Carbon County Resource Needs Assessment

June 2012

Conserving Natural Resources For Our Future

Price River Watershed Conservation District

UACD
Utah Association of Conservation Districts

UDAF
Utah Department of Agriculture and Food

USDA NRCS Natural Resources Conservation Service

Acknowledgments

Price River Conservation District

with the:

Utah Association of Conservation Districts (UACD)
Utah Department of Agriculture and Food (UDAF)
Natural Resources Conservation Service (NRCS)

in partnership with the:

Utah Conservation Commission

Utah Conservation Districts Zones 1 through 7
Utah Association of Conservation Districts
Utah Department of Agriculture and Food
Utah Department of Environmental Quality
Utah Department of Natural Resources
Utah Grazing Board (Chair and Vice-Chair)
Utah School and Institutional Trust Lands Administration
Utah State University Cooperative Extension
Utah Weed Supervisor Association

Utah Partners for Conservation and Development (UtahPCD)

State Agencies and Organizations:

Utah Association of Conservation Districts
Utah Department of Agriculture and Food
Utah Department of Community and Culture
Utah Department of Environmental Quality
Utah Department of Natural Resources
Utah Resource Conservation & Development Councils
Utah School and Institutional Trust Lands Administration
Utah State University College of Natural Resources
Utah State University Cooperative Extension
Utah Energy Office

Federal Agencies:

U.S. Department of Interior
- Bureau of Land Management
- U.S. Fish and Wildlife Service
- Bureau of Reclamation

U.S. Department of Agriculture
- U.S. Forest Service
- Natural Resources Conservation Service
- Agriculture Research Service
- Farm Service Agency

Other

State Historical Preservation Office
Governor's Office of Planning and Budget
Carbon County Office of Toursim

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Carbon County Resource Assessment: Executive Summary


Photo by Carbon County Office of Tourism

Why a Resource Assessment?

The Price River Watershed Conservation District has developed this resource assessment with the goal that conservation efforts in the county address the most important local resource needs. This report identifies natural and social resources present in Carbon County and details specific areas of concern. Local, state, and regional entities can use this assessment to develop county resource management plans or to target conservation assistance needs.

We recognize that all who could have provided information for this assessment may not have had the opportunity. This document is dynamic and will be updated as additional information is available. Your comments are requested:

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Natural Resource Priorities and Concerns

The Price River Watershed Conservation District has identified five natural resource priorities and concerns. These priorities receive special emphasis because of their immediate significance to Carbon County:

1. **Water Quantity and Quality:** Storage and delivery, salinity, and mining impacts.
2. **Soil:** Erosion, salinity, and organic matter.
3. **Energy Development and Alternative Energy:** Conventional, renewable, and alternative energy development.
4. **Rangeland:** Watering facilities, noxious weeds, and grazing permits.
5. **Fish and Wildlife:** Sensitive/endangered species and wild life management.

General Resource Observations

Natural and social resources are categorized as Soil, Water, Air, Plants, Animals and Humans (SWAPA + H). This assessment describes the general condition of these resources and highlights additional concerns in each category. As opportunities become available to address these issues, and as circumstances change, their emphasis should be elevated accordingly.

Conservation districts provide local leadership and education to connect private property owners with state and federal assistance to improve, protect and sustain Utah's soil, water and related natural resources.

Introduction

The Conservation District Movement

The Dust Bowl of the 1930s brought the beginning of national programs for conserving soil and water resources in the United States. On April 27, 1935, Congress declared soil erosion "a national menace" and established the Soil Erosion Service. Since then, the agency has been changed to the Natural Resources Conservation Service (NRCS). Seeing a need for local input, farmers were allowed to set up their own districts to direct soil conservation practices in May of 1936. Today, Utah has 38 conservation districts divided into seven zones.

Conservation Progress

Since the organization of the Price River Watershed Conservation District in 1938, great strides have been made toward increasing and sustaining natural resources in Carbon County. The 2005 resource assessment listed the most critical resource concerns as 1) water quantity, 2) surface water quality, 3) ground water quality, 4) soil erosion and condition, and 5) fish and wildlife. The 2012 resource assessment provides an opportunity to evaluate the progress made during the last six years and to set new goals to address the highest priority conservation needs in Carbon County.

Public Outreach

In June 2010, the Price River Watershed Conservation District conducted a public meeting to determine which resources in the county were of major concern and which conservation issues were most pressing. Comments received at the meeting indicated that water quantity and quality are still major concerns as well as soil erosion and soil condition. Other top concerns included: energy development and alternative energy; rangeland conditions, specifically limitations on watering facilities, invasive weeds, and grazing permits; and fish and wildlife management.

Wind-devastated farmland during the Dust Bowl.

Private garden in Carbon County.

Carbon County Overview

Background

Carbon County is located in east-central Utah, and has a total land area of approximately 1,476 square miles. The western end of the county rises to the Wasatch Plateau and slopes down eastward to the Price River, which cuts through Castle Valley. This valley stretches across the southern half of Carbon County and continues into Emery County, with the Wasatch Plateau and Range on the north and west and the Book Cliffs along the east border. The Green River marks the eastern border of the county. Price is the county seat, with other major towns and cities being Helper, Wellington, East Carbon, and Sunnyside.

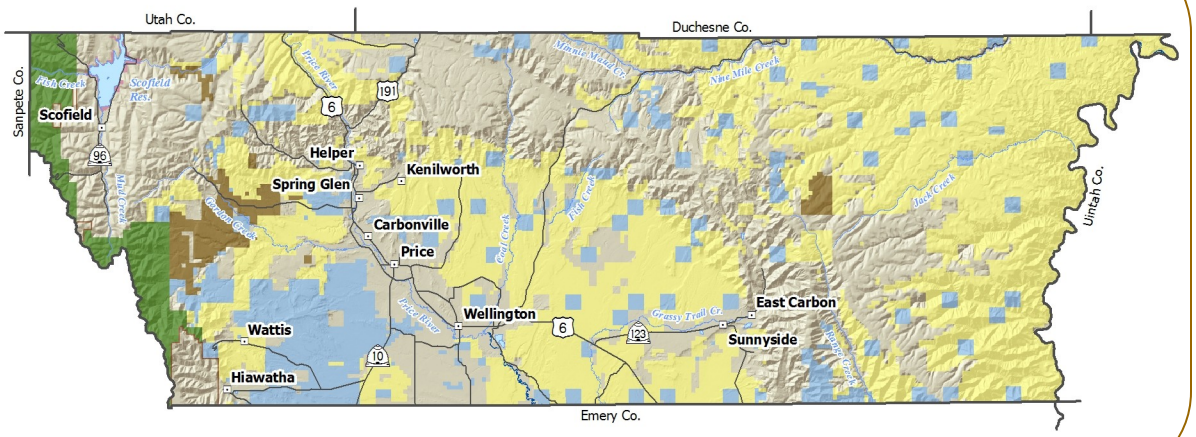
Mormon settlements were established all along the Price River in the late 1870s. Farming and ranching became early economic activities, giving Carbon County a tradition of cowboys and outlaws. In the early 1880s, the opening of the railway for the Denver and Rio Grande Western Railroad aided in the discovery and opening of the vast coal lands in the county, from which Carbon County takes its name. Coal mines hired many workers from Eastern Europe and Japan which contributed to the large ethnic diversity of the county. Coal mining continues to play a vital role in the county's economic and social development. In 1894, Carbon County was created from a portion of Emery County by the territorial legislature.[1]

In 2010, the population of Carbon County was 21,403. Median family income in 2009 was $44,684, or 20% below the state average of $55,183. Carbon County's racial makeup is primarily white: 92.3% of the total – ethnic population presence is similar to the state as a whole.[2]

A dry climate, a shortage of irrigation water late in the summer, and a short growing season often limit crop production. Main crops grown in the area include alfalfa, small grains, and irrigated pasture. The raising of beef cattle and sheep is the main source of agricultural income.[3]

Carbon County is also home to Utah State University Eastern, previously known an the College of Eastern Utah.

Carbon County Land Ownership



1 Utah Association of Counties
2 U.S. Census Bureau
3 Soil Survey of Carbon-Emery Area, Utah

Carbon County

Photo credits clockwise from top left: Utah State University - Eastern by Kimball Johnson; Hiking in Carbon County by Carbon County Office of Tourism; Fishing in Carbon County by Carbon County Office of Tourism; Helper Arts Festival by Kimball Johnson; Carbon County cropland with sheep by USDA-NRCS; International Days in Price, Utah by Kimball Johnson; Rock art in Nine Mile Canyon by Carbon County Office of Tourism.

Water Quantity & Quality

Because of the area's desert climate, water in Carbon County is scarce. The area is highly dependent on mountain snow pack, stream flow and reservoir storage for all water needs.

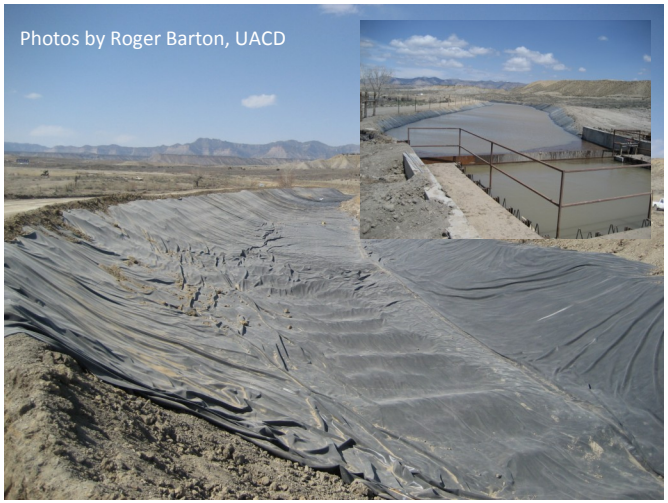
Storage and Delivery

Some Carbon County water user groups are currently in the process of lining and piping many open canals in efforts to improve community safety, eliminate seepage and water loss, and improve the quality of water being delivered. Additional lining and piping projects are in need of funding.

Sprinkler Irrigation and Salinity Control

Flood irrigation has been the method of crop and pastureland irrigation in Carbon County for over a century. Once saturated by flood irrigation, the salt-bearing soils of ancient shallow seas produce large salt accumulations and damage to previously productive agricultural land. Surface return flows and seeps from deep percolation containing these slats then flow downstream. Downstream water users of the Colorado River are then affected by the high salt content of water used for residential, commercial, industrial, and agricultural purposes.

The majority of canal and irrigation companies in Carbon County have made the transition to pressurized sprinkler irrigation systems in an effort to reduce the salt loading into the Colorado River system, eliminate return flows and deep percolation, improve irrigation efficiency, and increase crop yields. Through the Colorado River Basin Salinity Control Program, local irrigation companies are working with the Bureau of Reclamation, the Natural Resources Conservation Service, and the Price River Watershed Conservation District to help fund the systems. The pressurized irrigation systems are now lowering water tables, which restores cropland to productive use, and is stopping salt laden water from running off fields and into the Colorado River system.



Top: Lining the Wellington canal, 2008
Bottom: Scofield Reservoir is the main source of drinking water for Carbon County

Mining Impacts

Underground coal mining provides a solid economic base for Carbon County and provides needed coal for the energy industry. The Utah Division of Environmental Quality (DEQ), the regulatory agency for the quality of mine discharge, indicates that coal mining activities can increase salts and iron through the leaching of spoil materials, groundwater discharge, or the erosion of disturbed surface material. Point source inputs are possible from the discharge of dewatering effluents, and from other controlled sources. Non-point source discharges can also occur from uncontrolled sources and from increased surface disturbances.[4] There has also been expressed concern of mining impacts on water supply. The interception of groundwater by underground mining activities may alter or diminish natural flows of seeps and springs used by local water user groups. The Utah Division of Oil, Gas and Mining (DOGM) regulates the hydrological effects of mining and administers water replacement rules. Cooperation between DOGM, DEQ, the Utah Division of Water Rights, mining companies, and local water user groups is needed to protect water resources and the mining industry alike.[5]

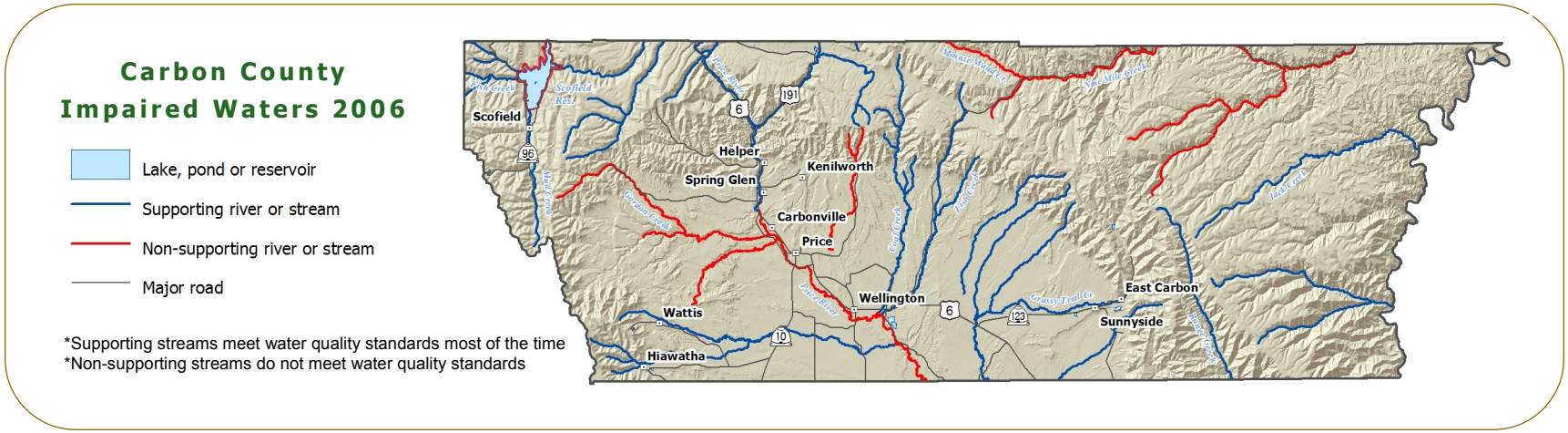
Additional concerns exist regarding water quantity and quality in Carbon County. The following list shows a number of those concerns as well as needs that, if observed, may help address these concerns:

Concerns

- Lack of water storage necessary to fully utilize acquired water rights for irrigation and other uses
- Lack of existing watershed plans
- Health risks from large mosquito populations
- Major flooding events impacting communities, farms, and rangelands
- Salinity from flood irrigation and resulting salt loading in the Colorado River

Needs

- Maintain water storage capacity of reservoirs by reducing sedimentation loading and seek additional storage
- Develop watershed plans
- Support of the reduction of mosquito populations and public education on control methods
- Heightened flood control measures, especially with the abandonment of canals due to the sprinkler irrigation transitions which were previously used as flood control structures
- Continue to support and install pressurized irrigation systems



4 Utah Division of Water Quality
5 Utah Division of Water Resources

Soil

Erosion

The nature of the soils in Carbon County present many land use challenges. Carbon County farmlands are unique in that they are nearly exclusively formed from Mancos shale. Mancos shale soils are very erosive and have inconsistent shrink/swell properties. Very few farmed areas in Carbon County are not in the highly erosive land (HEL) category.

Salinity

Water movement in the shale bedrock can be unpredictable due to concentrated flows caused by the nature of the substrate. This piping may direct and concentrate water and salts in the soil in such a way that at times it may cause two to three feet of lifting and cracking in a concrete basement, when only a short distance away the houses have little or no problems. Mancos shale soils can and do present significant challenges to structures penetrating the soil where both water and sodium salts are available. Mancos shale parent material also presents another challenge in that it has inconsistent types and amounts of salts deposited within it. Sodium chloride, calcium carbonate, and gypsum salts are the major salt components affecting soils formed from Mancos shale. High salt content driven by sodium salts reduce available water capacity. Sodium left behind by water movement through the soil can form salts that push the pH so high that crops have reduced ability to uptake specific nutrients. Gypsum salts on the other hand promote soil structure, water infiltration, and lower the pH. Fortunately, Mancos shale soils' erosive properties are balanced by its soil forming properties. Well maintained irrigated fields have been found to increase in soil depth with use. Implementation of proper irrigation water management practices can help ensure healthy topsoil by reducing percolation and keeping salts from surfacing.[6]

Top: The erosive nature of the Mancos shale alluvium.
Bottom: Cropland with salts at surface level.

6 J. Dyer, USDA-NRCS

Organic Matter

Because of the low content of organic matter in Carbon County soils, the return of organic matter is particularly important in soils that are irrigated. The majority of soils in the area are formed from shale and are rich in illite and kaolinite clays. These clays have a low capacity to retain plant nutrients. Supplemental fertilizers including phosphorous and nitrogen are often used on crop and pastureland to increase plant growth, making it more practical in returning organic matter to the soil. No-till planting provides producers an opportunity to return organic matter to their soil by planting new crops into crop residue and stubble, thus returning more organic matter to the soil than conventional tillage. Use of no-till equipment also reduces erosion and reduces fuel and equipment costs as compared to conventional tillage practices.

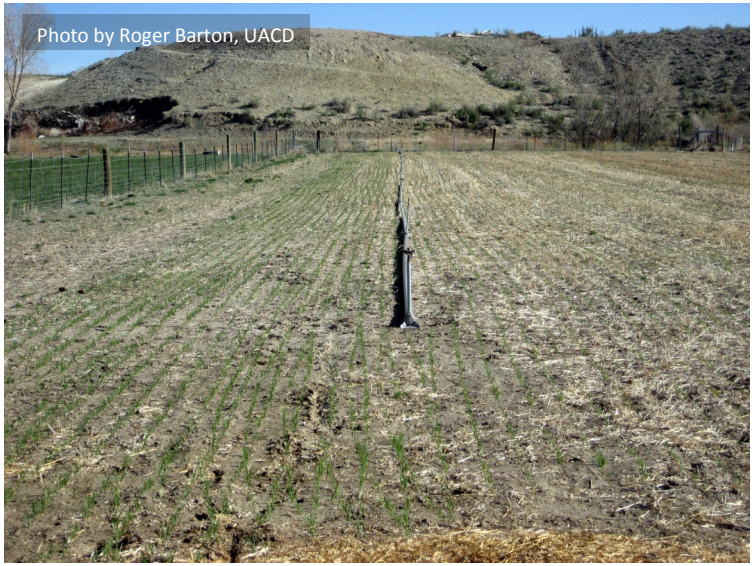
Additional concerns exist regarding soils in Carbon County. The following list shows a number of those concerns as well as needs that, if observed, may help address soil concerns:

Concerns

- Salt from Mancos shale entering and polluting water sources
- Soil compaction
- Lack of public knowledge of Carbon County soil composition, nutrient needs, and pH
- Lack of vegetative cover to protect soil from erosion

Needs

- Continue participation in the Colorado River Basin Salinity Control Program
- Increase the use of pasture aeration and ripping to decrease soil compaction
- Educate the public on best management practices of nutrient application and soil sampling
- Use no-till planting to increase organic matter and reduce erosion.



No-till planting into crop residue. This method of planting decreases erosion, improves soil tilth, and increases organic matter in the soil.

Energy Development & Alternative Energy

Energy development plays an important role in national, state, and local economies, especially that of Carbon County. Continued responsible development of these resources is vital in maintaining today's standard of living.

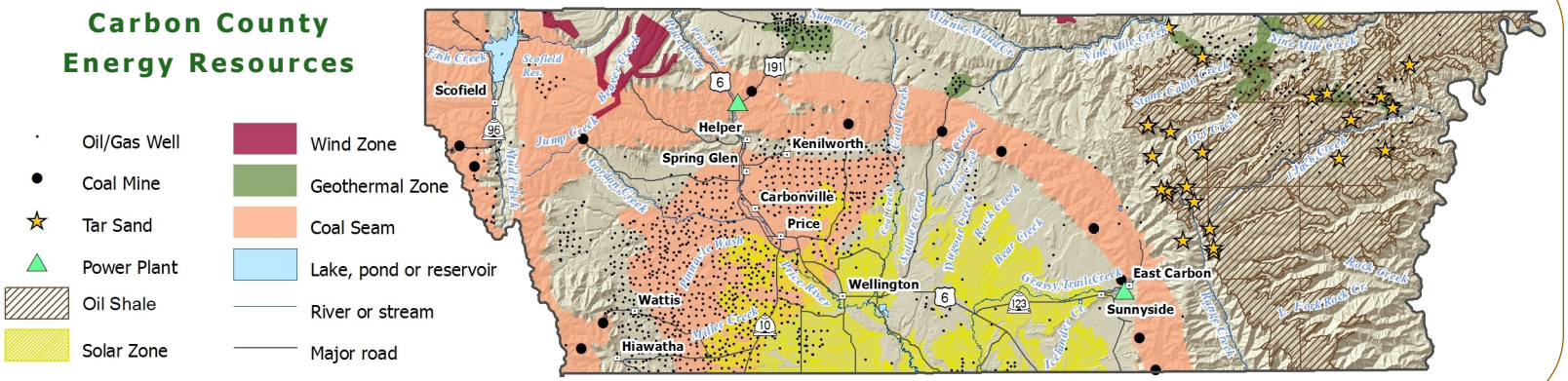
Conventional Energy Development

Coal mining and oil/gas production are the major energy industries found in Carbon County. Carbon County has one of the state's most economic coal reserves, of which the vast majority is consumed by power generation facilities. Coal production has steadily declined over the last decade. The future of coal mining in Utah depends on a number of factors, including economic, geological, technical, and political factors. The Energy Information Administration suggests coal will continue to provide the largest share of electric energy to the U.S., even as alternative energy resources are being developed. Increased demand for coal may be seen if successful carbon capture technology, coal-to-liquids plants, and coal-to-gas plants are implemented, as well as if increased exports to the Pacific Rim are made.[7]

Carbon County
Oil, Gas, & Coal Production

	2010	2009	2008
Oil	46,254	69,831	50,682
Natural Gas	83,618,904	96,592,822	94,546,489
Coalbed Methane	44,663,100	49,007,036	53,679,093
Coal	Data unavailable	9,457	11,533

Gas volumes reported in MCF (1 MCF = 1,000 cubic feet)
Coal tonnage reported in thousand short tons
Source: Utah Dept. of Natural Resources, Utah Geological Survey



7 Economic Development Corporation of Utah

Renewable and Alternative Energy

Carbon County has potential for the development of renewable energy resources including wind, solar, and geothermal, as well as alternative energy resources such as tar sands and oil shale. The richest deposits of tar sands in the U.S. are found in Utah and California. Bitumen from tar sands can be refined to make synthetic crude oil, asphalt, jet fuel, and gasoline. One of Utah's largest tar sand deposits is located in Carbon County near Sunnyside and has an estimated 4,400 million barrels (MMBbl) worth of crude oil and 1,700 MMBbl of additional potential. Factors such as access, technology, and investment constraints currently limit production.[8]

Additional concerns exist regarding energy development in Carbon County. The following list shows a number of those concerns as well as needs that, if observed, may help address energy development concerns in the county:

Concerns

- Regulations slowing energy development
- Water availability
- Expense of system installation verses income potential
- Potential land disturbances, water impacts, and other natural resource-impacting factors
- Lack of educational opportunities for local citizens

Needs

- Reduction of regulation inhibiting energy development
- Cooperation between water user groups, energy development companies, land use agencies, and citizens to both protect water rights and ensure opportunities for energy development
- Realistic financial opportunities and incentives for developers and landowners for renewable and alternative energy development
- Proper construction, operation, and maintenance of developments to prevent soil erosion, water contamination, and other possible negative impacts
- Education and coordination with citizens by developers to encourage safe, proper, and efficient energy development

Photo by Utah Division of Oil, Gas & Mining

Carbon Sequestration in Carbon County

Utah is currently hosting a 90 million dollar major commercial-scale carbon sequestration experimental project in Carbon County, located 15 miles west of Price underneath a producing natural gas field. The project will be the largest evaluation of large-scale CO_2 injection in the U.S. If given approval by federal regulators, the project's operations will inject up to 1 million tons of CO_2 per year for 3 to 4 years into an underground geologic formation. This would allow nearby power generating facilities - if required to lower CO_2 emissions - to store CO_2 underground as apposed to releasing emissions into the atmosphere. The project is expected to serve as a "proof-of-concept" for future projects in Utah and across the nation.[9]

8 DOE Office of Petroleum Reserves
9 State of Utah Office of Energy Development

Rangeland

Carbon County's rangeland has historically been highly utilized for livestock grazing and remains an important resource for the ranching industry today. Cattle and sheep ranchers typically graze during the summer months in upland ranges administered by the U.S. Forest Service and the State Institutional Trust Lands Administration (SITLA). In spring, fall, and winter months, cattle and sheep are generally moved to lower rangeland to graze crop aftermath in irrigated, private fields and are fed hay in winter. Other ranchers utilize private rangelands year long. Ranchers alike are challenged with limited water and watering facilities, invasive and noxious weeds, and yearly changes to grazing permit numbers and durations.

Water for Livestock & Wildlife

Carbon County ranchers are challenged with limited water and watering facilities on rangelands, especially in grazing areas in the lower elevations with little precipitation. The same problem exists for wildlife. Many existing watering facilities are runoff catchment facilities or unlined ponds. Water in these facilities is usually lower in quality and has a higher concentration of dissolved solids, specifically soluble salts. Historically, cattle have also watered out of open canals used for water distribution. However, the ongoing transition from open canals and ditches to sprinkler irrigation has eliminated many open canals, leaving ranchers with few options for watering livestock and reducing watering facilities for wildlife. Partnerships need to be developed between ranchers, wildlife managers and land managers to create more watering facilities for livestock as well as wildlife. The Carbon Canal Winter Water project serves as an example of successful partnering in order to improve watering facilities. Such partnerships will result in greater distribution of wildlife and livestock, which will also result in improved utilization of rangeland vegetation and fewer impacts to private cropland.

Typical upland Wyoming big sagebrush range site in Carbon County, typically used for summer grazing.

Cheat Grass

As is the case for many counties in Utah, cheatgrass presents a major problem to Carbon County rangelands. This noxious and invasive weed is widely adapted. It grows on all exposures and all types of topography from desert valley bottoms to the tops of the highs mountain peaks, 2500 to 13,000 feet in elevation. It invades heavily grazed rangeland, roadsides, waste places, burned areas, and disturbed sites quickly. Cheatgrass is fair to good for livestock before the inflorescence emerges, then has little value. Management should be aimed at replacing cheatgrass with a perennial plant cover. This involves releasing grazing pressure during the flower and seed formation stages of the desirable plants.[10]

10 Utah State University

Public Grazing Permits

Carbon County cattle and sheep ranchers have seen increasing challenges with grazing permit windows and reductions in permit numbers on public grazing allotments. These changes have been made by state and federal agencies in an effort to better manage the rangelands. Yearly changes in grazing permit numbers and windows usually depends on that years' plant growth and precipitation. The frequency and intensity of grazing, as well as the opportunity for growth and regrowth, are all important factors in maintaining healthy rangelands. Ranchers and public agencies must work together to protect the range and also to protect the ranching industry in Carbon County.

Additional concerns exist regarding rangeland in Carbon County. The following list shows a number of those concerns as well as needs that, if observed, may help address rangeland concerns:

Concerns

- Overall rangeland vegetative health
- Beetle-killed timber and resulting fire and watershed hazards to forests and communities
- Noxious and invasive weeds which degrade the range and riparian areas, specifically tamarisk trees
- Flooding from rangelands impacting private property
- Protection of sensitive and endangered species and resulting reduction of multiple use including grazing

Needs

- Implementation of rangeland improvement projects including brush control, seeding projects, pinion and juniper removal, noxious and invasive weed control, and livestock water developments
- Management of beetle-killed timber to protect local water resources, reduce fire hazards and protect soil and vegetation
- Enhancement of Sage grouse and other wildlife species on a multiple use basis. These species have lived in harmony with livestock for many years and livestock should be used as a tool to enhance habitat
- Support of the continued use of the tamarisk beetle as a method of controlling this species, along with removal and restorative revegetation
- Improved flood control

Public grazing allotment near Scofield Reservoir. The top photo shows the range prior to a year of grazing rest. Results of rest are shown in the bottom photo. Proper grazing management can benefit both the range and the livestock that utilize it.

Fish & Wildlife

Fish

The lower Price River is valuable habitat for native fish such as flannelmouth sucker and bluehead sucker. Colorado pikeminnow have also been shown to utilize the lower Price River as far up as Farnham diversion near Wellington, Utah. The Colorado pikeminnow is the largest minnow in North America, historically known to grow up to 6 feet long. The Colorado pikeminnow is a federally listed endangered species. The Desolation Canyon section of the Green River forms the boundary between Carbon and Uintah Counties. This section is important for Colorado pikeminnow, as well as humpback chub, and razorback sucker that are also federally listed.[11]

Wildlife Management

All wildlife plays an important role in Carbon County. Price River Watershed Conservation District and partners recognize the need for improved management of wildlife and habitat to minimize negative impacts and maximize positive impacts to both private and public lands of Carbon County. Deer herds in Carbon County have been a concern to many land managers. Several deer herds are now utilizing forage in the populated communities reserved for private livestock. Fences are destroyed and riparian areas of damaged by the removal of protective vegetation. These residential deer herds can negatively impact crop production. High numbers of deer and elk are also impacting livestock use on rangeland. Collaboration of federal, state, local, private, and other groups is needed in order to maintain healthy deer and elk herds as well as protect local agriculture and range resources.

Challenges for Pollinators

Bees and other pollinators are currently facing many challenges in the modern world. Habitat loss, disease, parasites, and environmental contaminants have all contributed to the decline in many species of pollinators. These pollinators serve an important purpose, as many plants cannot reproduce without pollen carried to them by foraging pollinators. It is estimated that one out of every three bites of food we eat exists because of animal pollinators. Protection of pollinators and enhancement of their habitat - especially that of native bees - is needed in order to pollinate the plants that provide the food we eat.[12]

Photo: USDA Agricultural Research Service

Mule Deer in cropland

11 Utah Division of Wildlife Resources
12 USDA-NRCS

Predator Control

Predator control is vital to the establishment of sage grouse and other threatened and endangered species. It is observed that the increase in predators, through their protection, has resulted in the decrease of the sensitive species that wildlife agencies are trying to protect. The use of best management practices to control predators is needed to protect sensitive species.

Additional concerns exist regarding and wildlife in Carbon County. The following list shows a number of those concerns as well as needs that, if observed, may help address fish and wildlife concerns:

Concerns

- Predators reducing the numbers of desired wildlife species
- Habitat management instead of predator control reducing acreage once available to grazing
- Introduction of otters can create water use problems
- Wolves and the potential negative impacts on citizens, livestock, and wildlife
- Endangered species and sensitive species regulation impacting water and land use
- Decline in pollinator numbers

Needs

- Improved management of predator numbers to restore historic populations of wildlife, especially where habitat is sufficient
- Use livestock as a tool to improve habitat
- Discouragement of otter introduction
- Discouragement of wolf introduction
- Collaboration and increased opportunities for local input on endangered and sensitive species-related regulation
- Support and increase the number of pollinators through habitat enhancement and other measures

13 Utah Conservation Data Center

Greater Sage-Grouse

(Centerocerus urophasiarus)

The Greater Sage-Grouse - also known as the Sage-Hen and the Sage-Chicken - is the largest of the North American grouse. These birds inhabit sagebrush plains, foothills, and mountain valleys. Sagebrush is the predominant plant of quality habitat. A good understory of grasses and forbs, and associated meadow areas, are essential of optimum habitat. Male Sage-Grouse gather in traditional "strutting grounds" during March and April and put on spectacular courtship performance—strutting with their tails erect and spread, and air sacs inflated. The principle winter food item is sagebrush leaves. During summer, the fruiting heads of sagebrush, leaves and flower heads of clovers, dandelions, grasses and other plants are taken.

Sage-Grouse were abundant in pioneer times, but sagebrush eradication and intensive use of lands by wildlife and domestic livestock have reduced their numbers. Sage-Grouse range is declining in Utah in both quantity and quality. Sage-Grouse range has declined 50 percent from historical times. Greater Sage-Grouse are native to Utah and are listed as a sensitive species by the Utah Division of Wildlife Resources.[13]

Soil

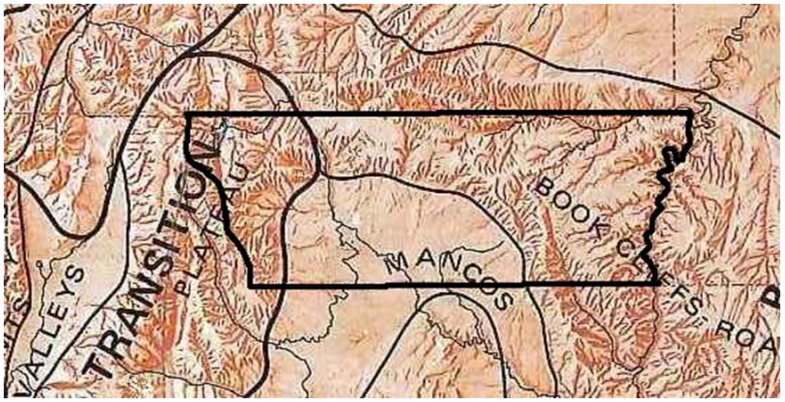
Carbon County soils are similar to most soils found on the Colorado Plateau, in that they are directly tied to the portion of the geology exposed in stratigraphic column and the elevation, aspect, and slope upon which they are found. The varying soils conditions of the area produce varying soil resource conditions.

Mancos Shale Area

The majority of Carbon County's cities, towns, and farming operations are located in the Mancos shale area. Mancos shale soils are very erosive and have inconsistent shrink/swell properties. Mancos shale parent material also presents other challenges in that it has inconsistent types and amounts of salts deposited within it. Sodium chloride, calcium carbonate, and gypsum salts are the major salt components. This can create problems with irrigated cropland and the resulting transfer of salts into the Colorado River. The non-farmed portions of the Mancos shale area support winter cattle and wildlife grazing.[6]

Wasatch Plateau Area

Located on the west side of Carbon County is the basin and range of the Colorado Plateau, locally known as the Wasatch Plateau. In Price Canyon is found the Mesaverde Group exposure. This formation contributes a significant portion of the sands found in the mixed alluvium fans and washes, which helps mitigate many of the negative properties of the Mancos shale alluvium deposits. Unlike the southern portion of the Wasatch Plateau, the Blackhawk Formation in the Carbon County area is thick and contains thick coal deposits. Shale layers throughout the stack form aquacludes (impermeable layers) - concentrating seeps that present challenges in regards to roads. Large sections of road may slide down hill off the shale during and shortly after heavy rainfall events. The nature of and condition in which these soils exist provides excellent quality livestock and wildlife grazing, along with quality recreation such as hunting, fishing, and hiking.[6]



Carbon County's land form types

Bookcliffs Area

The northeast portion of Carbon County presents another major land resource difference. This area is unique because of elevation and landform position. In this area of the Bookcliffs, the North Horn and Price River Formation thin significantly and the Blackhawk Formation is presented. These and other changes in parent material and higher rainfall totals result in fewer challenges managing sodium salts. Additionally, erosion is reduced, water capacity is improved, and infiltration is improved. Landslides are common, often forming impoundment lakes in the narrow valleys. High clays often exhibit shrink/swell characteristics and will bake hard in the summer. In these high clay areas, two-needle pinyons are unable to extract enough water to compete with juniper trees and will be missing or exist only in small numbers. The Colton Formation residue and shale layers present significant challenges to road building, particularly in Nine Mile Canyon and Emma Park.[6]

6 J. Dyer, USDA-NRCS

Prime Farmland

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 86,524 acres of prime farmland in Carbon County; however, these must be irrigated to qualify for this designation. An additional 5,871 acres of farmland could be considered prime farmland if it is both irrigated and drained.

Farmland of Statewide Importance

Land identified by state agencies as important for agricultural use, but not of national significance can be designated as statewide important farmland. Carbon County has approximately 11,545 acres of potentially statewide important farmland, but the actual is less due to a requirement for irrigation.

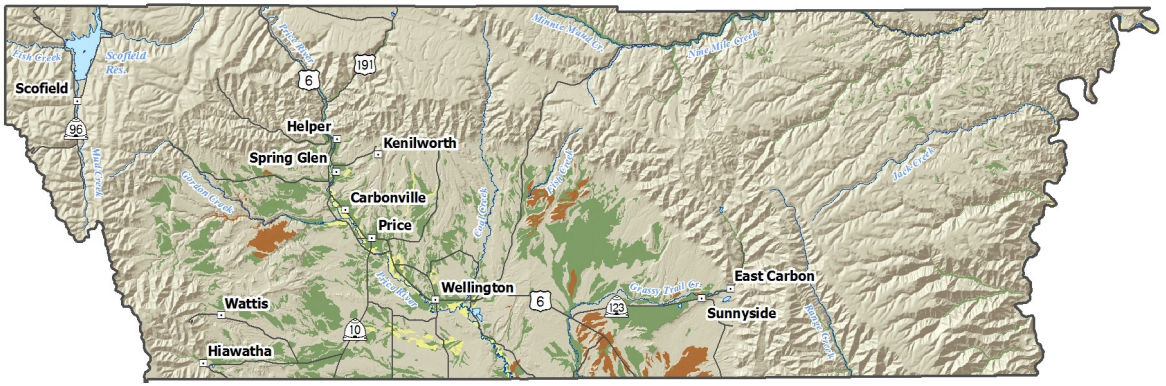
Locally Important Farmland

Carbon County currently does not have any land officially designated as "locally important farmland." However, if such a designation is made in the future, the Price River Watershed Conservation District suggests that any soils currently under agricultural production and other crop-producing soils that may be utilized when improved irrigation systems are installed be considered "locally important farmland." Rangeland soils are also highly important to livestock and wildlife.

Farmland in Carbon County

Carbon County Important Farmland Classification

- Farmland of statewide importance
- Prime farmland if irrigated
- Prime farmland if irrigated and drained
- Lake, pond or reservoir
- River or stream
- Major road



Water

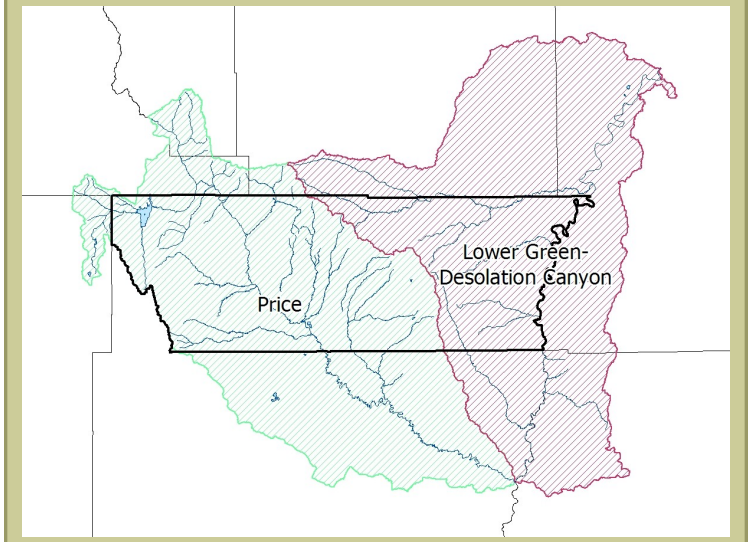
Water Supply

The majority of the water in the Price River, which is the main source of water in Carbon County, originates as snowmelt from the Wasatch Plateau. The foothills of the Wasatch Plateau are an important area for groundwater recharge in the basin and have been identified as sensitive groundwater areas. The tributaries draining the Book Cliffs area are another significant source of spring snowmelt and contribute to the flows in the Price River during isolated storm events. The Price River flows for roughly 50 miles in a general southeasterly direction and then terminates at the confluence with the Green River. Fish Creek and White River are the northern tributaries with Fish Creek being the largest. Operation of Scofield Reservoir, a large storage facility on Fish Creek, has a major influence on water flows in the Price River.[14]

Scofield Reservoir is located within the Wasatch Montane Zone ecoregion at an elevation of 7,618 feet. The reservoir was constructed at the confluence of several perennial streams including Fish Creek, Mud Creek (locally referred to as Clear Creek), Pondtown Creek and other springs and small tributaries. The reservoir's outlet feeds into the Price River and ultimately the Colorado River. The capacity of Scofield Reservoir is 73,600 acre feet and has a surface area of 2,815 acres. Scofield Reservoir is used for several purposes including flood control, recreation, and storage for drinking water and irrigation. Irrigation is the primary use for water in the Price River Drainage.[15]

Scofield Reservoir

Carbon County Watersheds



Carbon County consists of the Price and Lower Green-Desolation Canyon watersheds.

14 Utah Division of Water Quality
15 Utah Department of Environmental Quality

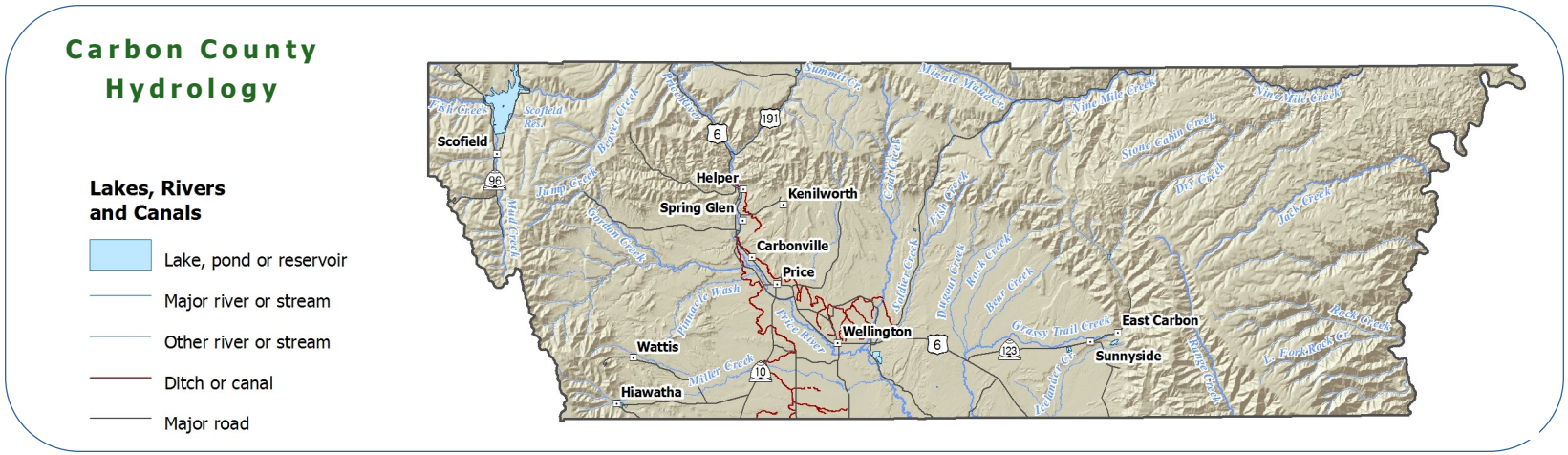
Water Quality

Primarily due to high concentrations of total dissolved solids (TDS), several sections and tributaries of the Price River have been listed on the State of Utah's 303(d) list of impaired waters as non-supporting of their agricultural use classifications. Additionally, for certain smaller river sections, pH, dissolved oxygen and dissolved iron are also cited for causing impairment. Impaired Price River sections begin at the confluence of, and include Gordon Creek, a smaller hierarchy stream. The primary sources for TDS in receiving waters are agricultural and residential runoff, and erosion of soluble salt soils. In an effort to address this, local landowners are participating in salinity programs to prevent deep percolation and runoff.[14]

Scofield Reservoir is listed on the State of Utah's 303(d) list as partially supporting its designated beneficial use because of low dissolved oxygen and high total phosphorus concentrations. Nutrients are delivered to the reservoir directly during summer draw down, during spring runoff and summer storm events, and in tributary flows. Nutrient contamination causes excessive algal growth and turbidity. Water with high biological productivity results in lower oxygen concentrations and stress to the aquatic community. Summer and winter fish kills have been reported to occur within the reservoir.[15] Native soils are the major source of phosphorus affecting the reservoir. Stream bank stabilization and erosion control measures will help reduce phosphorus loading.

Irrigation

Crop and pastureland in the county require irrigation for plant needs. Carbon County has approximately thirteen irrigation and canal companies which serve the majority of the irrigated land in the county and manage the water that irrigates approximately 16,000 acres of land.



14 Utah Division of Water Quality
15 Utah Department of Environmental Quality

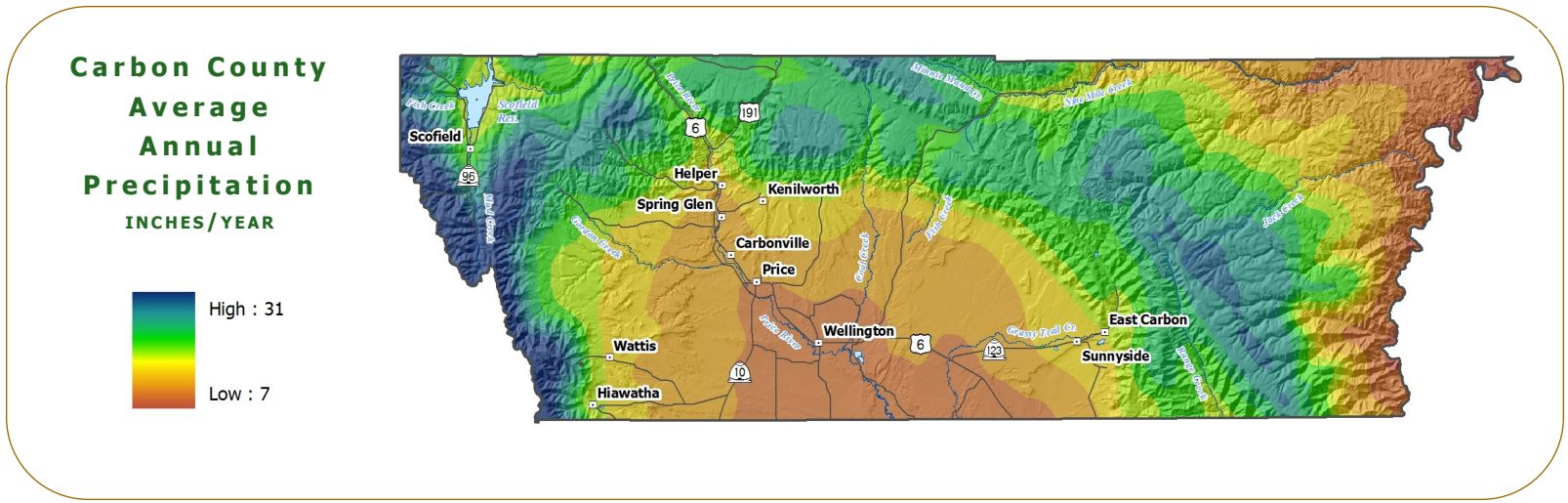
Air and Climate

Climate

The Sierra Nevada, Cascade, and Rocky Mountain ranges greatly influence the climate of Carbon County. Storms from the Pacific Ocean cross the Sierra Nevada and Cascade Mountains before they reach Utah. The moisture associated with these storms generally condenses and falls as precipitation in the areas over which clouds rise in crossing the mountains. As a result, the air that reaches Utah is comparatively dry and produces little or no rain. The Rocky Mountains are an effective barrier to cold, continental air masses that move southward from Canada during the winter months.

On a small scale, the Wasatch Mountains that border Carbon County on the west, and the Tavaputs Plateau that borders the county on the north provide a sheltering effect to the area from storms associated with northerly or westerly winds. These topographic features create a "rain shadow" late in fall, in winter, and in spring. In summer and early fall, these mountains aid in the development of showers and thunderstorms from the masses of moisture-laden air that occasionally move into the southeastern part of Utah from the Gulf of Mexico. These storms, generally called cloudbursts, produce large quantities of rain in short periods of time.

In general, the climate of Carbon County is dry. The average annual precipitation in the lower elevations is between 6 and 10 inches per year. In the high mountains on the west side of the county, the annual precipitation may be as much as 30 inches per year, with most of it falling in winter. The main season of rainfall is from late July through October. The largest amounts fall during the thunderstorm season in August. November is the driest month.[3] The length of the growing season decreases almost linearly with increases in elevation. It ranges from more than 140 days in the valley to less than 20 days on the top of the Roan Plateau, where freezing temperatures can occur any day of the year.[16]



16 Soil Survey of Carbon Area, Utah

The county has an abundance of sunshine and clear skies. Winds are generally light to moderate in all seasons of the year. As a rule, the strongest winds blow from the south for several days at a time. These winds reduce the effectiveness of precipitation in the spring.

Winters are cold and dry. Generally, from 10 to 20 inches of snowfall is received at the low elevations. The high mountains west of the county receive several hundred inches of snow per year. The snow received in the mountains in winter supplies much of the irrigation water needed on the farmland in the valleys. January is the coldest month with its mean temperature between 18 and 24 degrees F.[3]

Air Quality

Identified by the Clean Air Act, six common air pollutants are found across the United States which can create health hazards, harm the environment, or cause damage to property. These six common air pollutants include carbon monoxide, lead, nitrogen dioxide, particulate matter (PM10 and PM2.5), ozone, and sulfur oxides.

Carbon County 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. Areas that do not meet the NAAQS are classified as nonattainment areas and are then required to develop and implement comprehensive state plans to reduce pollutant levels. The State of Utah currently has 24 air monitoring stations located across the Wasatch Front and in Southwestern Utah.[17]

NRCS Snow Survey and SCAN Programs

Carbon County's SNOTEL site at Timberline

The Natural Resources Conservation Service (NRCS) Snow Survey Program generates water supply forecasts and provides near real-time climatic data from high elevation, snow-fall driven environments in the western United States. Timing and amount of snowpack, along with temperature fluctuations throughout the spring and summer months, impact the amount of water available for irrigation during the growing season. The NRCS Snow Survey provides valuable data that is used to help manage water resources in order to maximize available water.

In Carbon County, NRCS operates one SNOTEL (SNOwpack TELemetry) site that monitors conditions at Timberline (8,684 ft). Although located in neighboring counties, the Clear Creek #1, White River #1, Mammoth/Cottonwood, and Indian Canyon SNOTEL sites are highly important to watersheds in Carbon County. Additional climatic data is available at http://www.ut.nrcs.usda.gov/snow/.

The NRCS Soil Climate Analysis Network (SCAN) is a nationwide climate network that provides near real-time soil moisture and temperature data coupled with additional climate information for use in natural resource planning, drought assessment, water resource management, and resource inventory. The stations are remotely located and collect hourly atmospheric and soils data from spatially representative soils and landscapes. Sites are located in agriculturally important areas that best represent current irrigated and non-irrigated practices. Carbon County as one SCAN location at Price (5,647 ft). For access to data from other nearby sites, visit http://www.wcc.nrcs.usda.gov/scan/Utah/utah.html.

3 Soil Survey of Carbon-Emery Area, Utah
17 Utah Department of Environmental Quality, Division of Air Quality

Plants

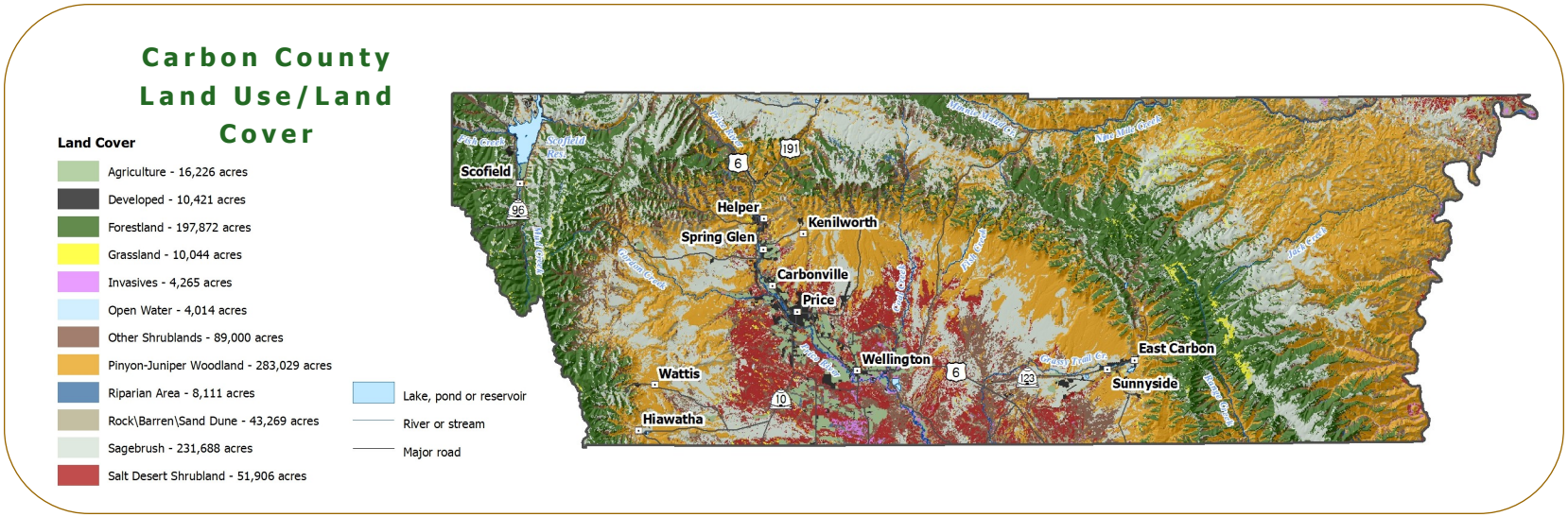
Crops and Pasture

There are approximately 16,000 acres of irrigated land in Carbon County. The primary irrigated crops are alfalfa and small grains. Carbon County had 6,200 acres in alfalfa production in 2009 and 5,700 acres in 2010.[18] The remaining irrigated land is used as pasture consisting mainly of native, introduced and improved grasses.

With the vast majority of the irrigated land in Carbon County residing in an aridic moisture regime, farmers rely heavily on the mountain snowpack for irrigation water, especially between the months of June and October. Most, if not all, of the irrigated farm ground relies heavily on reservoir storage. For the lower irrigated portions of the county, freeze free periods are typically between 110-180 days. For those irrigated acres, freeze free periods are typically between 90-120 days. These shorter growing periods coupled with the arid nature of the county, can often limit crop production. Noxious weeds area of increasing concern with roads and waterways being two of the primary impacted corridors.

Rangeland

Rangelands are very important to the agricultural economies in Carbon County. There are approximately 560,000 acres of rangeland in the county.[19] Rangelands provide grazing for domestic livestock and valuable habitat for a variety of wildlife species such as pronghorn antelope, mule deer and elk. Rangelands in the lower elevations consist of grass species such as galleta, blue grama, Indian ricegrass, needle and thread and Sandberg bluegrass and forb species such as scarlet globemallow, phlox and western yarrow. Shrubs in the lower elevations include species such as shadscale, fourwing saltbush, Gardner saltbush, winterfat, bud sagebrush, black sagebrush and low rabbitbrush. As elevation and precipitation increase, grasses include species such as Indian ricegrass, western wheatgrass, bluebunch wheatgrass, Salina wildrye, needlegrasses and fescues. Forbs such as western yarrow, Indian paintbrush, Oregon grape and lupine are present. Shrubs include species such as big sagebrush, woods rose, antelope bitterbrush, rabbitbrush, mountain mahogany, gambel oak, chokecherry, serviceberry and snowberry.



18 Utah Agricultural Statistics
19 SWGap

Forestland and Woodland

The primary woodland type in Carbon County is pinyon pine and juniper. There are approximately 283,000 acres of this ecotype in the county.[19] The vast majority of the pinyon and juniper is found on the descending plateaus associated with the Wasatch Mountains to the west and north and the Bookcliffs to the east. The depth and texture of the soil limit water holding capacity and thus influence tree growth. Understory vegetation consists of grasses, forbs, shrubs and other plants. Pinyon pine and juniper tress are considered invasive and require management for grass and forb growth as well as erosion control. Some woodland areas, if well managed, produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

Forested land covers approximately 155,000 acres in Carbon County.[20] Forestlands include species such as quaking aspen, Douglas fir, Engelmann spruce, subalpine fir and ponderosa pine. These forests overlay some of the county's most valuable watershed, wildlife, and recreation areas. Threats and challenges for these ecotypes include the degradation of watersheds and potential irreversible changes in forest health that can result from poor management such as overgrazing by wildlife and domestic livestock, excessive timber harvest, bark beetle infestation, residential or recreation-related development, and surface mineral development.

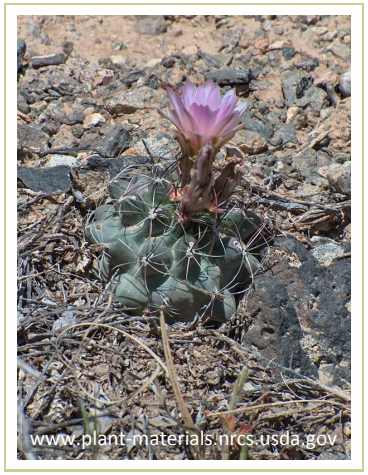
In general, the forests in Carbon County are in good condition, although spruce beetles (Dendroctonus rufipennis) are present and have affected approximately 90 percent of spruce trees. Aspen forests are being displaced by shade tolerant conifers. In general, the risk for catastrophic wildfire is low but as fallen timber, dead standing beetle killed timber and understory growth increase, the intensity of a fire increases exponentially. Continued forest harvesting, thinning of understory trees, and/or fuel reduction are encouraged to help reduce the risk of epidemic populations of beetles and catastrophic wildfire.

A recent assessment by the Utah Division of Forestry, Fire & State Lands (www.ffsl.utah.gov/stateassessment.php) shows the location of areas that would benefit from forestry-related projects. 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.

13 Utah Conservation Data Center
20 USGS National Gap Analysis Program

Threatened and Endangered Plant Species

Graham beardtongue *(Penstemon grahamii)* proposed threatened species occurs only in the Uinta Basin in Carbon County, Duchesne County, and Uintah County, Utah, and in immediately adjacent Rio Blanco County, Colorado. This species has thick leathery leaves, and large, tubular, light to deep lavender flowers. Graham beardtongue grows on semi-barren knolls, ridges, and steep slopes in a mix of fragmented shale and silty clay soils closely associated with the Mahogany zone (oil shale bearing) of the Green River Formation.[13]



Uinta Basin hookless cactus *(Sclerocactus wetlandicus)* is a federally listed threatened plant that occurs in the Uinta Basin in Duchesne, Uintah, and Carbon Counties, Utah. This species is a perennial herb with a commonly solitary, egg-shaped stem and produces pink flowers. This cactus is found on river benches, valley slopes, and rolling hills and grows in salt desert shrub and pinyon-juniper communities. This species and its habitat is vulnerable to disturbance from oil and gas exploration and development, livestock grazing, building stone collecting, and off-road vehicle use.[13]

Animals

Livestock

Livestock production is the main focus of agriculture in Carbon County. The average annual market value of livestock sales of $4,264,000 makes up 84 percent of total agricultural products sold in the county.[21] Most cattle operations found in the county are cow-calf operations where calves are marketed and sold in the fall. The sheep industry is also a major industry for the county. The mountains surrounding the county and the desert of the lower elevations provide significant summer and winter range for the beef cattle and sheep industries.

Endangered and At-Risk Species

The Utah Division of Wildlife Resources maintains information on Utah plants and animals classified as at-risk. The state's objective is to prevent at-risk species from being listed by the federal U.S. Fish and Wildlife Service as Threatened, Endangered, or Candidate Species under the Endangered Species Act. A candidate species does not receive statutory protection, though it increases the urgency for state and federal agencies to give priority to and manage to improve

Carbon County's Federally Listed Threatened (T), Endangered (E), and Candidate (C) Species

Common Name	Status
Humpback Chub	E
Bonytail	E
Colorado Pikeminnow	E
Razorback Sucker	E
Greater Sage-grouse	C
Black-footed Ferret	E Extirpated
Gray Wolf	E

Utah Division of Wildlife Resources, *County Lists of Utah's Federally Listed Threatened(T), Endangered(E), and Candidate© Species*. March 29, 2011. http://dwrcdc.nr.utah.gov/ucdc/ViewReports/te_cnty.pdf

Burrowing owl

The burrowing owl is an at-risk species in Carbon County

utahwildlifephotos.com

At-Risk Species

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

- Bald Eagle
- Bluehead Sucker
- Burrowing owl
- Colorado River Cuthroat Trout
- Ferruginous hawk
- Flannelmouth Sucker
- Kit Fox
- Long-Billed Curlew
- Northern Goshawk
- Roundtail Chub
- Townsend's Big-Eared Bat
- Western Red Bat
- Western toad
- White-tailed prairie-dog

This list was compiled using known species observations from the Utah Natural Heritage Program within the last 20 years. A comprehensive species list, which is updated quarterly, can be obtained from the Utah Division of Wildlife Resources website: dwrcdc.nr.utah.gov/ucdc/

21 USDA-NASS, 2007 Census of Agriculture

Bald eagle, *utahwildlifephotos.com;* American badger, *utahwildlifephotos.com*; Bull elk, *utahwildlifephotos.com*

Aquatic Life

Carbon County is home to many cold and warm water species of fish. Scofield Reservoir, a Blue Ribbon Fishery, contains rainbow trout, tiger trout, and Bear Lake cutthroat trout. Brown trout are numerous in Lower Fish Creek, and cutthroat trout are abundant in Upper Fish Creek.[11]

Game

Carbon County supports an immense number and diversity of terrestrial wildlife species. The county is known for having one of the highest densities of golden eagles in the world. The county also contains a significant population of nesting peregrine falcons. Sage-grouse in Carbon County are gaining attention as populations are declining across the west. Threats to local sage-grouse populations include oil and gas development, pinyon-juniper encroachment, and population isolation. Mexican spotted owls, a federally threatened species, can be located in the Desolation Canyon area. Winter range for mule deer and elk is limited in the county with habitat protection areas such as Gordon Creek Wildlife Management Area being essential for survival. The county also holds critical habitat for Rocky Mountain bighorn sheep, which can commonly be seen during the summer months near the town of Sunnyside. Another wildlife species important to the county is the white-tailed prairie dog, which provides habitat for reptiles, burrowing owls, and insects.

Other species found in the county include blue grouse, chukar, pheasant, turkey, rabbits, doves, bear, mountain lion, bobcat, fox, moose, pronghorn, and numerous passerine birds.[11]

11 Utah Division of Wildlife Resources

Humans: Social and Economic Considerations

Population

Carbon County's population has fluctuated over the last 70 years between approximately 16,000 and 24,500. The population in 2010 was 21,403. The change in population from 2000 to 2010 was 4.8 percent. As of the year 2010, populations of Carbon County cities and towns were:[22]

East Carbon	1,301
Helper	2,201
Price	8,715
Scofield	24
Sunnyside	377
Wellington	1,676

Demographics

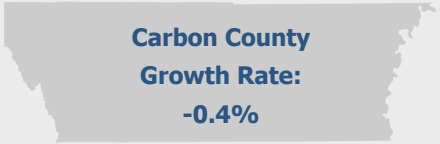
In 2010, the county's racial makeup was 84.1 percent white; 12.4 percent of Hispanic or Latino origin; 0.9 percent American Indian and Alaska Native; 0.6 percent Asian; 0.4 percent black; and 1.5 percent of persons reported being of another race. Persons under age 5 represent 8 percent of the population; persons under age 18 represent 26.7 percent; and persons 65 years and older represent 13.7 percent of the population. 12.5 percent of the county's population is below the poverty level, which is 1 percent higher than the state average for 2009.[22]

Economy

Coal, the state rock of Utah, has dominated Carbon County's economic history. Its high wages help bolster the entire county economy. During the 90's the economic base began diversifying into trade, transportation, utilities, government and various services.

Carbon County Population Data

Area name	Carbon
Period Year	2009
Population	19,768
Births	335
Deaths	205
Natural Increase	130
Net Migration	-203
Annual Change	-73
Annual Rate of Change	-0.4%



Source: Utah Population Estimates Committee
http://www.governor.state.ut.us/dea/UPEC.html

22 Utah Department of Workforce Services

Labor and Wages

In 2008, Carbon County had the third-highest employment growth rate in Utah with a growth rate of 4.7 percent. The county held precisely the same position in 2009, but with the second-smallest job loss in Utah. This amounted to roughly 110 jobs lost over the year. Due to the relative stability of the county's economy, Carbon County continues to resist the current recession.

Wages increased slightly in 2010. The average monthly wage increased from $3,060 in 2009 to $3,187 in 2010. Median household income for 2010 was $45,244.[46] The three largest employers in the county for 2010 were Carbon County School District, the State of Utah, and Canyon Fuels Company.[22]

Recreation

Carbon County, also known as Castle Country, has many points of interest for tourism. Attractions include Nine Mile Canyon, Scofield Reservoir and State Park, dinosaur museums, ancient Native American rock art, railroad and mining history, ghosts towns, and numerous outdoor activities including, hiking, biking, camping, fishing, hunting, and more.

Nine Mile Canyon is perhaps the most popular destination for tourists in the county and is considered an outdoor museum. Featured in National Geographic, the canyon is very remote and has many panels of rock art and dwellings that have remained untouched for hundreds of years. The canyon is 50 miles long and provides visitors opportunities for hiking and picture-taking.

Carbon County also sits at the northern end of the San Rafael Swell where visitors can enjoy scenes from tall mesas, buttes, and pinnacles to flat desert floors inhabited by antelope, wild horses and burros. The Swell is a high desert much different than the deserts in the southwestern part of Utah.[23]

Photos by Carbon County Office of Tourism

Top: Rock art in Nine Mile Canyon.
Below: Mountain biking in the mountains of Carbon County.

22 Utah Department of Workforce Services
23 Utah.com

Appendices

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Map & GIS Data Sources

Carbon County Land Ownership - Land ownership status and areas of responsibility for the State of Utah. The Utah School and Institutional Trust Lands Administration (SITLA) and the Bureau of Land Management revise this data regularly to reflect changes in ownership. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=LandOwnership

Roads – This data set represents street centerline data for the State of Utah as compiled by the Utah Automated Geographic Reference Center from data contributed by local, county, state, federal and tribal governments. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Roads

County Boundaries – This data set represents county boundaries in Utah at 1:24,000 scale. Last updated 2/9/2011. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Counties

Carbon County Impaired Waters and Respective Watersheds– Data set produced by the Utah Department of Environmental Quality Division of Water Quality and certified by the U.S. Environmental Protection Agency in 2006. The dataset shows Assessment Units in Carbon County for which existing pollution controls are not stringent enough to implement state water quality standards. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=DWQAssessmentUnits

Carbon County Energy Resources

Coal Seams - This data set represents coal seams in the state of Utah. The data set was created by Utah Geological Survey (UGS), a division of the Utah Department of Natural Resources. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Coal_4FootSeams

Coal Mines - This data set represents coal deposit areas in the state of Utah. The data set was created by Utah Geological Survey (UGS), a division of the Utah Department of Natural Resources. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Coalmine_UGS

Oil and Gas Wells – This data set represents oil and gas well surface points in the state of Utah as of 9/21/2010. The data set was created by the Utah Department of Natural Resources, Oil Gas and Mining Division. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=DNROilGasWells

Power Plants - This data set represents power plant locations in the state of Utah. The data set was created by Utah Geological Survey (UGS), a division of the Utah Department of Natural Resources. Last updated July 2008. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=PowerPlants_CO2

Tar Sands – This data set represents the current tar sand resources of Utah. It was derived from the Utah Mineral Occurrence System by Utah Geological Survey (UGS), a division of the Utah Department of Natural Resources. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=TarSands

Geothermal Zones – Data set produced by the National Renewable Energy Laboratory (NREL) for the Utah Renewable Energy Zones Task Force Phase I Report: Renewable Energy Zone Identification. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=UREZPhase1_GeothermalZones

Solar Zones – Data set produced by the National Renewable Energy Laboratory (NREL) for the Utah Renewable Energy Zones Task Force Phase I Report: Renewable Energy Zone Identification. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=UREZPhase1_SolarZones

Wind Zones – Data set produced by the National Renewable Energy Laboratory (NREL) for the Utah Renewable Energy Zones Task Force Phase I Report: Renewable Energy Zone Identification. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=UREZPhase1_WindZones

Oil Shale – Dataset produced by the U.S. Geological Survey for the Uintah Basin, Utah 2010 Oil Shale Assessment. The dataset shows the location of the Mahogany Bed and Parachute Creek Outcrop within Carbon County. Available for download from the U.S. Geological Survey Energy Resources Program at: http://energy.usgs.gov/OilGas/UnconventionalOilGas/OilShale/

Map & GIS Data Sources Continued -

Carbon County Important Farmland Classification – Prime and Statewide Important Farmland derived from the following SSURGO soil surveys: UT616 - Carbon Area, Utah Parts of Carbon and Emery Counties and UT623 – Emery Area, Utah – Parts of Emery, Carbon, Grand and Sevier Counties using Soil Data Viewer, a tool created by USDA Natural Resources Conservation Service as an extension to ArcMap that allows users to create soil-based thematic maps. SSURGO Soil Surveys are available for download from the NRCS Soil Data Mart: http://soildatamart.nrcs.usda.gov/

Carbon County Hydrography – A subset of the National Hydrography Dataset (NHD). The National Hydrography Dataset (NHD) is a comprehensive set of digital spatial data that contains information about naturally occurring and constructed bodies of water, paths through which water flows, and related entities. The NHD was developed by U.S. Geological Survey (USGS) in cooperation with U.S. Environmental Protection Agency, USDA Forest Service, and other Federal, State, and local partners. Available for download from the Utah Automated Geographic Reference Center at: http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=StreamsNHDHighRes and http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=LakesNHDHighRes

Carbon County Watersheds – A subset of the National Hydrography Dataset (NHD). The National Hydrography Dataset (NHD) is a comprehensive set of digital spatial data that contains information about naturally occurring and constructed bodies of water, paths through which water flows, and related entities. The NHD was developed by U.S. Geological Survey (USGS) in cooperation with U.S. Environmental Protection Agency, USDA Forest Service, and other Federal, State, and local partners. Available for download from the USGS National Map website at: http://nationalmap.gov/index.html

Carbon County Average Annual Precipitation – Produced by U.S. Department of Agriculture Natural Resources Conservation Service – National Cartography and Geospatial Center. This vector data set provides derived average annual precipitation according to a model using point precipitation and elevation data for the 30-year period of 1971 – 2000.

Carbon County Land Use/Land Cover – USGS National Gap Analysis Program. 2004. Provisional Digital Land Cover Map for the Southwestern United States. Version 1.0. Produced by RS/GIS Laboratory, College of Natural Resources, Utah State University. Published 9/15/2004. Multi-season satellite imagery from 1999 – 2001 were used in conjunction with digital elevation model derived datasets to model natural and semi-natural vegetation.