Are attitudes toward wolves changing? A case study in Utah. Biological Conservation 139(1-2):211-218.

Bureau of Land Management [BLM]. n.d. Public land statistics (1996-2008). <https://www.blm.gov/public_land_statistics/>. Accessed 4 May 2017.

Bureau of Land Management [BLM]. 2008. Moab field office record of decision and approved resource management plan. <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=94940>. Accessed 3 Nov 2016.

Bureau of Land Management [BLM]. 2012. Suitable wild and scenic river segments, Utah 2012. <https://www.blm.gov/style/medialib/blm/ut/natural_resources/wild_and_scenic_rivers.Par.67178.File.dat/WSR_Table2012.pdf>. Accessed 30 Oct 2016.

Bureau of Land Management [BLM]. 2012. Manual Transmittal Sheet 6400 – Wild and Scenic Rivers – Policy and Program Direction for Identification, Evaluation, Planning, and Management (Public). U.S. Department of the Interior. <https://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.76771.File.dat/M6400_WildScenicRivers_Final%20071312.pdf>. Accessed 30 Oct 2016.

Bureau of Land Management [BLM]. 2012. Socioeconomic report for the Canyon Country District Office Moab master leasing plan and associated environmental impact statement. <https://eplanning.blm.gov/epl-front-office/projects/lup/68430/88317/105657/Moab-MLP_Socioeconomic-Baseline-Final_web.pdf>. Accessed 16 Jan 2017.

Bureau of Land Management [BLM]. 2016. Record of decision and Moab master leasing plan/approved resource management plan amendments for the Moab and Monticello field offices. U.S. Department of the Interior. <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=99718>. Accessed 28 Mar 2017.

Bureau of Land Management Office of Public Affairs. 2001. The federal land policy and management act, as amended. U.S. Department of the Interior. <http://www.blm.gov/or/regulations/files/FLPMA.pdf>. Accessed 24 Oct 2016.

Cameco Corporation. 2017. Uranium spot price. <https://www.cameco.com/invest/markets/uranium-price>. Accessed 15 Mar 2017.

City of Moab. 2016. Moab water conservation plan 2016. <http://www.riversimulator.org/Resources/farcountry/MoabCity/MoabCityWaterConservationPlanFinal2016.pdf>. Accessed 6 Mar 2017.

Donaldson, F. J. 2007. Farmer beware: water rights enforcement in Utah. Journal of Land, Resources, and Environmental Law 27:367-385. <http://www.epubs.utah.edu/index.php/jlrel/article/viewFile/56/49>. Accessed 30 Oct 2016.

Downen, J. C., P. S. Perlich, J. E. Crispin, and A. Isaacson. 2009. The structure and economic impact of Utah's oil and gas exploration and production industry. Bureau of Economic and Business Research. University of Utah. <http://publiclands.utah.gov/wp-content/uploads/2013/08/Oil-Gas-Economic-Impact_July.pdf>. Accessed 17 Oct 2016.

Duffy-Deno, K.T., 1998. The effect of federal wilderness on county growth in the intermountain western United States. Journal of Regional Science 38(1):109-136.

Economic Profile System. 2016. A profile of federal land payments. Headwaters Economics. <https://headwaterseconomics.org/tools/economic-profile-system/>. Accessed 17 Oct 2016.

Economic Profile System. 2016. A profile of mining, including oil & gas. Headwaters Economics. <https://headwaterseconomics.org/tools/economic-profile-system/>. Accessed 17 Oct 2016.

Economic Profile System. 2016. A profile of industries that include travel & tourism. Headwaters Economics. <https://headwaterseconomics.org/tools/economic-profile-system/>. Accessed 17 Oct 2016.

Economic Profile System. 2017. A profile of agriculture: Grand County, UT. Headwaters Economics. <https://headwaterseconomics.org/tools/economic-profile-system/>. Accessed 18 Jan 2017.

Economic Profile System. 2017. A profile of land use. Headwaters Economics. <https://headwaterseconomics.org/tools/economic-profile-system/>. Accessed 15 Jan 2017.

Environmental Protection Agency. 2016. Cleaning up abandoned uranium mines. <https://www.epa.gov/navajo-nation-uranium-cleanup/cleaning-abandoned-uranium-mines>. Accessed 7 Mar 2017.

Firmage, R. A. 1996. A history of Grand County. Utah Centennial County History Series. Utah State Historical Society. <http://utah-primoprod.hosted.exlibrisgroup.com/primo_library/libweb/action/dlDisplay.do?vid=MWDL&afterPDS=true&docId=digcoll_usl_22library2_lib/34305>. Accessed 18 Sep 2016.

Godfrey, B. E. 2008. Livestock grazing in Utah: history and status. Utah State University, Logan, Utah.

Governor's Office of Energy Development. 2014. Utah's 10-year strategic energy plan 2.0. <http://energy.utah.gov/download/reports/10%20Year%20Strategy_2.0_03042014.pdf>. Accessed 9 Jan 2017.

Grand Conservation District. 2012. Grand county resource needs assessment. <http://www.uacd.org/resource-assessments-news>. Accessed 12 Oct 2016.

Grand County. n.d. Grand County sheriff's office. <http://www.grandcountyutah.net/240/Sheriff>. Accessed 12 Oct 2016.

Grand County. 2008. Grand County scenic byways corridor management plan. <http://www.grandcountyutah.net/DocumentCenter/View/152>. Accessed 16 Jan 2017.

Grand County. 2011. Spanish Valley storm drain master plan update. <http://www.grandcountyutah.net/DocumentCenter/View/132>. Accessed 16 Jan 2017.

Grand County. 2012. Grand County master plan. Moab, Utah.

Gurrister T. 2014. Ravens ravaging sage grouse in Box Elder. Standard Examiner. <http://www.standard.net/Environment/2014/05/29/Ravens-harassing-sage-grouse-in-Box-Elder-elsewhere>. Accessed 2 Feb 2017.

Headwaters Economics. 2015. The economic value of public lands in Grand County, Utah. <http://headwaterseconomics.org/land/reports/economic-grand-county/>. Accessed 12 Oct 2016.

Headwaters Economics. 2016. County payments: history, context and policy. <https://headwaterseconomics.org/dataviz/county-payments/>. Accessed 15 Nov 2016.

Headwaters Economics. 2016. A summary of research and careful analysis on the economic impact of protected federal lands. <https://headwaterseconomics.org/wp-content/uploads/Protected_Lands_Economics.pdf>. Accessed 15 Mar 2017.

Herndon, R. 2014. Transportation district commits $10,000 to Book Cliffs corridor study. The Moab Times-Independent. <http://www.moabtimes.com/view/full_story/25384293/article-Transportation-district-commits->. Accessed 5 Mar 2017.

Hoffmann R. 2012. New paradigm: WSU research prompts state policy to reduce cougar problems and overharvest, maintain ample hunting. Washington State University. <http://cahnrs.wsu.edu/news-release/2012/09/25/new-paradigm-wsu-research-prompts-state-policy-to-reduce-cougar-problems-and-overharvest-maintain-ample-hunting/>. Accessed 15 Mar 2017.

Horn, J, R. Alan, and S. Chandler. 1994. Grand County resource area class I cultural inventory. Alpine Archaeological Consultants, Inc. Montrose, Colorado.

Hylland M. D., and W. E. Mulvey. 2003. Geologic hazards of Moab-Spanish Valley, Grand County, Utah. Special Study 107. Utah Geological Survey. <http://www.riversimulator.org/Resources/farcountry/Geology/GeoHaz/SS-107.pdf>. Accessed 15 Oct 2016.

Jet Propulsion Laboratory, California Institute of Technology [Cal-Tech]. 2017. NASA dust-on-Snow data help Colorado River managers. National Aeronautics and Space Administration. <https://www.jpl.nasa.gov/news/news.php?feature=6724>. Accessed 22 Mar 2017.

Keith J., P. Jakus, J. Larsen, S. Burr, D. Reiter, and J. Zeitlin. 2008. Impacts of wild and scenic rivers designation. Utah State University. <http://digitallibrary.utah.gov/awweb/awarchive?type=file&item=27530> . Accessed 15 Oct 2016.

Kem C. Gardner Policy Institute. 2016. Utah travel & tourism profile: state and counties. University of Utah. <http://gardner.utah.edu/wp-content/uploads/2016/10/profiles_2015.pdf>. Accessed 18 Jan 2017.

Kim, M., and P. M. Jakus. 2013. The economic contribution and benefits of Utah's blue ribbon fisheries. Utah State University. <http://csee.usu.edu/files/uploads/CSEE_RR_4_Kim_and_Jakus_Feb_2013.pdf>. Accessed 15 Oct 2016.

Loss, S. R., T. Will, and P. P. Marra. 2013. The impact of free-ranging domestic cats on wildlife of the United States. Nature Communications 4:1396.

Maffly, B. 2016. BLM set to approve expansion of inactive uranium mine in Utah. The Salt Lake Tribune. <http://www.sltrib.com/home/4173217-155/blm-set-to-approve-expansion-of>. Accessed 15 Mar 2017.

Mine Safety and Health Administration [MSHA]. 2017. Mission. <https://www.msha.gov/about/mission>. Accessed 15 Mar 2017.

Moab Area Watershed Partnership [MAWP]. 2014. A comprehensive watershed management plan for the Moab area.

<http://www.riversimulator.org/Resources/farcountry/ClimateDocuments/aComprehensiveWatershedManagementPlanForMoabArea2014MAWP.pdf>. Accessed 4 Feb 2017.

National Agricultural Statistics Service. 2016. Utah annual statistics bulletin. U.S. Department of Agriculture. <https://www.nass.usda.gov/Statistics_by_State/Utah/Publications/Annual_Statistical_Bulletin/>. Accessed 21 Jan 2017.

National Agricultural Statistics Service. 2017. Quick stats database. U.S. Department of Agriculture. <https://quickstats.nass.usda.gov/results/DA8404E2-A5A5-349B-8982-B398240B2546>. Accessed 21 Mar 2017.

National Interagency Fire Center. 2015. Federal firefighting costs (suppression only). U.S. Department of the Interior. <https://www.nifc.gov/fireInfo/fireInfo_documents/SuppCosts.pdf>. Accessed 18 Oct 2016.

National Oceanic and Atmospheric Administration [NOAA]. 2009. State of the science fact sheet: air quality. <https://esrl.noaa.gov/csd/factsheets/airqualitysos.pdf>. Accessed 27 Feb 2017.

National Park Service. n.d. Arches National Park - about us. <https://www.nps.gov/arch/learn/management/index.htm>. Accessed 15 Nov 2016

National Parks Service. N.d. National register of historic places. Digital Archive on NPGallery. <https://npgallery.nps.gov/nrhp>. Accessed 18 Oct 2016.

National Parks Service [NPS]. n.d. Visitor use statistics. U.S. Department of the Interior. <https://irma.nps.gov/Stats/>. Accessed 30 Nov 2016.

National Park Service [NPS]. 2004. Air resources management. <https://www.nature.nps.gov/Rm77/air.cfm>. Accessed 12 Oct 2016.

National Park Service [NPS]. 2010. Partnership wild & scenic rivers. <https://www.nps.gov/pwsr/index.htm> Jan 3 2016.

National Park Service [NPS]. 2015. Screening for contaminants of emerging concern in waters of the Northern Colorado plateau network. <https://irma.nps.gov/DataStore/DownloadFile/551578>. Accessed 21 Mar 2017.

National Wild and Scenic Rivers System. 2016. A national system. <https://www.rivers.gov/national-system.php>. Accessed January 3 2017.

Natural Resources Conservation Service [NRCS]. 2009. Grand County resource assessment. U.S. Department of Agriculture. <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ut/technical/dma/nri/?cid=nrcs141p2_034115> Accessed 12 Oct 2016.

Neilson, D. 1991. Rural Utah economic survival -- federal land grazing. Utah State University. <http://digitalcommons.usu.edu/eri/7/>. Accessed 3 Nov 2016.

O'Brien M., P. Rogers, K. Mueller, R. MacWhorter, A. Rowley, and B. Hopkin. 2010. Guidelines for aspen restoration on the National Forests in Utah. <http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=8036&context=aspen_bib>. Accessed 14 Mar 2017.

Office of Legacy Management. 2017. Legacy management sites - Utah. U.S. Department of Energy. <https://www.lm.doe.gov/Utah/>. Accessed 7 Mar 2017.

Papich, B. n.d. Exotic weeds threaten Grand County. Grand County Weed Board. <http://www.grandcountyutah.net/DocumentCenter/View/181>. Accessed 16 Jan 2017.

Pope, C. A., J. Schwartz, and M. R. Ransom. 1992. Daily mortality and PM_{10} pollution in Utah Valley. Archives of Environmental Health: A International Journal 47(3).

Powell, A. K., editor. 1994a. Utah history encyclopedia. Wildlife management in Utah. The University of Utah Press. Salt Lake City.

Powell, A. K., editor. 1994a. Utah history encyclopedia. Uranium mining in Utah. The University of Utah Press. Salt Lake City.

Scott, D. 2004. The enduring wilderness. Fulcrum Publishing, Golden, Colorado, USA.

Soulé, M.E., J. A. Estes, B. Miller, and D. L. Honnold. 2005. Strongly interacting species: conservation policy, management, and ethics. BioScience, 55(2): 168-176.

Southeastern Utah Association of Local Governments [SEUALG]. 2003. Natural hazard pre-disaster mitigation plan. <http://wfrc.org/programs/pdmplans/SE/Part%2010.%20San%20Juan%20County.pdf>. Accessed 3 Nov 2016.

Stoddard, P. 2017. Update on the nuclear power plant for Green River. Emery County Progress. <http://ecprogress.com/news/update-on-the-nuclear-power-plant-for-green-river/article_c644dfe2-fec2-5c5b-83e9-ecc586f15882.html>. Accessed 15 Mar 2017.

Sutter, J. V., M. E. Andersen, K. D. Bunnell, M. F. Canning, A. G. Clark, D. E. Dolsen, and F. P. Howe. 2005. Utah comprehensive wildlife conservation strategy (CWCS). Utah Division of Wildlife Resources Publication Number 05-19. <http://iwjv.org/sites/default/files/utah_strategic_wildlife_action_plan.pdf>. Accessed 7 Jan 2017.

Tamarisk Coalition. n.d. Southeast Utah riparian partnership. <http://tamariskcoalition.org/events/southeast-utah-riparian-partnership>. Accessed 3 Nov 2016.

Tanner, F. M. 1976. The far country: a regional history of Moab and La Sal, Utah. Olympus Pub. Co..

Tipps, B, A. D. La Fond, and R. I. Birnie. 1996. Cultural resource investigations near White Crack, Island-in-the-Sky District, Canyonlands National Park, Utah. Cultural Resource Selections No. 11. Intermountain Region, National Park Service, Denver.

Udall, B. and J. Overpeck. 2017. The 21st century Colorado River hot drought and implications for the future. Water Resources Research. <http://onlinelibrary.wiley.com/doi/10.1002/2016WR019638/epdf>. Accessed 3 Feb 2017.

University of Utah, Bureau of Economic and Business Research. 2014. An analysis of a transfer of federal lands to the state of Utah. <http://publiclands.utah.gov/wp-content/uploads/2014/11/1.%20Land%20Transfer%20Analysis%20Final%20Report.pdf> Accessed 18 Oct 2016.

U.S. Department of Agriculture [USDA]. 2011. Cattle and calves nonpredator death loss in the United States, 2010. USDA–APHIS–VS–CEAH. Fort Collins, CO. #631.1111. <https://www.aphis.usda.gov/animal_health/nahms/general/downloads/cattle_calves_nonpred_2010.pdf>. Accessed 5 Jan 2017.

U.S. Department of Agriculture [USDA]. 2012. Grand County profile. Census of Agriculture. <https://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Utah/cp49019.pdf>. Accessed 18 Sep 2016.

U.S. Department of Agriculture [USDA]. 2015. Wildlife services protects resources. Animal and Plant Health Inspection Service. <https://www.aphis.usda.gov/aphis/ourfocus/wildlifedamage/SA_Protected_Resources>. Accessed 7 Jan 2017.

U.S. Department of Agriculture [USDA]. 2016. November 2016 crop acreage data. Farm Service Agency. <https://www.fsa.usda.gov/news-room/efoia/electronic-reading-room/frequently-requested-information/crop-acreage-data/index>. Accessed 29 Nov 2016.

U.S. Department of Energy. 2015. Utah wind resource map and potential wind capacity. <http://apps2.eere.energy.gov/wind/windexchange/wind_resource_maps.asp?stateab=ut>. Accessed 9 Mar 2017.

U.S. Department of the Interior, U.S. Fish and Wildlife Service, and U.S. Department of Commerce, U.S. Census Bureau. 2011. National survey of fishing, hunting, and wildlife-associated recreation. <https://www.census.gov/prod/2012pubs/fhw11-nat.pdf>. Accessed 18 Jan 2017.

U.S. Department of the Interior. 2016. Payment in lieu of taxes. <https://www.doi.gov/pilt>. Accessed 12 Dec 2016.

Utah Division of Air Quality [UDAQ]. 2012. It's up to all of us (Video File). <https://www.youtube.com/watch?v=Vi9WF1FptG4>. Accessed 27 Feb 2017.

Utah Economic Council. 2014. Utah economic outlook. <http://www2.eccles.utah.edu/sites/default/files/media/outlook.pdf>. Accessed 27 Feb 2017.

U.S. Environmental Protection Agency. 2015. What are wetland functions? <https://www.epa.gov/wetlands/what-are-wetland-functions>. Accessed 21 Oct 2016.

U.S. Environmental Protection Agency. 2016. Prevention of significant deterioration basic information. <https://www.epa.gov/nsr/prevention-significant-deterioration-basic-information>. Accessed 24 Oct 2016.

U.S. Fish & Wildlife Service. 2015. Endangered species act: overview. U.S. Department of the Interior. <https://www.fws.gov/endangered/laws-policies/>. Accessed 7 Jan 2017.

U.S. Fish & Wildlife Service. 2016. National wetlands inventory. U.S. Department of the Interior. <https://www.fws.gov/wetlands/data/Mapper.html>. Accessed 12 Oct 2016.

U.S. Forest Service. 1986. Manti-La Sal land and resource management plan. <https://www.fs.usda.gov/detail/mantilasal/landmanagement/planning/?cid=stelprdb5383364>. Accessed 24 Oct 2016.

U.S. Forest Service. 2008. Record of decision and forest plan amendments. Wild and Scenic River Suitability Study for National Forest System Lands in Utah. <https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5122056.pdf>. Accessed 16 Jan 2017.

U.S. Forest Service. 2014. Initial review of livestock grazing effects on select ecosystems of the Dixie, Fishlake, and Manti-La Sal National Forests. <https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3810252.docx>. Accessed 21 Mar 2017.

U.S. Forest Service. 2016. Visitor use report: Manti-LaSal NF. <https://apps.fs.usda.gov/nfs/nrm/nvum/results/ReportCache/2011_A04010_Master_Report.pdf>. Accessed 2 Mar 2017.

U.S. Geological Survey [USGS]. 2010. 2010-2011 Minerals Yearbook. <https://minerals.usgs.gov/minerals/pubs/state/2010_11/myb2-2010_11-ut.pdf>. Accessed 16 Jan 2017.

U.S. Geological Survey [USGS]. 2016. Potash cache: USGS study summarizes U.S. sources of an essential nutrient for agriculture. <https://www.usgs.gov/news/potash-cache-usgs-study-summarizes-us-sources-essential-nutrient-agriculture>. Accessed 20 Mar 2017.

U.S. Government Accountability Office [GAO]. 2017. Hardrock mining on federal lands. <http://www.gao.gov/key_issues/hardrock_mining_federal_lands/issue_summary>. Accessed 5 Mar 2017.

U.S. National Parks Travel Guide. n.d. Arches national park culture. <http://www.us-parks.com/arches-national-park/culture.html>. Accessed 4 Nov 2016.

Utah Department of Agriculture and Food [UDAF]. 2012. Planning for agriculture. Utah Agriculture Sustainability Task Force. <http://ag.utah.gov/documents/Agtaskforce.pdf>. Accessed 4 Nov 2016.

Utah Department of Agriculture and Food [UDAF], and Utah Department of Natural Resources [UDNR]. 2012. Collaborative group on sustainable grazing for U.S. Forest Service lands in Southern Utah. <http://www.ag.utah.gov/documents/SustainableGrazingSoUtForests.pdf>. Accessed 15 Mar 2017.

Utah Department of Agriculture and Food [UDAF]. 2017. Band inspection & registration. <http://ag.utah.gov/animal/animal-identification.html>. Accessed 17 Jan 2017.

Utah Department of Transportation [UDOT]. 2013. Final report: Uinta Basin energy and transportation study. <https://www.udot.utah.gov/projectpages/TIGSOWNER.gf?f=App%20F%20-%20UBETS%20Final%20Report%20April%202013%20-%20Rev%201.pdf>. Accessed 5 Mar 2017.

Utah Division of Air Quality. 2015. Annual report. Utah Department of Environmental Quality. <http://www.deq.utah.gov/Divisions/daq/info/annualreports/docs/2015/02Feb/Final_Annual_Report_2015.pdf>. Accessed 17 Oct 2016.

Utah Division of Forestry, Fire, & State Lands. 2013. Master cooperative wildland fire management and Stafford Act response agreement. Utah Department of Natural Resources. <https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5409791.pdf>. Accessed 18 Jan 2016.

Utah Division of Forestry, Fire & State Lands. 2014. Utah forest health highlights. Utah Department of Natural Resources. <http://www.ffsl.utah.gov/images/forestry/health/StateHighlights2014.pdf>. Accessed 18 Sep 2016.

Utah Division of Forestry, Fire, & State Lands. 2016. Utah forest action plan. Utah Department of Natural Resources. <http://www.ffsl.utah.gov/images/forestry/stateassessment/UtahFAP-2016-LowRes.pdf>. Accessed 19 Sep 2016.

Utah Division of Oil, Gas, and Mining [DOGM]. 2017. Live data statistics. Utah Department of Natural Resources. <http://www.oilgas.ogm.utah.gov/Statistics/Statistics.cfm>. Accessed 3 Nov 2016.

Utah Division of State History. 2016. SHPO compliance. Utah Department of Heritage & Arts. <https://heritage.utah.gov/history/shpo-compliance>. Accessed 10 Oct 2016.

Utah Division of Water Resources. 2000. Utah state water plan - Southeast Colorado river basin. <https://collections.lib.utah.edu/details?id=1158996>. Accessed 3 Nov 2016.

Utah Division of Water Rights [UDWRi]. 2011. Water right information. Utah Department of Natural Resources. <http://www.waterrights.utah.gov/wrinfo/>. Accessed 15 Oct 2016.

Utah Division of Water Rights [UDWRi]. 2014. Canal companies and contact information. Utah Department of Natural Resources. <https://www.waterrights.utah.gov/canalinfo/canal_owners.asp>. Accessed 15 Oct 2016.

Utah Division of Water Rights [UDWRi]. 2015. Private Canal Owners and Contact Information. <http://www.waterrights.utah.gov/canalinfo/canal_priv_owners.asp>. Accessed 14 Nov 2016.

Utah Division of Water Quality. 2013. Nutrient pollution in Utah. Utah Department of Environmental Quality. <http://www.deq.utah.gov/Topics/FactSheets/docs/handouts/nutrients.pdf>. Accessed Jan 9 2017.

Utah Division of Wildlife Resources [UDWR]. n.d. Participating CWMU properties. Utah Department of Natural Resources. <https://wildlife.utah.gov/maps/public/list_cwmus.php>. Accessed 18 Jan 2017.

Utah Division of Wildlife Resources [UDWR]. 2009. Utah aquatic invasive species management plan. Utah Department of Natural Resources Publication No. 08-34..
<https://wildlife.utah.gov/pdf/AIS_plans_2010/AIS_mgt_plan_full.pdf>. Accessed 15 Oct 2016.

Utah Division of Wildlife Resources [UDWR]. 2012. Predator management in Utah.
<https://wildlife.utah.gov/pdf/fact_sheets/predators.pdf>. Accessed 13 Mar 2017.

Utah Division of Wildlife Resources. 2015. Blue ribbon fisheries map.
<https://wildlife.utah.gov/hotspots/blueribbon.php>. Accessed 8 Sep 2016.

Utah Division of Wildlife Resources. 2015. County lists of Utah's federally listed threatened, endangered, and candidate species. <http://dwrcdc.nr.utah.gov/ucdc/ViewReports/te_cnty.pdf>. Accessed 16 Jan 2017.

Utah Division of Wildlife Resources [UDWR]. 2015. Deer herd management plan #14.
<https://wildlife.utah.gov/hunting/plans/deer_14.pdf>. Accessed 20 Mar 2017..

Utah Division of Wildlife Resources [UDWR]. 2015. Greater sage-grouse habitat (GIS Data).
<http://dwrcdc.nr.utah.gov/ucdc/downloadgis/disclaim.htm>. Accessed 17 Jan 2017.

Utah Division of Wildlife Resources [UDWR]. 2015. Participating CWMU properties.
<https://wildlife.utah.gov/maps/public/list_cwmus.php>. Accessed 8 Sep 2016.

Utah Division of Wildlife Resources [UDWR]. 2015. Utah wildlife action plan; 2015-2025. Utah Department of Natural Resources. DWR publication 15-14. <https://wildlife.utah.gov/wap/Utah_WAP.pdf>. Accessed 3 Nov 2016

Utah Division of Wildlife Resources [UDWR]. 2015. Utah's state listed species by county.
<http://dwrcdc.nr.utah.gov/ucdc/ViewReports/sscounty.pdf>. Accessed 7 Jan 2017.

Utah Division of Wildlife Resources [UDWR]. 2016. Utah community fisheries map. <https://wildlife.utah.gov/cf/community_fisheries/index.html>. Accessed 8 Sep 2016.

Utah Geological Survey. n.d. Wetland information center. Utah Department of Natural Resources. <http://geology.utah.gov/resources/wetlands/>. Accessed 12 Oct 2016.

Utah Heritage Foundation. 2013. Profits through preservation: executive summary. <http://www.utahheritagefoundation.com/preservation-resources/econstudy#.WH7MV1UrKpo>. Accessed 3 Nov 2016.

Utah Native Plant Society. n.d. Rare plants introduction. <http://www.unps.org/index.html?PAGES/rare.html>. Accessed 10 Jan 2017.

Utah Native Plant Society. 2010. Utah rare plant guide: species by county. <http://www.utahrareplants.org/pdf/SpeciesCounty.pdf>. Accessed 14 Mar 2017.

Utah Seismic Safety Commission. 2008. Putting down roots in earthquake country. Utah Geological Survey. <https://www.utah.gov/beready/documents/roots_earthquake_low.pdf>. Accessed 3 Jan 2017.

Utah State Parks. n.d. Dead Horse Point state park. Utah Department of Natural Resources. <http://stateparks.utah.gov/parks/dead-horse/>. Accessed 4 Sep 2016.

Utah State University [USU]. 2005. Grand County agricultural profile. USU Cooperative Extension Service. <http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1098&context=extension_curall>. Accessed 4 Sep 2016.

Utah State University [USU]. 2009. Rangeland resources of Utah. USU Cooperative Extension Service.<https://extension.usu.edu/utahrangelands/files/uploads/RRU_Final.pdf>. Accessed 3 Nov 2016.

Western Forestry Leadership Coalition. 2009. The true cost of wildfire in the Western US. Lakewood, Colorado. <https://www.blm.gov/or/districts/roseburg/plans/collab_forestry/files/TrueCostOfWilfire.pdf>. Accessed 18 Oct 2016.

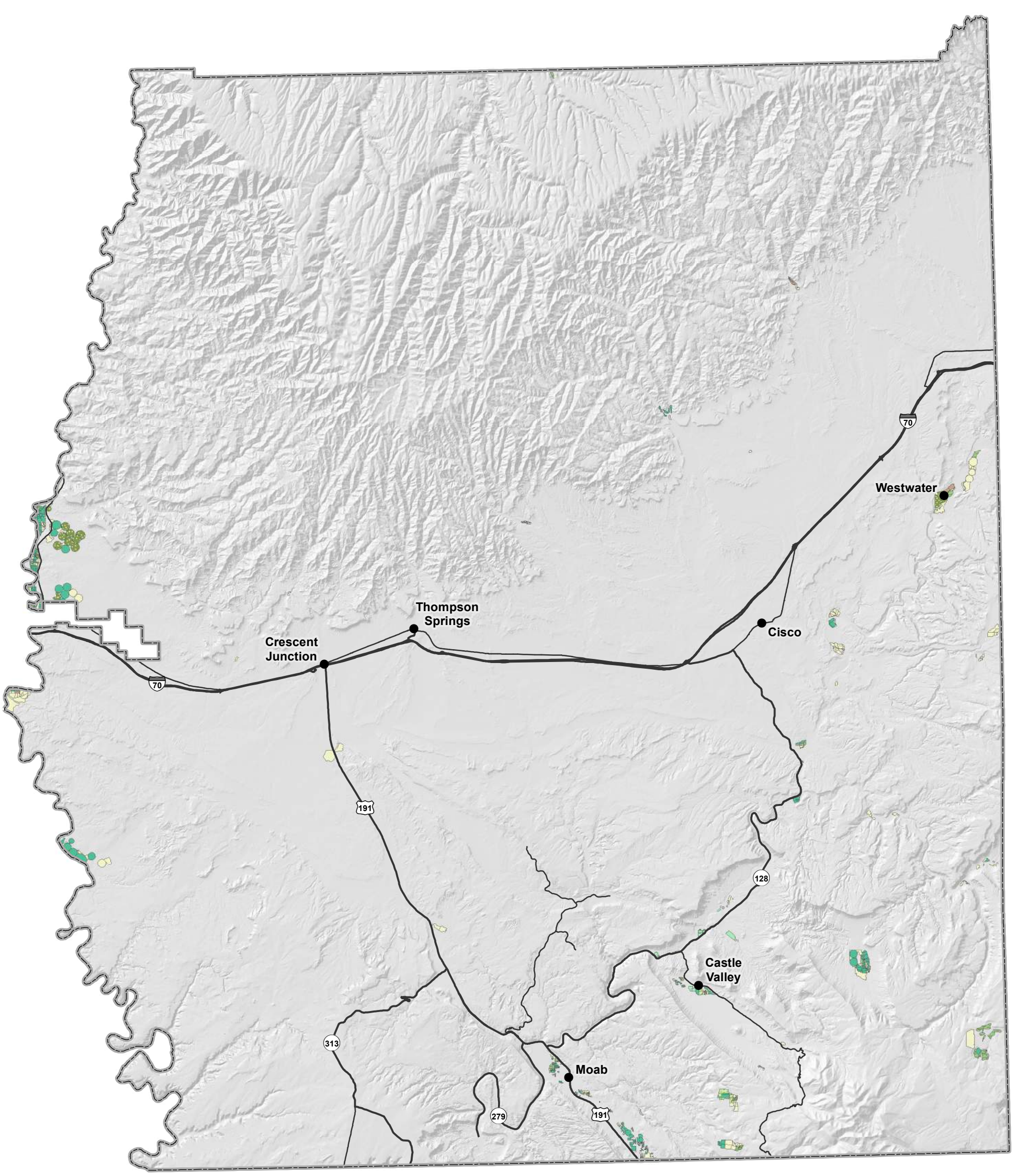
Whitesides, R. E. 2004. The Utah strategic plan for managing noxious and invasive weeds. Utah Weed Advisory Council and The Utah Weed Control Association. <http://www.utahweed.org/PDF/strategic_plan.pdf>. Accessed 31 Jan 2017.

World Health Organization. 2014. Ambient (outdoor) air quality and health: fact sheet N°313. <http://who.int/mediacentre/factsheets/fs313/en/>. Accessed 25 Feb 2016.

World Wildlife Fund. 2004. The economic values of the world's wetlands. <http://d2ouvy59p0dg6k.cloudfront.net/downloads/wetlandsbrochurefinal.pdf>. Accessed 4 Jan 2017.

Grand County Agriculture

Crop Type



Crop Type

- Alfalfa
- Beans
- Corn
- Fallow
- Grass Hay
- Grain
- Idle
- Other Horticulture
- Melons/Pumpkins/Squash
- Orchard
- Pasture
- Vineyard

N

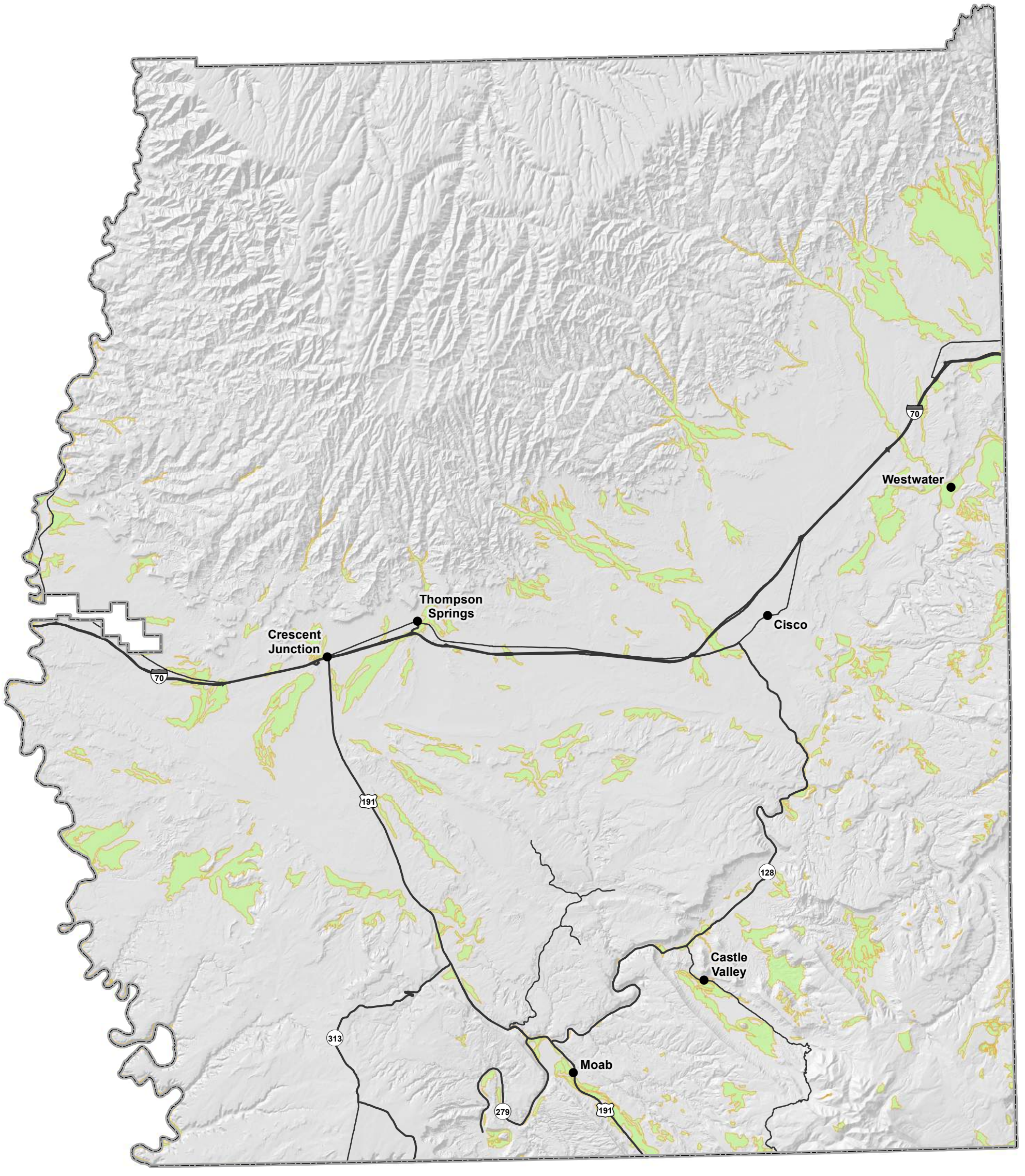
0 2.5 5 Miles

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Agriculture

Prime, Unique, & Important Farmland



Prime, Unique, and Important Farmland

N

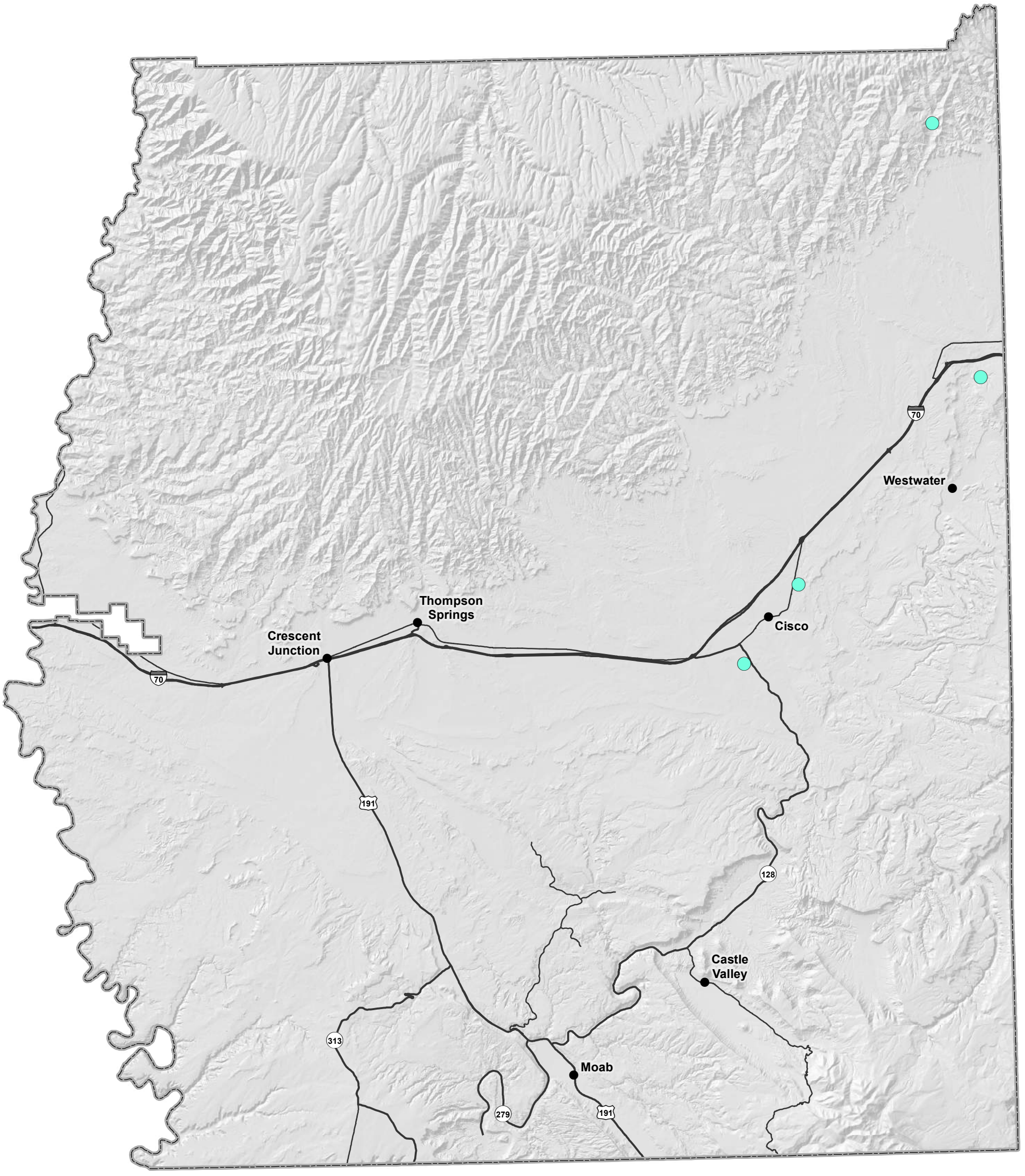
0 2.5 5 Miles

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Air Quality

Air Emissions Inventory



Utah Division of Air Quality
Air Emissions Inventory

N

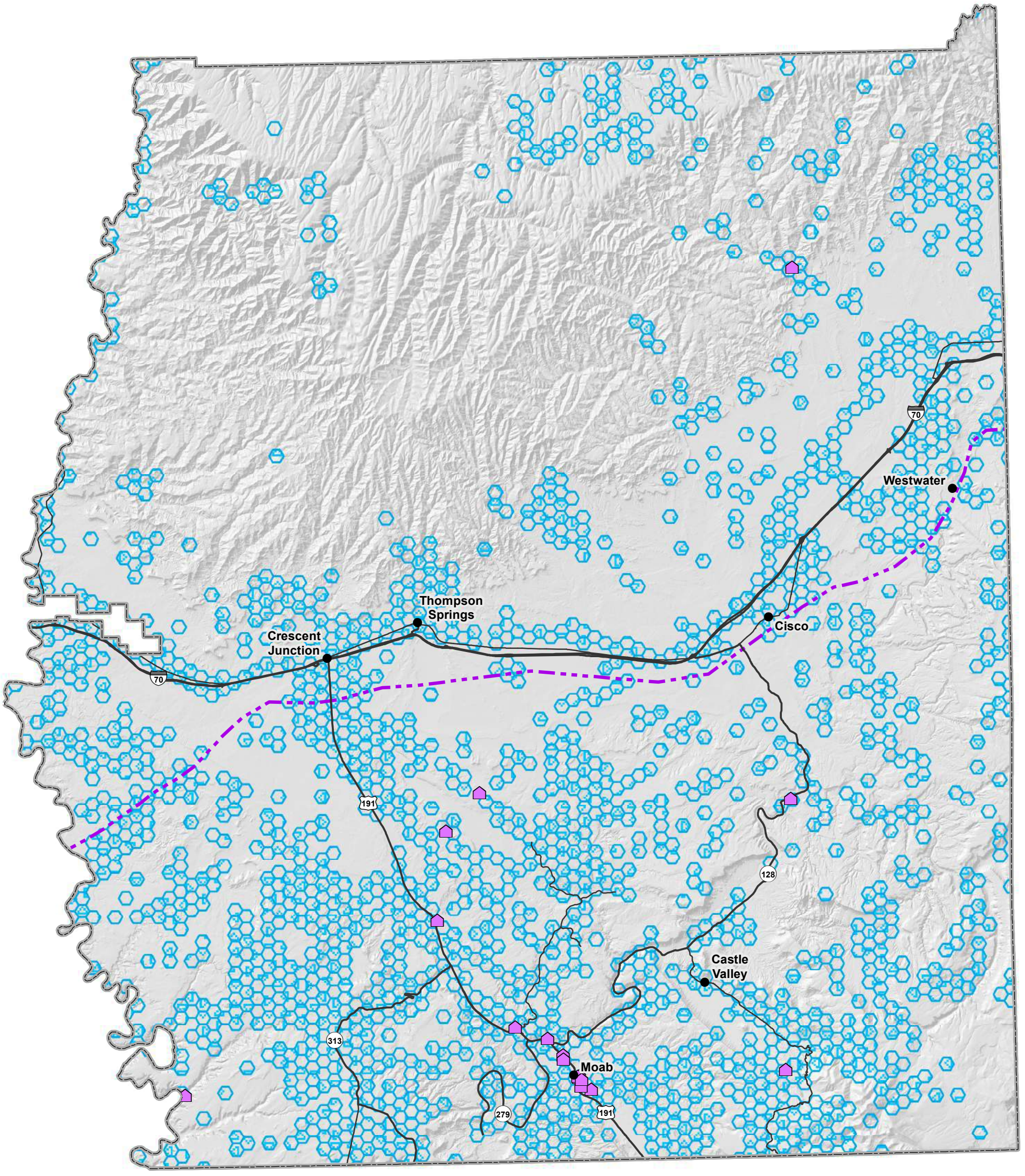
0 2.5 5 Miles

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Cultural Resources

Historic Places & Archaeological Sites



National Register of Historic Places

Historic Trail

Known Archaeology Sites Present

N

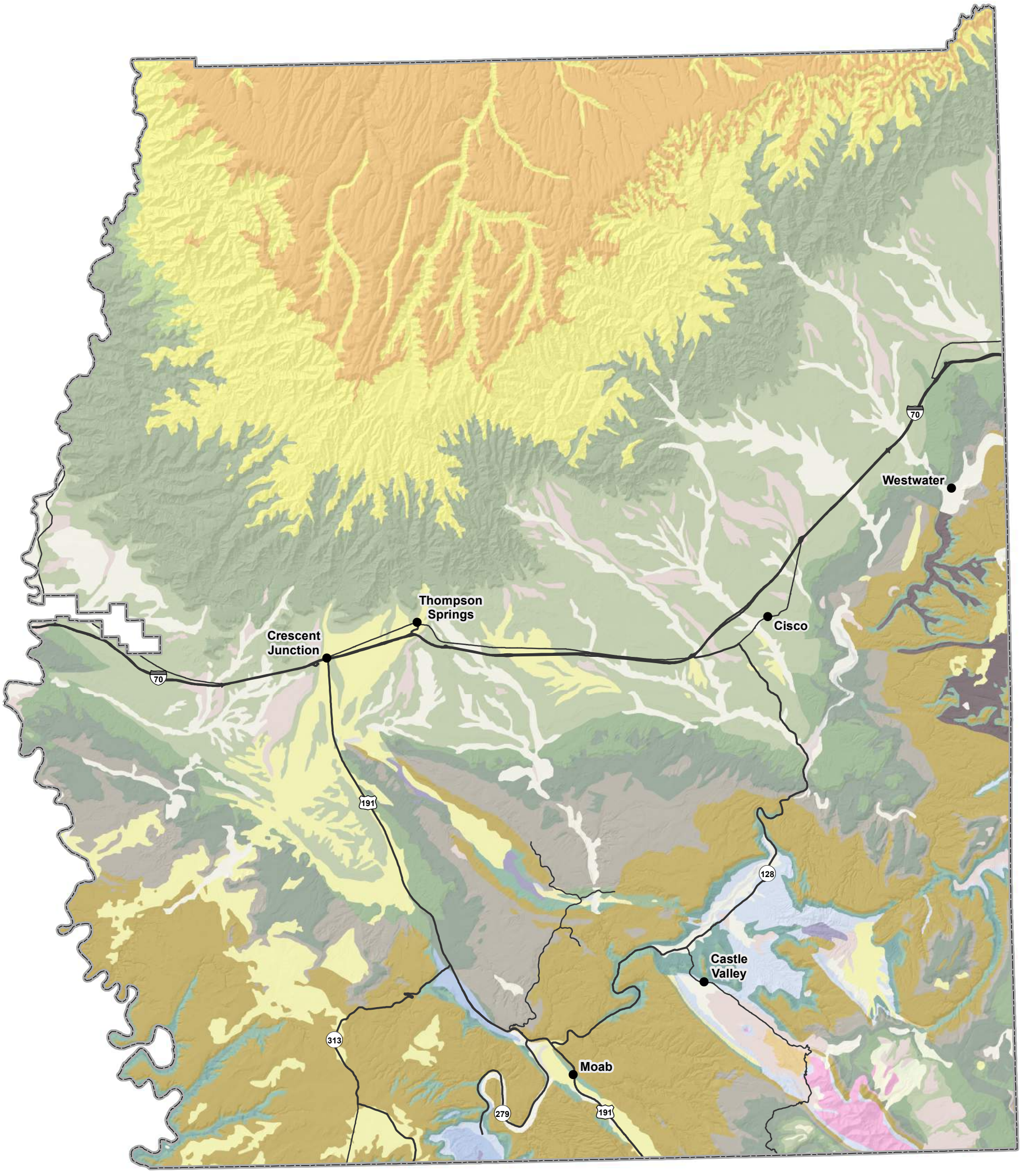
0 2.5 5 Miles

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Geology

Geologic Units



Geologic Units (1:500,000)

Qa	T3	K2	Tr1
Qao	T2	K1	P1
Qe	T1	J2	PP
Qg	Ti	J1	P
Qls	TK	Jg	PCm
T5	K3	Tr2	

N

Miles

0 2.5 5

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Paleontological Resources

Paleontological Sensitivity

Paleontological Sensitivity

N

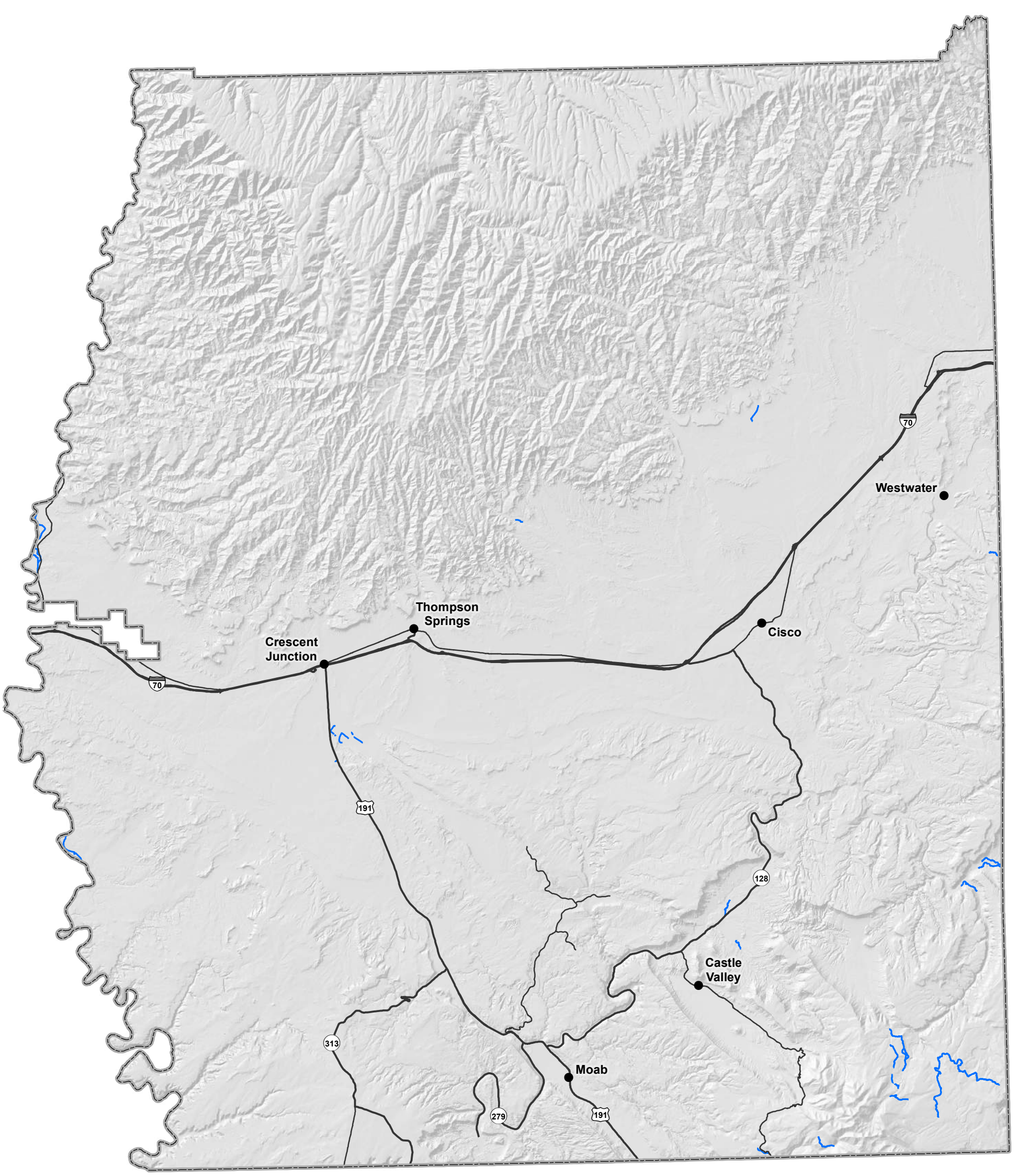
0 2.5 5 Miles

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Ditches and Canals

Canals



Canals

N

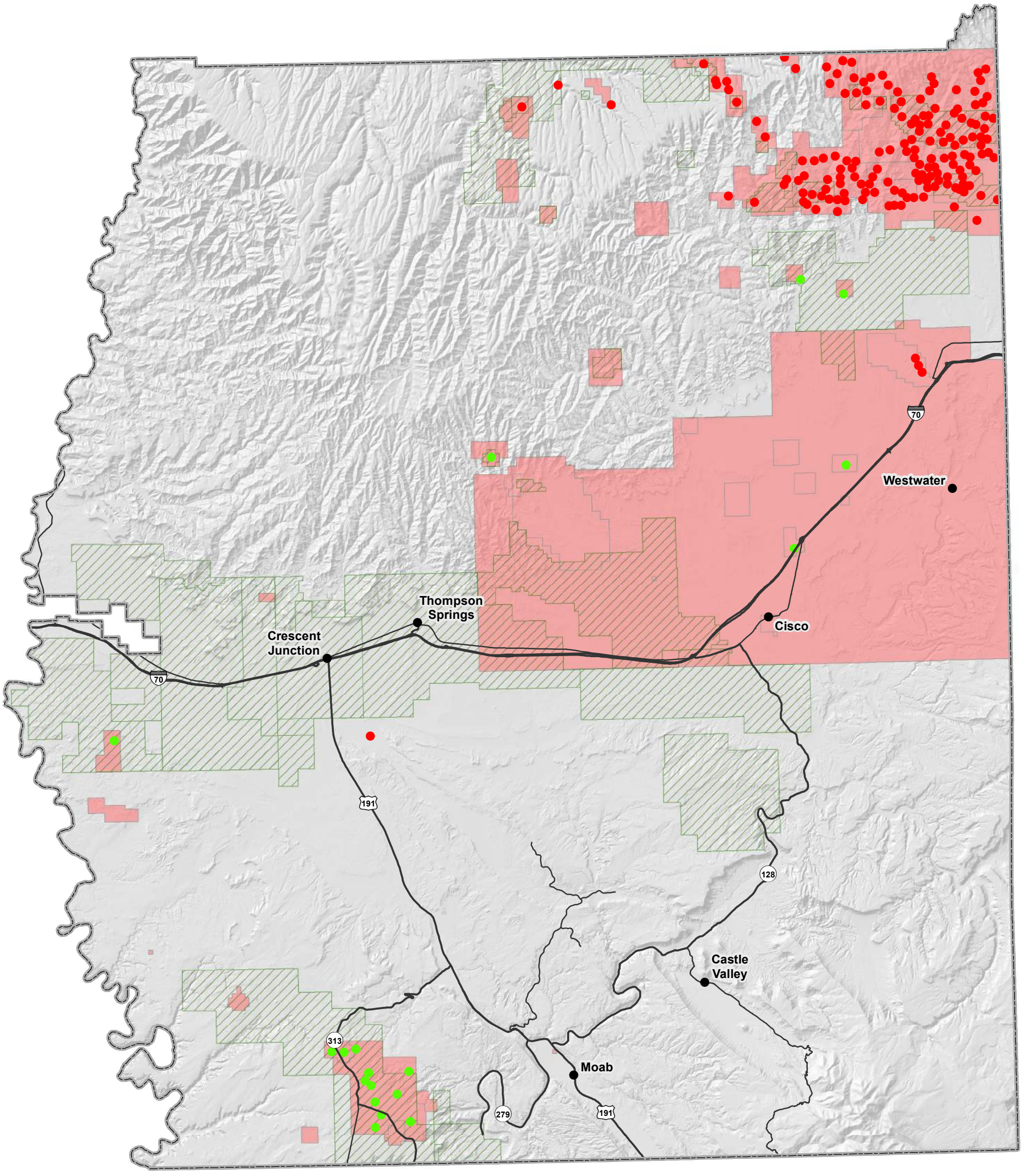
0 2.5 5 Miles

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Energy

Oil and Gas



Producing Gas Wells
Producing Oil Wells
Oil and Gas Units
Oil and Gas Fields

N

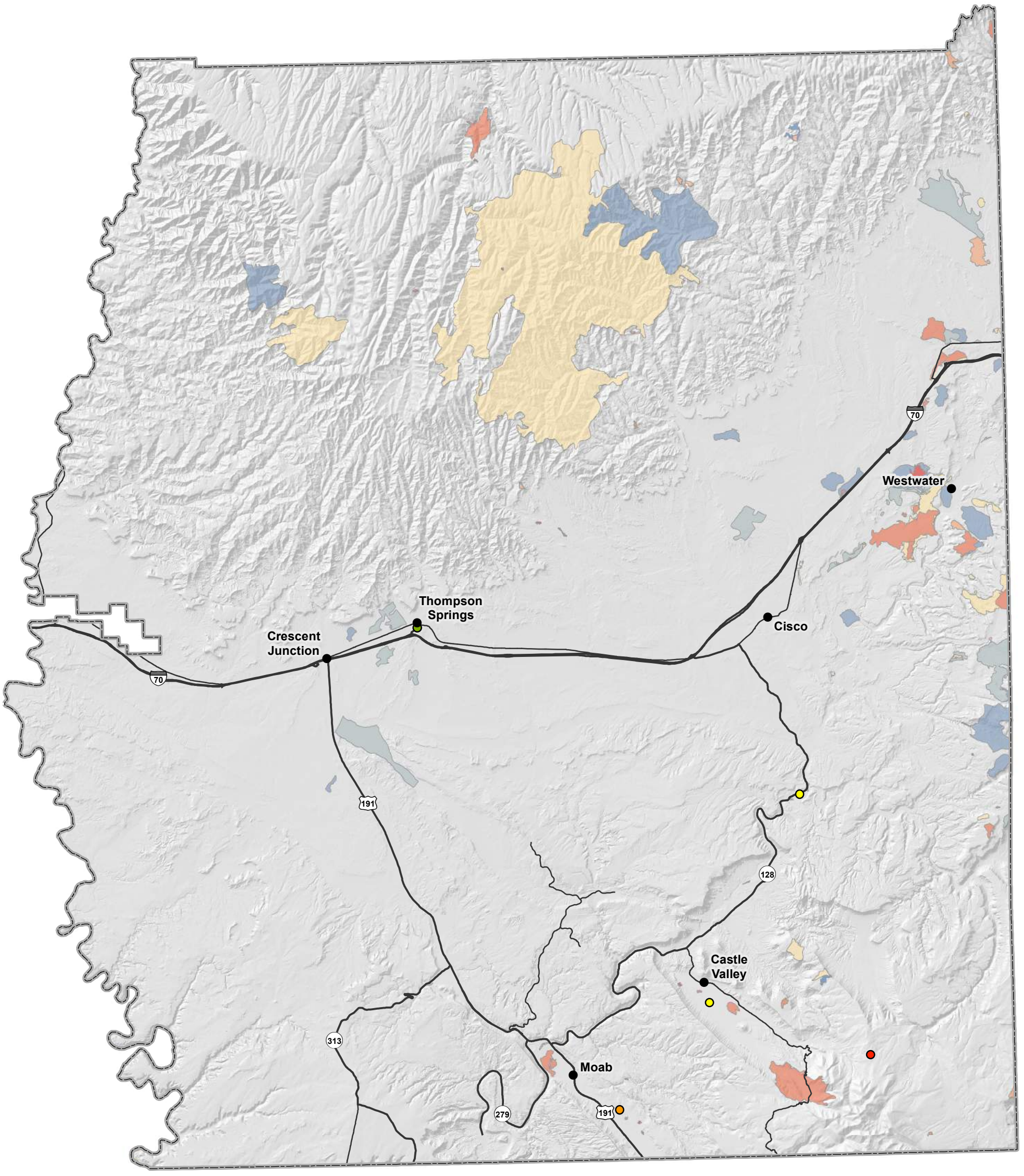
0 2.5 5 Miles

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Fire Management

Fire Perimeters and Risk Areas



Communities At Risk

Overall Score

- None
- 0 - 7
- 7 - 8
- 8 - 10
- 10 -12

Fire Perimeters

Date

- 1976 - 1982
- 1983 - 1990
- 1991 - 1995
- 1996 - 1998
- 1999 - 2002
- 2003 - 2005
- 2006 - 2009
- 2010 - 2015

N

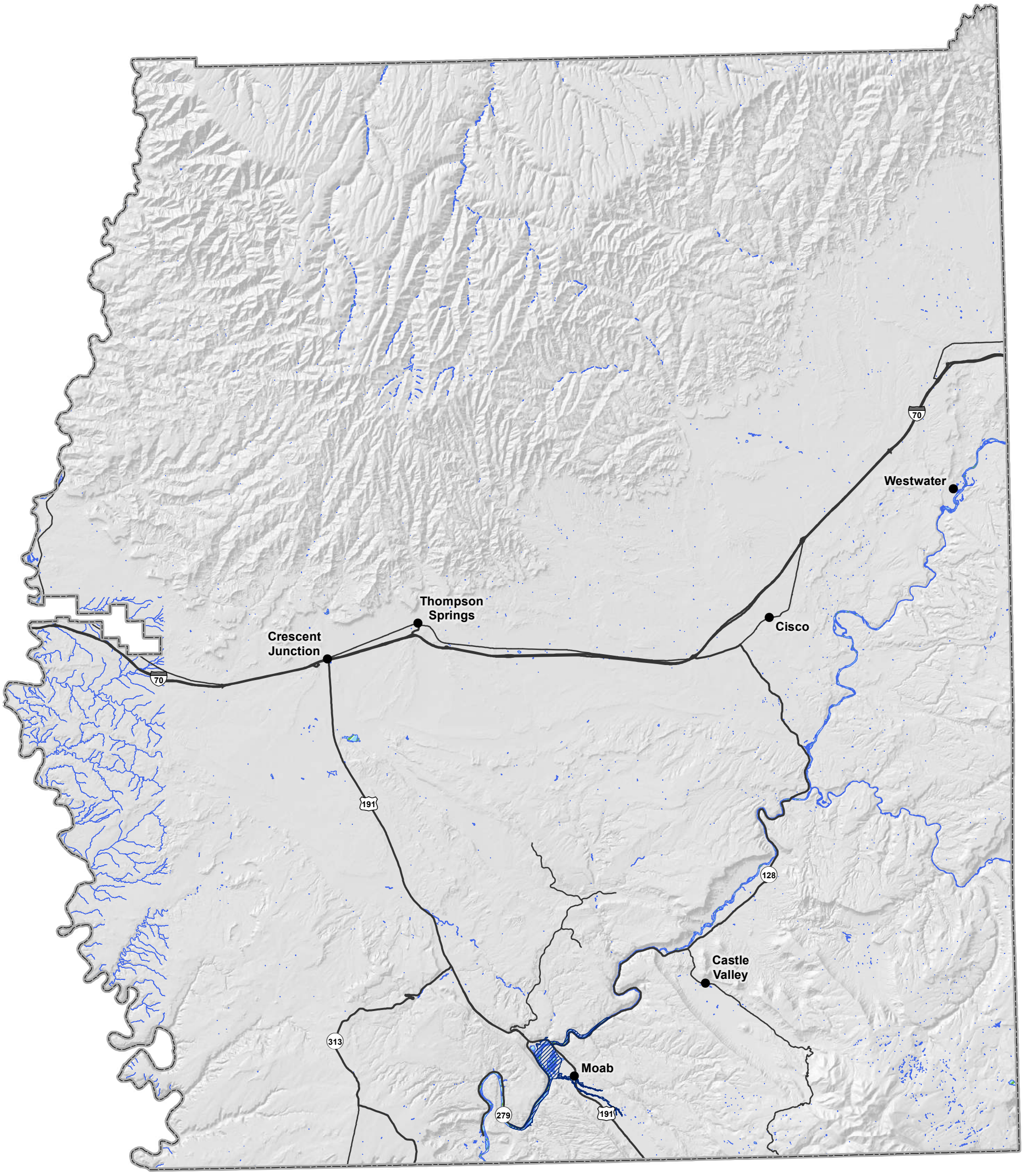
0 2.5 5 Miles

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Floodplains and Wetlands

Flood Hazard Areas and Wetlands



Flood Hazard Areas
Wetlands

N

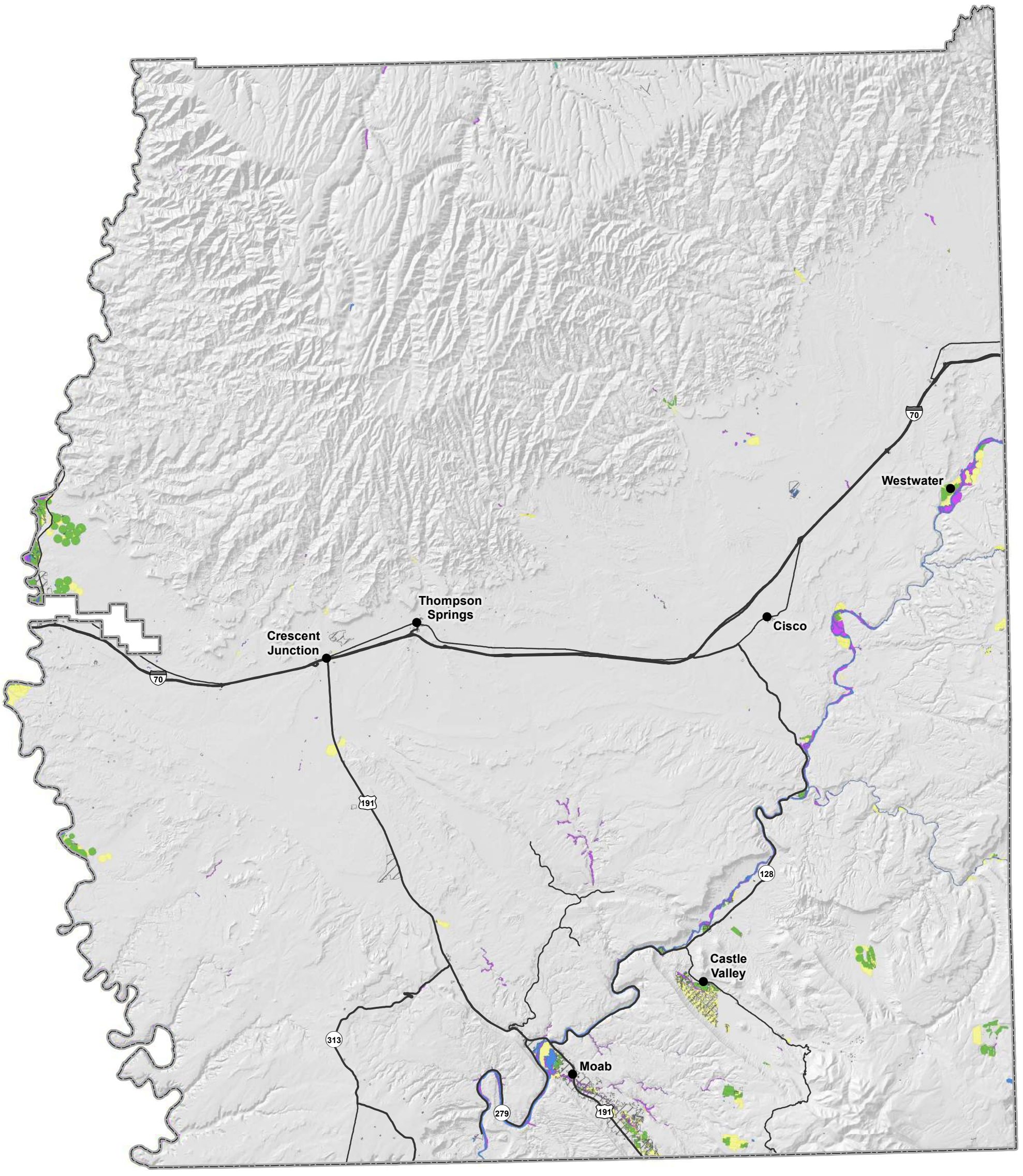
0 2.5 5 Miles

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Irrigation

Irrigation Type



Irrigation Type
- Irrigated Agricultural Lands
- Non-irrigated Agricultural Lands
- Non-agricultural Wetland or Other Riparian Area
- Naturally Irrigated Agricultural Land
- Urban
- Open Water

N

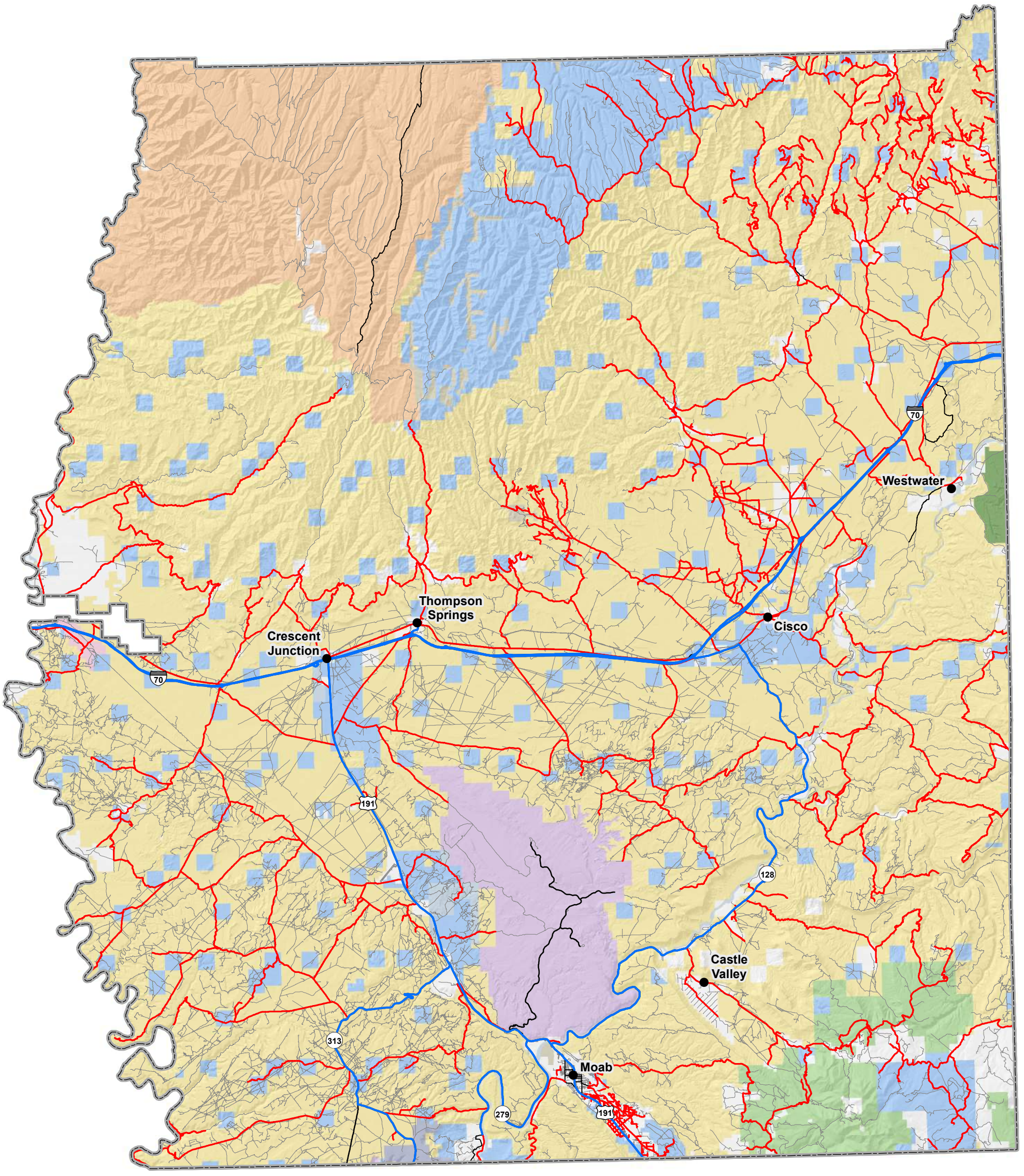
0 2.5 5 Miles

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Land Access

Roads



Interstates, US Highways, and State Highways

Grand County B Roads

Major Local Roads

Minor Local Roads

Landownership

- Bureau of Land Management
- National Parks, Monuments & Historic Sites
- National Forest
- National Wilderness Area
- Military Reservations and Corps of Engineers
- Private
- State Trust Lands
- State Sovereign Land
- State Parks and Recreation
- State Wildlife Management Area
- Other State
- Tribal Lands

N

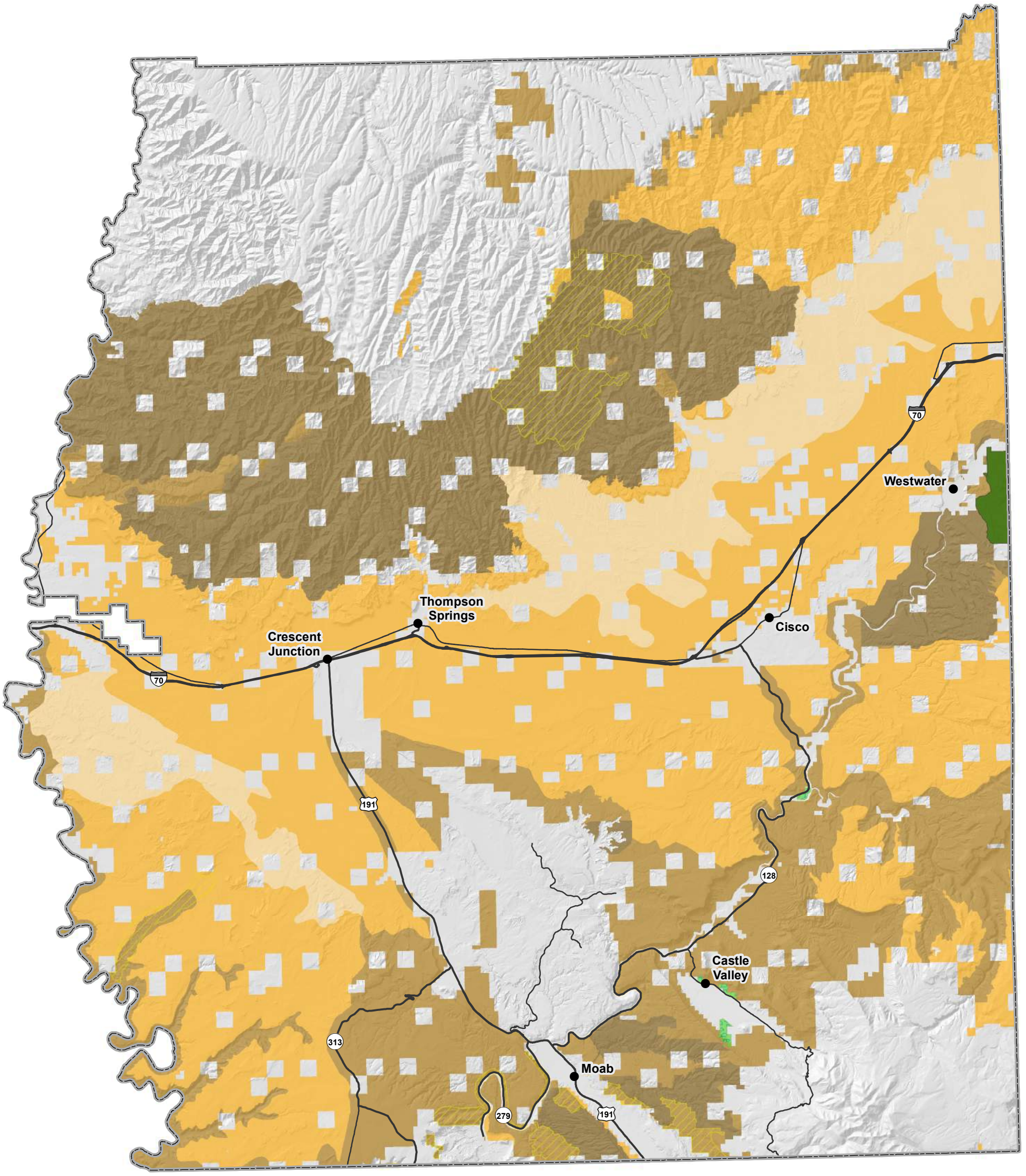
0 2.5 5 Miles

RURAL COMMUNITY CONSULTANTS

Grand County Utah

Grand County Land Use

Conservation



Conservation Easements
Wilderness Areas
ACEC

BLM Visual Resource Management Class

VRM Class 1
VRM Class 2
VRM Class 3
VRM Class 4

N

0 2.5 5 Miles

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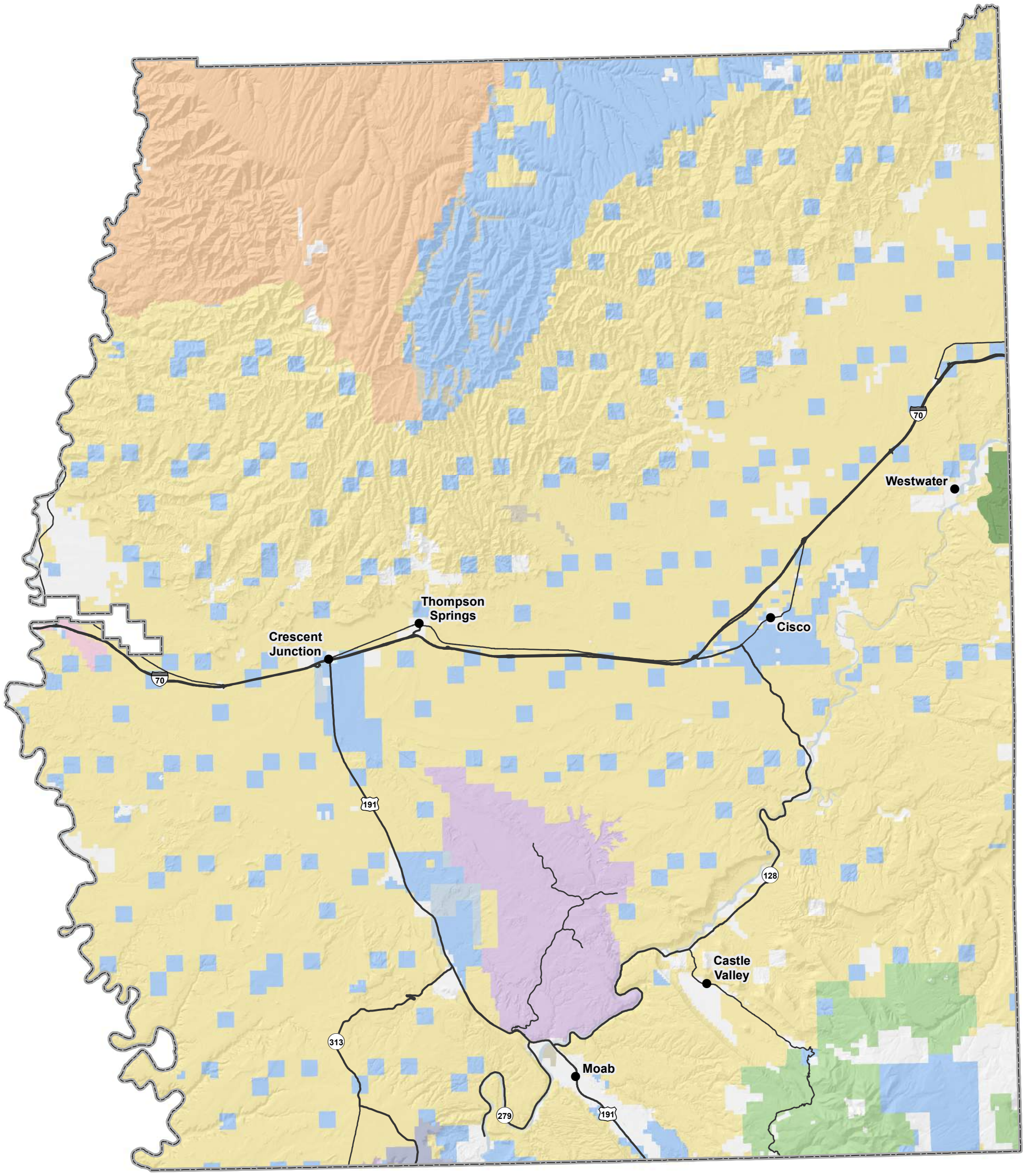
Grand County Utah

Grand County Land Use

Landownership



Landownership

- Bureau of Land Management
- National Parks, Monuments & Historic Sites
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- Other State
- Tribal Lands

N

0 2.5 5 Miles

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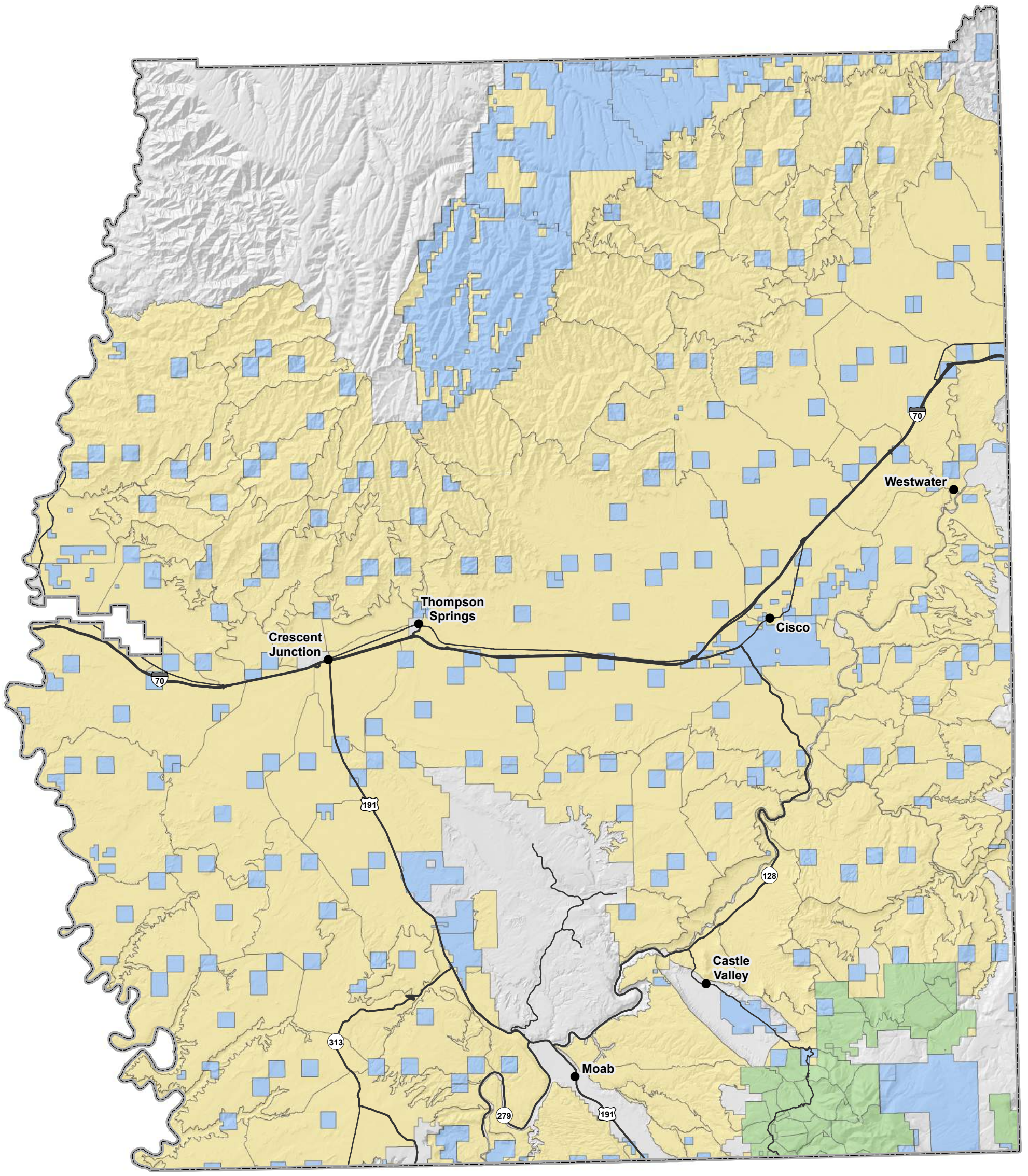
Grand County Livestock and Grazing

Grazing Allotments



Grazing Allotments (By Manager)

- Bureau of Land Management
- State Trust Lands
- US Forest Service

N

0 2.5 5 Miles

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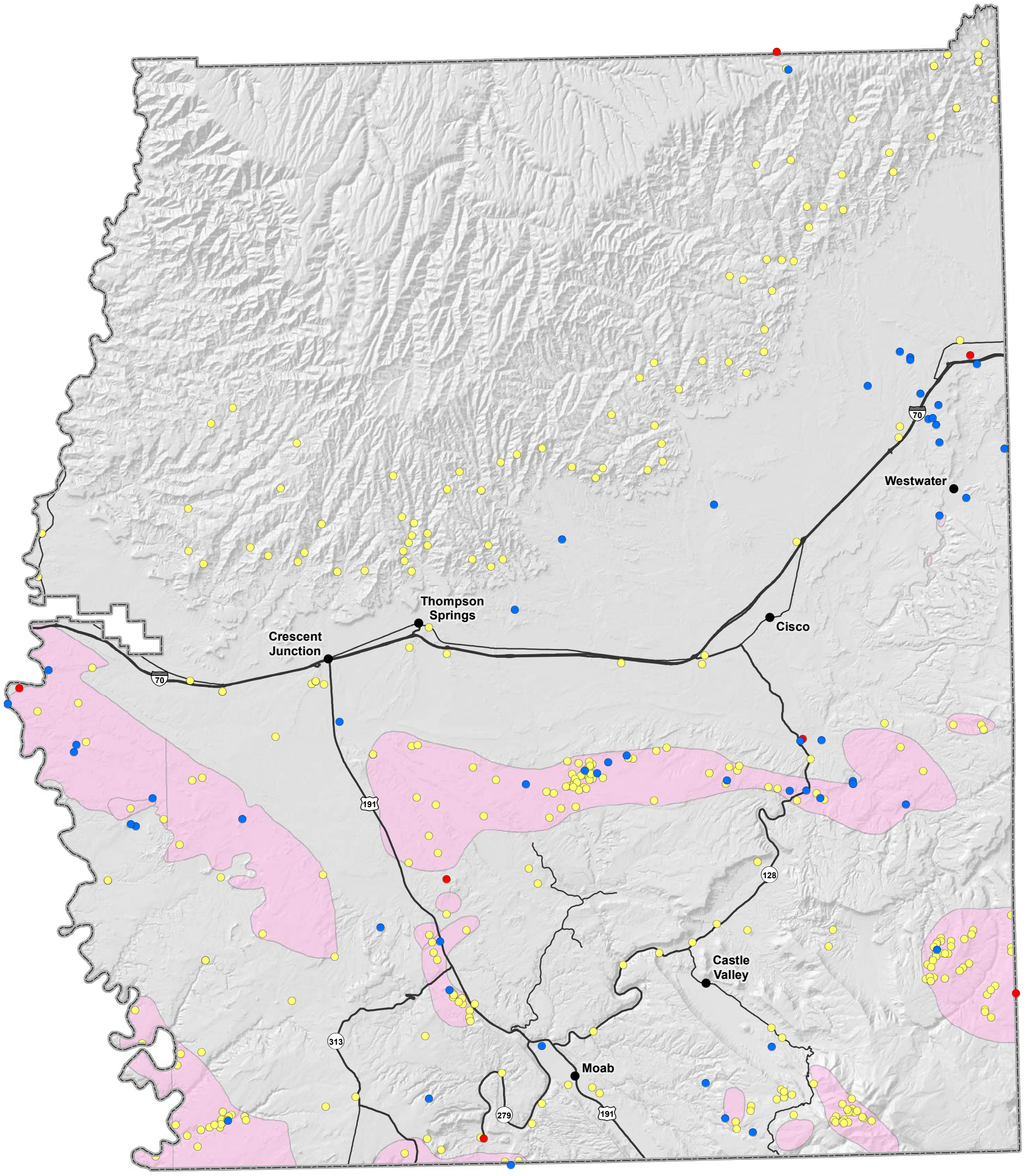
Grand County Mining and Minerals

Mine and Mineral Locations



Mineral Locations
Active Mineral Mines
Retired Mineral Mines
Mineral Deposits

N

0 2.5 5 Miles

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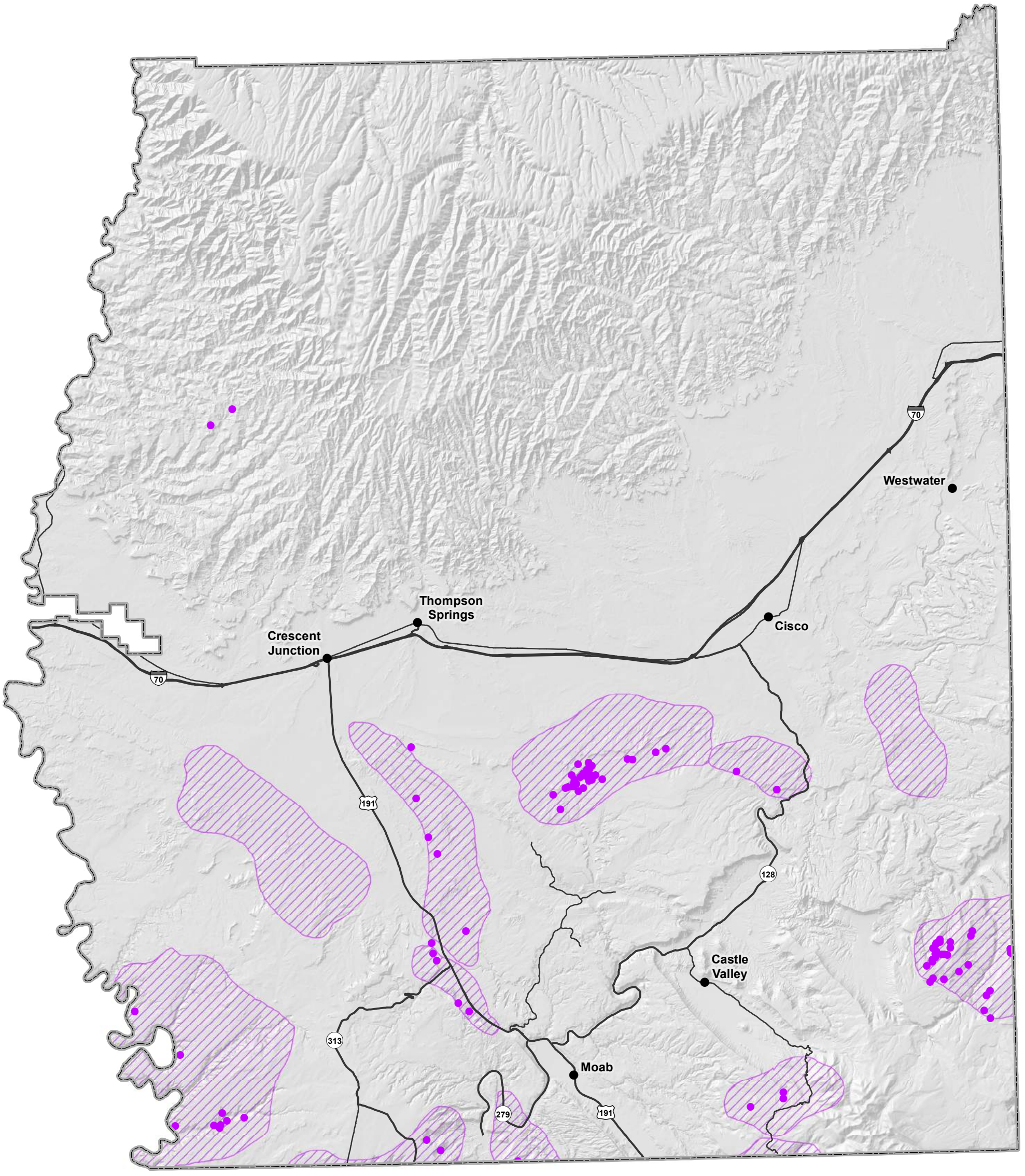
Grand County Mining and Minerals

Uranium



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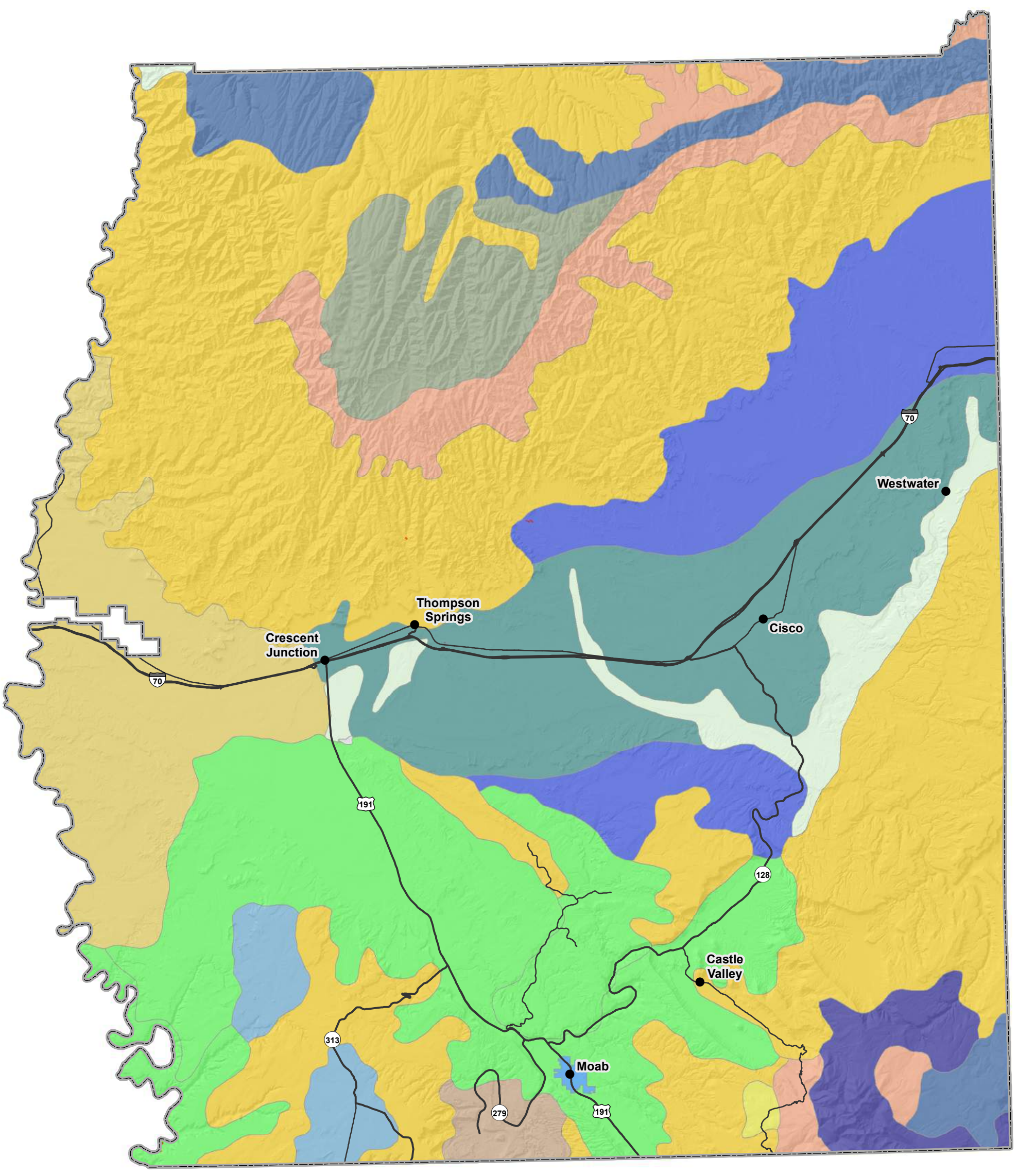
Grand County Utah

Grand County Vegetation

Noxious Weeds and Dominant Vegetation



- Noxious Weeds

Dominant Vegetation

- Blackbrush
- Cheatgrass
- Cities
- Cultivated Land
- Douglas Fir
- Dropseed
- Engelmann Spruce
- Greasewood
- Mat-atriplex
- Oak
- Ricegrass
- Sagebrush
- Shadscale
- Utah Juniper

N

0 2.5 5 Miles

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Grand County Utah

Grand County

Hill Creek
West Willow Creek
East Willow Creek
Westwater Creek
Bitter Creek
Dry Fork
Westwater
Green River
Thompson Springs
Crescent Junction
Cisco
Coach Creek
Ryan Creek
Colorado River
Dolores River
Tenmile Wash
Green River
Castle Valley
Castle Creek
Beaver Creek
MOAB
Mill Creek
La Sal Junction

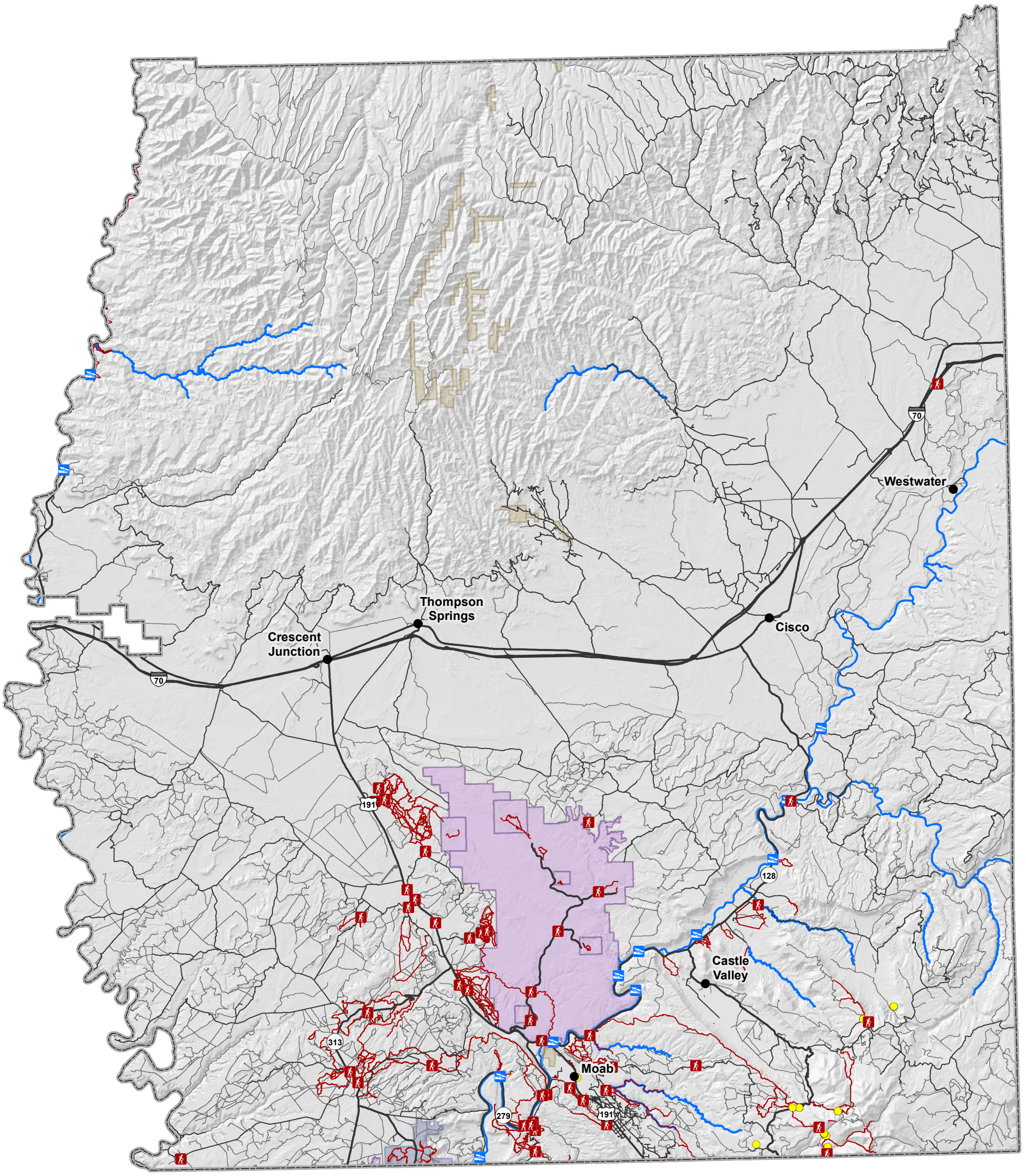
N

Miles
0 2.5 5

Grand County
Utah

Grand County Recreation

Recreation Points and Areas of Interest



- Trailheads
- Boat Ramps
- US Forest Service Recreation Sites
- County-maintained Roads
- Motorized Trails
- Non-motorized Trails
- Wild and Scenic Rivers
- National Parks, Monuments and Historic Sites
- State Parks and Recreation
- State Wildlife Management Area

N

0 2.5 5 Miles

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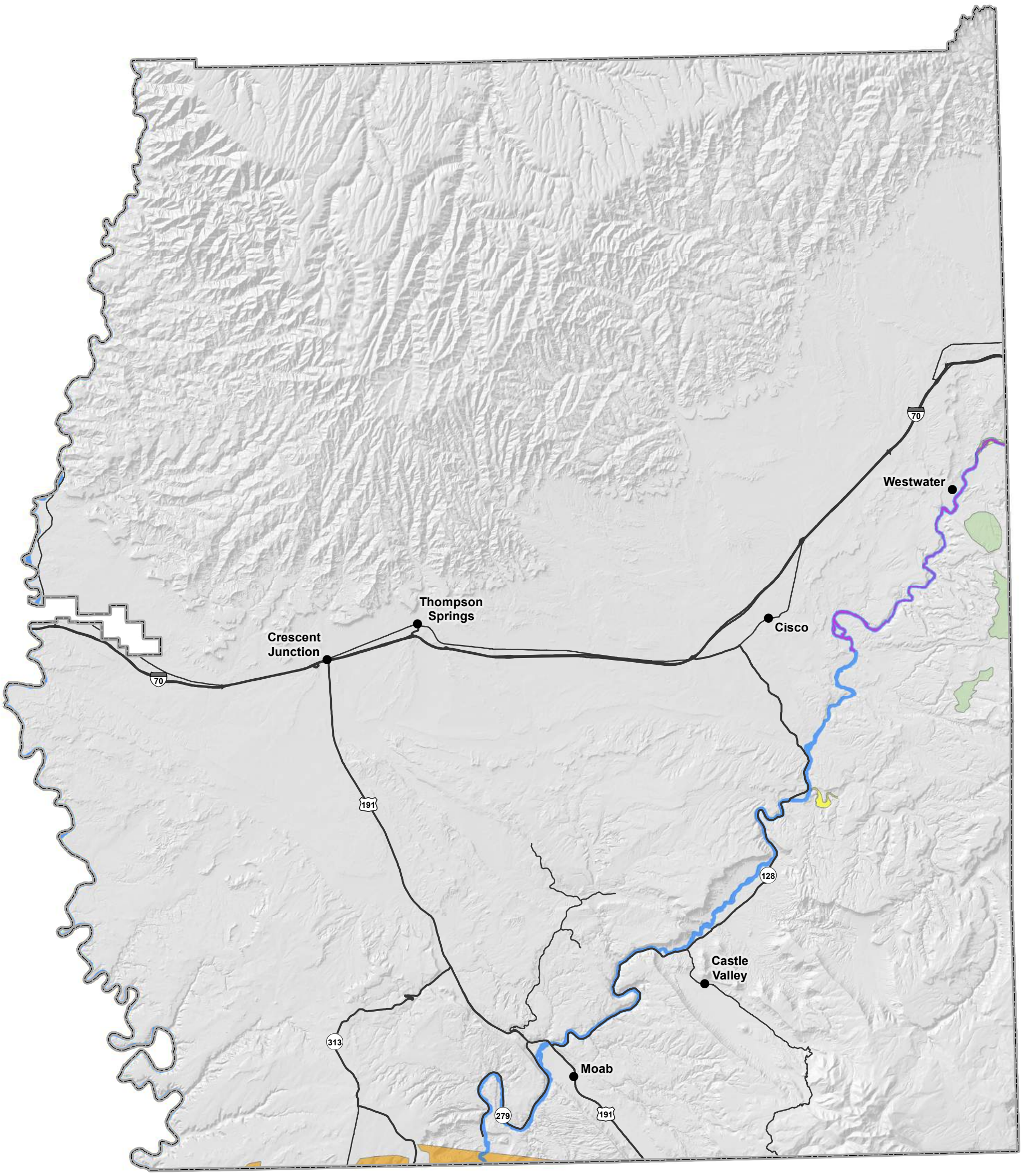
Grand County Utah

Grand County
Listed and Sensitive Species



Critical Habitat
- Bonytail Chub and Humpback Chub
- Colorado Pikeminnow and Razorback Sucker
- Mexican Spotted Owl Critical Habitat
- Gunnison Sage-grouse
- Yellow-billed Cuckoo (Proposed)

N

0 2.5 5 Miles

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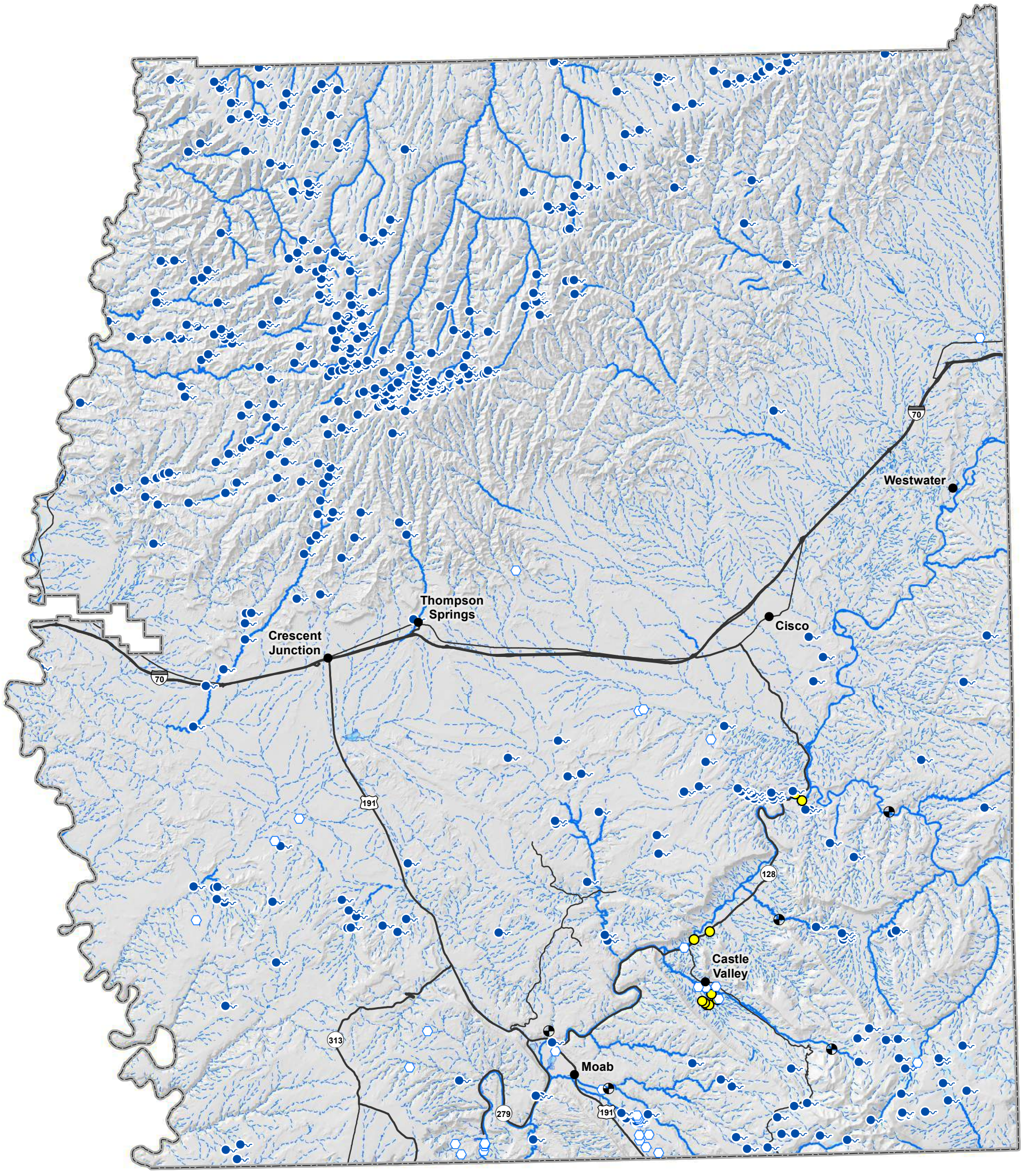
Grand County Water Resources

Hydrology



- Gaging Station
- Sink Rise
- Spring/Seep
- Well
- Stream/River - Perennial
- Stream/River - Intermittent
- Canal
- Lake

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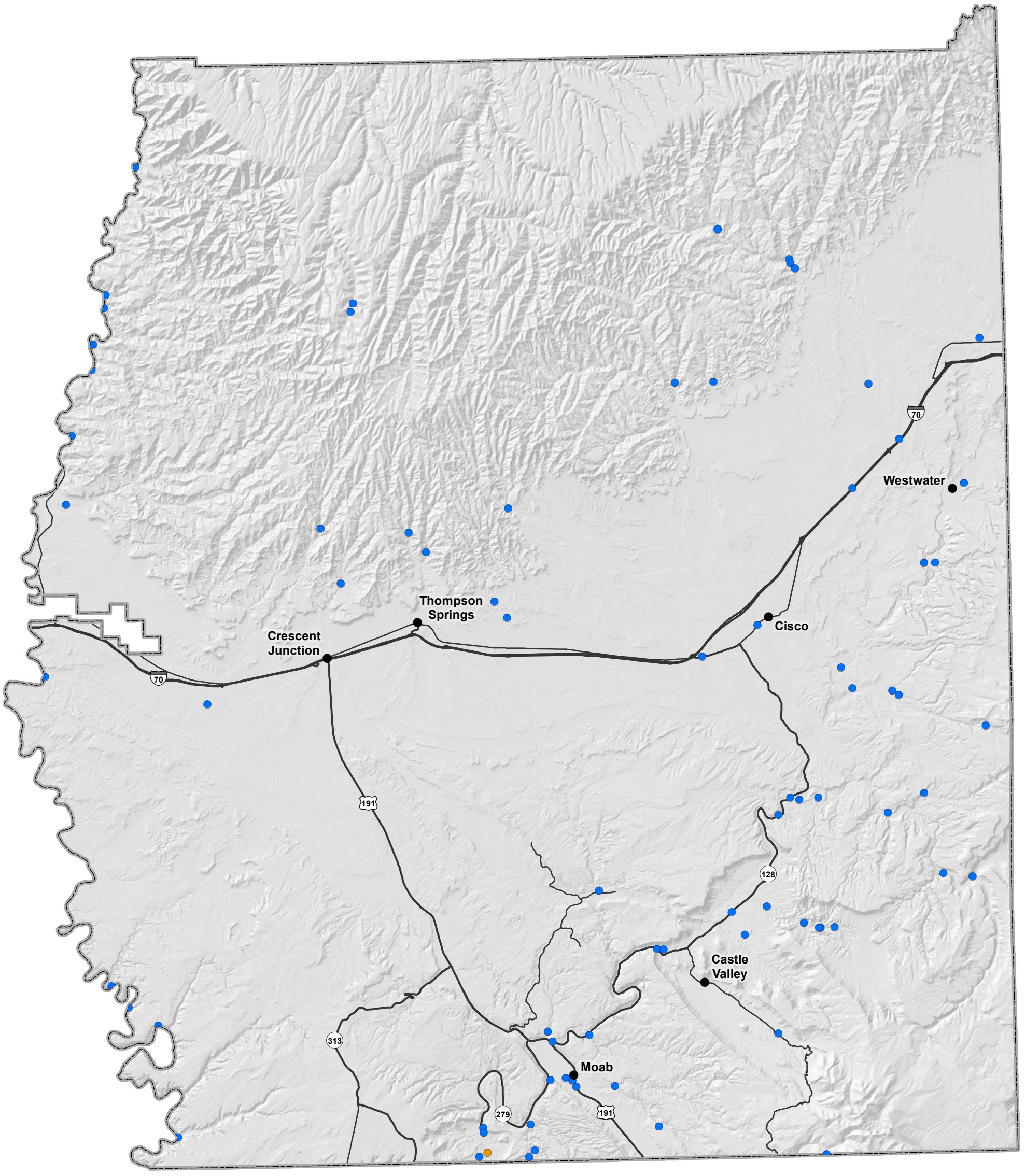
N

0 2.5 5 Miles

Grand County Water Resources

Water Quality



Stream Water Quality Monitoring Site

DWQ Groundwater Permit

N

0 2.5 5 Miles

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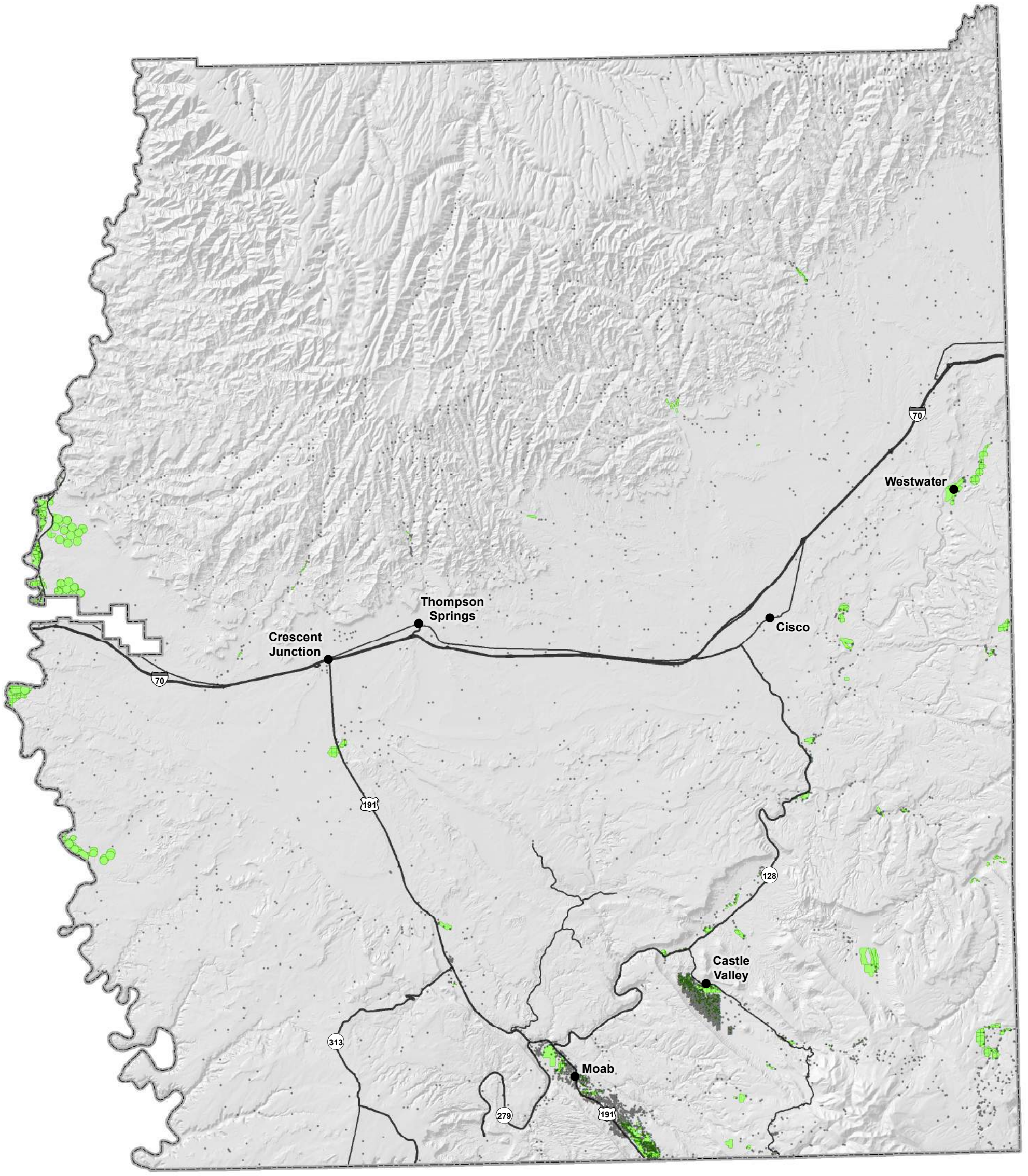
Grand County Water Resources

Water Rights



Points of Diversion

Place of Use

N

Miles

0 2.5 5

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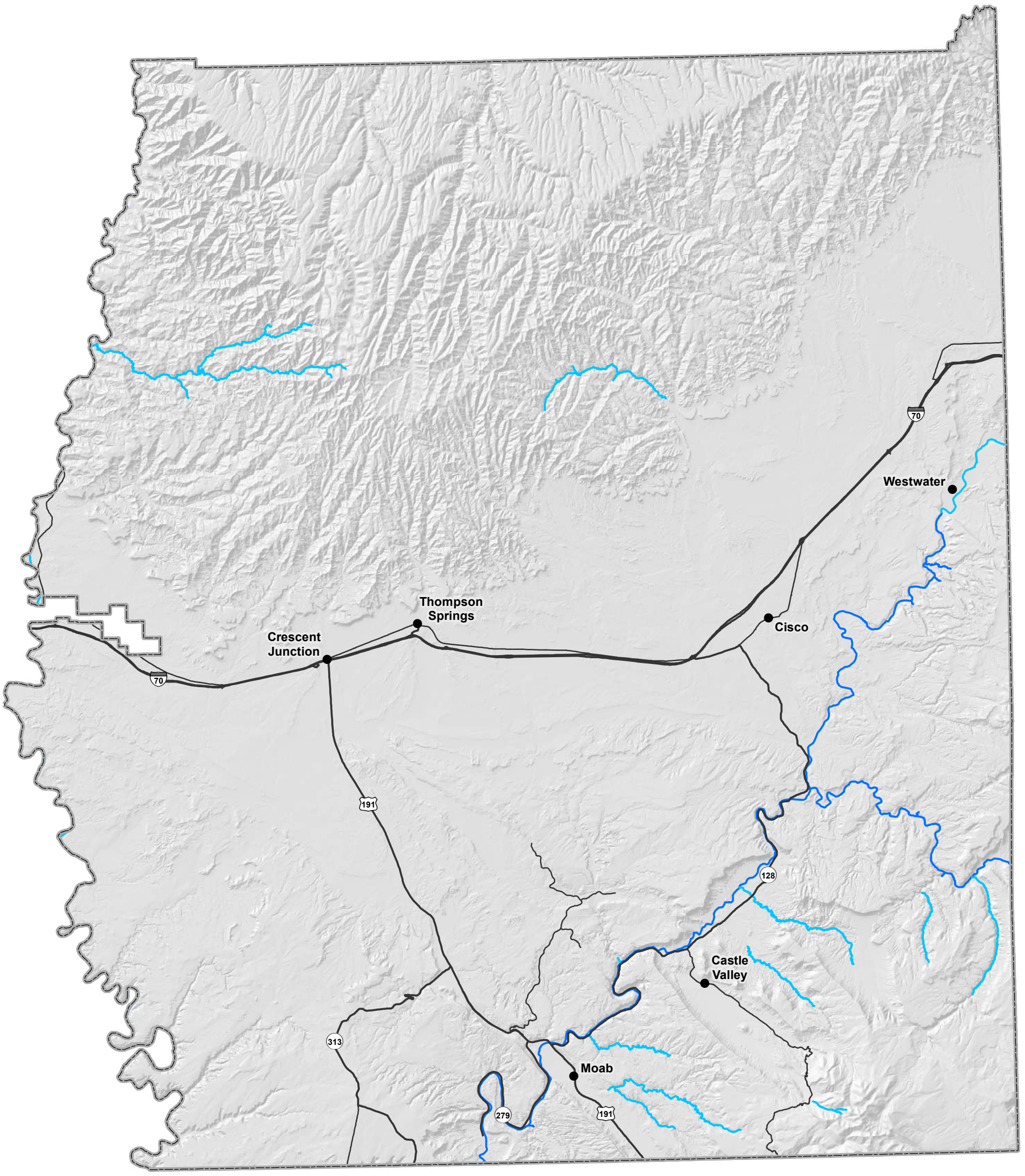
Grand County Utah

Grand County Wild and Scenic Rivers

Eligible and Suitable River Segments



Wild and Scenic Rivers
- Suitable
- Eligible

N

0 2.5 5 Miles

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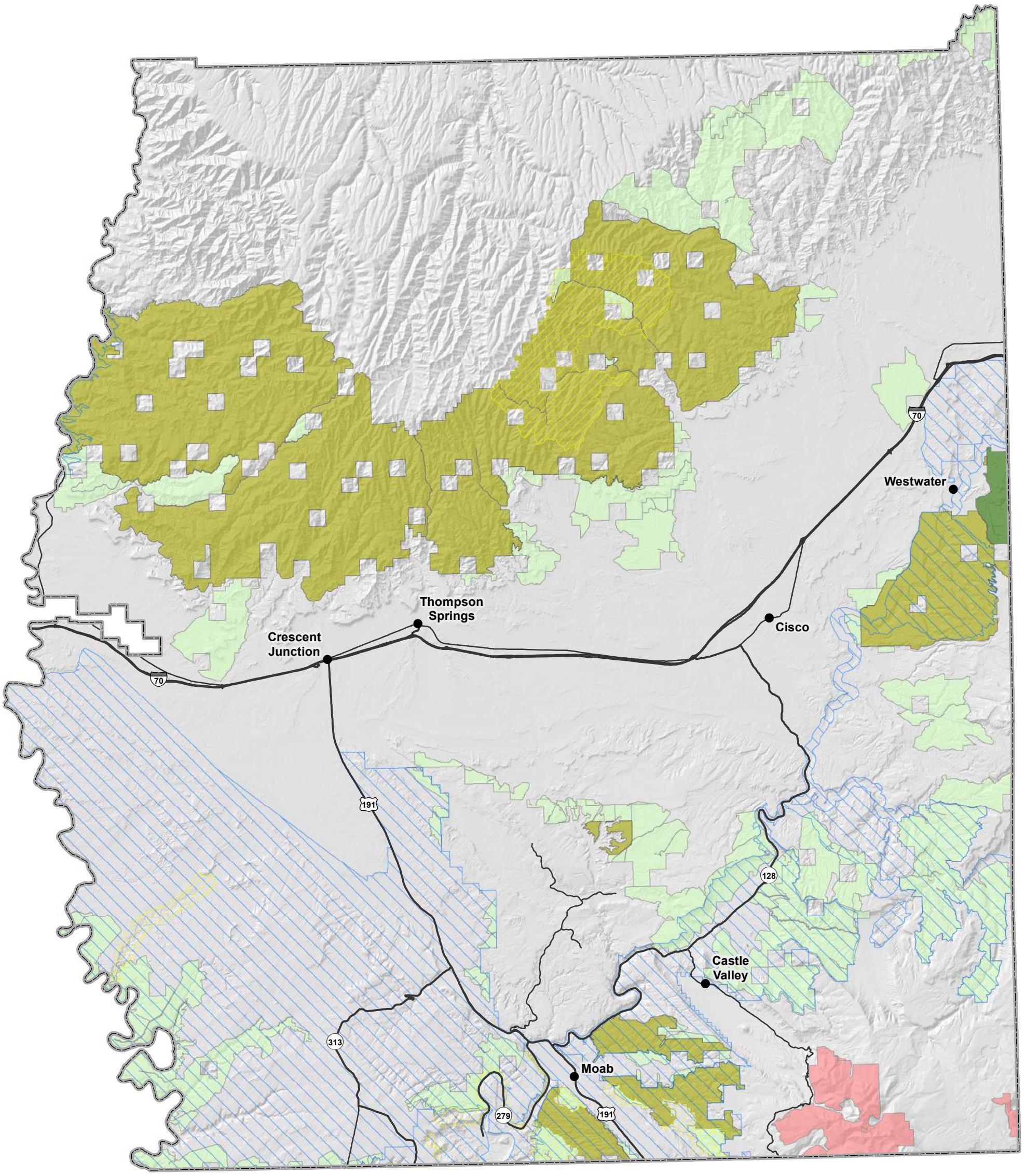
Grand County Wilderness

Wilderness and Related Lands



- ACEC
- Wilderness Areas
- Wilderness Study Areas
- Wilderness Characteristics
- USFS Roadless Inventory
- Special Recreation Management Areas

N

0 2.5 5 Miles

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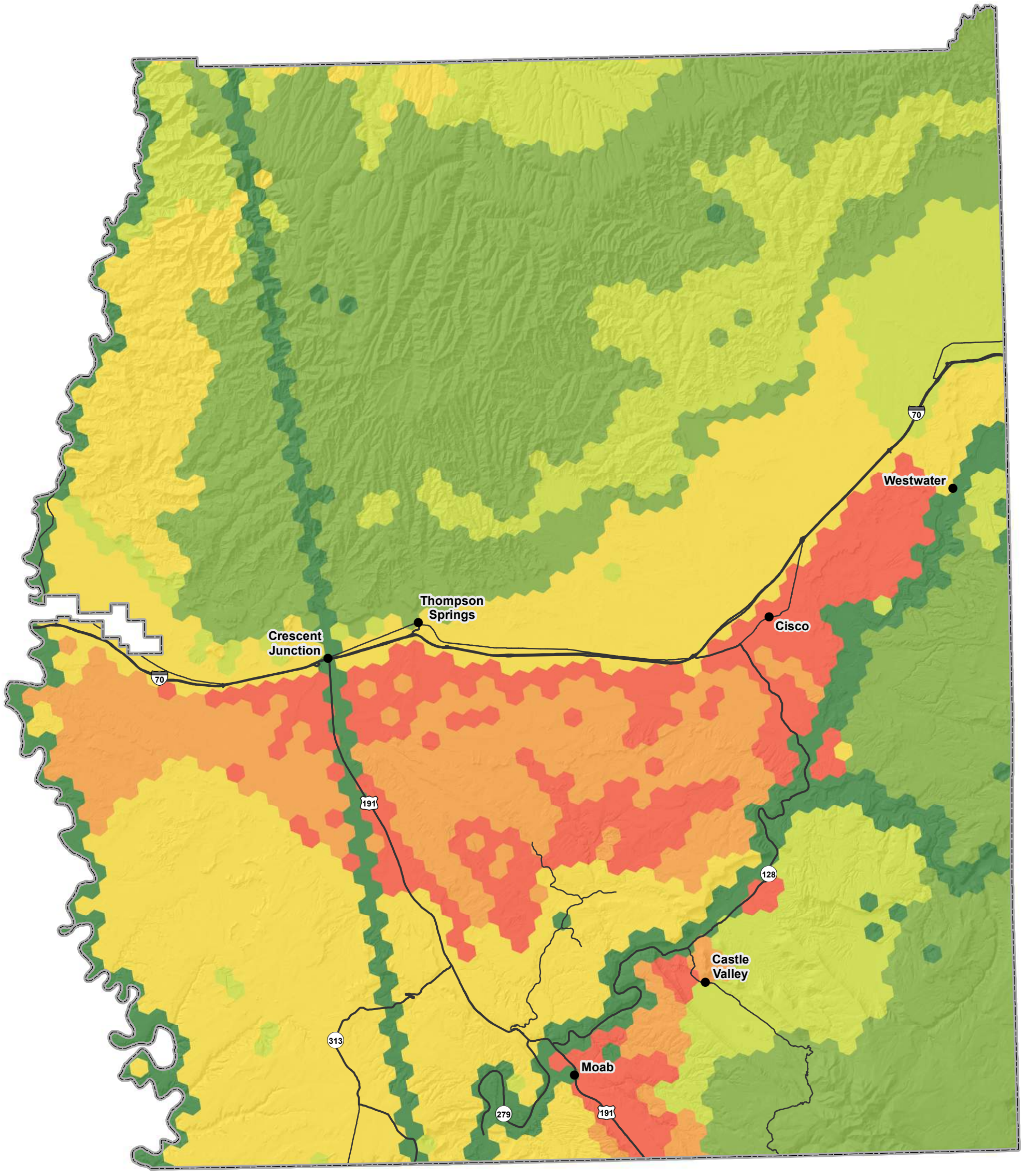
Grand County Wildlife

Crucial Habitat



Crucial Habitat Rank - Most Crucial (1) to Least Crucial (6)

- Rank 1
- Rank 2
- Rank 3
- Rank 4
- Rank 5
- Rank 6

N

0 2.5 5 Miles

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Grand County Utah

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