



Wallsburg Coordinated Resource Management Plan

Wasatch Conservation District

October 1, 2012

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Appendices (Bound Separately)

- Appendix A. Watershed Council Meetings
- Appendix B. Geology and Environmental Hazards
- Appendix C. Stream Visualization and Assessment Protocol Report
- Appendix D. Grazingland, Forest, and Pastureland Reports
- Appendix E. Water Quality Assessment Report
- Appendix F. Water Right Point of Diversion Maps
- Appendix G. Septic Tank Functionality Report
- Appendix H. Hydrology Report

1.0 Executive Summary

The Wallsburg watershed, which covers about 45,000 acres, is tributary to Deer Creek Reservoir in Wasatch County, Utah. The major waterway in the watershed, Main Creek, conveys surface water from the upper mountainous watershed through rangeland and agricultural land. About one-third of the watershed (15,000 acres) is forest, about 3,000 acres are used for agriculture, and just under half of the watershed (21,600 acres) is privately owned. The watershed has about 600 residents; the only town in the watershed is the town of Wallsburg.

The Utah Division of Water Quality conducted a total maximum daily load (TMDL) study for Deer Creek Reservoir, and this study identified Main Creek as a major source of phosphorus in the reservoir. To address this and other water quality concerns, the Wasatch Conservation District initiated this Wallsburg Coordinated Resource Management Plan (CRMP).

1.1 Resources of Concern and Priority Rankings

In March 2007, local landowners and conservation agencies met to address local resource concerns and to form the Wallsburg Watershed Coordinating Council (WWCC) as the planning group for addressing these concerns. Using the CRMP process, stakeholders and the WWCC spoke about the local resources and the potential for actions to protect and restore these resources. Participants at the meeting listed the resources about which they had concerns and then ranked them by priority. Table 1-1 lists the top 20 concerns.

Table 1-1. Top Resource Concerns

Water conservation	Riparian management
Water quality	Animal waste
Noxious and invasive weeds	Soil erosion
Water rights	Predator control
Irrigation water management	Threatened/endangered species
Wildlife habitat	Recreation impacts
Forest health	Pest management
Septic tank management	Well head protection
Air quality	Grazing management
Wetland protection	Agricultural land converted to other uses

Because of this ranking, this CRMP will identify recommendations and implementation activities for the following watershed resources: riparian corridors, rangeland, water quality, wildlife, forestland, and pastureland. In addition to these resources, this CRMP also assesses local economics, water rights, and septic tank functionality.

1.2 Results of the Resource Assessments

The resource assessments conducted for the CRMP identified specific concerns, degraded conditions, and land-use activities that could be better managed. The potential actions and recommendations focus on improving water quality and water management, conserving

water, improving rangeland and pastureland, and restoring riparian and aquatic habitats while allowing a compatible level of agricultural use.

Some actions and projects were recommended under several of the resource assessments. For instance, a supplemental water source for irrigation was recommended in both the riparian corridor and grazinglands assessments as a benefit to sustaining natural creek flows, conserving water, and improving forage production. Likewise, stream restoration is valued as a water quality improvement through potentially reducing the transport of sediment and also as a way to improve aquatic habitat by providing shade and pool/riffle environments.

1.3 Recommended Strategies and Actions

This CRMP identifies guidance, strategies, and actions to improve water and water management in the Wallsburg watershed. Specific projects, actions, and studies with an estimated cost of about \$2.9 million are described along with potential funding and implementation partners (see Table 6-1, Wallsburg Watershed Recommendations, on page 116).

The specific recommendations are organized by resources and identified below in the table. However, wherever possible, the actions should be integrated to achieve synergistic and positive effects on water quality, water management, water conservation, riparian and aquatic habitats, and the local economy. Table 1-2 identifies the eight general recommendations and the resource category for each. Stream bank stabilization (item 3) and rehabilitation of aquatic resource habitat (item 7) account for about \$1.9 million of the total estimated costs.

Table 1-2. Recommended Actions

	Recommendation	Resource(s) in Table 6-1	Estimated Cost
1.	Provide watershed information and education.	Information and education	\$25,000
2.	Conduct preliminary planning to identify a supplemental source of irrigation water to reduce the stream diversions, thereby allowing natural flows to remain in the creeks.	Water conservation	\$100,000
3.	Implement riparian corridor conservation practices to reduce the transport of sediment.	Water quality	\$600,300
4.	Investigate the spring source of Spring Creek to identify and reduce the sources of phosphorus.	Water quality	\$50,000
5.	Coordinate and implement management plans and strategies to maximize grazing distribution and control noxious weeds on 10,000 acres.	Grazingland; pastureland	\$278,300
6.	Enhance 5,600 acres of wildlife habitat and wet meadows.	Wildlife habitat	\$365,000
7.	Restore Main Creek aquatic habitat and stream flow and manage fish communities.	Aquatic resources	\$1,333,670
8.	Prepare community onsite wastewater-treatment evaluations and management strategies to reduce the influence of wastewater-treatment systems on water resources.	Groundwater quality	\$185,000

2.0 Coordinated Resource Management Plan

Development of a CRMP is a voluntary, locally led planning process that has proven to be successful in managing natural resources. The CRMP process is a *people process* that allows local people to actively participate in developing and implementing proactive natural-resource-management decisions. The CRMP process brings all the affected interests, both private and public, together to establish common goals and to resolve issues as a team.

The CRMP process is open to everyone who is interested in resource issues and strives to balance environmental concerns while considering human and cultural needs.

Increasing demand for natural resources has led to intensified conflicts between interest groups, land users, and resource-management agencies. Coordinated resource management and planning has evolved as a way to reduce these conflicts and reach mutually agreeable management strategies.

2.1 What Is CRMP?

Resource management and planning is a consensus-based process by which natural-resource owners, managers, land users, and related interests work together as a team to formulate and implement plans for managing all major resources and ownerships in a specific area and/or for resolving specific conflicts.

The purpose of the process is to resolve conflicts or issues that can hinder or preclude sound resource-management decisions. It can also proactively plan for improving natural resources and is based on the belief that people with common interests can work together to develop viable management strategies.

The goal of the process is to enhance the quality and productivity of natural resources by achieving compatibility among the multiple uses in a specific area. The objective is to improve and maintain natural resources in ways that are consistent with the priorities of the landowners, land users, interest groups, and land-management agencies.

The CRMP process is a voluntary, nonregulatory process that uses consensus as its strength. Landowners, users, managers, and other interested parties work together as a team from beginning to end. The exchange of values and viewpoints on objectives, problems, and alternatives is essential to achieving common goals and meeting resource needs. The most effective process is one that involves the local community from the outset and one in which the regulating agency is comfortable with the local community being involved at the highest level of decision-making.

The general flow of a CRMP process is as follows:

1. A private or public entity requests a CRMP program.
2. Private and public landowners and managers, resource managers, and other interested parties in the general planning area are invited to an initial meeting.
3. At the end of the initial meeting, consensus is reached about whether a plan should be developed.

4. The specific planning area is defined; issues, problems, and concerns are listed; and goals and objectives are developed.
5. The information that is available and needed is determined.
6. A checklist is developed to ensure that all resources have been considered.
7. Each objective is addressed, and all actions needed to accomplish it are determined. For each action, the planning group determines who, what, when, and how long.
8. A plan is developed using all information from the prior steps, and the plan is re-evaluated.
9. A system is set up to implement and maintain the plan.
10. The plan is implemented.

Once the plan is implemented, there is an annual review of the plan, plan progress, accomplishments, and problems and development of new objectives through an adaptive management process.

2.2 Rules of Coordinated Resource Management Planning

The CRMP process has three rules:

1. **Management by consensus.** Participation in CRMP is voluntary, and consensus promotes involvement. Everyone must agree on conclusions before they can be accepted by the group.
2. **Commitment.** All participants must be committed to the success of the program.
3. **Broad involvement.** All interested and/or affected parties should participate.

2.3 Initiating the Wallsburg CRMP Process

The Wallsburg CRMP process was initiated because coordinated management was needed to resolve immediate resource problems and to prepare plans to keep problems from developing.

The CRMP process was initiated at the local level by landowners in the Wallsburg watershed. The Wasatch Conservation District is a legal special district and political subdivision of state government with responsibility for land and water conservation. For this reason, the District took the lead to organize the CRMP process.

The District coordinated assigning priorities and creating timetables and schedules with the other agencies, organizations, and interests involved. The CRMP process was reviewed with all parties to help them decide whether to proceed. Once the decision was made to proceed with the CRMP process, a list of everyone who would be invited to participate was drafted and notices were sent.

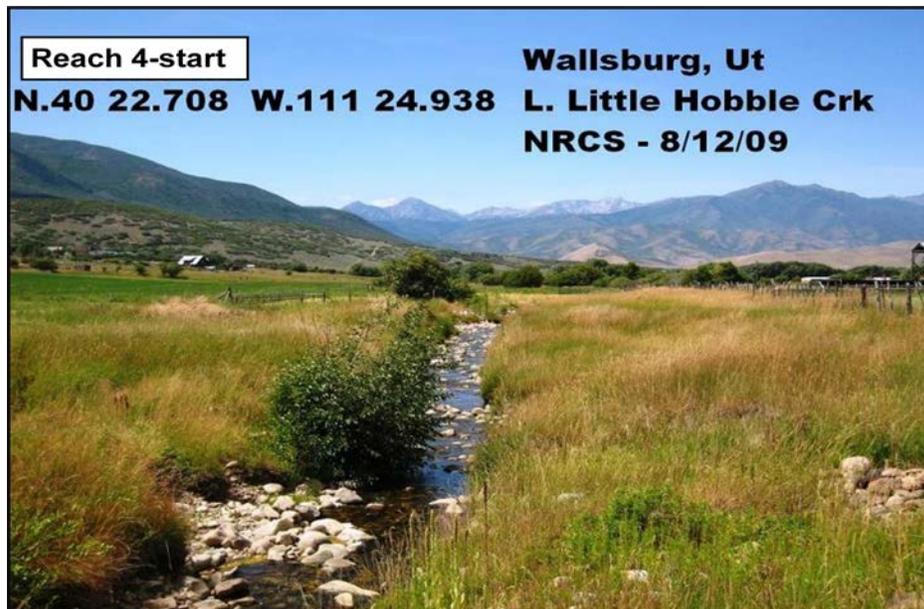
The chair of the CRMP planning group is a supervisor from the Wasatch Conservation District. The chair's role is to oversee the organization of the planning group, assemble available inventory data, schedule meetings, and otherwise motivate the individuals involved in this planning process.

3.0 Introduction to the Wallsburg Watershed CRMP

3.1 Initiation of the Wallsburg CRMP

The Wallsburg CRMP was initiated because coordinated management was needed to resolve immediate resource problems and to prepare plans to keep problems from developing.

The Wallsburg CRMP was initiated by the Wasatch Conservation District on March 29, 2007. Local landowners and conservation agencies met in a public meeting to address local resource concerns. The meeting was conducted by the chair of the Wasatch Conservation District. The Uinta Headwaters Resource Conservation and Development (RC&D) coordinator facilitated the meeting to ensure that all participants had an opportunity to present their input.



Using the CRMP process, everyone was given the opportunity to speak about the local resources and the potential for protection and restoration. During the plan's initial phase, a public visioning session was held at which the participants identified their resource concerns for the watershed. Participants at the meeting listed the resources about which they had concerns. Once those were listed, everyone was given an opportunity to rank, by priority, those resources needing the highest level of attention. Watershed concerns were then tabulated, as shown below in Table 3-1.

Table 3-1. Natural Resource Concerns for the Wallsburg Watershed

Resource Concern	Priority Ranking Points	Number of Responses
Water conservation	40	11
Water quality	35	8
Noxious and invasive weeds	31	12
Water rights	28	8
Irrigation water management	25	7
Wildlife habitat	18	5
Forest health	10	5
Septic tank management	10	5
Air quality	10	4
Wetland protection	10	3
Riparian management	7	3
Animal waste	6	2
Soil erosion	6	2
Predator control	6	2
Threatened/endangered species	5	1
Recreation impacts	4	3
Pest management	4	2
Well head protection	4	1
Grazing management	4	1
Agricultural land converted to other uses	3	2
Absentee landowners	1	1
Stormwater management	1	1
Crop production	1	1

At the same public meeting, representatives were chosen to represent the landowners and various conservation agencies on the Wallsburg Watershed Coordinating Council. Members of the watershed council are identified below in Section 3.3, Wallsburg Watershed Coordinating Council.

3.2 Participating Agencies

The Wallsburg CRMP was prepared with input from the following agencies and participants:

Lead agency:	Wasatch Conservation District
Participating agencies:	U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) U.S. Forest Service, Uinta-Wasatch-Cache National Forest Utah Division of Water Quality Utah Division of Water Rights Utah Division of Wildlife Resources Wasatch County Health Department
Consultants:	Desert Rose Environmental HDR Engineering, Inc.
In cooperation with:	Wasatch County Wallsburg Town Central Utah Water Conservancy District Local landowners Irrigation companies

3.3 Wallsburg Watershed Coordinating Council

The Wallsburg Watershed Coordinating Council (WWCC) was formed as the planning group for the CRMP. The coordinating council consists of local citizens and property owners as well as representatives from local governments and agencies, state agencies, and federal agencies. The WWCC currently consists of the following members:

Name	Representing
Alan Brown (Chair)	Wasatch Conservation District
Ray Loveless	Wasatch Conservation District
Bob Gappmeyer	Wasatch Conservation District/Landowner
Bob Probst	Wasatch Conservation District
Norm Evenstad	NRCS
Ana Vargo	NRCS
Reed Oberndorfer	Central Utah Water Conservancy District (CUWCD)
Lowell Gardner	NRCS
Keith Covington	Utah Association of Conservation Districts (UACD)
Jeff Dunn	Land Manager
Harvey Mecham	Landowner
Dee Mecham	Landowner
Lorin Smart	Landowner

The current WWCC would like to acknowledge the past participating council members who participated in meetings during the initial phases of this plan: Val Warnick, Barbara Carey, and Larry Hartley.

Meetings were held on the following dates:

- 2007: March 29
- 2008: December 3
- 2009: January 21, February 18, March 18, April 15, May 20, June 17, July 15, October 21
- 2010: February 17
- 2011: May 17, August 9, September 14 (tour)
- 2012: February 28, July 6 (tour)

Available WWCC meeting minutes and presentation materials are included in Appendix A, Watershed Council Meetings.

3.4 Wallsburg Watershed Outreach Plan

The Wallsburg Watershed Outreach Plan was prepared by the Uinta Headwaters RC&D (Devaney 2009) and was adopted by the Wasatch Conservation District and the WWCC. The purpose of the outreach plan is to communicate a strategy for involving property owners, local citizens, agencies, and other interested parties in the planning process and developing the watershed plan.

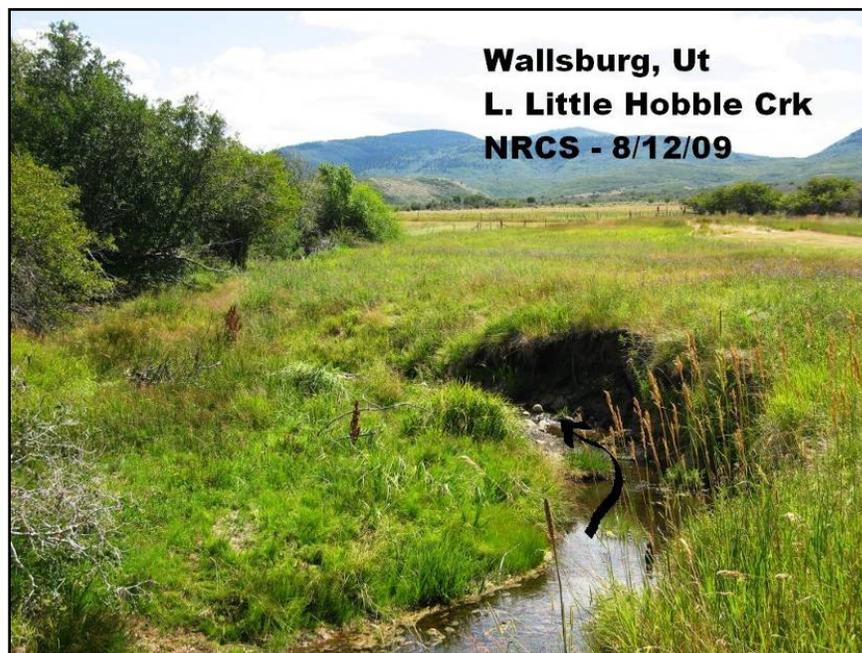
Key components of the outreach plan include the following:

- Schedule of WWCC meetings
- Wasatch Conservation District newsletter to keep people informed
- Public outreach workshops to report CRMP progress
- Public meeting to present the final CRMP

4.0 Watershed Characterization

This section provides a general description of the Wallsburg watershed with the intent of identifying opportunities for implementing projects that would improve the condition of the watershed. This review of the physical, biological, and chemical condition of the watershed, as well as the social components (such as population growth and recreational use), identifies areas that might need some type of watershed project or that might respond well to a watershed project.

This section specifically addresses the following aspects of the watershed: watershed area, authorities and jurisdictions, population and land use, social environment and recreation, water resources, and wildlife and habitat.

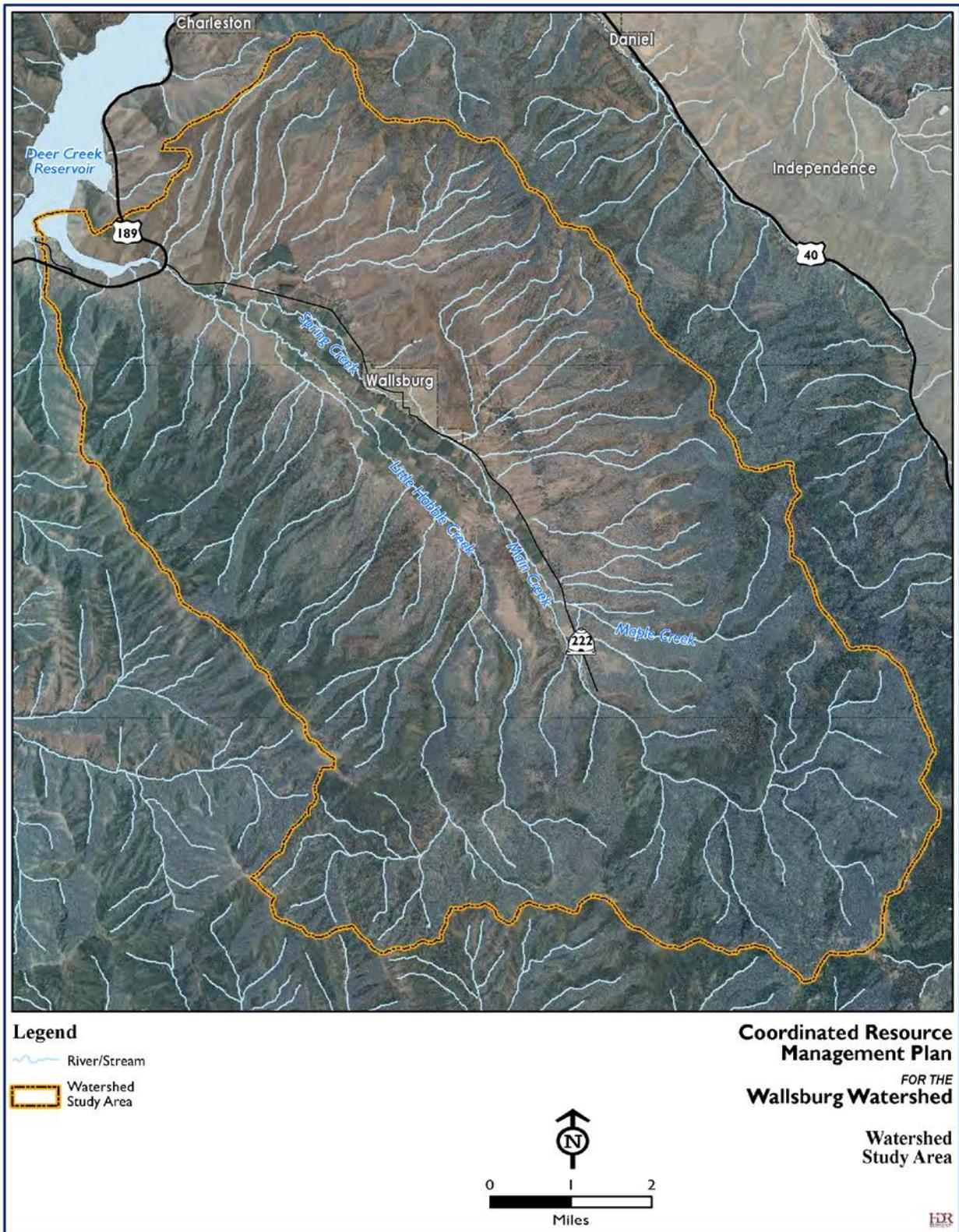


The best available information was used to develop this characterization. In several cases, further data collection and analyses were conducted to provide additional information that was used to assess the watershed and identify potential projects and management strategies.

4.1 Watershed Area

The Wallsburg watershed is located 10 miles southeast of Heber City, Utah, in the Wasatch Mountains. The watershed is about 11 miles long and 7 miles wide and encompasses about 45,000 acres (70 square miles) in Wasatch County (see Figure 4-1 below). The following sections include general descriptions of the topography, town, roads, and climate in the watershed.

Figure 4-1. Watershed Study Area



4.1.1 Topography, Geology, and Soils

The Wallsburg watershed is a narrow river valley bounded by mountains on the south and Deer Creek Reservoir on the north. Elevation ranges from about 9,500 feet in the surrounding peaks to about 5,500 feet at Main Creek’s discharge into Deer Creek Reservoir near U.S. Highway 189 (US 189). The watershed slopes to the northwest and is drained by Main Creek; tributaries to Main Creek are Spring Creek and Little Hobble Creek.

The watershed has a wide central area that is used primarily for agriculture and residential development. Irrigation ditches convey water from Main Creek across the eastern slope of the watershed, intersecting intermittent drainages. Figure 4-2 below shows the topography of the watershed.

NRCS reviewed previous studies and identified sources of data that describe groundwater conditions, geology, soils, and geologic hazards. Shallow groundwater (the water table 3 to 10 feet below the ground surface) is mapped throughout the valley floor. Within the watershed, some slopes show a moderate potential for landslides. NRCS analyzed the potential sediment yield from the watershed due to eroding stream banks along Main Creek by comparing previous studies conducted in 1997 and 2009. NRCS also assembled three geologic hazard maps for the northern section of the watershed: a map of landslide hazards, a map of the Federal Emergency Management Agency (FEMA) 100-year floodplain and shallow groundwater, and a map of earthquake and problem soil hazards. These maps, along with detailed information on geology, soils, sedimentation, and geologic hazards, are provided in Appendix B, Geology and Environmental Hazards.

4.1.2 Wallsburg Town

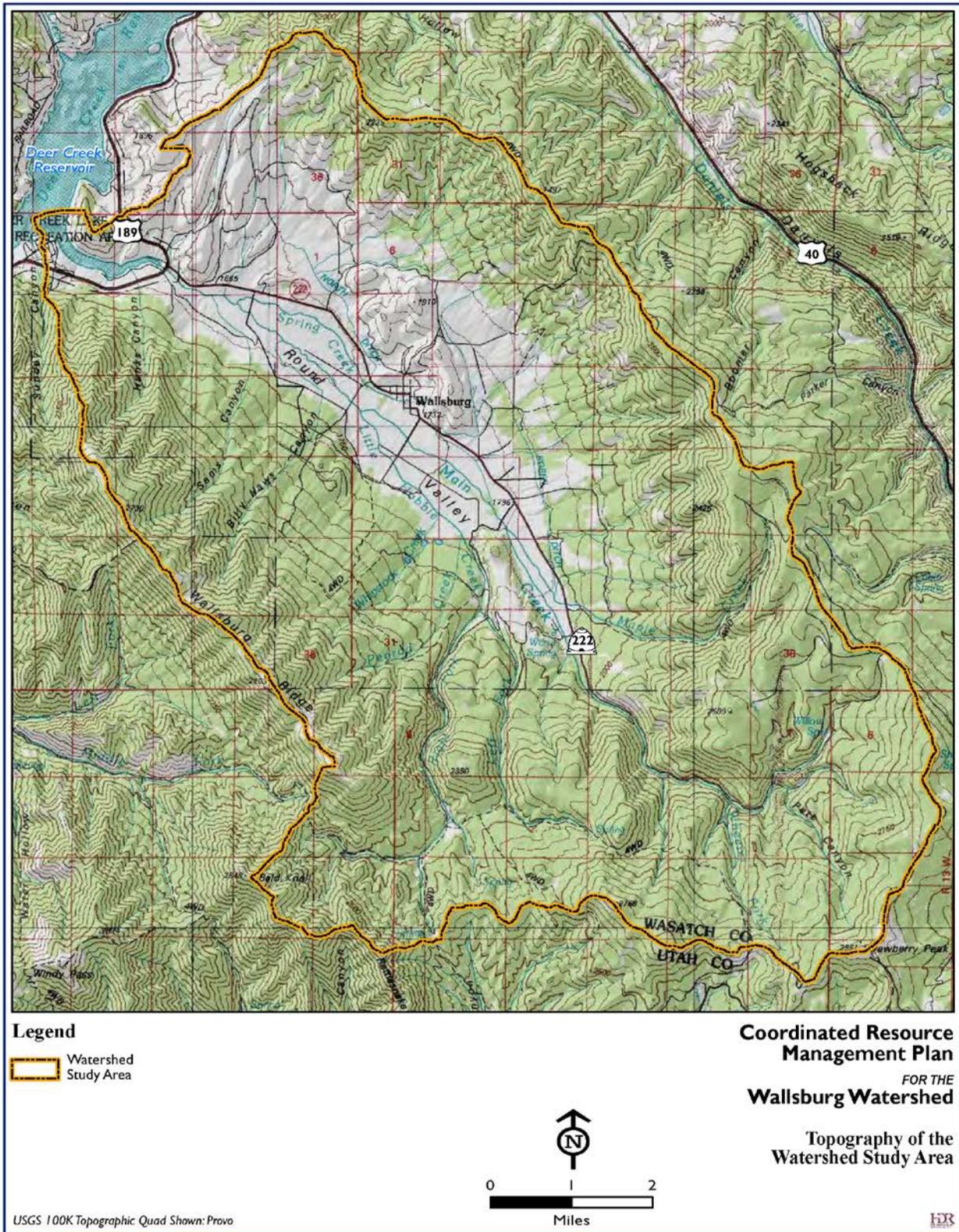
Wallsburg is a small, incorporated community in the center of Round Valley in Wasatch County. The town covers about 320 acres (0.5 square mile), or less than 1% of the watershed. The town has remained essentially the same for many years. Isolated among the Wasatch Mountains, the town and the surrounding valley are one of the few remaining pristine areas in the region.

The Little Warm Valley and Round Valley were the Native American names for the area. It eventually was named for William Madison Wall, a native of North Carolina, who helped construct a road through Provo Canyon. Wall was an explorer, colonizer, military officer, and church leader.

When Wallsburg was originally settled in the 1870s, it was mainly an agricultural community. Grazing and farming remain a significant part of the community today. Unlike most cities in Wasatch County, Wallsburg has experienced little growth within its boundaries. However, in all likelihood, the town and valley will grow as a result of both natural increase (births) and in-migration.

The town is characterized by its rural atmosphere with beautiful views of the surrounding mountains and an abundance of agriculture and open space. These natural features are valuable resources that have made Wallsburg unique, and great care should be taken to maintain and preserve the rural atmosphere while making it a wonderful place to live, work, and raise a family.

Figure 4-2. Topography of the Watershed Study Area



4.1.3 Roads

There is one main northwest-southeast road—Main Canyon Road (State Route 222)—through the watershed (see Figure 4-2 above). This road connects US 189 near Deer Creek Reservoir to Wallsburg and continues to the upper watershed. Main Canyon Road is the primary access road for residents living south and east of the town. A series of local roads, including Roundy Lane, Round Valley Road, and Little Valley Road, connect Main Canyon Road to the western side of the valley.

Wallsburg relies on Wasatch County for the maintenance of all current roads in the town. Wallsburg will continue to cooperate with the Wasatch County transportation goals and objectives in planning, building, and maintaining roads.

4.1.4 Climate

The nearest weather station is located on Deer Creek Dam (Station 422057, elevation 5,270 feet) about 6 miles downstream and northwest of the watershed. Annual average precipitation at the station site is 24.56 inches, with the majority received between October and April. January is reported as the coldest month of the year with a normal mean temperature of 19.5 degrees Fahrenheit, and July is the hottest month with a normal mean temperature of 66.8 degrees Fahrenheit.

4.2 Authorities and Jurisdictions

This section identifies the federal, state, and municipal governments and agencies that have jurisdiction over resources in the CRMP area, manage land that is included in the CRMP area, or have an interest in CRMP implementation.

4.2.1 Federal Agencies



Natural Resources Conservation Service

Since 1935, the Natural Resources Conservation Service (originally called the Soil Conservation Service) has provided leadership in a partnership effort to help the United States' private landowners and managers conserve their soil, water, and other natural resources.

The conservation provisions in the Food, Conservation, and Energy Act of 2008 (2008 Farm Bill) provide conservation opportunities for farmers and ranchers. The new provisions build on the conservation gains made by farmers and ranchers through the 1985, 1996, and 2002 Farm Bills. They simplify existing programs and create new programs to address high-priority environmental goals.

NRCS provides various programs to land users, communities, units of state and local government, and other federal agencies in planning and implementing conservation systems.



U.S. Forest Service

The U.S. Forest Service (USFS) is the largest land manager in the Wallsburg watershed. The Uinta-Wasatch-Cache National Forest encompasses nearly 15,700 acres in the watershed. Established in 1905, USFS is an agency of the U.S. Department of Agriculture. The Heber-Kamas District Ranger manages the National Forest land in the watershed.

The Heber-Kamas District manages livestock grazing on one allotment in the watershed, known as the Wallsburg Allotment, and one allotment that straddles the Wallsburg watershed and Hubble Creek drainage, known as the Little Valley Allotment. Permitted use for seasonal grazing by ewes with lamb was supported with a 2008 Notice of Decision.



U.S. Army Corps of Engineers

Section 404 of the Clean Water Act grants the U.S. Army Corps of Engineers (Corps) primary authority for regulation of dredging and filling waters of the United States including wetlands, streams, and creeks. Wetlands are “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions.” Many streams and creeks in the watershed could fall under the jurisdiction of the Corps if they are altered.



Federal Emergency Management Agency

The mission of the Federal Emergency Management Agency (FEMA) is to reduce the loss of life and property and protect communities nationwide from all hazards, including natural disasters, acts of terrorism, and other human-made disasters. FEMA leads and supports the nation in a risk-based, comprehensive emergency management system of preparedness, protection, response, recovery, and mitigation.

The major regulatory authority exercised by FEMA that affects watershed function is delineating and managing floodplain zones. For this reason, FEMA works closely with state and local officials to identify flood hazard areas and flood risks. There are FEMA-mapped floodplains along Main Creek, Spring Creek, and Little Hubble Creek in the Wallsburg watershed. Changes to the creeks that could affect the mapped floodplains require coordination and permitting through FEMA.



U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) leads the nation’s environmental science, research, education, and assessment efforts. EPA is responsible for numerous activities including developing and enforcing regulations and performing environmental research. The two most applicable statutes affecting watershed management are the Clean Water Act (U.S. Congress, 1972) and the Safe Drinking Water Act (U.S. Congress, 1974). States are typically given principal responsibility for implementing the provisions of these federal acts. Utah has been granted primacy for implementing specific sections of the Clean Water Act (CWA).

The CWA is the cornerstone of water quality protection in the United States. EPA divides water pollution sources into two categories: point and non-point. Point sources of water pollution are stationary locations such as sewage-treatment plants. There are no point sources of pollution in the Wallsburg watershed. Non-point sources are more diffuse and include agricultural runoff, septic tanks, and paved roads and parking lots. EPA works with state and local authorities to monitor pollution levels in the nation's water and to provide status and trend information on a representative variety of ecosystems.

The Safe Drinking Water Act (SDWA) focuses on all waters that are either actual or potential sources for drinking water. EPA regulates the quality of the nation's drinking water by issuing and enforcing safe-drinking-water standards. EPA also protects the nation's drinking water by safeguarding our watersheds and regulating the release of pollutants into the environment. In partnership with local authorities and community groups, EPA encourages water conservation. EPA also works with these partners to develop contingency plans for source contamination and other water emergencies.

The Utah agencies that are responsible for implementing the CWA and the SDWA are the Division of Water Quality, the Division of Water Rights, the Division of Drinking Water, and the Division of Water Resources.

4.2.2 State Regulatory and Management Agencies



Utah Department of Environmental Quality, Division of Water Quality

The Utah Division of Water Quality is responsible for regulating surface water discharges, wastewater treatment, stormwater, and groundwater in Utah. As a regulatory division, the Division of Water Quality oversees all permits for discharge, monitors water quality, establishes water-quality standards, sets beneficial-use designations, oversees total maximum daily load (TMDL) studies, and administers groundwater discharge permits.



Utah Department of Natural Resources, Division of Water Rights

The Utah Division of Water Rights is the state agency that regulates water right appropriations (that is, the designation of a legal right to take possession of specific water at a specific time) and the distribution of water in Utah. Water rights are granted based on quantity, source, priority date, nature of use, point of diversion, and physically putting the water to a beneficial use.

The doctrine of prior appropriation allows those who first made beneficial use of water to use and distribute the water from a certain source before those entities with later priority dates.

In addition to overseeing water right appropriations, the Division administers a Stream Alteration Permit Program that regulates activities affecting the bed and banks of natural streams.



Utah Department of Natural Resources, Division of Water Resources

The Utah Division of Water Resources is responsible for promoting the orderly and timely planning, conservation, development, use, and protection of Utah's water resources. The Division evaluates the state's water resources and supply demands on a river-basin basis. The State's 1997 Utah Lake Basin Plan summarizes existing conditions and forecasts water demands and includes the Wallsburg watershed in the larger basin setting.



Utah Department of Natural Resources, Division of Forestry, Fire and State Lands

The management objectives of the Utah Division of Forestry, Fire and State Lands are to protect and sustain the beneficial uses of state lands consistent with their long-term protection and conservation. Any beneficial use of public-trust resources is subsidiary to long-term conservation of the resources. The Division oversees permit uses, grants easements, and leases land.



Utah Department of Natural Resources, Division of Parks and Recreation

The Utah Division of Parks and Recreation owns and manages Deer Creek Reservoir State Park. It also administers off-highway vehicle, boating, and trails programs and works to provide access to waterways and trails while protecting resources.



Utah Department of Natural Resources, Division of Wildlife Resources

The Utah Division of Wildlife Resources has authority for managing and conserving wildlife. The Division operates the Wallsburg Cooperative Wildlife Management Unit (CWMU) that lies within the watershed. It issues hunting permits and fishing licenses for the CWMU pursuant to Title 23 of the Utah Administrative Code.

4.2.3 Municipal Government

The town of Wallsburg is located in the Wallsburg watershed and has a population of about 275 people. Wallsburg Town provides culinary water to residents through a system of tanks, pumps, and pipelines (MAG 2007). Residents of Wallsburg and the unincorporated areas of the watershed use onsite wastewater-treatment systems (septic tanks) for sewage disposal.

The Mountainland Association of Governments (MAG), along with the Town's planning commission and staff, produced the *Wallsburg General Plan, 2007–2012* (General Plan). The General Plan included the following vision for the community.

Community Visions and Goals

The community vision for Wallsburg is stated as “to be a beautiful, peaceful, organized community which enhances the historic, rural atmosphere of the valley, through preserving open space and our rural heritage” (MAG 2007).

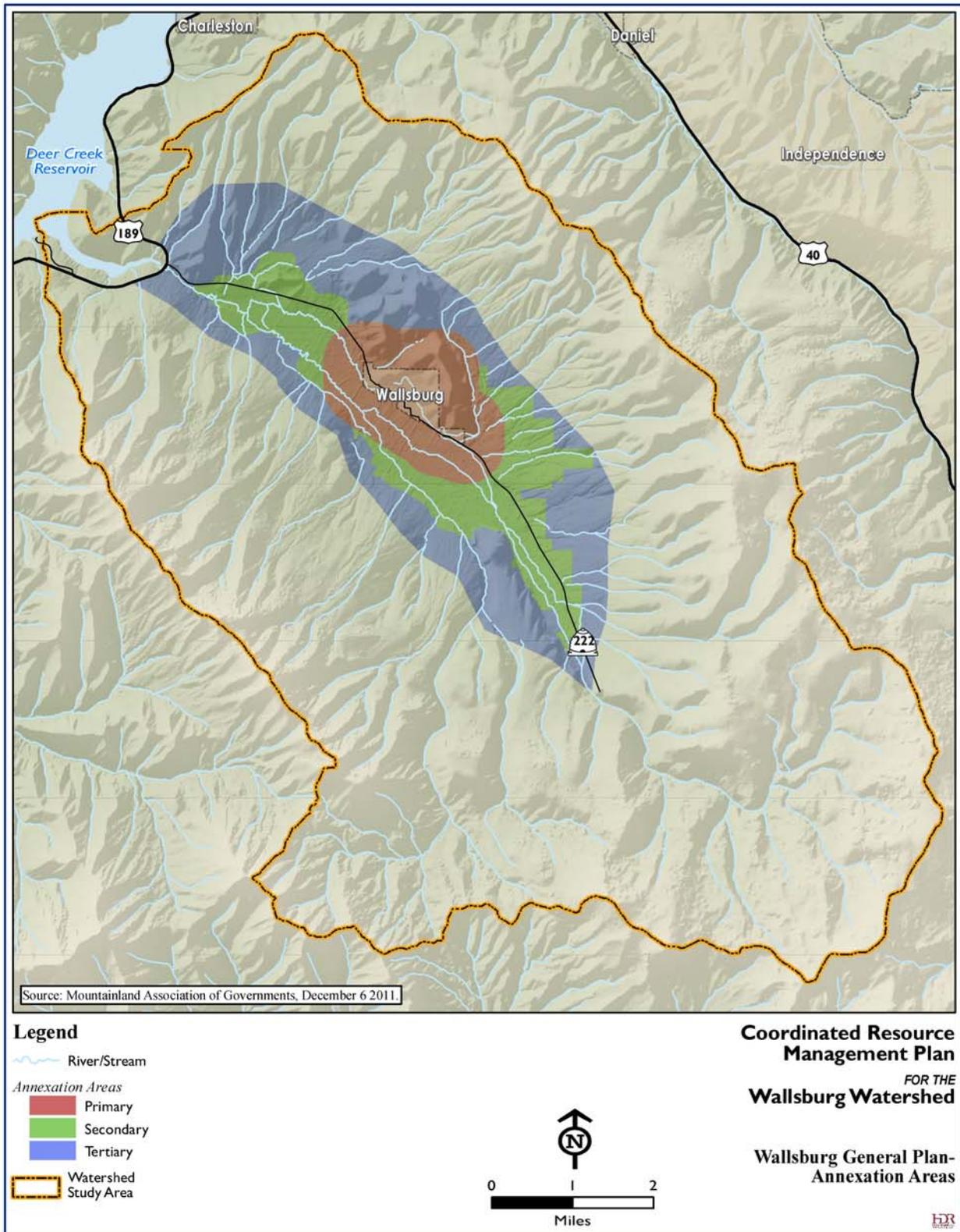
The three goals, objectives, and policies of the plan are as follows:

- **Goal 1: To be a beautiful, peaceful, organized community.**
 - *Objective 1: To be a beautiful community.*
 - Policy 1: Ensure that all town property is well maintained.
 - Policy 2: Enact and enforce a Town ordinance concerning property maintenance including old vehicle and equipment storage.
 - Policy 3: Hold an annual Community Cleanup Day focusing on community-wide upkeep as well as area-specific cleanups.
 - Policy 4: Establish a community beautification committee with awards for residential landscaping.
 - *Objective 2: To be an organized, peaceful community.*
 - Policy 1: Accept only well-managed growth and development in areas that benefit the community and maintain open space.
 - Policy 2: Development should be permitted only to the degree that the Town has capacity to provide the necessary public services or that capacity is provided by landowners in a manner that is economical to the Town.
 - Policy 3: Work together with Wasatch County to manage growth and control land uses and development in surrounding areas.
- **Goal 2: To enhance the historical and rural atmosphere of Wallsburg.**
 - *Objective 1: To enhance the historic, rural atmosphere of Wallsburg.*
 - Policy 1: Identify and encourage the preservation of prime agricultural land in Wallsburg.
 - Policy 2: Development should be encouraged into areas that have marginal agricultural value.

- Policy 3: Institute conservation and open-space development design standards to ensure that new development maintains a rural character while maintaining property rights.
- Policy 4: Priority should be given to existing animal rights and to maintaining zoning regulations that facilitate the ownership of animals for recreation and family food production.
- Policy 5: Encourage the preservation of historical structures and land uses such as agriculture.
- **Goal 3: To maintain open space.**
 - *Objective 1: To maintain open space.*
 - Policy 1: Enact a conservation subdivision ordinance that requires development to maximize open space.
 - Policy 2: Identify and prioritize desirable open-space areas that meet community objectives. Encourage mechanisms for acquisition including, but not limited to, bonding and outright purchase.
 - Policy 3: Work with county, state, and non-governmental open-space preservation funds and programs.
 - Policy 4: Do not extend roads and services to areas desired for open space.

Wallsburg Town has identified areas of projected annexations in the General Plan along with goals, policies, and criteria for future annexation petitions. Figure 4-3 below identifies the areas surrounding the town that have been identified as potential annexation areas.

Figure 4-3. Wallsburg General Plan – Annexation Areas





Wasatch County

The Wallsburg watershed is in Wasatch County, Utah. Wasatch County has eight municipalities within its boundaries: Heber City, Midway, Charleston, Wallsburg, Daniel, Hideout, Independence, and part of Park City. Within the watershed are 10 special service districts that provide municipal services; two provide countywide services and the other eight service residents in specifically defined areas.

The *Wasatch County General Plan, 2001–2016* was approved December 10, 2001. The purpose of this general plan is to provide a comprehensive approach to coordinating development, natural resources, and open space in order to provide a harmonious relationship that meets the needs of present and future residents and also promotes the health, safety, and general welfare of the residents of the county.

The basic uses for the general plan are categorized as follows:

- It is a guide to the Planning Commission and County Commission as they evaluate proposals for improvements to or changes in the county's infrastructure.
- It is a guide to the Planning Commission and County Commission as they review requests for the approval of development projects.
- It is the framework that guides the establishment of policies regarding zoning, the development code, and capital-improvement programming.
- It is the source of information with regard to public policies useful in making decisions concerning plans for future development.
- It is a source of information with regard to public policies that could have any impact on a single parcel of property.



MOUNTAINLAND
ASSOCIATION OF GOVERNMENTS

Mountainland Association of Governments

The Wasatch Rural Planning Organization (RPO) was organized by Wasatch County to coordinate, plan, and prioritize future transportation investments in Wasatch County. RPOs are generally rural organizations servicing populations of less than 50,000. In Utah, RPOs are managed and coordinated by regional organizations. For the Wasatch RPO, the Mountainland Association of Governments (MAG) is the lead coordinating agency. Members of the Wasatch RPO include the Utah Department of Transportation (UDOT), Wasatch County, the Cities of Heber and Midway, and the Towns of Charleston and Wallsburg.

4.3 Population and Land Use

4.3.1 Population

The Wallsburg watershed area is populated with one town and the surrounding area in unincorporated Wasatch County.

MAG reports that, in 2000, the population of the town of Wallsburg was 274, with 83 households and an average household size of 3.3 people. In the 2010 U.S. Census, the population of the town was reported at 250 in 2010, with 85 households and an average household size of 2.94 people.

In April 2008, MAG projected that the population of the town of Wallsburg would grow to 557 in 2010, 864 in 2020, and 1,190 in 2030, which includes growth due to land annexation. While the population projections made in 2008 were high, growth of the area is expected to continue, and residents were active in working with MAG to develop the General Plan to identify priority elements and to plan for the future. Historic population numbers for the town of Wallsburg are presented in Table 4-1.

Table 4-1. Population of the Town of Wallsburg, 1950–2000

Area	1950	1960	1970	1980	1990	2000
Wallsburg	207	180	211	239	252	274

Population estimates for the unincorporated county area in the watershed are not routinely conducted. However, using the estimated number of septic tanks in the watershed and the average household size, the population of the unincorporated area in the watershed is likely to be about 600 to 700 people.

4.3.2 Land Cover, Ownership, and Land Use

Land Cover

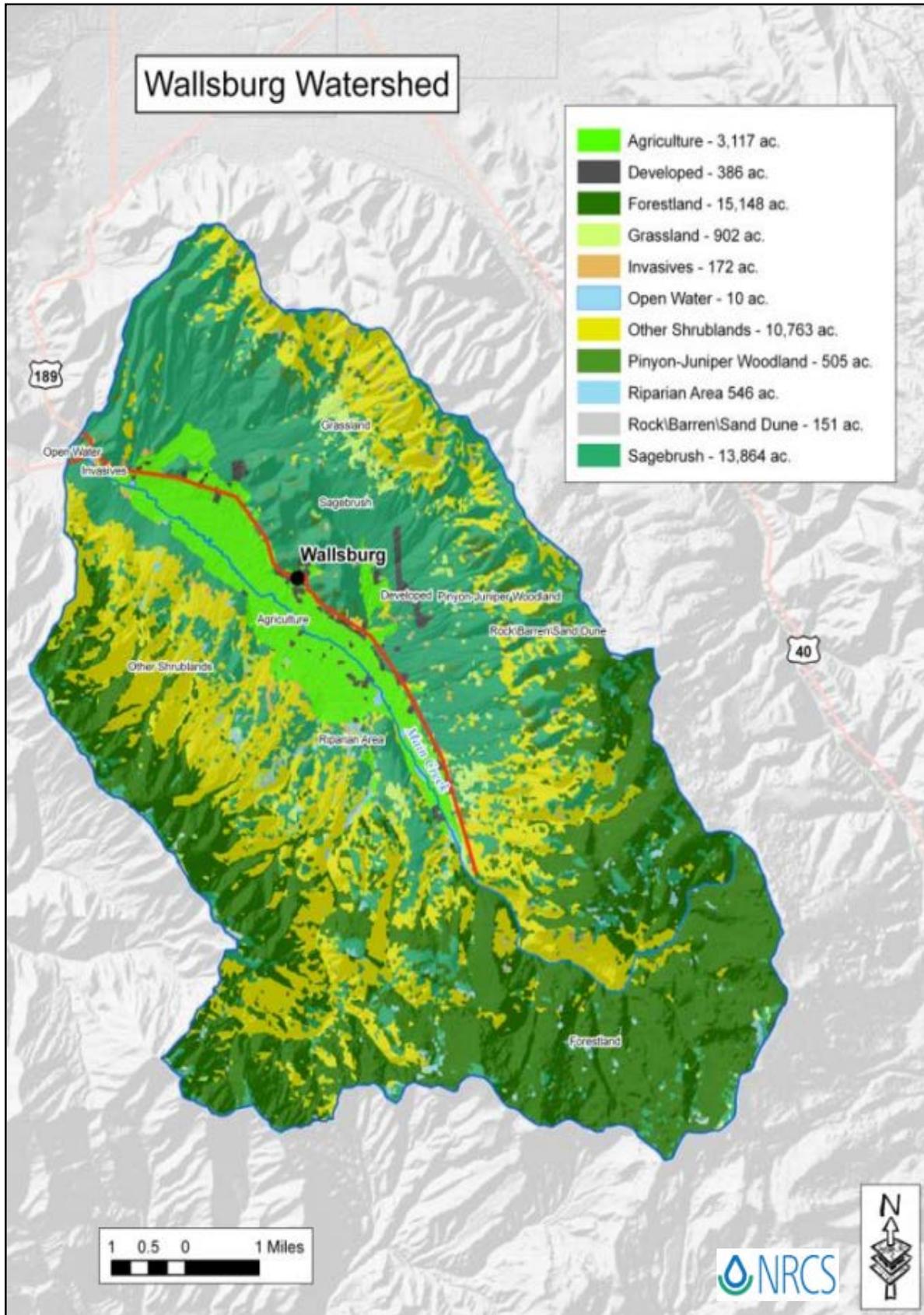
The land cover in the Wallsburg watershed can be generally described as dominated by three types: forestland in the upper reaches of the watershed, sagebrush and shrublands in the mid-elevations of the watershed, and agriculture in the lowlands of the watershed. Table 4-2 below shows the percentages of land cover type for the watershed; these are illustrated in Figure 4-4 below (NRCS 2010a).



Table 4-2. Percentages of Land Cover in the Wallsburg Watershed

Land Cover Type	Acres	Percent of Watershed (%)
Agriculture	3,117	6.8
Developed (town)	386	0.8
Forestland	15,148	33.2
Grassland	902	2.0
Invasives	172	0.4
Open water	10	0.0
Other shrublands	10,763	23.6
Pinyon-juniper woodland	505	1.1
Riparian	546	1.2
Rock/barren	151	0.3
Sagebrush	13,864	30.4

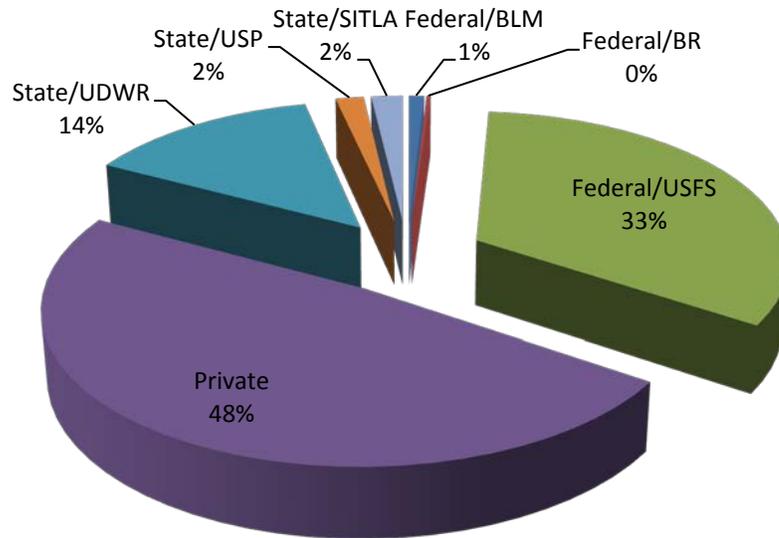
Figure 4-4. Land Cover in the Wallsburg Watershed



Land Ownership

Land in the Wallsburg watershed is owned by private, state, and federal entities (see Figure 4-5). Just under half of the land is owned privately, with the other half managed by state and federal agencies.

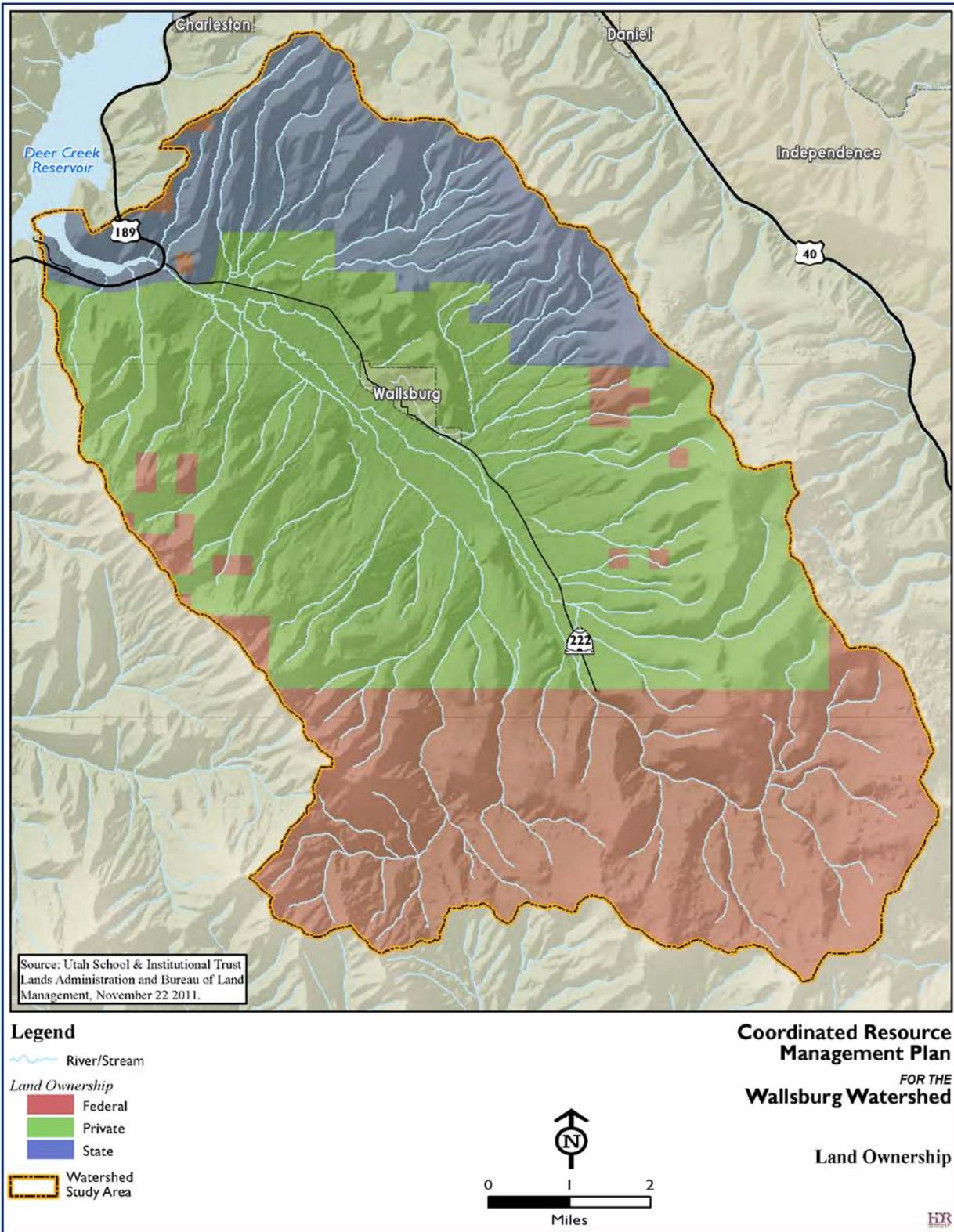
Figure 4-5. Percentages of Land Ownership/Management in the Wallsburg Watershed



UDWR = Utah Division of Water Resources; USP = Utah Division of State Parks and Recreation; SITLA = State of Utah School and Institutional Trust Lands Administration; BLM = Bureau of Land Management; BR = Bureau of Reclamation; USFS = U.S. Forest Service

A majority of the central and lower portions of the watershed, which are the most suitable acres for agriculture, are privately owned. USFS manages the federal lands that occupy the upper third of the watershed including the headwaters for Main, Maple, and Little Hobble Creeks. The Utah Division of State Parks and Recreation manages a parcel of land by Deer Creek Reservoir. The Utah Division of Forestry, Fire and State Lands and the federal Bureau of Land Management (BLM) also manage land holdings in the watershed. Figure 4-6 below shows land ownership in the watershed.

Figure 4-6. Land Ownership



Land Use

Land use is considered in the General Plan (MAG 2007) to be an important element of future development in the watershed. Historically, development of the central watershed has been dominated by agricultural and residential uses. The community values the open space of the watershed, and preservation is a key planning element of the General Plan.

Table 4-3 identifies the land uses of the watershed according to the General Plan. A large portion of the upper watershed is not designated with a specific land use (Undesignated).

Table 4-3. Land Use in the Wallsburg Watershed

Land Use	Acres	Percent of Watershed (%)
Residential – 0.5-acre lots	333	<1
Residential – 5-acre lots	2,569	5
Agricultural	1,155	2
Preservation area	27,984	58
Public facilities	8	<1
Undesignated	16,076	33

4.4 Social Environment and Recreation

Through the process of developing the General Plan, the Wallsburg community concluded that it is important to preserve property rights while maintaining an open, rural feel to the watershed (MAG 2007). The community identified primary and secondary open-space areas and determined that these areas should be connected and form a network of open land wherever possible. Three areas are of particular concern:

- Land south and west of Main Canyon Road
- Land along two wildlife corridors that traverse the watershed east-west; one is near the northern end of the valley and the second, much larger corridor is in the middle of the valley
- The Main Canyon Road corridor

Open spaces in the watershed are valued for their ecological, agricultural, cultural, and recreational qualities.



Popular recreation activities in the watershed include hunting, fishing, driving all-terrain vehicles (such as four-wheelers), and hiking.

The Utah Division of Wildlife Resources cooperatively manages the privately owned Wallsburg Cooperative Wildlife Management Unit (CWMU), which consists of about 8,170 acres southeast of Wallsburg. In 2012, public hunting permits will be issued for mule deer and elk on this CWMU. The Division also manages a portion of the watershed as the Heber Wildlife Management Area 69.

Dirt roads provide seasonal access for all-terrain vehicles to the upper watershed and over the mountain ridges into Daniels Canyon and Utah County.

There are no established public camping facilities in the watershed. A girls' camp for members of the Church of Jesus Christ of Latter-day Saints is located about 5 miles southeast Wallsburg, along Main Creek, and offers camping facilities on private land with a capacity of 250 to 300 occupants.

4.5 Water Resources

This section describes the water resources in the Wallsburg watershed. These resources are surface waters, including natural streams; irrigation canals; wetlands; and water quality.

4.5.1 Surface Waters

Main Creek flows from its headwaters on National Forest land through the watershed and discharges to Deer Creek Reservoir near US 189. Main Creek and its major tributaries, Little Hobble Creek and Maple Creek, are fed by precipitation and springs. Another tributary known as Spring Creek begins at a large spring near the town center of Wallsburg and supplies irrigation water to farms downstream from Wallsburg.

All surface waters in the Wallsburg watershed eventually discharge to Deer Creek Reservoir. Main Creek, Little Hobble Creek, and Spring Creek are designated as perennial streams. However, several irrigation diversions on each stream lead to seasonal dewatering. Downstream from Wallsburg, Main Creek flows year-round because springs and seeps contribute water to the creek (UDNR 1991). Maple Creek is diverted completely into irrigation canals and does not flow into Main Creek.

The characteristics of surface waters in the watershed are summarized in Table 4-4 and shown in Figure 4-1, Watershed Study Area.

Table 4-4. Major Creeks in the Wallsburg Watershed

Stream	Source	Stream Miles	Average Flow ^a
Little Hobble Creek	Upper watershed	3.1	<ul style="list-style-type: none"> • No gage • 2-year event flow is estimated at less than 1 cfs (cubic feet per second) • 10-year flow is estimated at 30 cfs
Main Creek	Upper watershed	14.6	<ul style="list-style-type: none"> • No current gage • 2-year event flow is estimated at 140 cfs • 10-year event flow is estimated at 229 cfs • Estimated average annual flow is 13–18 cfs to Deer Creek Reservoir
Maple Creek	Maple Canyon, upper watershed	5.1	<ul style="list-style-type: none"> • No gage
Spring Creek	Spring source within town limits	3.2	<ul style="list-style-type: none"> • No gage

^a Source: NRCS 2010a

Within the watershed, over 30 minor tributaries seasonally flow from the upper watershed mountains to the valley and discharge into Main Creek or are intercepted by irrigation canals and stock ponds.

The above-mentioned creeks and tributaries might be considered jurisdictional waters of the United States under CWA Section 404. If they are determined to be jurisdictional under Section 404 and if any CRMP activities would discharge fill to the creeks and tributaries,

then a Stream Alteration Permit issued by the Utah Division of Water Rights and a Section 404 permit issued by the Corps would be required.

4.5.2 Irrigation Canals

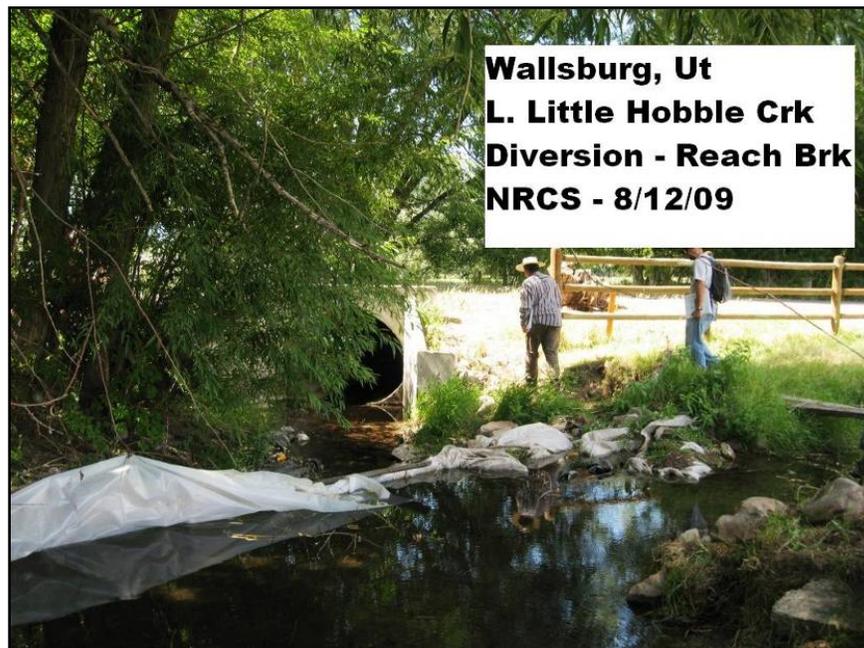
Table 4-5 lists the irrigation companies with water rights in the Wallsburg watershed.

Table 4-5. Irrigation Companies

Company	Total Water Rights (cfs)	Total Water Rights (AF)	Uses	Source
Extension Irrigation Company	—	13.66	Irrigation, stock, domestic	Underground
Hobble Creek Irrigation Company	118	399	Irrigation, stock, domestic	Surface, underground
Main Creek Irrigation Company	46	16	Irrigation, stock, domestic	Surface, underground
North Ditch Irrigation Company	6	529	Irrigation, stock, domestic	Surface
Round Valley Water Corporation	20	—	Irrigation, stock	Surface
Wallsburg Irrigation Company	3	3.8	Irrigation, stock, other	Surface

Source: Utah Division of Water Rights 2011

AF = acre-feet



The 1997 Tri-Valley Watershed Plan Environmental Assessment identified irrigation-water-management methods and efficiencies for the watershed (NRCS 1997). In the upper watershed, most of the irrigated land upstream of Wallsburg is irrigated with sprinkler systems (65% on-farm efficiency). The irrigation water supply for this area is diverted from surface sources, Main Creek, Maple Creek, Little Hobble Creek, and smaller springs. The irrigation-conveyance system was improved by installing one main pond and pipeline to convey water to the fields, and these replaced numerous hillside canals and pond systems.

Irrigation canals and ditches might also be considered jurisdictional under CWA Section 404.

The Tri-Valley Report states that segments of Main Creek and Little Hobble Creek are dewatered by irrigation diversions after the spring high-water flows. Because there are no on-stream storage reservoirs, there is no opportunity to put water back into these segments for a continuous fishery habitat. The lack of continuous natural stream flows is a concern of several agencies (see Section 5.0, Watershed Planning Elements, of this plan).

The Tri-Valley Report also states that, downstream from Wallsburg in the lower watershed, most of the irrigated land is managed using flood irrigation (see Table 4-6). The water supply for this area comes from Spring Creek and several smaller seeps and springs.

Table 4-6. Acres of Cropland in the Lower Wallsburg Watershed That Are Irrigated by Flood Systems

Irrigation Company or Area	Irrigated Acres	Present Irrigation Efficiency (%)
North Ditch	403	20–30
Bull River Ditch	117	20–30
Lower valley pastures	613	20–30

Source: NRCS 1997

The NRCS grazingland and pastureland assessment (see Appendix D, Grazingland, Forest, and Pastureland Reports) indicated that water quality and quantity could be improved with more efficient irrigation infrastructure and management practices. This is reflected in several of the recommendations made in Section 6.0, Summary of Watershed Recommendations.

4.5.3 Wetlands

The National Spatial Data Infrastructure (NSDI) database identifies wetlands across the country based on information collected in 1986 (USFWS 1986). Although there is a NSDI database map for the Wallsburg watershed, it identifies a large percentage of the central valley as wetlands and is meant to provide general information only. Projects that would disturb areas adjacent to and along the various streams in the watershed would require a site-specific wetland delineation study. If an area has wetland characteristics, the Corps would need to decide whether the specific wetland is jurisdictional under the Corps' regulatory program.

4.5.4 Water Quality

The Utah Water Quality Board, the Utah Division of Water Quality, the Utah Drinking Water Board, and the Utah Division of Drinking Water are responsible for regulating and managing water quality in Utah.

The Division of Water Quality determines beneficial-use classifications for streams, rivers, lakes, and reservoirs in Utah. Narrative and/or numeric water quality standards (Utah Code Annotated, R317-2-7) apply to all waters in the state.

Designated Beneficial Uses

All surface waters in the Provo River watershed that are tributary to Deer Creek Reservoir, including Main Creek, are classified for the following beneficial uses:

- **1C** – Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water.
- **2B** – Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingesting water or a low degree of bodily contact with the water. Examples include wading, hunting, and fishing.
- **3A** – Protected for cold-water species of game fish and other cold-water aquatic life, including the necessary aquatic organisms in their food chain.
- **4** – Protected for agricultural uses including irrigating crops and stock watering.

Total Maximum Daily Load

Section 303 of the Clean Water Act directs each State to establish water quality standards to protect the beneficial uses of surface water and groundwater resources. The Act requires States to identify impaired water bodies and develop a total maximum daily load (TMDL) study for each pollutant that is causing impairments in the various water bodies.

The Division of Water Quality has identified Deer Creek Reservoir as not meeting its beneficial uses because of a lack of dissolved oxygen in the lower water column. Below is a brief description of the Deer Creek TMDL study (Psomas 2002) and some of the progress that has been made as remediation projects have been implemented.

During the 1980s, the reservoir had high nutrient loads and had become very eutrophic. However, current water quality analyses show that the reservoir has improved significantly and could now be considered a mesotrophic lake based on the average Carlson Trophic State index. The improvements can be attributed to the focus on the watershed and efforts to reduce pollution sources. Phosphorus sources in the watershed have been targeted for reduction to meet the recommended targets and endpoints of the TMDL study.

What are eutrophic and mesotrophic water bodies?

A eutrophic water body is characterized by excessive nutrients that support algae growth that leads to the depletion of the oxygen in the water. A mesotrophic water body is characterized as having a moderate amount of nutrients.

Main Creek is one of the four major stream inputs to Deer Creek Reservoir that are monitored. The data suggest that the Provo River contributes 75% of the flow but only 69% of the phosphorus load. Main Creek, on the other hand, contributes 8% of the flow and 17% of the phosphorus load.

The TMDL study found that Main Creek has high concentrations of nutrients and sediments in its flow to Deer Creek Reservoir. For additional discussion on the water quality of the creeks in the watershed, see Section 5.4, Water Quality Assessment.

What is the Carlson Trophic State index?

The Carlson Trophic State index is a measurement standard to quantify clarity in lakes. Low clarity of water can be related to the high amounts of nutrients that support algal biomass.

Stormwater

Stormwater runoff from urban and rural landscapes often contains high concentrations of various pollutants and is a significant source of pollution. Common pollutants in stormwater include pesticides, fertilizers, oils, salt, sediment, and other debris. An estimate of stormwater pollutant loading is an important component in characterizing a watershed. Estimates serve to develop management strategies in an effort to target load reductions and help improve water quality.

What is a pollutant load?

A pollutant load is the amount of a pollutant that enters a water body.

To minimize the amount of pollutants that enter the water through stormwater runoff, EPA initiated a two-phase process for implementing stormwater regulations. Phase I was first implemented in 1990 and affected certain types of industries, construction sites larger than 5 acres, and cities with a population larger than 100,000. No communities in Wasatch County, including Wallsburg, were affected by Phase I.

Phase II of EPA's stormwater regulations, which was first implemented in 2003, affects smaller construction sites and any areas designated as Urbanized Areas by the U.S. Census Bureau. Phase II rules apply to any community outside an urbanized area that has a population greater than 10,000 and a population density higher than 1,000 people per square mile. The town of Wallsburg does not meet these criteria.

While it might be a long time before Wallsburg will have to comply with federal and state municipal stormwater rules, the Town should take a proactive approach to protect its municipal water from stormwater discharges.

However, for construction sites that disturb more than 1 acre anywhere in the state, including the Wallsburg watershed, the project owner is required to obtain a permit for the stormwater discharges associated with construction activities. The Division of Water Quality issues permits for stormwater discharges associated with construction activities and requires the use of best management practices to reduce the potential for erosion and to control sediment leaving the site.

Floodplains

Floodplains are defined as normally dry areas that are occasionally inundated by high stream flows. A stream has a *regulatory floodplain* if the floodplain is identified and mapped by FEMA. Development in floodplains can reduce their flood-carrying capacity and extend the flooding hazard beyond the developed area.

FEMA-mapped floodplains are managed at the local level to prevent flooding. FEMA-mapped floodplains have been identified along Main Creek, Little Hobble Creek, and Spring Creek in the Wallsburg watershed. Activities in floodplains must be analyzed for impacts to the floodplain. For example, a landowner could not modify a creek's alignment or shape to cause flooding upstream or downstream on neighboring properties.

Groundwater

Utah Department of Natural Resources (UDNR) Technical Publication 101 assesses the surface water and groundwater hydrology and the effects of groundwater recharge in both the Heber Valley and the Wallsburg watershed (UDNR 1991). Technical Publication 101 estimates that up to 11 cfs of water recharges the groundwater. The technical publication states that, since about 1978, as irrigation practices changed from flood to sprinkler irrigation, recharge could be lower than the 1969 estimate of about 2 cfs, although there are no recent data to support this possibility. The technical publication estimates that 0.2 cfs is pumped from about 115 small-diameter domestic and stock wells in the watershed.

Seasonal water-level fluctuations in wells in the watershed were also assessed by UDNR in Technical Publication 101. According to the technical publication, in the central part of the watershed, the highest groundwater levels occur in the winter and spring due to stream infiltration. These groundwater levels can drop by 2 to 4 feet in the summer and fall as the streams are diverted for irrigation use. However, in the lower watershed, well (D-5-4)2cca-1, which is near the confluence of Main Creek and Deer Creek Reservoir, is reported to fluctuate 5 feet, with the groundwater level being the highest in July. This might be when groundwater recharge from unused or return irrigation water is the highest (UDNR 1991).

4.6 Wildlife and Habitat

4.6.1 Aquatic Species

Two state sensitive fish species, leatherside chub (*Lepidomeda copei*) and Bonneville cutthroat trout (*Oncorhynchus clarkii utah*), are found in the Wallsburg watershed. The other sensitive species found in the watershed is the Columbia spotted frog (*Rana luteiventris*).

4.6.2 Wildlife Species

The Wallsburg watershed supports a diverse wildlife community. There is year-round habitat throughout all or part of the watershed for elk, mule deer, and moose and possibly for black bear, cougar, and a variety of game birds. The northern and eastern hillsides of the watershed are crucial elk winter range, and the southwestern hillside is crucial year-long elk habitat. The northeast and southwest lower hillsides are crucial mule deer winter range, and the upper hillsides are crucial mule deer winter/spring range. Wild turkeys also have been introduced into the area and are doing well.

4.6.3 Vegetation

Agriculture is the predominant land use in the lower-elevation river valley. In the adjacent foothills, sagebrush and juniper communities are common. Upper-elevation vegetation consists of oak brush and maple on the south-facing steeper slopes with mixed conifer and aspen dominating the moister, north- and west-facing sites. The vegetation characteristics of grazing lands and pasturelands are discussed in Sections 5.3 and 5.10, respectively.

5.0 Watershed Planning Elements

In order to assess watershed resource concerns, resource evaluations and assessments are conducted to identify watershed-specific projects for implementation. This section explores several watershed planning elements in order to identify recommendations and implementation activities. The watershed planning elements evaluated and documented are described in the following reports (the primary authors are shown in parentheses) and summarized below:

1. Economic Overview (NRCS) – Complete overview in Section 5.1, Economic Overview
2. Riparian Assessment and Inventory (NRCS) – Summary assessment in Section 5.2, Riparian Assessment and Inventory; complete assessment in Appendix C, Stream Visualization and Assessment Protocol Report
3. Range Assessment and Inventory (NRCS) – Summary assessment in Section 5.3, Range Assessment and Inventory; complete assessment in Appendix D, Grazingland, Forest, and Pastureland Reports
4. Water Quality Assessment (Desert Rose Environmental) – Summary report in Section 5.4, Water Quality Assessment; complete assessment in Appendix E, Water Quality Assessment Report
5. Wildlife Management (Utah Division of Wildlife Resources) – Complete report in Section 5.5, Wildlife Management
6. Forestry Assessment and Inventory (NRCS) – Summary assessment in Section 5.6, Forestry Assessment and Inventory; full assessment in Appendix D, Grazingland, Forest, and Pastureland Reports
7. Water Rights Inventory (HDR Engineering, Inc.) – Complete assessment in Section 5.7, Water Rights Inventory; supplemental maps in Appendix F, Water Right Point of Diversion Maps
8. Septic Tank Functionality (Wasatch County Health Department) – Summary report in Section 5.8, Septic Tank Functionality; complete report in Appendix G, Septic Tank Functionality report
9. Hydrology (NRCS) – Summary report in Section 5.9, Hydrology; complete report in Appendix H, Hydrology Report
10. Pastureland Assessment (NRCS) – Summary assessment in Section 5.10, Pastureland Assessment; full assessment in Appendix D, Grazingland, Forest, and Pastureland Reports

The resource evaluations and assessments were conducted between 2009 and 2012, and reports of the assessments are included in a separate bound document. These resource assessments are the “backbone” of this document and are the basis for the recommendations presented later in this document. Specific land characteristics, current management practices, creek conditions, and water quality data are documented in the complete reports in the appendices. Summaries of these resource assessments are presented below.

5.1 Economic Overview

NRCS conducted an economic assessment and analysis to identify existing economic conditions and revenues from land activities in the watershed. This qualitative and quantitative evaluation was conducted by NRCS's economist and land management scientists and is presented below.

5.1.1 Background

The valley floor of the watershed in which the town of Wallsburg is situated contains agricultural land, residential properties, and recreational homes as well as points of access for surrounding public recreation land. While the economic history of Wallsburg is largely agricultural, the economic future of the valley might become more slanted toward commercial and residential development.

A majority of the current residents of the valley are opposed to increased development in their community (MAG 2007, p. 12.8). Because of anticipated economic pressures, there is likely to be an increase in the tension between the traditional lifestyle in the valley and some landowners' desire to profit from the subdivision and development of their land.

As population growth and an ongoing influx of new residents from both in and out of state continue to affect communities in Wasatch and Summit Counties, pressure to develop the Wallsburg watershed is likely to increase. Due to its close proximity to attractive, popular communities such as Midway, Heber City, and Park City, the Wallsburg watershed is at risk of becoming a more attractive target for development. While this is not a problem in itself, mixed desires in the community could eventually create an unfavorable atmosphere of conflict and resentment related to economic disparity.

Furthermore, new residents might tend to look negatively on traditional land uses in the valley. For example, local residents have carefully guarded their legal right to keep large animals on residential properties in Wallsburg and its surrounding community. The smells, sounds, and work activities that accompany this type of zoning might come under criticism as newcomers, who might be unfamiliar or uncomfortable with standard agricultural activities, are affected by them.

The following sections assess the economic setting and recent economic conditions in the Wallsburg community. In addition, they address some changes that could occur given different economic scenarios. They also offer recommendations for the local community to consider as it moves beyond the timeframe of the 2007 Wallsburg General Plan.

5.1.2 Observations

The Wallsburg watershed has experienced growth, especially new non-agricultural residential housing, combined with its traditional, agriculturally oriented land uses. If farmers and ranchers sell farmland or rangeland for new development, conflicts could occur between the new residents and the long-term residents.

There are few commercial businesses in the Wallsburg watershed and in Wallsburg itself. This is typical of small, rural communities where the population is not large enough to support many commercial businesses. The Wallsburg General Plan mentions the possibility of establishing new businesses in the community, including a convenience store.

The valley remains mostly agricultural and has many farms with well-developed infrastructure, such as sprinkler irrigation systems and extensive farm machinery. Some of the residences in town have corrals and other animal-related facilities next to them.

Some of the residences in Wallsburg show signs of economic stress. However, the town and valley in general have an overall appearance of economic health. Some residences in the valley do not fit the economic profile of the surrounding residences, which is an indication of the previously mentioned growth in the watershed.

5.1.3 Possible Future Economic Scenarios

This section presents four possible future economic scenarios for the Wallsburg watershed: (1) maintenance of the status quo, (2) moderate economic development, (3) moderate economic development with an emphasis on agriculture, and (4) aggressive economic development. These scenarios could affect the community goal, stated in the General Plan (MAG 2007), to enhance the historical and rural atmosphere of Wallsburg.

1. **Maintenance of the status quo.** If the community chooses, it could insist on maintaining the existing commercial and agricultural configuration of the valley. Only minimal changes to the business environment would occur. Agricultural operations would continue largely unchanged, and the population would evolve from generation to generation with few changes in overall composition.
2. **Moderate economic development.** In contrast, entrepreneurs could establish new businesses in or near Wallsburg. Businesses that depend on visitors from outside the valley would be vulnerable to fluctuations in traffic and visitation rates. Businesses designed to provide products and/or services to outside communities would have a higher probability of success because they would have a more stable customer base.
3. **Moderate economic development with an emphasis on agriculture.** In a separate scenario, the community could moderately expand business activities as described in scenario 2 but add agricultural capacity. In this scenario, the existing agricultural community would optimize the use of natural resources to create a more economically and physically sustainable agricultural sector. There appear to be several opportunities in the Wallsburg area for improving agricultural output through more efficient use of resources. Although there are currently multiple sprinkler irrigation systems in the valley, it also appears that there are additional opportunities to improve irrigation systems and agricultural systems in general.

4. **Aggressive economic development.** In this scenario, the current emphasis on rural community and agriculture would be dropped in favor of aggressive residential and commercial development. The Wallsburg watershed would become much more like a Snyderville Basin or Sun Valley–style community. Remnants of the existing town would make up the “historic” core of the new community, and many residential buildings would be either replaced or converted to commercial uses. Tourism and second-home residences would dominate, and zoning would be changed to support incoming development rather than protecting the current rural land uses.

Expanding the commercial activities in the Wallsburg watershed would change the valley’s character. Wallsburg’s road system is designed to support only light traffic, and a new set of roads might need to be developed. However, it is unlikely that there are enough local customers to support a large increase in retail development. Therefore, businesses would need to attract customers from outside the valley. Further study would be required to determine whether businesses could attract customers outside the tourist season and what effect this would have on the existing rural community atmosphere.

5.1.4 Recommendations

Based on the economic overview, the following actions may be considered in order to preserve the rural character of the Wallsburg watershed:

1. Commercial businesses in Wallsburg should cater to local customers. For example, a successful café or restaurant could be established in town if it had a low overhead and served a menu that would attract repeat local customers. For long-term viability, if commercial businesses are designed to provide products or services to customers outside the valley, they would need to be tied to stable markets. Being closely connected to outside markets tends to increase rather than decrease economic vulnerability and instability (Power 1998). This is even truer when an industry exports natural resources outside the community at the expense of the community’s beauty or natural amenities. We recommend that the community carefully consider the types of businesses it will allow in order to protect the existing natural environment and the general rural ambiance and to maintain the community’s economic and social benefits.
2. There are opportunities in the agricultural community to enhance output and make current farms and ranches more productive and profitable. If these operations can be made more profitable, this could delay or reverse the conversion of agricultural land to residential developments. As a result, the community would maintain the current rural lifestyle and atmosphere, as stated in the General Plan.

An overview of existing and potential economic benefits from agriculture in the valley is shown in Table 5-1 below. NRCS estimates that total revenues from annual production on irrigated pasture lands and non-irrigated rangelands could increase by as much as 60% if producers were to adopt improved irrigation water and management strategies. The present value of this increase in gross revenues, based on a 25-year project life and a 4% discount rate, is \$3,017,500 above the estimated current levels of revenue. This value was calculated using 5-year average market prices published by the Utah Department of Agriculture and Food and is based on an

NRCS forage and grazing-management analysis that incorporates improved grazing and irrigation water management strategies. Also, Table 5-1 estimates gross revenues from the agricultural land in the watershed, since production costs for individual farms can vary widely. Individual producers would need to factor in their own production costs in order to estimate personal returns from the improvements.

3. New development in the Wallsburg watershed should follow the recommendations in the General Plan, especially with respect to cluster development and limitations on the sizes of individual lots. If large-scale changes in commercial or residential development patterns in the Wallsburg watershed are proposed, community leaders and residents should hire a facilitator or negotiator to make sure their voices are heard in the Town's decision-making processes. Because the community is vulnerable to an influx of new development and residents, it will be important for current residents, whether recent arrivals or long-term residents, to fully participate in civic dialogue and in decision-making processes such as zoning changes, transportation corridor developments, and so on.

5.1.5 Conclusion

Wallsburg and the surrounding area are likely to undergo many changes in the coming years. In order for the economic component of these changes to serve the needs of the Wallsburg watershed as a whole rather than serving only the interests of specific individuals, the needs and preferences of the stakeholders—all valley residents—should be considered early in any decision-making process. Members of the community are encouraged to become actively engaged in guiding local decisions to ensure that changes in the local economy support local preferences as much as possible.

5.2 Riparian Assessment and Inventory

The three major creeks in the Wallsburg watershed were evaluated and assessed by NRCS to identify improvements to re-establish a healthy stream ecosystem and restore biological, physical, and chemical integrity to the stream corridors. This qualitative and quantitative evaluation was conducted by multiple ecologists, biologists, and engineers, with assistance from landowners, over several days in accordance with NCRS protocols to provide the basis for planning, designing, and implementing stream and riparian conservation practices. The complete stream assessment is provided in Appendix C, Stream Visualization and Assessment Protocol Report. Below is a summary of the assessment with NRCS's recommendations.

Table 5-1. Estimates of Current and Potential Crop Production Revenue

Crop Type	Acres	5-Year Typical Market Price	Unit	Current Annual Production Per Acre	Current Annual Gross Revenue (Total)	Potential Annual Production Per Acre	Potential Annual Gross Revenue (Total)	Difference in Annual Gross Revenue (Total)
<i>Irrigated Land</i>								
Abandoned pasture	20	\$15	AUM	0	\$0	6	\$1,800	\$1,800
Alfalfa hay/grain rotation	52	\$15	AUM	3	\$2,340	4	\$3,120	\$780
Grass/alfalfa hay – cut and baled	835	\$110	Ton	2.5	\$229,625	3.5	\$321,475	\$91,850
Grass/alfalfa hay – aftermath grazed	835	\$15	AUM	1	\$12,525	1.5	\$18,788	\$6,263
Horse pasture	436	\$15	AUM	1	\$6,540	4	\$26,160	\$19,620
Irrigated pasture – alfalfa	88	\$15	AUM	2.5	\$3,300	6	\$7,920	\$4,620
Irrigated pasture – grass	265	\$15	AUM	2.5	\$9,938	6	\$23,850	\$13,913
Wet meadow – wild flood	919	\$15	AUM	2.25	\$31,016	5	\$68,925	\$37,909
Wet meadow pasture	14	\$15	AUM	2.5	\$525	5	\$1,050	\$525
Subtotal	3,185				\$295,809		\$473,088	\$177,279
<i>Non-irrigated Land</i>								
High mountain pasture	13,813	\$15	AUM	0.09	\$18,836	0.13	\$27,626	\$8,790
Range seeding	3,150	\$15	AUM	0.05	\$2,363	0.20	\$9,450	\$7,088
Subtotal	16,963				\$21,198		\$37,076	\$15,878
Total	20,148				\$317,007		\$510,164	\$193,156

AUM = animal unit month

5.2.1 Background

The inventory described in the *Main Creek, Little Hobble Creek, and Upper Spring Creek Stream Visual Assessment Protocol (SVAP₂) Inventory* report (NRCS 2010a) was conducted by NRCS to identify areas of concern along and within the riparian corridors of Main Creek, Little Hobble Creek, and Spring Creek. The Stream Visual Assessment Protocol, Version 2 (SVAP₂) inventory was conducted on August 12–13, 2009, for Little Hobble Creek, Spring Creek, and most of Main Creek. An earlier SVAP₂ inventory was conducted in October 2006 for the lower 1.7 miles of Main Creek (reaches 25–29), the results of which are also included in NRCS’s 2010 SVAP₂ report. The complete 2006 and 2010 SVAP₂ reports are attached as Appendix C, Stream Visualization and Assessment Protocol Report.

What is riparian habitat?

Riparian habitat is habitat along a river, stream, canal, or other waterway. Riparian habitat is wetter than the surrounding upland areas and provides different habitat.



The SVAP₂ inventory team was composed of interdisciplinary members from the USDA-NRCS, the Utah Association of Conservation Districts (UACD), and local landowners. The SVAP₂ inventory followed the standard protocols of NRCS’s Stream Visual Assessment Protocol, Version 2. The protocol is described in detail in the *National Biology Handbook, Version 2, Subpart B – Conservation Planning, Part 614 – Stream Visual Assessment Protocol* (NRCS 2009). For most of Main Creek, the team could assess only eight of the 16 elements rated in the SVAP₂ protocol because the creek is mostly dewatered from April to October (NRCS 2010a).

Figure 5-1 and Figure 5-2 below show the stream reaches that were inventoried and evaluated. The summary data sheets that describe each reach of Main Creek are presented in Table 5-3 below. The Little Hobble Creek summary data sheet is presented in Table 5-4 below, and the upper section of Spring Creek is shown in Table 5-5 below.

Figure 5-1. SVAP₂ Stream Reaches (Upper Reaches)

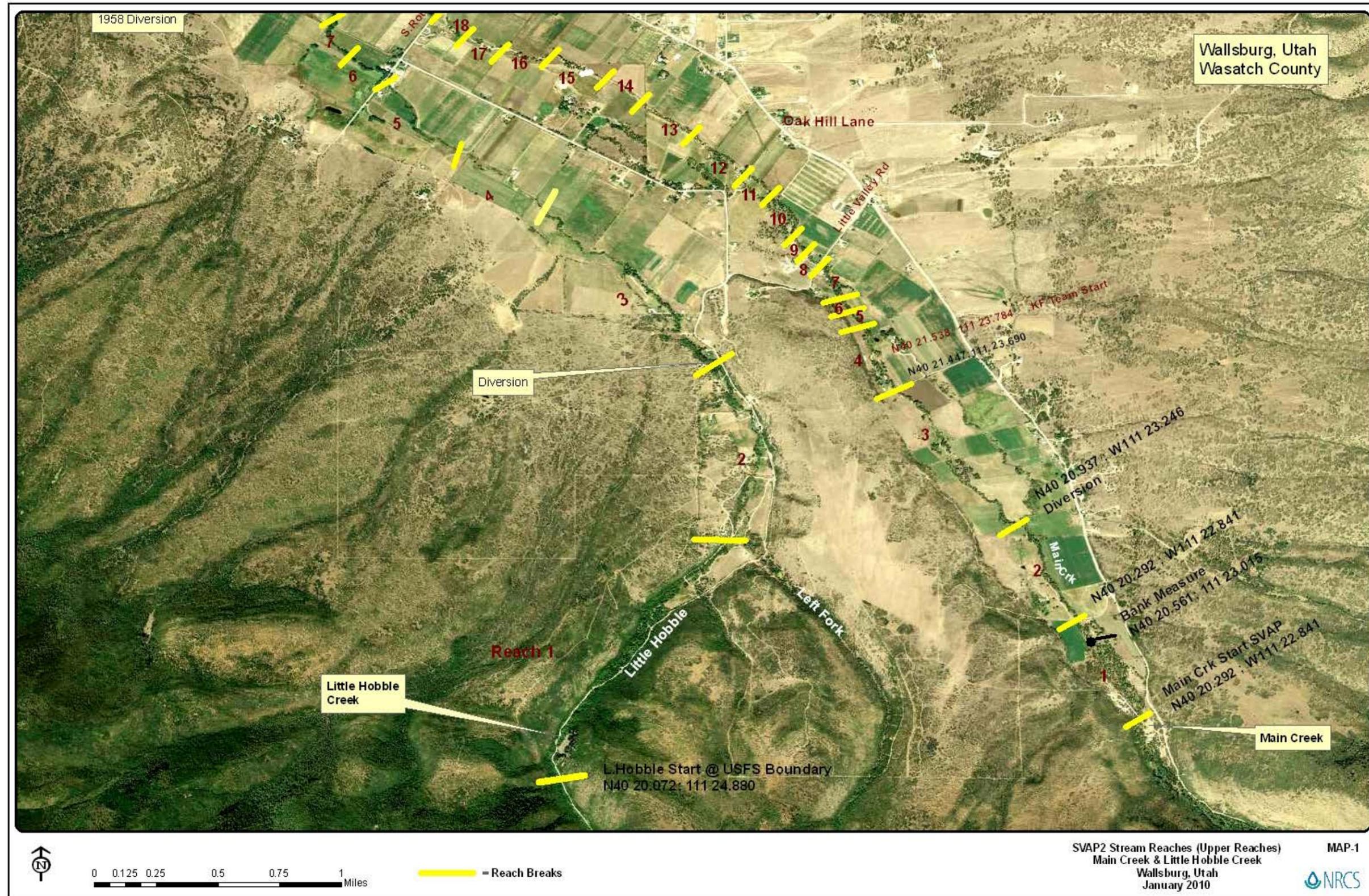
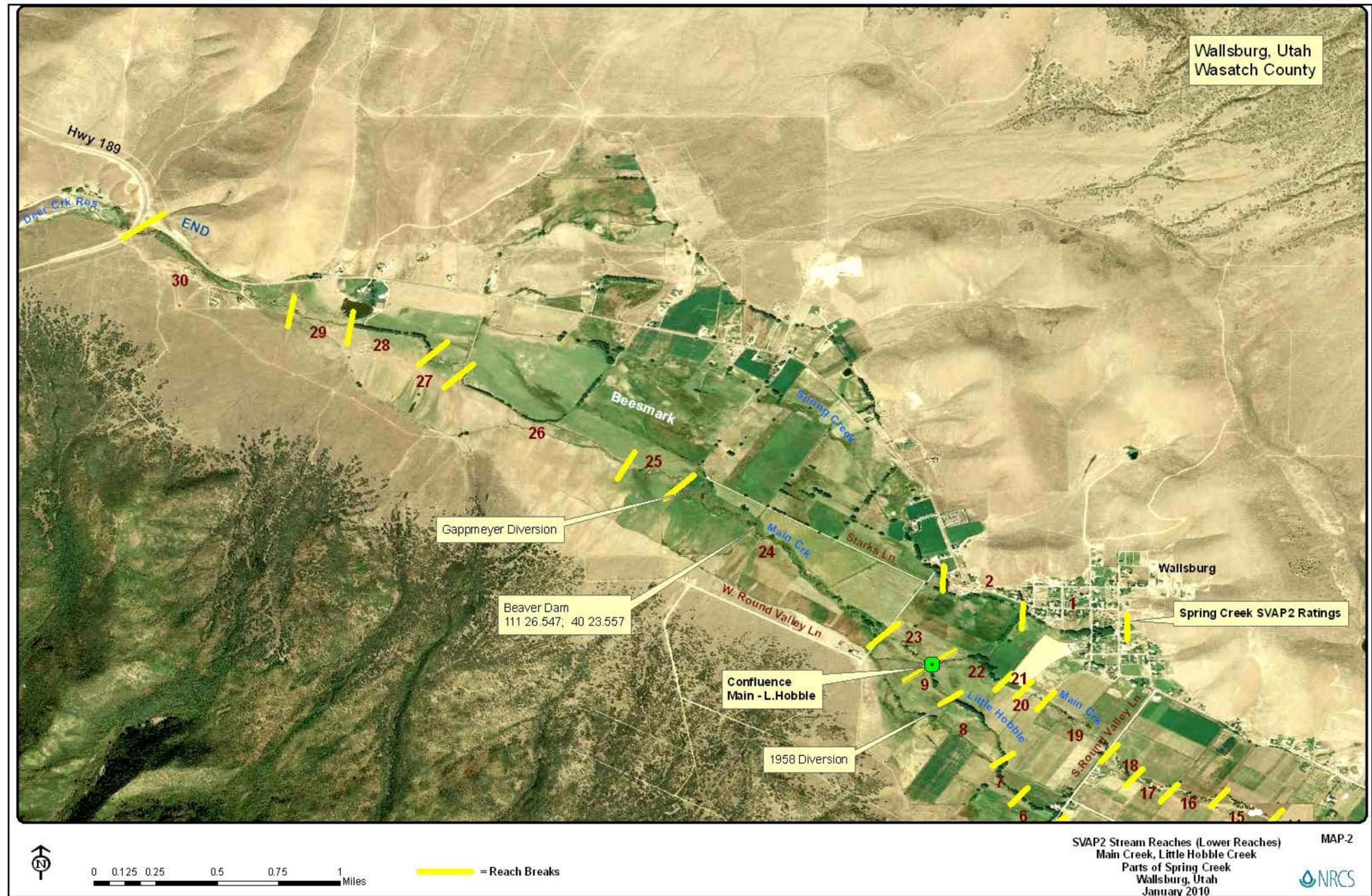


Figure 5-2. SVAP₂ Stream Reaches (Lower Reaches)



5.2.2 Results and Recommendations

The 2009 SVAP₂ inventory (NRCS 2010a) provided an assessment and restoration recommendations on a reach-by-reach basis as well as some overall recommendations, alternative recommendations, and proposed funding sources. The reach-by-reach SVAP₂ inventory is summarized for each reach as an overall score, as shown in Table 5-2.

Table 5-2. 2009 SVAP₂ Inventory Scores and Interpretation

SVAP ₂ Score	General Condition	Main Creek (linear feet)	Little Hobble Creek (linear feet)	Spring Creek (linear feet)
1 to 2.9	Severely degraded	6,717 (17%)	0 (0%)	0 (0%)
3 to 4.9	Poor	17,372 (43%)	5,501 (24%)	0 (0%)
5 to 6.9	Fair	14,609 (36%)	5,620 (24%)	3,515 (100%)
7 to 8.9	Good	1,480 (4%)	6,128 (26%)	0 (0%)
9 to 10	Excellent	0 (0%)	6,030 (26%)	0 (0%)
	Total inventory	40,178 (100%)	23,279 (100%)	3,515 (100%)

Source: NRCS 2010a

Main Creek

Main Creek was inventoried and evaluated based on existing conditions. Thirty reaches were developed, covering about 8 miles. The evaluation began below the irrigation diversion with reach 1 and ended at the US 189 culvert. The analysis of the 2007 and 2009 Main Creek SVAP₂ inventories revealed groups of reaches with similar SVAP₂ scores and similar needs and opportunities for restoration. For example, stream reaches 1 through 7 were evaluated as being in fair condition, and some bank stabilization was recommended. However, since reach 1 starts below a diversion, it was observed that these reaches require water, since they were dewatered during the inventory process. See Table 5-3 below for the specific recommendations for each stream reach. The complete document is provided in Appendix C, Stream Visualization and Assessment Protocol Report.

General recommendations for Main Creek included:

- Restore flow.
- Increase riparian width.
- Control noxious/invasive plants.
- Control livestock access/fencing.
- Install bank protection/grade structures.
- Assess the need for old diversion structures and possibly remove them.
- Remove trash and debris from the channel.
- Plant native willows where recommended.

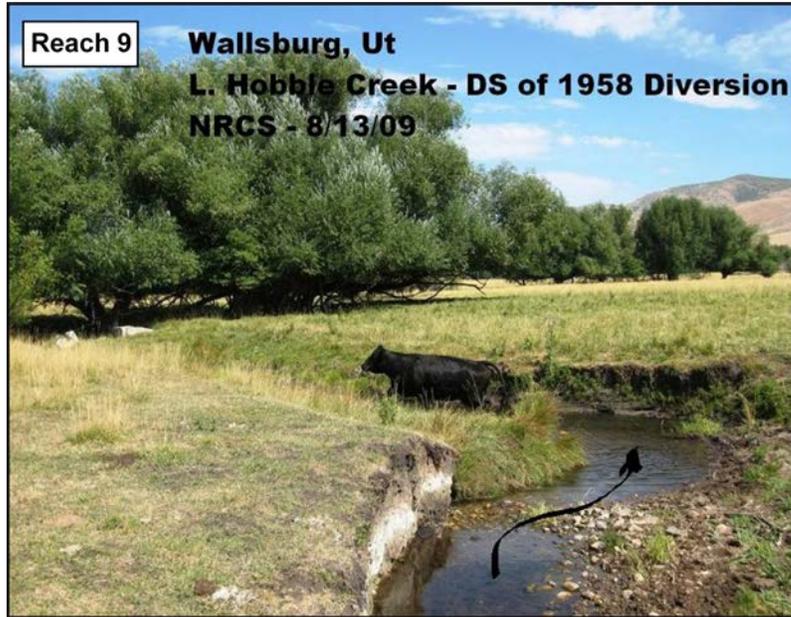


Little Hobble Creek

Similar to Main Creek, Little Hobble Creek originates on land managed by the U.S. Forest Service high in the watershed. Nine reaches were identified over a distance of about 4.4 miles, beginning at the Little Hobble Creek and Left Fork confluence (reach 1) to the confluence with Main Creek (Little Hobble Creek reach 9 and Main Creek reach 23). The Little Hobble Creek SVAP₂ scores were more variable than those for Main Creek, ranging from Excellent to Poor condition. Reaches 4, 6, 8, and 9 received Poor scores due to lack of woody riparian cover or non-native woody riparian cover, incised channel, unstable banks, and noxious weeds/invasive plants. Reaches 3 and 7 received Fair scores due to dewatered/turbid channel, noxious/invasive plants, and eroding banks. See Table 5-4 below for the specific recommendations for each stream reach. The complete document is provided in Appendix C, Stream Visualization and Assessment Protocol Report.

General recommendations for Little Hobble Creek included:

- Install bank protection.
- Restore flow.
- Control livestock access.
- Assess the need for old diversion structures and possibly remove them.
- Remove trash and debris from the channel.
- Plant native willows where recommended.



Spring Creek

Spring Creek originates from a spring source within the town limits of Wallsburg and flows into Main Creek. Two reaches on Spring Creek (reaches 1 and 2), that begin at the spring source and extend about 0.6 mile downstream were assessed and used as training for the SVAP₂ protocol. Both reaches received Fair scores due to nutrient enrichment from livestock access. Reach 2 also suffered from low flows, inadequate riparian cover, and impending bank erosion due to the accumulation of twigs and woody debris. See Table 5-5 below for the specific recommendations for each stream reach. The complete document is provided in Appendix C, Stream Visualization and Assessment Protocol Report.

General recommendation for Spring Creek included:

- Test the water quality.
- Manage grazing.
- Install grade controls.
- Plant native willows in the lower reach.
- Mitigate the impending bank erosion.
- Consider reducing the velocity.

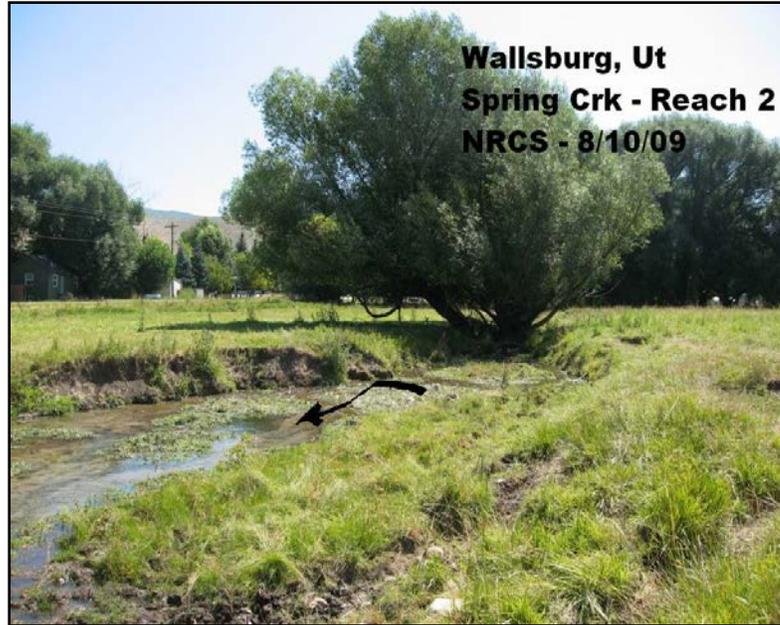


Table 5-3 below provides a reach-by-reach summary of the SVAP₂ ratings, observations, and recommendations for Main Creek, Little Hobble Creek, and Spring Creek.

NRCS identified the potential for stream and habitat restoration work that could be eligible for planning, design, and construction through the Wetlands Restoration Program (WRP) or the Environmental Quality Incentives Program (EQIP). There are three main options:

1. **Restoration Only.** Cost-share agreement with NRCS in which NRCS would pay 75% of the costs and the landowner would pay 25% and agree to perform maintenance for 10 years.
2. **30-Year Easement.** Landowner agrees to a 30-year conservation easement along the creek, with permanent retirement of use for cropland for the easement area. NRCS would pay 75% of the easement value, 75% of the restoration costs, and 100% of the legal costs to establish the easement.
3. **Permanent Easement.** Landowner agrees to a perpetuity conservation easement along the creek, with permanent retirement of use for cropland for the easement area. NRCS would pay 100% of the easement value, 100% of the restoration costs, and 100% of the legal costs to establish the easement.

In addition to the NRCS programs identified above, other federal, state, and local programs fund watershed and riparian restoration projects in cooperation with landowners.

Table 5-3. SVAP₂ Summary – Main Creek to US 189

Rch No.	Stream - General Location	1 Chan Condition	2 Hydrologic Alteration	3 Bank Condition	4 Riparian Area Quantity	5 Riparian Aral Quality	6 Canopy Cover	7 Water Appearance	8 Nutrient Enrichment	9 Manure and Human Waste	10 Pools	11 Barrier to Movement	12 Fish Habitat Complexity	13 Aquatic Invertebrate Habitat	14 Aquatic Invertebrate Community	15 Riffle Embeddedness	16 Salinity	Total	Total / # rated	Reach Length (ft)	Eroding bank (ft)	Eros ion (ton)	Observations	Recommendations
1	Main Crk Diversion N40 20.292 ; W111 22.841; to Ables ~N40 20.292 ; W111 22.841	10	1	8	10	9	5	NR	NR	6	NR	0	NR	NR	NR	NR	NR	49	6.1	2436	0	0	Mostly dewatered during irrigation season, anything above 16 cfs continues downstream, channel dry in most of this reach, numerous bridges, livestock has access to the corridor, good age class of vegetation. Soil = Steed loam (St), Mountain loam bottom ecological site.	Not much opportunity for restoration through this corridor - mainly needs water.
2	Able - N40 20.292 ; W111 22.841....to J.Young ~ N40 20.937 ; W111 23.246	10	0	8	3	9	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	33	5.5	2280	150	0.2	Diked along entire reach; Riparian area reduced in width - limited to active channel; Canopy~30%; 40 20.939 / 111 23.246; Warm Spring Div = 40 20.966/111 23.251. Soil = Steed loam (St), Mountain loam bottom ecological site.	Not much opportunity for restoration through this corridor, mainly needs water. 150 feet of bank protection.
3	J.Young to Taylors (Clarks old place) 40 21.447/111 23.690	10	1	7	4	8	3	NR	NR	6	NR	0	NR	NR	NR	NR	NR	39	4.9	3687	300	0.7	Numerous bridges; Dewatered; Livestock have access; Riparian density limited-but is wide; Invasives=Houndstongue, Thistle. Soil = Steed loam (St), Mountain loam bottom ecological site (upper 80% of reach; Kovich loam (Km) at lower 20% of reach.	Not much opportunity for restoration through this corridor; channel morphology is good, mainly needs water. 300 feet of bank protection.
4	KF-Team Start N40 21.538 / 111 23.784 - Clark--> Prop line	9	2	8	8	6	8	NR	NR	8	NR	8	NR	NR	NR	NR	NR	57	7.1	1480	300	0.9	Dewatered (May-Sept), some ponded areas, Woody veg good, herbaceous layer w/invasive, smooth brome; scotch/musk/Canadian thistle; Bulbous bluegrass, cheatgrass, field bindweed; [scuds, mayfly, dragonfly, snail]; Pool N40 21.664/ 111 23.814 (break reach). Soil = Kovich loam (Km) -	Control invasives - especially noxious weeds; Not much opportunity for restoration other than....adding water back to the corridor. 300 feet of bank protection.
5	Start: N40 21.664 111 23.814	9	3	8	8	6	8	6	7	8	3	8	4	5	7	8	NR	98	6.5	400	0	0	Dewatered (May-Sept), some shallow pools; water withdrawals is main driver in this corridor. Soil = Kovich loam (Km) -	Not much opportunity for restoration without water during growing season.
6	Start: N 40 21.686 111 23.843	8	2	7	7	4	8	NR	NR	1	NR	8	NR	NR	NR	NR	NR	45	5.6	330	0	0	Understory eliminated, width of riparian vegetation reduced; horse manure in stream & riparian areas. Soil = Kovich loam (Km) -	Grazing management - control access or reduce numbers.
7	Start: N40 21.757 111 23.880	7	2	6	6	5	8	NR	NR	3	NR	8	NR	NR	NR	NR	NR	45	5.6	835	0	0	Crack willow present, Moter wort, bedstraw, penny cressin herbaceous. Soil = Kovich loam (Km) -	Grazing management - control access to the stream or reduce numbers.
8	Start: L.Valley Rd to Div - 40 21.925 / 111 24.010	7	2	5	1	3	2	NR	NR	9	NR	1	NR	NR	NR	NR	NR	30	3.8	360	0	0	Riparian are restricted by corrals/residence; riparian zone under modification, one age class-dominated by narrow-leaf cottonwood; Canopy cover reduced; Diversion=partial barrier to young fish (even when not dewatered). Reach previous = encroachment on both banks, weedy pasture & house at rt side / barrels/coops/sheds/corral at left side, trash in stream, goat corral on right bank ==> confines riparian zone. Soil = Kovich loam (Km) -	Remove diversion; Relocate corrals - set back from stream; Leave woody debris in creek; Comprehensive Nutrient Management Plan needed.
9	Diversion to Drain ditch discharge - 40 21.987;111 24.061	5	2	6	1	3	7	NR	NR	5	NR	1	NR	NR	NR	NR	NR	30	3.8	375	0	0	Channel incised- Stage IV; Riparian similar to previous reach/better canopy cover; Drainage ditch results in concentrated flow that can carry manure from corrals to stream. Soil = Kovich loam (Km) -	Remove diversion, expand riparian zone (buffer) to filter drainage flows; Look at WQ sample; AFO/CAFO - Comprehensive Nutrient Management Plan (from drainage ditch).
10	Drain Ditch to Pipe crossing - 40 22.113; 111 24.149	5	2	8	7	5	4	NR	NR	8	NR	8	NR	NR	NR	NR	NR	47	5.9	960	0	0	Increase in herbaceous cover through this reach; undisturbed width, W. wheatgrass, crested wheatgrass, smooth brome, orchard grass, mostly mature trees; Livestock have access; Manure on terrace adjacent, but limited use evident w/tall grasses.	CRP - right bank
11	Pipe Crossing to Oak Hill Ln: 40 22.191; 111 24.225	6	2	8	8	5	2	NR	NR	8	NR	8	NR	NR	NR	NR	NR	47	5.9	650	150	0.7	Stream has access to floodplain in spots; riparian vegetation recruitment on one side; cropland encroaching & limiting width on other side.	CRP or other protection program for left bank area (looking downstream). 150 feet of bank protection.

Rch No.	Stream - General Location	1 Chan Condition	2 Hydrologic Alteration	3 Bank Condition	4 Riparian Area Quantity	5 Riparian Aral Quality	6 Canopy Cover	7 Water Appearance	8 Nutrient Enrichment	9 Manure and Human Waste	10 Pools	11 Barrier to Movement	12 Fish Habitat Complexity	13 Aquatic Invertebrate Habitat	14 Aquatic Invertebrate Community	15 Riffle Embeddedness	16 Salinity	Total	Total / # rated	Reach Length (ft)	Eroding bank (ft)	Eros ion (ton)	Observations	Recommendations
12	Oak Hill Ln to Fence - 40 22.340; 111 24.405	1	2	2	1	3	3	NR	NR	1	NR	8	NR	NR	NR	NR	NR	21	2.6	1250	300	1	Cars in stream used for rip-rap; corral in stream; sheds falling in; lack of woody riparian vegetation; garden on the bank; reach is straightened and diked. Pictures: KF #26 = 40 22.225 / 111 24.270 (corral); #28 looking US from end of reach	Control livestock access to the stream; Grazing Management education will be useful here; IPM on alfalfa ; broadleaf herbicide has reduced age-class diversity. 300 feet of bank protection
13	Fence to Fence at 40 22.442; 111 24.593	3	2	6	1	3	1	NR	NR	8	NR	NR	NR	NR	NR	NR	NR	24	3.4	1100	0	0	Herbicide in alfalfa may kill some age classes of cottonwood; No manure, but potential commercial fertilizer runoff; Large veg. gaps; Reduced diversity; Some rip-rap areas and diked in sections. Photos: KF #29	Nutrient management; Integrated Pest Management; Planting of riparian vegetation.
14	Fence to Fence at 40 22.524; 111 24.723	2	2	5	0	1	0	NR	NR	8	NR	8	NR	NR	NR	NR	NR	26	3.3	800	0	0	Rip-rap in this section, dikes, concrete, stream crossing; No woody vegetation, large gaps, non-native herbaceous. Pictures: KF# 30- gabions SOIL: Km= Kovich loam-deep water table - depth to root restrictive layer >60", avail water to 60" is high, seasonal zone of saturation at 36" during April through June, OM in surface =~8%, Irrig Cap Class = 3w (includes upstream to 500 feet DS of Oak Hill Ln)	Tree planting
15	Fence to end of dikes/riprap: 40 22.551 ; 111 24.766 to 40 22.597; 111 24.894	1	2	2	1	3	2	NR	NR	8	NR	8	NR	NR	NR	NR	NR	27	3.4	1030	0	0	High dikes, thistle, debris dam in fence- N40 22.577; 111 24.836; rip-rap in this corridor, reach is channelized. Picture: KF#31 Top of reach	Thistle control, take debris out of stream if it can cause lateral cutting.
16	End of dike/riprap to N40 22.617; 111 25.025	6	2	6	6	5	2	NR	NR	9	NR	8	NR	NR	NR	NR	NR	44	5.5	862	250	9	Incision with recovery some cut banks; moderately stable in most sections, some bank failures, no grazing impacts, low species diversity, introduced understory, some vegetal gaps, some functional groups. Pictures: KF #33-34 - end of rch cutbank	Water needed. 250 feet of bank protection
17	End of narrowleaf ctnwood begin crack willow : N40 22.670; 111 25.210	6	2	6	4	3	1	NR	NR	9	NR	8	NR	NR	NR	NR	NR	39	4.9	740	350	2	Fewer trees - mostly hawthorn; mostly introduced understory, Canada thistle, some rip-rap including cars (contributing to recovery); Fences creating debris jams. Pictures: KF # 35,36 = car riprap, typical reach SOIL: same Kovich soil (Km) as upstream	Tree planting; Noxious weed control. 350 feet of bank protection
18	Fence @ crack willow to Round Valley Rd (Check)	6	2	7	4	4	3	NR	NR	9	NR	8	NR	NR	NR	NR	NR	43	5.4	868	400	11	Banks mostly protected by grasses/crack willow, large gaps however, patches of crack willow, hawthorn; Some canopy cover from crack willow. Pictures: KF # 37-from Round Valley Rd looking upstream. Soil change to CgA around farmstead = Clegg loam = no zone of saturation within 72"; OM=4%; Non-irrig capability=4e / Irrig = 3e	Remove trash from channel; Fences cause debris jams; Tree planting. 400 feet of bank protection
19	Round Valley Rd to 40 22.885; 111 25.427 - fence-end of chnlized section 40 22.940; 111 25.527	1	2	7	1	5	9	NR	NR	9	NR	8	NR	NR	NR	NR	NR	42	5.3	1690	500	14	Transition to lowland riparian; car rip-rap present-stabilized w/trees; Coyote willow in channel directing water toward right bank; Channelized; Fence adjacent on left bank - cutbanks undercutting smooth brome ~3' deep; Very narrow reach - becoming clogged with willow. Pictures: KF # 39-41 riprap & trash in channel	Set back existing fence on the left bank; Remove trash. 500 feet of bank protection
20	End Chan sect to fence @ end of riprap - 40 22.980; 111 25.605	1	2	3	1	3	1	NR	NR	2	NR	8	NR	NR	NR	NR	NR	21	2.6	435	300	12	Cars as riprap, concrete, stumps, root wads present; Livestock access breaking down bank in sections; Pasture over-grazed. Pictures: KF# 39-41 top reach, 42 bank condition. SOIL: change in this to CrA (Crooked Crk clay loam; seasonal zone saturation at 18" - year round; occasionally flooded; poorly drained; Wet Fresh Meadow (sedge) ecological site; Non-irrig/Irrig Capability = 4w; Hydric;	Grazing Management - control access; Pull out old riprap; Slope back banks / Revegetate. 300 feet of bank protection.
21	Start: 40 22.980; 111 25.605....to.40 22.998; 111 25.667	5	2	7	4	5	8	NR	NR	8	NR	8	NR	NR	NR	NR	NR	47	5.9	357	0	0	Overall stabilized/vegetated riprap; Incised - but not as deep; Missing tall trees; mostly coyote willow; Some invasives. Pictures: #43	Overall grazing management; weed control

Rch No.	Stream - General Location	1 Chan Condition	2 Hydrologic Alteration	3 Bank Condition	4 Riparian Area Quantity	5 Riparian Aral Quality	6 Canopy Cover	7 Water Appearance	8 Nutrient Enrichment	9 Manure and Human Waste	10 Pools	11 Barrier to Movement	12 Fish Habitat Complexity	13 Aquatic Invertebrate Habitat	14 Aquatic Invertebrate Community	15 Riffle Embeddedness	16 Salinity	Total	Total / # rated	Reach Length (ft)	Eroding bank (ft)	Eros ion (ton)	Observations	Recommendations
22	40 22.998/111 25.667 to Little.Hobble Crk Confluence	6	2	5	1	1	1	5	6	3	5	9	6	6	5	4	NR	65	4.3	1576	300	6	Crack willows w/no understory; Heavy impacts from cattle; Bare soil & manure on banks; Cattle breaking down banks; Diversion water returns in springs; Introduced pasture grasses downstream. Pictures: KF # 44-46=top of reach,cows in crk, div across fence line; #50,51 = 40 23.069; 111 25.869 = broken fld drain discharge to crk. SOIL: change to Kd (Kovich loam-channelled); poorly drained, avail water to 60" is low; seasonal zone of saturation at 18" during Jan-June & Nov-Dec; Non-irrig land capability = 7w; Irrig = 3w; meets Hydric criteria.	Grazing management; Cross fencing; Riparian pasture; Tree planting; Bank protection. 300 feet of bank protection
23	Conflu - Main/Hobble to Smart Rd Bridge	6	2	3	1	1	1	5	5	4	7	9	2	4	5	3	NR	58	3.9	1142	500	24	Stage IV - recovering, withdrawals, excessive bank erosion, water appearance visible to ~2 feet, algae present, mayfly & scuds present.	Grazing management (address livestock access), tree planting for improved woody diversity, thistle control, streambank protection (bio-engineering); 500 feet of bank protection
24	Smart Rd Bridge to property line downstream of the Gappmeyer diversion @ 40 23.686; 111 26.812 <END>	7	7	6	4	5	2	9	4	8	10	10	7	7	7	4	NR	97	6.5	5377	2000	95	Stage V - cutbanks, some water withdrawals, eroding at cutbanks, numerous riparian veg gaps - but decent diversity, young age class, Good numbers of young native woody species, decent floodplain access, midges, mayflies, caddis - good abundance, couple cars for rip-rap in bank, beaver dam @ 40 23.558; 111 26.568; (check valley slope)	Enhance woody vegetation, thistle control, bank protection, continue grazing management practices. Check hydrology/hydraulics- valley slope (Nathaniel modeling). 2000 feet of bank protection
25	Beesmark 2006 SVAP-Reach 1 - continue reaches to Hwy189	2	4	1	1	1	1	5	5	3	3	8	3	2	2	3	NR	44	2.9	1802	775	21	E3 Channel characteristics, some floodplain access, channel actively widening-but not deeply incised or entrenched, cutbanks actively eroding (3-6 ft high), no riparian vegetation, excessive sediment in stream, livestock has access, manure in stream.	Good potential for restoration. Restriction of livestock will allow woody/herbaceous vegetation to re-establish and help stabilize banks. Consider planting willows to expedite recovery. No instream structures required. 775 feet of bank protection
26	Beesmark 2006 SVAP-Reach 2	1	1	1	1	1	2	5	5	3	1	8	2	1	1	3	NR	36	2.4	3230	1600	32	F3 Channel, hydrology severely impaired, channel straightened, deeply incised, eroding banks-both sides (5,000+ feet); some Crack willows present below Spring Crk outlet, little to no habitat for fish or invertebrates, livestock access and manure impairing channel, rip-rap at 90 degree bend at end of reach	Low potential of restoring function to this reach due to past alterations, restricting livestock will allow woody/herbaceous vegetation to recover, willows may need to be planted to help expedite recovery. Consider designed cross vanes to reduce stream slope if lateral movement of banks accelerates. Rip-rap/Pole Planting may be needed at end of reach at 90 deg turn (8 ft bank); 1600' of bank protection
27	Beesmark 2006 SVAP-Reach 3	4	5	4	1	1	1	5	5	3	3	8	3	1	1	3	NR	48	3.2	721	218	2.2	Braided channel, Spring Crk contributing to flow, banks moderately unstable, flows have access to floodplain, riparian vegetation is absent, poor fish habitat	High potential for restoration, restrict livestock access, enhance woody/herbaceous cover; plant willows to help recovery and accelerated headcutting. Pending headcutting ==> instream structure may be needed. 218 feet of bank protection
28	Beesmark 2006 SVAP-Reach 4	5	6	7	3	3	6	5	5	3	5	8	6	3	3	2	NR	70	4.7	1554	276	2.8	B3c Channel, channel straightened, some rip-rap/crack willow on both sides, hydrol improved due to upstream tribis; livestock access/manure present	Moderate potential to restore function; restrict livestock access to the stream; no instream structures required. 276 feet of bank protection
29	Beesmark 2006 SVAP-Reach 5	7	5	4	1	1	1	5	5	3	3	8	4	1	1	3	NR	52	3.5	1077	822	8.3	C3 Channel, Heavy grazing removed woody veg, inadequate root masses in banks, high potential for restoration, channel has access to floodplain, 2-4 ft banks eroding, no riparian vegetation.	Grazing management (restrict-limit access); plant woody veg - wiillows; no instream structures required; 822 feet of bank protection
30	Below Beesmark - to Hwy 189 - KF team	6	3	6	2	3	2	4	5	5	7	9	4	5	5	0	NR	66	4.4	3210	500	5.4	Recovering-Stage IV - past incision in this section; Horses impacting bank stability & riparian quality; scattered willows, mostly herbaceous cover on banks; turbid water in pools; Algae in riffles; Horses have unlimited access part of the year; Pools present - not obscured by depth. Some mayflies, scuds (dom); crayfish	Control horse access; Consider bio-engineering practices; 500 feet of bank protection
																				42614	9991	247		

Table 5-4. SVAP₂ Summary – Little Hobble Creek to Main Creek Confluence

Rch No.	Stream - General Location	1 Chan Condition	2 Hydrologic Alteration	3 Bank Condition	4 Riparian Area Quantity	5 Riparian Aral Quality	6 Canopy Cover	7 Water Appearance	8 Nutrient Enrichment	9 Manure and Human Waste	10 Pools	11 Barrier to Movement	12 Fish Habitat Complexity	13 Aquatic Invertebrate Habitat	14 Aquatic Invertebrate Community	15 Riffle Embeddedness	16 Salinity	Total	Total / # rated	Reach Length (ft)	Erode (ft)	Eros (ton)	Observations	Recommendations
1	Little Hobble-USFS to L.Fork Confluence	10	8	9	10	9	10	10	10	9	10	9	9	9	10	10	NR	142	9.5	6030	0	0	Flood d div has right to 50% water, but not taking that much, caddis, mayfly, stonefly present, no macrophyte beds	Maintain roads for erosion control, monitor runoff impacts to the stream
2	L.Fork to Sprinkling Diversion	7	8	8	6	7	5	10	9	6	10	8	10	10	8	8	NR	120	8.0	4100	0	0	Several bridges in this reach/some seem to narrow, culverts present, caddis mayfly, snails, some incision, thistle, houndstongue, knapweed	Some livestock access problems (pastures) - can be solved; Increase woody vegetation where there are gaps.
3	L.Hobble Sprinkler Diversion to: N40 22.078; 111 24.930	5	5	6	4	5	4	10	6	8	10	8	7	8	8	6	NR	100	6.7	4676	320	15	Highway ditch runoff to culverts frequent, willow growth good through the reach, water is sediment laden after storm events (from upper areas); access of cattle to the stream (not much activity however - due to steep slopes); channel dewatered but establishes quickly ds, steel pipe crossing-low; smooth brome, thistle, knapweed, no large wood, few root mats	Channel dewatered, but establishes flow quickly downstream; 320 feet of bank protection practices
4	N40 22.078; 111 24.930 to the lane past big barn	4	5	4	0	1	0	10	4	4	3	1	1	2	8	6	NR	53	3.5	2022	500	4	No woody vegetation, entrenched channel, numerous cut banks (incised), water withdrawals, excessive erosion, smooth brome dominates, algae-covered rocks, some cobbles/boulders present.	Grazing management, woody riparian establishment. Look at bridges. 500 feet of bank protection
5	Lane past big barn - to next Lane	7	5	9	8	8	9	10	9	8	10	1	8	9	8	7	NR	116	7.7	2028	170	0.5	Incision, some bank erosion, withdrawals, narrow riparian community, invasives present, some algae, culvert/diversion - both ends, dominant mayfly, some stonefly, caddis, snails	Fix culvert for fish access, look at bridges (need?); grazing management, widen buffer area in some locations. 170 feet of bank protection
6	"Next Lane" to end of property (short reach)	3	2	2	1	2	6	10	6	0	7	0	4	4	6	2	NR	55	3.7	961	375	7	Stage II, many bank failures, dewatered, only few crack willows, thistle, canopy~50%, some algae, severe livestock access impact, 1 large/ 1small pool, scuds dominant, caddis & stonefly present	Address grazing management (livestock access), enhance woody vegetation; bank protection measures. 375 feet of bank protection
7	"Short reach" to old diversion @ Big guns	4	2	6	7	6	8	6	6	8	5	1	4	NR	6	1	NR	70	5.0	944	150	1	Incised, no floodplain, almost dewatered, some bank erosion, good riparian density/diversity...but invasives common, some turbidity, some algae, stubble grazing in hay fields, shallow pools only, old diversion present, junk cars/appliances present on banks; scuds, snails, mayfly, caddis present	Remove appliances/cars from streambanks; Assess need for old diversion structures with sprinklers; Evaluate incision at this reach ==> no straightening/dikes? 150 feet of bank protection
8	"Old diversion w/big guns to 1958 diversion 40 22.945; 111 25.846	5	1	5	5	4	9	7	7	5	7	0	4	5	5	0	NR	69	4.6	1642	800	14	Incised, no floodplain access, stagnant water, some bank erosion, riparian area is narrow/some gaps, old age crack willow, turbid water-clearing further downstream, some algae, manure in stream w/pasture access, low aquatic inverts, sediment high, stonefly & mayfly present.	Assess old diversions/remove - is there need with sprinkling systems already installed; manage livestock access. 800 feet of bank protection
9	"1958/68 Diversion" to confluence with Main Creek.	6	2	3	1	1	3	5	5	5	8	1	4	2	6	2	NR	54	3.6	876	300	5	Minor incision, hydro alteration w/withdrawals, excess bank erosion, scattered crack willows, invasive herbaceous community, all introduced woody veg, cattle access keep water turbid, algae & odor present, manure present, stonefly/caddis present (not abundant)	Grazing management (address livestock access), woody vegetation needed, bank protection alternatives. 300 feet of bank protection

Table 5-5. SVAP₂ Summary – Spring Creek (Upper Section)

Reach No.	Stream - General Location	1 Chan Cond	2 Hyd Alt	3 Bnk Cnd	4 Rip Qnt	5 Rip Qual	6 Can Cover	7 Wat App	8 Nut Enrch	9 Man, Wste	10 Pools	11 Bar Mvmt	12 Fish Hab	13 Aq Hab.	14 Aq Com	15 Rif Embed	16 Saline	Total	Total / # rated	Reach Lgnth (ft)	Erode (ft)	Eros (ton)	Observations	Recommendations
1	Spring Crk -source N40 23.196; -111 25.236 --to-- Crack Willow boundary - N40 23.249; -111 25.603	10	8	8	7	7.5	9	10	3	2	2	10	4	5	5	NR	NR	90.5	6.5	1800			B-channel (Rosgen), Photos 1-8, Spring fed flows (4-5 cfs), Livestock access==> nutrient enrichment from livestock & septic sources, mostly grp I invertebrates. Soils = Wallsburg-Rock Outcrop complex; colluvium/residuum parent material, depth to root restrictive layer = 12-20 inches, well drained, Mountain Shallow Loam ecological site, not hydric.	Water quality testing, Grazing Management/access, Shrub planting
2	Crack Willows-N40 23.249; -111 25.603 --to--ditch cleanout @ N40 23.376; -111 25.882.	5	5	5	1	4	2	9	9	4	2	5	6	7	8	3	NR	75	5.0	1715			Livestock impacts severe, no channel-forming flows, return ditch and diversion ditch in the reach, culvert, needs trees, non-native veg dominant, Risk of de-watering wet meadow if headcutting/gradient changes. Soil = Crooked Creek clay loam, parent material is alluvium from mixed sources, zone of water saturation is at 18 inches year round, meets <u>hydric</u> criteria, Wet Fresh Meadow ecological site.	Grazing Management, Plant trees, control access, consider potential for headcutting due to twiggs/woody debris concentration ==> consider grade control practice, Corral placement consideration, Nutrient Management. Consider wetland conditions of the soil.

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General Recommendations

The NRCS SVAP₂ report (NRCS 2010a) identifies specific improvements to the three riparian corridors that were inventoried and assessed; these improvements cover over 13 miles of stream. These improvements fall into two broad categories—conservation practices and restoration practices—based on NRCS practice standards. Improvements are estimated to cost about \$554,100. In addition to the NRCS stream improvements, Section 5.5, Wildlife Management, discusses the stream improvement recommendations for Main Creek that are specific to aquatic resources.

Conservation buffers, which are strips of riparian vegetation placed to provide ecological protections and benefits, are recommended for all three streams in the valley. The recommended NRCS conservation practice and cost estimate for each stream are summarized in Table 5-6.

Table 5-6. Recommended Conservation Practices and Estimated Costs for Stream and Habitat Restoration

Practice	Main Creek	Little Hobble Creek	Spring Creek
Channel bank vegetation	\$161,600	\$19,500	\$2,600
Fence	\$61,400	\$15,400	\$6,200
Riparian herbaceous cover	\$1,600	\$1,300	—
Stream habitat improvement and management	—	\$65,000	—
Prescribed grazing	\$2,400	\$1,000	\$500
Earthwork and streambank protection	\$132,200	\$10,700	\$1,800
Grade-control structures	\$22,400		
Pest management	\$33,100	\$4,000	—
Watering facility	\$6,100	\$4,100	\$1,200
Total	\$420,800	\$121,000	\$12,300

A recommendation proposed in the SVAP₂ report (NRCS 2010a) is to restore flow to reaches of Main Creek and Little Hobble Creek. These creeks are mostly dewatered from April to October by irrigation diversions and withdrawals in some reaches. Restoring stream flows during the growing season would yield great benefits to the fishery, riparian condition, and overall functioning of the ecosystem.

The Central Utah Project operates a pipeline near the headwaters of Main Creek and Little Hobble Creek. The report recommends evaluating the possibility of working with the Central Utah Water Conservancy District to provide an additional source of water for stream flows or irrigation, thereby allowing continuous flows through the riparian corridors.

5.3 Range Assessment and Inventory

The rangelands in the Wallsburg watershed were evaluated and assessed by NRCS to identify improvements that could be undertaken to reduce impacts to watershed health and water quality. Grazing management practices were inventoried and improved management methods and infrastructure needs are recommended that would increase rangeland production and provide effective rangeland management in the watershed. The complete rangeland assessment is provided in Appendix D, Grazingland, Forest, and Pastureland Reports. Below is a summary of the assessment with NRCS’s recommendations.

5.3.1 Background

NRCS has prepared a report titled *Wallsburg Watershed Grazinglands* (NRCS 2010c). This grazinglands report inventories and assesses all the rangelands, pasturelands, and haylands in the Wallsburg watershed. Rangeland classification in the report uses the NRCS Soil Survey Ecological Site Assessment framework. The complete grazinglands report, which includes information for the pastureland and agricultural assessments, is summarized below and is attached as Appendix D, Grazingland, Forest, and Pastureland Reports.



5.3.2 Results and Recommendations

Rangelands in the Wallsburg watershed are present in three ecological zones—the Upland, Mountain, and High Mountain zones—as well as in several ecological sites. Ecological zones were defined in the report by the characteristics in Table 5-7 below.

In general, the Uplands are characterized by high sagebrush cover (>30%) and an understory dominated by bulbous bluegrass or Sandberg bluegrass. The presence of these plant communities indicates that improper grazing practices (heavy, continuous, season-long grazing, or HCSLG) have been used on the site in the past. Burned and reseeded areas with a greater perennial-grass component are important mule deer winter ranges, and Upland areas provide important greater sage-grouse habitat. There are about 9,764 acres of Upland zone in the watershed.

The Mountain sites are characterized by dominant Gambel oak cover and a poor understory plant composition. Native perennial grasses are largely absent, but forbs and shrubs are diverse, indicating that improper grazing practices have been used in the past. There are about 13,692 acres of Mountain zone in the watershed.

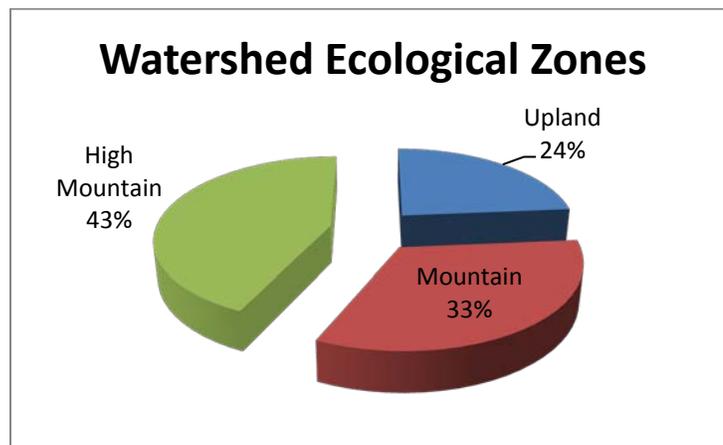
What is a forb?

A forb is an herbaceous flowering plant that is not a grass, sedge, or rush.

The High Mountain sites are characterized as complexes of aspen, oak, and conifers. Most of the High Mountain sites were in good condition but had similar symptoms in their understory plant community of improper grazing practices as the lower-elevation sites. There are about 17,837 acres of High Mountain zone in the watershed.

Figure 5-3 identifies the ecological zones and the percentage of each zone in the watershed.

Figure 5-3. Ecological Zones in the Wallsburg Watershed



Within each ecological site is a range of conditions and plant communities. The major ecological sites identified in the grazinglands report are summarized in Table 5-7 below. Several small (less than 100-acre) ecological sites were also identified in the report but are not described in Table 5-7.

Table 5-7. Inventory and Ecological Site Characterization of Rangelands in the Wallsburg Watershed

Ecological Zone	Characteristics	Ecological Site			Comments
		Soil	Plant Community	Acres	
Upland	Lowest elevations 12–16 inches/year precipitation Xeric/frigid Big sagebrush and juniper	Loam	Bonneville big sagebrush	1,450	Sagebrush cover 20–35%; understory variable.
			(Bonneville big sagebrush) bulbous bluegrass stand	158	No shrubs or perennials, probably tilled. Bulbous bluegrass dominated.
		Loam	Wyoming big sagebrush	129	Understory dominated by Sandberg bluegrass and introduced perennials. Sagebrush cover 36%.
			Basin big sagebrush	688	Very good-condition, productive and diverse understory. Sagebrush cover >30%.
		Gravelly loam	Bonneville big sagebrush	3,586	Understory of Sandberg, Kentucky, bulbous bluegrasses; sagebrush cover up to 30–35%.
			(Bonneville big sagebrush) oak invaded	2,077	Understory of Sandberg, Kentucky, bulbous bluegrasses.
			(Bonneville big sagebrush) recent burn	23	Pubescent and crested wheatgrass dominant.
		Stony loam	Bonneville big sagebrush	580	Cheatgrass, bulbous bluegrass dominated.
		Upland Shallow loam	Black sagebrush	522	
			Bonneville big sagebrush site complex, burned, reseeded	493	Non-native grasses; sagebrush cover 4%.
Mountain	Most abundant 16–22 inches/year precipitation Xeric/frigid Gambel oak	Loam	Gambel oak	1,571	Lacking perennial bunchgrasses; past HCSLG.
		Gravelly loam	Gambel oak	10,822	Lacking perennial bunchgrasses; past HCSLG.
		Stony loam	Gambel oak	1,299	Lacking perennial bunchgrasses; past HCSLG.
		Mountain clay loam	Slender wheatgrass	58	
High Mountain	Highest elevations >22 inches/year precipitation Udic/frigid-cryic Aspen/conifer	Loam	Aspen	7,022	Generally good condition; some evidence of HCSLG.
			Douglas fir	543	
		Stony loam	Aspen	6,770	Generally good condition; some evidence of HCSLG.
			Douglas fir	27	
			Mixed conifer	3,454	Generally healthy; some insect damage.
		Lithic	Aspen	21	

Source: NRCS 2010c

Soil moisture regime: xeric =dry; udic = humid

Soil temperature regime: frigid = cold; cryic= very cold soils

The major resource problems related to rangelands identified in the grazinglands report are summarized below.

- Invasive species:
 - Lower-elevation understory plant communities are dominated by bulbous bluegrass, which decreases the value for wildlife habitat and livestock forage.
 - Noxious weeds, including musk, Canadian and Scotch thistle, and knapweeds are present in the watershed and could rapidly expand if not controlled.
- Livestock forage:
 - Forage production is below potential. Replacing invasives with perennial grasses and improving grazing management might improve production.
 - Inadequate stock watering sources limit the grazing management flexibility needed to accomplish time-controlled grazing.

The *Wallsburg Watershed Grazinglands* report (NRCS 2010c) makes several recommendations that are summarized in Table 5-8 below. More details can be found in Appendix D, Grazingland, Forest, and Pastureland Reports.



Table 5-8. Recommended Practices to Improve Grazinglands and Habitat in the Wallsburg Watershed

Practice	Activity	Description	Cost Estimate
Prescribed grazing	Grazing Land Conservation Plans	Considered first priority	\$80,000
	Prescribed grazing	Implement on 10,000 acres	\$40,000
	Stock watering	Install 10 new sources	\$50,000
	Fences	Install 10 miles of fence	\$50,000
Brush management for improving habitat	Sagebrush sites	Reduce sagebrush cover to 15% on 3,150 acres	\$315,000
	Oak-invaded sites	Chemical treatment of oak	\$50,000
Weed control	Spot treatment and public outreach	Spray noxious infestations; public relations campaign	\$15,000
Wildlife habitat management	Conduct above treatments with wildlife habitat concerns in mind	Maintain sagebrush and maximize edges for wildlife	\$0
Total			\$600,000

5.4 Water Quality Assessment

Stream water quality in the Wallsburg watershed was evaluated and assessed by Desert Rose Environmental. The Wasatch Conservation District coordinated with the Utah Division of Water Quality to conduct additional water quality sampling and analyses to identify pollutant concentrations at strategic sampling points along Main Creek, Spring Creek, and Little Hobble Creek. Monthly water quality data were compared to historic data, observed land-management practices, and the stream assessment observations to formulate recommendations that focused on improving water quality throughout the watershed. The complete water quality assessment and report is provided in Appendix E, Water Quality Assessment Report. Below is a summary of the assessment and recommendations.

5.4.1 Background

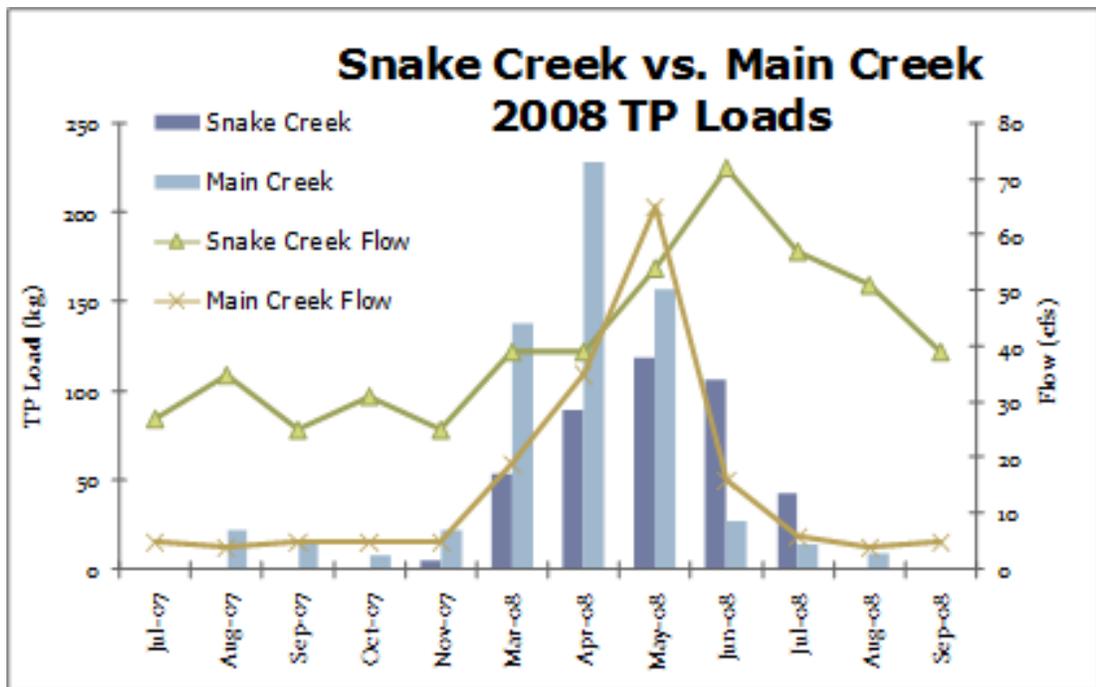
A Water Quality Assessment Report for the Wallsburg watershed was prepared by Desert Rose Environmental (2012) and is summarized in Section 5.4. The report presents the results of monthly water quality sampling in Main Creek and an analysis conducted from October 2009 through September 2010, compares this recent water quality with historic data for Main Creek and major tributaries, and relates the results of the SVAP analysis to water quality results. The complete Wallsburg Watershed Water Quality Assessment Report is attached as Appendix E, Water Quality Assessment Report.

Section 4.5, Water Resources, describes the watershed and the surface water resources in the valley. Section 4.5.4, Water Quality, provides a detailed description of the TMDL status for Deer Creek Reservoir. Main Creek is one of the four major stream inputs to Deer Creek Reservoir, and the creek contributes 8% of the reservoir's inflow and 17% of the phosphorus

load. The reservoir’s TMDL study establishes water quality targets and endpoints for the waters entering the reservoir, including Main Creek. The TMDL’s phosphorus targets for streams tributary to Deer Creek are 0.030 mg/L (milligrams per liter) for total phosphorous and 0.025 mg/L for dissolved total phosphorous.

The total phosphorus concentration and flow in Main Creek were compared to the total phosphorus concentration and flow in Snake Creek (which, like Main Creek, is tributary to Deer Creek Reservoir). This comparison (see Figure 5-4 below) shows that, while flows in Snake Creek are larger than those in Main Creek, phosphorus concentrations in Main Creek are higher, which produces a higher annual load to Deer Creek Reservoir from Main Creek than from Snake Creek.

Figure 5-4. Monthly Total Phosphorous Loads and Flows for Snake Creek and Main Creek Drainages to Deer Creek Reservoir



5.4.2 Results

Monthly Water Quality Sampling in 2009–2010

For the Water Quality Assessment Report, the Utah Division of Water Quality conducted monthly sampling at six locations in the Wallsburg watershed in coordination with Desert Rose Environmental. Four locations were chosen because historic water quality data were available, and two new sites were chosen because of their land-use activities. Figure 5-5 below shows the sampling locations in the upper Wallsburg watershed.

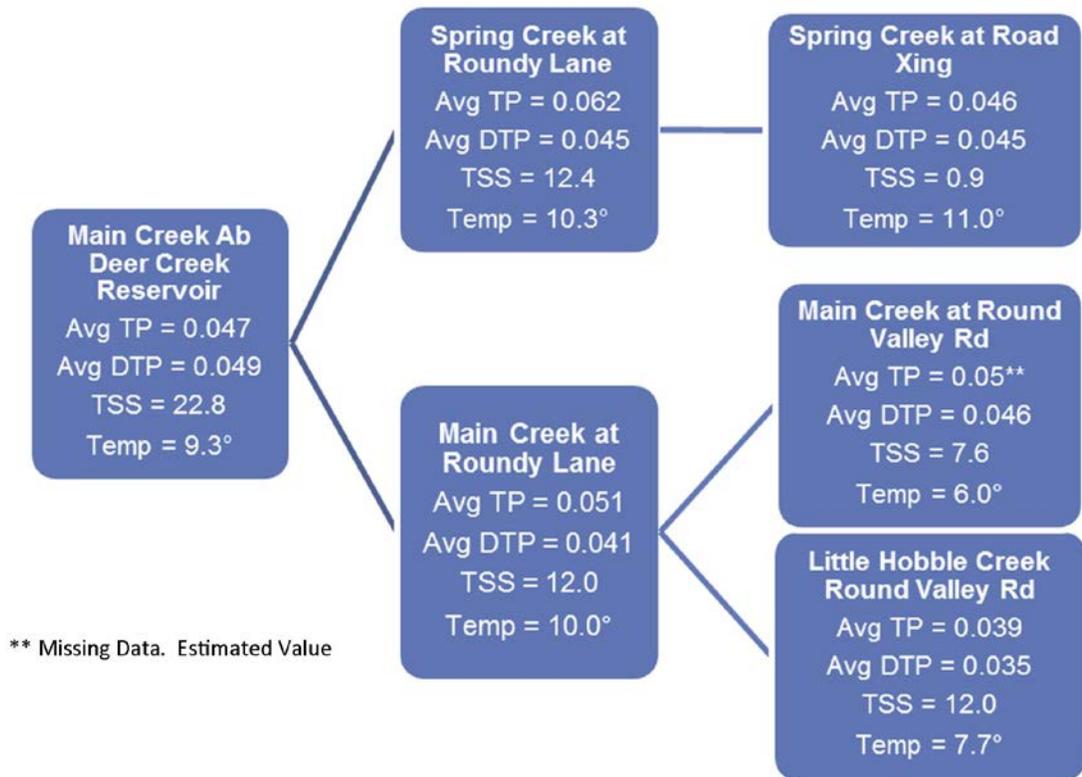
Figure 5-5. Water Quality Sampling Locations in the Upper Wallsburg Watershed



Monthly samples were collected and analyzed for total phosphorus (TP), total dissolved phosphorus (DTP), and total suspended solids (TSS). Field measurements for pH, conductivity, and temperature were also collected, and the creek flow was estimated.

Figure 5-6 below schematically illustrates the water quality sampling stations and the average results for analyses conducted during 2009 and 2010. Note that temperature is reported in degrees Celsius.

Figure 5-6. Average Water Quality Data at Sampling Sites, 2009–2010



Historic water quality data in the Wallsburg watershed were collected and analyzed in 1986, 1987, and 1988 consistently at three sites (Main Creek above Deer Creek Reservoir, Main Creek, and Little Hobble Creek at Round Valley Road) and were reported in the EPA STORET database. Data are available for the station Spring Creek at Roundy Lane for 1986 only.

The Main Creek location above Deer Creek Reservoir has the most complete data set, with monthly water quality data available for the period 1985 through 2010. This site has high spring flows due to snowmelt, with the lowest monthly flow in July.

Table 5-9 below compares average monthly data at the lowest Main Creek sampling location for flow, TSS, TP, and DTP. However, July has the lowest average flow of 6.5 cfs for the period 1985 to 2007. TSS are typically higher in the late winter and spring during higher runoff flows. On average, TSS levels are highest in May at 60 mg/L, which is similar to the timing of peak flow. Whereas the average peak flow in May stands out from the rest of the months, the average TSS levels for March and April (55 mg/L and 59 mg/L, respectively) are very close to the average TSS levels in May. Peak phosphorus concentrations also generally occur in the late winter or early spring during high runoff.

Table 5-9. Average Monthly Water Quality Data for Main Creek above Deer Creek Reservoir, 1985–2010

Month	Flow, Average (cfs)	Solids, Total Suspended (TSS) Average (mg/L)	Phosphorus, TP Average (mg/L)	Phosphorus, DTP Average (mg/L)
January	16.16	27.13	0.06	0.03
February	31.24	34.60	0.06	0.02
March	26.43	54.89	0.08	0.03
April	44.89	58.83	0.08	0.03
May	72.34	60.14	0.09	0.03
June	15.86	9.99	0.05	0.03
July	6.49	4.15	0.06	0.05
August	6.74	8.81	0.06	0.04
September	7.33	5.17	0.05	0.03
October	10.91	7.56	0.04	0.02
November	11.61	11.10	0.04	0.02
December	16.32	10.75	0.06	0.00

Figure 5-7 and Figure 5-8 below illustrate the water quality data for the Main Creek sampling location above Deer Creek Reservoir for 1999 through 2010. Average annual DTP and TP are compared to Deer Creek TMDL target concentration goals of 0.025 mg/L and 0.030 mg/L, respectively. The data show that TP and DTP concentrations generally exceed target goals for the watershed.

Figure 5-7. Average Annual TP, DTP, and Flow at the Lowest Main Creek Water Quality Station

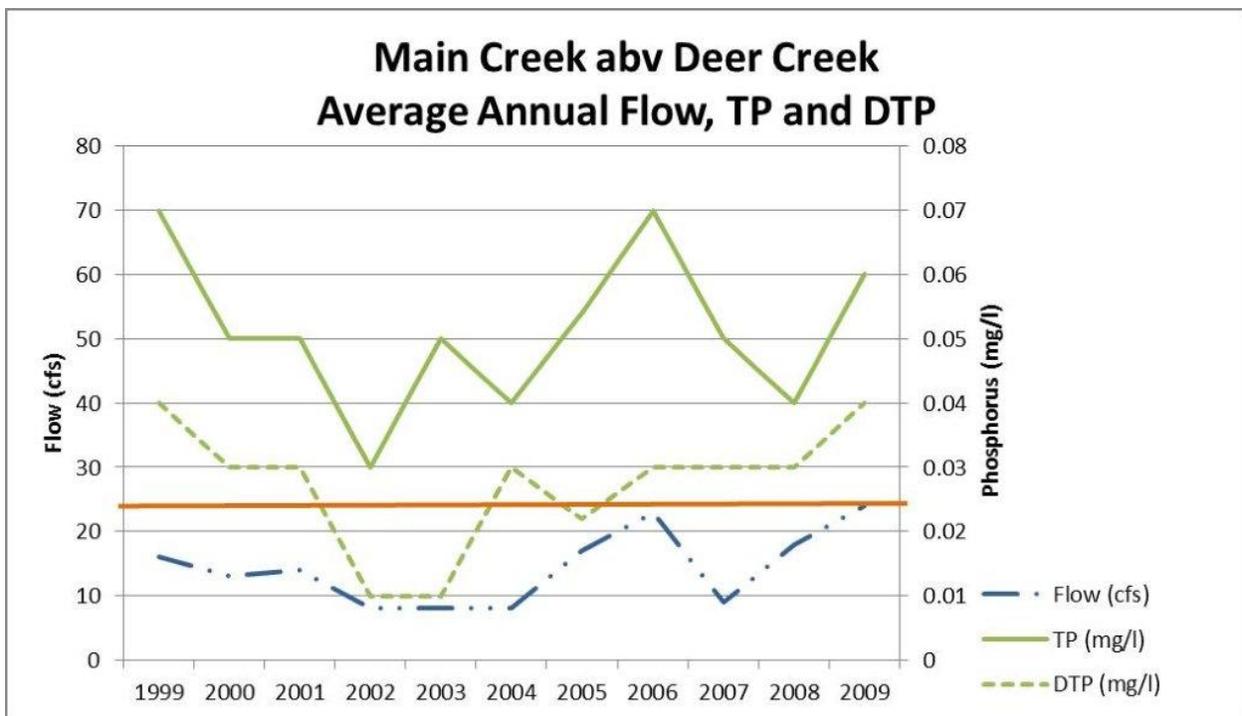
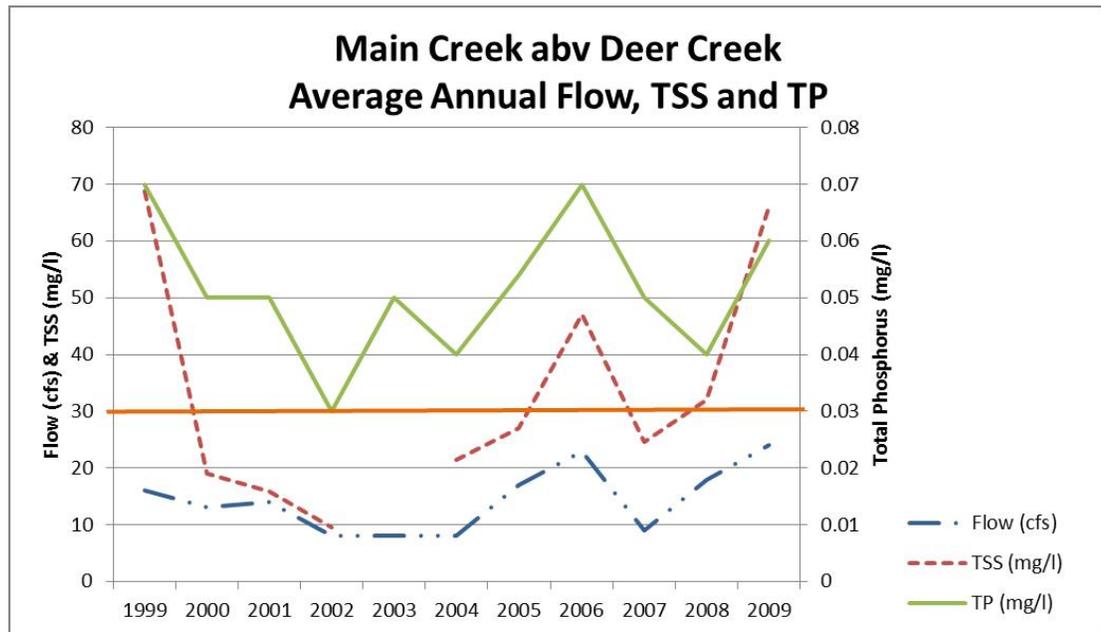


Figure 5-8. Average Annual TP, TSS, and Flow at the Lowest Main Creek Water Quality Station



Escherichia coli (*E. coli*) are a type of bacteria commonly found in the intestines of mammals, including humans. Because *E. coli* are commonly associated with human and animal wastes, they are part of the group called fecal coliforms, and their presence in a water body can indicate recent contamination from animal waste.

Water samples taken during 2009 and 2010 for this assessment were analyzed for *E. coli*. Table 5-10 provides a summary of the *E. coli* results for the locations sampled. Each location had at least one sample during the year that exceeded the state *E. coli* standard of 668 mpn (most probable number). Results were especially high at Main Creek at Round Valley Road and at Spring Creek in Wallsburg at Roundy Lane, where the average *E. coli* concentrations exceeded the state standard.

Table 5-10. Summary of *E. coli* Results, 2009–2010 Sampling Events

Sampling Description	<i>E. coli</i> (mpn)		
	Minimum	Maximum	Average
Little Hobble Creek at Round Valley Road crossing	8.6	1,299.7	265.0
Main Creek above Deer Creek Reservoir at US 189 crossing	12.1	1,203.3	231.9
Main Creek at Round Valley Road crossing	14.5	1,732.9	873.7
Main Creek at Roundy Lane (below confluence with Little Hobble Creek)	7.5	920.8	204.0
Spring Creek at Round Valley Road crossing below Wallsburg Springs	1.0	1,553.1	201.2
Spring Creek in Wallsburg at Roundy Lane	209.8	1,732.9	804.3

Source: Desert Rose Environmental 2012

Field screening results for pH, conductivity, and temperature are provided in Appendix E, Water Quality Assessment Report.

5.4.3 Recommendations

The recommendations presented below are meant to help improve the water quality in the Wallsburg watershed. The Watershed Committee expects that implementing these recommendations will cumulatively improve the overall health of the watershed.

- **Goal 1 – Meet the TMDL endpoint of 0.03 mg/L of TP in Main Creek.** A reduction of about 0.02 mg/L of TP is needed to meet this goal.
 - *Recommendation 1a* – For identified livestock operations that affect water quality, work with owners to prepare and implement voluntary nutrient-management plans.
 - *Recommendation 1b* – Work with livestock owners to develop and implement grazing-management plans to control livestock access to Main Creek.
 - *Recommendation 1c* – Stabilize stream banks to reduce erosion.
- **Goal 2 – Meet the TMDL endpoint of 0.025 mg/L of DTP in Main Creek.** A reduction of between 0.015 mg/L and 0.02 mg/L of DTP is needed to meet this goal.
 - *Recommendation 2a* – Complete additional groundwater and surface water sampling, testing, and analysis to determine the source of high DTP in Spring Creek. Once the causes are identified, develop an implementation strategy to reduce and/or eliminate the phosphorus sources.
 - *Recommendation 2b* – For identified livestock operations that affect water quality, work with owners to develop and implement nutrient-management plans.
 - *Recommendation 2c* – Work with livestock owners to develop and implement grazing-management plans to control livestock access to Main Creek.
- **Goal 3 – Reduce the TSS concentrations.** On average, a reduction of about 30 mg/L (a 75% reduction) of TSS is needed to meet this goal.
 - *Recommendation 3a* – Stabilize stream banks to prevent erosion.
 - *Recommendation 3b* – Work with livestock owners to develop and implement grazing-management plans to control livestock access to Main Creek.

The water quality data were compared to the results from the Stream Visual Assessment Protocol (SVAP₂) Inventory prepared by NRCS in January 2010. Specific recommendations were identified for each stream reach. Water quality results were also compared to the Septic Tank Density Study conducted as part of the Wallsburg CRMP. Specific recommendations were developed based on these comparisons.

Main Creek

With watershed drainage and tributary flows providing the source of flow in Main Creek, higher springtime flows due to snowmelt can be expected, with lowest flows in the late summer. Monthly water quality data are available from 1986 to 2011 at the farthest downstream location. Only 2009–2010 data are available at the mid-watershed location at Roundy Lane, and only 9 years of data (since 1986) are available at the upper watershed location at Round Valley Road (1986–1988, 1994, 1995, 2000, 2005, 2009, and 2010).

At each of the three Main Creek monitoring locations, monthly concentrations of TSS, TP, and DTP do not correlate with flow. It is to be expected that higher concentrations of TSS and TP would occur during high-flow times when flows erode the stream banks and carry sediment downstream. With TSS and TP concentrations fluctuating throughout the year (regardless of flow quantities), it appears that outside influences near or along the stream are stirring up sediments. These influences could be animal grazing, channel alignment straightening, irrigation water management, or construction activities.

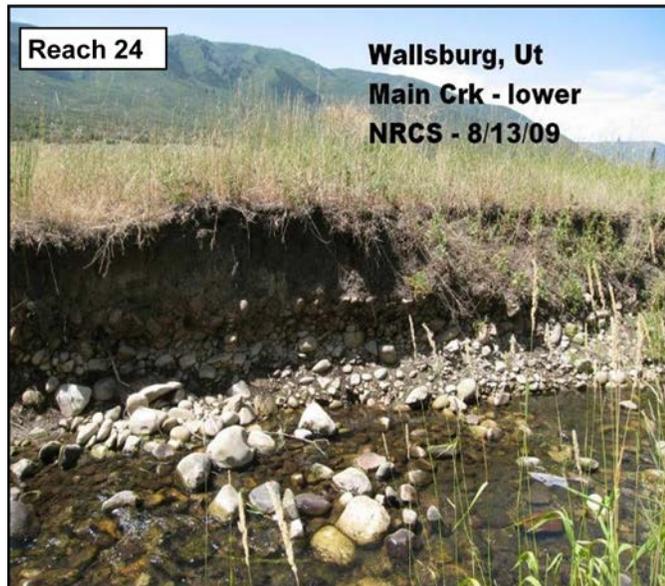


Table 5-11 below summarizes the water quality constituents by segment and compares them to the sediment load reduction estimates from the SVAP.

Table 5-11. Main Creek, SVAP Results Compared to Water Quality

Main Creek Segment	Water Quality Concerns	SVAP Reaches	Length of Eroding Stream Bank (feet)	Eroding Stream Bank Length as Percentage of Total Stream Length (percent)	Potential Sediment Load Reduction (tons/year)
Above Round Valley Road (M5)	TSS, TP, TDP	1–18	2,200	11	26
Round Valley Road to Roundy Lane (M4)	TSS	19–23	1,600	31	56
Roundy Lane to Deer Creek Reservoir	TSS, TP ^a	24–30	6,200	36	167

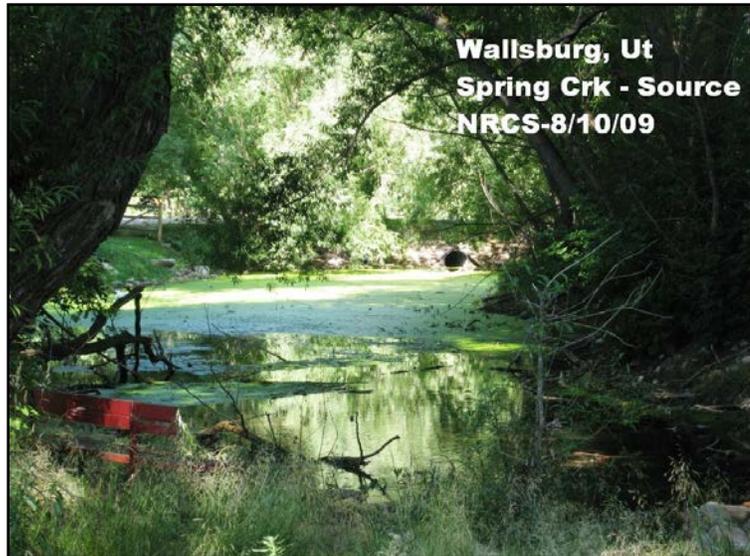
^a Water quality reflects the contributions of Spring Creek and Main Creek.

Spring Creek

The source of Spring Creek is a spring in the town of Wallsburg. The spring source supplies a more consistent flow rate, with some seasonal variability. There are two water-quality monitoring locations on Spring Creek: Spring Creek at road crossing (S2) has water quality data and flow data for 2009 and 2010, and Spring Creek at Roundy Lane (S1) has water quality data for 1986, 2009, and 2010, but no flow data.

TSS concentrations are low, with high TP and DTP values at the upstream monitoring point (S1). These data can be considered baseline water quality data, since they reflect the water quality at the headwaters of Spring Creek. An investigation to determine the cause of the high TP and DTP at the spring source is recommended. This could be done by sampling as close to the spring source as possible, dye-testing the septic systems of nearby residences, or inventorying land-use and land-management practices such as fertilizer and pesticide use. Once the causes are identified, an implementation strategy should be developed to reduce the phosphorus load. It is estimated that the Spring Creek source assessment would cost about \$50,000.

During the SVAP evaluation, evidence of livestock accessing the stream corridor was observed. The consequences of these observed conditions are evident by the high TP and DTP values in the upper reaches. Recommendations to mitigate these problems could include improved grazing management and evaluating the function of nearby septic tanks.



Monitoring data from Spring Creek at Roundy Lane indicate an increase in TSS and TP above this location. The SVAP observations of severe livestock impacts and irrigation water management practices could cause the higher TSS and TP water quality values. Recommendations for this segment include grazing management, grade controls, and runoff management from nearby corrals.

Little Hobble Creek

With watershed drainage providing the source of flow in Little Hobble Creek, higher springtime flows due to snowmelt can be expected, with lowest flows in the late summer. Little Hobble Creek (segment M3) has one water quality monitoring site at Round Valley Road, with data collected monthly for 1986–1988, 2009, and 2010. The monitoring site on Main Creek at Roundy Lane (segment M2) is downstream of the confluence of Little Hobble Creek and Main Creek, and therefore the water quality is influenced by both streams.

Table 5-12 summarizes the water quality concerns by reach and compares the sediment-load-reduction estimate from the SVAP.

Table 5-12. Little Hobble Creek, SVAP Results Compared to Water Quality

Hobble Creek Segment	Water Quality Concerns	SVAP Reaches	Length of Eroding Stream Bank (feet)	Length of Eroding Stream Bank as Percentage of Total Stream Length (percent)	Potential Sediment Load Reduction (tons/year)
Above Round Valley Road (M3)	TSS	1–5	990	5	20
Round Valley Road to Roundy Lane (M2)	TP, DTP ^a	6–9	1,600	37	27

^a Monitoring data reflect the influences of Main Creek and Little Hobble Creek.

5.5 Wildlife Management

Wildlife in the Wallsburg watershed was evaluated and assessed to provide information and recommend improvements to re-establish healthy wildlife habitats. This section identifies upland wildlife and game species with habitats mapped in the watershed. This section also discusses aquatic resources, including fish communities, plus recommendations for improving aquatic resources in the watershed.

5.5.1 Background

Section 5.5 is based on existing data and a summary of reports prepared by the Utah Division of Wildlife Resources and HDR Engineering, Inc., relating to upland wildlife and aquatic resources in the Wallsburg watershed.

Wildlife Resources

The Wallsburg watershed supports a variety of upland wildlife and game species. Many of the wildlife species are common inhabitants of montane habitats in Utah. The Wallsburg watershed lies in the game management unit identified as Wasatch Mountains Management Unit 17 (Utah Division of Wildlife Resources 2007).

What are montane habitats?

Montane habitats are habitats on mountains or other high-elevation areas.

Current upland and big game management plans that cover the Wallsburg watershed include:

- 2006 Deer Herd Unit Management Plan, Deer Herd Unit 17 (Utah Division of Wildlife Resources 2006)
- 2009 Greater Sage-Grouse Management Plan (Utah Division of Wildlife Resources 2009a)
- 2009 Utah Bat Conservation Plan (Utah Division of Wildlife Resources 2009b)
- 2009 Utah Moose Statewide Management Plan (Utah Division of Wildlife Resources 2009c)
- 2012 Elk Unit Management Plan, Elk Herd Unit 16 (Utah Division of Wildlife Resources 2012)

The Utah Division of Wildlife Resources inventories areas of land and water with physical and biological features that constitute habitat for specific species of wildlife. These habitats are given value designations, and sometime seasonal designations, based on use. Crucial-value habitats are those areas on which the local population of wildlife species depends for survival, since there are no alternative ranges or habitats available. Habitat identified as crucial is essential. If this habitat is degraded or made unavailable, the carrying capacity and/or the number of individuals will significantly decrease. Substantial-value habitats are areas that are used by a wildlife species but are not crucial for the survival of the population. If substantial-value habitat is degraded or made unavailable, the carrying capacity and/or the number of individuals will not significantly decrease.

Mule Deer and Rocky Mountain Elk

The Wallsburg watershed supports abundant mule deer habitat. According to the Division of Wildlife Resources, the watershed contains about 38,056 acres of crucial mule deer habitat, including over 6,000 acres of winter range, over 11,000 acres of winter/spring habitat, and over 2,000 acres of summer habitat (see Figure 5-9 below). The watershed also contains about 28,077 acres of crucial year-long habitat and 13,911 acres of crucial winter habitat for Rocky Mountain elk (see Figure 5-10 below). As stated in Section 4.4, Social Environment and Recreation, the Division cooperatively manages the privately owned Wallsburg Cooperative Wildlife Management Unit (CWMU), which consists of about 8,170 acres southeast of the town of Wallsburg.

Greater Sage-Grouse

Greater sage-grouse also occupy the Wallsburg watershed, which supports about 11,500 acres of occupied habitat, as classified by the Division of Wildlife Resources, and no brood or winter habitat (see Figure 5-11 below). Greater sage-grouse habitat improvements were identified as a need in the *Wallsburg Watershed Grazinglands* report (NRCS 2010c) and are included in this report's list of recommendations.

The Utah Division of Wildlife Resources has formed local working groups to review state plan strategies and to update specific project and threats. The Strawberry Valley Adaptive Resource Management (SVARM) Sage-Grouse Local Working Group was organized in 2004 and meets several times a year to coordinate activities for areas including the Wallsburg watershed. SVARM (utahcbcp.org/htm/groups/strawberryvalley) has published a greater sage-grouse conservation plan that focuses on conservation strategies and actions in Wasatch and Duchesne Counties.

Other Species

The Utah Division of Wildlife Resources has identified other species and mapped critical habitat for these species in the Wallsburg watershed. Black bear, moose, blue grouse, chukar, and Rio Grande wild turkey habitats are shown in Figure 5-12, Figure 5-13, Figure 5-14, Figure 5-15, and Figure 5-16, respectively. Table 5-13 compares the mapped habitats for various wildlife species in the Wallsburg watershed.

Table 5-13. Wildlife Habitat Areas

in acres

Wildlife Species	Occupied	Year-Long Substantial	Spring/Fall Crucial	Winter Crucial	Winter Substantial
Black bear	0	23,900	0	0	0
Blue grouse	0	44,230	0	0	0
Chukar	0	9,760	0	0	0
Greater sage-grouse	11,500	0	0	0	0
Moose	0	13,425	5,800	0	12,600
Mule deer	0	0	11,000	0	6,000
Rio Grande wild turkey	0	35	0	0	0
Rocky Mountain elk	0	28,000	0	14,000	0

Figure 5-9. Mule Deer Habitat

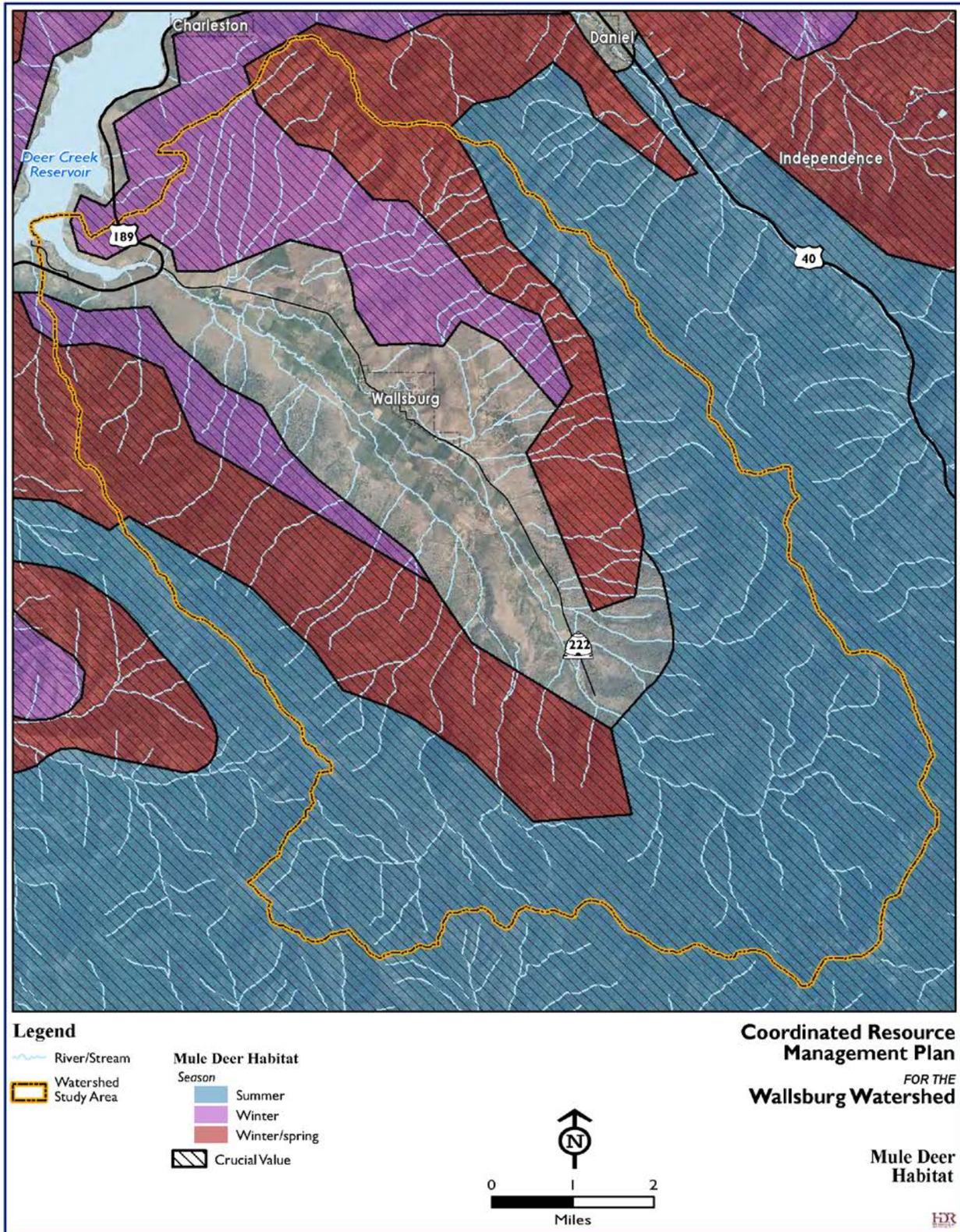


Figure 5-10. Rocky Mountain Elk Habitat

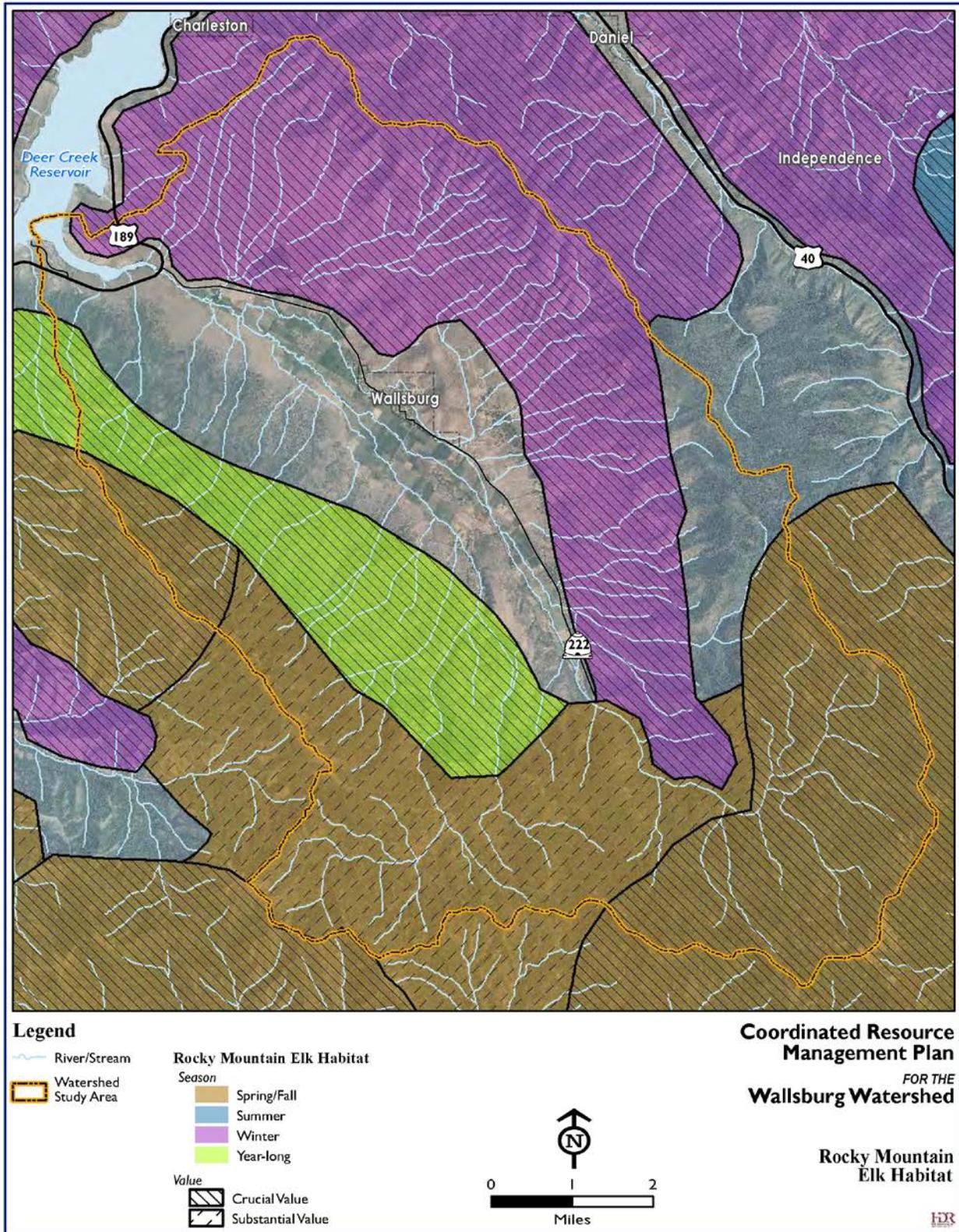


Figure 5-11. Greater Sage-Grouse Habitat

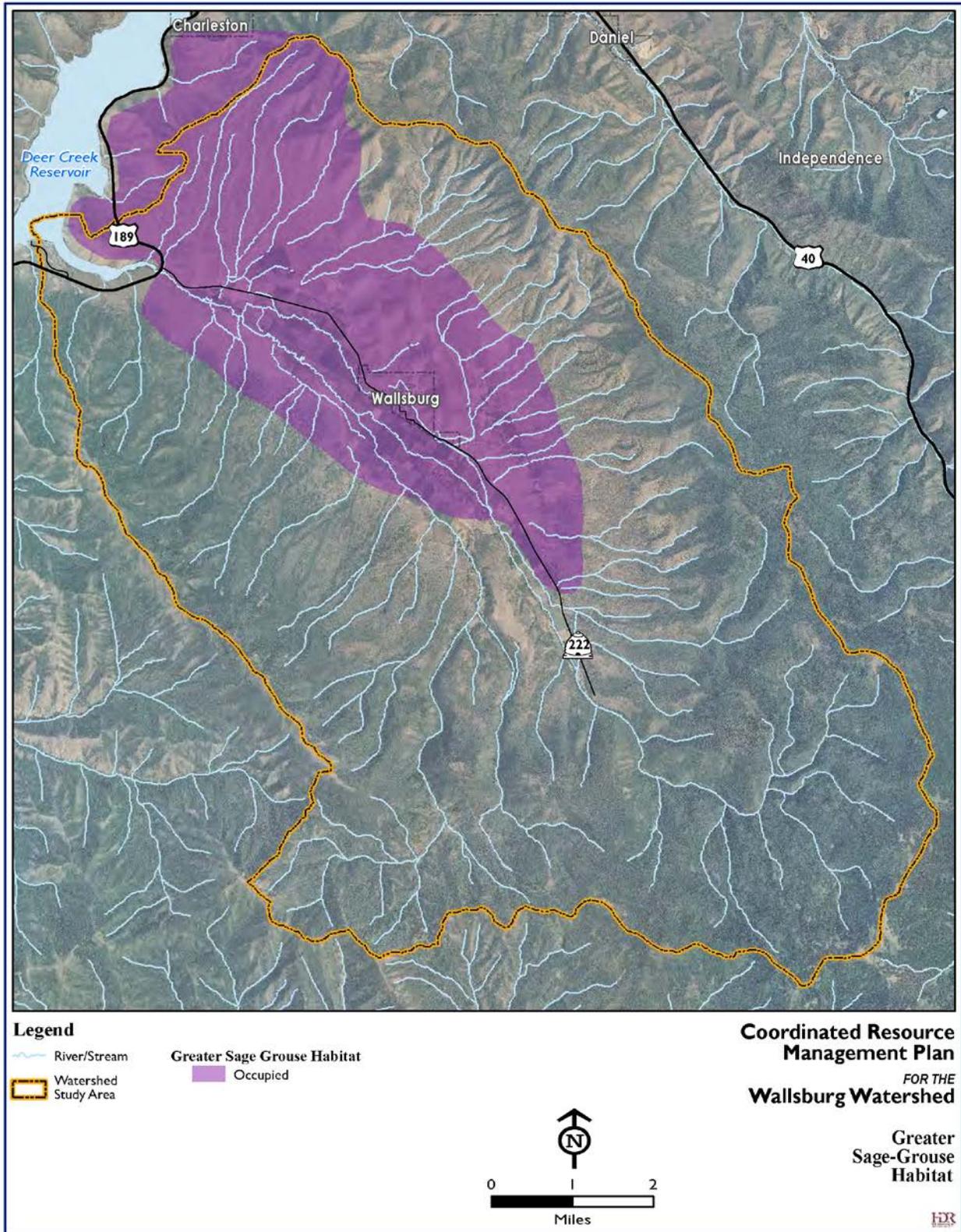


Figure 5-12. Black Bear Habitat

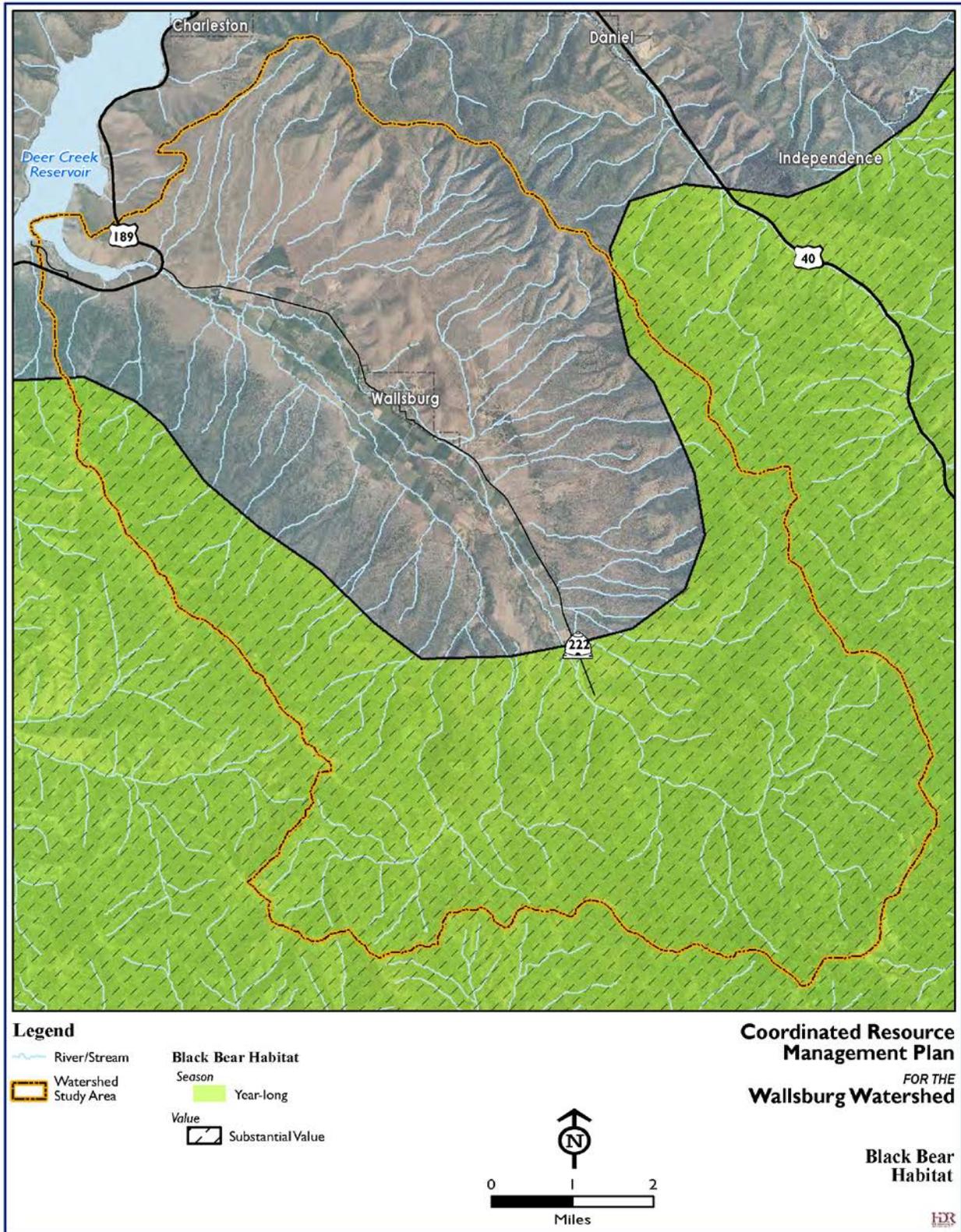


Figure 5-13. Moose Habitat

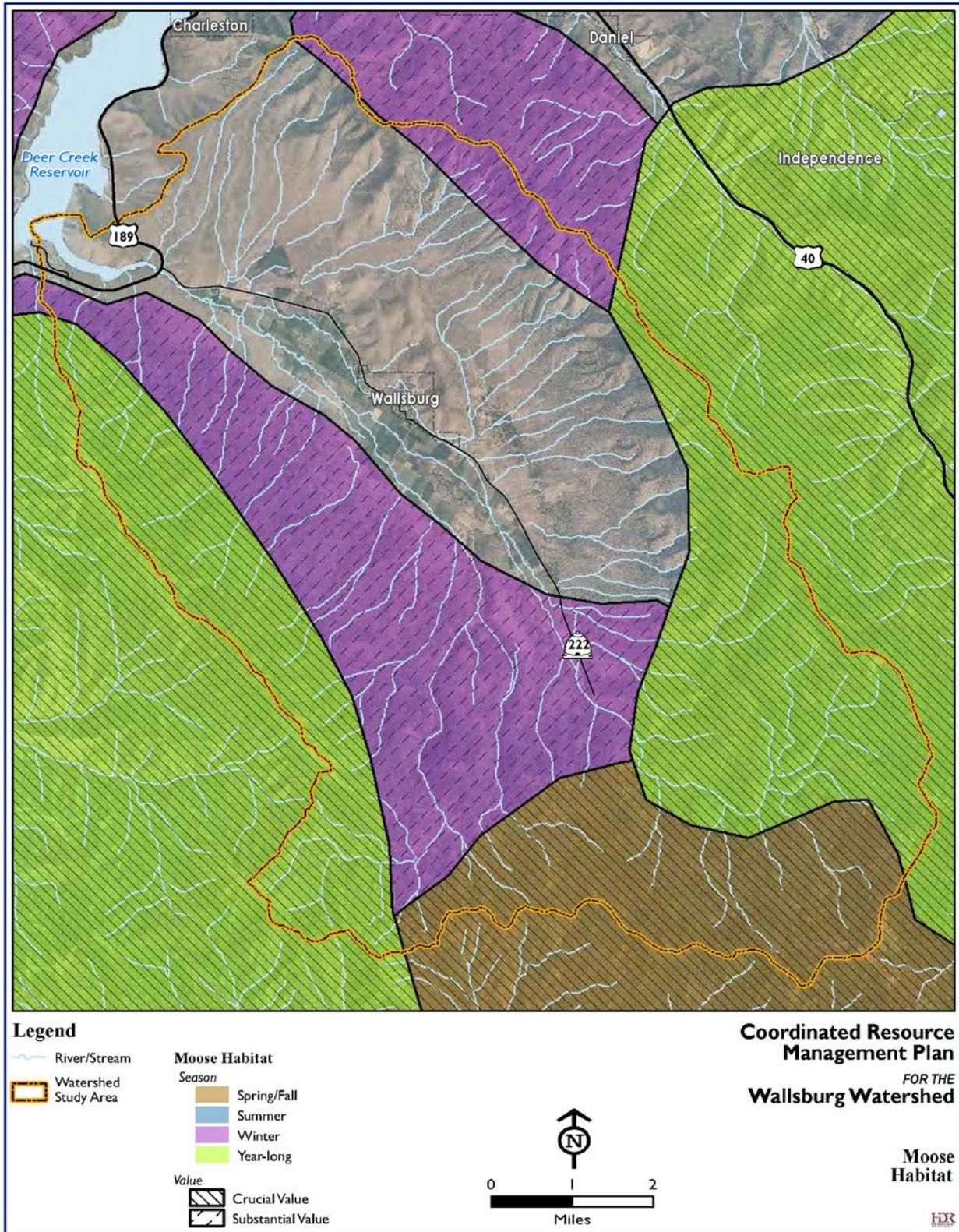


Figure 5-14. Blue Grouse Habitat

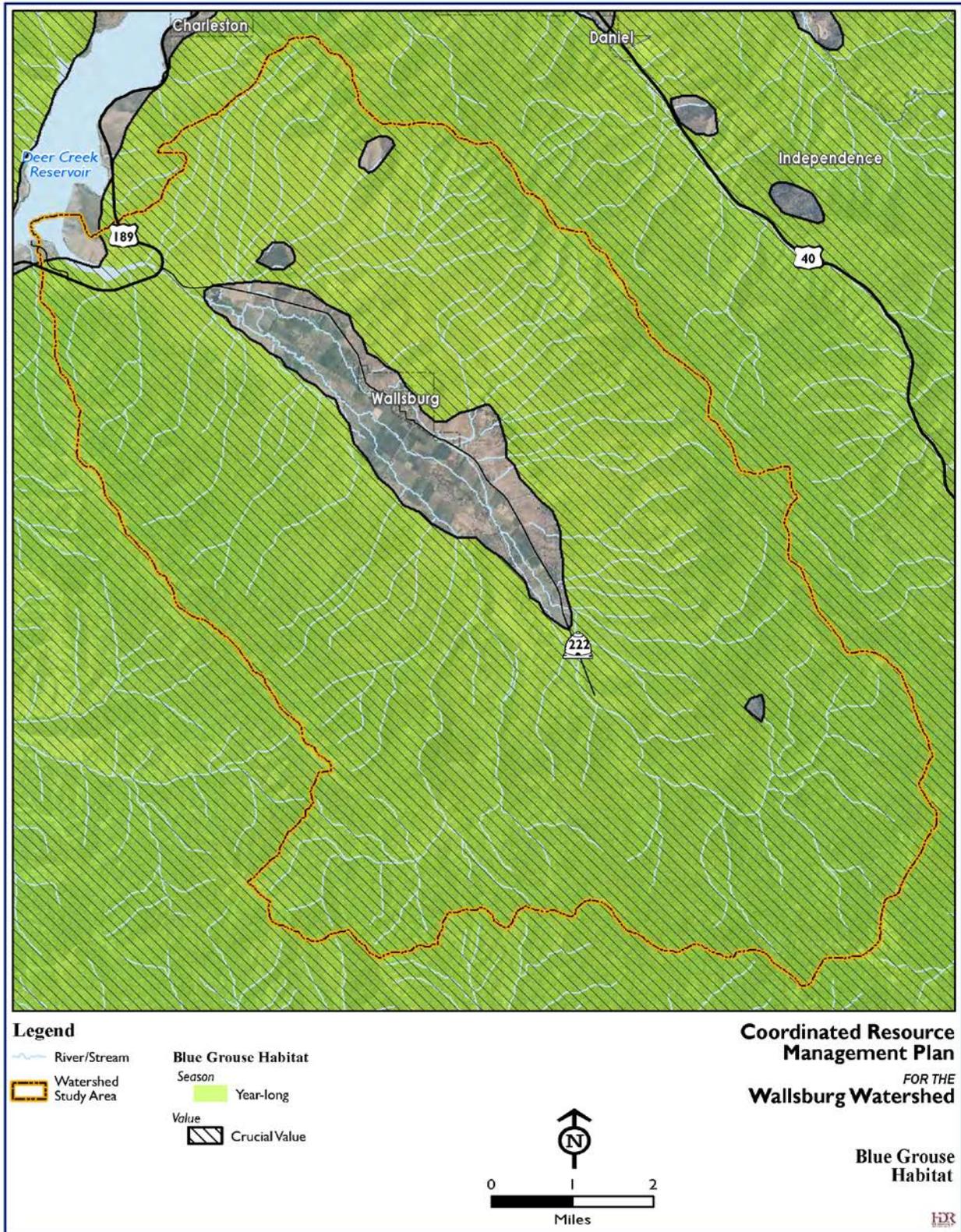


Figure 5-15. Chukar Habitat

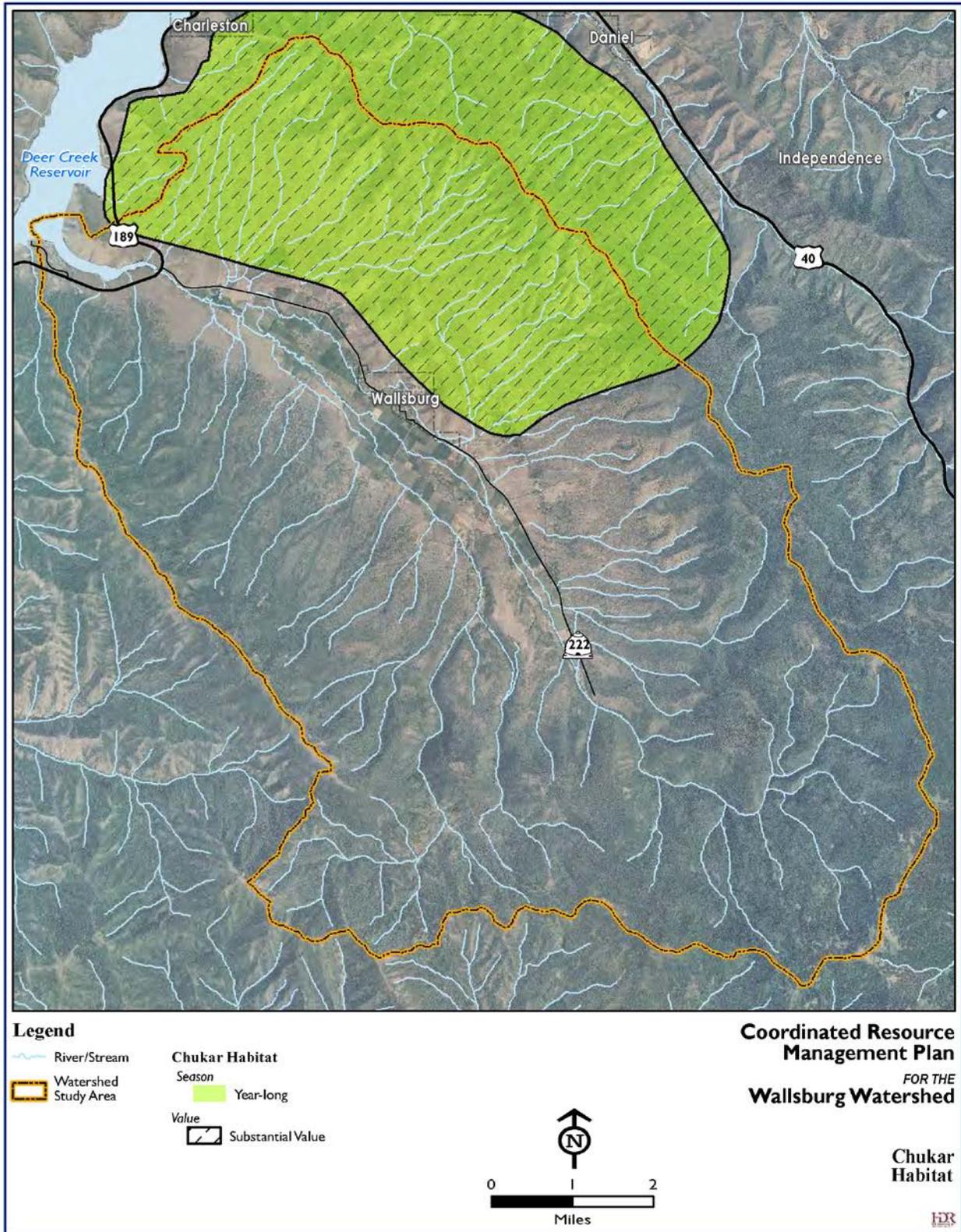
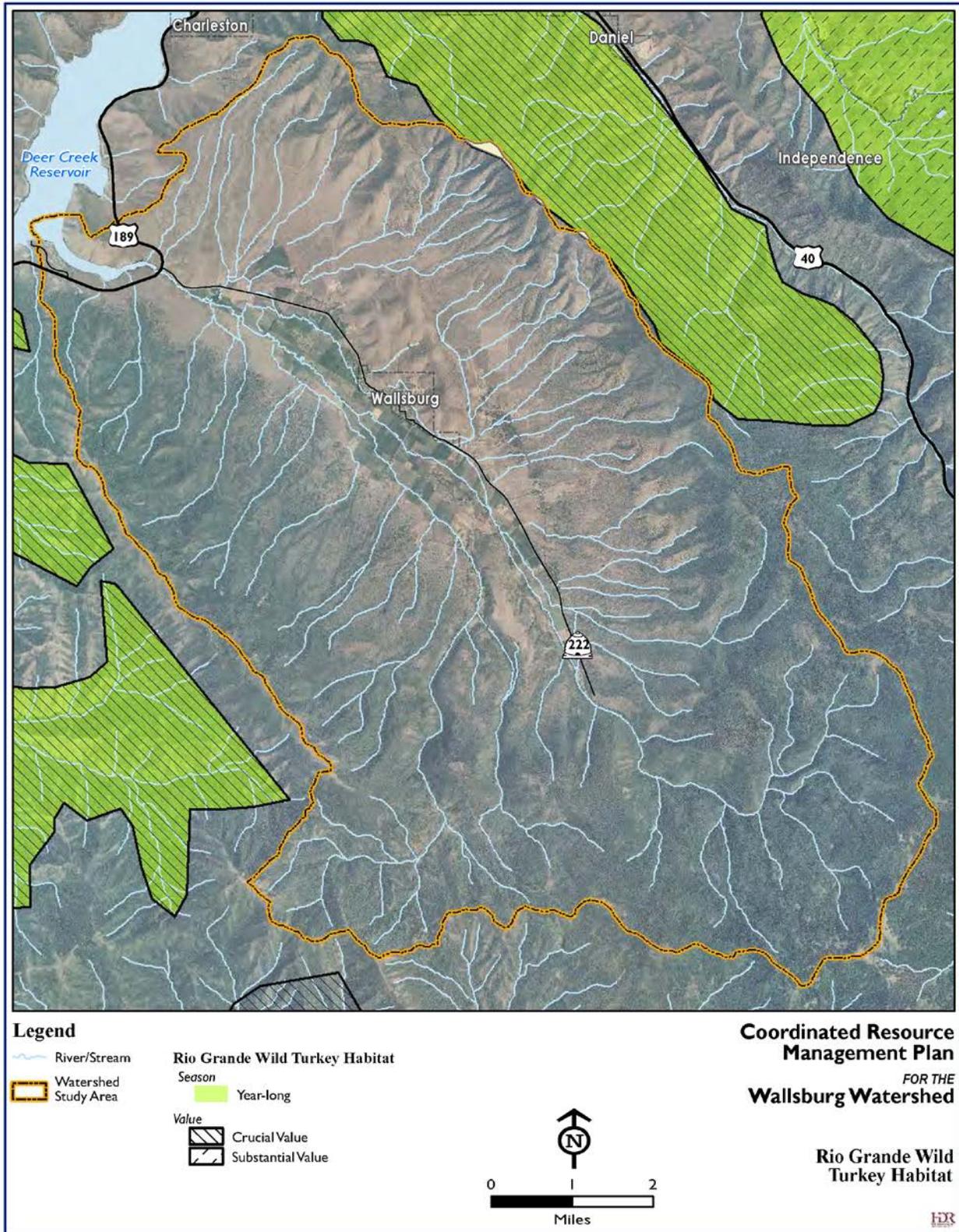


Figure 5-16. Rio Grande Wild Turkey Habitat



Special-Status Species

The Utah Conservation Data Center has recorded several special-status species as being present in Wasatch County (see Table 5-14). However, not all of these species are necessarily present in the Wallsburg watershed.

Table 5-14. Special-Status Species in Wasatch County

Common Name	Scientific Name	Status
Bald eagle	<i>Haliaeetus leucocephalus</i>	SPC
Black swift	<i>Cypseloides niger</i>	SPC
Bluehead sucker	<i>Catostomus discobolus</i>	CS
Bobolink	<i>Dolichonyx oryzivorus</i>	SPC
Bonneville cutthroat trout	<i>Oncorhynchus clarkii utah</i>	CS
Brown (grizzly) bear	<i>Ursus arctos</i>	S-ESA
Canada lynx	<i>Lynx canadensis</i>	S-ESA
Colorado river cutthroat trout	<i>Oncorhynchus clarkii pleuriticus</i>	CS
Columbia spotted frog	<i>Rana luteiventris</i>	CS
Ferruginous hawk	<i>Buteo regalis</i>	SPC
Fringed myotis	<i>Myotis thysanodes</i>	SPC
Greater sage-grouse	<i>Centrocercus urophasianus</i>	S-ESA
Lewis's woodpecker	<i>Melanerpes lewis</i>	SPC
Long-billed curlew	<i>Numenius americanus</i>	SPC
Northern goshawk	<i>Accipiter gentilis</i>	CS
Roundtail chub	<i>Gila robusta</i>	CS
Short-eared owl	<i>Asio flammeus</i>	SPC
Smooth greensnake	<i>Opheodrys vernalis</i>	SPC
Southern leatherside chub	<i>Lepidomeda aliciae</i>	SPC
Three-toed woodpecker	<i>Picoides tridactylus</i>	SPC
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	SPC
Western toad	<i>Bufo boreas</i>	SPC
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	S-ESA

S-ESA: Federally listed or candidate species under the Endangered Species Act

SPC: Wildlife species of concern

CS: Species receiving special management under a Conservation Agreement in order to preclude the need for federal listing

Fisheries Resources

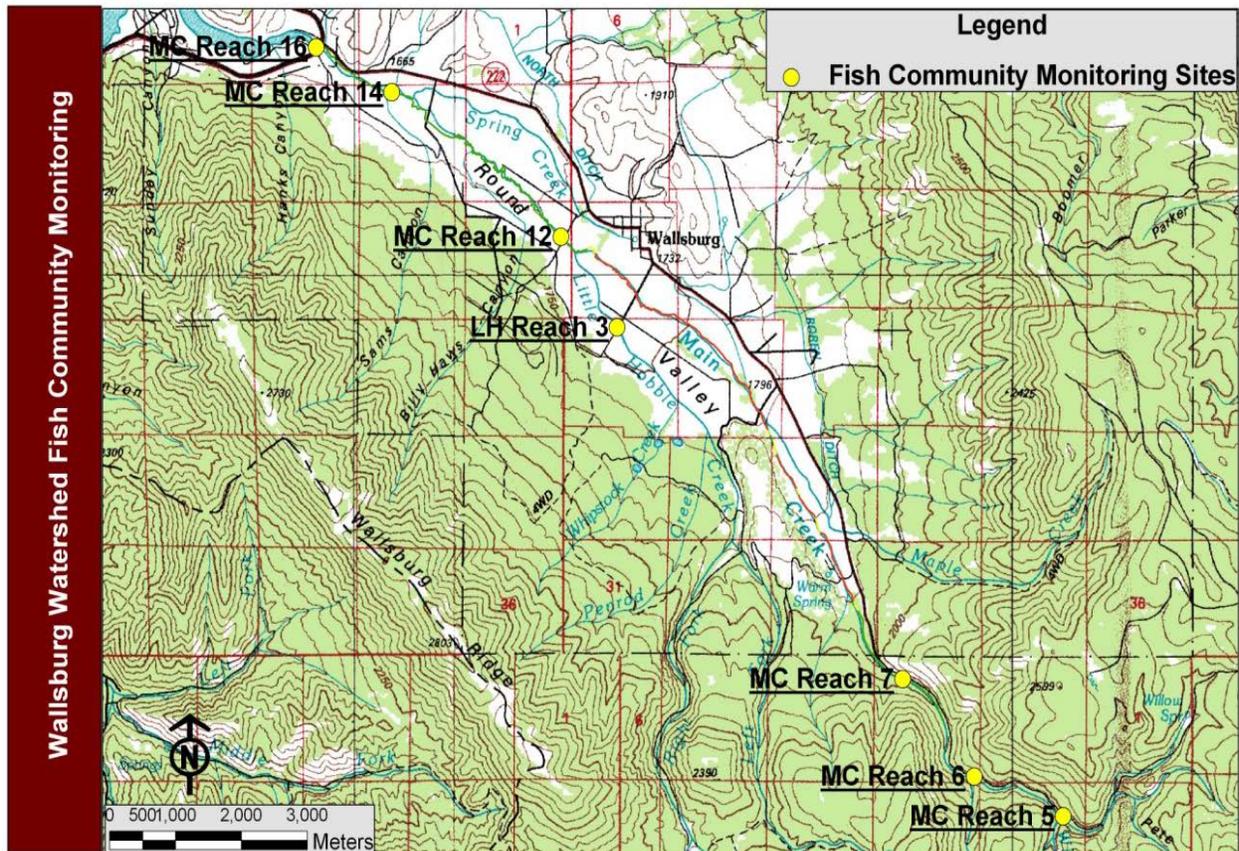
The Wallsburg watershed contains significant aquatic resources in the form of perennial and ephemeral streams, springs, and riparian wetlands. The watershed is inhabited by a unique assemblage of native aquatic species including Bonneville cutthroat trout, southern leatherside chub, and Columbia spotted frog. Lotic (flowing) aquatic resources in the watershed are fragmented by water-diversion structures, impassable culverts, and seasonally dewatered reaches.

Given its unique assemblage of aquatic resources, the Wallsburg watershed is a focus area for implementing conservation measures. Such measures could include restoring rivers and riparian areas, increasing angler access, removing non-native species, purchasing and/or

leasing in-stream flow, and modifying water-diversion structures (through voluntary efficiency projects) to facilitate fish migration and sustained in-stream flow.

Several lotic systems in the Wallsburg watershed support fish communities, but two systems, Main Creek and Little Hobble Creek, support the majority of fisheries biomass in the watershed. The most recent thorough surveys of Main and Little Hobble Creeks were conducted in 2009 and 2010 using dual-pass electroshocking methods (see Figure 5-17). Little data exists on smaller systems, such as Spring Creek, in the watershed, but those with permanent water are believed to have a species composition similar to the composition in Main and Little Hobble Creeks.

Figure 5-17. Fish-Monitoring Locations in the Wallsburg Watershed



The watershed is inhabited by at least four species of trout: Bonneville cutthroat trout (*Oncorhynchus clarkii utah*), brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), and rainbow trout (*Oncorhynchus mykiss*). Bonneville cutthroat trout are the only trout native to the watershed.

Several native nongame fish species, including southern leatherside chub (*Lepidomeda aliciae*), longnose dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*), reidside shiner (*Richardsonius balteatus*), mountain sucker (*Catostomus platyrhynchus*), Utah sucker (*Catostomus ardens*), and mottled sculpin (*Cottus bairdii*), inhabit aquatic systems in the watershed. Two additional non-native game fish, yellow perch (*Perca flavescens*) and green sunfish (*Lepomis cyanellus*), are also present in the lower portions of Main Creek. Table 5-15 below identifies the relative proportions of the various fish found in Main Creek during fish surveys.

Table 5-15. Relative Proportions of Fishes Captured during Surveys of Main and Little Hobble Creeks

Stream	Reach	Site	Date	n	Southern Leatherside Chub	Longnose Dace	Speckled Dace	Redside Shiner	Mountain Sucker	Utah Sucker	Mottled Sculpin	Bonneville Cutthroat Trout	Rainbow Trout	Brown Trout	Brook Trout	Yellow Perch	Green Sunfish	
Main Creek	5	1	3-Aug-09	4	0	0	0	0	0	0	0	1.00	0	0	0	0	0	
Main Creek	6	1	3-Aug-09	24	0	0	0	0	0	0	0	1.00	0	0	0	0	0	
Main Creek	7	1	27-Jul-05	15	0	0	0	0	0	0	0.43	0.57	0	0	0	0	0	
		2	3-Aug-09	37	0	0	0	0	0	0	0.62	0.38	0	0	0	0	0	0
			18-Aug-10	57	0	0	0	0	0	0	0.47	0.53	0	0	0	0	0	0
Main Creek	12	2	9-Aug-05	161	0	0.01	0.89	0.07	0.02	0	0	0	0	<0.01	0	0	0	
		1	11-Jul-07	363	0.02	0.02	0.47	0.12	0.10	0	0.26	0	0	<0.01	0	0	0	
			12-Aug-08	100	0.03	0	0.48	0.07	0.03	0	0.38	0	0	0.010	0	0	0	
			12-Aug-09	237	0.01	0	0.22	0.01	0.03	0	0.70	0	0.01	0.02	0	0	0	
Main Creek	14	1	3-Sep-09	509	0.04	0.12	0.27	0.28	0.22	0.01	0	0	0.01	0.05	0	<0.01	<0.01	
			30-Jun-10	340	0.06	0.14	0.24	0.15	0.31	0.01	0.06	0	<0.01	0.02	0	— ^a	<0.01	
Main Creek	16	1	4-Aug-05	105	0	0.05	0.14	0	0.02	0	0.19	0	0.02	0.39	0	0.19	0	
			2	11-Jul-07	332	0.02	0	0	0.01	0.00	0	0.64	0	0.01	0.31	0	0	0
		12-Aug-08		191	0	0	0	0	0.03	0	0.81	0	0.05	0.12	0	0	0	
		10-Sep-09		417	0	0	0	0	0.01	0	0.79	0	0	0.20	0	0	<0.01	
Little Hobble Creek	3	1	28-Jul-05	15	0	0	0	0	0	0	0	0	0.33	0	0.67	0	0	
			12-Aug-09	91	0	0	0.02	0	0	0	0	0	0	0.20	0	0.78	0	0

Source: Grover and Crockett 2010

^a No data were provided in the source table.

Two of the native fish species in the watershed, Bonneville cutthroat trout and southern leatherside chub, are classified as Utah sensitive species and are managed through comprehensive multiagency management plans, known as conservation agreements and strategies, to guide conservation efforts (Lentsch et al. 1997; Utah Division of Wildlife Resources 2010). Fish surveys conducted in 2009 allow the Division of Wildlife Resources to estimate populations of trout species and leatherside chub (see Table 5-16).

Table 5-16. Fish Population Estimates for Southern Leatherside Chub and Combined Trout Species in Main Creek in 2009

Reach	Date	Southern Leatherside Chub			Trout (All Species Combined)			
		#/100m ²	Avg. Length (mm)	Avg. Weight (g)	#/km	#>150mm/km	Avg. Length (mm)	Avg. Weight (g)
5	3-Aug-09	0	NA	NA	131	0	113	22
6	3-Aug-09	0	NA	NA	525	88	110	21
7	3-Aug-09	0	NA	NA	230	180	161	54
12	12-Aug-09	0.97	86	8.3	63	63	366	563
14	3-Sep-09 ^a	3.81	77	5.2	123 ^a	58 ^a	251	297
16	10-Sep-09	0	NA	NA	871	467	191	130

^a Sampling error prevented the calculation of a trout population estimate for 2009.

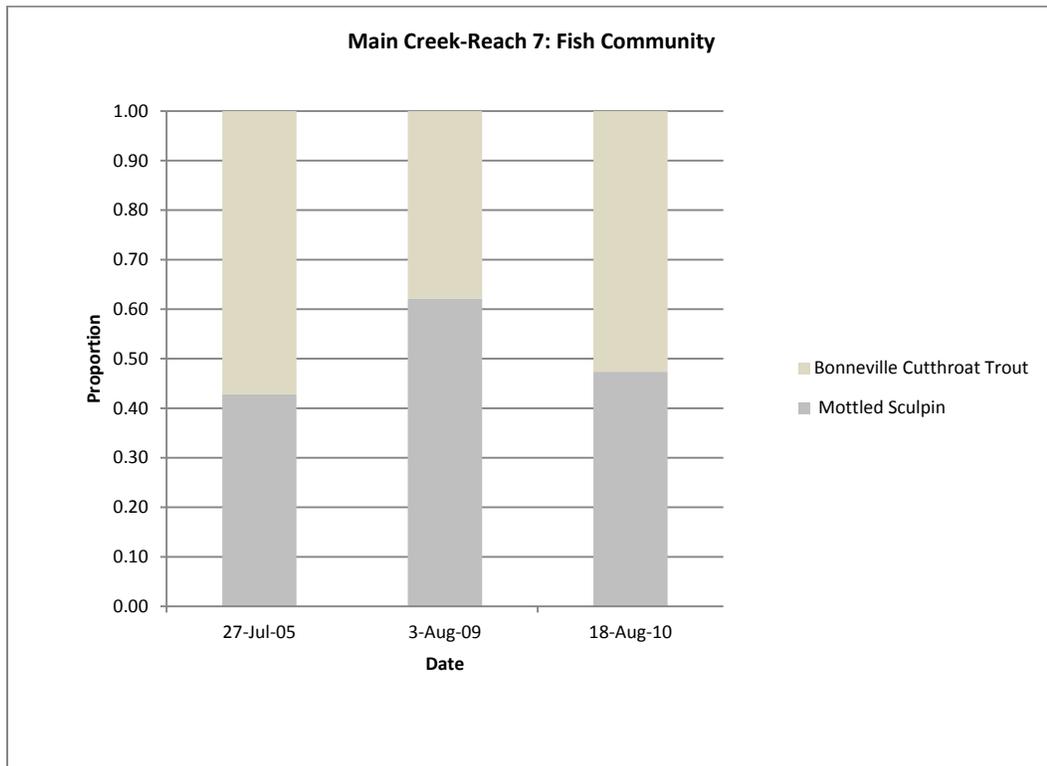
= number; m² = square miles; avg. = average; mm = millimeters; g = grams; km = kilometers

The Main Creek population of Bonneville cutthroat trout is managed as a conservation population in an effort “to preserve the historical genome and/or unique genetic, ecological, and/or behavioral characteristics within specific populations” (Lentsch et al. 2000, p. 17).

The Main Creek population of southern leatherside chub is the most genetically divergent population within the species complex and might be experiencing the harmful effects of a population bottleneck caused by genetic isolation (that is, little connectivity with other populations) (Belk et al. 2010).

In the upper portions of Main Creek, specifically reach 7, fish surveys conducted in 2005, 2009, and 2010 reveal a native fish community composed of Bonneville cutthroat trout and mottled sculpin (see Figure 5-18 below).

Figure 5-18. Fish Community Composition in Reach 7 of Main Creek



Source: Utah Division of Wildlife Resources 2010

Amphibian Resources

At least five amphibian species, Columbia spotted frog (*Rana luteiventris*), Western chorus frog (*Pseudacris triseriata*), tiger salamander (*Ambystoma tigrinum*), Woodhouse toad (*Bufo woodhousii*), and Great Basin spadefoot toad (*Spea intermontana*), inhabit the watershed. Most of these species rely on breeding habitat associated with seasonally flooded meadows and beaver ponds within riparian corridors. Columbia spotted frogs are classified as a Utah sensitive species and are managed through a multiagency management plan (Bailey et al. 2006). The population of Columbia spotted frogs in the watershed was not discovered until 2008 and has been documented in only a small geographic area (Crockett et al. 2009).

5.5.2 Results and Recommendations

Wildlife Resources

Wildlife resource habitat in the Wallsburg watershed is dominated by mule deer, Rocky Mountain elk, and greater sage-grouse. Other species of wildlife identified by the Division of Wildlife Resources are black bear, moose, blue grouse, chukar, and Rio Grande wild turkey.

The Division of Wildlife Resources will complete the 5-year update for the mule deer and elk management plan for the Wasatch Mountains Management Unit in 2013. Also, underway is the statewide update to the 2009 Greater Sage-Grouse Management Plan. It is recommended that, as projects are implemented in the Wallsburg watershed, Wasatch Conservation District

coordinates with the Division habitat manager and the results of future studies are incorporated into future watershed planning efforts.

Greater sage-grouse and big-game habitat improvements were identified as a need in the *Wallsburg Watershed Grazinglands* report (NRCS 2010c) and are discussed in Section 6.0, Summary of Watershed Recommendations. Improvements include targeting 3,150 acres of habitat for sagebrush and rabbitbrush treatment, thinning the shrub canopy and improving the understory plant community, and treating oak clones on about 2,500 acres.

Aquatic Resources

The results of field studies and fish inventories for the upper, middle, and lower reaches of Main Creek and Little Hobble Creek are summarized below.

Main Creek Upper Reaches

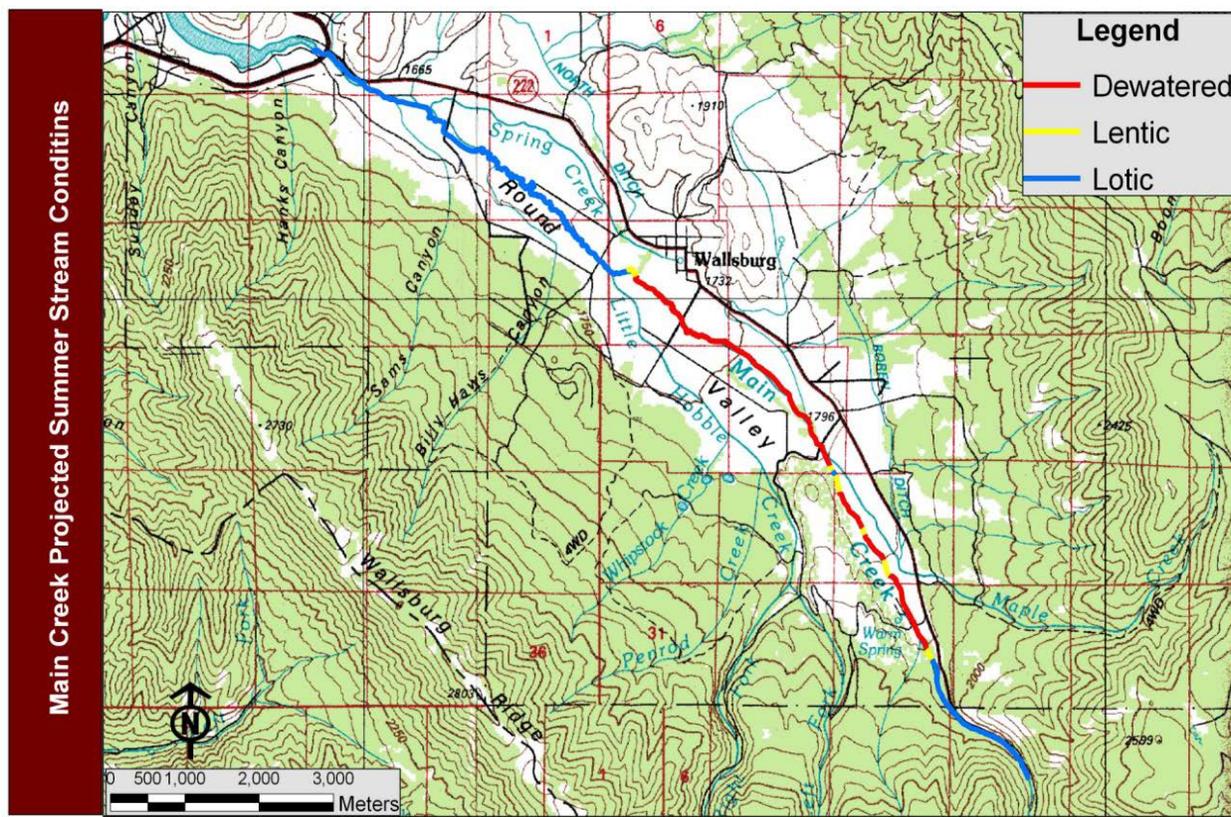
Fish-monitoring surveys conducted from 2005 to 2010 in Main Creek suggest several trends. The uppermost reaches of the system (reaches 5 and 6) were inhabited solely by native Bonneville cutthroat trout with densities ranging from 131 to 524 fish per kilometer of stream (see Table 5-15 above). The average weight and total length of fish sampled in the two reaches were relatively consistent and ranged from 21 to 22 grams and 110 to 113 millimeters, respectively (see Table 5-16 above).

Surveys conducted in 2005, 2009, and 2010 in reach 7 found a native fish community composed of Bonneville cutthroat trout and mottled sculpin (see Figure 5-18 above). Population estimates conducted in reach 7 in 2009 estimated a Bonneville cutthroat trout population of 230 individuals per kilometer of stream with an average length of 161 millimeters and an average weight of 54 grams (see Table 5-16 above).

Main Creek Middle Reaches

Limited fish survey data exist for the reaches of Main Creek located between the USFS boundary and Roundy Lane due to the lack of year-round flow in these reaches. Data collected independently by both the Utah Division of Wildlife Resources and NRCS (NRCS 2010a) in 2009 were used to create a map of seasonally dewatered reaches of Main Creek (see Figure 5-19 below). The represented spatial extent of dewatered reaches is a snapshot of conditions during early August 2009. Future annual conditions will vary depending on seasonality, precipitation, and timing of diversion operations. Nonetheless, the 2009 conditions have been typical of late summer water conditions in Main Creek in recent years.

Figure 5-19. Summer Water Conditions in Main Creek



Key: Dewatered = dry; lentic = small pools but no flow; lotic = flowing water

Based on conditions in 2009, about 5.7 kilometers of Main Creek are seasonally dewatered (see Figure 5-19 above). Dewatering limits fish migration between the upper and lower reaches, traps fish if they are unable to escape to watered reaches, limits available fisheries habitat and productivity, and harms riparian vegetation and corresponding stream bank stability (Cross et al. 1985; Rood et al. 2003; Perkins et al. 2010). Main Creek from about Roundy Lane Bridge downstream to its confluence with Deer Creek is expected to have perennial flow during a typical year.

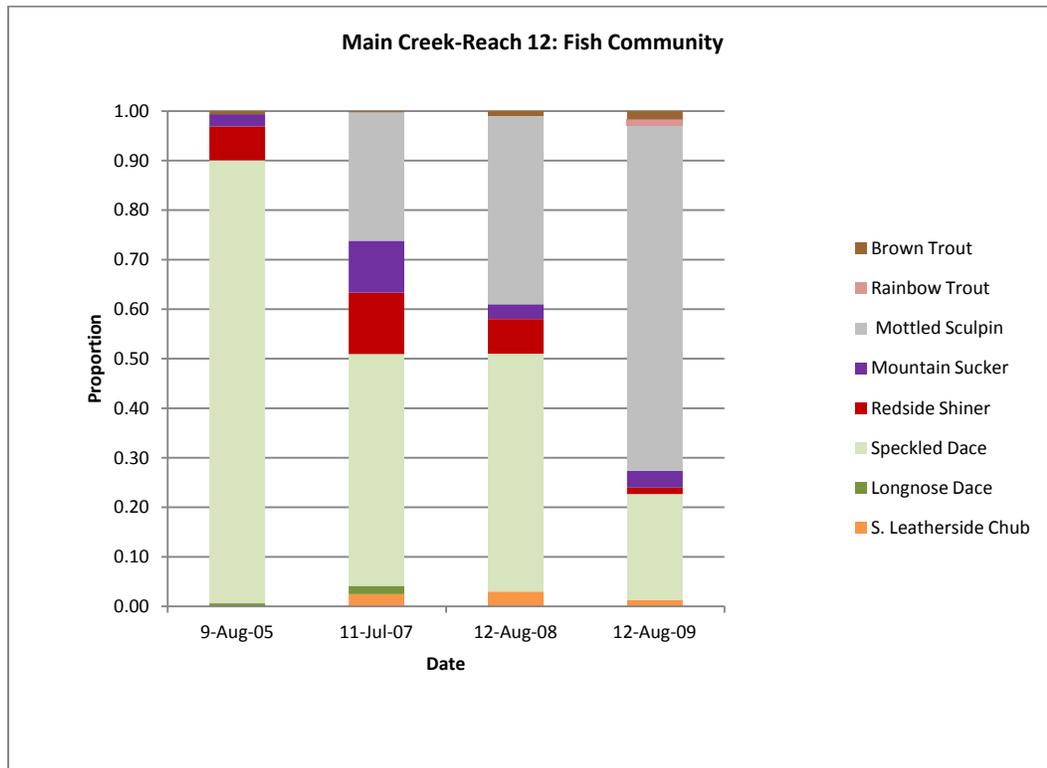
Fish surveys in reach 12 (near the Roundy Lane Bridge) found a fish community composed of native cyprinids and non-native trout (see Figure 5-20 below). The relative proportions of fish species captured during surveys in reach 12 have changed over time. The proportion of mottled sculpin has increased, whereas speckled dace have decreased proportionally since 2005.

What are cyprinids?

Cyprinids are members of the family of freshwater fishes that includes carp and minnows.

A statistical analysis indicates that the relative abundances of the five most common species in reach 12 in 2009 differed significantly from previous years (Grover and Crockett 2010). The reach contains low densities of southern leatherside chub (0.97 individual per 100 square meters) with average lengths of 86 millimeters and average weights of 8.3 grams. The reach also contains low densities (63 individuals/kilometer) of non-native brown and rainbow trout (see Table 5-16 above).

Figure 5-20. Fish Community Composition, Main Creek near Roundy Lane



Source: Utah Division of Wildlife Resources 2010

Main Creek Lower Reaches

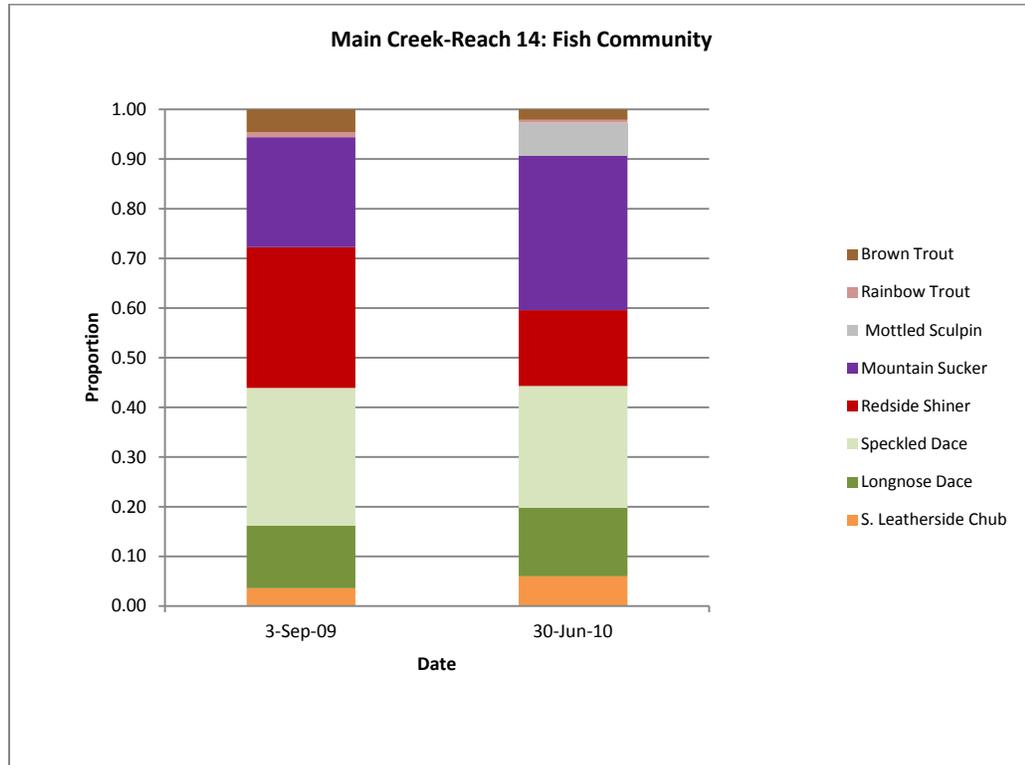
There are two monitored fish survey sites (reaches 14 and 16) in the lower 1.4 kilometers of Main Creek. Reach 14 has a diverse assemblage of species proportionally dominated by native cyprinids and suckers (mountain sucker, speckled dace, and reddsider shiner) (see Figure 5-21 below). Southern leatherside chub densities (3.81/100 square meters) in reach 14 are significantly higher than in any other site in Main Creek (see Table 5-16 above). A sampling error in 2009 prevented the determination of an accurate trout population estimate, but the site was resurveyed in 2010. Relatively low densities of trout (123/kilometer) were encountered in 2010. Of those 123/kilometer, only 58/kilometer were of a total length over 150 millimeters. The sampling location for reach 16 is upstream of US 189 near Main Creek's confluence with Deer Creek Reservoir.

Surveys in 2009 found a fish community dominated by mottled sculpin and brown trout (see Figure 5-22 below and Table 5-15 above). Multiple surveys have detected the presence of fish species associated with Deer Creek Reservoir, including green sunfish and yellow perch. The reservoir also serves as a source of rainbow trout migration into Main Creek. Such migration will be harmful to the upstream Bonneville cutthroat trout if hybridization between the two species occurs (Lentsch et al. 1997). The reach contains relatively high densities of trout (predominantly brown trout) with an estimated 871 individuals per kilometer, of which 467 are over 150 millimeters in total length (see Table 5-16 above).

No southern leatherside chub have been detected in reach 16 since 2007. The distribution and abundance of southern leatherside chub in Main Creek likely reflect a complex interplay

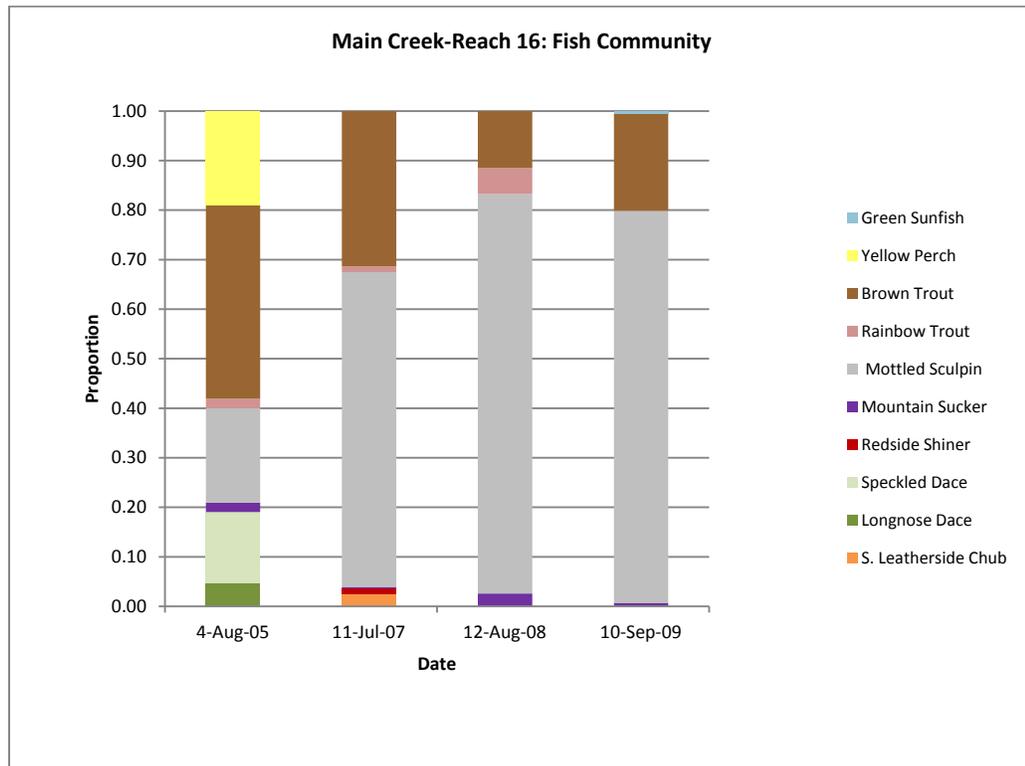
between habitat parameters and the influence of other species. Brown trout, a piscivorous (fish) predator, harms the habitat associations, foraging success, and survival of southern leatherside chub (Walser et al. 1999; Wilson and Belk 2001; Nannini and Belk 2006). Recent population estimates for southern leatherside chub and brown trout at sites in streams in which both species are present indicate that population densities of southern leatherside chub are negatively correlated with the population densities of brown trout in the Provo River (including Main Creek), the Spanish Fork River, and San Pitch River sub-basins (Grover and Crockett 2010).

Figure 5-21. Fish Community Composition in Lower Main Creek



Source: Utah Division of Wildlife Resources 2010

Figure 5-22. Fish Community Composition in Reach 16 of Main Creek

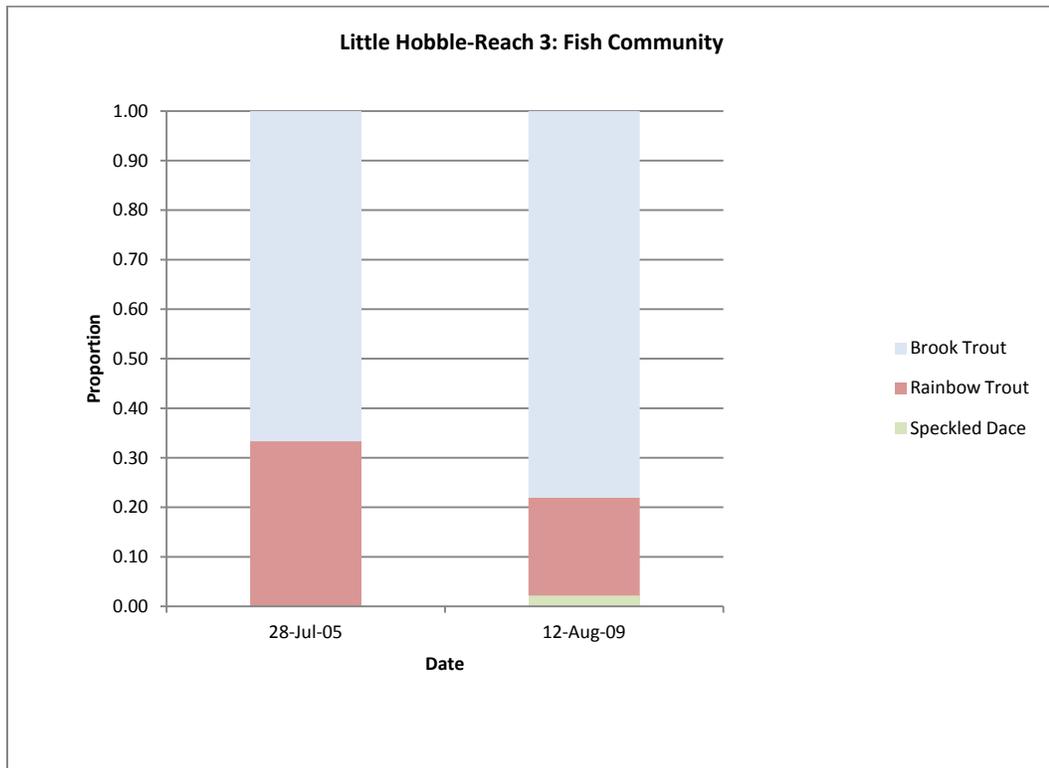


Source: Utah Division of Wildlife Resources 2010

Little Hobble Creek

There are limited recent survey data for Little Hobble Creek with the exception of surveys conducted in 2005 and 2009 near its confluence with Main Creek (see Figure 5-17 above). Species composition in 2009 was proportionally composed predominantly of non-native trout (brook trout, 78%; rainbow trout, 20%) with only a small proportion of speckled dace (2%) inhabiting the system (see Table 5-15 above). In 2005, a similar trout community was present, but no speckled dace were found (see Figure 5-23 below). Historic surveys conducted in the early 1970s indicate a fish community composed predominantly of native Bonneville cutthroat trout (Utah Division of Wildlife Resources 1973). It appears that Bonneville cutthroat trout have been eliminated from the lower reaches, but additional surveys are needed to determine whether Bonneville cutthroat trout still persist in the headwaters.

Figure 5-23. Fish Community Composition in Reach 3 of Little Hobble Creek



Source: Utah Division of Wildlife Resources 2010

Amphibian Surveys

Amphibian monitoring surveys were conducted from 2008 to 2011 in an effort to locate Columbia spotted frogs in the Wallsburg watershed. Current data (Grover and Crockett 2010) suggest that the Columbia spotted frog population in the watershed is relatively small (less than 20 individuals). Additional exploratory surveys of suitable habitat are needed in order to better evaluate the extent and viability of this population. The Division of Wildlife Resources is optimistic that future surveys will reveal a substantially larger population in the riparian corridors of Main and Little Hobble Creeks.

Aquatic Resource Recommendations

Several conservation strategies could be implemented in the watershed to enhance fisheries and aquatic resources. Implementation of all objectives is needed to fully protect aquatic resources in the watershed. A brief overview of each objective is included below.

Objective 1: Increase year-round hydrology and create a more natural channel morphology in lower Main Creek. Several entities (including the Utah Division of Wildlife Resources and NRCS) have identified impaired reaches in the watershed with dewatered sections, incised banks, inadequate riparian vegetation, excessive erosion, and other detriments to fisheries and aquatic resources.

- **Strategy 1:** Identify priority reaches for restoration based on current conditions, landowner support, and restoration feasibility. Create and implement a comprehensive stream-restoration plan.
- **Strategy 2:** Conduct an in-stream flow study to determine the minimum flow needed to maintain aquatic resources and desired stream function in Main and Little Hobble Creeks.
- **Strategy 3:** Acquire minimum sustained in-stream flows in the watershed through purchasing and/or leasing water and implementing collaborative water conservation/efficiency projects.
- **Strategy 4:** Cooperate with landowners to establish conservation easements that will ensure the long-term protection of riparian and wetland habitats.

Objective 2: Increase densities of Bonneville cutthroat trout and southern leatherside chub (two Utah sensitive species, both endemic to the Great Basin).

- **Strategy 1:** Mechanically and/or chemically remove non-native trout species from the middle and lower reaches of Main Creek to reduce predation, competition, and hybridization threats to Bonneville cutthroat trout.
- **Strategy 2:** Install a fish barrier in the lower downstream reaches of Main Creek to prevent the migration of non-native species from Deer Creek Reservoir. Non-native fish species pose predation, competition, and hybridization threats to Bonneville cutthroat trout and a predation threat to southern leatherside chub.

Objective 3: Increase angler access in the watershed.

- **Strategy 1:** Develop walk-in-access lease agreements and other partnerships with private landowners to allow angling access to Main and Little Hobble Creeks. The Utah Division of Wildlife Resources' Walk-In-Access Program monetarily compensates private landowners for public access to their property. Additional access improvements such as fence stiles, parking, and other measures can be funded through Habitat Council grants.

5.6 Forestry Assessment and Inventory

5.6.1 Background

NRCS conducted the forest resources evaluation for forest land in the Wallsburg watershed. This section provides a summary of the evaluation and recommendations. The complete report is included in Appendix D, Grazingland, Forest, and Pastureland Reports.

5.6.2 Results

NRCS's Grazinglands, Forest, and Pastureland report (NRCS 2010c) stated that forest resources in the watershed are in generally good health. Aspen ecological sites showed good regeneration and at least two age classes and low conifer encroachment. Douglas-fir and mixed-conifer stands showed low insect mortality and good age-class distribution with adequate regeneration. The forest report identified an unknown quantity of merchantable timber in the watershed but identified steep slopes as a limiting factor. However, the report goes on to state that, if timber were harvested, reforestation would be important and a silviculture plan would address successful harvesting and reforestation.

The Heber-Kamas Ranger District of the Uinta-Wasatch-Cache National Forest assessed forest resource health for the purpose of reauthorizing current grazing management on the Wallsburg and Little Valley sheep allotments (USFS 2008). The allotments are summarized in Table 5-17. The USDA Forest Service evaluated the current grazing-management practices against the goals and sub-goals of the Forest Plan and concluded that grazing as currently managed meets or is moving toward each of the three applicable forest goals.

Table 5-17. Sheep Grazing Allotments on USFS-Managed Land in the Wallsburg Watershed

Allotment	Drainage	Acres	Animal Units
Wallsburg	Main Creek	5,446	1,200 (June 6 – Oct 5)



5.7 Water Rights Inventory

HDR Engineering, Inc., prepared the water rights inventory, which consists of a data review and GIS (geographic information systems) representation of existing points of diversion in the Wallsburg watershed as identified and administered by the Utah Division of Water Rights (2011). Points of diversion (PODs) are locations where water is removed for use and include underground, surface, return, rediversion, and point-to-point diversions. This section discusses water right diversions and the associated beneficial uses of the water use in the Wallsburg watershed. Detailed maps are provided in Appendix F, Water Right Point of Diversion Maps.

5.7.1 Background

During the CRMP process, water conservation and water quality protection emerged as top priorities of the stakeholders in the Wallsburg watershed. The water rights inventory is intended to help stakeholders understand water use and water management in the watershed.

A recommendation made by several resource agencies was to evaluate the potential to develop an irrigation water source to replace the surface diversions from Main Creek and Little Hobble Creek. If water rights were satisfied from a different source, the natural flows in the creeks could be restored. This recommendation is discussed below and is recommended in order to improve surface water conservation, provide a more reliable source of irrigation water, and provide the water necessary for restoring the riparian and aquatic resources in the watershed.

5.7.2 Results

The Utah Division of Water Rights maintains a database of water right PODs based on information submitted with water right applications. The location data are of varied quality and include both map-scaled and field-surveyed information.

The Division's data indicate that there are 1,127 PODs in the Wallsburg watershed. These PODs and the numbers and statuses of the water rights are summarized in Table 5-18 and shown in Figure 5-24 below. Detailed maps of the watershed showing the locations and types of PODs are attached as Appendix F, Water Right Point of Diversion Maps.

The water right database was analyzed to show recent trends in POD activity in the Wallsburg watershed. For the analysis, the terminated and unapproved water rights were removed from the analysis, leaving 896 PODs that have approved and perfected rights in the watershed. Figure 5-25 below shows the number of approved water right and perfected water right PODs in the watershed for surface and underground diversions only.

What is a perfected water right?

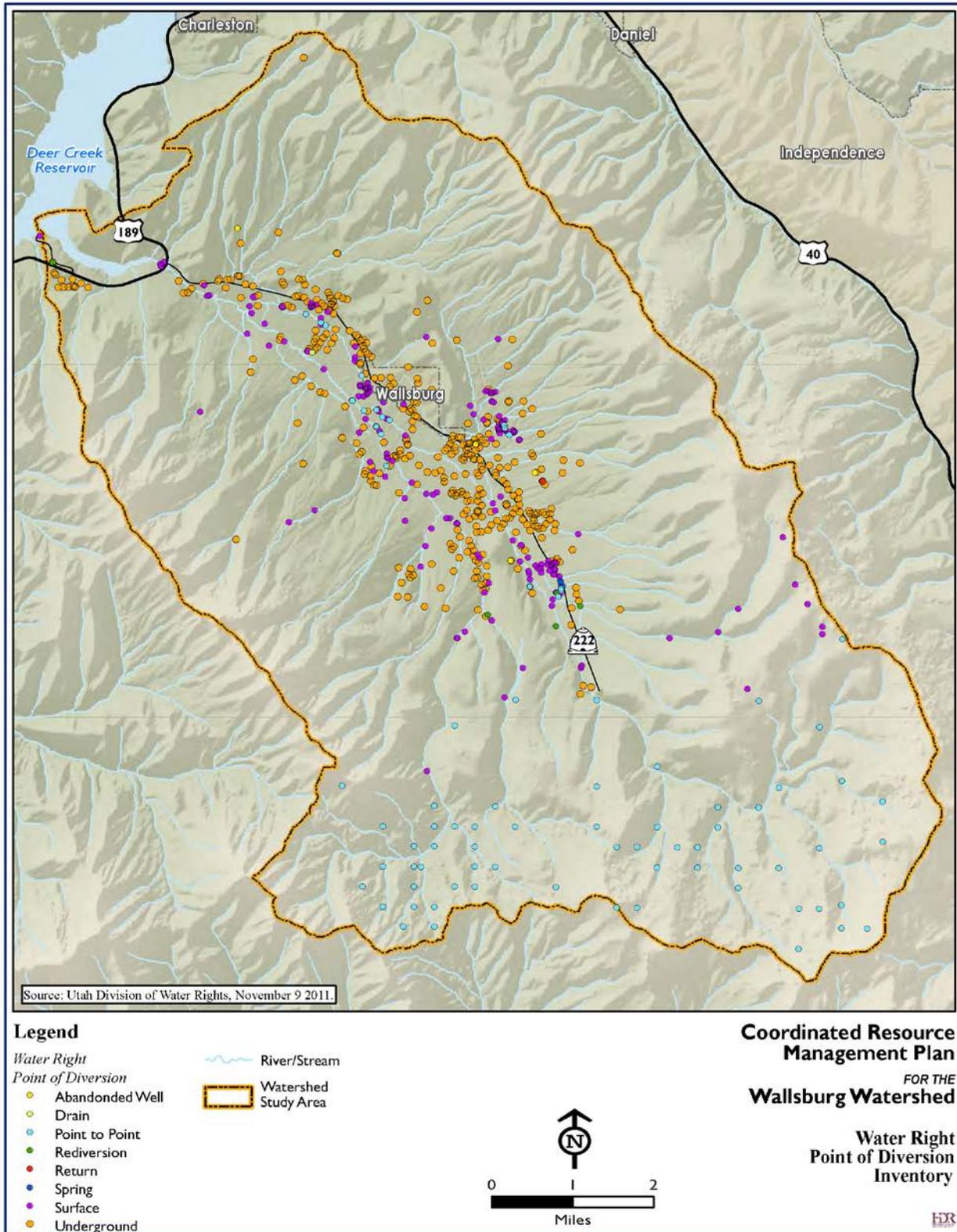
A perfected water right is a fully developed water right that has been certified by the State Engineer.

Table 5-18. Numbers and Statuses of Water Rights for Points of Diversion in the Wallsburg Watershed

Type of POD	Approved	Shares	Perfected	Terminated	Unapproved	POD Totals
Abandoned well	1	0	3	0	0	4
Drain	0	0	1	0	0	1
Point to point	0	0	108	0	41	149
Rediversion	3	0	20	0	1	24
Return	2	0	0	0	0	2
Spring	9	0	1	0	0	10
Surface	31	47	396	37	12	523
Underground	78	0	196	137	3	414
Total	124	47	725	174	57	1,127

Source: Utah Division of Water Rights 2011

Figure 5-24. Water Right Point of Diversion Inventory



Beneficial Use

Many PODs have multiple uses; for instance, a surface diversion can be used for both irrigation and stock watering, while some wells have domestic, irrigation, and stock uses. The beneficial uses for the PODs with perfected or approved water rights are shown in Table 5-19. Each physical POD could have multiple uses, so the total number of PODs in the table is more than the number of physical PODs.

Table 5-19. Number of Points of Diversion Associated with Each Use

Use	Number of PODs ^a
Domestic	424
Irrigation	825
Stock	753
Municipal	8
Other	61
Not listed	89

Source: Utah Division of Water Rights 2011

^a Some PODs have multiple uses and are tabulated under each of their uses.

Water can be withdrawn from the natural source by many different types of diversions. Table 5-20 lists the number of PODs by beneficial use and type of diversion for identified PODs in the watershed.

Table 5-20. Number of PODs by Beneficial Use and Type of Diversion

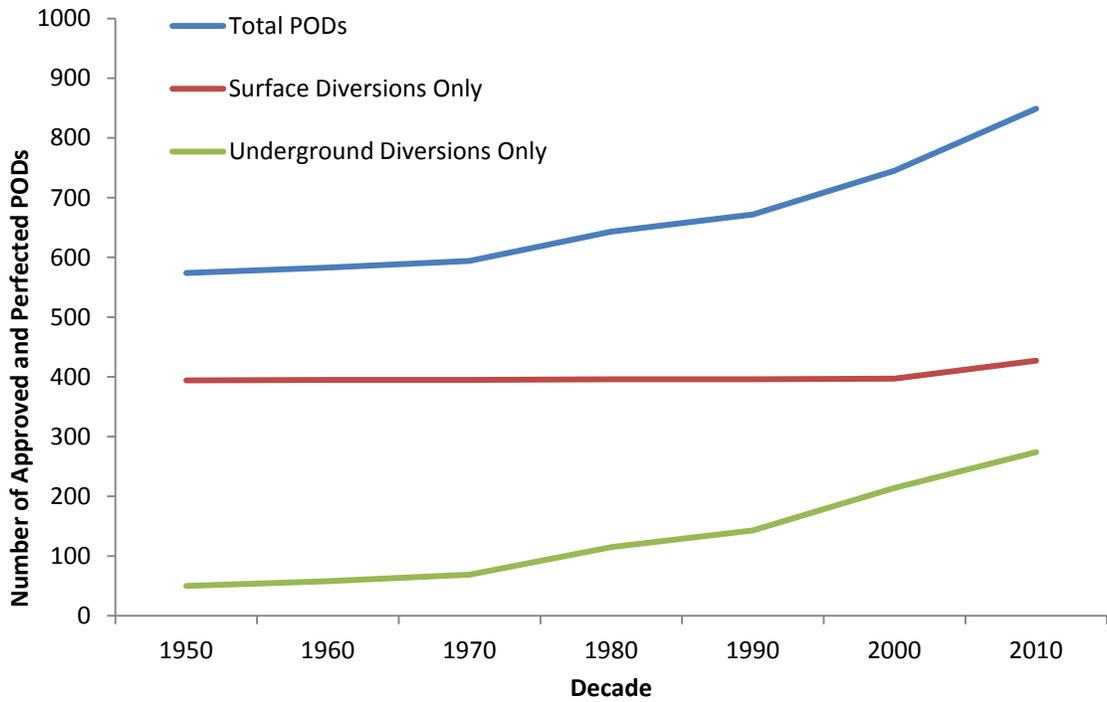
Type of POD	Beneficial Use						Total ^a
	Domestic	Irrigation	Stock	Municipal	Other	Not Listed	
Abandoned well	4	4	2	0	0	0	4
Drain	0	1	1	0	0	0	1
Point to point	40	1	148	0	36	1	149
Rediversion	3	22	13	0	0	0	24
Return	2	2	2	0	0	0	2
Spring	9	10	1	0	0	0	10
Surface	67	462	296	2	15	27	536
Underground	299	323	290	6	9	61	426
Total^a	424	825	753	8	61	89	1,152

Source: Utah Division of Water Rights 2011

^a Some PODs have multiple uses and are tabulated under each of their uses.

Data were analyzed to identify PODs that have approved or perfected rights by decade. This analysis shows a trend of increasing underground PODs in the last 20 years. These data are shown in Figure 5-25 below.

Figure 5-25. Approved and Perfected Surface and Underground Water Right PODs since 1950



Source: Utah Division of Water Rights 2011

The water rights inventory analysis identifies a trend in water appropriation that could support the concern of some water users that the watershed no longer yields enough water to satisfy all rights. Utah follows the doctrine of prior appropriation; that is, the first person to use the water (“senior appropriator”) acquires the right (“priority”) to use the water against all later users (“junior appropriators”). The community recognizes the value of water conservation, and this analysis supports the need for water-conservation programs so that all water rights can be exercised.

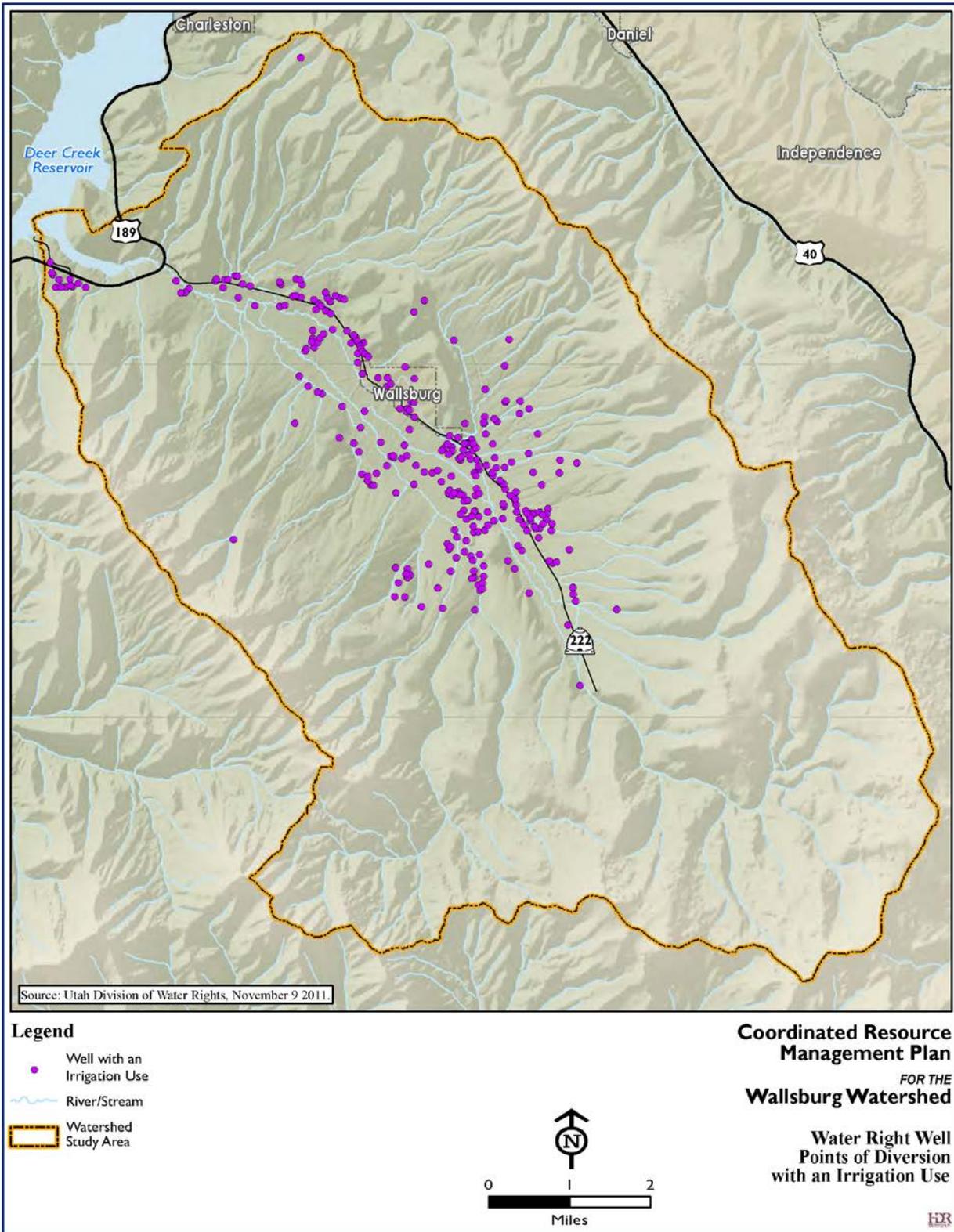
Figure 5-26 below shows the underground PODs that have a beneficial use of irrigation.

5.7.3 Recommendations

Water conservation, water rights, and irrigation-water management were three of the top five resource priorities identified during this CRMP process. Any watershed-improvement projects should not harm the ability of water right holders to exercise their rights.

The recommendation to conduct preliminary planning for a Wallsburg watershed improvement plan is supported by each of the resource evaluations made in the watershed and is specifically recommended by the riparian assessment (see Section 5.2, Riparian Assessment and Inventory) and the grazinglands resource assessment (see Section 5.3, Range Assessment and Inventory). Because the majority of water right PODs provide water for irrigation and stock use, the preliminary planning should first focus on evaluating an alternate or supplemental water supply for irrigation and stock-watering uses.

Figure 5-26. Water Right Well Points of Diversion with an Irrigation Use



In discussions with Central Utah Water Conservancy District and Wasatch Conservation Board members, it was determined that the preliminary planning should meet the following goals: (1) identify supplemental or alternate irrigation and stock water sources; (2) identify opportunities to improve irrigation efficiency; (3) identify the water development, conservation, and efficiency improvements necessary to restore natural flows to Main Creek and Little Hobble Creek; and (4) identify additional means of improving the quality of water in Main Creek that flows into Deer Creek Reservoir by reducing the amounts of sediment and phosphorus.

The preliminary planning study should include, at a minimum, the following tasks:

- **Inventory existing irrigation systems.**
 - Identify irrigation and ditch companies, conveyance systems and diversions, water rights, and places of use.
 - Determine the acreage of irrigated and stock water rights from (1) surface diversions of each of the major creeks (Spring Creek, Little Hobble Creek, and Main Creek) and (2) underground PODs.
- **Determine the needed water supply.**
 - Identify the amount of irrigation and stock water required to satisfy water rights and ways it could be delivered so that existing irrigation companies can use the current infrastructure.
 - Identify water rights (transactions) or the beneficial-use conversions required to meet water needs and project goals.
- **Identify potential sources of water.**
 - Potential sources of water could include:
 - Strawberry Reservoir water supplied to the Wallsburg watershed through Soldier Creek or the Diamond Fork system
 - Daniels Pond (via the Central Utah pump station)
 - A new groundwater supply well
 - Deer Creek Reservoir water that would be pumped up to the watershed
 - A new storage facility on Little Hobble Creek
 - Wasatch County agricultural water (pipeline from Charleston)
- **Assess the benefits of each proposed watershed-improvement project.**
 - Evaluate and quantify the benefits of the project to the irrigation-water-management companies, irrigation efficiencies, aquatic and riparian resources, agricultural production, water quality, and Deer Creek Reservoir water quality.
- **Determine costs and funding.**
 - Determine the lifecycle costs for each project alternative, operating entity, and funding partner.

The preliminary planning should include coordination with the Wasatch Conservation Board, the Central Utah Water Conservancy District, the WWCC, the Provo River Watershed Council, irrigation companies in the Wallsburg watershed, and state and federal agencies as

required. The Wasatch Conservation District estimates that this planning will cost between \$50,000 and \$100,000 depending on the number of alternatives evaluated and the coordination needed.

5.8 Septic Tank Functionality

The Wasatch County Health Department provided a compilation of information regarding the use and management of onsite wastewater systems and recommendations for future water quality issues related to these systems in the Wallsburg watershed. The complete report discusses the typical design of these systems and how they can fail and estimates the number of systems in the watershed. The complete report is provided in Appendix G, Septic Tank Functionality Report. Below is a summary of the report and the County's recommendations.

5.8.1 Background

The Wasatch County Health Department provided a summary and assessment of onsite wastewater treatment systems (septic tanks) in the Wallsburg watershed. The Department's report, *Onsite Wastewater Treatment Systems in the Wallsburg Watershed* (WCHD 2011), is included in Appendix G, Septic Tank Functionality Report. Figure 5-27 below was taken from this report and shows the locations of septic tanks in the watershed.

The Wasatch County Health Department is unaware of any ongoing studies or sampling of groundwater in the Wallsburg watershed area (WCHD 2011). Historically, there has been limited documentation of groundwater sampling data from wells and springs in the area. A 1991 study titled *Hydrology of Heber and Round Valleys, Wasatch County, Utah, with Emphasis on Simulation of Ground-water Flow in Heber Valley* was published by the Utah Department of Natural Resources (UDNR 1991). This report contained chemical analysis data from 14 wells and springs in Round Valley. One data point was from a sample collected in 1941, and the remaining data points were from samples collected in 1989. The samples were analyzed for 25 inorganic properties, not all of which had reported analytical data. The health department's 2011 report did not report the analytical data from the report by UDNR (1991).

In 1993, Wasatch County contracted Hansen, Allen & Luce, Inc., to prepare a hydrogeologic/water quality study to address some of the county's most pressing water quality issues (WCHD 2011). Wasatch County has sensitive watersheds that provide a significant portion of the culinary water supply to large population areas downstream. Throughout the years, Wasatch County has made significant efforts to protect the quality of the vulnerable water resources. The stated purpose of the study was to "assess the adequacy of current county water quality protection measures and to prepare or strengthen guidelines in the following three areas as needed: drinking water source protection, septic system usage, and surface water quality protection." The study is significant to this CRMP since it reviewed, collated, and summarized significant data specific to Wasatch County, including the Wallsburg watershed. Figure 5-28 below shows general groundwater elevation levels in the Wallsburg watershed, and Figure 5-29 below shows groundwater velocities and flow directions in the valley.

Figure 5-27. 2005 Survey of Septic Tanks in the Wallsburg Watershed

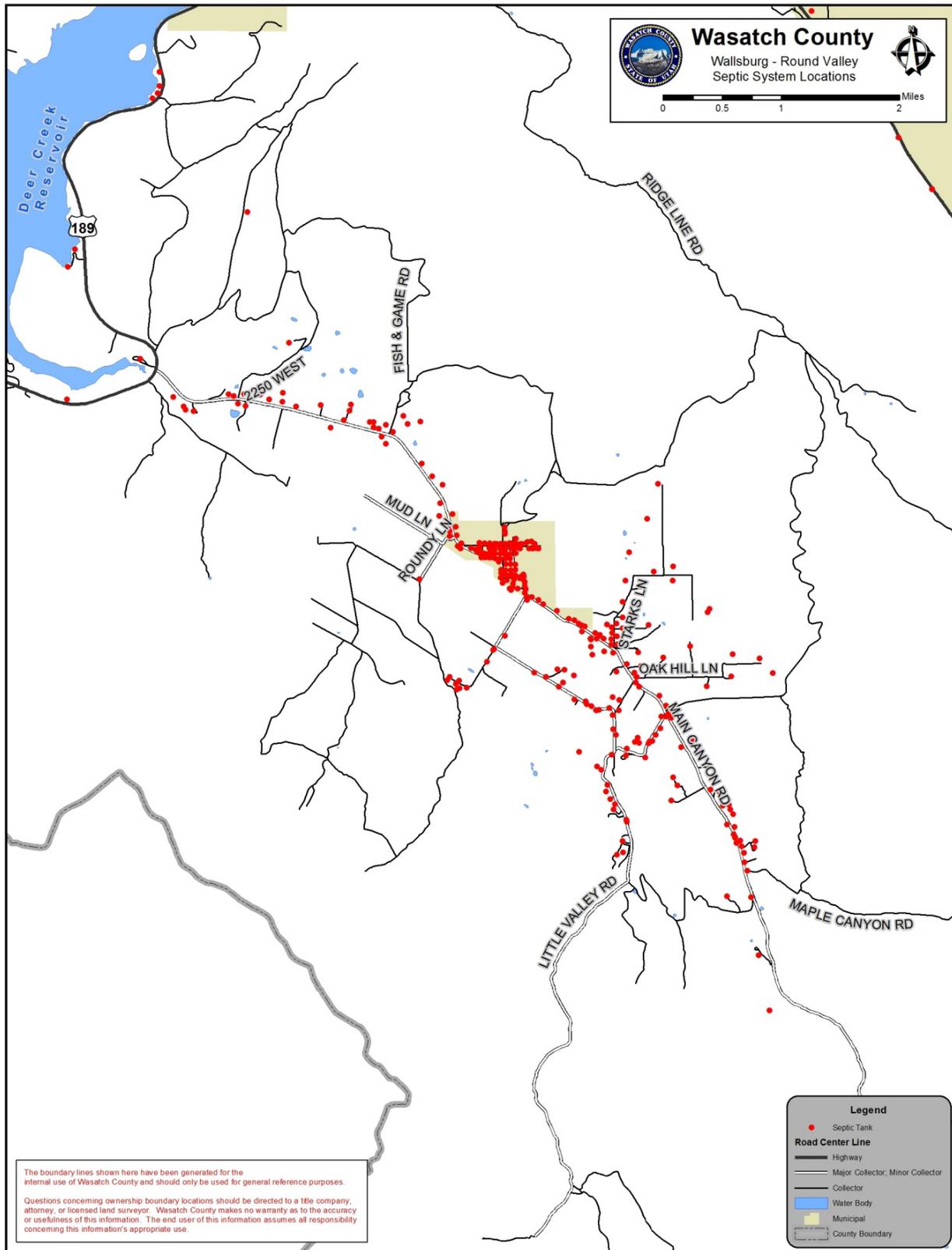
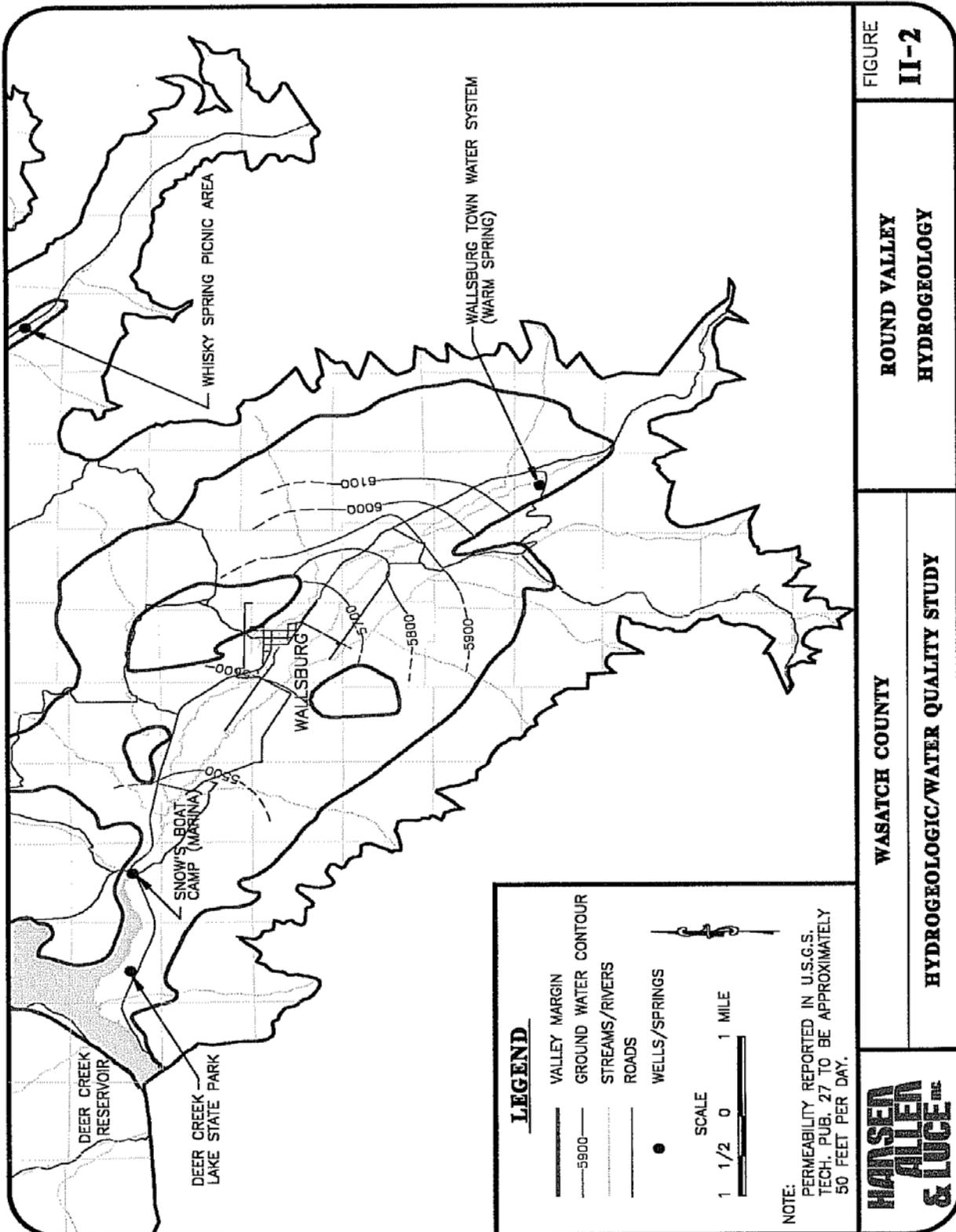
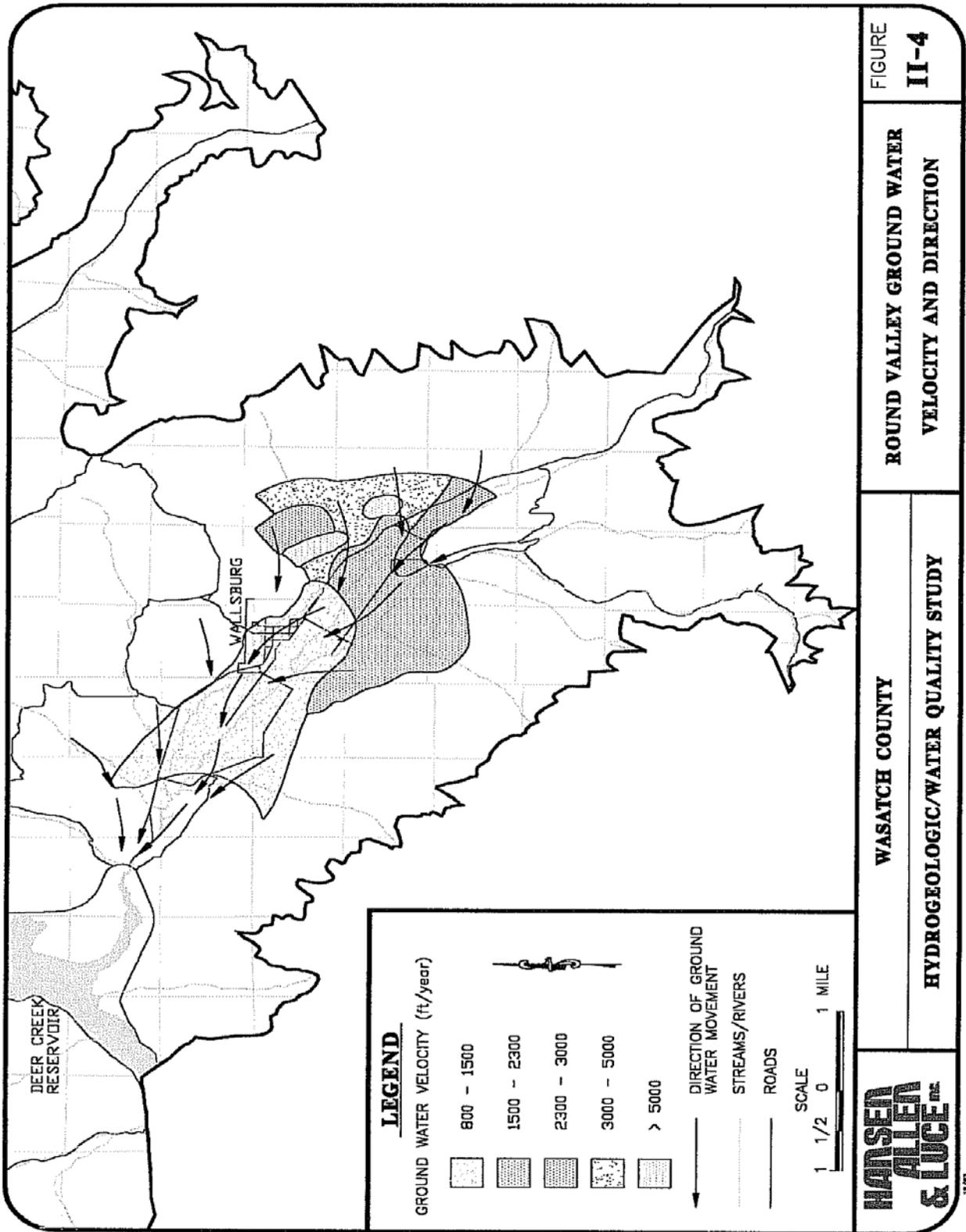


Figure 5-28. Hydrogeology in the Wallsburg Watershed



Source: Hansen Allen & Luce 1994

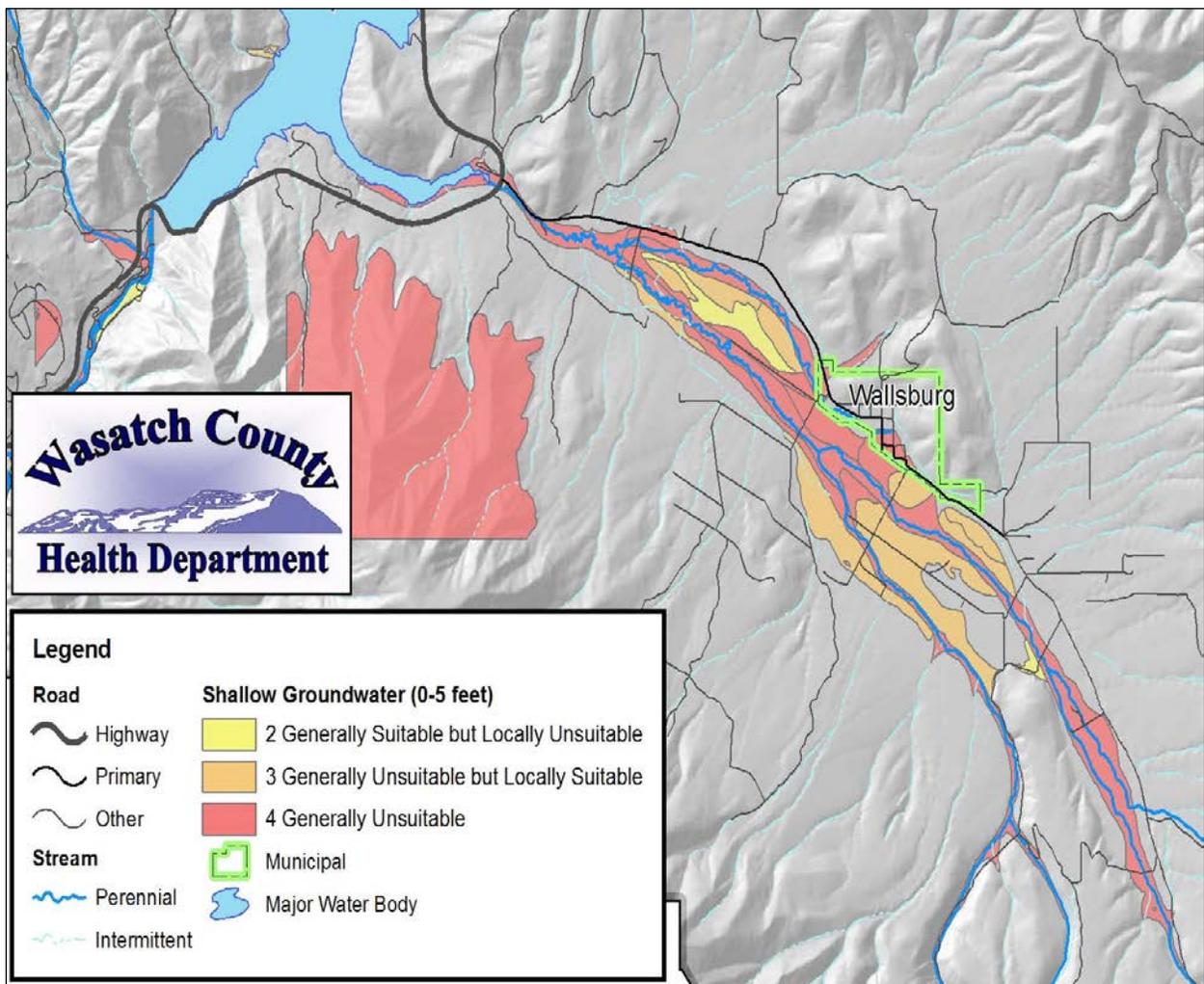
Figure 5-29. Groundwater Velocity and Direction in the Wallsburg Watershed



Source: Hansen Allen & Luce 1994

Most significantly, the Hansen, Allen & Luce report provided recommendations that Wasatch County has acted on, in part in the Wallsburg watershed, to reduce impacts on water quality. Specifically, Wasatch County increased the minimum size of new parcels to the recommended 5 acres as an attempt to reduce water quality issues caused by the densities of onsite wastewater treatment systems (OWTS). Additionally, the report recommended improving site evaluation and monitoring depths to groundwater. The report also reaffirmed Wasatch County’s rule requiring a 4-foot minimum separation to groundwater from the soil absorption system, replacing the 2-foot minimum separation requirement in Utah Code R317-4. Figure 5-30 shows the feasibility determination for OWTS as it relates to the depth of groundwater.

Figure 5-30. Suitable Areas for Onsite Wastewater Treatment Systems Given the Depth to Groundwater



Source: WCHD 2011

5.8.2 Results and Recommendations

The Wasatch County Health Department maintains files for properties where OWTS have been installed and operated. However, records extend only back to the 1980s and sometimes to the 1970s. A survey was conducted in 2005 in an attempt to identify parcels with OWTS and to locate the components of the systems. According to the data collected from the Department's files and the results of the survey, there were 289 OWTS in operation in the Wallsburg watershed in 2005. To take into account systems that might have been missed and the permits issued since that time, this CRMP estimates that there are 320 OWTS in the Wallsburg watershed.

The Department conducted a hydrogeologic study on groundwater in the Heber Valley. This study consisted of collecting groundwater samples and performing chemical analyses for pollutants of concern; collecting data related to the elevation of groundwater and flow directions; correlating the data collected with the existing U.S. Geological Survey three-dimensional, finite-difference groundwater flow model; and predicting the future septic tank influence on groundwater conditions based on future land-use build-out conditions. The Department was able to better understand the influence and effect of septic tanks on groundwater through this study and recommends that a similar study be conducted for the Wallsburg watershed. The Wallsburg study might be more effort if a groundwater model is developed for the existing and future data analyses, since there is no existing groundwater model for the area.

On average, about one to two failing OWTS a year in the area are reported to the Department. A wastewater permit is required for all failures, repairs, and replacements of OWTS. Unfortunately, not everybody reports a failure, repair, or replacement of their OWTS as required by the Department's wastewater rules.

Technologies are available for constructing new OWTS and repairing or replacing existing OWTS. Design techniques could be required that allow better treatment of wastewater and sustainability of the OWTS. Such techniques include oversizing the tank and drainfield, providing convenient access to the tank and drainfield for inspection purposes, using alternating drainfields, dosing the effluent throughout the drainfield through a pressurized system, and using alternative technologies that treat the effluent prior to disposal for water quality's sake.

However, these new technologies come with a price to the property owner. The Department estimates that a conventional OWTS for a single-family residence costs between \$8,000 and \$10,000 depending on the site conditions. The new alternative technologies could cost as much as \$20,000 per single-family residence. The Department recommends that a study be done with community outreach and involvement to evaluate the costs and benefits of requiring alternative treatment systems for new home construction and repairing or replacing existing systems in the Wallsburg watershed and to evaluate whether funds are available to offset the increased treatment costs.

Forming a sewer district should also be considered. A sewer district could be used to convert existing systems in the Wallsburg watershed to a modified centralized sewer system or even a traditional centralized sewer system. The centralized sewer treatment system would need to meet current no-discharge requirements pertaining to the Provo River watershed.

Regarding the use of OWTS in the Wallsburg watershed, the Department presents the following recommendations:

- Because private citizens own and operate these systems, there is limited ability to ensure the systems' proper operation and maintenance. For this reason, steps should be taken to initiate an educational campaign for property owners to help them understand how to operate and maintain their systems in a manner that minimizes impacts.

Estimated cost: \$7,500

- Develop and institute a maintenance program for all OWTS in the area. This program could be voluntary or could be overseen by an onsite wastewater management district. The program could require all OWTS owners to obtain an operating permit that would require the submission of proof of annual inspections of the entire system for renewal; or those participating could just be required to pump the septic tank and inspect all components of the system every 3 to 5 years of operation.

Estimated cost for voluntary program: \$7,500

Estimated cost for formal district program: \$25,500

- To understand the water quality issues in the Wallsburg watershed, the Department recommends that an expanded hydrogeologic/groundwater quality study, similar to the 1994 study for the Heber Valley area, be considered specifically for this area. This study could better evaluate the actual and future impacts to groundwater and surface water resources in the area from not only OWTS but also from agricultural and residential practices, changes in irrigation patterns, and use of pesticides and fertilizers.

Estimated cost: \$85,000

- Conduct a community-based study to identify the feasibility of requiring improved treatment systems for all new, repaired, or replaced OWTS. The study would look at the impact to current ordinances, future development, acceptable alternative technologies, potential funding to offset the increased treatment requirement, and community acceptance.

Estimated cost: \$25,000

- Conduct a feasibility study to evaluate the impacts and costs of alternative sewer collection and treatment systems. Potentially evaluate the impacts of using a STEP system (septic tank effluent pumping system that moves wastewater to a centralized disposal area) and the traditional centralized sewer system (central collection of sewage with treatment and disposal) as well as other options.

Estimated cost: \$60,000

5.9 Hydrology

NRCS conducted a hydrology analysis to evaluate the flow regimes of Main Creek in the Wallsburg watershed. This qualitative and quantitative evaluation was conducted by NRCS hydrologists and is summarized below. The complete hydrology report is provided in Appendix H, Hydrology Report.

5.9.1 Background

The Utah NRCS office conducted a hydrology study of the Wallsburg watershed to estimate potential discharges from the ungaged watershed (NRCS 2010b). Three hydrology models were used to derive the various parameters necessary to estimate the return interval discharges that could be expected from the Wallsburg watershed: NRCS GeoHydro, HEC GeoHMS, and WinTR20. A verification and sensitivity analysis was conducted on the model results to verify the accuracy of the predictions. The verification study included a comparison of model predictions to USGS regression equations and USGS stream gages in the vicinity.

What are return interval discharges and bankfull discharges?

A return interval discharge is the flow in a creek from a probabilistic storm event. A bankfull discharge is generally the flow in a creek from a 2-year storm event.

A bankfull analysis was also conducted to determine the Main Creek discharges. Details of the modeling techniques and verification of the analysis used, as well as model inputs and outputs, are included in the *Wallsburg (Round Valley) Hydrology* report in Appendix H, Hydrology Report.

5.9.2 Results and Recommendations

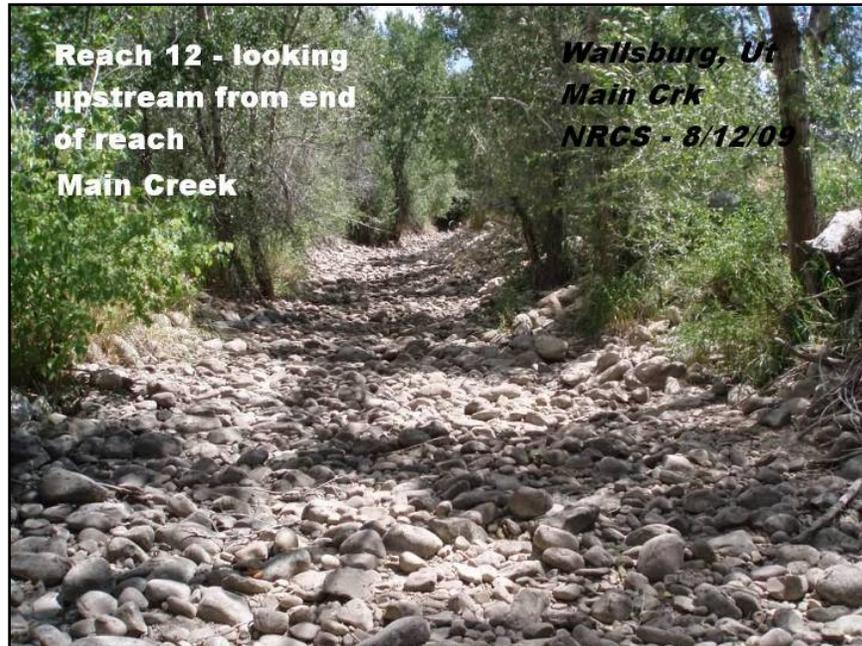
The Main Creek drainage system was delineated into 12 sub-basins. Table 5-21 summarizes the average return interval discharges at the outlet of Round Valley predicted by the NRCS report (NRCS 2010b).

Table 5-21. Return Interval Discharges for Main Creek

Watershed Area (square miles)	2-Year Event (cfs)	5-Year Event (cfs)	10-Year Event (cfs)	25-Year Event (cfs)	50-Year Event (cfs)	100-Year Event (cfs)
70.09	142.6	163.3	229.0	386.5	556.5	860.9

Source: NRCS 2010b

The NRCS (2010b) hydrology report did not make specific recommendations. However, the information in the report should be considered in any engineered restoration project.



5.10 Pastureland Assessment

NRCS conducted an inventory of pasture and hayland in the Wallsburg watershed. In addition to the inventory, NRCS evaluated wildlife habitat and the effects of current irrigation practices on water quality and quantity. The complete report is provided in Appendix D, Grazingland, Forest, and Pastureland Reports. Below is a summary of the assessment with NRCS's recommendations.

5.10.1 Background

In the NRCS report, pasturelands in the Wallsburg watershed were divided into nine categories based on their use, management, and soils. Wet meadows, including wild flood and pasture, account for the largest acreage of land, followed by pastures with grass and alfalfa.



5.10.2 Results and Recommendations

NRCS estimates that about 3,186 acres of the Wallsburg watershed are irrigated pasture and hayland. The land categories and a summary of observations from the *Wallsburg Watershed Grazinglands* report are provided in Table 5-22.

Table 5-22. Irrigated Pasture and Haylands in the Wallsburg Watershed

Irrigated Land Category	Acres	Observations
Wet meadows	933	Flood and sub-irrigated pastures with high plant diversity; some poisonous and undesirable weeds present. Typically one hay cut and continuous season-long grazing.
Grass/alfalfa hay	835	Dominant use for irrigated, low-water-table lands. Flood and sprinkler irrigation used. Few weeds. Typically two hay cuts and stubble grazing in fall.
Horse pasture	436	Season-long grazing, severely used. Mostly flood-irrigated, non-native grasses with many weeds. Low forage production from poor management.
Irrigated pasture grass	265	
Buildings and farmsteads	557	All yards, buildings, parking lots, etc., in the watershed were included in this category.
Alfalfa/grain rotation	52	Well managed.
Abandoned	20	
Alfalfa pasture	88	Alfalfa apparently used for pasture.
Total	3,186	

Source: NRCS 2010c

The major resource problems related to rangelands that were identified in the grazinglands report are summarized below.

- Invasive species:
 - Lower-elevation understory plant communities are dominated by bulbous bluegrass, which decreases the value for wildlife habitat and livestock forage.
 - Noxious weeds, including musk, Canadian and Scotch thistle, and knapweeds are present in the watershed and could rapidly expand if not controlled.
- Livestock forage:
 - Forage production is below potential. Replacing invasive species with perennial grasses and improving grazing management could improve production.
 - Inadequate stock-watering sources limit the grazing management flexibility needed to accomplish time-controlled grazing.

The recommendations made in the pastureland report are summarized in Table 5-23. More details can be found in Appendix D, Grazingland, Forest, and Pastureland Reports.

Table 5-23. Recommended Practices to Improve Pasturelands in the Wallsburg Watershed

Practice	Activity	Description	Cost Estimate
Small-pasture management	Public outreach campaign	Educate landowners on principles of irrigation management and grazing management to maximize forage production.	\$20,000
Planting improved forage species	Establish Garrison creeping meadow foxtail	Plant Garrison creeping meadow foxtail on half of the 933 acres of wet meadow.	\$23,325
Total			\$43,325

Source: NRCS 2010c

The pastureland report (NRCS 2010c) also suggested that converting the flood-irrigated lands to pressurized sprinkler irrigation and/or exchanging water would yield great benefits for water quality and conservation and should be explored.

6.0 Summary of Watershed Recommendations

The overall goal of this watershed CRMP is to identify watershed priorities based on stakeholder input, assess existing resources in the Wallsburg watershed, and develop a framework of recommendations and actions that can be implemented to address priorities.

The top three priorities for the watershed identified in this CRMP are:

- Managing and conserving water quality and quantity
- Improving rangeland and pastureland
- Managing riparian corridors

Table 6-1 below identifies recommendations for restoring the riparian corridors and grazing management to improve water quality in Main Creek, Spring Creek, and Little Hobble Creek. Developing a supplemental irrigation water source would allow better water management and increase water conservation.

To address the resource needs and priorities, resource agencies and consultants developed the following recommendations presented in Table 6-1 for specific projects. Implementing these recommendations is strictly voluntary on the part of the landowners and watershed council partners. Designation as a partner does not imply responsibility or commitment of resources.

In all, implementing the recommendations would cost an estimated \$2.9 million and would involve multiple landowners. This plan identifies funding programs through NRCS (Environmental Quality Incentives Program [EQIP], Conservation Resource Program [CRP], and Wildlife Habitat Incentives Program [WHIP]), the Utah Department of Agriculture and Food, Provo River Watershed Council, Wasatch County, the Utah Division of Water Quality (319 Non-point Source Program), and the Utah Division of Wildlife Resources as potential funding sources.

Table 6-1. Wallsburg Watershed Recommendations

Resource	Objective	Strategy	Estimated Cost	Partners ^a
Information and Education	Publicize opportunities for landowners to participate, and increase awareness of watershed issues	Hold watershed committee meetings, create newsletters, update Wasatch Conservation District website, and meet with land owners.	\$25,000	WCD, landowners, residents
Water Conservation	Increase stream flow in Main Creek and Little Hobble Creek	Conduct preliminary planning study to evaluate the Wallsburg Watershed Improvement Plan, which would provide an additional source of irrigation water to the watershed.	\$100,000	CUWCD, WCD
Water Quality	Improve water quality in Spring Creek	Conduct an assessment of the Spring Creek water source to identify the cause(s) of the high phosphorus. Develop a plan to reduce the phosphorus sources to Spring Creek.	\$50,000	NRCS, PRWC
	Riparian corridor conservation practices to minimize sediment transport	Main Creek riparian practices: 4 miles of fence, 44 acres of seeding, 1,000 linear feet of willow planting, 66 acres of weed treatment, grazing management, and 15 watering troughs.	\$233,900	WRP, 319, PRWC, property owners
		Little Hobble Creek riparian practices: 2 miles of fence, 44 acres of seeding, 3,000 linear feet of willow planting, 66 acres of weed treatment, grazing management, and 10 watering troughs.	\$121,000	WRP, NRCS WHIP, NRCS EQIP, 319, PRWC
		Upper Spring Creek riparian practices: 1.2 miles of fence, 44 acres of seeding, 1,000 linear feet of willow planting, 66 acres of weed treatment, grazing management, and five watering troughs.	\$33,500	WRP, NRCS EQIP, NRCS WHIP, PRWC
	Stream corridor restoration for the Beesmark Property	Fencing and restoration practices on 8,390 linear feet of Main Creek: 12,000 cubic yards of earthwork, 60 cubic yards of concrete structure, 5 miles of fence, and 11,400 acres of new vegetation.	\$186,900	WRP, property owners, NRCS, PRWC
Total Water Quality			\$650,300	
Groundwater Quality	Assess hydrogeologic/ groundwater quality	Evaluate current and future impacts to groundwater and surface water resources from OWTS, agricultural and residential land-management practices, change in irrigation patterns, and use of pesticides and herbicides.	\$75,000	Wasatch County, Utah Division of Water Resources
	OWTS education	Educate and inform residents about OWTS and operating and maintenance (O&M) procedures.	\$15,000	Wasatch County
	OWTS management	Develop and enforce an O&M program.	\$25,000	Wasatch County

Table 6-1. Wallsburg Watershed Recommendations

Resource	Objective	Strategy	Estimated Cost	Partners ^a
Groundwater Quality (<i>continued</i>)		Conduct a feasibility study to create an onsite wastewater management district or sewer district. Could require operating permit and annual inspections. Fund through permits or convert onsite systems to a centralized sewer system.	\$ 60,000	Utah Division of Water Quality, Wasatch County
		Create guidance document for best practices for new septic systems.	\$10,000	Wasatch County
	Total Groundwater		\$185,000	
Grazingland	Improve grazingland production	Develop whole-ranch grazing-management plans with the five to seven largest landowners/permittees.	\$80,000	UDAF, USU, UACD, NRCS
	Implement prescribed grazing practices	Target 10,000 acres with conservation plans to implement practices.	\$40,000	USDA Farm Bill Program
	Increase grazing distribution	Develop 10 new/improved stock-watering facilities to facilitate grazing distribution on public and private land.	\$50,000	USFS, Utah Division of Water Rights, NRCS GIP, UDAF
	Implement grazing management	Construct 10 miles of fences to implement grazing management on private land.	\$50,000	NRCS, UDAF
	Implement weed-control practices and education	Conduct public outreach and spot treatment on public and private land.	\$15,000	NRCS EQIP
Pastureland	Education and outreach campaign	Conduct workshops and field days, prepare grazing guide, and conduct personal interviews with landowners.	\$20,000	USU Extension Services, UACD, NRCS
	Plant wet meadow sites	Target 933 acres of wet meadow for seeding with Garrison creeping meadow foxtail.	\$23,300	
Total Grazingland/Pastureland		\$278,300		
Wildlife Habitat	Increase greater sage-grouse and big game habitat	Target 3,150 acres for sagebrush and rabbitbrush treatment, thin shrub canopy, and improve understory plant community.	\$315,000	Utah Division of Wildlife Resources, NRCS EQIP
		Target 2,500 acres for chemical treatment on individual oak clones.	\$50,000	Utah Division of Wildlife Resources, NRCS EQIP
Total Wildlife Habitat		\$365,000		

Table 6-1. Wallsburg Watershed Recommendations

Resource	Objective	Strategy	Estimated Cost	Partners ^a
Aquatic Resources	Restore native fish community	Construct separation structure to restrict the upstream migration of non-native fish from Deer Creek Reservoir into Lower Main Creek.	\$25,000	Utah Division of Wildlife Resources, URMCC
	Restore natural stream conditions throughout the lower 6 miles of Main Creek	Conduct in-stream flow study to determine minimum flow requirements for fisheries habitat.	\$45,000	Utah Division of Wildlife Resources, UWRL
		Restore proper meander ratios, bank slope, and vegetative cover to stream through comprehensive stream-restoration project. Basis of cost is \$100,000–\$150,000 per mile (depending on condition) for 6 miles.	\$900,000	Utah Division of Wildlife Resources, NRCS, Utah Division of Water Quality, HC
	Restore native fish community to Main Creek	Mechanically and/or chemically remove brown trout and stock Bonneville cutthroat trout below Roundy Lane and above the barrier after restoration.	\$8,000	Utah Division of Wildlife Resources
	Increase angling opportunities	Develop walk-in-access leases and other voluntary partnerships with private landowners to allow angling access to Main and Little Hobble Creeks.	\$5,670	WIA, HC
	Ensure Main Creek in-stream flows	Purchase and/or lease in-stream flow and implement water-conservation projects.	TBD	Utah Division of Wildlife Resources, UWRL, NRCS, TU, HC
	Ensure long-term protection of aquatic habitat	Establish conservation easements with private landowners to protect riparian and wetland habitat.	\$350,00	Utah Division of Wildlife Resources, NRCS
Total Aquatic Resources			\$1,333,670	
Grand Total			\$2,937,270	

Table 6-1. Wallsburg Watershed Recommendations

Resource	Objective	Strategy	Estimated Cost	Partners ^a
^a Abbreviations:				
319 = 319 Non-point Source Grant Program (State of Utah)		PRWC = Provo River Watershed Council		USFS = U.S. Forest Service
CUWCD = Central Utah Water Conservancy District		TBD = To be determined		USU = Utah State University
EQIP = Environmental Quality Incentives Program (NRCS)		TU = Trout Unlimited		UWRL = Utah Water Research Laboratory (USU)
GIP = Grazing Improvement Program (NRCS)		UACD = Utah Association of Conservation Districts		WCD = Wasatch Conservation District
HC = Habitat Council		UDAF = Utah Department of Agriculture and Food		WHIP = Wildlife Habitat Incentives Program (NRCS)
NRCS = Natural Resources Conservation Service		URMCC = Utah Reclamation, Mitigation, and Conservation Commission		WIA = Walk-in-Access
		USDA = U.S. Department of Agriculture		WRP = Watershed Restoration Program

7.0 Wallsburg Watershed Implementation Plan

Improvements and recommendations from this planning process have been programmed into a multi-year implementation plan based on funding, landowner partnership, regulating agency partnership, and input from landowners, municipal leaders, and the Wasatch Conservation Board. The watershed CRMP implementation plan and phasing describe a strategy to address the three priorities for the watershed: managing water quality and quantity, improving rangeland and pastureland, and managing riparian corridors.

This CRMP serves as the basis for the area watershed plan, along with the Deer Creek Reservoir TMDL and Wallsburg General Plan. Together, these three documents meet EPA's requirement that nine elements are addressed through the watershed planning process. Table 7-1 lists the nine elements and the document that EPA has identified as critical, and this table will serve as the basis of future CWA Section 319 funding.

Table 7-1. Wallsburg Watershed Plan Elements

Element ID	Watershed Plan Element Description	Documents
a	Identification of causes or sources of pollutants	Deer Creek TMDL, 2006
b	Estimate of pollutant load reduction	Deer Creek TMDL, 2006
c	Description of non-point source management measures	Deer Creek TMDL, 2006; Wallsburg General Plan, 2007; Wallsburg CRMP, 2012
d	Costs and funding sources to implement plan	Deer Creek TMDL, 2006; Wallsburg CRMP, 2012
e	Information/education component	Deer Creek TMDL, 2006; Wallsburg CRMP, 2012
f	Schedule for implementation	Deer Creek TMDL, 2006; Wallsburg CRMP, 2012
g	Description of milestones	Wallsburg CRMP, 2012
h	Criteria to determine if load reductions are met	Deer Creek TMDL, 2006; Wallsburg CRMP, 2012
i	Monitoring component	Deer Creek TMDL, 2006; Wallsburg CRMP, 2012

Implementation of the CRMP studies and projects will be coordinated through the Wasatch Conservation District in cooperation with and with the assistance of federal, state, and local agencies and landowners. The partners identified to date are NRCS, UACD, Wasatch County, the Utah Divisions of Water Quality and Wildlife Resources, and local organizations such as the Provo River Watershed Council and the Utah Reclamation, Mitigation, and Conservation Commission.

Table 7-2 below identifies the phasing of the watershed recommendations and milestones for each of the phases. Four phases have been identified, spanning 13 years; however, the timing of the phases will be based on funding opportunities and landowner participation. Phase 1 will start in 2012 and is scheduled for completion in 2014. If opportunity and funding align, multiple phases could be implemented at the same time.

Table 7-2. Wallsburg Watershed Plan Implementation Phasing and Milestones

Project/Study	Estimated Cost	Phase 1 2012–2014	Phase 2 2014–2018	Phase 3 2018–2020	Phase 4 2020–2025
Watershed information/education	\$25,000	\$5,000	\$5,000	\$10,000	\$5,000
Water supply	\$100,000	—	\$100,000	—	—
Spring Creek study	\$50,000	—	—	—	\$50,000
Stream stabilization	\$600,300	\$285,000	\$229,100	\$86,200	—
Groundwater study	\$75,000	—	—	\$75,000	—
Wastewater study	\$60,000	—	—	—	\$60,000
Septic tank education	\$15,000	\$5,000	\$10,000	—	—
Septic tank mgmt study and guidance document	\$35,000	—	—	—	\$35,000
Grazing management plans	\$80,000	—	—	\$80,000	—
Grazing conservation	\$40,000	—	\$20,000	\$20,000	—
Stock water facilities	\$50,000	—	\$16,000	\$16,000	\$18,000
Stream fencing	\$50,000	\$5,000	\$25,000	\$10,000	\$10,000
Weed control/education	\$15,000	—	\$15,000	—	—
Pastureland guide/workshops	\$20,000	—	—	\$20,000	—
Wet meadow seeding	\$23,300	—	\$23,300	—	—
Greater sage-grouse habitat improvements	\$315,000	—	\$157,500	\$157,500	—
Oak clone treatment	\$50,000	—	—	\$50,000	—
Stream structure/rechannelization	\$925,000	\$285,000	\$250,000	\$150,000	\$240,000
In-stream flow study	\$45,000	\$45,000	—	—	—
Fish stocking	\$8,000	—	—	—	\$8,000
Conservation easements	\$350,000	—	\$150,000	\$100,000	\$150,000
Increase angling opportunities	\$5,670	—	—	—	\$5,670
Provide in-stream flow	TBD	—	—	—	—
Total	\$2,937,270	\$630,000	\$950,900	\$774,700	\$581,670

The Wallsburg watershed recommendations include studies, education, and on-the-ground projects estimated at \$2.9 million. Over 85% of the total estimate is targeted for implementing projects throughout the watershed, with 12% focused on studies and 3% on education and outreach.

Table 7-3 below identifies the overall watershed plan and Phase 1 elements. Phase 1 will start in 2012 led by the Wasatch Conservation District in partnership with other agencies and landowners. Phase 1 will include tasks such as project administration, public information and education, technical expertise, data analysis, and obtaining funding. As landowners and the District identify specific areas for implementation, work plans will be prepared and grant applications and reporting requirements submitted per project and/or phase.

The District also plans that, the end of Phase 4 or sooner, the watershed plan will be evaluated in accordance with an adaptive management approach. Adaptive management is a process that evaluates projects that have been implemented to provide feedback that can be incorporated into the next watershed plan. Periodic review of goals, objectives, and activities, including monitoring results, will provide essential data to determine whether progress is being made.

Table 7-3. Overview of the Wallsburg Watershed Plan and Phase 1 Work Plan

Parameter	Wallsburg Watershed Plan	Phase 1 Work Plan – Lower Main Creek Improvements and Flow Study
Period	2012–2025	2012–2014
Geographic Scope	70 square miles (45,000 acres)	Lower 4.1 miles of Main Creek
Goal Statement	<ul style="list-style-type: none"> • Improve watershed management to reduce the transport of sediment and nutrients to Deer Creek Reservoir through comprehensive resource strategies 	<ul style="list-style-type: none"> • Reduce nutrient and sediment loading to Deer Creek Reservoir from the lower 4.1 miles of Main Creek • Conduct in-stream flow analysis
Objectives	<ul style="list-style-type: none"> • Manage and conserve water quality and quantity • Improve rangeland and pastureland • Manage riparian corridors 	<ul style="list-style-type: none"> • Provide stream bank stabilization and vegetation shading for the lower 4.1 miles of Main Creek • Install fences to control access • Create riparian buffers • Identify in-stream flow quantities to sustain aquatic habitat and riparian corridor
Estimated Costs	\$2.9 million over 13 years: <ul style="list-style-type: none"> • \$75,000 for education • \$355,000 for studies • \$2.4 million for projects 	\$630,000 <ul style="list-style-type: none"> • \$10,000 for education • \$45,000 for in-stream flow study • \$575,000 for stabilization, vegetation, and fences
Partners	<ul style="list-style-type: none"> • Wasatch Conservation District • Natural Resources Conservation Service • Utah Association of Conservation Districts • Wasatch County • Landowners 	<ul style="list-style-type: none"> • Natural Resources Conservation Service • Utah Department of Agriculture and Food • Utah Division of Water Quality, Non-Point Source Program • Utah Division of Wildlife Resources • Utah Reclamation, Mitigation, and Conservation Commission • Provo River Watershed Council • Landowners
Schedule	<ul style="list-style-type: none"> • Begin with visible projects along Main Creek to build on success • Coordinate with landowners and funding partners • Conduct education and outreach throughout • Target stream improvements first • Allow flexibility in plan based on landowner participation, funding, and partner agencies 	<ul style="list-style-type: none"> • Watershed committee landowner contacts, 2012–2014 • Landowner participation arrangements, 2012 • Newsletters and website updates, 2012–2014 • Design lower reach improvements, 2012 • Stream stabilization and vegetation, 2013–2014 • In-stream flow study, 2012–2013 • Project administration and reporting, 2012–2014

Table 7-3. Overview of the Wallsburg Watershed Plan and Phase 1 Work Plan

Parameter	Wallsburg Watershed Plan	Phase 1 Work Plan – Lower Main Creek Improvements and Flow Study
Criteria	<ul style="list-style-type: none"> • Water quality • Aquatic habitat • Riparian corridor • Grazing- and pasture-management plans • Water quantity management and conservation 	<ul style="list-style-type: none"> • Landowner contacts and participation • Feet of Main Creek bank protection and stream bank vegetation • Feet of stream habitat improvement • Miles of fences • In-stream flow study completed • Acres of riparian buffer created, vegetation planted, and vegetation maintained • Administration of contracts
Monitoring	<ul style="list-style-type: none"> • Main Creek water quality monitoring; coordinate with PRWC • Administrative contracts and funds expended and secured • WCD landowner contacts • Changes in public awareness and support • Evaluation of practices implemented and changes made to the watershed plan 	<ul style="list-style-type: none"> • Attend watershed and landowner meetings • Water quality monitoring data review • Education and outreach materials • Feet of stream bank protected and channel vegetation planted and maintained • Feet of stream habitat improvement • Miles of fences • Acres of riparian buffer created, vegetation planted, and vegetation maintained • Contracts executed, funds expended, and project reporting submitted

8.0 List of Preparers

This plan represents a cooperative effort between the Wasatch Conservation District and NRCS with the assistance of state and local agencies, stakeholders, and consultants. The following agencies and people have prepared reports that have been incorporated into this document.

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9.0 References

Bailey, C.L., K.W. Wilson, and M.E. Anderson

- 2006 Conservation agreement and strategy for Columbia Spotted Frog (*Rana luteiventris*) in the State of Utah. Utah Division of Wildlife Resources, Publication Number 06-01, Salt Lake City, Utah.

Belk, M., J. Rasmussen, J. Johnson, and K. Mock

- 2010 Effects of Fragmentation in Leatherside Chub. Draft Final Report prepared for the Southern Leatherside Chub Conservation Team. Utah Division of Wildlife Resources, Salt Lake City, Utah.

Crockett, C., M. Mills, P. Thompson, P. Webber, K. Wheeler, and R. Fridell

- 2009 Columbia Spotted Frog (*Rana luteiventris*) Statewide Monitoring summary; Central and Northern Regions, 2009. Pages I-1 through I-32 in Columbia Spotted Frog (*Rana luteiventris*) Statewide Monitoring Summary, 2001-2008. Utah Division of Wildlife Resources, Publication Number 09-32, Salt Lake City, Utah.

Cross, F., R. Moss, and J. Collins

- 1985 Assessment of dewatering impacts on stream fisheries in the Arkansas and Cimarron Rivers. Kansas Fish and Game Commission, 161 pp.

Desert Rose Environmental

- 2012 Wallsburg Watershed Water Quality Management Plan February 29.

Devaney, Michelle

- 2009 Wallsburg Watershed Outreach Plan. Uinta Headwaters Resource Conservation and Development (RC&D), Heber City, Utah. October.

Grover, M., and C. Crockett

- 2010 Southern Leatherside Chub (*Lepidomeda aliciae*) Monitoring and Management Activities in the Central Region, 2010. Utah Division of Wildlife Resources, *in press*, Salt Lake City, Utah.

Lentsch, L., Y. Converse, and J. Perkins

- 1997 Conservation agreement and strategy for Bonneville cutthroat trout (*Oncorhynchus clarki utah*) in the State of Utah. Utah Division of Wildlife Resources, Publication Number 97-19, Salt Lake City, Utah.

Lentsch, L., C. Toline, J. Kershner, J. Hudson, and J. Mizzi

- 2000 Range-wide conservation agreement and strategy for Bonneville cutthroat trout (*Oncorhynchus clarki utah*). Utah Division of Wildlife Resources, Publication Number 00-19, Salt Lake City, Utah.

Hansen Allen & Luce

- 1994 Hydrogeologic/water quality study, Wasatch County, Utah.

[MAG] Mountainland Association of Governments

- 2007 Wallsburg General Plan, 2007–2012.

Nannini, M.A., and M.C. Belk

- 2006 Antipredator responses of two native stream fishes to an introduced predator: does similarity in morphology predict similarity in behavioral response? *Ecology of Freshwater Fish* 15:453–463.

[NRCS] U.S. Department of Agriculture, Natural Resources Conservation Service

- 1997 Tri-Valley Watershed Plan. USDA NRCS, Utah Office.
- 2009 National Biology Handbook, Version 2.
- 2010a Main Creek, Little Hobble Creek and Upper Spring Creek, Stream Visual Assessment Protocol (SVAP₂) Inventory, Wasatch County, Utah. USDA NRCS, Utah Office. January.
- 2010b Wallsburg (Round Valley) Hydrology, Wallsburg, Wasatch County, Utah. Prepared by Nathaniel Todea, Salt Lake City, Utah. USDA NRCS, Utah Office. January.
- 2010c Wallsburg Watershed Grazinglands. Prepared by Shane Green, Salt Lake City, Utah. USDA NRCS, Utah Office. January.

Perkins, J., K. Gido, E. Johnson, and V. Tabor

- 2010 Consequences of stream fragmentation and climate change for rare Great Plains Fishes. Draft report for the Great Plains Landscape Conservation Cooperative.

Power, Thomas Michael

- 1998 Lost Landscapes and Failed Economies: The Search for a Value of Place.

Psomas

- 2002 Deer Creek Reservoir Drainage Total Maximum Daily Load Study. March.

Rood, S., J. Braatne, and F. Hughes

- 2003 Ecophysiology of riparian cottonwoods: stream flow dependency, water relations and restoration. *Tree Physiology* 23: 1113–1124.

[UDNR] Utah Department of Natural Resources

- 1991 Hydrology of Heber and Round Valleys, Wasatch County, Utah, with Emphasis on Simulation of Groundwater Flow in Heber Valley. Technical Publication No. 101. D. Michael Roark, Walter F. Holmes, and Heidi K. Shlosar.

[USFS] U.S. Department of Agriculture, Forest Service

- 2008 Decision Memo, Wallsburg and Little Valley Allotments Grazing Reauthorization. USDA Forest Service, Uinta-Wasatch-Cache National Forest, Heber-Kamas Ranger District, Wasatch County, Utah. September 30.

[USFWS] U.S. Fish and Wildlife Service

- 1986 National Spatial Data Infrastructure, Wetland Layer at <http://www.fws.gov/wetlands/data/>.

Utah Division of Water Rights

- 2011 Search of water right records conducted November 9, 2011 at www.waterrights.utah.gov/wrinfo/query.asp.

Utah Division of Wildlife Resources

- 1973 [Historic surveys conducted in the early 1970s indicate a fish community composed predominantly of native Bonneville cutthroat trout]
- 2006 Deer Herd Unit Management Plan: Deer Herd Unit #17 (Wasatch Mountains). wildlife.utah.gov/hunting/plans/deer_17.pdf. April.
- 2007 Utah Big Game Range Trend Studies: Wildlife Management Unit 17 (Wasatch Mountains). wildlife.utah.gov/range/wmu17.htm. Accessed August, 15, 2012.
- 2009a Utah Greater Sage-Grouse Management Plan 2009. wildlife.utah.gov/uplandgame/sage-grouse/pdf/management_plan_2009.pdf. Publication 09-17. June 4.
- 2009b Utah Bat Conservation Plan 2009-2014.
- 2009c Utah Moos Statewide Management Plan 2009-2017.
- 2010 Conservation Agreement and Strategy for Southern Leatherside Chub (*Lepidomeda aliciae*) in the State of Utah. Publication 10-19, Salt Lake City, Utah.
- 2012 Elk Unit Management Plan: Elk Herd Unit #16 (Central Mountains). wildlife.utah.gov/public_meetings/info/2012-05_elkplans_CRO.pdf. May.

Utah School and Institutional Trust Lands Administration and Bureau of Land Management

- 2011 Land ownership data layer [LandOwnership.shp]. Downloaded from the Utah Automated Geographic Reference Center (gis.utah.gov/data/sgid-cadastre/land-ownership) on November 22.

Walser, C.A., M.C. Belk, and D.K. Shiozawa

- 1999 Habitat use of leatherside chub in the presence of predatory brown trout (*Salmo trutta*). *Great Basin Naturalist* 59:272–277.

[WCHD] Wasatch County Health Department

- 2011 Onsite Wastewater Treatment Systems in the Wallsburg Watershed.

Wilson, K.W., and M.C. Belk

- 2001 Habitat characteristics of leatherside chub (*Gila copei*) at two spatial scales. *Western North American Naturalist* 61:36–42.

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