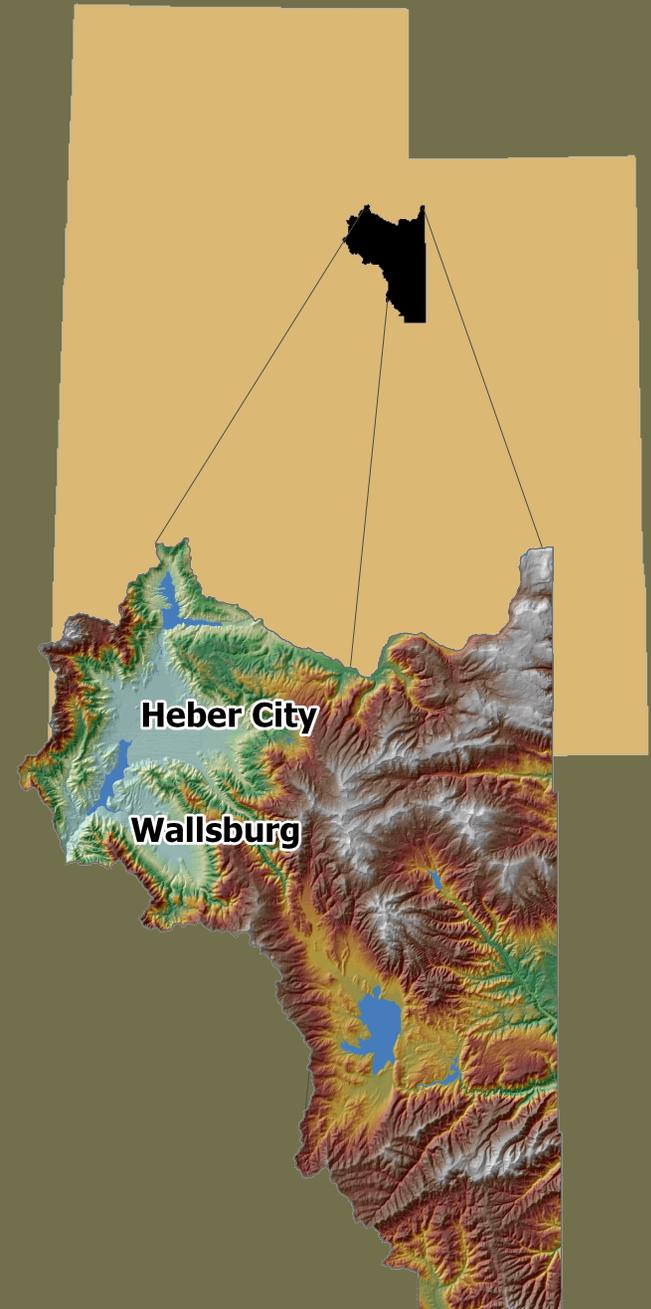


WASATCH COUNTY RESOURCE ASSESSMENT

APRIL 2013

Conserving Natural Resources For Our Future

WASATCH COUNTY CONSERVATION DISTRICT



Acknowledgments

Wasatch County 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 - 7
Utah Association of Conservation Districts
Utah Department of Agriculture and Food
Utah Department of Environmental Quality
Utah Department of Natural Resources
Utah Division of Forestry, Fire and State Lands
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

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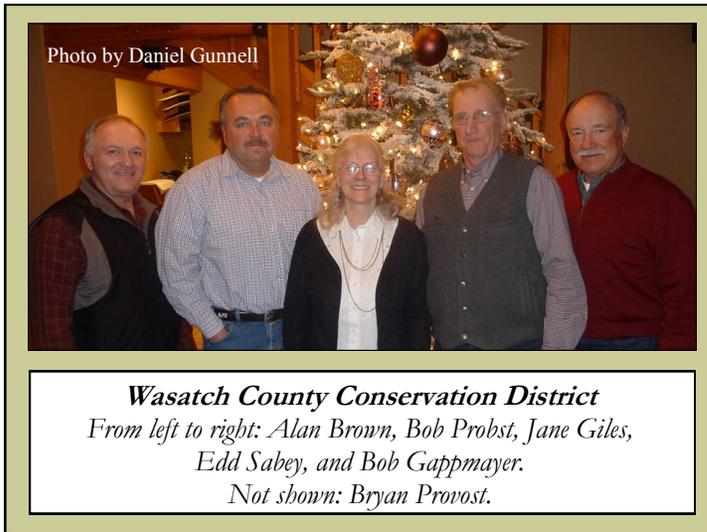
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Table of Contents

• Executive Summary	ii
<hr/> Why a Resource Assessment? · Natural Resource Priorities and Concerns · General Resource Observations	
• Introduction	I
<hr/> Conservation District Movement · Conservation Progress · Public Outreach	
• County Overview	2
<hr/> Background	
• Natural Resource Priorities and Concerns	4
<hr/> Noxious Weeds · Water Quality & Conservation · Small Acreage Agriculture · Wildlife Habitat · Forest Health	
• General Resource Observations	14
<hr/> Soil · Water · Air & Climate · Plants · Animals · Humans: Social & Economic Considerations	
• References	26
<hr/> Map & GIS Data Sources · References	

Wasatch County Resource Assessment : Executive Summary



Why a Resource Assessment?

The Wasatch 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 Wasatch 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 may not have had the opportunity. This document is dynamic and will be updated as additional information becomes available.

Your comments are requested:

Wasatch Conservation District
PO Box 545
Heber City, Utah 84032
<http://wasatchconservationdistrict.org/>

Natural Resource Priorities and Concerns

The Wasatch Conservation District has identified five natural priorities and concerns. These priorities receive special emphasis because of their immediate significance to Wasatch County.

1. **Noxious and Invasive Weeds:** Thistle, leafy spurge, toadflax, and knapweed.
2. **Water Quality and Water Conservation:** Watershed health of Deer Creek, Jordanelle, and Strawberry reservoirs and water conservation efforts.
3. **Small Acreage Agriculture:** Sustainability and urbanization.
4. **Wildlife Habitat:** Sage-grouse and impacts of the wildlife-urban interface.
5. **Forest Health:** Declining aspen forests and soil erosion.

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 was 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.

Conservation Progress

Since the organization of the Wasatch County Conservation District in 1949, great strides have been made toward increasing and sustaining natural resources in Wasatch County. The 2005 resource assessment listed the most critical resource concerns as 1) invasive and noxious weeds, 2) impacts of urban and suburban growth, 3) watershed health and water quality, and 4) soil erosion and condition. The 2013 resource assessment provides an opportunity to evaluate the progress made during the last several years and to set new goals to address the highest priority conservation needs in Wasatch County.

Public Outreach

In April 2011, the Wasatch County 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 invasive and noxious weeds are still a major concern, as well as water quality and urban and suburban growth. Other top concerns included small acreage agriculture, wildlife habitat, specifically concerning sage-grouse, and forest health, concerning both aspen and beetle killed conifers.



Wind-devastated farmland during the Dust Bowl.



Farmland in Heber City, Utah. Photo courtesy of Ivan Spencer.

Wasatch County Overview

Background

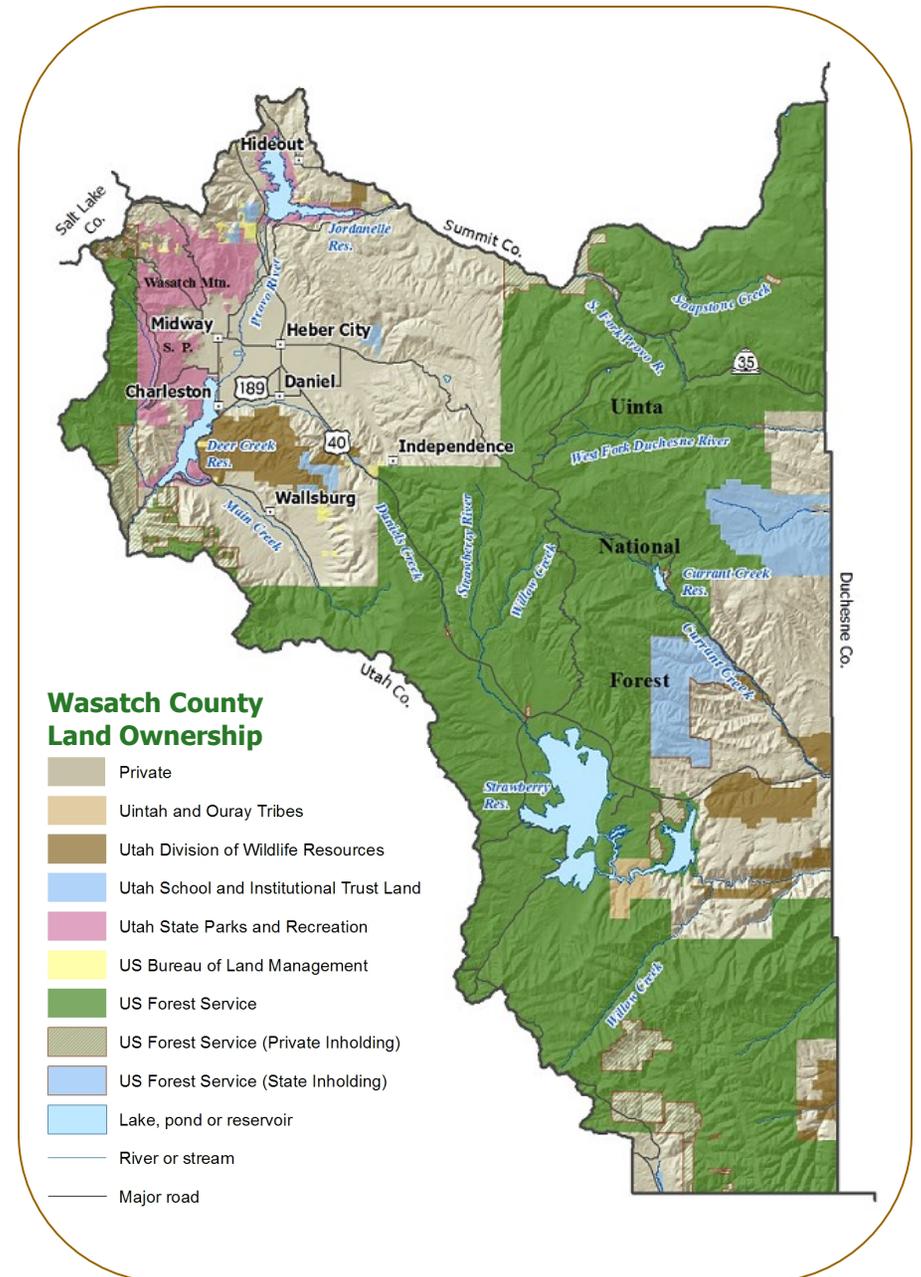
Wasatch County is located in north-central Utah, between the Great Basin and the Uintah Basin, and has a total land area of approximately 1,176 square acres.¹ Much of the county's area is mountainous, except for Strawberry, Round, and Heber valleys. The county's highest peaks top 10,000 feet, and over half of the land is 7,500 feet above sea level.²

Wasatch in Ute means "mountain pass" or "low pass over high range". The first settlers came into Wasatch County from Utah Valley in the spring of 1859 and located a short distance north of present day Heber City. In 1862 the territorial legislature created Wasatch County, which then included all of the Uinta Basin. The last boundary change occurred in 1914 when Duchesne County was created out of the eastern half of Wasatch County.²

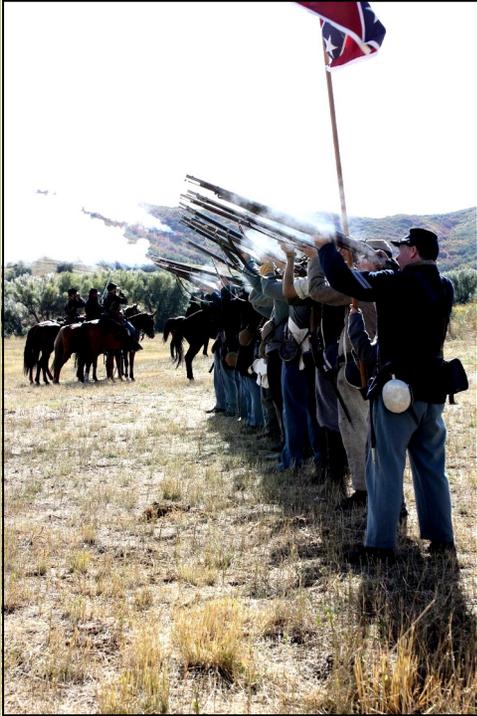
The county is divided into two watersheds—the Colorado and the Great Basin drainage systems. The southern part of the county drains to the Colorado River by way of the Strawberry River; however, most of the water is diverted through tunnels to Utah County. With three large man-made reservoirs, Jordanelle, Strawberry, and Deer Creek, Wasatch County is a popular recreational area. The climate zone, classified as undifferentiated highlands, offers cool summers and very cold winters. The average annual precipitation is approximately sixteen inches.²

In 2010, the population of Wasatch county was 23,530. Median family income was \$65,204. At 82.8%, Wasatch county's racial makeup was primarily white.¹

Nearly all of the county's population and irrigated agricultural lands are located in the Heber and Round valleys. Heber Valley contains the incorporated communities of Heber City, Midway, and Charleston, while Round Valley contains the town of Wallsburg.



¹ U.S. Census Bureau
² Utah Association of Counties



WASATCH COUNTY

Photo credits clockwise from top left: Fort Douglas Military Museum Living History Detachment, by Tori Elvell; white fir, by Brock Benson; sprinkler irrigation wheel line, by Jane Giles; hot air balloons rise above irrigation diversion structure, by Jane Giles; and Steam Engine 618 on Wildwood Bridge in Provo Canyon, by the Heber Valley Railroad.

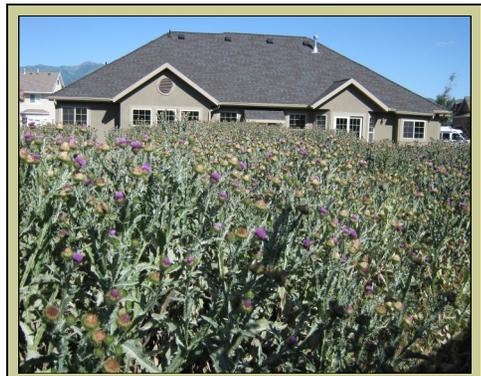
Priority Resources and Concerns

NOXIOUS WEEDS

The invasion of noxious weeds has been likened to a raging biological wildfire out of control and spreading rapidly. With more than 7,000 acres affected, noxious weeds are a major concern throughout Wasatch County.

If weed infestations spread without control or containment, large acreages of land used for farming, grazing, or recreation will become completely useless. Noxious weeds have been known to reduce property values, reduce forage for livestock and wildlife, increase soil erosion, displace native plants species, which reduces biodiversity, and reduce field production.

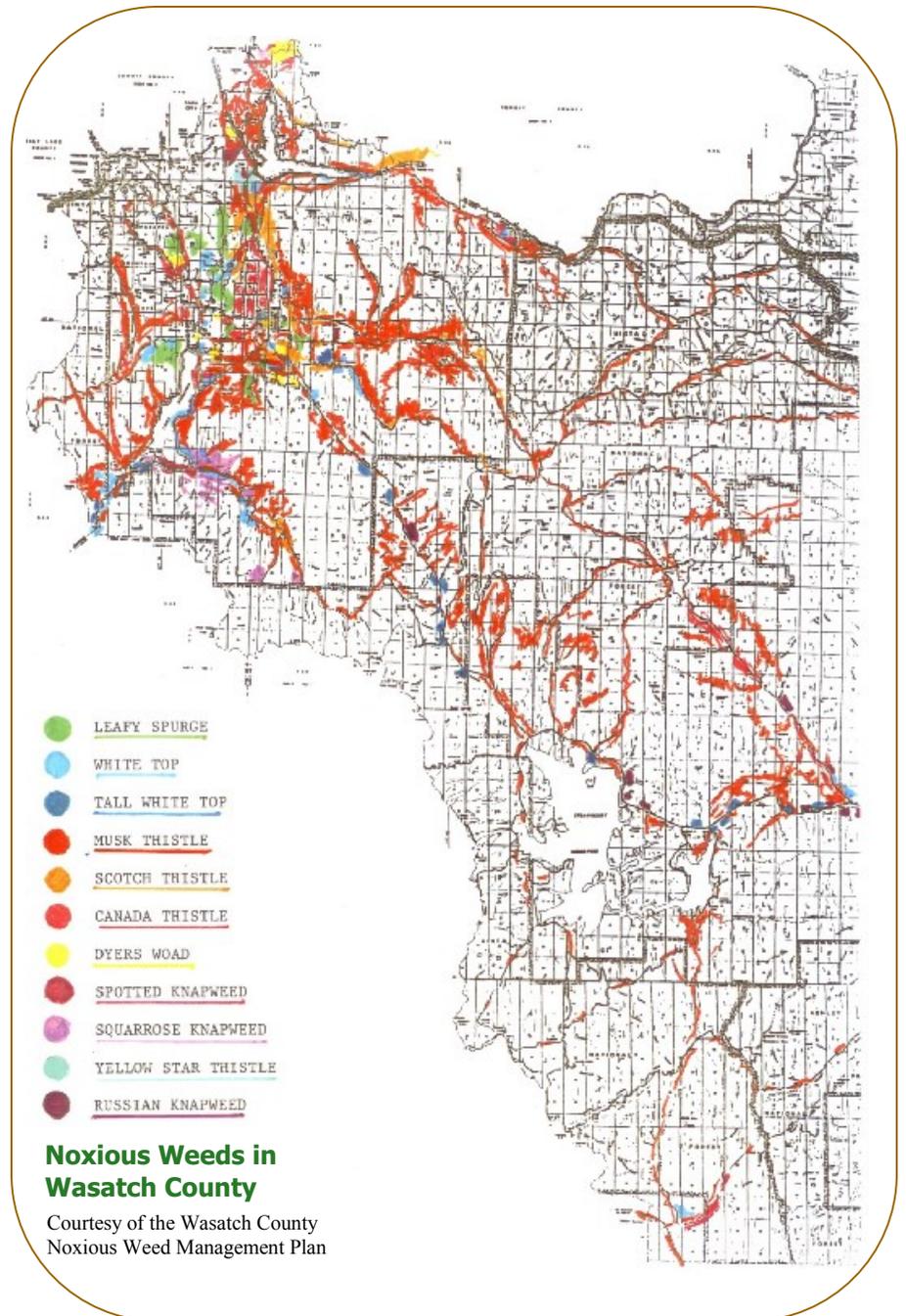
Many noxious weeds are toxic to animals. Leafy spurge can be poisonous to cattle and contact can cause blindness. Yellowstar thistle and Russian Knapweed are toxic to horses. Houndstongue is poisonous to both horses and cattle. The seeds, stems and leaves of poison hemlock and black henbane are poisonous to people and animals. Musk, Scotch, and Canada thistle along streams, rivers, and lake shores can become so thick that it may affect those wanting to fish.



*A Canada thistle patch in Heber City.
Photo courtesy of Jane Giles.*

On rangelands, noxious weeds like leafy spurge can displace native grasses and forbs, which reduces the forge for livestock

and big game animals. This in turn reduces the carrying capacity of rangelands, reduces ground cover, and increases the potential for soil erosion.³



Prevention and Early Detection

Weeds are a problem for everyone. Federal, state, and local agencies and private landowners are responsible for the noxious weeds present on their lands. Prevention, early detection, control, and eradication of noxious weeds are the most practical means of weed management. Listed below are things that can be done to control the spread of noxious weeds.

- **Education.** Learn to identify the problem weeds of Wasatch County.
- **Buy only certified weed-free hay.**
- **Avoid planting noxious weeds as an ornamental or in landscaping,** such as Russian olive, tamarisk, or sulfur cinquefoil.
- **Be aware of hitchhikers.** Weed seeds attach themselves to clothing when hiking, hunting, fishing, or working. Pets and animals can also carry hitchhikers.
- **Bird feeders beware.** Some bird seed mixtures can be loaded with noxious and invasive weed seeds.
- **Know its origin.** Gravel, road fill, and topsoil can be contaminated with seeds.
- **Control.** Each weed is different, and the way to control one might not work for another. The County Weed Supervisor is a great source for information on weed control.³

Current Weed Control Efforts

Wasatch County Weed Department

The weed department focuses primarily on weed control efforts on county land. They track infestations and advise landowners on proper maintenance.

Wasatch County Weed Board

County weed boards are responsible for the formulation and implementation of county-wide coordinated noxious weed control programs designed to prevent and control noxious weeds.

Wasatch County Coordinated Weed Management Area (CWMA)

The Wasatch County CWMA is the main tool to obtain cooperation and coordination of the noxious weed program among land management agencies and private landowners. The CWMA has resulted in increased sharing of expertise, information, and resources and provides a process to improve the efficiency and effectiveness of the noxious weed program in Wasatch County.

Wasatch County Noxious Weeds List

Listed below are the major weeds that are problematic in Wasatch County.

Class A

- Blackhenbane
- Leafy Spurge
- Johnson Grass
- Spotted Knapweed
- Yellowstar Thistle
- Yellow Toadflax
- Russian Knapweed
- Salt Cedar
- Dyers Woad
- Oxeye Daisy
- Perennial Pepperweed
- Poison Hemlock
- Scotch Thistle
- Squarrose Knapweed

Class C

- Bermuda Grass
- Canada Thistle
- Diffuse Knapweed
- Field Bindweed
- Medusa Head
- Purple Loosestrife
- Quack Grass
- St. Johnswort
- Sulfur Cinquefoil

Class B

- Tall White Top
- Dalmatian Toadflax
- Houndstongue
- Musk Thistle

Class A weeds are relatively minor in extent and density but pose a well known threat to native plant communities and should be a top priority with eradication as the ultimate goal. Class B weeds are meant to be contained and controlled, with the goal of halting the spread. Class C weeds should be watched closely and contained when possible. The goal, however, is not to stop the spread but to disseminate education, research, and biological control for those that want management of the weed.

Priority Resources and Concerns

WATER QUALITY & CONSERVATION

The water quality of Jordanelle Reservoir is very good. It has a moderate hardness, with early total phosphorus parameters exceeding state standards. This is not unusual, as elevated phosphorus levels are expected during the early stages of a new reservoir. There are three water bodies on the 303 (d) list of impaired waters in the county.

Strawberry Reservoir

High total phosphorus and low dissolved oxygen concentrations in Strawberry Reservoir have exceeded the state's water quality standards for its cold-water fisheries beneficial use designation. Though listed, analyses seem to indicate a fairly healthy reservoir. However, small bays and deep portions of the reservoir do experience unfavorable conditions at certain times of the year.

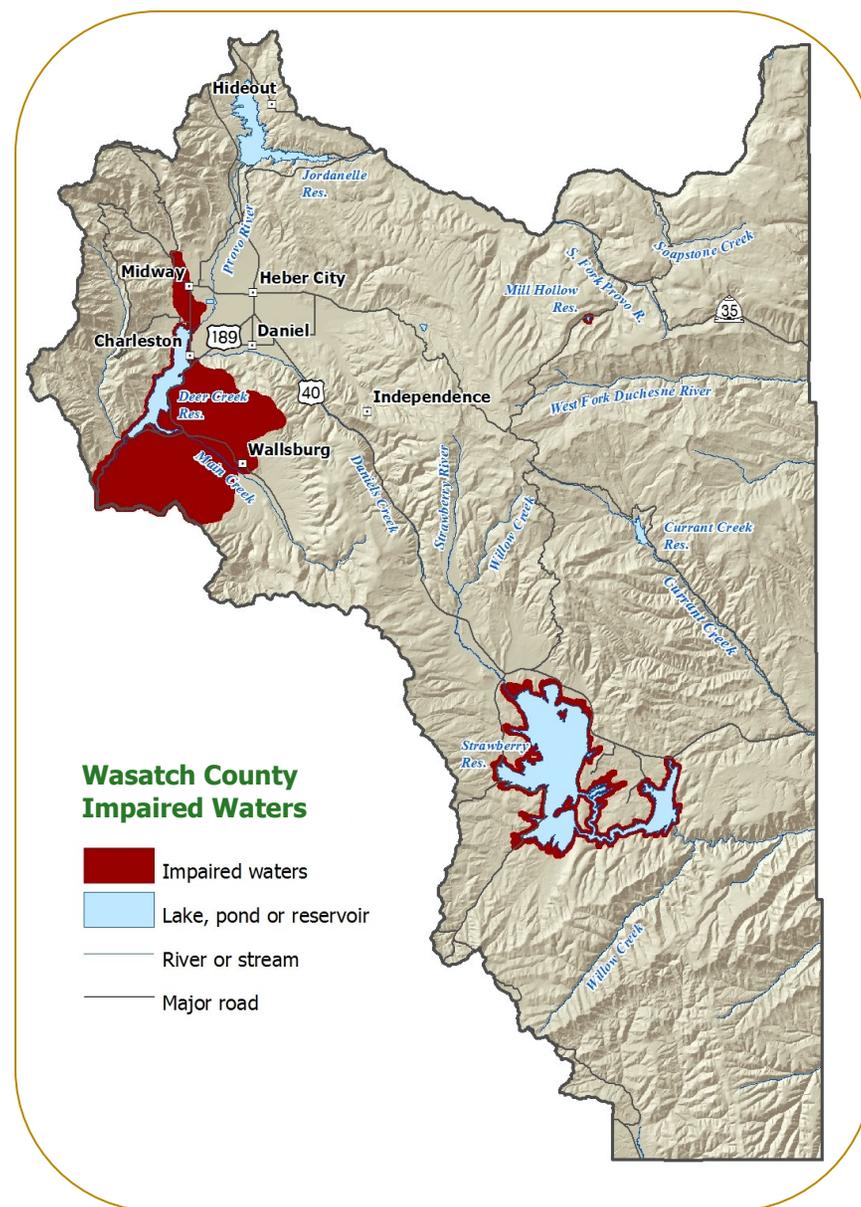
Mill Hollow Reservoir

Parameters that have exceeded state water quality standards for defined beneficial uses are phosphorus and dissolved oxygen. On occasion, when a heavy algal bloom is in progress, pH values will exceed the criteria of 9.0.

Deer Creek Reservoir

Deer Creek has been identified as a priority target for the state's water quality improvement effort. Past water quality monitoring has shown that Deer Creek Reservoir regularly exceeded state water quality criteria for total phosphorus and dissolved oxygen. Erosion has been identified as one of the major sources of phosphorus into the reservoir. Main Creek has high concentrations of nutrients and sediments in its flow to Deer Creek Reservoir. The high sediments indicate that stream bank stabilization is a likely problem.⁴ To address the issues, a large stream restoration project along Main Creek will begin fall of 2013 in Wallsburg.

Streams and lakes not meeting their water quality standards are identified on the state's 303 (d) list, per the Clean Water Act. This section of the act also requires states to develop and implement plans to improve water quality to meet these standards.



Water Quality Issues

Stream-bank Erosion: Sediment is probably one of the most easily recognized water quality issues. Turbid water decreases light penetration, interferes with plant growth, and decreases species diversity. Sediment also decreases the storage capacity of lakes and reservoirs. Solutions include stream fencing, proper grazing management, stream restoration, bank stabilization, and riparian vegetation establishment.

Nutrients: Increases of phosphorus and nitrogen into receiving waters results in an increase of plant and algae growth, which can lead to increased eutrophication rates. Highly enriched conditions result in changes in taste, color, and odor of drinking water and a significant decrease in organism diversity. Solutions include stream fencing, proper grazing management, berms, stream restoration, and riparian vegetation establishment.⁵

Wasatch County Water Efficiency Project

Completed in the spring of 2001, the Wasatch County Water Efficiency Project increased water use efficiency throughout Wasatch County. Approximately 9.5 miles of canal were lined with concrete. Pipelines, regulating ponds, and pump stations were installed to distribute water from the canals to nine participating irrigation companies on the east side of the Heber Valley, and approximately 9.2 miles of stream were enhanced. Due to the conserved water, the efficiency project was able to replace the water that was diverted from the upper Strawberry trans-basin diversion structure, allowing for the removal of the structure and returning the diverted water to the Strawberry River Watershed and increasing the natural stream flow. Termination of the trans-basin diversion and the increased flow of approximately 2,900 acre feet of water has improved the fishery in the Strawberry River.

A major water use change was the conversion of 3,675 acres of farmland from flood to sprinkler irrigation. Overall, irrigation use efficiency on the converted lands increased from 35 percent to approximately 65 percent. The second type of water use change was an improvement in water availability, primarily during years with low precipitation. Since the completion of the project, producers have reported an increase in crop yields.

Additional uses for the conserved water includes supplemental in-stream flows and the maintenance of wetland areas.⁶



Wasatch County Water Efficiency Project cement canal lining.



Regulation pond. Photos courtesy Jane Giles

⁵ Water Quality Indicators Guide

⁶ Wasatch County Water Efficiency Project Feasibility Study

Priority Resources and Concerns

SMALL ACREAGE AGRICULTURE

The unprecedented movement of people from cities and towns into formerly rural areas has created many problems in sanitation, flood control, and road and building construction, as well as farming. Summer home developments have already started in several parts of the Heber Valley Area. Many summer and year-round homes have been built in the mountains and foothills west and northwest of Midway. Expanding population into Wasatch County will require additional public services and such facilities as schools, churches, and recreational areas.

Land values in this area have taken a sharp rise in recent years. The median house value in Wasatch County was \$317,900 in 2006 to 2010 and has grown by 71.56% since 2000, which is much higher than the state average rate of 48.67%.⁷ This is mainly due to summer home site developments and other speculative ventures. The result of this rise in home and land value has made it almost prohibitive to purchase land for farming.

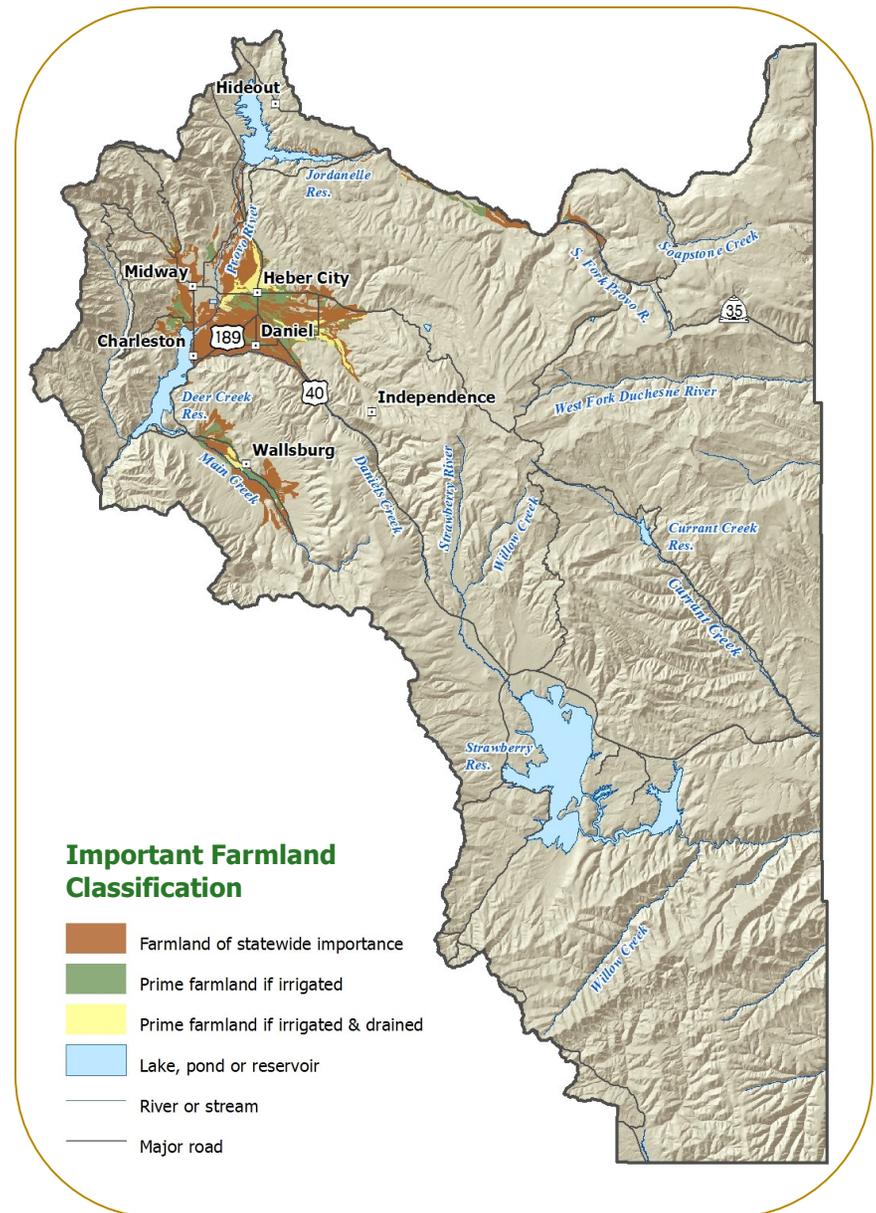
As Wasatch County continues to grow and develop, planners and land managers will need to consider the role productive farm lands and soils play in maintaining the economic viability of agriculture in the county.⁸

Farmland of Statewide Significance

Land identified by state agencies as important for agricultural use, but not of national significance, can be designated as statewide important farmland.

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.



7 USA.com, Wasatch County

8 Soil Survey, Heber Valley Area, Parts of Wasatch and Utah Counties

Priority Resources and Concerns

WILDLIFE HABITAT

Aquatic Habitat

In 1999, the Utah Division of Wildlife Resources and the U.S. Bureau of Reclamation initiated the Provo River Restoration Project by creating new meanders, side channels, and wetland ponds in and around the Provo River. A multiple-thread meandering channel was created. The river was reconnected to existing remnants of historic secondary channels, and small side channels were inserted to recreate aquatic features. A significant amount of vegetation was added to provide the necessary environment for healthy fisheries. Side channels and ponds were created to improve fish habitat and create wetland habitat for wildlife.⁹



Photo Courtesy: Utah Reclamation Mitigation and Conservation Commission, by Tyler Allred

Mule Deer Habitat

Mule deer numbers are declining across the West, and recent deer hunts have been difficult for many Utah hunters. This issue has been—and continues to be—a top priority for Utah's wildlife managers. Over the past six years, the Division of Wildlife Resources (DWR) has invested tens of millions of dollars to implement a comprehensive deer-management plan and to help our struggling herds.



Photo Courtesy: Utah Division of Wildlife Resources

The DWR has launched a massive effort to restore mule deer habitat. It's the largest such initiative ever undertaken in Utah—and in the West. Over the past six years, the DWR and its many partners have improved mule deer habitat on more than 778,000 acres, at a cost of more than \$76 million. Habitat improvement projects often take a few years to pay off, but over the long term, this effort will result in healthier deer populations statewide. The current Utah deer-management plan (effective 2008–2013) includes an objective to improve another 500,000 acres of habitat.

Starting in early December each year, the DWR monitors individual mule deer herds on a weekly basis. Biologists look at both the deer and their winter range, assessing the following factors: snow depth, area temperatures, availability of forage, body condition (fat measurements), and depredation issues. If the deer fall below certain pre-established thresholds in three or more of these categories, the DWR is prepared to begin a supplemental feeding program to help them through the season.¹⁰

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 wildlife in Wasatch 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 creating water use problems.
- Wolves potentially negatively impact citizens, livestock, and wildlife.
- Endangered species and sensitive species regulation impacting water and land use.
- Declining pollinator numbers.

Needs

- Improve management of predator numbers to restore historic populations of wildlife, especially where habitat is sufficient.
- Use livestock as a tool to improve habitat.
- Discourage otter introduction.
- Discourage wolf introduction.
- Collaborate and increase opportunities for local input on endangered and sensitive species-related regulation.
- Support and increase the number of pollinators through habitat enhancement and other measures.¹²

Greater Sage-Grouse

(Centerocercus urophasianus)



The greater sage-grouse is an icon of western sagebrush ecosystems. It is a large, rounded-winged, spike-tailed, ground-dwelling bird, about two feet tall and weighing from two to seven pounds. Females are a mottled brown, black, and white. Males are larger and have a large white ruff

around their neck and bright yellow air sacs on their chest.¹¹ Sagebrush is the predominant plant of quality habitat. A good understory of grasses and forbs, and associated meadow areas, are essential for 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 eaten.¹²

Greater sage-grouse conservation is urgent. Once seen in great numbers across sagebrush landscapes of the West, sage-grouse have declined in number over the past one hundred years because of the loss, degradation, and fragmentation of the sagebrush habitats essential for their survival. Greater sage-grouse now occupy only about 56% of the habitat that was available to them before the arrival of settlers of European descent. Sagebrush ecosystems are home to a surprisingly abundant number of wildlife species that depend on this complex and often fragile ecosystem type. If sage grouse populations are in trouble, it means other sagebrush-dependent species are too.¹¹

Priority Resources and Concerns

FOREST HEALTH

Trees are identified as an important resource in Wasatch County. With the creation of a tree board, public awareness in Heber City is high. In 2010, Heber City was recognized as a Tree City. Not only are the trees located in the city important, but the surrounding mountainous woody vegetation are also of vital concern. Watershed health is dependent upon vegetation in order to increase water percolation and reduce soil erosion.¹³

In 2011, the U.S. Forest Service performed a forest health aerial detection survey within Wasatch County. The table to the right shows the type of species infected, number of trees, and acres affected. The results of the survey showed the biggest impact was contributed to a epidemic population of spruce beetle and spruce tree mortality.

Spruce beetle populations are rapidly expanding in some areas, causing entire drainages to be infested in the course of one year. In some cases nearly every mature spruce has been killed in multiple drainages, from the creek bottoms all the way up to the high elevations.

In Wasatch County substantial pockets of spruce mortality (over 20,000 trees killed) were detected on the northern end of the Heber Ranger District. High levels of Engelmann spruce mortality were mapped, centered around Duchesne Ridge and extending south to Trout Creek Ridge, north to Soapstone Basin, west to Bald Knolls, and east to the district boundary and along the Lake Creek drainage.

The spruce beetle still poses important management concerns for the heavily used recreation areas along the Wasatch Back.¹⁴

2011 Wasatch County Forest Health Aerial Detection Survey

Insect/Tree Species	Trees	Acres
Mountain Pine Beetle	815	490
Douglas-fir Beetle	587	285
Spruce Beetle	23,325	10,125
Fir Engraver	75	38
Subalpine Fir Mortality	615	312
Aspen Dieback/Decline		755
Aspen Defoliation		421

Forest Health Aerial Detection Survey



Beetle kill spruce. Photo courtesy PJ Abraham, Division of Forestry Fire and State Lands.

¹³ Heber City Corporation

¹⁴ Wasatch County Forest Health Resource Assessment

Aspen is another species in the county showing signs of stress and lack of regeneration. The two principle reasons associated with these observations are: succession of aspen forests to other vegetation types due to fire exclusion and heavy ungulate damage.

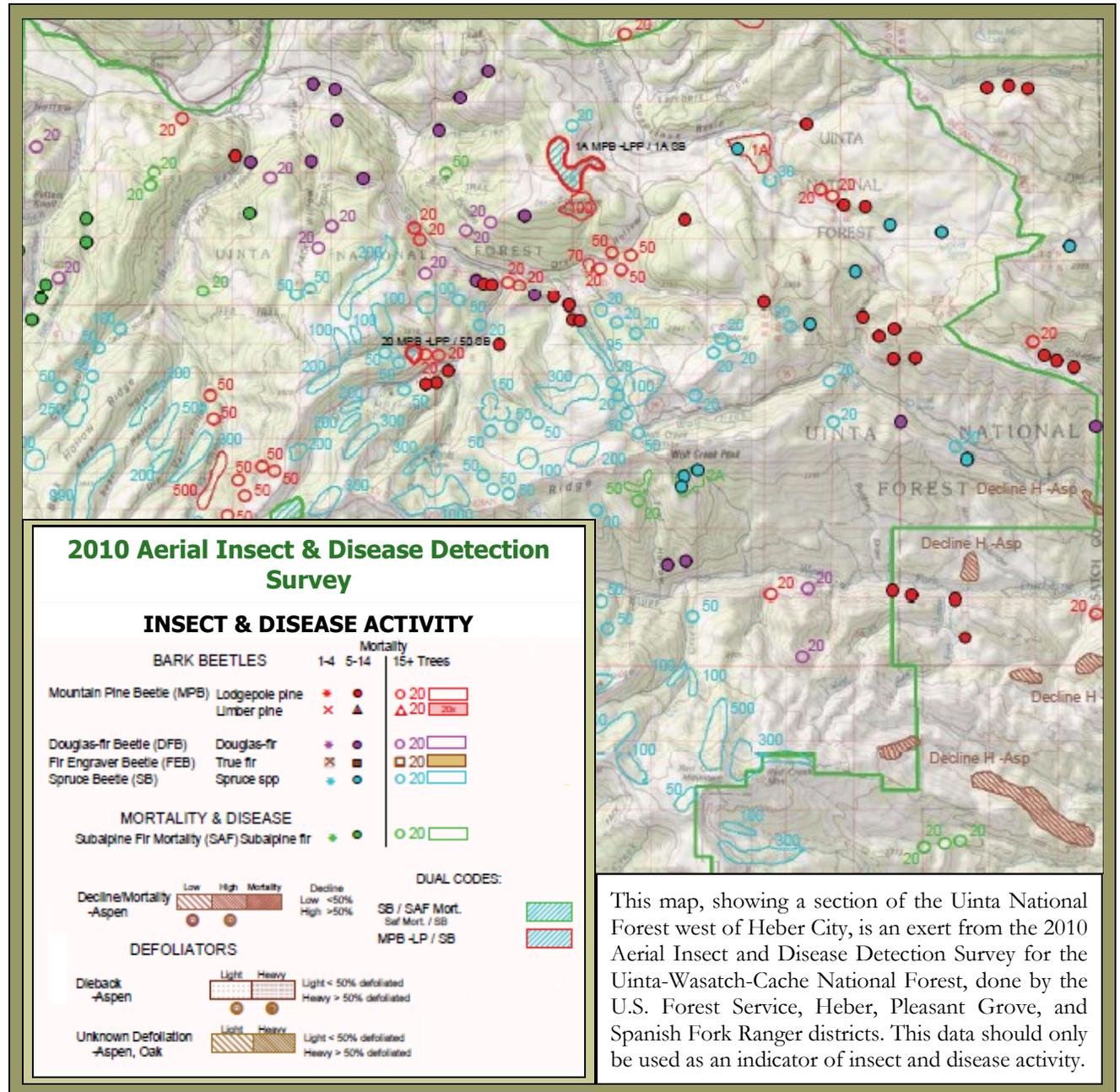
Given the abundance of dead, dying, and on-the-ground debris, fire has become an ever increasing concern. Fire is nature's way of cleaning landscapes and recycling resources. The different types of landscapes found within the county have become dependent upon fire to maintain the health and vigor of the many ecosystems found within in the area. With the advent of fire suppression, many of the ecosystems have departed from pre-suppression conditions. As a result, when fires occur, they are often more damaging to ecosystems and cause a greater adverse impacts to soil, wildlife habitat, recreational resources, and important watersheds.¹⁵

For technical assistance or more information regarding forest health concerns please contact:

PJ Abraham, Area Forester
Forestry, Fire & State Lands
2210 S. Hwy. 40 Ste. B
Heber City, UT 84032
(435)671-3326

Additional information regarding the 2010 Aerial Insect and Disease Detection Survey can be found at:

http://www.fs.usda.gov/detailfull/r4/forest-grasslandhealth/?cid=fsbdev3_016120&width=full



This map, showing a section of the Uinta National Forest west of Heber City, is an excerpt from the 2010 Aerial Insect and Disease Detection Survey for the Uinta-Wasatch-Cache National Forest, done by the U.S. Forest Service, Heber, Pleasant Grove, and Spanish Fork Ranger districts. This data should only be used as an indicator of insect and disease activity.

General Resource Observations

SOIL

The majority of the soils in Wasatch county are derived predominately from mixed sedimentary rocks. In some areas the bedrock is mostly limestone, while in others it is mainly quartzite or sandstone. Old andesite flows make up a thick section of volcanic materials that filled the valleys of an older erosional surface. Subsequent glacial drift has created a mantle of andesite and sedimentary deposits.⁸

Information on the soils in Wasatch County can be obtained from the Web Soil Survey at: websoilsurvey.nrcs.usda.gov. The soil survey provides data and information produced by the National Cooperative Soil Survey, a nationwide partnership of federal, regional, state, and local agencies, including private entities and institutions. The Web Soil Survey (WSS) allows a user to 1) define an area of interest (AOI), 2) view the survey boundaries and soil types overlaid on a photo, 3) explore various interpretations, and 4) print maps and descriptive information.

The WSS delineates and describes large areas of similar soils. Common uses are evaluating soils suitability for dwellings with basements, landscaping, roads, and septic tanks and measuring for vegetative productivity and chemical and physical properties. Using this information, agricultural producers, agencies, counties, and municipalities can know the suitability of various soils and can be alerted to soil limitations. This basic resource information is critical when making land-use and management decisions.

When limitations are identified, on-site investigations should be conducted by a soil scientist or soil engineer.

Soil limitations identified in soil surveys include, but are not limited to, frequent flooding, ponding or standing water, shrink/swell properties, settling after saturated with water, erosion properties, potential excavation difficulties, subsidence properties, danger of sliding on slopes, and ecological site assessments.

Soil Survey near Heber City



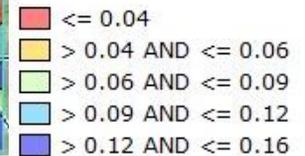
Map Unit Legend			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BeD2	Bezzant cobbly loam, 10 to 20 percent slopes, eroded	15.5	5.3%
Ca	Center Creek loam	97.5	33.7%
CgB	Clegg loam, 3 to 6 percent slopes	2.0	0.7%
Hk	Holmes cobbly sandy loam	12.6	4.4%
Hm	Holmes cobbly sandy loam, channeled	78.3	27.0%
Hr	Holmes gravelly loam	56.3	19.5%
Km	Kovich loam, deep water table variant	6.5	2.2%
RdA	Rasband loam, 1 to 3 percent slopes	12.7	4.4%
RdC	Rasband loam, 3 to 10 percent slopes	1.6	0.6%
W	Water	0.1	0.0%
WcC	Watkins Ridge silt loam, 6 to 15 percent slopes	6.3	2.2%
Totals for Area of Interest:		289.6	100.0%

Web Soil Survey map showing selected area of interest west of Heber City and the associated table of soil types.

Web Soil Survey

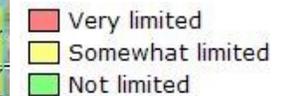
Three examples of Web Soil Survey (WSS) interpretations showing suitability and limitations for the selected area: available water capacity, soil limitations for dwellings with basements, and septic tank absorption fields. Additional soil criteria and the complete descriptions for each category below can be obtained at: websoil.survey.nrcs.usda.gov. WSS is a free online service that provides information on a large variety of soil concerns for any selected land area or parcel.

Available Water Capacity



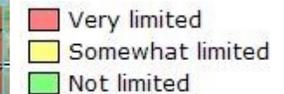
Available water capacity (AWC) refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are content of organic matter, soil texture, bulk density, and soil structure, with corrections for salinity and rock fragments. Available water capacity is an important factor in the choice of plants or crops

Soil Limitations for Dwellings with Basements



Dwellings are single-family houses for three stories or less. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding,

Septic Tank Absorption Fields



Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Saturated hydraulic conductivity (Ksat), depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the

General Resource Observations

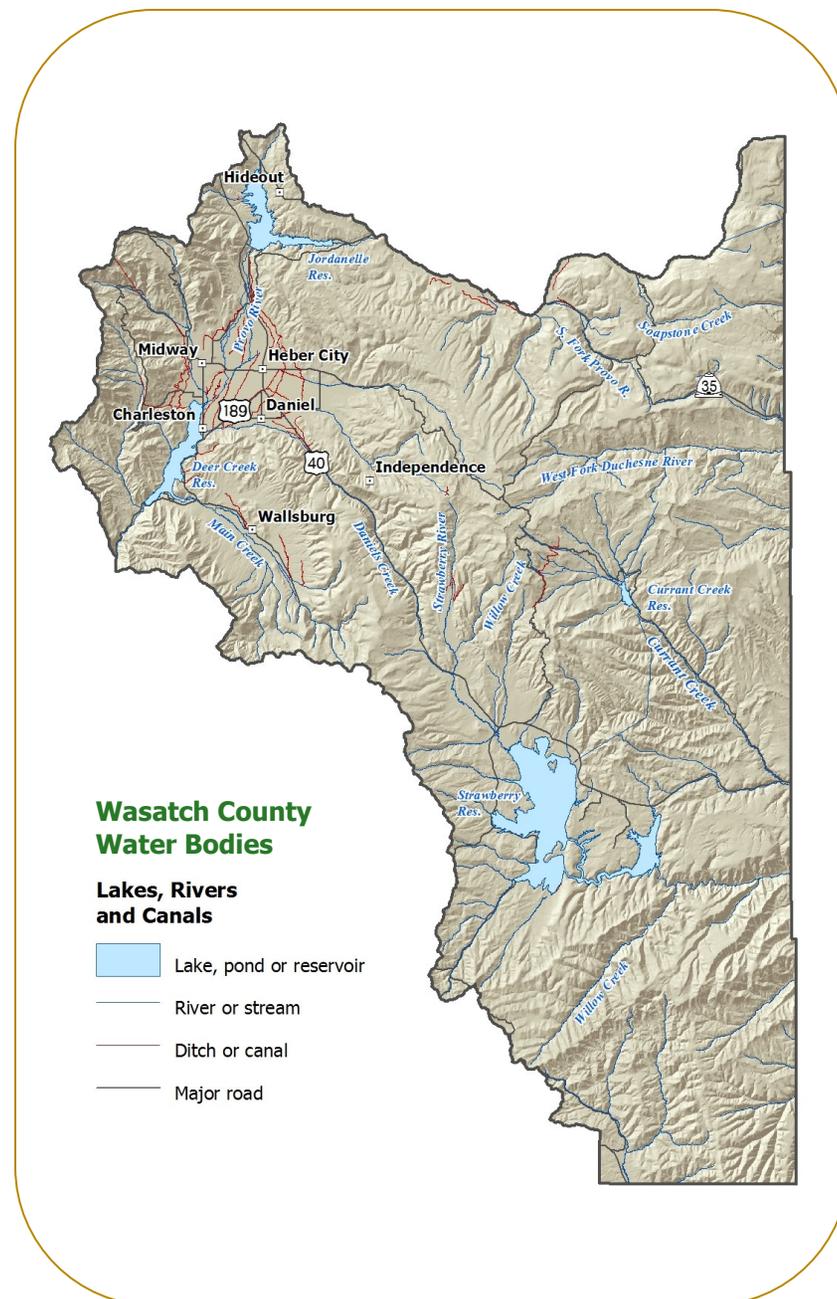
WATER

With many high mountains and valleys and an annual precipitation rate of 16 to 30 inches in the higher elevations¹⁵, Wasatch County rarely hurts for water. At 32 square miles, reservoirs and lakes in the county cover approximately 2.63 percent of the total land in the county.¹

At approximately 1,106,500 acre-feet of storage, the largest water-body in the county is Strawberry Reservoir. The Strawberry Watershed is approximately 136,000 acres, with 132 miles of the perennial streams and 235 miles of intermittent stream found within the watershed area. Strawberry Reservoir is one of principal water storage features of the Central Utah Project that delivers water to the Uinta Basin and the Wasatch Front. It is estimated that the Central Utah Project's Utah Lake Drainage Basin Water Delivery System delivers an average of 101,900 acre-feet of water from Strawberry Reservoir to the Wasatch Front area for municipal and industrial uses. Recreation is significant; Strawberry is considered to be Utah's premier trout fishery in terms of angler hours and number of fish produced. It is the destination of over two million visitors each year, and is one of the most heavily used reservoirs in the state.¹⁶

The second largest water-body in the county is Jordanelle Reservoir with 360,500 acre-feet. Jordanelle is an impoundment of the Jordan River, capturing spring runoff and storing it for irrigation, municipal, industrial, fish and wildlife, and recreational use. The Jordanelle Watershed is approximately 339,800 acres.⁴

Deer Creek Reservoir is located in Wasatch County, has a capacity of 152,700 acre-feet, drains an area of 171,663 acres, and serves residents of both Utah and Salt Lake Counties. The reservoir has four major inflows: Provo River, Main Creek, Snake Creek, and Daniels Creek.⁹



15 Pioneer, Utah's Online Library

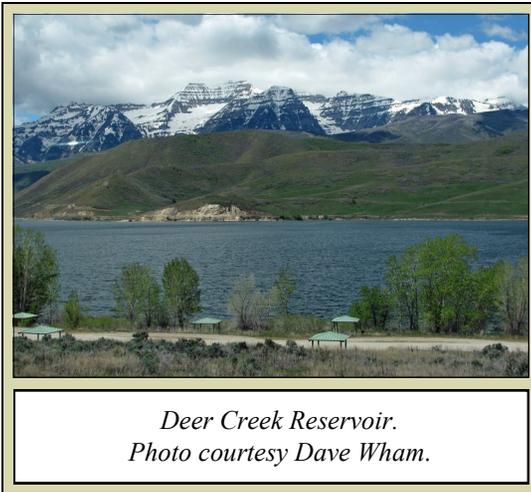
1 US Census Bureau

16 Strawberry Reservoir TMDL

4 Utah DEQ, DWQ, Watersheds, Lakes and Reservoirs.

9 Deer Creek TMDL

Currant Creek Reservoir only holds 15,670 acre-feet of water, drains an area of 30,200 acres, and is primarily used for irrigation on the Wasatch Front. As urbanization replaces agricultural land, it is expected that some water will be used for culinary purposes.



*Deer Creek Reservoir.
Photo courtesy Dave Wham.*

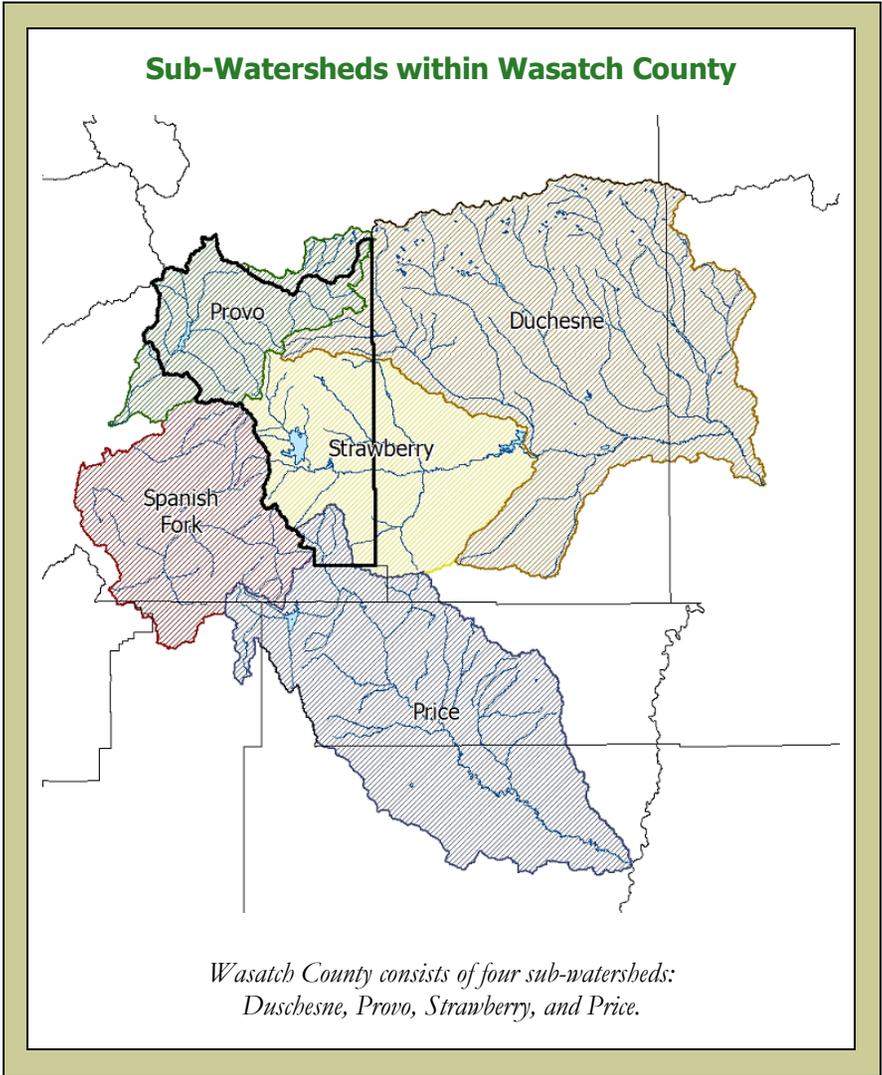
Mill Hollow Reservoir is a small artificial stabilized lake (315 acre-feet) maintained by the Division of Wildlife Resources to provide angling opportunities. Water is used for recreation and aquatic habitat and is never drained for agricultural use.⁴

The Provo River flows approximately 70 miles and is a source of irrigation water for agricultural purposes. In the Heber Valley there are fourteen irrigation companies that have water rights to the Provo River.⁹

Wasatch county is divided into two main watersheds—the Colorado and

the Great Basin drainage systems. Because of its annual precipitation and its location between the Uinta and Wasatch mountains, Heber Valley is well endowed with water. Flowing from the East are Daniels, Lake Fork, and Center creeks. From the north and northeast is the Provo River. From the west Snake Creek drains a central portion of the Wasatch Mountains. Two additional sources of water are man-made—the Ontario Drain Tunnel west of Keetley drains many of the Park City mines and the Weber/Provo diversion canal diverts water from the Weber across the Kamas prairie in Summit to the Provo River in Wasatch County.¹⁵

As depicted in the map to the right, sub-watersheds include the Provo, Duchesne, and Strawberry. A small portion of the Price River watershed is located in the southern tip of the county. The Spanish Fork watershed borders on the west.



4 Utah DEQ, DWQ, Watersheds, Lakes and Reservoirs.
9 Deer Creek TMDL
16 Pioneer, Utah's Online Library

General Resource Observations

AIR & CLIMATE

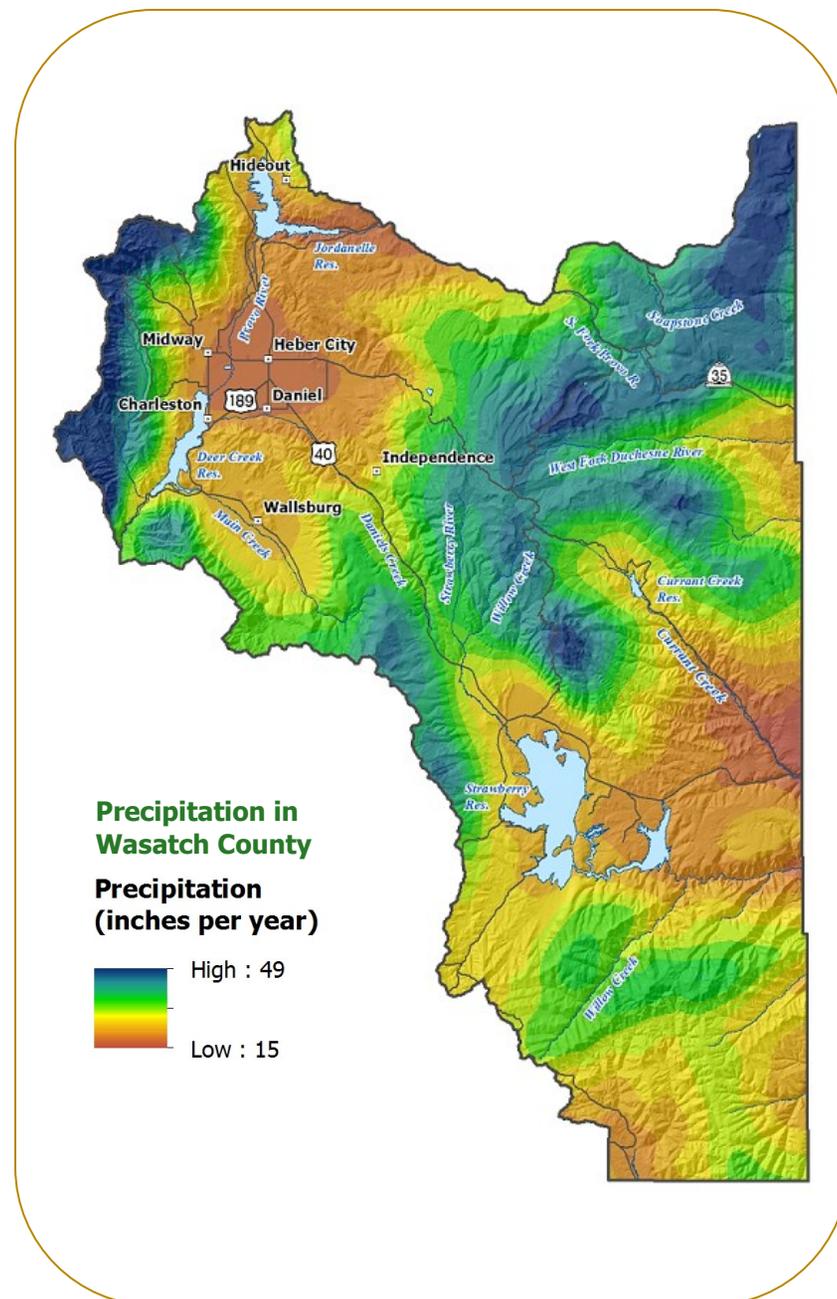
Air Quality

Identified by the Clean Air Act, six common air pollutants are found across the United States that 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.

Wasatch 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

Climate

The Heber Valley area, consisting of mountain valley and the surrounding higher areas of mountains, has a very wide variation in climate. The floor of the valley averages just over a mile above sea level; however, some fifteen miles to the west, the Wasatch Mountains tower more than a mile higher. The valley has two main drainage ways and several minor ones, but the only outlet is through the relatively narrow Provo Canyon. The remainder of the area is composed of the encircling mountains, which have fairly steep slopes.⁸



The climate of this area is continental. It features low humidity, abundant sunshine all year except in winter and early in spring, relatively light precipitation, and wide ranges in annual temperature. The topographic features result in the formation of a pronounced temperature inversion during most seasons of the year, because the cold air flows down the mountain slopes and collects on the floor of the valley below. This inversion causes the average temperature on the slopes 1,000 to 1,500 feet above the valley floor to be several degrees higher than temperatures either above or below this level. The growing season on the valley floor is very short, generally between June 19th and September 4th.

Summer temperatures are cool and pleasant. A maximum temperature of 100°F is recorded during only about one out of ten years. During the warmest month (July), maximum temperatures are generally in the middle eighties and the minimum in the middle forties.

Winter temperatures are very cold. The January average minimum on the valley floor is only 6°F and the maximum is in the middle thirties. The bulk of the precipitation is received from October to May, when low-pressure fifteen from the Pacific Ocean frequent the region. Amounts range from as low as fifteen inches a year near the valley floor to between 25 and 36 inches on some of the higher mountain slopes. On an average, the heaviest amounts occur during December and January, but there is a secondary maximum in August when summer thunderstorms occur. Nearly half the annual precipitation falls as snow in the lower valley, and the percentage increases as the elevation increases.

Winds in the valley are generally light to moderate during all seasons of the year, but they become quite strong at higher elevations during winter storms. In the lower valley, the strong winds that occur are generally associated with local thunderstorm activity.⁸

NRCS Snow Survey and SCAN Programs



The SNOTEL site at Strawberry Divide in Wasatch County.

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 Wasatch County, NRCS operates five SNOTEL (SNOWpack TELemetry) sites monitoring snowpack conditions: Beaver Divide (8,280 ft), Cur-rant Creek (8,000 ft), Daniels-strawberry (8,123 ft), Hobble Creek (7,399 ft), and Strawberry Divide (8,123 ft). SNOTEL sites are highly important to the watersheds and water outlook in Wasatch 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. For access to data from other nearby sites, visit <http://www.wcc.nrcs.usda.gov/scan/Utah/utah.html>.

General Resource Observations

PLANTS

Crops and Pasture

There are approximately 17,000 acres of irrigated land in Wasatch County. The primary irrigated crops are oats for grain and hay for forage. Wasatch County had roughly 6,800 acres in alfalfa production in 2009 and 6,200 acres in 2010. The remaining irrigated land is used as pasture consisting mainly of native, introduced, and improved grasses.¹⁸

Rangeland

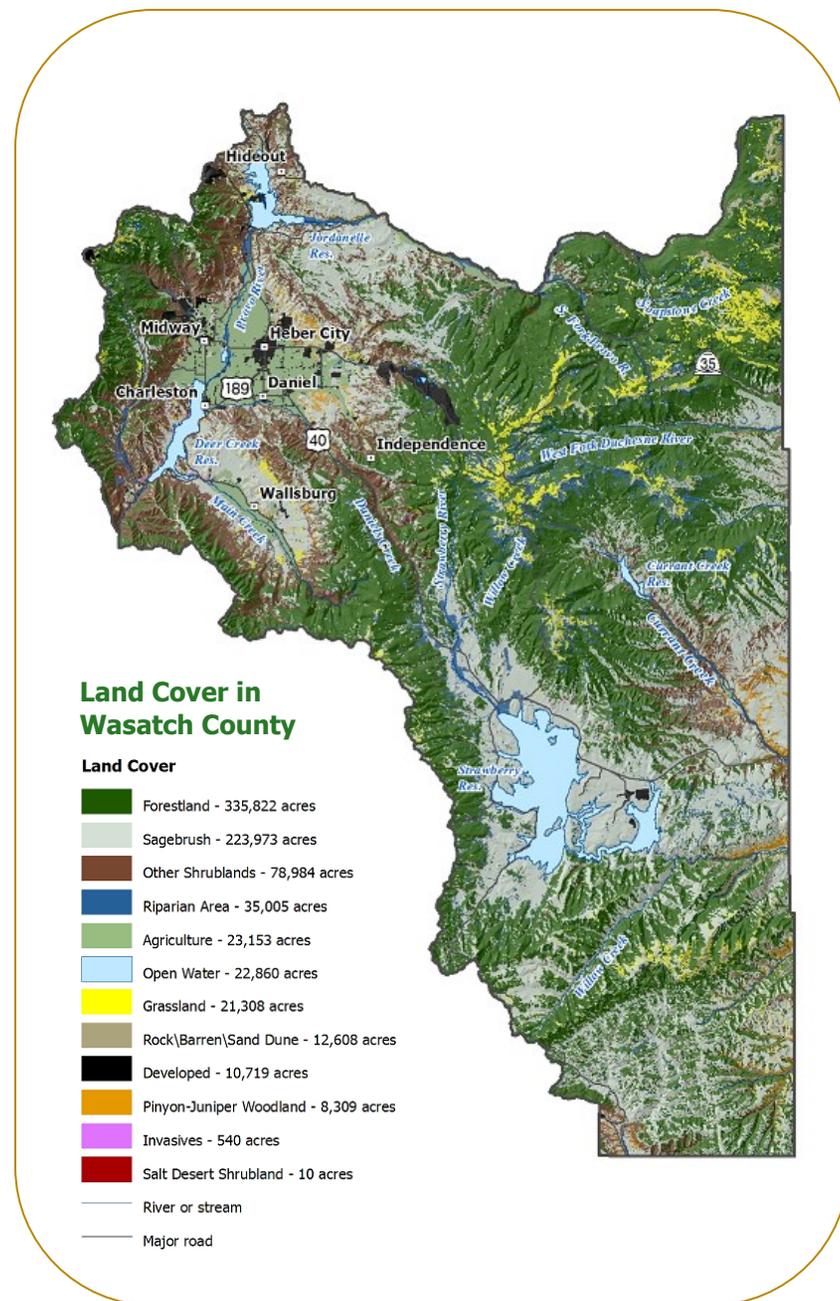
Wasatch County lies within the E47A, Wasatch Mountains North Major Land Resource Area (MLRA). Approximately 90 ecological range sites are found in the county and four major zones: the lowland sub-irrigated zone, upland zone, mountain zone, and high mountain zone.

Plants present in the lowland sub-irrigated zone may include: tufted hairgrass, Nebraska sedge, alpine timothy, meadow plantain, white march marigold, bittercress, cottonwood, Geyer willow, and Woods rose. These sites have the potential to produce approximately 6,400 lbs. of herbage per acre in favorable years.

The upland zone may include: bluebunch wheatgrass, needleandthread grass, Indian ricegrass, Great Basin wildrye, western aster, longleaf hawksbeard, common yarrow, arrowleaf balsamroot, Wyoming and basin big sagebrush, bitterbrush, and winterfat. This zone has a potential to produce 1,600-2,000 lbs. of herbage per acre in favorable years.

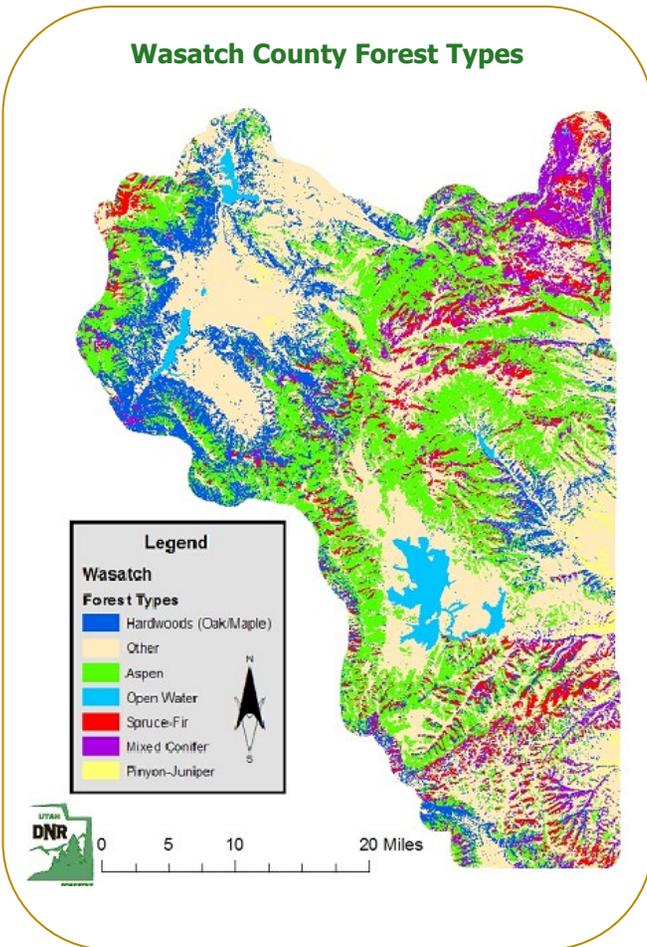
Plants present in the mountain zone may include: bluebunch wheatgrass, muttongrass, Indian ricegrass, king spike fescue, common yarrow, arrowleaf balsamroot, small leaf pussytoes, black sage, mountain big sage, curleaf mountain mahogany, and serviceberry. This zone has the potential to produce 2,400-2,500 lbs. of herbage per acre per year.

Plants in the high mountain zone may include: slender wheatgrass, mountain brome, sheep fescue, nodding brome, cutleaf balsamroot, larkspur, phlox, bitterbrush, and silver sagebrush. This zone has the potential to produce 1,700-1,800 lbs. per acre in favorable years.¹⁹



Production varies from zone to zone depending on moisture, soils, climate, and elevation. The growing season varies from 50 to 180 days, depending on ecological site and elevation. Elevation in Wasatch County varies from 5,600 feet to over 10,000 feet. The majority of grazing land is controlled by federal (USFS) and state governments (DWR and SITLA) and comprises a total of 443,483 acres. Private rangeland is made up of about 51,046 acres.²⁰ Production is excellent on most ecological sites in favorable years and plays a vital role in helping to maintain and support the ranching industry. Cattle and sheep are the dominant grazers with horses and goats playing a lesser role in rangeland utilization. Wildlife populations depend heavily on native rangelands and utilize all major ecological range sites in Wasatch County for forage, nesting, escape cover, parturition cover, and summer and winter range. Like anywhere, invasive weeds can be a problem on range sites that may get abused by domestic grazing animals. It will be a priority of the district to continue working with livestock producers to carry out responsible range management.²⁰

Wasatch County Forest Types



Forestland and Woodland

Tree species that are found above the cities are: Gambel oak, bigtooth maple, boxelder, cottonwood, mahogany, juniper, lodgepole, ponderosa, Douglas fir, aspen, white-fir, spruce (blue and Englemann), sub-alpine fir, and limber pine.

It is difficult to put a value on forested land. However, the only timber in the county that holds commercial value are conifers (Douglas fir, spruce, and, to some extent, white and sub-alpine firs). With the current spruce beetle attacks, the value of spruce is diminishing each year the trees stands die. Other than these species, there's virtually no value in any tree species at this point in time.²¹

Ute ladies'-tresses (*Spiranthes diluvialis*)

Status: Threatened



Ute ladies'-tresses is a perennial herb with erect, glandular-pubescent stems 12-60 cm tall, arising from tuberous-thickened roots. Basal leaves are narrowly linear, up to 1 cm wide and 28 cm long, and persist at the time of flowering. Leaves become progressively smaller up the stem and are alternate. The inflorescence is a sparsely pubescent 3-15 cm long spike of numerous small white or ivory-colored flowers arranged in a gradual spiral. Individual flowers are 7.5-15 mm long and faintly fragrant (with a vanilla-like scent). The lip petal is oval to lance-shaped, narrowed at the middle, and has crispy-wavy margins. Sepals are separate or fused only at the base (not fused into a hood-like structure) and are often spreading at their tips. Fruits are cylindrical capsules with numerous seeds.²²

1 US Census Bureau

20 Wallsburg Coordinated Resource Management Plan

21 PJ Abraham, DFFSL

22 United States Fish and Wildlife Service

General Resource Observations

ANIMALS

Livestock

Most cattle operations in the county are cow-calf operations where calves are marketed and sold in the fall. The sheep industry is also found in the county. In 2007, cattle and sheep production in Wasatch County averaged around 11,000 and 10,000, respectively.²³ The mountains and lower elevations of the valley floors provide significant summer and winter range for the beef cattle and sheep industries.

Aquatic life

Because Strawberry, Deer Creek, and Jordanelle reservoirs are higher in elevation, they offer an abundant population of cold water sport fish. All three reservoirs contain numerous trout species, including rainbow trout, cutthroat trout, brown trout, and brook trout. Other species of fish include small mouth bass, largemouth bass, yellow perch, chubs, and carp. Walleye were illegally introduced to Deer Creek Reservoir and have become the dominate predator; crawfish were also illegally introduced. Anglers at Mill Hollow Reservoir will occasionally catch albino rainbow trout.⁴

Wildlife

Mule deer and Rocky Mountain elk inhabit the mountains of Wasatch County during the summer and spend winter in lower elevations. Moose also call Wasatch County home. Several Wildlife Management Areas (WMAs) are located in the county and are managed by the Utah Division of Wildlife Resources, primarily for preserving wildlife habitat and providing sportsmen access for hunting and fishing. Black bear, mountain lion, bobcat, badger, mink, skunks, beaver, muskrat, raccoon, red fox, and coyote are found in Wasatch County, along with many other smaller mammal species. River otter can be observed in the Provo River above and below Jordanelle Reservoir.

Many bird species can be observed in Wasatch County, including raptors, waterfowl, wading birds, and migratory birds. The number and variety of birds in Wasatch County is so diverse that two birding organizations have identified the Heber Valley/Provo River corridor and Strawberry Valley as *Important Bird Areas* and *Utah Bird Habitat Conservation Areas*, for their respective organizations. Bald eagles can be observed during the winter in Wasatch County. The large expanses of sage brush communities in several areas of the county provide habitat for greater sage-grouse.²⁴



Photo Courtesy: US Fish and Wildlife Service

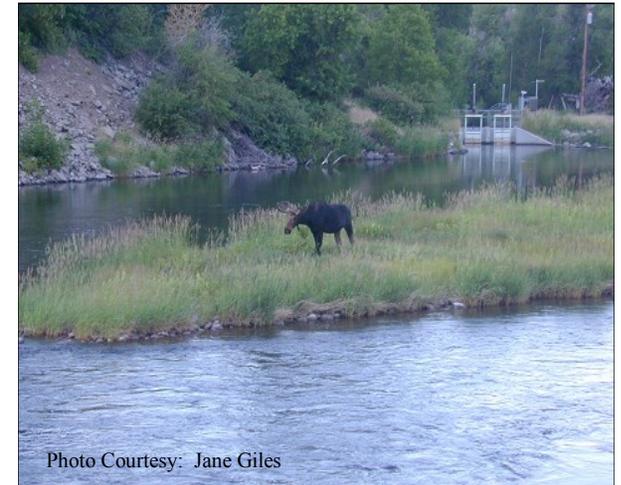


Photo Courtesy: Jane Giles

²³ National Agriculture Statistics Service

⁴ Utah DEQ: DWQ: Watersheds: Lakes and Reservoirs

²⁴ Doug Sakaguchi, Wildlife Biologist, DWR

Utah Sensitive Species

The purpose the Utah Sensitive Species list is to identify those species in the state that are the most vulnerable to population or habitat loss. This list provides land managers, wildlife managers, and concerned citizens with a brief overview of the conservation status of listed species. The list is intended to stimulate management actions, e.g., development and implementation of a conservation strategy, for listed species. By developing and implementing timely and sufficient conservation measures for sensitive species, federal listing of these species under the Endangered Species Act (ESA) may be precluded.²⁵

Threatened and Endangered Species

The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the U.S. Fish and Wildlife Service and the Commerce Department's National Marine Fisheries Service (NMFS). Under the ESA, species may be listed as either endangered or threatened. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened.²⁶

Wasatch County's Federally Listed Threatened (T), Endangered (E), and Candidate (C) Species	
Common Name	Status
Greater Sage-Grouse	C
Yellow-Billed Cuckoo	C
Brown (Grizzly) Bear	T Extirpated
Canada Lynx	T

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



The Canada lynx is on the threatened species list.

Utah Sensitive Species

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

- Bald Eagle
- Black Swift
- Bluehead Sucker
- Bobolink
- Bonneville Cutthroat Trout
- Brown (Grizzly) Bear
- Canada Lynx
- Colorado River Cutthroat Trout
- Columbia Spotted Frog
- Ferruginous Hawk
- Fringed Myotis
- Greater Sage-Grouse
- Lewis's Woodpecker
- Long-Billed Curlew
- Northern Goshawk
- Roundtail Chub
- Short-Eared Owl
- Smooth Greensnake
- Southern Leatherside Chub
- Three-Toed Woodpecker
- Townsend's Big-Eared Bat
- Western Toad
- Yellow-Billed Cuckoo

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 at: dwrcdc.nr.utah.gov/ucdc/.

²⁵ Utah Division of Wildlife Resources

²⁶ US Fish and Wildlife Service

HUMANS: Social and Economic Considerations

Population

From 1980 to 2011, Wasatch County's population has increased at an average rate of 3.6 percent per year. The highest population increase rate was 8.1 percent in 1980. The total population of Wasatch County in 2011 was 24,456. While natural increase is a factor in the county's population growth, two-thirds is from net in-migration.²⁷ As of 2010, populations of Wasatch County cities and towns were:

Charleston	415
Daniel	938
Heber	11,362
Hideout	656
Independence	164
Midway	3,845
Wallsburg	250

Demographics

In 2011, the county's racial makeup was 82.8 percent White, 13.5 percent Hispanic or Latino, 0.9 percent Asian, 0.8 percent American Indian, 0.5 percent Black, and 0.2 percent Hawaiian or Pacific Islander. In the same year, persons under the age of 18 represented 33.5 percent and persons 65 years and older represented 8.8 percent of the population. Seven percent of the county's population were below the poverty level, which is 4.4 percent lower than the state average of 11.4 percent mean from 2007 to 2011. High school graduates in the county made up 91.1 percent of the population, while 30.5 percent of the county reports having a bachelors degree or higher.¹



Wasatch County Fair Days Carnival. Photo courtesy Ivan Spencer.

Wasatch County Population Data

	Area Name	Wasatch
	Period Year	2011
	Population	24,456
	Births	372
	Deaths	121
	Natural Increase	251
	Net Migration	523
	Annual Change	774
Annual Rate of Change	3.3%	

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

Economy

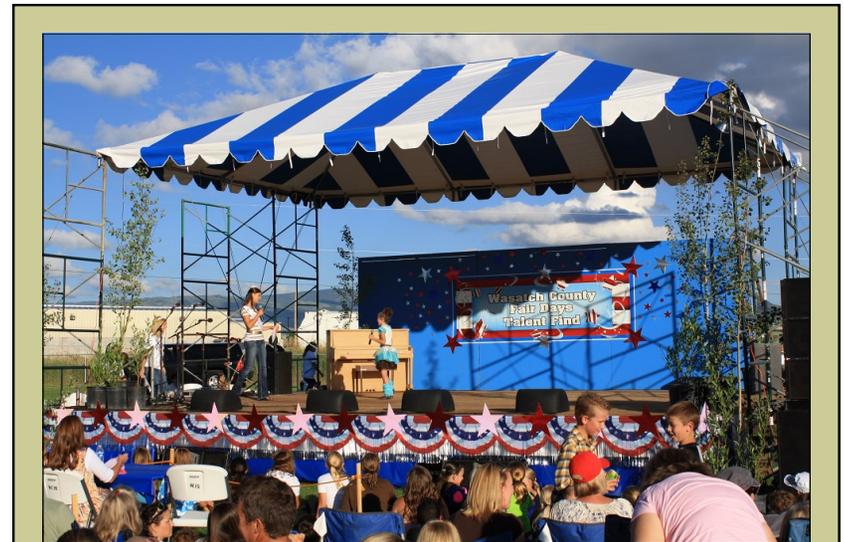
The top five nonfarm employers are the Wasatch School District, Wasatch County, Homestead/Zermatt Resort, the State of Utah and RMD Management. Federal, state, and local government jobs are the most prevalent in the county, followed by leisure/hospitality, trade/transportation/utilities, construction, and health/social services.²⁸ Agriculture is a significant portion of the labor force in Wasatch County, accounting for the jobs of nearly half the labor force. According to the USDA 2007 census of agriculture in Wasatch County, the mainstays of the agricultural community are beef cow, sheep, and hog production and oats for grain and hay for forage.²³

Recreation

Wasatch County offers year-round outdoor recreation. In summer, temperatures are usually cool and pleasant. In winter, abundant snowfall and access to numerous ski resorts makes it a paradise for winter recreation. The Provo River is a premier blue ribbon trout fishery, with brown and rainbow trout reaching record lengths. Deer Creek, Strawberry, and Jordanelle reservoirs offer additional fishing sites, as well as water skiing, boating, and opportunities for other water sports. Heber City and Midway offer various 18-hole golf courses, spas, resorts and dining options. Swiss Days is held annually in Midway and attracts tens of thousands of visitors.

One of the most popular attractions in Heber Valley is the historic Heber Valley Railroad. The sixteen miles of track between the valley and Vivian Park in Provo Canyon offers access to some of the most spectacular scenery in the state. From the reservoir, the tracks descend into Provo Canyon, following the twists and turns of the Provo River. Here, wildlife is abundant, featuring bald eagles, deer, and elk. Scenic excursions range from one and a half hours round-trip to three hours round-trip. Seasonal activity rides are also available.

The Uintas includes a high, pristine mountain area in northeastern Utah that is popular for fishing, hiking, backpacking, horse packing, hunting, and other outdoor activities. Much of the area is designated as a roadless wilderness where vehicles are prohibited. A few roads, and a handful of rugged 4X4 tracks, provide access to areas outside the wilderness and to trailheads. Developed campgrounds are located wherever roads extend into the forest. Camping is also allowed in undeveloped areas.²⁹



Wasatch County Fair Days Talent Find. Photo courtesy Ivan Spencer.



Sunset barbeque. Photo courtesy Heber Valley Railroad.

28 Heber Valley Economic Development
23 USDA, National Agriculture Statistics Service
29 Utah.com

Bibliography

Map and GIS Data Sources

Land Ownership/Overview: 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](http://gis.utah.gov/sgid-vector-download/utah-<u>sgid-vector-gis-data-layer-download-index?fc=LandOwnership</u>)

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>

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](http://gis.utah.gov/sgid-vector-download/utah-<u>sgid-vector-gis-data-layer-download-index?fc=StreamsNHDHighRes</u>)

Important Farmland: Prime, Statewide and Uniquely Important Farmland derived from the following SSURGO soil surveys: UT613 –Summit Area, Utah, Parts of Summit, Salt Lake and Wasatch Counties and UT622 - Heber Valley Area, Utah - Parts of Wasatch and Utah 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 depicts information about the kinds and distribution of soils on the landscape. The soil map and data used in the SSURGO product were prepared by soil scientists as part of the National Cooperative Soil Survey. SSURGO Soil Surveys are available for download from the NRCS Soil Data Mart: <http://soildatamart.nrcs.usda.gov/>

Soils Detail Data: Detailed soil properties derived from the following SSURGO soil surveys: UT613 –Summit Area, Utah, Parts of Summit, Salt Lake and Wasatch Counties and UT622 - Heber Valley Area, Utah - Parts of Wasatch and Utah Counties using Soil Data Viewer, a tool created by USDA Natural Resources Conservation Service as an extension to ArcMap that allows users to cre-

ate soil-based thematic maps. SSURGO depicts information about the kinds and distribution of soils on the landscape. The soil map and data used in the SSURGO product were prepared by soil scientists as part of the National Cooperative Soil Survey. SSURGO Soil Surveys are available for download from the NRCS Soil Data Mart: <http://soildatamart.nrcs.usda.gov/>

General Soils: General soil properties derived from the STATSGO soil survey. STATSGO depicts information about soil features on or near the surface of the Earth. These data are collected as part of the National Cooperative Soil Survey. STATSGO is designed primarily for regional, multi-county, riverbasin, state, and multi-state regional planning, management, and monitoring. The STATSGO Soil Survey is available for download from the NRCS Soil Data Mart: <http://soildatamart.nrcs.usda.gov/USDGSM.aspx>

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.

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.

Assessment Units (Impaired Waters): Produced by Utah Division of Water Quality, January 2010. This dataset represents water quality assessment units for the State of Utah, and shows the 2006 assessment category for meeting State of Utah 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](http://gis.utah.gov/sgid-vector-download/utah-<u>sgid-vector-gis-data-layer-download-index?fc=DWQAssessmentUnits</u>)

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](http://gis.utah.gov/sgid-vector-download/utah-<u>sgid-vector-gis-data-layer-download-index?fc=Roads</u>)

County Boundaries: This data set represents county boundaries in Utah at 1:24,000 scale. Last updated July, 2012. 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](http://gis.utah.gov/sgid-vector-download/utah-<u>sgid-vector-gis-data-layer-download-index?fc=Counties</u>)

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Map and GIS Data Sources continued...

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