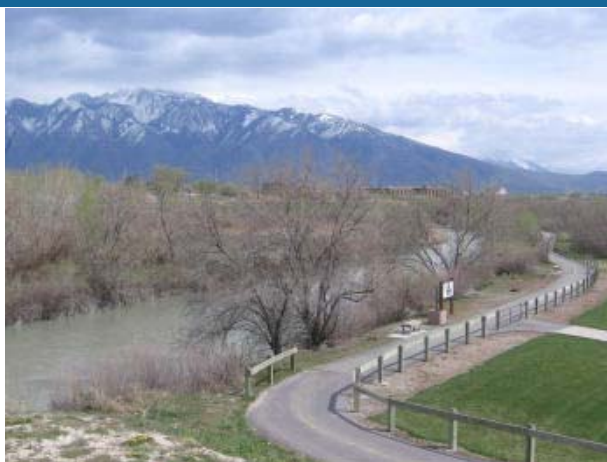


## EXECUTIVE SUMMARY

The purpose of the Water Quality Stewardship Plan (WaQSP) is to provide a framework of goals and policies that will forge water quality stewardship consistent with Congressional goals and representative of the needs of the local population. As such, the WaQSP is written and directed toward the development and completion of specific implementation activities designed to restore and protect the Salt Lake Countywide Watershed. The WaQSP seeks to institutionalize water quality stewardship of current and future county and municipal governments through 2030 and beyond. By institutionalizing water quality stewardship, Salt Lake County (SLCo) and its partners will protect and enhance the health of local waterways in Utah's most densely populated urban area.



Jordan River Parkway, Jordan River Corridor Sub-Watershed

### Goals

The over-riding goal of the WaQSP is to improve watershed functions, which are: 1) water quality, 2) hydrology, 3) habitat and 4) social services in SLCo. This will be achieved as the WaQSP supports adaptive management strategies that enhance, restore and preserve watershed functions, while providing a place to live and work.

In order to develop and implement a comprehensive watershed plan, Salt Lake County has worked toward the following goals: 1) Provide for high quality waters that support the nationwide goals of “fishable” and “swimmable”, 2) Provide leadership and facilitate implementation and coordination of water quality projects with

stakeholders, and 3) Develop a dynamic plan and process, with stakeholder support, that will guide Salt Lake County's water quality improvement efforts over the next six (6) years and beyond.

### Watershed Functions and Strategic Targets

In order to identify appropriate implementation activities, it is necessary to recognize the functions of a watershed and define what constitutes a healthy watershed. Many people do not realize that there is more to a healthy watershed than just water quality. For the purposes of the WaQSP, the following watershed functions were identified and used to direct implementation activities:

- 1) Water Quality and Quantity (Point Source, Nonpoint Source, and Water Supply),
- 2) Habitat (Aquatic and Terrestrial),
- 3) Hydrologic (Flood Storage and Conveyance and Stream Stability), and
- 4) Social, Recreation & Aesthetics.



Upper Parley's Creek Sub-Watershed

Including a social, recreation and aesthetic function was considered valuable due to the urban nature of Salt Lake County, which is home to approximately one million people. Furthermore, efforts to maintain and/or restore a healthy watershed are dependent upon how the



population values the watershed in which they live and play.

A Visioning Session was held on September 21, 2006 to initiate the WaQSP development. County personnel, the Jordan River Watershed Council (JRWC), and various consultants participated in this visioning session designed to introduce the WaQSP to stakeholders, establish goals, define watershed functions, and establish strategic targets for the WaQSP. In order to facilitate improvement of watershed functions in Salt Lake County, seven (7) strategic targets were identified to focus this WaQSP planning cycle. All WaQSP recommendations and implementation activities are focused on the following targets:

1. Reduce pollutant loads to improve water quality in the Salt Lake Countywide Watershed sufficient to support aquatic habitat, water supply and social functions.
2. Develop regional wastewater planning procedure requirements to enhance, improve and protect water quality functions.
3. Evaluate and prioritize the effects of Utah Lake outflow and diversion canals on water quality and flow by developing optimized management protocols, that will enhance and protect water quality, habitat and hydrologic functions.
4. Improve and protect wetlands and stream bank stability to prevent degradation from erosion and sediment transport to protect water quality, habitat, and hydrologic functions.
5. Increase stream corridor and watershed recharge area preservation to improve habitat, social, recreational and water use functions.
6. Increase instream flows under normal and drought conditions to support aquatic habitat and recreational functions
7. Identify funding mechanisms for plan update, long-term watershed monitoring, and ongoing adaptive management.



Dimple Dell Park, Lower Dry Creek Sub-Watershed

### Background

The WaQSP is an update of the 1978 Salt Lake County Area-Wide Water Quality Management Plan. The 1978 Plan was developed with the assistance of federal monies through the Clean Water Act (CWA), Section 208, and is commonly referred to as the “208 Plan”. The intent of 208 Plans nationwide was to describe specifics of municipal wastewater treatment facilities in order to reduce pollutant loads in the nation’s waterways. In addition, 208 plans identified the nature and extent of other pollutants entering surface waters with an emphasis on impairment of beneficial uses. The last update of the Salt Lake County Area-Wide Water Quality Management Plan was in 1982.

As part of an ongoing water quality planning effort, Salt Lake County has worked collaboratively with local government and non-profit organizations to monitor, protect, and restore water quality over the last thirty years. In 2005 a request was made to amend the Area-Wide Water Quality Management Plan. In the process of re-visiting the 1978 Plan, it became apparent that numerous factors (land use, population projections, jurisdictional boundaries, etc.) have changed significantly since the 1970’s, making the need for an update imperative. As a result, the Salt Lake County Council allocated monies in the 2006, 2007, and 2008 budgets to develop this Water Quality Stewardship Plan (WaQSP). The WaQSP serves as an update of the Area-Wide Water Quality Management Plan and contains

essential elements required in section 208 of the CWA. Additionally, the WaQSP incorporates guidance from the recently published Handbook for Developing Watershed Plans to Restore and Protect Our Waters (EPA, 2006).

## Authority

On February 6, 1978, with the completion of the Area-Wide Water Quality Management Plan, Salt Lake County Government was designated the Area-Wide Water Quality Planning Agency (APA) by then Governor Scott M. Matheson. The APA designation authorizes Salt Lake County to: 1) plan water quality-related activities, 2) provide for consistency of water quality related activities, and 3) enforce water quality related ordinances. Salt Lake County holds several implementation authorities including, but not limited to, the countywide flood control permit, land use jurisdiction in the unincorporated County, a joint stormwater permit, and water quality enforcement through the Salt Lake Valley Health Department (SLVHD). However, WaQSP success requires collaboration and coordination between all agencies that hold authorities pertaining to water quality and watershed implementation activities in the County (e.g. local municipal government, state government and federal management and regulatory agencies). Salt Lake County, as the Area-Wide Water Quality Management Agency, is committed to facilitating a meaningful public and stakeholder process associated with WaQSP implementation.



Mill Creek, Upper Mill Creek Sub-Watershed

## Stakeholder Involvement

The WaQSP was developed over a three (3) year period with the assistance of Stantec Consulting, several sub-consultants, the Jordan River Watershed Council (JRWC), and a Blue Ribbon Committee comprised of local water quality and planning experts. Additionally, the WaQSP has been reviewed by numerous stakeholders and presented to the public and stakeholders through: meetings with city officials and the JRWC; presentations to the Salt Lake County Council, Council of Governments (COG), Conference of Mayors, and Community Councils; public workshops; newsletters distributed at approximately 100 locations; outreach at public festivals/gatherings, and a Countywide Watershed Symposium. Stakeholder involvement will continue to be an essential component of Salt Lake County's ongoing water quality planning and implementation activities.

## WaQSP SUMMARY

This section summarizes the major findings and recommendations from the WaQSP document.

### Chapter 1.0 Introduction

This chapter provides background for the WaQSP effort including: Salt Lake County authority, previous accomplishments, stakeholder involvement, purpose and principles. Additionally, this chapter reviews parallel water quality planning efforts that are key to WaQSP success.



Big Cottonwood Creek, Lower Big Cottonwood Creek Sub-Watershed

## Chapter 2.0 Goals and Objectives

This chapter summarizes overriding goals and tasks to be accomplished as part of the ongoing water quality stewardship effort. Additionally, this chapter reviews major watershed functions and strategic targets that guide this planning cycle.

## Chapter 3.0 Watershed Characterization

In this chapter of the WaQSP, watershed characteristics were analyzed for current (2005) and projected future conditions (2030). This type of analysis served the dual purpose of identifying current and potential problem areas, with the intent to restore, as well as protect, watershed functions.

An extensive mapping effort was part of the watershed characterization. The data compiled for each sub-watershed was mapped using a Geographic Information System (GIS). This information was categorized into ranges in order to provide a quick analysis of current and projected conditions.

**Watershed Area** The WaQSP examines watershed and water quality within the Salt Lake Countywide Watershed as defined by the Salt Lake County (SLCo) boundary (Figure E.1). The SLCo boundary is very similar to the boundary of the Jordan River Watershed with the exception of areas in the northwest portion of the County that drain directly to the Great Salt Lake and areas within Utah County that drain to the Jordan River. The Salt Lake Countywide Watershed drains approximately 805.6 square miles (515,600 acres). This watershed is unique in that approximately 46% of the land in the watershed is in rugged mountain ranges and is largely undevelopable; whereas, the rest of the land is urban and highly developed. In addition, there are 16 municipal governments within incorporated Salt Lake County. Complex jurisdictional and geographic conditions result in challenging water quality management, and must be taken into consideration when implementing projects.

**Streams** In Salt Lake County, ten major drainages originate from the Wasatch Mountains and ten drainages originate from the Oquirrh Mountains. These drainages contain waterbodies



Figure E.1 WaQSP Study Area

Table E.1 Salt Lake County Streams and Rivers

Stream <sup>1</sup>	Watershed	Source	Flow Gauge Location	Average Flow Range (cfs)	Total Stream Miles
Barney's Creek	Barney's Creek	Oquirrh		NA	8.4
Beef Hollow	Jordan River	Oquirrh		NA	5.5
Big Cottonwood Creek	Big Cottonwood Creek	Wasatch	Cottonwood Ln.	11.1—45.9	24.2
Big Willow Creek	Willow Creek	Wasatch		NA	10.95
Bingham Creek	Bingham Creek	Oquirrh		NA	10.2
Burr Fork	Emigration Creek	Wasatch		NA	2.3
Butterfield Creek	Midas/Butterfield Creek	Oquirrh		NA	8.1
City Creek	City Creek	Wasatch	Memory Grove	1.9—7.5	11.8
Coon Creek	Coon Creek	Oquirrh		NA	7.8
Copper Creek	Midas/Butterfield Creek	Oquirrh		NA	5.3
Corner Canyon Creek	Corner Canyon Creek	Wasatch		NA	7.9
Dry Creek	Dry Creek	Wasatch		NA	9.1
Dry Creek (Bells Canyon)	Dry Creek	Wasatch		NA	2.4
Emigration Creek	Emigration Creek	Wasatch	Canyon Mouth	0.8—12.3	15.2
Harker's Canyon	Coon Creek	Oquirrh		NA	7.8
Jordan River	Jordan River	Utah Lake	9000 South	42.3—675	43.8
Jordan River	Jordan River	Tributaries	500 North	139—254	
Kersey Creek	Great Salt Lake	Oquirrh		NA	2.6
Lambs Canyon	Parley's Creek	Wasatch		NA	5.3
Lee Creek	Great Salt Lake	Oquirrh		NA	4.0
Little Cottonwood Creek	Little Cottonwood Creek	Wasatch	Crestwood Park	13.1—32.7	22.3
Little Willow Creek	Willow Creek	Wasatch		NA	4.8
Midas Creek	Midas/Butterfield Creek	Oquirrh		NA	10.1
Mill Creek	Mill Creek	Wasatch	Canyon Avenue	8.6—20.5	18.5
Mountain Dell Canyon	Parley's Creek	Wasatch		NA	6.1
Parley's Creek	Parley's Creek	Wasatch	Suicide Park	3.2—20.0	19.4
Red Butte Creek	Red Butte Creek	Wasatch	1600 East	1.4—7.4	6.8
Rose Creek	Rose Creek	Oquirrh		NA	11.2
Willow Creek	Willow Creek	Wasatch		NA	15.9
Wood Hollow	Jordan River	Oquirrh		NA	5.1
<b>Total</b>					<b>296.7</b>

<sup>1</sup> Streams include main stem tributaries in each watershed.

<sup>2</sup> Average flow for period 1999-2003.

that range in size from less than three miles to 44 miles in length and have unique flow and water quality conditions (Table E.1). In addition to ecological, water quality, and social functions, these streams are identified as Countywide Facilities for flood control purposes and are often used to convey stormwater discharge to either the Jordan River or the Great Salt Lake.

**Watershed and Sub-watershed Boundaries** For planning purposes, Salt Lake County was divided into 17 watersheds (based on topography in the mountains and stormwater drainage areas in the valley), and 27 sub-watersheds (based primarily on management practices and jurisdiction). These watersheds and sub-watersheds are presented in Figure E.2.

**Authorities and Jurisdictions** The main authorities and jurisdictional controls that affect watershed health are reviewed in this section of the WaQSP. Generally, this discussion includes federal, state and local agencies that are grouped into three categories: 1) regulatory, 2) land management, and 3) municipal governments. Collaboration and coordination between regulatory, management, and municipal authorities is essential for watershed protection and stewardship.

**Population and Land Use** Population and land use data was compiled from the Wasatch Front Regional Council (WFRC) (the Metropolitan Planning Organization). Additionally, Stantec Consulting provided existing land use data. This information was used to identify current and future trends in population, population density, and land

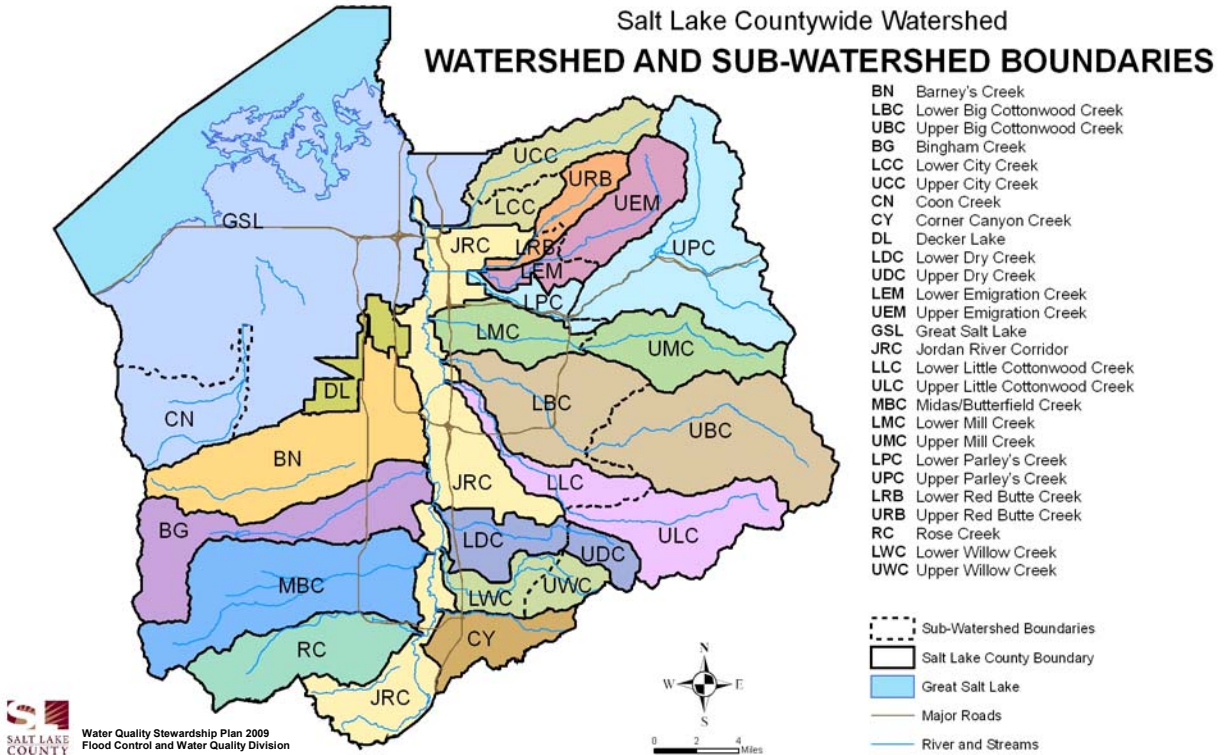


Figure E.2 Watershed and Sub-Watershed Boundaries

use. An increase in population and change in land use typically results in impacts to the watershed. These impacts are mainly due to a loss of open space and an increase in impervious surfaces. These changes can result in an increase in stormwater runoff, stream bank erosion, channel widening, and habitat loss.

Midas/Butterfield Creek sub-watershed. The analysis of open space indicates an anticipated overall loss of 13,707 acres (6.0%) in Salt Lake County by 2030, with the greatest loss in the Lower Mill Creek sub-watershed of 392 acres (66%).

The WaQSP population analysis indicates that Salt Lake County's population is expected to increase from 970,612 in 2005 to 1,381,519 by 2030, representing a 42% increase. Cities in the southwestern region of SLCo are anticipated to experience the highest percent change in population. The Jordan River Corridor and Barney's Creek sub-watersheds are anticipated to have the highest populations in 2030; whereas the largest change in population is likely to occur in the Midas/Butterfield, Barney's Creek, Jordan River Corridor, and the Great Salt Lake sub-watersheds.

**Social and Recreation** An important aspect of an urban watershed is the value residents place on outdoor recreational activities. If these opportunities are of value to the community, watershed protection is more likely to be supported. Salt Lake County has many recreational opportunities, throughout the year. Recreational opportunities are found in both the mountains and urban areas of the County. These activities include snow sports, trail use, park use, golfing, boating, and hunting. A public survey conducted in 2007 indicated the most common outdoor activity in the area is hiking or walking (84% participate in this activity at least 1-2 times per year).

Land use analysis, based on city land use plans, predicts an overall increase of 5,429 acres (3.7%) of impervious surfaces in the Salt Lake Countywide Watershed by 2030. The largest increase in impervious surfaces is anticipated to occur in the

An analysis of developed and permitted recreation in each sub-watershed was conducted in order to

identify areas with low recreation opportunities. A large majority of the sub-watersheds in Salt Lake County have between 0 to 10% of their land containing developed recreational opportunities (parks, golf courses, duck clubs, Waterfowl Management Areas, Special Use Areas, Nordic Ski Tracks, Heli-ski Areas, and rock climbing areas). As Salt Lake County's population continues to grow, it is important to preserve and enhance recreational opportunities while recognizing that some types of recreation may have a negative impact on watershed functions. Therefore, particular attention to the type and design of recreational facilities must be taken into consideration when planning and updating facilities.



Corner Canyon Creek, Lower Corner Canyon Sub-Watershed

**Geology and Soils** The potential for soil erosion was analyzed in order to identify areas that are prone to erosion problems. While erosion is a natural process, excessive erosion can result from poor land management practices, and is detrimental to watershed functions.

The majority of sub-watersheds with high erosion potential are located in the Wasatch Mountains (Upper Red Butte, Upper Emigration Creek, Upper Parley's Creek, and Upper Mill Creek sub-watersheds). However, the Oquirrh Mountains also contain areas with high erosion potential (e.g. Coon Creek sub-watershed). The valley portion of the County typically shows a low erosion hazard potential.



Kayakers in the Jordan River, Jordan River Corridor Sub-Watershed

**Groundwater** Groundwater is a major contributor to flow in many streams and rivers and has a strong influence on watershed functions. Approximately 5 to 20% of the precipitation that falls in the Wasatch Mountains provides groundwater recharge. Other sources of groundwater recharge include: infiltration of excess irrigation water, and seepage from canals and storm drain systems. Groundwater discharge occurs with seepage from the shallow aquifer to the surface streams and well withdrawals. It is estimated that approximately 1/3 of the total groundwater discharge is due to well withdrawals.

Groundwater recharge areas in Salt Lake County were reviewed to identify regions that may be more susceptible to contamination. Areas near the Great Salt Lake are considered to have a low susceptibility to contamination, whereas the majority of the valley is moderately susceptible. In order to protect drinking water sources from contamination, several cities have adopted source water protection ordinances.

**Climate** Salt Lake County has a semi-arid climate with four distinct seasons. Summer months are typically hot and dry with low relative humidity (mean humidity is typically less than 60%). Winter months are cold, but usually not severe due to the low relative humidity. The average maximum daytime temperatures in Salt Lake City range from 37° F in January to 93° F in July. Mountain temperatures can be substantially different than valley temperatures due to altitudinal effects or temperature inversions typical in winter months.

The average annual precipitation in the valley section of the County is less than 20 inches per year. Annual snowfall varied between 22 and 86 inches in the valley between 1995 and 2005. The mountains receive higher levels of both rain and snow.

**Hydrology** Hydrology is the study of the movement, distribution and quality of water as it relates to the watershed. In Salt Lake County, the hydrology of the streams is dominated by snowmelt, with higher flows occurring from April through July. Groundwater base flow into the streams typically occurs from August through March. The hydrology of streams in the Wasatch Mountains differs substantially from that of the valley streams. The mountains exhibit a more natural system, whereas the waterways in the valley have been modified by human activities, including diversions and development. The hydrology of streams in the Oquirrh Mountains is influenced by irrigation canals, mining activities, and storm drain systems. The Jordan River



Upper City Creek Sub-Watershed

hydrology has been highly altered such that it is managed primarily as a flood conveyance and irrigation system. Jordan River flows are strongly affected by releases from Utah Lake, canals, tributaries, stormwater conveyance, and treated wastewater effluent discharges.

Hydrologic modification occurs when human activities significantly change the function or quality of watershed hydrology. For the purposes of the WaQSP, the following modifications have been evaluated:

1. Instream flow alteration
2. Stream channel alteration
3. Flood control – activities that may effect floodplain areas

The following hydrologic modifications of surface waters in the County have been identified:

- Approximately 47% of the stream lengths of intermittent streams, and 57% of the stream lengths of perennial streams in Salt Lake County have experienced instream flow modifications.
- Of the streams that have been assessed, approximately 17% of the stream lengths have been engineered in some fashion. Typical engineered stream sections may include bank stabilization, channel lining, grade control structures, piping and/or a combination of other alterations.



Historic diversion of Mill Creek (no longer used), Lower Mill Creek Sub-Watershed



**Geomorphology** Geomorphology refers to the physical formation and evolution of river shape from the interaction between water and the landscape. Streams in the mountains of Salt Lake County are generally steeper, with a narrow floodplain, and a greater ability to transport sediment. As the slope flattens in the valley, sediment deposition and floodplain widening occurs. Stream straightening, channelization, and floodplain disconnection has occurred due to agricultural activities and urban development. In addition, dredging, hardening of stream banks, and piping streams has occurred over time.



Red Butte Creek, Upper Red Butte Creek Sub-Watershed

Development in a floodplain may result in reduced flood capacity and increased peak flows. Many stream channels in Salt Lake County have been straightened, deepened and/or widened for flood control purposes. These activities often cause increased flow velocity and erosion, and negatively impacts the surrounding habitat. The percentage of floodplain development in the County was estimated using 100 year FEMA floodplain maps and aerial photographs. This analysis identified the percentage of FEMA floodplain within each sub-watershed that had been developed. The sub-watersheds with the highest level of development were generally on the east side of the valley: Lower Mill Creek (98.6%), Lower Big Cottonwood Creek (91%), Lower Little Cottonwood Creek (78.1%), Upper and Lower Willow Creek (83.9% and 78.6%), and Corner Canyon Creek (77.1%).

for terrestrial, aquatic, and avian species remain and flourish within natural, or mainly undeveloped, waterways and sub-watersheds.

For the WaQSP, the percent of river and streams with adjacent public land was analyzed to estimate the percent of protected parcels along the streams. In general, the west-side sub-watersheds, and the lower east-side sub-watersheds have the lowest percentages of adjacent publicly owned land. The purpose of this analysis was to identify areas that may require more protection.

**Habitat** Habitat refers to the type of environment in which populations of diverse organisms live. Although 1/3 of Salt Lake County is occupied by urban development, significant habitat resources

**Water Quality** A review of water quality in Salt Lake County was conducted, including the current status of impaired waterbodies, an analysis of historical and predicted pollutant loading trends, existing point source discharges, and nonpoint source pollutants.



Kersey Creek, Great Salt Lake Sub-Watershed

The State of Utah Division of Water Quality (DWQ) designates beneficial uses for waterways in Utah. Water quality standards are developed for each beneficial use.

DWQ conducts assessments of water quality in Waters of the State to determine if pollution controls are stringent enough to meet the water quality standards. Streams in Salt Lake County considered to be impaired are listed in Table E.2.

In addition to known water quality impairments, an analyses of historical trends for particular pollutants was conducted as part of the WaQSP. Approximately 15 years of stream sampling data



**Table E.2 Impaired Water Bodies in Salt Lake County**

Beneficial Use Designation	Stream Segment and Impairment
2B, 3A, 4	Big Cottonwood Creek - Segment 1, temperature impairment (LBC)
2B, 3A	Emigration Creek, E. coli impairment (UEM & LEM)
2B, 3B, 3D, 4	Jordan River—Segment 1, dissolved oxygen and total dissolved solids impairment (JR)
2B, 3A, 3D, 4	Jordan River – Segment 2, E. coli and dissolved oxygen impairment (JR)
2B, 3B, 4	Jordan River – Segment 3, E. coli impairment (JR)
2B, 3A, 4	Jordan River – Segment 5, E. coli, temperature, and total dissolved solids impairment (JR)
2B, 3A, 4	Jordan River – Segment 6, temperature and total dissolved solids impairment (JR)
2B, 3A, 4	Jordan River – Segment 7, temperature and total dissolved solids impairment (JR)
2B, 3A, 4	Little Cottonwood Creek – Segment 1, temperature and total dissolved solids impairment (LLC)
1C, 2B, 3A	Little Cottonwood Creek – Segment 2, zinc impairment (ULC)
1C, 2B, 3A	Parley’s Creek – Segment 1, habitat alteration segment (UPC & LPC)

was reviewed to determine if a trend exists in total phosphorus (TP) and total dissolved solids (TDS) concentrations. This analysis indicates that stream water quality in Salt Lake County has not significantly degraded over the years as measured by these constituents.



Decker Lake Stormwater Facility, Decker Lake Sub-Watershed

Predicted stormwater pollutant loadings were also developed based on future land use data. This analysis included total phosphorus (TP), total nitrogen (TN) and total suspended solids (TSS). Using land use maps from 2000 and 2030. The greatest increase in future loading occurred in four sub-watersheds (Coon Creek, Upper City Creek, Upper Dry Creek, Midas/Butterfield Creek) predicted to have over 20% increase in TP. No significant increases in TSS or TN were found.

**Chapter 4.0 Watershed Planning Elements**

The WaQSP contains nine water quality planning elements (Economic, Wastewater, Stormwater, Nonpoint Sources, Water Supply, Instream Flows, Habitat, Utah Lake, and Headwaters Protection). Each planning element includes a characterization of current conditions, an assessment of future needs, an evaluation of management options, and recommendations. A summary of these planning elements is provided below.

**Economic** This planning element addresses the following strategic target of the WaQSP:

- Identify funding mechanisms for plan implementation, long-term watershed monitoring, and on-going adaptive management.

The Economic planning element considers the economic costs and benefits associated with water quality protection and enhancement. Additionally, this section identifies possible funding mechanisms for updating of the WaQSP. Existing research shows benefits of a healthy watershed exist for both recreational use and non-use activities. Household values tend to increase with proximity to natural open spaces. Outdoor retail businesses, as well as nature-based tourism, also benefit from increased watershed health and water quality.

This section reviewed the following funding options:

- **Taxes**  
Offers the largest available funding base because these can apply to businesses, households, and tourists.

- **Fees/Charges for services**  
Assessment of fees in exchange for a particular service, giving citizens a choice of whether or not to participate.
- **Charges for watershed degradation**  
Surcharges assessed directly on polluters.
- **Fines**  
Fines charged by a regulatory agency.
- **Voluntary contributions**  
This method is favored among local residents, however, it is sometimes difficult to raise the required funds.
- **Specific Funding Mechanisms**  
Includes specific fees, assessments or charges (e.g. septic tank surcharge, trailhead fee, or stormwater connection fee).

Stream corridor preservation techniques were also evaluated in this planning element. Corridor preservation techniques include:



Rose Creek, Lower Rose Creek Sub-Watershed



- **Appropriation of funding**  
Direct acquisition of critical lands for preservation by the County or other management agencies.
- **Development exactions**  
Contribution of land or money as a condition on new development.
- **Incentive zoning**  
Amenities given to the County from a developer in return for a bonus, such as increased density on a site.
- **Transfer of development rights**  
Selling of development rights.
- **Conservation easements**  
Establishing an easement for the preservation and maintenance of land or water areas.
- **Overlay zones**  
Zones created to promote sensitive development in critical areas.
- **Cluster development**  
Reduced lot sizes in order to preserve open space.
- **Land trades**  
Trades of land between the County and a developer for parcels of greater ecological interest.



Aerial View of Salt Lake City Water Reclamation Facility

**Wastewater** This planning element addresses the following strategic target of the WaQSP:

- Develop regional wastewater planning procedure requirements to enhance, improve and protect water quality functions.

The Wastewater planning element considers the effect of wastewater treatment plant effluent on water quality in receiving waters. In addition, an evaluation of existing and planned future facilities for each sewer agency was conducted to assist in the development of future wastewater management alternatives.

The original Area-Wide Water Quality Management Plan recommended consolidation of nine existing treatment plants into four, two of which discharge directly to the Jordan River. The four existing and one planned wastewater treatment facilities in Salt Lake County were reviewed for treatment capacities, treatment technologies, and expansion plans. A summary of this review is provided in Table E.3.

**Table E.3 Existing and Projected Wastewater Flows**

Flow	Water Reclamation Facility					
	Salt Lake City	Magna	Central Valley	South Valley	Future Riverton Facility	Total
Ave. Plant Flow 2005 (mgd)	33.9	2.4	53.2	28.9	N/A	118
Ave. Daily Flow 2030 (mgd)	37.6	4.0	67.5	56.7	N/A	166
Current Capacity (mgd)	56	3.3	75	38	N/A	172.3

The existing four facilities use conventional secondary treatment that incorporates an activated sludge process. This has been the predominant treatment technology nationwide for the past 30 – 40 years. Recent advances in treatment technology may be applicable for enhancing treatment or expanding treatment capacity at existing facilities. The future Riverton wastewater facility is planned to use membrane bio-reaction technology and will initially have a capacity of 15 mgd.



Stormwater Sampling Station

Projected wastewater flows (2030) were calculated using population projection data from the Wasatch Front Regional Council (WFRC) and recorded 2005 flows. These flows are presented in Table E.3.

As part of the Wastewater Planning Element, an extensive review of current regulations and trends was conducted. Wastewater discharges are regulated at federal, state and local levels. Understanding these regulations is important when establishing a permit review process through the WaQSP. The WaQSP review process is presented in Figure E.3.

**Stormwater** This planning element addresses the following strategic target of the WaQSP:

- Reduce pollutant loads to improve water quality in the Salt Lake Countywide Watershed sufficient to support aquatic habitat, water supply and social functions.

The Stormwater planning element considers the effect of stormwater on the quantity and quality of receiving waters. Stormwater can degrade the quality of water in the streams by conveying pollutants from developed areas and construction sites. Stormwater also impacts the hydrology in the streams by impacting the quantity and timing of runoff.

Stormwater discharges are currently regulated by the Utah Department of Environmental Quality, Division of Water Quality (DWQ). Discharge permits are required for municipal and industrial stormwater discharges. Industrial permits include discharges related to construction activities. Permittees are required to develop stormwater management plans (SWMP) or stormwater pollution prevention plans (SWPPP), with the intent to minimize the discharge of stormwater pollutants to the maximum extent practicable (MEP). Salt Lake County has a joint Utah Pollutant Discharge Elimination System (UPDES) permit for municipal stormwater discharges.



Harkers Creek Culvert, Coon/Harkers Sub-Watershed

**Table E.4 Water Quality Parameters that Salt Lake County Monitors**

Cadmium – total & dissolved	Hardness
Copper – total & dissolved	Nitrogen – nitrate, nitrite, TKN
Lead – total & dissolved	Total Nitrogen
Zinc – total & dissolved	Ammonia
E. Coli	Phosphate – total & ortho
pH	BOD <sub>5</sub>
TSS	COD
TDS	Oil & Grease

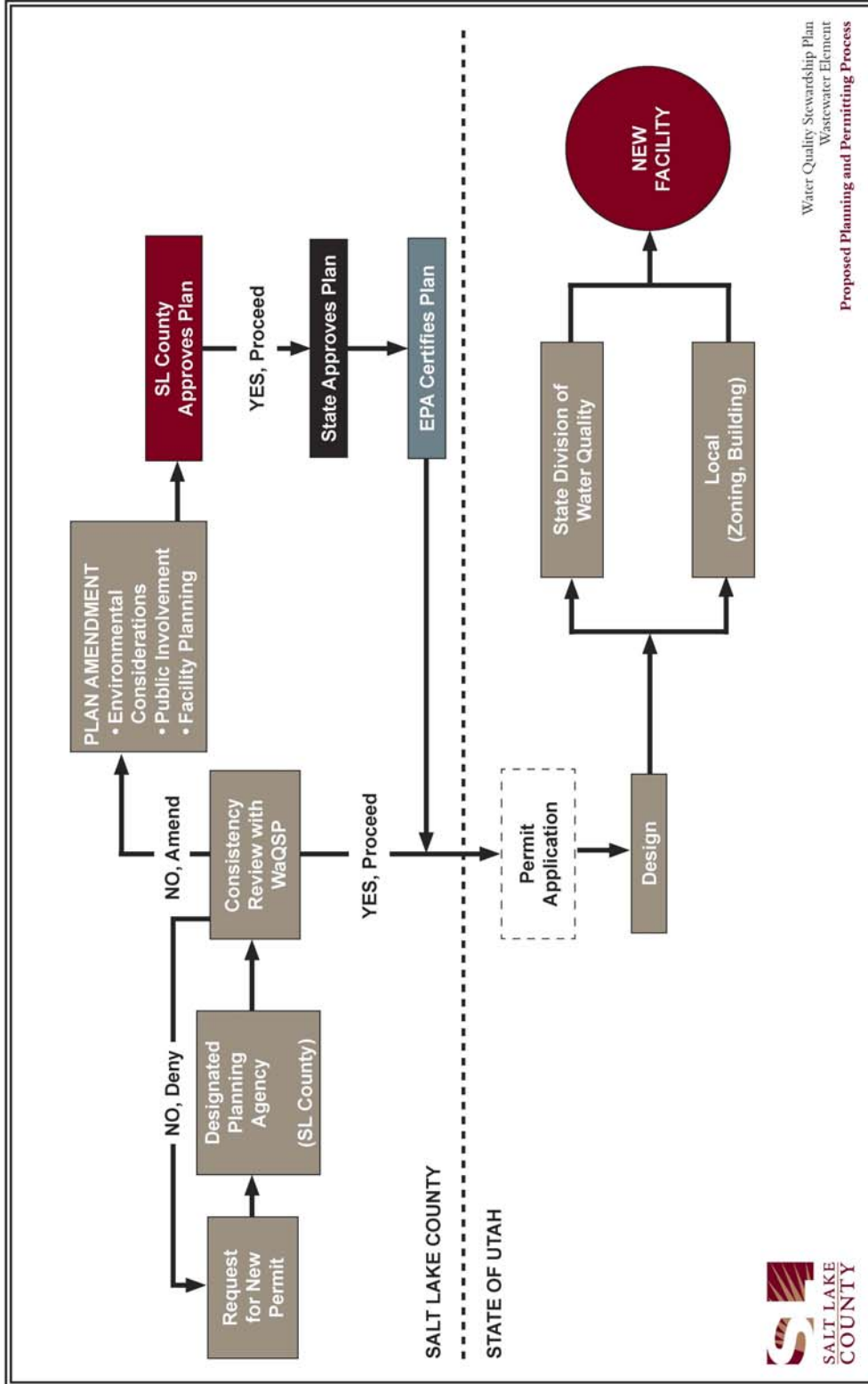


Figure E.3 WaQSP Involvement in Discharge Permit Process

Stormwater has been extensively monitored in Salt Lake County through the years. This includes instream sampling as part of a nationwide study in the late 1970s (NURP), and on-going sampling of stormwater outfalls as part of the discharge permit requirements. Table E.4 identifies the parameters that the County currently monitors.

Six sampling stations were selected to represent loading from current land use. The data obtained for permit compliance is used in calculating pollutant loads and event mean concentrations (EMC). This information can then be used to evaluate land use impacts, seasonal variation, and comparisons with other municipalities. A review of this data indicates the stormwater pollutant levels are similar if not lower than those in comparable regional municipalities. Future development may generate additional stormwater quantity and increase pollutant loads. With appropriate management practices, potential stormwater quantity and pollutant loads may be minimized.



Trash in Copper Creek, Great Salt Lake Watershed

**Nonpoint Sources** This planning element addresses the following strategic target of the WaQSP:

- Improve water quality in the Salt Lake Countywide Watershed by reducing pollutant loads sufficient to support aquatic habitat, water supply and social functions.

The Nonpoint Source planning element considers the effect of nonpoint pollutant sources on the quantity and quality of water in receiving waters. Nonpoint sources include agriculture, mining, atmospheric deposition and hydrologic modification. Pollution from diffuse or "nonpoint" sources is considered to be the largest source of water quality problems nationwide.

The State of Utah has identified nine (9) sources of nonpoint pollution, each of which has different impacts, and is regulated under different programs. These sources are as follows:

- Agricultural Runoff
- Urban Runoff
- Construction Runoff
- Hydrologic Modification
- Habitat Modification
- Mining
- Land Disposal
- Silviculture
- Other

All of these categories, with the exception of silviculture, are applicable to Salt Lake County. In addition, the potential impacts caused by golf



Mountain View Golf Course, Bingham Creek Sub-Watershed



courses, managed parks, and atmospheric deposition was evaluated. A review of specific regulations, management plans, existing and future conditions, and source reduction strategy indicate that attention to nonpoint sources is currently addressed by management plans and permits; however, implementation of plans and practices must be coordinated on a watershed basis.

**Water Supply** This planning element addresses the following strategic targets of the WaQSP:

- Increase stream corridor and watershed recharge area preservation to improve water use functions.
- Increase instream flows under normal and drought conditions to support aquatic habitat and recreational functions.

The Water Supply planning element considers the effect of water supply activities on the quantity and quality of receiving waters in Salt Lake County. The condition of the watershed recharge area affects the quantity and quality of water for supply purposes. The quantity of water used for potable and irrigation purposes affects the amount of flow available in the stream and could adversely impact recreational and habitat uses.

In Salt Lake County, potable water is provided by municipal water systems, private water companies, and two large water districts. There



Upper Big Willow Creek Sub-Watershed

are three large water providers: Salt Lake City Department of Public Utilities, Metropolitan Water District of Salt Lake and Sandy, and Jordan Valley Water Conservancy District. Information regarding these sources is provided in Table E.5. The majority of water supply in Salt Lake County comes from imported sources outside the County. Other sources include groundwater, springs, and the Wasatch Mountain streams.

**Table E.5 2005 Water Sources for Major Salt Lake County Potable Water Providers**

Provider	Sources of Water (ac-ft)		
	Groundwater	Wasatch Streams	Imports <sup>4</sup>
Salt Lake City <sup>1</sup>	1,288	38,255	0 –(from MWD only)
MWD for SL & Sandy <sup>2</sup>	Na	16,966	36,351
JVWCD <sup>3</sup>	8,859	1,891	63,926
<b>Total</b>	<b>10,147</b>	<b>57,112</b>	<b>100,277</b>

NOTE: These numbers may change significantly every year based on snow pack.

**Sources:**

<sup>1</sup> Utah Division of Water rights. "Public Water Suppliers Flow Data."

<sup>2</sup> Communication with Claudia Wheeler, Environmental Services Manager, MWD of SL & Sandy.

<sup>3</sup> JVWCD Annual Report 2005 – JVWCD also delivers 27,929 acre-feet of raw water (9,866 from Utah Lake and 18,063 af from the Provo River).

<sup>4</sup> Currently all imported water is from the Provo River.





Little Cottonwood Creek, Upper Little Cottonwood Creek Sub-Watershed

An evaluation of projected demand for water supply sources in 2030 indicates additional sources will be necessary. The water providers are considering wastewater reuse for irrigation purposes, conservation, new wells, new surface water sources, and other imported sources to meet these projected demands. It is anticipated that new sources, as well as water reuse, will not impact water quality; however, new sources may affect the quantity of surface water in Salt Lake County.

The State of Utah has established standards for drinking water sources. In addition, water providers are required to treat the water to drinking water quality standards established by the State.

*Instream Flows* This planning element addresses the following strategic target of the WaQSP:

- Increase instream flows under normal and drought conditions to support aquatic habitat and recreational functions.

The Instream Flow planning element considers the quantity of flows in the streams and river of Salt Lake County for recreational and aquatic habitat purposes. Hydrologic modification of stream flows has historically occurred to accommodate water supply demands and irrigation needs. These alterations have resulted in flow reductions or interruptions to many streams in the County.

The flow regime of a stream is considered to be of primary importance to the ecological integrity of a watershed. Many physical habitat features are formed and maintained by stream flow. A natural

stream with an active floodplain provides for a range of habitat types. Hydrologic modifications can have significant impacts on water quality, stream stability, and habitat. Minimum instream flows are necessary to sustain fish, riparian, and wildlife habitats.

Several regulatory agencies have certain controls that can impact instream flows. These include:

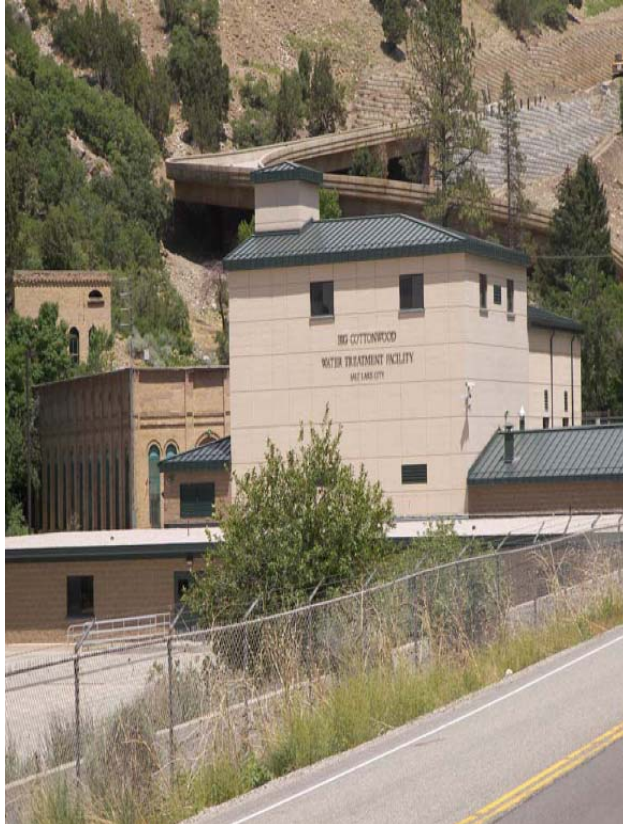
- DWQ – regulates discharges to protect designated uses
- DEQ and the NPS Task Force – considers hydrologic modification as a nonpoint pollutant source
- Federal Government Power Act – requires a balance between natural resources and the generation of electricity
- Division of Water Rights (DWRi) – the State Engineer has the authority to preserve water for natural flows
- Salt Lake County – flood control permit

In this section, existing instream flow conditions were characterized in order to: identify streams that would benefit from flow augmentation and to assess the level of hydrologic modification of the streams.

The current conditions of each sub-watershed were reviewed in order to assess the instream flow category, including a review of the ecology,



Jordan River during high flows, Jordan River Corridor Sub-Watershed



Big Cottonwood Water Treatment Facility, Lower Big Cottonwood Creek Sub-Watershed

recreation and hydrology. Future water development plans for the planning period 2005 – 2030 were reviewed for potential effects on instream flows. These include:

1. Import Water – plans to import 25,000 af/year from the Bear River, 30,000 af/year from the Utah Lake System, and 9,000 af/year of groundwater from Utah County. The impact of this import water on instream flows is not known at this time.
2. Water reuse – plans are being developed by water providers and wastewater treatment plants for additional future water reuse. The impacts of water reuse on instream flows is not known, however, it is anticipated that the primary effect will be on the Jordan River.

Strategies for flow preservation and augmentation were presented. Consideration should be given to the ecological integrity of the stream corridor, as some stream segments may not be good candidates for flow augmentation. The following

strategies may be used for instream flow augmentation:

- water rights & water shares acquisition legislation
- water rights inventory and reallocation
- stormwater management practices
- water rights applications
- instream flow studies
- canal water diversions
- flow augmentation screening and prioritization
- import water

**Habitat** This planning element addresses the following strategic targets:

- Improve and protect wetlands and stream bank stability to prevent degradation from erosion and sediment transport.
- Increase stream corridor and watershed recharge area preservation.

This planning element considers the quantity and quality of aquatic, riparian and wetland habitat along the stream corridors in the watershed. The physical habitat in the watershed has been degraded by various activities in the past, including encroachment and modification by development, hydraulic alteration for flood control, and increased runoff and sediment loads from land use changes. An extensive effort has been made to evaluate the existing conditions, future



Upper Corner Canyon Creek Sub-Watershed

conditions, habitat deficiencies, and opportunities and techniques for the preservation, conservation and restoration of habitats in the watershed.

Using current methodologies and available information, the existing condition of aquatic, riparian, and wetland habitats in each sub-watershed was evaluated. Each habitat type represents important components to the overall watershed health. In addition, an overview of the special status wildlife species dependent on these habitats is provided. It is noted that there are information gaps within the watershed, however, every effort was made to use existing studies and datasets.



Ecosystem restoration site along Jordan River, Jordan River Corridor Sub-Watershed

It is anticipated that the factors that have led to the current habitat conditions will continue in the future. Examples of these factors are:

- population growth
- conversion of natural land cover types
- loss of habitats by development pressures
- conversion of agricultural land to industrial and residential use
- increased recreational use
- increased water consumption
- groundwater drawdown
- trans-basin water imports
- water supply exchange agreements
- increase impermeable surfaces



Ecosystem restoration site construction along Jordan River, Jordan River Corridor Sub-Watershed

Efforts to restore habitats in the watershed have been increasing over the years due in part to legislation and growing public awareness. The success of these efforts has varied. Continued efforts are necessary to achieve management objectives for the Countywide Watershed. The following options and techniques are recommended:

- Restoring stream channels
- Stabilizing channel bed and banks
- Developing instream habitat features
- Improving fish passage
- Controlling nonpoint sources of sediment



Ecosystem restoration site along Jordan River, (2 years after construction), Jordan River Corridor Sub-Watershed



**Utah Lake** This planning element addresses the following strategic target:

- Evaluate and prioritize the effect of Utah Lake outflow and diversion canals on water quality and flow by developing optimized management protocols that will enhance and protect water quality, habitat, and hydrologic functions.

The Utah Lake planning element considers the effect of Utah Lake and canal return flow on water quality in Salt Lake County. Utah Lake is a primary source of water for the Jordan River. Water is released from Utah Lake based on water rights, irrigation season, and flood control. Most times these releases do not reflect a natural hydrologic regime. This scenario can adversely impact the quantity and quality of both the Jordan River and its tributaries.



Mt. Timpanogas behind Utah Lake



View of Wasatch Mountains from Salt Lake City

**Headwaters Protection** This planning element addresses the following strategic target:

- Improve water quality in the Salt Lake Countywide Watershed by reducing pollutant loads sufficient to support aquatic habitat, water supply and social functions.

The Headwaters planning element considers the water quality and watershed issues specific to the Wasatch and Oquirrh mountains. These issues are outlined below.

**Wasatch Mountains** — Some of the current issues in the Wasatch Mountains include: sanitation, transportation and protection of critical watershed lands. Existing plans and regulations should be revisited for water supply source protection as well as watershed protection strategies.

**Oquirrh Mountains** — The land in the Oquirrh Mountains is currently transitioning from mining to urban development. Consequently, watershed protection strategies are not as developed as in the Wasatch Mountains. Sensitive land regulations should be developed and applied to future development activities.

**Recommendations and Implementation** Table E.6 provides a summary of the purpose of the planning elements and the major recommendations and implementation tasks for countywide activities.

**Table E.6 Major Recommendations and Implementation Tasks for Countywide Activities**

Element	Scope	Major Recommendations	Implementation
Wastewater	<p>Provide a description of existing facilities</p> <p>Review emerging trends in wastewater technology</p> <p>Review current regulatory standards and trends</p> <p>Develop wastewater flow projections based on WFRC population projections</p>	<p>Formalize the planning and permitting process</p> <p>Perform an evaluation of service area build-out conditions to 2050 and beyond.</p> <p>Integrate the environmental and public process in the planning and permitting of future discharge facilities.</p> <p>Evaluate Countywide sewer capacity and flow routing alternatives (model).</p> <p>Evaluate ongoing Countywide wastewater planning process.</p>	<p>Salt Lake County should work with the State Division of Water Quality and stakeholders to finalize the wastewater planning and permitting process.</p> <p>Salt Lake County may work with local Publicly Owned Treatment Works (POTWs) and Improvement Districts to develop both the scope and funding for consistent area-wide master planning.</p> <p>Salt Lake County should integrate environmental and public process in the planning and permitting of future facilities.</p>



Wetlands along Jordan River, Jordan River Corridor Sub-Watershed



**Table E.6 Major Recommendations and Implementation Tasks for Countywide Activities—  
Continued**

Element	Scope	Major Recommendations	Implementation
<b>General Stormwater Quality Policy</b>			
Stormwater	<p>Review of existing regulations</p> <p>Review existing conditions (stormwater flow and quality)</p> <p>Review the extent of stormwater impact</p> <p>Review current issues</p> <p>Review anticipated stormwater conditions</p>	<p>Incorporate water quality considerations into the evaluation of Flood Control Permits due to the Countywide drainage system influence on surface, irrigation, and groundwaters.</p> <p>Update the current stormwater quality management plan and the current GIS-based stormwater conveyance map.</p> <p>Sample instream water quality during storm events to assess the impacts to surface water quality. Continue to sample stormwater discharges, as required by the State stormwater permit for large municipalities.</p> <p>Participate in concurrent management programs relating to surface waters that convey stormwater within Salt lake County.</p>	<p>Salt Lake County may revise current flood control permit process to include potential water quality impacts to receiving streams/river.</p> <p>As part of the UPDES permit, Salt Lake County will update it's stormwater quality management plan on a five-year cycle.</p> <p>The Salt Lake County Stormwater program may seek partners and funding to expand their sampling to include instream grab samples during storm events.</p> <p>Salt Lake County will continue to participate in ongoing planning efforts that relate to surface waters (e.g. TMDLs, SLC Watershed Management Plan, Salt Lake County FCOZ permit).</p>



Detention pond on Midas Creek during flood event

**Table E.6 Major Recommendations and Implementation Tasks for Countywide Activities—  
Continued**

Element	Scope	Major Recommendations	Implementation
<b>Stormwater Treatment Policy</b>			
Stormwater— <i>Continued</i>		<p>Evaluate retrofitting existing regional stormwater facilities to incorporate water quality treatment components and encourage the use of post-construction water quality practices (i.e. constructed wetlands, bio-swales, wet ponds, and other natural best management practices) during the permitting of new stormwater conveyance and discharge systems.</p> <p>Develop countywide water quality design criteria targeting specific constituents for stormwater management facilities. Incorporated alternatives to meet specific needs of the cities.</p> <p>Conduct a feasibility study to identify specific irrigation canals that could be operated and maintained as water quality control facilities (i.e. linear detention basins) when not being used for transport of irrigation water.</p> <p>Design, construct and monitor one treatment BMP per year. Incorporate open space and recreational opportunities into these projects to meet requirements of the Clean Water Act (208(b)(2)(A)).</p>	<p>The Salt Lake County Stormwater Program, in conjunction with the Stormwater Coalition, may evaluate projects to retrofit existing regional stormwater facilities to incorporate water quality treatment practices.</p> <p>The Salt Lake County Stormwater Program, in conjunction with the Stormwater Coalition, may develop countywide design criteria for stormwater management facilities.</p> <p>Salt Lake County may work with the Board of Canal Presidents to conduct a feasibility study to identify specific canals that may be operated and maintained as Countywide water quality facilities.</p> <p>The Salt Lake County Stormwater program may seek partners and funding to construct and monitor one stormwater treatment BMP per year.</p>



**Table E.6 Major Recommendations and Implementation Tasks for Countywide Activities—  
Continued**

Element	Scope	Major Recommendations	Implementation
<b>Funding/Fiscal Policy</b>			
<p>Stormwater— <i>Continued</i></p>		<p>Continue funding the overall stormwater coordinator Program and the municipal stormwater program in unincorporated County.</p> <p>Use drainage funding sources to implement or expand existing post-construction BMP implementation.</p> <p>Seek demonstration funds and/or grant monies to implement new stormwater quality improvement strategies.</p> <p>Continue to partner with other co-permittees for efficient programs.</p>	<p>Salt Lake County should continue to fund the stormwater coordination program and municipal stormwater program in unincorporated County.</p> <p>Salt Lake County may work with the stormwater coalition to implement or expand existing post-construction BMP programs.</p> <p>Salt Lake County may work with the Stormwater Coalition and other stakeholders to apply for and oversee grant monies to implement stormwater quality improvement strategies.</p> <p>Salt Lake County should continue to partner with co-permittees.</p>



**Table E.6 Major Recommendations and Implementation Tasks for Countywide Activities—  
Continued**

Element	Scope	Major Recommendations	Implementation
Nonpoint Sources	<p>Review sources, regulations, existing conditions, anticipated conditions, and management plans regarding:</p> <ul style="list-style-type: none"> <li>- Agricultural runoff</li> <li>- Urban runoff</li> <li>- Construction runoff</li> <li>- Golf course and managed parks</li> <li>- Hydrologic modification and habitat alteration</li> <li>- Mining</li> <li>- On-site wastewater disposal</li> <li>- Landfills and industrial land treatment</li> <li>- Atmospheric deposition</li> </ul>	<p>Implement strategies in <i>A Utah Strategy to Address Water Pollution From Animal Feeding Operations</i> (AFO/CAFO Committee, 2001).</p> <p>Implement strategies in the State of Utah Water Plan for the Jordan River Basin (Utah Division of Water Resources, 1997).</p> <p>Implement recommended management practices for golf courses and parks.</p> <p>Avoid activities within the stream corridor and maintain suitable stream buffers.</p> <p>Flood control activities should be conducted in a sustainable way to promote stable channel conditions.</p> <p>Implement strategies in Nonpoint Source Management Plan for Abandoned Mines in Utah (Utah DEQ, 2005).</p> <p>Continue adherence to the Utah DWQ guidelines and Salt Lake Valley Health Department regulations pertaining to on-site waste disposal systems.</p> <p>Continue adherence to the Utah Solid and Hazardous Waste Act with regard to landfills.</p>	<p>Current nonpoint source strategies, outlined in the State nonpoint source plans, should be employed in all implementation activities.</p> <p>Discussions may be held with the Salt Lake County Parks and Recreation Department to identify ways in which management of County Parks and Golf Courses may be improved to reduce nutrient runoff.</p> <p>Salt Lake County Flood Control and Water Quality Division may develop and adhere to a flood control management manual that will accommodate, to the best extent possible, flood control requirements, stable channel conditions and the ecological health of the County streams.</p> <p>The Salt Lake Valley Health Department should continue to adhere to the guidelines and regulations pertaining to on-site waste disposal systems.</p>

**Table E.6 Major Recommendations and Implementation Tasks for Countywide Activities—*Continued***

Element	Scope	Major Recommendations	Implementation
Water Supply	<p>Review existing systems and sources</p> <p>Review groundwater and drinking water quality standards</p> <p>Review master plans of principal water providers</p> <p>Describe existing water treatment facilities</p> <p>Identify effects of water supply strategies on water quality</p>	<p>Facilitate discussions between water supply, wastewater, and stormwater professionals to assure that water resources are viewed collectively in Salt Lake County.</p> <p>Support water reuse efforts.</p> <p>Support water conservation efforts.</p>	<p>Salt Lake County may continue to monitor water development activities to identify potential impacts to local streams and river.</p> <p>Salt Lake County should continue to facilitate discussions between water providers, wastewater treatment facilities and watershed managers through the Jordan River Watershed Council.</p> <p>Salt Lake County may support water reuse and conservation efforts.</p>



Bingham Creek Sub-Watershed



Big Cottonwood Creek, Upper Big Cottonwood Creek Sub-Watershed

**Table E.6 Major Recommendations and Implementation Tasks for Countywide Activities—*Continued***

Element	Scope	Major Recommendations	Implementation
Instream Flows	<p>Review existing stream flow conditions of all major streams and river in Salt Lake County</p> <p>Review anticipated changes to flow conditions of all major streams and river in Salt Lake County</p> <p>Identify methods to preserve and augment stream flow</p>	<p>Improve both quality and quantity of stream gauge data in Salt Lake County.</p> <p>Further examine options for acquisition or reassignment of water rights to be used for instream flows.</p> <p>Ensure that a rigorous review process is conducted for any proposed changes to water rights and water use that could potentially reduce instream flows.</p> <p>Encourage the adoption of Leadership in Energy and Environmental Design criteria.</p> <p>Conduct a detailed instream flow study of the Jordan River and targeted tributaries that considers hydrology and physical habitat.</p> <p>Develop a management strategy for the releases from Utah Lake such that the flows in the Jordan River more closely resemble a natural flow regime.</p>	<p>Salt Lake County may work with local governments, State agencies, the USGS and irrigation companies to fund, install and maintain additional stream flow gauges.</p> <p>Salt Lake County should work collaboratively with water right holders to identify opportunities for flow augmentation.</p> <p>Salt Lake County may work with the Division of Water Rights to ensure that a rigorous review process is conducted for proposed changes to water rights and uses. This should be done in accordance with existing DWRi programs.</p> <p>Salt Lake County may work with cities in encouraging incorporation of Leadership in Energy and Environmental Design criteria in neighborhood and site developments.</p> <p>With improved stream gauge data, Salt Lake County may work with local stakeholders to conduct a detailed instream flow study of the Jordan River and key tributaries.</p> <p>Salt Lake County may work with the Utah Lake Commission to develop a management strategy for releases from Utah Lake that will accommodate both water right needs and the ecological health of the Jordan River.</p>



**Table E.6 Major Recommendations and Implementation Tasks for Countywide Activities—  
Continued**

Element	Scope	Major Recommendations	Implementation
Habitat	<p>Document and assess existing aquatic, terrestrial and wetland habitat conditions of watersheds</p> <p>Review anticipated future aquatic, terrestrial and wetland habitat conditions of watersheds</p> <p>Identify habitat deficiency types</p> <p>Review mechanisms to preserve, conserve, and restore streams</p>	<p>Develop a wetland delineation that goes beyond existing data (NWI, SAMP, Jordan River WAIDS, Albion and Brighton Basins data).</p> <p>Develop a watershed-wide inventory and functional analysis of stream segments and/or riparian corridors that are interrupted or disconnected.</p> <p>Develop a comprehensive inventory of fish and eventually macroinvertebrates in County streams, river and lakes.</p> <p>Develop a staged, comprehensive geomorphological assessment of County streams and rivers.</p> <p>Conduct a Countywide delineation of past and current riparian corridors.</p> <p>Work with established programs to acquire easements and parcels adjacent to Salt Lake County streams and river.</p>	<p>Salt Lake County may work with the Open Space Committee, the University of Utah and other interested stakeholders to fund the development of a Countywide wetland database to assist with preservation efforts.</p> <p>Salt Lake County may incorporate data from the Stream Function Index (SFI) with both the WaQSP Habitat and Instream Flows Elements to develop a functional analysis of interrupted and/or disconnected stream segments.</p> <p>Salt Lake County may work with DWR to compile existing fish data and to identify potential funding mechanisms to conduct a countywide inventory of fish abundance and diversity.</p> <p>The State DWQ is currently developing macroinvertebrate standards for Waters of the State.</p> <p>Salt Lake County may work with local partners to identify funding for both geomorphological and riparian assessments of local streams.</p>

**Table E.6 Major Recommendations and Implementation Tasks for Countywide Activities—  
Continued**

Element	Scope	Major Recommendations	Implementation
Headwaters	Review the characteristics of the Wasatch and Oquirrh mountains	Continue cooperative agreements between Salt Lake City, the Town of Alta, the USFS and Salt Lake County in order to maximize use of funds.	Salt Lake County may continue to work collaboratively with other management and regulatory agencies in the Wasatch Mountains.
	Review jurisdictional responsibilities in each of these areas	Re-establish core working headwaters group to facilitate inter-agency coordination.	The Salt Lake County may facilitate an inter-agency coordination group that will meet quarterly.
	Review plans written for the Wasatch and Oquirrh Mountains	Work with the Town of Alta, Salt Lake City, and the USFS to develop criteria for land acquisition in the Wasatch Mountains.	Salt Lake County may work with Salt Lake City, the USFS and the Town of Alta to develop criteria for land acquisition in the Wasatch.
	Make recommendations for future management of these resources.	Work with established programs to acquire critical headwater lands.	Salt Lake County may work with private and public partners to acquire critical lands in both the Wasatch and Oquirrh Mountains.
		Incorporate recharge area protection requirements into proposed Salt Lake County Source Water Protection Ordinance.	Salt Lake County may organize stakeholder meetings to explore visitor fee programs for Big and Little Cottonwood Canyons.
		Work with local stakeholder groups to explore visitor fee programs for Big and Little Cottonwood Canyons.	Salt Lake County may organize stakeholder meetings to explore enhanced public transportation in the Wasatch Mountains.
		Work with local stakeholders to explore enhanced public transportation programs in the Wasatch Mountains – specifically in the summer months.	



**Table E.6 Major Recommendations and Implementation Tasks for Countywide Activities—  
Continued**

Element	Scope	Major Recommendations	Implementation
<p>Headwaters— <i>Continued</i></p>		<p>Continue to work collaboratively with management and regulatory agencies to sponsor public information and education campaigns for both the Wasatch and Oquirrh Mountains.</p> <p>Explore the possible establishment of a Watershed Protection Fund that could be used, in part, to support regular maintenance of facilities.</p> <p>Install sanitation facilities in heavily used rock climbing areas.</p> <p>Limit commercial and residential development to the most suitable sites.</p> <p>Enforce FCOZ to the fullest extent possible with minimal variances.</p> <p>Work collaboratively with management and regulatory agencies to identify long-term funding sources for land acquisition</p> <p>Key aspects of the FCOZ should be incorporated into the PCA Ordinance for development adjacent to the Oquirrh Mountains.</p> <p>Develop a comprehensive Watershed Function Index for the headwater areas.</p>	<p>Salt Lake County may work collaboratively with management and regulatory agencies to identify funding and develop informational material to enhance public information and education campaigns for both the Wasatch and Oquirrh Mountains.</p> <p>Salt Lake County may organize stakeholder meetings to discuss the development of a Watershed Protection fund.</p> <p>Salt Lake County may limit, to the maximum extent possible, commercial and residential to suitable sites in the Headwater areas.</p> <p>Salt Lake County may enforce FCOZ to the fullest extent possible with minimal variances.</p> <p>Salt Lake County may organize stakeholder meetings to identify funds to support long-term land acquisition and management programs.</p> <p>Salt Lake County may work with its partners to incorporate FCOZ requirements into the PCA Ordinance.</p> <p>Work with Salt Lake City, the USFS and other stakeholders to develop a Watershed Function Index.</p>

## Chapter 5.0 Atlas of Opportunities

The Atlas of Opportunities provides a set of management practices designed to address water quality problems or “stressors” identified in each sub-watershed.

As part of a watershed plan, appropriate management practices can be selected to restore or protect the watershed once stressors are identified. Chapter 3.0, Watershed Characterization, provides a critical element in determining the current and potential stressors in the sub-watersheds of Salt Lake County. Chapter 3.0 also identifies potential causes of these water quality stressors. The Atlas of Opportunities reviews stressors by sub-watershed and makes management recommendations to address those stressors. These summaries, or “fact sheets”, are intended for use by stakeholders in project implementation.

As the WaQSP establishes an iterative watershed management process, an evaluation of the effectiveness of implemented management practices should be conducted on an on-going basis to inform future efforts. If a given management practice is found to be ineffective, the water quality stressor should be re-evaluated and new management practices recommended.

Table E.7 presents the recommended management practice stressors identified in Chapter 3.0.



Example of urban/river interface, San Antonio River in Austin, TX



Example of community restoration activities, Jordan River Corridor Sub-Watershed



Green roof on Latter-Day Saint Conference Center, Jordan River Corridor Sub-Watershed



Example of Stormwater Pond in Sugarhouse Park, Lower Parley's Creek Sub-Watershed

Table E.7 Management Practices

STRUCTURAL

NON-STRUCTURAL

Watershed Function and Management Practices			
Water Quality	Habitat	Conveyance	Social/ Recreational
Bioretention Cells	Bioengineered Habitat Structures	Bioengineered Bank Stabilization	Develop Trail Networks Local to Regional Levels
Channel Restoration/ Enhancement	Canal Water Diversion	Channel Restoration/ Enhancement	Direct Visitor Use Routes
Constructed Wetlands	Channel Restoration/ Enhancement	Erosion Control	Recreational Facilities Accessibility and Resource Compatibility
Green Roofs	Constructed Wetlands	Floodplain Reestablishment	Re-vegetation and Stabilization
Individual Cistern Irrigation System	Dam Removal/Retrofit	Grade Control Structures	Riparian Buffer Restoration/ Enhancement
Infiltration Basins	Diversion Structure Removal	Stormwater BMP Retrofitting	Stabilize Recreation Areas
Manufactured Treatment Systems	Exotic Fish Species Mgmt.	Stormwater Ponds	
Oil Water Separators	Fish Passage Improvement	Stream Daylighting	
On-lot Stormwater Detention	Native Fish Stocking	Wetland Restoration/ Enhancement	
Revetments	Riparian Buffer Restoration/ Enhancement		
Sand Filters	Stream Daylighting		
Sediment Basins	Vegetation Management		
Stormwater Ponds	Wetland Restoration/ Enhancement		
Trash Racks			
Vegetated Swales			
Educational Materials	Buffer Protection Ordinances	401 Permitting	Education & Interpretive Opportunities
Minimize DCIAs	Land Acquisition for preservation	Impervious Surface Limits/Open Space Requirements	Identify Community Needs & Opportunities
Minimize Soil/ Vegetation Disturbance	Leadership in Energy and Environmental Design criteria	Leadership in Energy and Environmental Design criteria	Leadership in Energy and Environmental Design criteria
On-lot Stormwater Detention	Minimum Flow Protection	Sediment Source Control	Participate in New or Existing Planning Efforts
Open Space Preservation	Reallocation of Water Rights	Stormwater Ordinances	Volunteer Programs
Pet Waste Programs	Stream Alteration Ordinances	Streambank Re-vegetation	
Rainwater Harvesting	Volunteer Programs		
Sensitive Area Protection	Water Rights Acquisition		
Stormwater Ordinances/Permits			
Urban Forestry/ Preservation of Natural Vegetation			
Volunteer Programs			



## Chapter 6.0 Implementation Program

Implementation is the heart of the WaQSP effort. Watershed implementation strategies and opportunities have been identified by reviewing: 1) existing authorities necessary for WaQSP implementation, 2) delineating general implementation policies and practices, 3) making recommendations for implementation projects, and 4) identifying possible funding sources for implementation. Additionally, the implementation chapter outlines a process for updating and amending the WaQSP.

*Public and Stakeholder Involvement Plan* This section provides a summary of a Public Survey conducted in 2007 with regards to watershed issues. This survey serves as a primary guide for the Public Involvement (PI) Plan associated with the WaQSP. The goal of the PI Plan is to encourage and facilitate sub-watershed committees to oversee implementation of the WaQSP at a sub-watershed scale. The PI Plan includes specific tasks for sub-watershed plan development and implementation, as well continuous or on-going tasks for long-term WaQSP implementation. Ultimately, PI efforts will initiate community involvement and educate the public with regards to watershed issues.



Midas Creek, Midas/Butterfield Creek Sub-Watershed

*Practices* This section presents recommendations for WaQSP implementation by SLCo and local stakeholders. Table E.6 above provides Countywide recommendations and implementation tasks. Additional recommendations and tasks are contained in Chapter 5.0 Atlas of Opportunities. To focus Salt Lake County's efforts over the next six years, 15 priority tasks have been identified. In focusing on these tasks, Salt Lake County will continue to review watershed needs to establish an adaptive management cycle that will address future concerns and incorporate the successes and failures of past implementation activities. To complete the 15 priority tasks, an implementation plan including cost estimates and funding options, has been developed. Priority tasks are as follows:

1. Encourage the adoption of Leadership in Energy and Environmental Design criteria.
2. Develop sensitive areas overlay zone ordinance template for use on the west side of unincorporated Salt Lake County and within cities.
3. Establish maximum impervious surface area ordinance for site developments within unincorporated Salt Lake County.
4. Develop a Countywide Water Quality Predictive Management Tool for water quality planning and compliance purposes.
5. Expand water quality and quantity data collection.
6. Develop a wetland assessment that augments existing data. Work with established programs to acquire easements and parcels adjacent to SLCo streams that contain wetlands.
7. Evaluate current Lower Jordan River flow management strategies for impact to water quality.
8. Implement Public Involvement Plan.
9. Maintain and update Stream Function Index (SFI).
10. Develop countywide water quality design criteria for stormwater management facilities.

11. Maintain and update Water Quality Stewardship Plan (WaQSP). As part of ongoing planning efforts, re-establish a core working headwaters group to facilitate inter-agency coordination and further define permit consistency review procedures.
12. Provide assistance, coordination, facilitation and oversight for water quality improvement grant applications.
13. Sample instream water quality during storm events.
14. Continue stream restoration/enhancement and maintenance efforts.
15. Implement BMPs for stormwater quality purposes.

In addition to implementing countywide recommendations, SLCo, with the assistance of advisory committees, will facilitate the development of sub-watershed plans. These plans will include a detailed implementation schedule, milestones, measurement criteria, monitoring, financial resources, and evaluation framework. These plans will also incorporate identified stressors, and include stream data and stakeholder input. While these plans will be developed in the future, it is anticipated that they will incorporate the four (4) major types of projects identified in Chapter 5.0. These are as follows:

1. Stream restoration
2. Stormwater utilities
3. Habitat enhancement
4. Land use ordinances

Salt Lake County plans to work with local stakeholders to identify priority sub-watersheds in order to effectively use existing monetary

resources. It is anticipated that these priority sub-watersheds will be identified in 2008, with plan development and implementation beginning in 2009.

**Amendment Process** The WaQSP is considered to be a dynamic/adaptive management planning process and will be updated every six (6) years. The next update of the WaQSP is scheduled for the year 2015. WaQSP updates will incorporate the most recent population and land use data and will address current Total Maximum Daily Load (TMDL) recommendations and 303(d) listings. Additionally, it is anticipated that with each update of the WaQSP, data will be collected and compiled into a Stream Function Index (SFI) report. With continued collection and analysis of water quality, habitat, hydrological and social data, Salt Lake County and our partners will be able to monitor changes to the Watershed on a continuous basis.

However, certain situations may develop (e.g. industrial uses may change or rapid and concentrated development may occur) where an amendment may be requested outside the scheduled WaQSP update cycle. The process to amend the WaQSP is initiated by a formal written request to amend, which will be sent to Salt Lake County, attention Flood Control and Water Quality Division. As outlined in Figure E.3, Flood Control and Water Quality staff will conduct a cursory review to determine whether a WaQSP amendment is required.

In order to assure that water quality and environmental considerations are fully addressed in any proposed amendment process, Salt Lake County will review the amendment to confirm that it is in harmony with the strategic targets, recommendations, and policies outlined in the WaQSP.



Corner Canyon Debris Basin, Lower Corner Canyon Sub-Watershed

The County Council has authority to approve or disapprove a WaQSP amendment based on their assessment of potential impacts to the Salt Lake Countywide Watershed.

### Chapter 7.0 Monitoring

In conjunction with the WaQSP, the County has initiated a field intensive monitoring program. The intent is to develop a method to evaluate: 1) the current health of the stream corridor, 2) the effectiveness of project implementation, and 3) the effectiveness of the WaQSP. This monitoring program is intended to be a continuous, on-going effort to refine and augment existing databases. The information collected as part of this effort will serve to focus watershed protection and restoration activities to achieve the most effective and fiscally responsible results.

In 2006, Salt Lake County developed a plan outlining a means to measure stream health in the Countywide Watershed. This methodology examines stream function as an indicator of overall watershed function. The end result of this data collection and compilation is a “Stream Function Index” (SFI). An SFI score measures the: water

quality, habitat, hydrology, and social function of both mountain and valley streams. The SFI is intended to serve as a repeatable method to measure management effectiveness and identify specific concerns. Although the SFI is a key piece of information directing management activities, it is fully acknowledged that to assess all watershed functions (wetland functional values, recharge/discharge balance, sediment loading etc.) would require a more comprehensive study in each sub-watershed.

Fieldwork for the SFI began in the spring of 2007 and will be published along with the final WaQSP document. SFI methodology and targets are contained in Appendix G. It is anticipated that SFI field assessments and data analysis will be conducted concurrently with future WaQSP updates.



Oquirrh Mountains