7.0 MONITORING

An important component of a watershed plan is the establishment and use of ongoing monitoring efforts. This chapter: 1) reviews existing monitoring efforts, 2) introduces the Ecosystem Health Index (EHI) and Stream Function Index (SFI), and 3) discusses the use of monitoring data in future implementation and planning efforts associated with the Water Quality Stewardship Plan (WaQSP).

7.1 EXISTING MONITORING EFFORTS

Numerous organizations and agencies collect water quality and watershed related data in Salt Lake County. On-going data collection efforts are reliably conducted by: 1) State Division of Water Quality, 2) Salt Lake City Public Utilities, and 4) Salt Lake County Stormwater Program. Other water quality and watershed-related data collection efforts are conducted intermittently. This section provides a brief overview of the on-going monitoring efforts conducted, but is not intended to provide a comprehensive overview of all data collection efforts or methodologies.

7.1.1 State Division of Water Quality

The State Division of Water Quality (DWQ) stream monitoring program consists of basin intensive and fixed-station ambient water quality monitoring. The fixed-station monitoring network consists of 51 stations throughout the State of Utah. These fixed-stations are used primarily to evaluate long-term water quality trends. Samples are collected every six (6) weeks (eight times per year). There are six (6) fixed-station monitoring sites in the Salt Lake Countywide Watershed.

Field data collection, Midas/Butterfield Creek Sub-Watershed

Field data collection, Midas/Butterfield Creek Sub-Watershed

In addition to fixed-station monitoring, basin intensive studies are used to: 1) assess water quality, 2) identify causes and sources of pollution, 3) determine beneficial use support, and 4) provide data for developing watershed management plans. The data collected as part of the basin intensive studies are used to develop the 303(d) list of impaired waters and select those streams or segments of streams for Total Maximum Daily Load (TMDL) analysis. Requirements under section 305(b) of the Clean Water Act (CWA) are also met using intensive survey data.

Basin intensive studies have been conducted statewide using the following rotation: 1) Bear/ Weber River watersheds, 2) Jordan River watershed, 3) Uinta Basin watershed, 4) Sevier/ Virgin/Beaver Rivers watershed, and 5) the Colorado River watershed on the Colorado Plateau. The last basin intensive study in Salt Lake County (Jordan River watershed) was conducted in 2004.

7.1.2 Salt Lake City Public Utilities

Salt Lake City Public Utilities collects water quality data for Wasatch Mountain streams. This data is typically collected bi-monthly and is used to monitor the quality of waters being discharged from the area over which Salt Lake City has extra-territorial jurisdiction.

Big Cottonwood Creek, Upper Big Cottonwood Creek Sub-Watershed

7.1.3 Salt Lake County

As part of the Utah Pollution Discharge Elimination System (UPDES) permit, Salt Lake County samples stormwater runoff for the determination of pollutant loading to the streams and river in the County. Samples are taken during representative storm events to: 1) comply with UPDES permit requirements (monitoring is required by permit conditions), 2) develop data for pollutant load analyses, 3) develop and track Event Mean Concentrations (EMCs) (used for establishment of water quality trends and for analysis of effectiveness of BMPs), and 4) predict quality of runoff from outfalls. This data is published on a five year basis by the County.

7.2 MONITORING WaQSP EFFECTIVENESS

In addition to existing monitoring efforts, Salt Lake County initiated a field intensive monitoring program in 2007. The intent of this program is to evaluate: 1) the current health of stream corridors, 2) the trend of water quality and watershed health in the County, and 3) the effectiveness of WaQSP implementation.

In 2006, Salt Lake County, and members of the WaQSP Steering Committee, developed protocols to assess stream function using physical, chemical, biological, and social factors (Appendix G). The resulting Ecosystem Health Index (EHI) and Stream Function Index (SFI) are defined by watershed functions that reflect local concerns and management goals. As part of the EHI and SFI development, effort was made to select metrics that will: 1) accurately define progress toward goals and objectives, 2) provide repeatable, quantitative measurements, and 3) capitalize upon existing data sets previously gathered by Salt Lake County and other organizations.

The EHI and SFI indices were developed to focus watershed protection efforts and to assess the effectiveness of WaQSP implementation activities. The EHI assesses physical, chemical, and biological components of the stream. The SFI includes social, recreational and aesthetic components, in addition to those characteristics included in the EHI.

EHI and SFI data collection and compilation will occur every six (6) years. This data will be collected in conjunction with WaQSP updates and used to augment existing datasets that characterize the physical, chemical, biological, and social/recreational/aesthetic conditions of streams in the County.

7.2.1 Methodology

The EHI and SFI include characteristics, or metrics, that can be used to indicate the physical, chemical, biological, and social/recreational/ aesthetic conditions of a stream. These characteristics may also serve as indicators of overall watershed health.

The EHI and SFI are comprised of stream functional groups, sub-groups, and individual metrics. The organization of these groups is

Jordan River at 10600 South, Jordan River Corridor Sub-Watershed

shown in Table 7.1. A computer GIS model was developed to provide an analysis of the data collected against specific targets set for each metric.

In general, each function reflects watershed components that are important to Salt Lake County and can generally be associated with biological, physical, chemical, or social aspects of the stream. Individual metrics are placed within stream functional groups based on their respective

Great Salt Lake, Great Salt Lake Sub-Watershed

Table 7.1 EHI and SFI Metrics

Stream Function	Sub-Group	Metric	EHI	SFI
Water Quality	Regulatory	303(d) List	Ecological Health Index (EHI)	Stream Function Index (SFI)
	Aquatic	Macroinvertebrate		
	Monitoring	Total Phosphorus Temperature TDS Dissolved Oxygen Coliform (E. coli)		
Habitat	Stream Channel	Pool/Riffle Ratio Water Depth Fish Passage Habitat Structures Flow Diversion		
	Riparian Corridor	Width Community Type		
Hydrology	Flood Conveyance	Floodplain Development Floodplain Connectivity		
	Stream Stability	Pfankuch Bank Stability Hydraulic Alteration		
Social	Aesthetics	Management Visually Aesthetics		
	Amenities (nodes)	Location Accessibility (ADA approved) Restrooms Resource Compatibility		
	Amenities (trails)	Trail Corridor Connectivity Resource Compatibility		

influence on those functions. A detailed discussion of field data collection methods is found in Appendix G of the WaQSP.

7.3 ECOSYSTEM HEALTH INDEX (EHI)

The Ecosystem Health Index (EHI) examines physical, chemical, and biological conditions of streams in Salt Lake County. A brief description of the watershed functions that comprise the EHI are provided below. Refer to Appendix G for further detail regarding the EHI sub-groups and metrics.

7.3.1 Water Quality

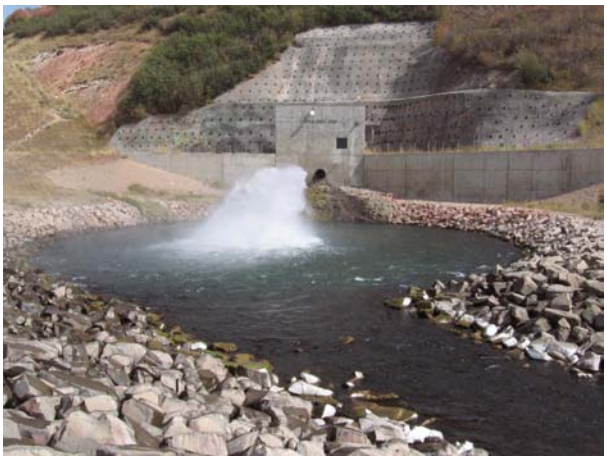
The water quality component of the EHI provides a means to assess water chemistry in the project area. This function is comprised of three (3) sub-groups:

1) Regulatory – The State of Utah 303(d) list of impaired waters (Department of Environmental Quality, 2006) is used to characterize water quality from a regulatory perspective.

2) Aquatic—The composition of macroinvertebrate communities reflect different species tolerance to pollution or changes in water quality and thus can be used as a surrogate measure of water chemistry.

3) Monitoring - Monitoring of water quality through direct measurements can indicate changes in upstream areas that contribute flow to receiving water bodies. The EHI will rely on existing water quality data posted on the EPAs data clearinghouse.

Duck in Jordan River, Jordan River Corridor Sub-Watershed



Little Dell Reservoir outlet, Upper Parley's Creek Sub-Watershed

7.3.2 Habitat

The habitat component of the EHI examines ecosystem components that contribute to aquatic and terrestrial habitat values of the stream channel and riparian corridor. Two sub-groups contribute to the Habitat Index Score:

1) Stream Channel - Metrics included in this sub-group measure channel features that provide habitat for the aquatic food chain.

2) Riparian Corridor - Metrics in this sub-group provide an indication of vegetative features that provide habitat for wildlife and shade for aquatic species.

7.3.3 Hydrology

The hydrology component of the EHI examines hydrologic features that contribute to proper conveyance of flood events through the watershed as well as physical stability of the stream network. Two sub-groups contribute to the Hydrology Index Score:

1) Flood Conveyance - Metrics included in this sub-group measure the ability of the

stream channel network to transport design storm events through the watershed.

2) Stream Stability - Metrics in this sub-group assess bank stability and the frequency with which stream channels experience hydraulic alteration as part of regularly scheduled maintenance activities.

7.4 STREAM FUNCTION INDEX (SFI)

The Stream Function Index (SFI) is considered an overall index that includes the EHI and adds a social, recreational, and aesthetic component. The social watershed functional group is designed to reflect social aspects that are important to residents of the project area. Social aspects can be combined with ecological metrics to determine the influence these aspects might have on stream health. The social functional group is comprised of (3) sub-groups with eight metrics that identify aesthetics and recreational amenities that are socially significant:

1) Aesthetics - This metric identifies the amount of land within the stream corridor that is managed as protected, open space. Aesthetics also includes an effort to measure visually pleasing land areas, although this is difficult to determine due to varied perspectives.

2) Amenities (nodes) - Metrics included in this sub-group are the number of recreational locations (or nodes), ADA accessibility, number of restrooms, and resource compatibility. The intent is to provide an assessment of a recreational experience, as well as evaluating whether or not these improvements are compatible with the environment.

3) Amenities (trails) – Metrics included in this sub-group include connectivity and resource compatibility. Similar to an evaluation of the nodes, this sub-group focuses on trail systems. Providing trail networks within the river corridor is considered an important amenity to the community. However, this amenity must be weighed against compatibility with the environment.

7.4.1 EHI and SFI Fieldwork

Fieldwork for the EHI and SFI began in the spring of 2007, and was designed to collect new data and verify existing data. Data collection and analysis will continue until all streams have been surveyed. It is anticipated that fieldwork will be conducted again with the next update of the WaQSP. This will allow for an evaluation of the effectiveness of WaQSP implementation efforts.

Pedestrian using bridge over Jordan River, Jordan River Corridor Sub-Watershed

Corner Canyon Creek, Lower Corner Canyon Creek Sub-Watershed

7.5 EHI AND SFI TARGETS

With each round of EHI and SFI data collection, targets will need to be determined for each metric. These targets will be based on scientific literature, current regulations, management goals and objectives, and local knowledge of the project area. These targets are not intended to be conclusive and will be adjusted if they are found to conflict with site-specific information gathered from each stream or river.

A score for each EHI and SFI metric will be developed with each data collection effort. These index scores will be based on a scale of 0 through 100, with 100 meaning that the target has been met. Once each metric has been scored, an overall EHI or SFI score will be determined by weighting and combining metric scores. Metric weights will be determined by the importance placed by Salt Lake County on each stream functional group, sub-group, or metric. The individual scores will be consolidated into one final EHI or SFI score for each stream.

In order to capture the diversity of the streams and river found in Salt Lake County, the County may consider using hydrology and elevation categories to determine both EHI and SFI targets.

7.6 WATERSHED FUNCTION

Although the EHI and SFI are key pieces 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. It is recommended that a comprehensive Watershed Functional Index (WFI) be developed for key sub-watersheds. A true WFI may include such factors as:

- Major hydrogeologic groundwater recharge zones
- Principal groundwater discharge zones in the headwaters
- Composite soil factor mapping overlay that describes permeability, erosion hazard, susceptibility to hillside slippage, water runoff potential, seasonal high water table conditions
- Vegetative analysis for all tree/shrub communities
- Estimated nitrogen/phosphorus loads from atmospheric deposition
- Potential wetland areas
- Slope limitation overlay
- Stream setback overlay
- Hydrogeomorphic characteristics, in addition to current Channel Stability Data.

7.7 CONCLUSION

The EHI and SFI are designed to provide a repeatable, unbiased means of assessing ecological health of the streams in Salt Lake County. Additionally, the SFI provides an assessment of social and recreational components of the stream corridor. The methodology used to calculate these indices can easily be modified to include additional stream segments or different metrics. An EHI and SFI score will be developed for each stream, and used for comparison purposes with future monitoring efforts.