5.0 ATLAS OF OPPORTUNITIES

In order to achieve the strategic targets outlined in Chapter 1.0, both countywide and sub-watershed specific projects need to be identified and implemented. Countywide concerns and recommendations are discussed in Chapter 4.0. However, in order to capture the complex variety of conditions in each of the 27 sub-watersheds countywide, data collected and compiled in Chapter 3.0 is examined by sub-watershed in this chapter. Based on identified water quality and watershed related conditions, major stressors are identified for each sub-watershed and recommendations are made to address these concerns. Additionally, this chapter provides information on management practices in identifying priority implementation activities.

The current characteristics of a watershed, as well as the projected characteristics, are critical to determining the cause of the stressor. Once the stressor(s) are identified, appropriate management practices can be selected to restore and/or protect the health of the watershed and improve water quality.

5.1 FUNCTIONS AND STRESSORS

As was discussed in Chapter 2.0, a healthy watershed provides four major functions to the local population. Components of these functions were evaluated in Chapter 3.0 in order to identify and prioritize areas where projects may be implemented to improve watershed function and health. The watershed functions include:

1) Water Quality
2) Habitat
3) Hydrologic
4) Social/Recreational

The characterization of the watershed allows for the evaluation of problems within each sub-watershed, and ultimately the identification of appropriate management practices. Identifying the cause of an impairment is referred to as "Stressor Identification" (Figure 5.1). A stressor is considered any physical, chemical, or biological condition that can induce an adverse response to watershed function.

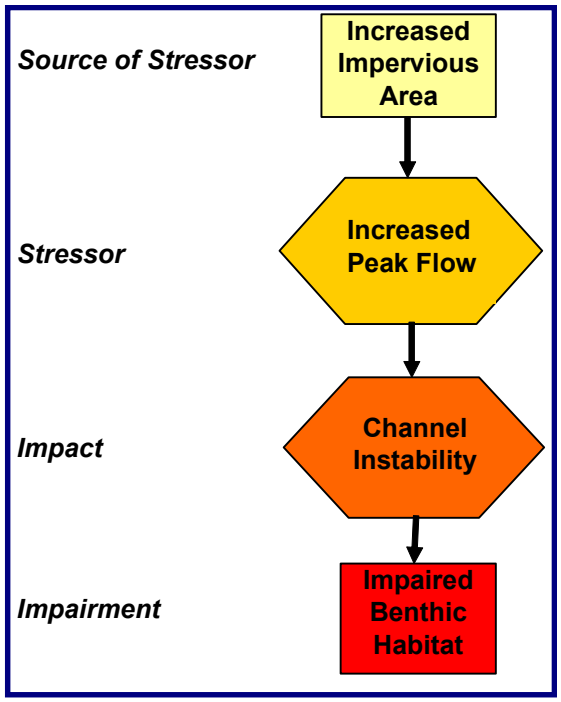


Figure 5.1 Stressor Identification—Conceptual Model

The first step in stressor identification is to develop a list of possible stressors for evaluation. This can be accomplished by data analysis or knowledge of aquatic habitats and stream hydrology. Identification of stressors allows for a determination of cause and effect relationships (EPA, 2000). Figure 5.2 is a simplified conceptual model of stressor identification (EPA, 2005). It should be noted that this is an iterative process that requires additional analysis until the stressor is successfully identified. This may include more data collection or identifying other stressors, and should be re-evaluated in future updates of the WaQSP.

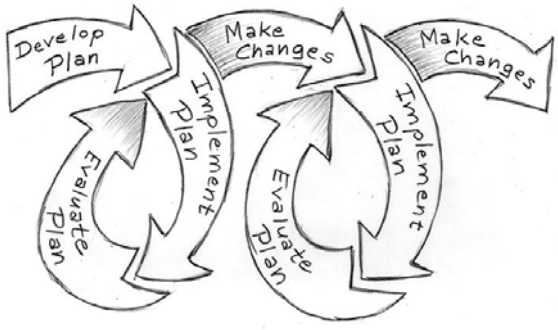


Figure 5.2 Model of Adaptive Management

5.2 WATERSHED STRESSORS

Identifying stressors in each sub-watershed is essential to identifying implementation activities and improving overall watershed function. Watershed characteristics for each sub-watershed are detailed in Tables 5.1 and 5.2. These characteristics were organized based on the watershed function that they are likely to influence most. For example, change in open space is associated with social/ recreational functions, whereas, erosion potential is associated with flood conveyance. To promote a general understanding of stressor severity, the characteristic values in Table 5.1 and 5.2 are colored based on anticipated effect (e.g. green indicates less stressed, yellow indicates more stressed, and red indicates most stressed). The color codes relate directly to the maps presented in Chapter 3.0. This information is separated into existing conditions (Table 5.1) and future projected conditions (Table 5.2). The future characteristics may be utilized for planning purposes.

The most common sub-watershed stressors are the following:

1) Lack of developed recreation

Recreational opportunities provide access to watershed resources and, as a result, operate to inform residents regarding their local environment. An increased sense of place and stewardship often results from this increased awareness. However, recreation activities may also be detrimental to local water quality and watershed health. In acknowledging this dichotomy, Salt Lake County seeks to promote recreational opportunities that are compatible with the resource, where the positive effects of education and stewardship outweigh any possible harm.

Trail in Lower Dry Creek Sub-Watershed

2) Lack of stream corridor protection

In an urban setting such as Salt Lake County, stream corridor protection is critical to watershed function. The lack of stream corridor protection often results in reduced riparian habitat, loss of wetlands, loss of recharge zones, loss of bank stability and reduced sinuosity. In order to preserve and enhance watershed function in the County, stream corridor protection is crucial.

House adjacent to Little Cottonwood Creek, Lower Little Cottonwood Creek Sub-Watershed

3) New development and re-development pressure

As the population in Salt Lake County continues to stretch beyond one million, both new development and re-development are occurring to accommodate this growth. In addition to economic and social benefits resulting from this growth, this growth may also result in the loss of pervious surface areas. Pervious surface areas are essential to support watershed functions such as filtration and habitat. It is Salt Lake County's position that effects from new and re-development activities may be reduced by employing low impact development activities.

5.3 SUB-WATERSHEDS

The results for each watershed were organized into several categories in order to easily evaluate the data and identify problem areas. The categories range from less stressed to more stressed, and are color coded accordingly (e.g. green indicates less stressed, yellow indicates more stressed, and red indicates most stressed). The color codes relate directly to the maps presented in Chapter 3 (please note the map reference in each column). This information may also be separated into existing conditions (Table 5.1), and future characteristics (Table 5.2), given that several components compared existing to projected conditions. The future characteristics may be utilized for planning purposes.

5.4 WATERSHED MANAGEMENT PRACTICES

Watershed management practices are types of measures implemented to achieve a specific goal in watershed health. There are many types of practices designed for different stressors, which may be used individually, or in combination to achieve the desired goal. Often times, these practices are identified as either structural or non-structural controls. Structural controls are defined as built facilities that typically provide some degree of treatment; non-structural controls usually involve changes in activities or behavior and focus on controlling pollutants at the source (EPA, 2005).

The intent of characterizing a watershed is to determine which management practices would be most effective in improving the condition of the watershed. Table 5.3 through 5.6 present management practices associated with each watershed function. A brief description of each management practice identified is provided in Sections 5.4.1 and 5.4.2.

Neighborhood in Draper City, Corner Canyon Sub-Watershed

Table 5.1 Sub-Watershed Stressors—Existing Conditions

Sub-watershed Code	EXISTING CHARACTERISTICS (2005)								
	Social/ Recreational	Conveyance				Habitat	Water Quality		
	Developed Recreation (%) Fig. 3.6.1	Severe & Very Severe Erosion Potential (%) Fig. 3.7.3	Reduced or Interrupted Flow (%) Fig. 3.10.2	Poor or Fair Stream Bank Stability (%) Fig. 3.11.1	Structures in FEMA Floodplain (%) Fig. 3.11.2	Streams w/ Adjacent Public Land (%) Fig. 3.12.1	Impaired (%) Fig. 3.13.2	Ave. Annual Change in TDS (mg/L) Fig. 3.13.3	Industrial Stormwater UPDES Permits (#) Fig. 3.13.9
BN	1.9	10.0	0.0	15.8	72.1	37.8	0.0	No Data	7
UBC	87.7	45.9	18.4	10.6	10.4	76.7	0.0	0.2	0
LBC	34.5	17.1	100.0	63.3	91.0	27.6	100.0	1.1	6
BG	2.7	21.3	100.0	20.5	36.9	36.3	0.0	No Data	8
UCC	98.1	26.3	34.6	9.3	0.0	99.4	0.0	0.3	0
LCC	42.0	35.9	100.0	71.1	19.4	44.8	0.0	No Data	2
CN	1.0	53.7	0.0	30.5	52.8	4.5	0.0	No Data	0
CY	28.5	25.5	68.6	64.6	77.1	56.7	0.0	No Data	3
DL	3.7	0.0	N/A	No Data	No Data	N/A	0.0	No Data	8
UDC	93.5	15.5	9.8	No Data	5.7	83.6	0.0	No Data	0
LDC	9.6	0.4	100.0	82.5	21.4	72.7	0.0	No Data	2
UEM	66.5	68.1	0.0	76.3	56.8	21.2	100.0	4.0	0
LEM	26.9	27.8	88.4	91.1	45.0	34.5	51.9	1.6	0
GSL	29.1	1.9	61.2	45.8	1.5	48.2	6.6	No Data	143
JR	9.5	5.6	72.2	No Data	57.9	90.0	33.6	1.6	70
ULC	90.3	19.5	20.6	23.8	7.3	78.7	100.0	0.4	0
LLC	40.9	21.1	100.0	77.1	78.1	23.2	100.0	5.8	3
MBC	5.1	12.4	12.8	43.9	69.9	26.9	0.0	-0.9	1
UMC	90.9	83.1	0.0	40.7	0.0	78.0	0.0	0.5	0
LMC	2.6	1.9	91.6	91.6	98.6	17.3	0.0	2.8	15
UPC	85.5	64.9	36.7	26.8	20.8	73.8	100.0	-0.1	0
LPC	23.9	27.2	100.0	94.3	40.0	32.8	91.3	7.5	2
URB	4.3	86.2	29.6	81.5	0.0	78.9	0.0	0.4	0
LRB	29.4	24.0	100.0	95.0	59.9	8.1	0.0	No Data	0
RC	11.6	1.9	79.3	40.1	48.9	48.7	0.0	No Data	0
UWC	98.7	49.8	0.0	No Data	83.9	66.9	0.0	No Data	0
LWC	9.2	0.7	91.1	66.7	78.6	34.5	0.0	No Data	2

Table 5.2 Sub-Watershed Stressors—Future Projected Conditions

Sub-watershed Code	FUTURE CHARACTERISTICS (2030)						
	Social/Recreational				Water Quality		
	Change in Population (Persons) Fig. 3.5.1	Change in Density (People/Acre) Fig. 3.5.2	Change in Impervious Surface (%) Fig. 3.5.6	Change in Open Space (%) Fig. 3.5.7	Change in TP Loading (%) Fig. 3.13.5	Change in TN Loading (%) Fig. 3.13.7	Change in TSS Loading (%) Fig . 3.13.6
BN	70,650	2.6	13.5	-53.4	19.7	6.3	7.8
UBC	60	0.9	0.1	0.0	0.0	0.0	0.0
LBC	52,930	1.7	11.8	-12.1	-2.5	2.3	-4.3
BG	36,450	2.8	0.5	-20.9	10.2	-3.0	1.5
UCC	230	0.0	5.4	0.3	134.4	22.3	42.0
LCC	1,700	0.4	0.8	7.2	-3.4	-0.5	0.4
CN	4,330	1.3	-22.3	-0.6	41.3	-5.6	9.4
CY	16,010	1.7	-0.9	23.8	-13.3	-6.1	-8.4
DL	6,700	1.1	13.2	-54.0	-8.9	2.0	-7.9
UDC	1,590	0.7	7.2	-2.6	21.3	4.1	4.2
LDC	14,880	1.7	10.5	-48.1	-4.7	-1.3	-5.4
UEM	40	0.4	0.0	0.0	0.4	0.1	0.2
LEM	1,810	0.6	19.2	-6.0	2.4	4.9	3.1
GSL	48,440	0.7	-8.4	6.5	15.4	-5.6	6.8
JR	57,230	1.6	17.5	-33.3	-8.1	0.1	-6.7
ULC	830	1.3	2.2	-1.1	0.6	0.4	-0.3
LLC	11,430	1.9	9.4	-8.6	-2.0	2.8	-4.8
MBC	100,840	4.0	19.0	-60.8	21.5	6.5	7.5
UMC	50	0.4	0.3	-0.1	0.6	0.1	0.1
LMC	12,060	1.2	17.4	-66.0	-7.3	2.7	-4.5
UPC	40	0.3	-3.4	0.6	-2.3	-0.5	-0.9
LPC	2,440	0.7	12.1	-6.7	-0.7	4.0	-0.6
URB	40	0.1	5.3	-1.1	7.6	1.6	1.9
LRB	810	0.3	37.5	12.2	-28.8	4.9	-23.6
RC	35,670	3.5	8.3	3.0	-0.2	1.2	1.8
UWC	1,150	0.3	-2.9	2.2	-0.8	-0.2	1.4
LWC	9,830	1.6	7.3	-19.9	-6.9	-1.6	-6.5

Table 5.3 Social/Recreational Management Practices

SOCIAL/RECREATION							
STRESSOR							MANAGEMENT PRACTICE
Structural							
Lack of Protected Land	Lack of Visual Aesthetics	Lack of Recreation Amenities	Lack of Accessible Recreation	Lack of Restrooms	Resource Compatibility Problems	Lack of Resource Connectivity	
✓			✓		✓	✓	Direct Visitor Use Routes
✓			✓		✓	✓	Develop Trail Networks Local to Regional Levels
		✓	✓				Recreational Facilities-Accessible and Resource Compatible
	✓				✓	✓	Revegetation and Stabilization
✓	✓				✓	✓	Riparian Buffer/Restoration/ Enhancement
Non-Structural							
Lack of Protected Land	Lack of Visual Aesthetics	Lack of Recreation Amenities	Lack of Accessible Recreation	Lack of Restrooms	Resource Compatibility Problems	Lack of Resource Connectivity	
					✓	✓	Education and Interpretive Opportunities
	✓			✓	✓		Facility Maintenance
✓		✓					Identify Community Needs and Opportunities
	✓				✓	✓	Leadership in Energy and Environmental Design Criteria
✓	✓	✓	✓	✓		✓	Participate in New or Existing Planning Efforts
	✓				✓	✓	Volunteer Programs

Table 5.4 Conveyance Management Practices

CONVEYANCE								
STRESSOR								MANAGEMENT PRACTICE
Structural								
Flooding			Stream Instability		Hydraulic Alteration			
Houses and/or Property	Lack of Floodplain	Lack of Floodplain Connectivity	Bank	Channel	Channelization	Dredging	Hardening	
			✓				✓	Bioengineered Bank Stabilization
	✓	✓	✓	✓	✓		✓	Channel Restoration/Enhancement
			✓	✓		✓		Erosion Control
✓	✓	✓						Floodplain Reestablishment
			✓	✓		✓	✓	Grade Control Structures
	✓	✓	✓	✓			✓	Revegetation and Stabilization
✓			✓	✓				Stormwater BMP Retrofitting
			✓	✓		✓		Stormwater Ponds
	✓	✓			✓		✓	Stream Daylighting
✓	✓	✓						Wetland Restoration/Enhancement
Non-Structural								
Flooding			Stream Instability		Hydraulic Alteration			
Houses and/or Property	Lack of Floodplain	Lack of Floodplain Connectivity	Bank	Channel	Channelizaation	Dredging	Hardening	
✓			✓	✓				Impervious Surface Limits/Open Space Requirements
✓	✓	✓	✓	✓	✓	✓	✓	Leadership in Energy and Environmental Design Criteria
			✓	✓		✓		Sediment Source Control
	✓	✓	✓	✓				Stormwater Ordinances
			✓	✓	✓		✓	401 Permitting

Table 5.5 Habitat Management Practices

HABITAT										
STRESSOR										MANAGEMENT PRACTICE
Structural										
Aquatic			Riparian			Wetlands		Instream Flows		
Limited Native Fish	Restricted Fish Passage	Limited Habitat Features	Limited Buffer Width	Limited Stream Cover	Limited Diversity	Limited Quantity	Limited Diversity	Limited Quantity	Limited Variability	
✓		✓								Bioengineered Aquatic Habitat Structures
								✓	✓	Canal Water Diversion
✓		✓								Channel Restoration/ Enhancement
								✓	✓	Diversion Structure Modification
✓										Exotic Fish Species Management
✓	✓									Fish Passage Improvement
✓										Native Fish Stocking
			✓		✓					Riparian Buffer Restoration/ Enhancement
	✓		✓	✓		✓	✓			Stream Daylighting
						✓	✓			Wetland Restoration/ Enhancement
Non-Structural										
Aquatic			Riparian			Wetlands		Instream Flows		
Limited Native Fish	Restricted Fish Passage	Limited Habitat Features	Limited Buffer Width	Limited Stream Cover	Limited Diversity	Limited Quantity	Limited Diversity	Limited Quantity	Limited Variability	
			✓			✓				Buffer Protection Ordinances
			✓			✓				Land Acquisition for Preservation
			✓			✓		✓	✓	Leadership in Energy and Environmental Design Criteria
								✓		Minimum Flow Protection
								✓	✓	Reallocation of Water Rights
✓										Stream Alteration Ordinances
								✓	✓	Water Rights Acquisition
		✓	✓	✓						Volunteer Programs

Table 5.6 Water Quality Management Practices

WATER QUALITY								
STRESSOR								MANAGEMENT PRACTICE
Point Sources	Urban Runoff	Pathogens	Chemical	Siltation	Thermal Energy	Nutrients	DO	**Structural**
	✓	✓	✓	✓	✓	✓	✓	Bioretention Cells
	✓	✓	✓	✓	✓	✓	✓	Channel Restoration/Enhancement
✓	✓	✓	✓	✓		✓	✓	Constructed Wetlands
	✓	✓	✓	✓	✓	✓	✓	Green Roofs
	✓	✓	✓	✓		✓	✓	Infiltration Basins
✓	✓	✓	✓	✓	✓	✓	✓	Manufactured Treatment Systems
	✓			✓				Revetments
✓	✓	✓	✓	✓	✓	✓	✓	Sand Filters
	✓	✓	✓	✓			✓	Sediment Basins
	✓	✓		✓	✓	✓		Stabilize Recreation Areas
	✓	✓	✓	✓		✓		Stormwater Ponds
✓							✓	Trash Racks
		✓		✓		✓	✓	Vegetated Swales
								Non-Structural
	✓	✓	✓			✓	✓	Educational Materials
	✓							Minimize DCIAs
	✓		✓	✓		✓		Minimize Soil/Vegetation Disturbance
	✓		✓	✓		✓	✓	On-lot Stormwater Detention
	✓				✓			Open Space Preservation
		✓				✓		Pet Waste Programs
		✓				✓		Rainwater Harvesting
				✓				Sensitive Area Protection
	✓	✓	✓	✓	✓	✓	✓	Stormwater Ordinances
				✓				Urban Forestry/Preservation of Natural Vegetation
	✓	✓					✓	Volunteer Programs

5.4.1 Structural Management Practices

Bioengineered Bank Stabilization Bioengineered bank stabilization refers to methods used to stabilize stream banks using natural vegetation often in conjunction with rock, natural materials, erosion control matting, etc. These structures have a more natural appearance.

9000 South Jordan River bioengineered bank stabilization, Jordan River Corridor Sub-Watershed

Bioretention Cells Bioretention cells, also referred to as rain gardens, are small landscaped, graded areas that are constructed with a special soil mix that can absorb and filter stormwater runoff. These landscaping elements aid in reducing stormwater runoff, replenishing the aquifer, and filtering non-point source pollution (EPA website).

Example of Bioretention Cells

Bioengineered Aquatic Habitat Structures Bioengineered habitat structures refers to the design and use of natural materials (e.g. logs, rocks, brush bundles, etc.) in combination with plants that will help to establish riparian and aquatic habitats. Examples of these include root wads, log and rock barbs, tree revetments, and bank shaping and planting. These structures have a more natural appearance.

Canal Water Diversion Canal water diversion refers to both the removal of the diversion or the additional of a diversion to redirect flow into a stream. The intent is to maintain adequate instream flows to support riparian and aquatic habitat.

Channel Restoration/Enhancement Channel restoration refers to the process of physically altering a stream channel to function properly in terms of a riparian and aquatic habitat. Channel restoration/enhancement practices may include restoring channel flow, plantings, creating pools and riffles, increasing sinuosity, installation of stream bank armor, and more. Benefits include reduced sediment loss, bank stability and increased habitat functions.

Jordan River ecosystem restoration project at 11400 South, Jordan River Corridor Sub-Watershed

Constructed Wetlands A constructed wetland refers to a manmade vegetated area that provides watershed function. The wetlands requires a water source to permit the growth of rushes, willows, cattails, and reeds to provide some habitat value, water quality benefit and flood conveyance capacity.

Develop Trail Networks Local to Regional Levels Plan trail systems that provide recreation opportunities to neighborhoods as well as on a regional scale. Connecting local and regional trails provide a wider range of movement and experiences for the trail user.

Example of constructed wetland at 7800 South on the Jordan River

Direct Visitor Routes User impacts to sensitive riparian vegetation can be reduced by design of user routes. Trail development and deterrents such as large rock and logs that blend into the natural setting, will direct visitor travel.

Residents walking on trail, Lower Parley's Creek Sub-Watershed

Diversion Structure Modification Modifications to diversion structures are intended to return a stream to its natural flow regime, reduce water temperatures, and to remove fish passage barriers while providing the necessary water rights conveyance.

Diversion structure on Mill Creek, Lower Mill Creek Sub-Watershed

Erosion Control Erosion control is the practice of preventing or controlling erosion caused by stormwater runoff. This usually involves the installation of erosion control Best Management Practices (BMPs) such as vegetation or rock stabilization.

Exotic Fish Species Management Exotic or non-native fish species are known to cause ecological damage, making control of these species important to the overall heath of the habitat. Techniques for management can be physical, mechanical, chemical or biological.

Fish Passage Improvement Fish ladders are often used to improve fish passage around artificial barriers. These are structures designed to facilitate the natural migration of fish. These are usually a series of steps with flow great enough to attract the fish.

Example of Fish Ladder

Floodplain Re-establishment Floodplain reestablishment refers to the practice of removing materials in the floodplain to improve the hydraulic capacity of the channel thereby reducing flood levels. Reestablishment of the floodplain also serves to create a more stable stream under high flow conditions.

Example of floodplain re-establishment along the Jordan River, Jordan River Corridor Sub-Watershed

Grade Control Structures Grade control structures in waterways typically consist of rock or logs, and are installed to maintain a desired streambed elevation. Grade control practices create a "hardpoint" along the channel, preventing the streambed from degrading under high and low flow conditions. Benefits include stream channel stability and floodplain connectivity.

Green Roofs Green roofs are designed to replace traditional types of roofs, and absorb, store, and later evapotranspire initial precipitation, thereby acting as a stormwater management system and reducing overall peak flow discharge to a storm sewer system. These roofs consist of a growing medium and plantings that are applicable to the climate.

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

Infiltration Basins An infiltration basin is a shallow impoundment which is designed to convey stormwater into the ground. These basins are normally dry and provide stormwater treatment through detention and filtration. These basins have the added benefit of groundwater recharge.

Example of Infiltration Basin

Manufactured Treatment Systems These stormwater treatment systems are manufactured and designed to provide some degree of treatment through a filter swirling path or additional chambers to trap sediment oil or floatables.

Native Fish Stocking Stocking of native fish serves to restablish a native population in order to restore the natural system. Often times, non-native fish populations cause impacts to a habitat such species dominance.

Recreational Facilities– Accessible and Resource Compatible Provide resource compatible and accessible recreational facilities for public education and safety. These facilities include restrooms, parking areas, and other amenities. Appropriate design of recreational facilities should consider resource protection and be consistent with watershed protection guidelines.

Re-vegetation and Stabilization This refers to re-vegetation of areas that are particularly susceptible to erosion or are in need of rehabilitation. Stabilization practices include rock protection, revegetation, and integrated methods to control soil erosion.

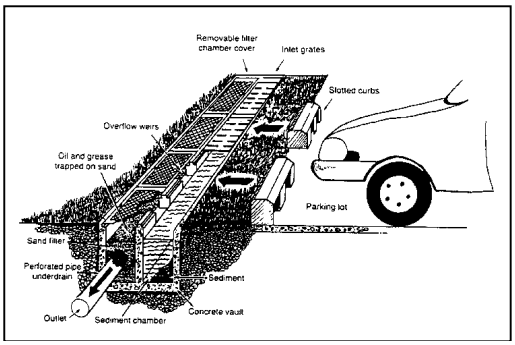
Revetments Revetments are structures placed on banks in such a way as to absorb the energy of stream flow. They are usually built to preserve the existing uses of the shoreline and to protect the slope. Many revetments are used to line the banks of freshwater rivers, lakes, and man-made reservoirs, to prevent banks from eroding . Types of revetments include hard armor and natural materials.

Example of Revetment

Riparian Buffer Restoration/Enhancement Riparian buffer restoration/enhancement refers to the process of returning natural functions to the land adjacent to streams and rivers. This includes invasive plant removal, revegetation, stream bank stability measures and more. Benefits include flood control, wildlife habitat, increased water quality and support of aquatic life and biodiversity.

View of a Riparian Buffer along Parley's Creek, Lower Parley's Creek Sub-Watershed

Sand Filters A sand filter consists of a storage zone underlain by a sand bed with an underdrain system. Stormwater treatment is provided through and filtering prior to discharge or infiltration.



Schematic of a Sand Filter

Sediment Basins Sediment basins are basins that are designed to provide extended detention times or a reduction in velocity to remove sediment from stormwater runoff.

Example of a Sediment Basin

Stabilize Recreation Areas Stabilizing heavily used areas refers to specific areas that tend to attract people, such as scenic viewpoints. These areas should be hardened or stabilized in such a manner as to minimize erosion and pollutant discharge due to the recreational use.

Example of hardened trail along the Jordan River, Jordan River Corridor Sub-Watershed

Stream Daylighting Stream daylighting refers to the process of removing engineered conveyance pipes and exposing the waterway to the surface. This allows for increased watershed functions of aquatic and wildlife habitat, social and aesthetic function.

Stormwater Ponds Stormwater ponds are constructed basins designed to hold and treat stormwater runoff. They are used in conjunction with inlet and outlet structures to control flow rate, treat sediment, and prevent down stream degradation. Stormwater ponds can be designed as detention, retention or infiltration ponds. These ponds provide flood control, and stormwater treatment benefits.

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

Stormwater BMP Retrofitting Retrofitting stormwater BMPs includes expanding, modifying or upgrading existing BMPs. Retrofitting provides the opportunity to control stormwater quantity and quality to the maximum extent practible.

Trash Racks Plastic or steel grates placed to protect inlets from debris and litter. Trash racks can also be placed on outlets of ponds.

Vegetated Swales A vegetated swale is a broad, shallow channel with a dense stand of vegetation covering the side slopes and bottom. Swales are designed to trap particulate pollutants, promote infiltration, and reduce the flow velocity of stormwater runoff.

Example of a Vegetated Swale

Wetland Restoration/Enhancement Refers to the process of physically altering the wetland area to provide watershed benefits such as habitat, flood control and water quality. Practices include management of water levels (hydrology), revegetation, recontouring areas, controlling invasive plants and species, restoring buffers and controlling pollution sources.

Example of wetlands along the Jordan River, Jordan River Corricor Sub-Watershed

5.4.2 Non-Structural Management Practices

Buffer Protection Ordinances Buffers are the natural boundary between a waterway and existing development. An ordinance establishing a specific size of buffer to be maintained can serve to protect water quality and aquatic habitat.

Community Action Groups Community action groups can serve to protect and enhance recreational opportunities in a watershed. Some examples in the Salt Lake Valley include Friends of the Great Salt Lake, Save Our Canyons, and Friends of Big Cottonwood Creek.

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

Directed Growth – Directed growth refers to a planning and zoning strategies that direct growth toward areas where it can be sustained with a minimal impact on the natural environment (EPA website). Through land use designations and zoning, development should be away from areas where land disturbance activities or pollutant loadings from subsequent development would severely impact surface waters, or in environmentally sensitive areas in order to minimize impacts to the watershed.

Educational Materials – A watershed education plan must be developed and planned around specific goals and objectives. The intent is to inform the public with regards to watershed issues and ways individuals may help to improve watershed health. A good plan would include a variety of media and messages, and possibly bilingual. Educational materials serve to reinforce the message, and help to reach a wider audience. Examples of materials include brochures, posters, commercials, busboards, and give-away items (e.g. pencils, notepads).

Example of stormwater educational materials

Education and Interpretive Opportunities – Providing information at trail heads and at various points along a trail, serve to not only enhance the visitor's experience, but to inform the public about important watershed issues. An informed public can be beneficial to achieving watershed goals.

Facility Maintenance Facilities provided for visitors should be maintained in order to enhance the visitor's experience. This includes restroom facilities, parking lots and signage.

Impervious Surface Limits - Impervious surface and open space limits refers to the establishment of limits of new impervious surfaces or minimum open space requirements on project sites. The intent is to minimize the impact to stormwater runoff quality and quantity caused by an increase in impervious surface areas.

Identify Community Needs and Opportunities - Determine type and location of resource compatible opportunities ammenities through the planning process and user group input. Part of the planning process includes feasible implementation recommendations.

Land Acquisition for Preservation – Land acquisition is important for the establishment and protection of stream corridors, riparian buffers, wetlands, open space, groundwater recharge and other watershed functions.

Leadership in Energy and Environmental Design Criteria Leadership in Energy and Environmental Design criteria encourages adoption of sustainable green building and development practices through the implementation of universally understood and accepted tools and performance criteria. It promotes a whole-building approach to sustainability by recognizing performance in areas of human and environmental health. Examples include sustainable site development, water savings, energy efficiency, and materials selection.

Drawing of a Leadership in Energy and Environmental Design Criteria Building

Minimum Flow Protection Minimum Flow Protection refers to a policy or ordinance that requires a minimum stream flows to be maintained in a stream channel to support the natural riparian and aquatic habitat.

Minimize Directly Connected Impervious Areas (DCIAs) Minimizing DCIAs refers to the policy of limiting the amount of precipitation that is converted to stormwater runoff by incorporating on-site storage and infiltration. Examples include redirecting rooftop runoff to pervious areas, alternative turnarounds to reduce the amount of impervious area associated with cul-de-sacs, and alternative pavements that are permeable.

Minimize Soil/Vegetation Disturbance Minimizing soil and vegetation disturbance during construction activities serves to reduce soil erosion and impacts to stormwater quality.

On-lot Stormwater Detention On-lot stormwater detention refers to the practice of containing stormwater runoff on individual lots to reduce impacts caused by an increase in impervious surface areas.

Open Space Preservation Open space preservation is an important aspect to a healthy watershed. Open space provides several benefits such as habitat, infiltration capacity, flood control, and groundwater recharge.

Participate in New or Existing Planning Efforts Various local, state and federal planning efforts are already in progress and typically include input from neighborhood and user groups. Local communities and neighborhoods can also plan and execute planning for projects that address specific needs of their watersheds.

Pet Waste Programs Pet waste programs include pet waste collection programs, pet awareness and education, signs, and pet waste control ordinances to alert residents to the proper disposal techniques for pet droppings. Controlling pet waste helps to minimize stormwater pollutants from these wastes and protect water quality.

Pet Waste Sign and Container

Rainwater Harvesting – An small scale cistern irrigation system is a tank or tank system that collects rainwater from roofs, which is then used for residential irrigation. This reduces household drinking water usage.

Re-allocation of Water Rights Reallocation of Water Rights refers to the transfer of water rights from irrigated agriculture to urban, industrial and environmental purposes to support beneficial uses.

Example of an Individual Cistern for Rainwater Harvesting

Sediment Source Control Sediment source control includes various methods to minimize impacts caused by sediment from point and nonpoint sources. Examples of controls are permits, discharge limitations, street sweeping and litter/ trash receptacles.

Example of Sediment Control in Dry Creek , Lower Dry Creek Sub-Watershed

Sensitive Area Protection – Sensitive area protection refers to the practice of designating specific areas in need to additional protection. These areas are typically designated due to specific issues; presence of threatened or endangered species, environmentally stressed areas, steep areas subject to a high degree of erosion, etc. Types of protection various depending upon the issue, examples include limiting development, requiring implementation of best management practices, and establishing ordinances. An example in the Salt Lake County-wide Watershed is the Foothill & Canyons Overlay Zone (FCOZ) which serves to control growth and development along the Wasatch Front.

Stormwater Ordinances Stormwater Ordinances give authority to municipality to establish and enforce criteria to reduce stormwater pollutant discharges, BMP installation and maintenance, etc.; all with the intent to minimize impacts to a watershed caused by stormwater runoff.

Stream Alteration Ordinances Stream alteration ordinances and/or permits are designed to minimize impacts to streams caused by construction activities in the bed or banks of streams.

Urban Forestry/Preservation of Natural Vegetation Preservation of urban forestry and natural vegetation serves the same function as preserving open space. This minimizes impacts to the watershed health by soil conservation, infiltration, groundwater recharge, etc.

Salt Lake City neighborhood, Lower Red Butte Creek Sub-Watershed

Volunteer Programs There are numerous volunteer programs that encourage active participation by individuals. These programs include litter and dog feces removal, plantings, educational programs, and much more. Volunteers may also be utilized for the protection and enhancement of recreational opportunities in a watershed.

Volunteer Effort, Jordan River Corridor Sub-Watershed

Water Rights Acquisition Water rights acquisition refers to acquiring water rights to provide instream flows. Acquiring water rights with the beneficial use of stream flow will support the riparian and aquatic environment.

401 Permitting Section 401 of the Clean Water Act delegates authority to the states to issue a 401 Water Quality Certification for all projects that require a Federal Permit. A 401 Certification is a type of permit issued by the appropriate state agency and ensures compliance with state regulations.

5.5 STRUCTURAL MANAGEMENT PRACTICES CONSTRUCTION COSTS

Table 5.7 presents unit construction costs for the structural management practices discussed in Section 5.4.1, excluding recreational management practices. The unit construction costs are presented to give a relative comparison of implementation costs between management practices. Other costs associated with management practice implementation include engineering design, permitting, contract document preparation, right-of-way acquisition, construction management and inflation.

5.6 WATERSHED MANAGEMENT PRACTICES

Once potential management practices are identified, these can be further screened to determine which has the potential to be most effective. This evaluation will help to ensure a more successful strategy in achieving the watershed goals. It is suggested that this process be utilized by those entities pursuing implementation of watershed projects, and may also be useful in the future as other goals or stressors are identified. This selection process was developed by EPA (EPA, 2005); a summary is as follows:

1) *Inventory existing efforts*

   First inventory any projects currently being implemented in the watershed. This would allow future projects to augment current efforts.

2) *Quantify effectiveness of current efforts*

   Evaluate the success of any existing efforts to help guide the selection of additional practices.

3) *Identify new opportunities*

   Identify areas in the watershed where management practices will likely achieve the best results.

Table 5.7 Structural Management Practices Construction Costs

Management Practice	Units	Construction Unit Cost	Annual Maintenance Cost	Reference
Water Quality - Structural				
Rain Gardens	Impervious Acre	$25,000	5%	CWP 2007; EPA 2004
Constructed Stormwater Wetlands	Impervious Acre	$3,000	5%	CWP 2007; EPA 2004
Green Roofs - Residential	Impervious Acre	$27,000		CWP 2007
Green Roofs - Non-Residential	Impervious Acre	$91,000		CWP 2007
Infiltration Basins	Impervious Acre	$25,000	5%	CWP 2007; EPA 2004
Manufactured Treatment Systems	Each	Varies by type		
Oil/Water Separators	Impervious Acre	$20,000		EPA 2005
Revetments	Stream Mile	$103,000		NRRSS 2007
Riparian Buffer Acquisition	Acre	Varies by land use		
Sand Filters	Impervious Acre	$58,000	12%	CWP 2007; EPA 2004
Sediment Basins	Impervious Acre	$8,000	5%	CWP 2007; EPA 2004
Stormwater Wet Ponds	Impervious Acre	$8,000	5%	CWP 2007; EPA 2004
Trash Racks	Each	Varies by size		
Vegetated Swales	Impervious Acre	$18,000	6%	CWP 2007; EPA 2004
Habitat - Structural				
Bioengineered Habitat Structures	Stream Mile	$96,000		NRRSS 2007
Channel Restoration/Enhancement	Stream Mile	$143,000		NRRSS 2007
Dam Removal/Retrofit	Each	$100,000		NRRSS 2007
Diversion Structure Removal	Each	No data		
Exotic Fish Species Management	Stream Mile	$54,000		NRRSS 2007
Fish Passage Improvement	Each	$65,000		NRRSS 2007
Native Fish Stocking	Stream Mile	$54,000		NRRSS 2007
Riparian Buffer Restoration/Enhancement	Stream Mile	$100,000		NRRSS 2007
Vegetation Management	Stream Mile	$46,000		NRRSS 2007
Wetland Restoration/Enhancement - Riparian	Acre	$56,000		EEP 2007
Wetland Restoration/Enhancement - Non-Riparian	Acre	$21,000		EEP 2007

Table 5.7 Structural Management Practices Construction Costs—*Continued*

Mangement Practice	Unit	Construction Unit Cost	Annual Maintenance Cost	Reference
Conveyance - Structural				
Bioengineered Bank Stabilization	Stream Mile	$103,000	Low	NRRSS 2007
Channel Realignment Restoration/ Sinuosity	Stream Mile	$143,000	Low	NRRSS 2007
Channel Bed Restoration/Raise Elevation	Stream Mile	$65,000	Low	NRRSS 2007
Erosion Control	Acre	$4,000		EPA 2007
Floodplain Excavation	Stream Mile	$293,000		NRRSS 2007
Grade Control Structures	Each	Varies by type	Low	
Natural Channel Restoration	Stream Mile	$143,000	Low	NRRSS 2007
Streambank Revegetation	Stream Mile	$46,000	Low	NRRSS 2007
Stormwater BMP Retrofitting	Impervious Acre	Varies by type		
Stormwater Detention Ponds	Impervious Acre	$4,000	1% Very Low	CWP 2007; EPA 2004
Wetland Restoration/Enhancement - Riparian	Acre	$56,000		EEP 2007
Wetland Restoration/Enhancement - Non-Riparian	Acre	$21,000		EEP 2007

4) *Identify critical areas*

Determine areas where management practices are needed based upon the watershed characterization and current efforts.

5) *Identify possible management practices*

Utilize available resources including this Plan to identify possible management practices. Selection should depend on the pollutant source and stressor.

6) *Identify pollutant reduction efficiencies*

Research the effectiveness of the selected practice. This may be a simple rating (eg. good, fair, poor) as the actual effectiveness is determined by site specific characteristics.

7) *Develop screening criteria*

Apply additional screening to develop the final practice selection. Consider the following criteria:

- Location within a critical area
- Estimated load reduction
- Legal and regulatory requirements
- Property ownership
- Site access
- Added benefits
- Unintended impacts
- Physical factors
- Infrastructure
- Costs
- Social acceptance

8) *Rank alternatives*

Rank the practices based upon the screening criteria presented above, or any additional criteria deemed important (eg. maintenance). Develop a consensus among stakeholders for selection. Consider mapping practices and implementing upstream projects first.

5.7 SUB-WATERSHED FACT SHEETS

This section presents a double-sided Fact Sheet for each of the 27 sub-watersheds in Salt Lake County. The fact sheets are intended to function as a concise reference for what are the critical issues affecting watershed health in each sub-watershed. The Fact Sheets include a map and description of the sub-watershed, a summary of stressor characteristics for existing and future projected conditions, and recommended management practices to protect and enhance watershed functions. The Fact Sheets follow in alphabetical order by watershed. To provide implementation guidance within municipalities, Table 5.8 summarizes the percent of each city in the various sub-watersheds. For those watersheds containing an upper and lower sub-watershed, the Fact Sheet for the upper sub-watershed precedes the lower sub-watershed.

Little Cottonwood Creek, Lower Little Cottonwood Creek Sub-Watershed

Jordan River Restoration site prior to construction, Jordan River Corridor Sub-Watershed

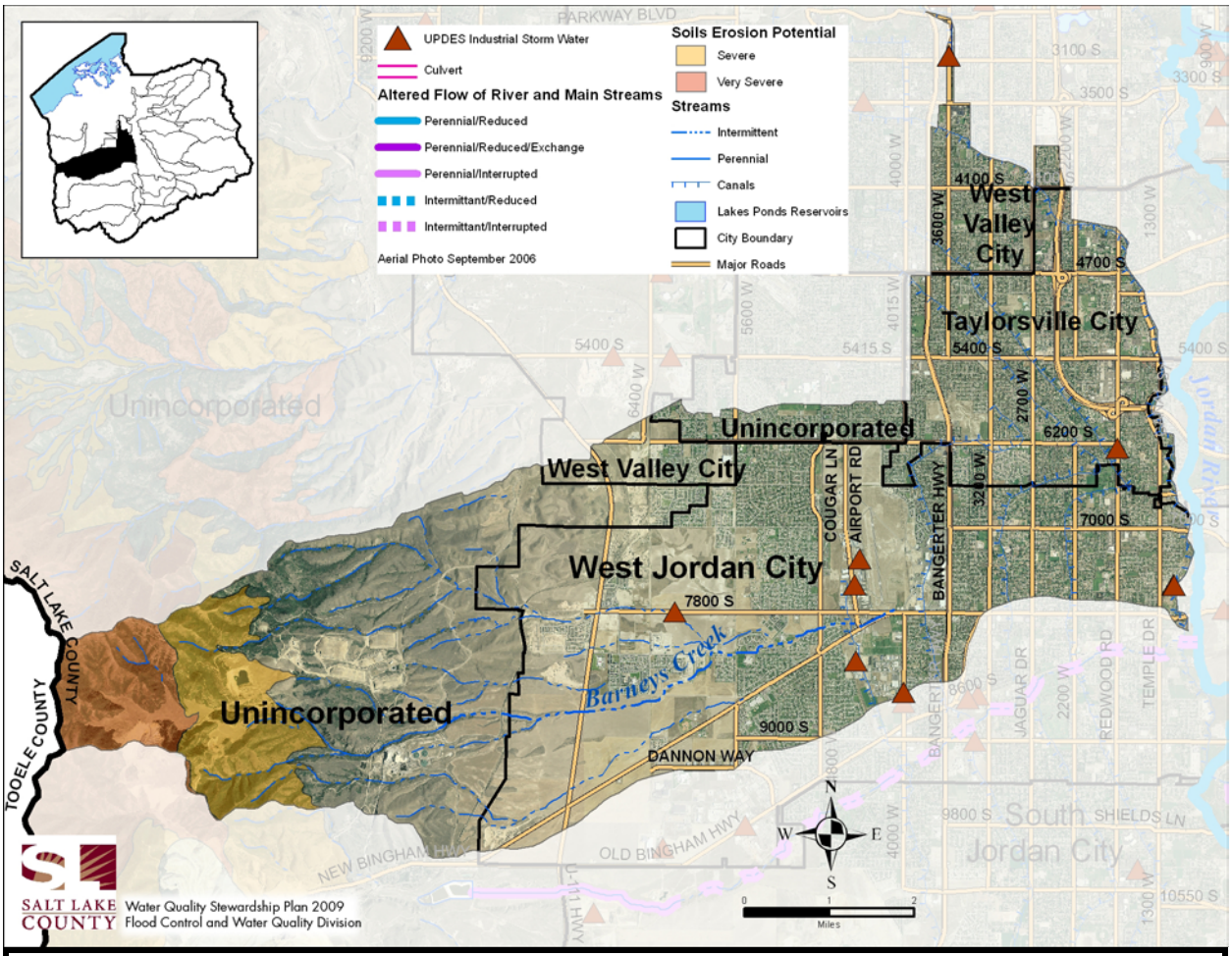
Table 5.8 Sub-Watershed percentage in each City

City	Sub-Watershed	% Sub-Watershed in City
Alta Town	Upper Big Cottonwood Creek	2%
	Upper Little Cottonwood Creek	98%
Bluffdale City	Corner Canyon Creek	11%
	Jordan River Corridor	54%
	Midas/Butterfield Creek	1%
	Rose Creek	34%
Cottonwood Heights City	Lower Big Cottonwood Creek	60%
	Lower Little Cottonwood Creek	40%
	Upper Big Cottonwood Creek	1%
Draper City	Corner Canyon Creek	52%
	Jordan River Corridor	9%
	Lower Dry Creek	6%
	Lower Willow Creek	31%
	Upper Willow Creek	3%
Herriman City	Jordan River Corridor	13%
	Midas/Butterfield Creek	28%
	Rose Creek	60%
Holladay City	Lower Big Cottonwood Creek	88%
	Lower Mill Creek	12%
Midvale City	Jordan River Corridor	97%
	Lower Little Cottonwood Creek	3%
Murray City	Barneys Creek	1%
	Jordan River Corridor	49%
	Lower Big Cottonwood Creek	33%
	Lower Little Cottonwood Creek	17%
	Lower Mill Creek	0%
Riverton City	Jordan River Corridor	16%
	Midas/Butterfield Creek	69%
	Rose Creek	16%

Table 5.8 Sub-Watershed percentage in each City

City	Sub-Watershed	% Sub-Watershed by City
Salt Lake City	Great Salt Lake	56%
	Jordan River Corridor	11%
	Lower City Creek	6%
	Lower Emigration Creek	4%
	Lower Mill Creek	2%
	Lower Parleys Creek	4%
	Lower Red Butte Creek	2%
	Upper City Creek	13%
	Upper Emigration Creek	0%
	Upper Parleys Creek	0%
	Upper Red Butte Creek	1%
Sandy City	Jordan River Corridor	38%
	Lower Dry Creek	44%
	Lower Little Cottonwood Creek	5%
	Lower Willow Creek	10%
	Upper Dry Creek	3%
	Upper Little Cottonwood Creek	0%
	Upper Willow Creek	0%
South Jordan City	Bingham Creek	36%
	Jordan River Corridor	13%
	Lower Dry Creek	3%
	Lower Willow Creek	1%
	Midas/Butterfield Creek	47%
South Salt Lake City	Jordan River Corridor	31%
	Lower Big Cottonwood Creek	0%
	Lower Mill Creek	69%
Taylorsville City	Barneys Creek	74%
	Decker Lake	1%
	Jordan River Corridor	25%
	Lower Big Cottonwood Creek	0%
West Jordan City	Barneys Creek	66%
	Bingham Creek	32%
	Jordan River Corridor	2%
West Valley City	Barneys Creek	69%
	Coon Creek	3%
	Decker Lake	17%
	Great Salt Lake	63%
	Jordan River Corridor	7%

BARNEY'S CREEK SUB-WATERSHED (31,873 Acres) - BN

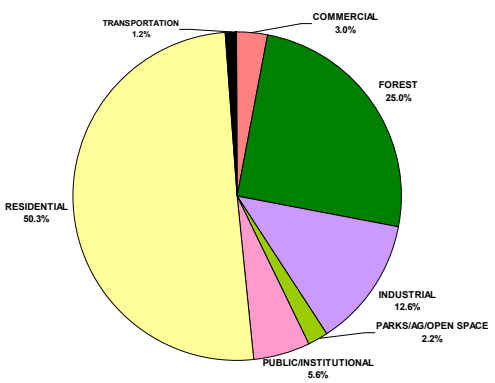


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
1.9	0.0	15.8	72.1	37.8	No Data

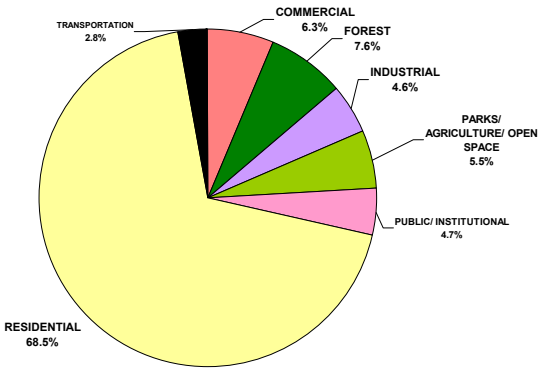
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
70,650	2.6	13.5	-53.4	19.7	6.3	7.8

Existing Land Use (2005)

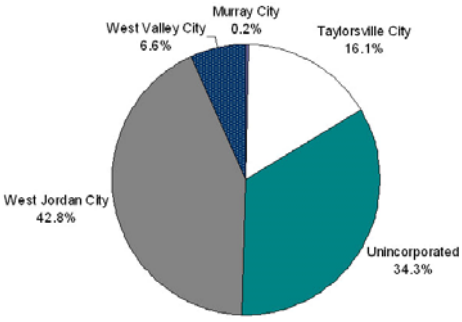


Future Land Use (2030)



BARNEY'S CREEK SUB-WATERSHED (31,873 Acres) - BN

DESCRIPTION



Barneys Creek sub-watershed has a drainage area of 49.8 square miles and contain intermittent stream flows. The headwaters of Barneys Creek are comprised of moderately steep mountains that range in elevation from 5,300 to 8,000 feet in the Oquirrh Mountain Range.

Barneys Canyon Mine is an open-pit gold mine located in the canyon. Kennecott operated the mine from 1989 to 2001 (Kennecott Utah Copper, 2007).

The primary land use in the canyon portion of the sub-watershed is mining activities. The valley portion of the sub-watershed is urbanized, primarily with residential and commercial land use; however, a few dry farms remain in this sub-watershed.

Designated beneficial use: 2B, 3D, 4 Stream Length(s): 8.4 Miles

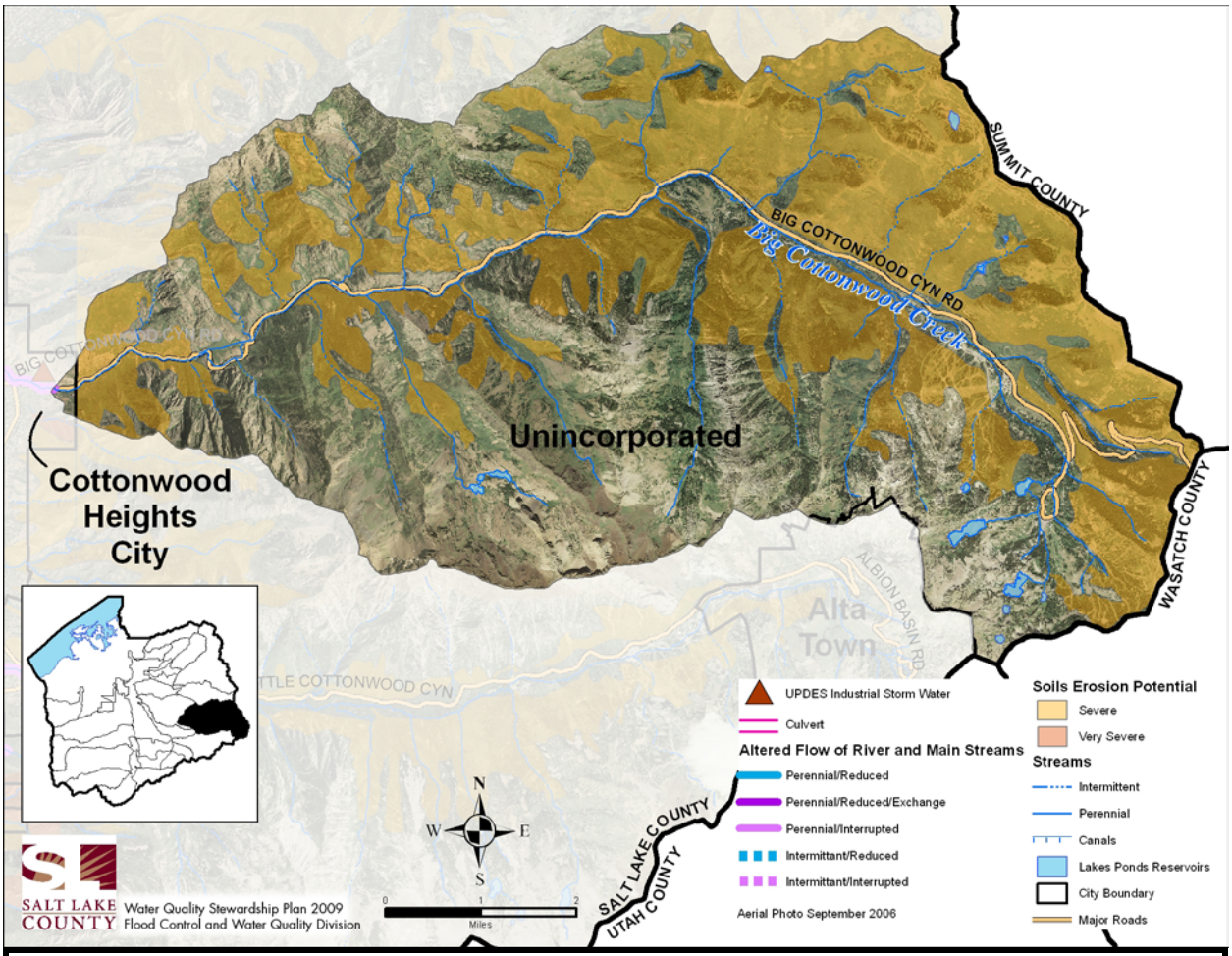
STRESSORS

- Lack of developed recreation opportunities
- Development in the floodplain
- Lack of stream corridor preservation
- Urban development pressures leading to loss of open space, increased stormwater pollution loads, and loss of groundwater recharge capability

RECOMMENDATIONS

- Riparian buffer restoration/ enhancement
- Leadership in Energy and Environmental Design criteria
- Land acquisition for preservation
- Volunteer programs
- Channel restoration/enhancement
- Floodplain reconstruction
- Wetland restoration/enhancement
- Identify community needs and opportunities
- Develop trail networks
- Stormwater BMP retrofitting
- Floodplain re-establishment

UPPER BIG COTTONWOOD CREEK SUB-WATERSHED (20,248 Acres) - UBC

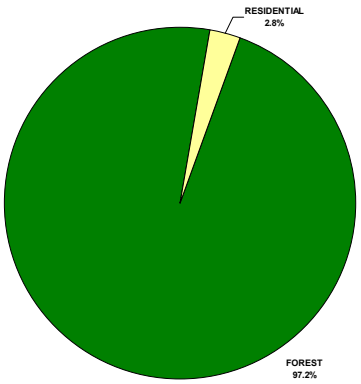


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
87.7	18.4	10.6	10.4	76.6	0.2

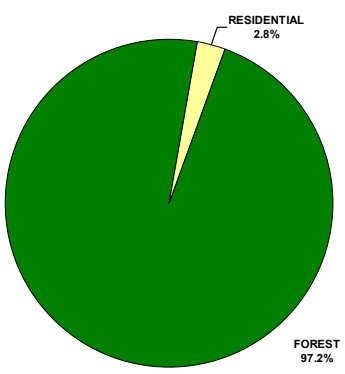
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
60	0.9	0.1	0.0	0.0	0.0	0.0

Existing Land Use (2005)

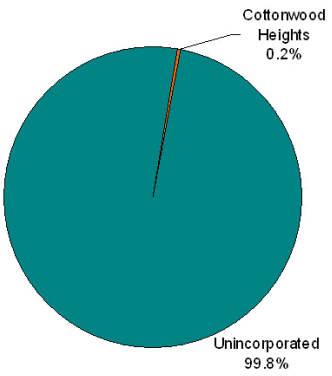


Future Land Use (2030)



UPPER BIG COTTONWOOD CREEK SUB-WATERSHED (20,248 Acres) - UBC

DESCRIPTION



The upper Big Cottonwood Creek sub-watershed is 20,248 acres and contains a perennial stream channel. This sub-watershed is located between upper Mill Creek and Upper Little Cottonwood Creek sub-watersheds. The headwaters of Big Cottonwood Creek commence in Brighton Basin at an elevation of approximately 9,600 feet in the Wasatch Mountain Range. Small areas of Cottonwood Heights and the Town of Alta overlap with this sub-watershed; however, the majority of the sub-watershed is in unincorporated Salt Lake County.

Notably, Big Cottonwood Creek is the largest source of surface water used by Salt Lake City for culinary purposes. Additionally, Upper Big Cottonwood Creek sub-watershed has developed and dispersed recreation areas. There are multiple jurisdictions in this sub-watershed including: United States Forest Service, Salt Lake City, and Salt Lake County. This sub-watershed is within the Foothill and Canyons Overlay Zone (FCOZ) and the Salt Lake City Watershed boundary.

Designated beneficial use: 1C, 2B, 3A Stream Length(s): 13.7 Miles

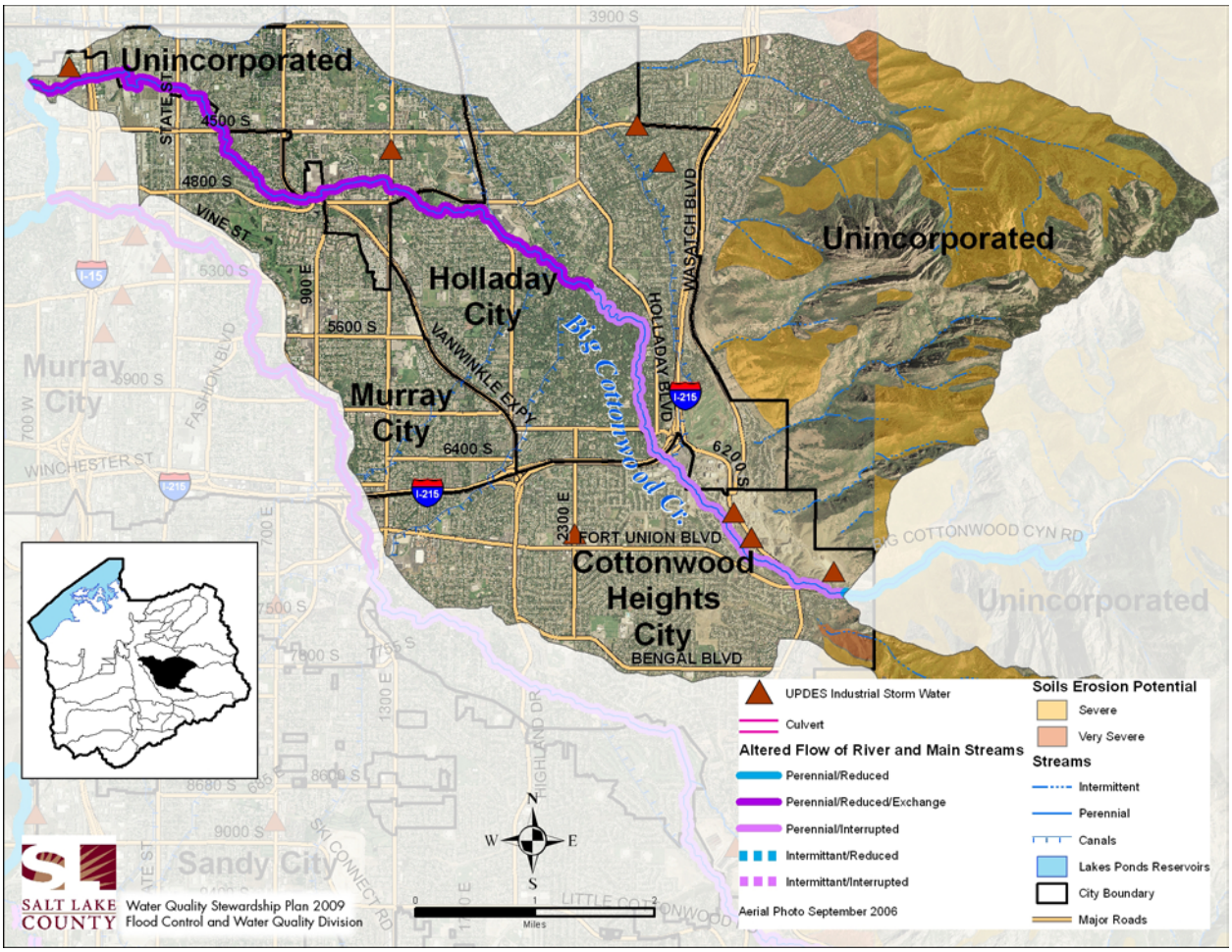
STRESSORS

- Recreation development pressures leading to increased stormwater pollution loads and loss of groundwater recharge
- Developed and dispersed recreation activities
- Highly erodible soils

RECOMMENDATIONS

- Riparian buffers
- Leadership in Energy and Environmental Design criteria
- Rainwater harvesting
- Land acquisition for preservation
- Green roofs
- Volunteer programs
- Recreational facilities accessible and resource compatible
- Identify community recreation needs and opportunities
- Sediment source controls
- Education and interpretive opportunities
- Vegetated swales
- Participate in new and/or existing planning efforts (FCOZ, Salt Lake City Watershed, Wasatch-Cache National Forest Management Plans)

LOWER BIG COTTONWOOD CREEK SUB-WATERSHED (31,955 Acres) - LBC

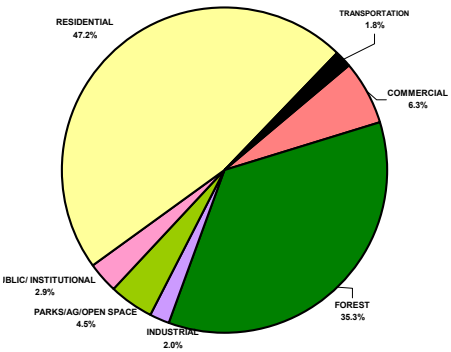


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
34.5	100.0	63.3	91.0	27.6	1.1

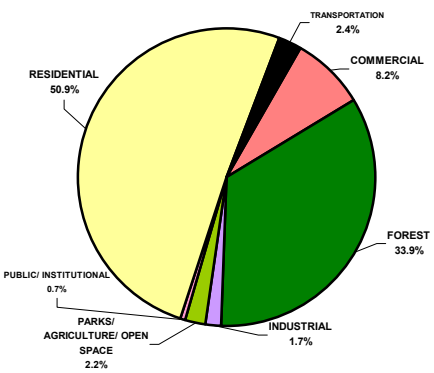
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
52,930	1.7	11.8	-12.1	-2.5	2.3	-4.3

Existing Land Use (2005)



Future Land Use (2030)



LOWER BIG COTTONWOOD CREEK SUB-WATERSHED (31,955 Acres) - LBC

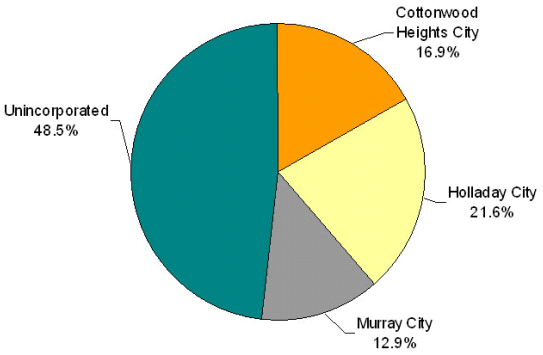
DESCRIPTION

The Lower Big Cottonwood Creek sub-watershed is 20,248 acres and contains both Perennial Interrupted and Perennial Reduced/Exchange, and flows at the base of the Wasatch Range.

Five municipal jurisdictions intersect the Lower Big Cottonwood Creek sub-watershed. This sub-watershed is highly urban, with a portion managed under FCOZ.

Designated beneficial use: 3A, 4

Stream Length(s): 10.5 Miles



STRESSORS

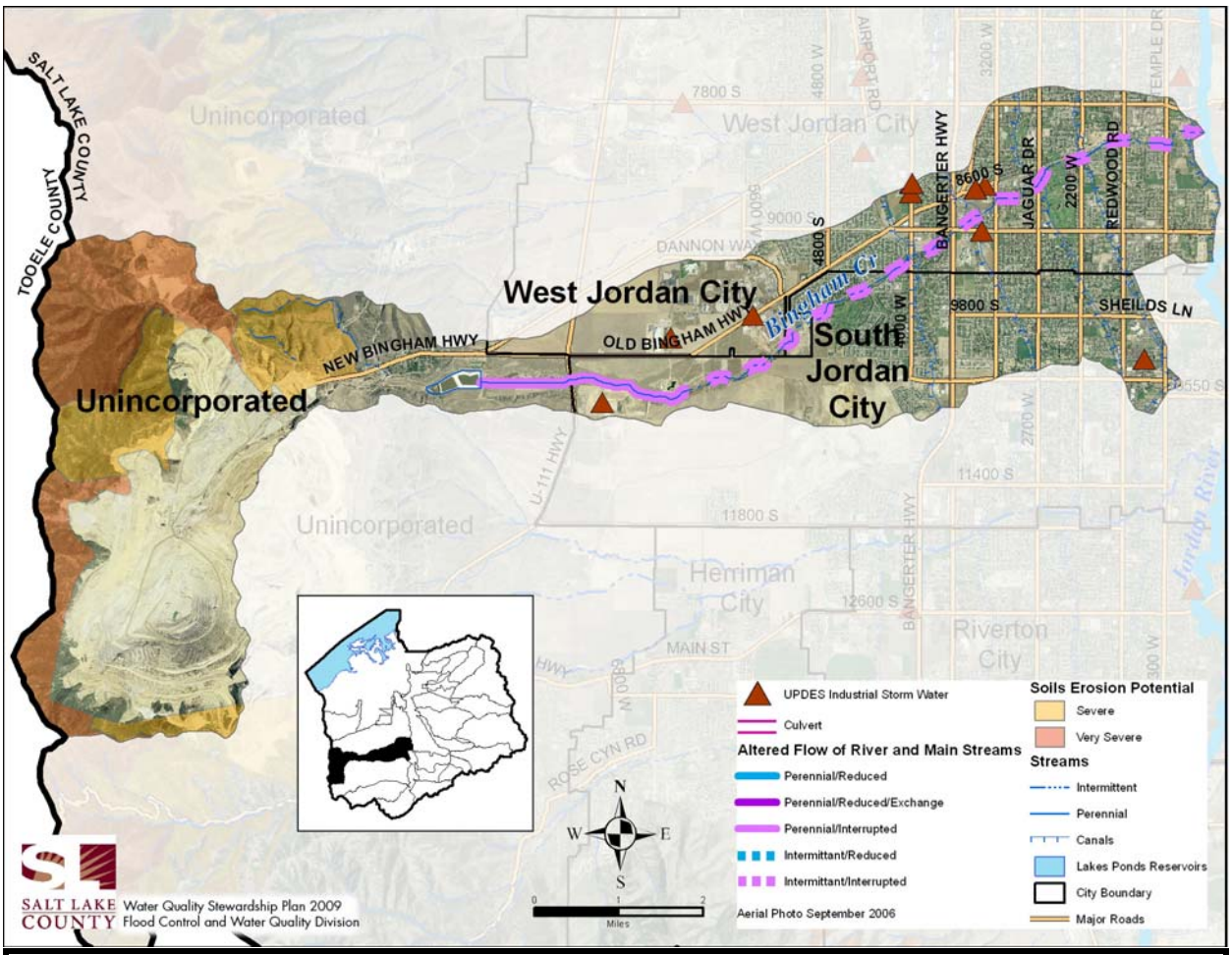
- Stream flow diversions
- Development in the floodplain
- Lack of stream corridor preservation
- Unstable banks and channel
- Urban development pressures leading to increased stormwater pollution loads and loss of groundwater recharge capability

RECOMMENDATIONS

- Floodplain reconnection
- Channel restoration/enhancement
- Wetland restoration/enhancement
- Diversion structure modifications
- Canal water diversion
- Leadership in Energy and Environmental Design criteria
- Water rights acquisition
- Riparian buffer restoration and/or enhancement
- Land acquisition for preservation
- Erosion control measures
- Volunteer programs
- Grade control structures
- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Participate in new and/or existing planning efforts
- Stream daylighting
- Educational and interpretive opportunities
- Bioengineered bank stabilization
- Streambank revegetation
- Floodplain re-establishment

Lower Big Cottonwood Creek is listed as water quality impaired on the State Division of Water Quality 303(d) for high temperature levels.

BINGHAM CREEK SUB-WATERSHED (23,172 Acres) - BG

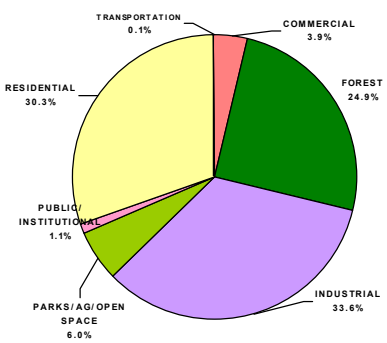


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
2.7	100.0	20.5	36.9	36.3	No Data

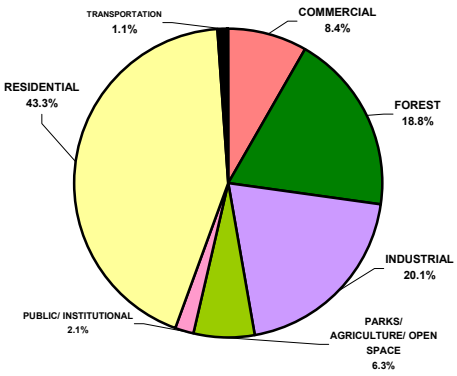
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
36,450	2.8	0.5	-20.9	10.2	-3.0	1.5

Existing Land Use (2005)



Future Land Use (2030)



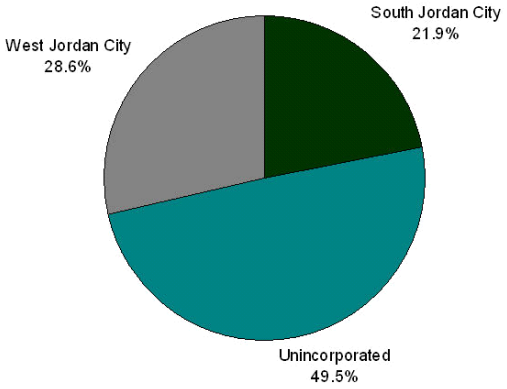
BINGHAM CREEK SUB-WATERSHED (23,172 Acres) - BG

DESCRIPTION

The Bingham Creek sub-watershed borders the southwest boundary of the Barney's Creek sub-watershed in the Oquirrh Mountains. The sub-watershed comprises 23,172 acres and contains intermittent, reduced, and intermittent interrupted sections.

The headwaters of Bingham Creek are primarily comprised of the Kennecott Bingham Canyon Mine, an open-pit copper mine. The industrial activities have resulted in the modification of natural drainage patterns in the sub-watershed.

The primary land use in the lower portion of the sub-watershed is residential.



Designated beneficial use: 2B, 3D, 4

Stream Length(s): 10.2 Miles

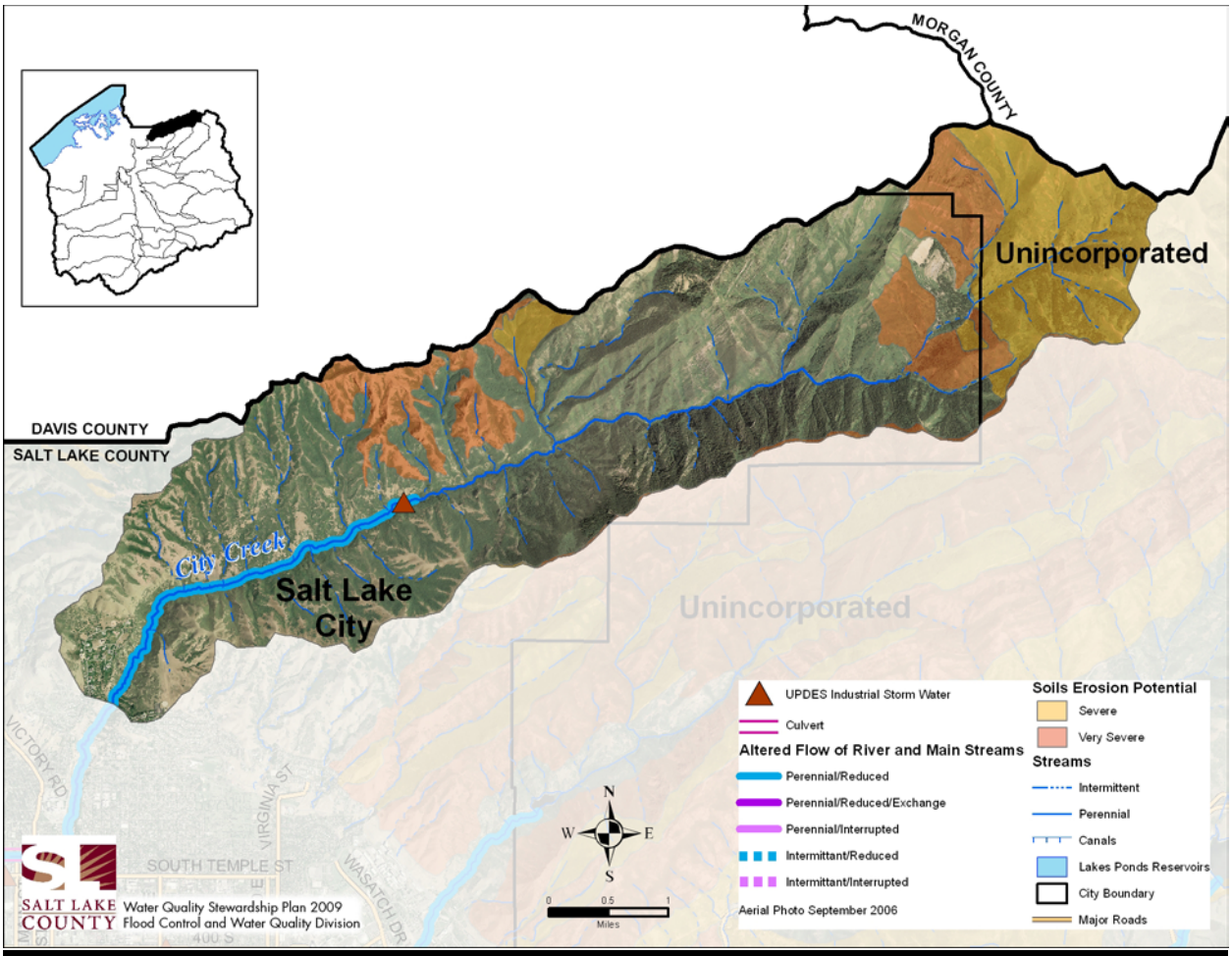
STRESSORS

- Lack of developed recreation opportunities
- Stream flow diversions
- Lack of stream corridor preservation
- Urban development pressures leading to increased stormwater pollution loads and loss of groundwater recharge

RECOMMENDATIONS

- Leadership in Energy and Environmental Design criteria
- Land acquisition for preservation
- Volunteer programs
- Riparian buffer restoration/enhancement
- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Participate in new and/or existing planning efforts
- Bioengineered bank stabilization
- Grade control structures
- Canal water diversion
- Channel restoration/enhancement
- Streambank revegetation
- Water rights acquisition
- Stream daylighting
- Stormwater BMP retrofitting

UPPER CITY CREEK SUB-WATERSHED (11,185 Acres) - UCC

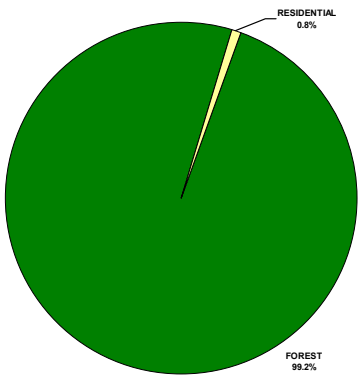


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
98.1	34.6	9.3	0.0	99.4	0.3

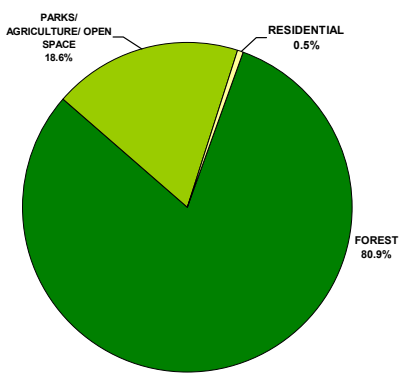
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
230	0.0	5.4	0.3	34.4	22.3	42.0

Existing Land Use (2005)



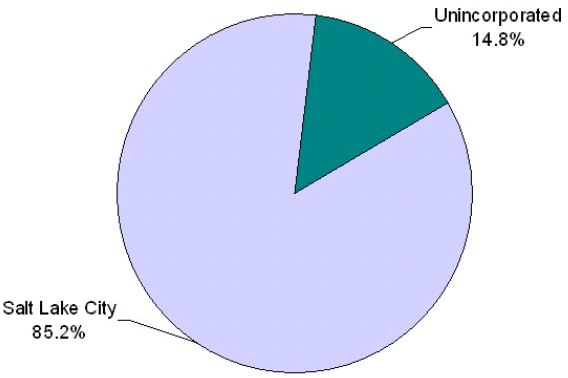
Future Land Use (2030)



UPPER CITY CREEK SUB-WATERSHED (11,185 Acres) - UCC

DESCRIPTION

Upper City Creek sub-watershed is 11,189 acres and contains the length of City Creek headwaters to the Salt Lake City water treatment plant as well as a small segment below the plant. The stream flow of Upper City Creek is a mix of Perennial and Perennial-Reduced flows. The reduced flows result from diversions for municipal water use.



The Upper City Creek sub-watershed above the water treatment plant is protected as a primary water supply source and designated as the City Creek Nature Preserve. The sub-watershed is owned by Salt Lake City and is managed according to guidelines designed to protect and sustain water quality. Use is limited to recreational activities including hiking, biking, picnicking, hunting and fishing. Below the water treatment plant, the land use is also limited to recreational activities. No dwellings or overnight camping are allowed in upper City Creek sub-watershed.

This sub-watershed is in a primary groundwater recharge zone.

Designated beneficial use: 1C, 3A

Stream Length(s): 10.3 Miles

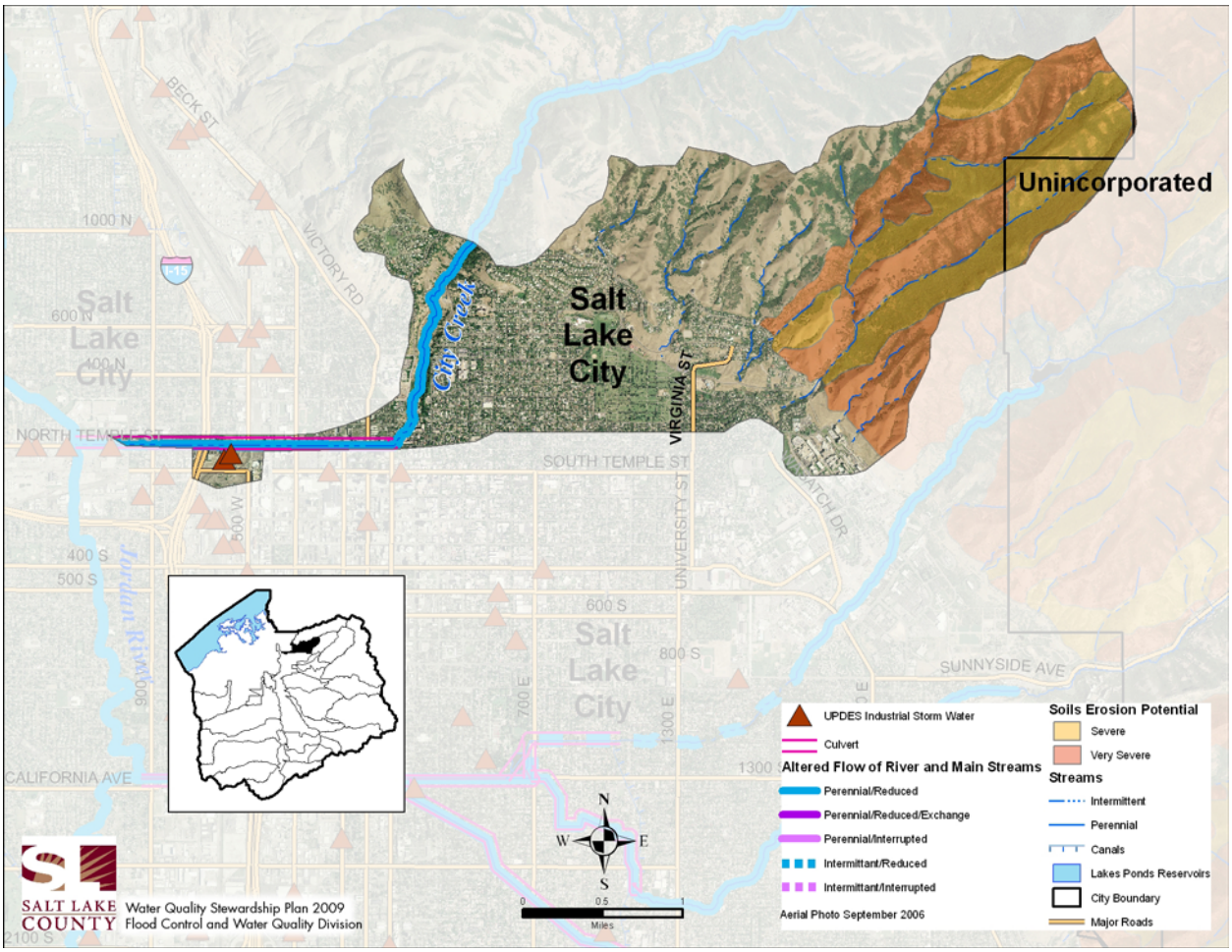
STRESSORS

- Stream flow diversions
- Dispersed and Developed Recreation
- Urban development pressures resulting in increased stormwater pollution loads

RECOMMENDATIONS

- Diversion structure modification
- Canal water diversion
- Leadership in Energy and Environmental Design criteria
- Water rights acquisition
- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Developed neighborhood action group
- Participate in new and/or existing planning efforts
- Education and interpretive opportunities

LOWER CITY CREEK SUB-WATERSHED (4,621 Acres) - LCC

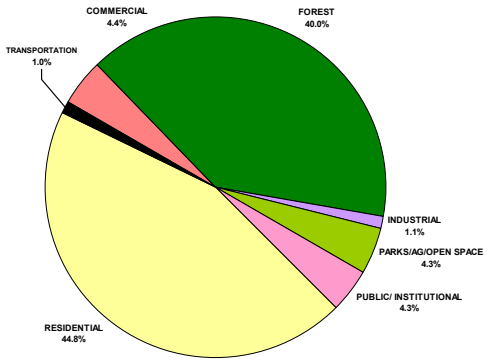


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
42.0	100	71.1	19.4	44.8	No Data

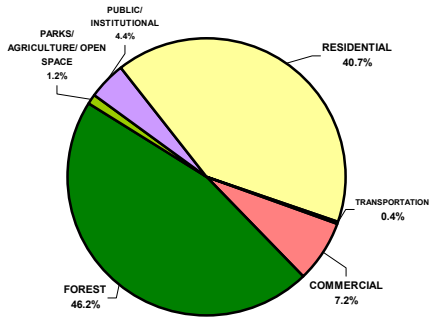
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
1,700	0.4	0.8	7.2	-3.4	-0.5	0.4

Existing Land Use (2005)



Future Land Use (2030)

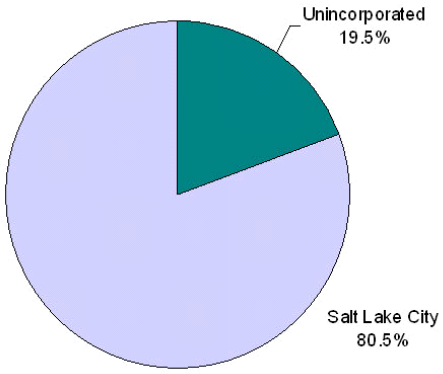


LOWER CITY CREEK SUB-WATERSHED (4,621 Acres) - LCC

DESCRIPTION

The Lower City Creek sub-watershed is 4,621 acres and contains a perennial/reduced stream flow. The sub-watershed is comprised of several undeveloped gulches and an urbanized residential neighborhood on the lower mountain/valley interface.

Surface water travels in an open channel downstream past the canyon mouth and into the valley at an elevation of approximately 5,000 feet. The stream is routed entirely into the North Temple storm drain at Memory Grove Park and discharges to the Jordan River.



Designated beneficial use: 2B, 3A

Stream Length(s): 1.5 Miles

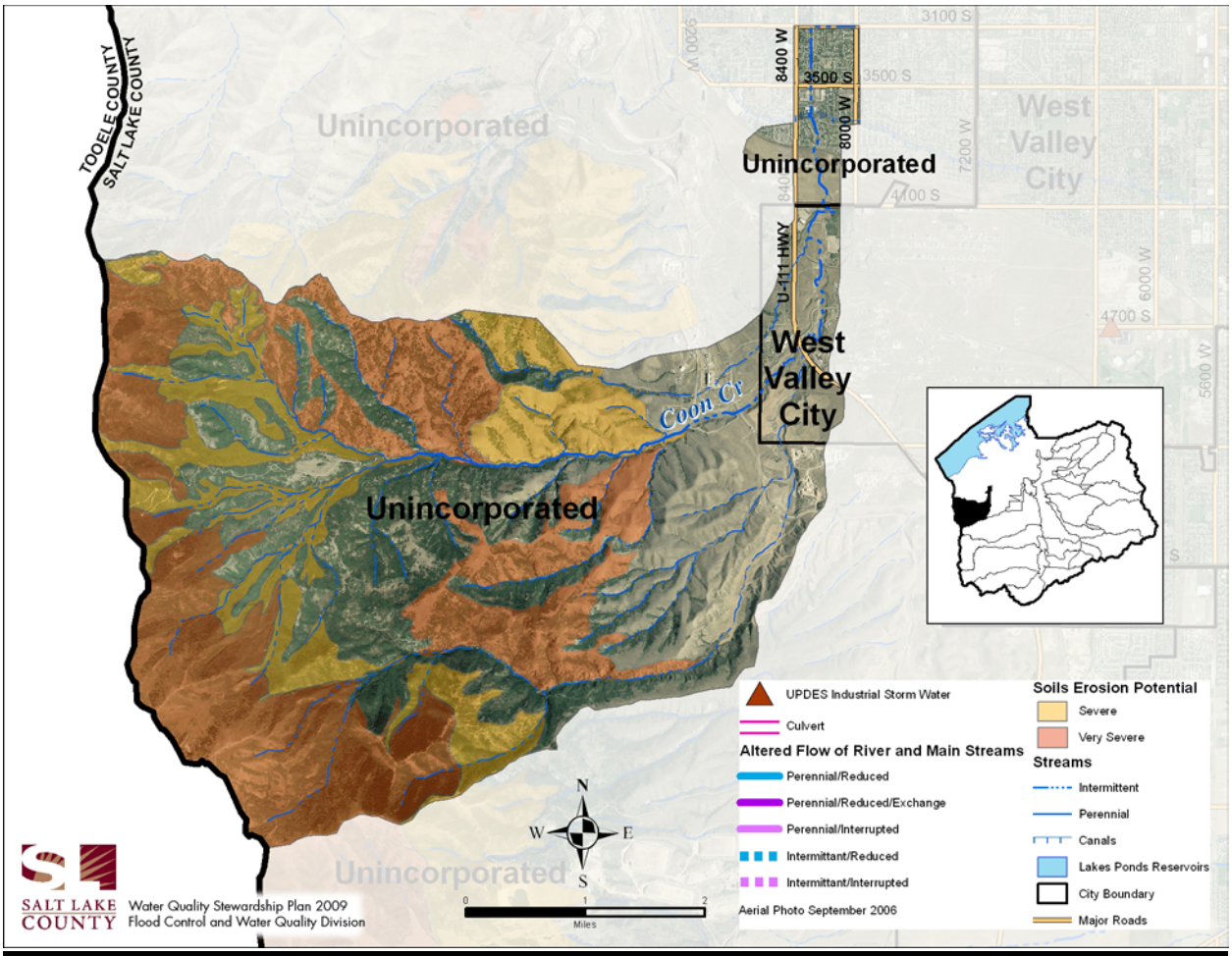
STRESSORS

- Stream flow diversions
- Lack of corridor preservation
- Stream channel alteration
- Urban development pressures leading to increased stormwater pollution loads
- Unstable banks and channel

RECOMMENDATIONS

- Stream daylighting
- Grade control structures
- Bioengineered bank stabilization
- Channel restoration/enhancement
- Streambank revegetation
- Diversion structure modification
- Leadership in Energy and Environmental Design criteria
- Minimum flow protection
- Water rights acquisition
- Riparian buffer restoration and/or enhancement
- Volunteer programs
- Stormwater BMP retrofitting
- Education and interpretive opportunities

COON/HARKERS CREEKS SUB-WATERSHED (14,409 Acres) - CN

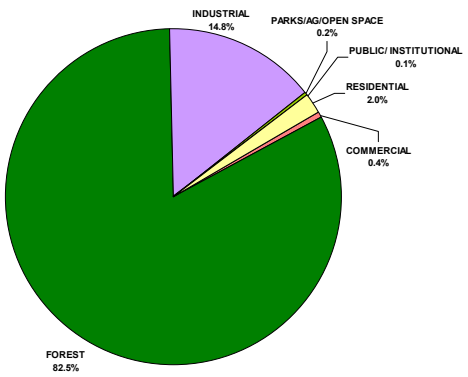


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
1.0	0.0	30.5	52.8	4.5	No Data

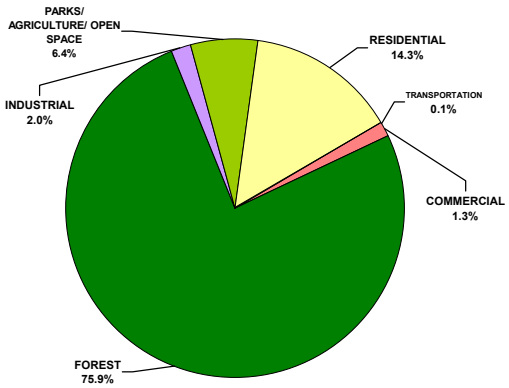
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
4,330	1.3	-22.3	-0.6	41.3	-5.6	9.4

Existing Land Use (2005)



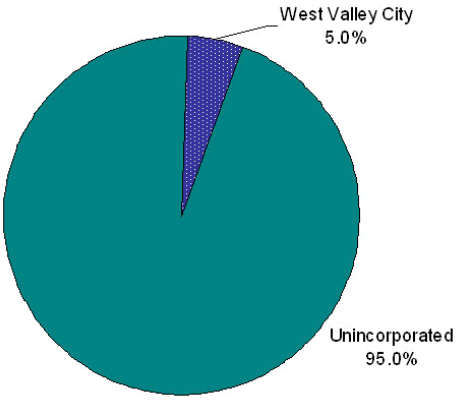
Future Land Use (2030)



COON/HARKERS CREEKS SUB-WATERSHED (14,409 Acres) - CN

DESCRIPTION

The Coon Creek sub-watershed is located south and west of Kersey Creek in the Oquirrh Mountains.



Flows in this sub-watershed are mostly Intermittent, with the exception of a portion of Harkers Creek.. Flows in Lower Coon Creek are supplemented by several tributaries including those from Harker's Canyon. Lower Coon Creek flows are diverted for irrigation. Coon Creek passes below the Utah and Salt Lake Canal and discharges to the C-7 ditch. Note, Coon Creek is piped from the Utah Salt Lake Canal to the C-7 Ditch.

The primary land uses in the canyon portion of this sub-watershed are managed for irrigation and wildlife. The valley portion of this sub-watershed is urbanized, primarily residential, industrial and commercial land use.

Designated beneficial use: 2B, 3D, 4

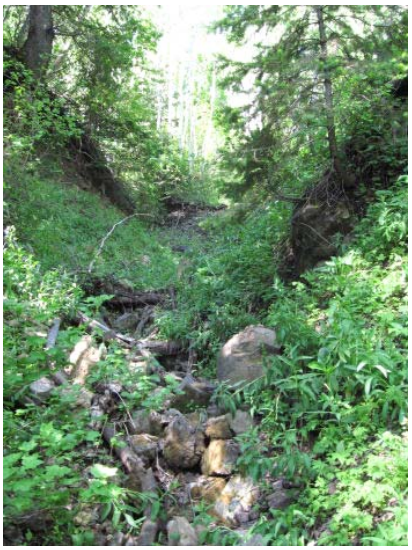
Stream Length(s): Coon Creek 7.8 Miles
Harkers Creek 7.8 Miles

STRESSORS

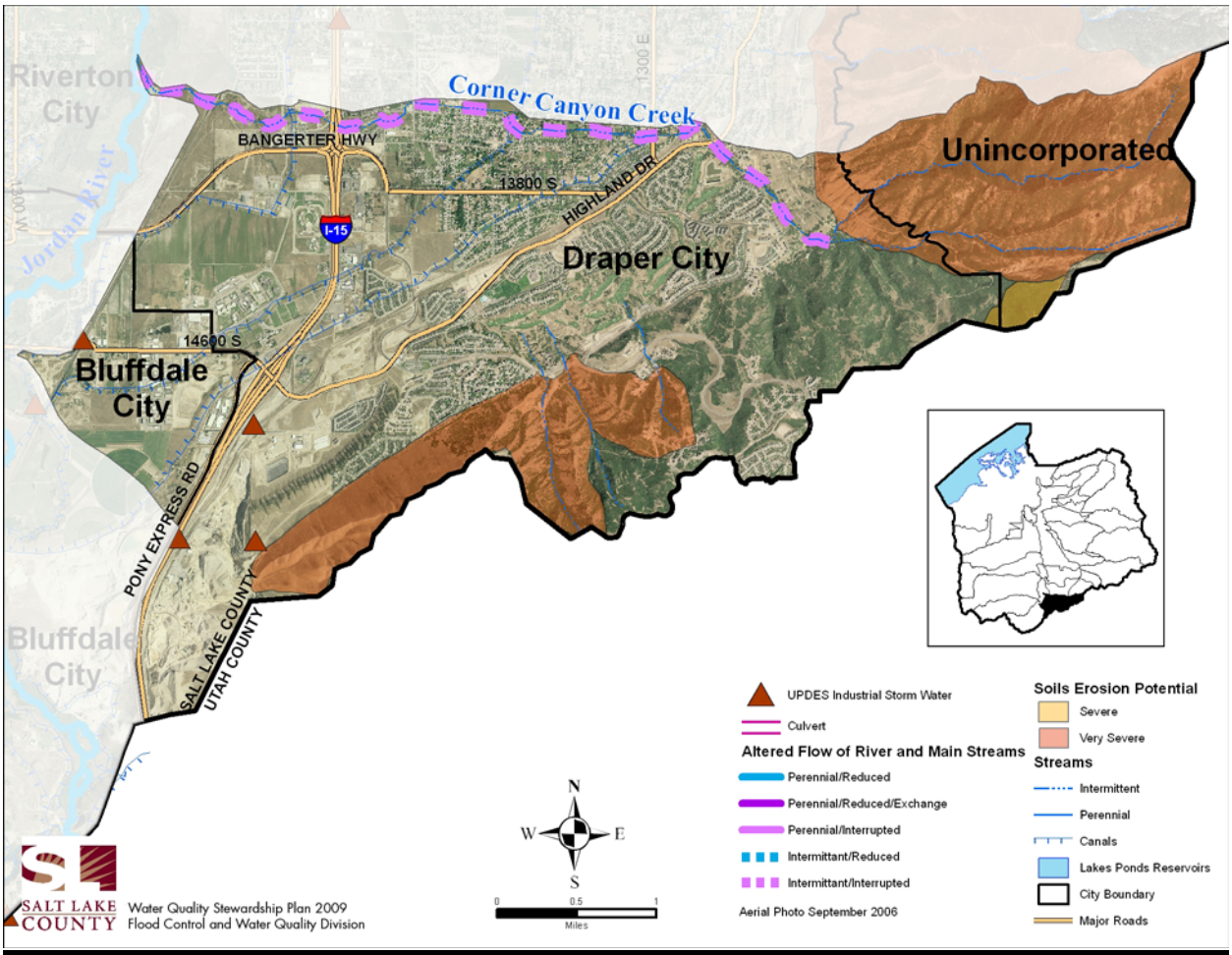
- Lack of developed recreation opportunities
- Development in the floodplain
- Lack of stream corridor preservation
- Urban development pressures leading to loss increased stormwater pollution loads
- Highly erodible soils

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Participate in new and/or existing planning efforts
- Riparian buffer restoration and/or enhancement
- Buffer protection ordinance
- Leadership in Energy and Environmental Design criteria
- Land acquisition for preservation
- Volunteer programs
- Bioretention cells
- Constructed wetlands
- Stormwater BMP retrofitting
- Manufactured treatment systems
- Education and interpretive opportunities



CORNER CANYON CREEK SUB-WATERSHED (9,344 Acres) - CY

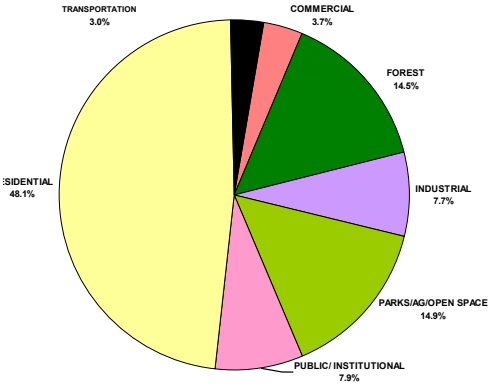


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
28.2	68.6	64.6	77.1	56.7	No Data

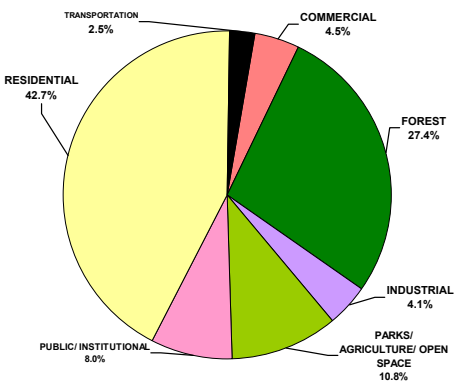
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
16,010	1.7	-0.9	23.8	-13.3	-6.1	-8.4

Existing Land Use (2005)



Future Land Use (2030)

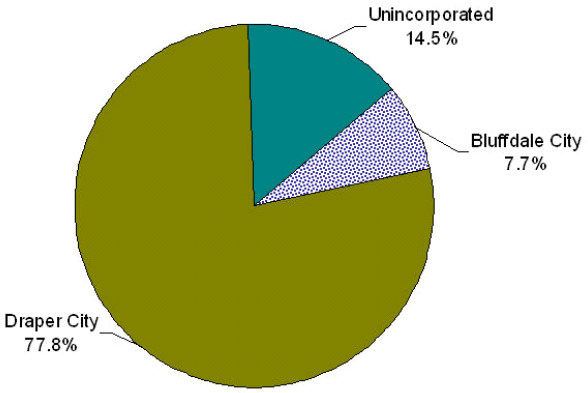


CORNER CANYON CREEK SUB-WATERSHED (9,344 Acres) - CY

DESCRIPTION

Corner Canyon Creek sub-watershed is located in the southeast corner of the Wasatch Mountains. The watershed is comprised of a total of 9,344 acres and contains four canyon drainages: Corner Canyon; Maple Hollow Canyon; Oak Hollow Canyon and an unnamed Canyon. Flows are perennial and intermittent/interrupted.

The upper sub-watershed is managed forest land for water supply, with an elevation range from 4,800 to 9,000 feet. The lower portion of the sub-watershed is primarily residential and commercial land use with numerous canals.



Designated Beneficial Use: Not Classified

Stream Length(s): 7.9 Miles

STRESSORS

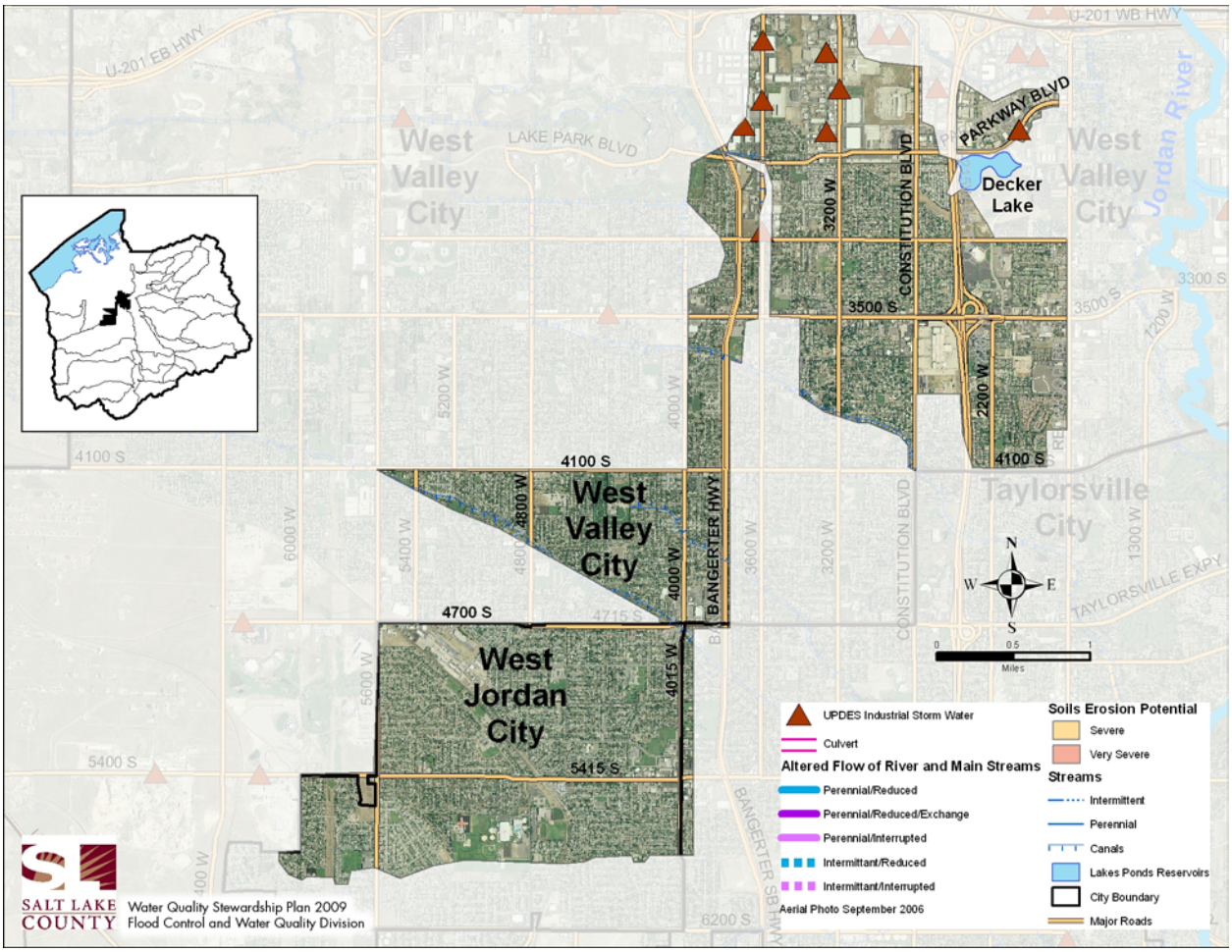
- Stream flow diversions
- Development in the floodplain
- Urban development pressures leading to increased stormwater pollution and loss of groundwater recharge compatibility
- Unstable banks and channel

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Participate in new and/or existing planning efforts
- Diversion structure modification
- Canal water diversion
- Leadership in Energy and Environmental Design criteria
- Minimum flow protection
- Water rights acquisition
- Floodplain reconstruction
- Open space land acquisition
- Volunteer programs
- Wetland restoration/enhancement
- Bioengineered bank stabilization
- Floodplain re-establishment
- Riparian buffer restoration and/or enhancement
- Stream Corridor protection ordinance
- Land acquisition for preservation

- Grade control structures
- Channel restoration/enhancement
- Streambank revegetation
- Stormwater BMP retrofitting

DECKER LAKE SUB-WATERSHED (6,238 Acres) - DL

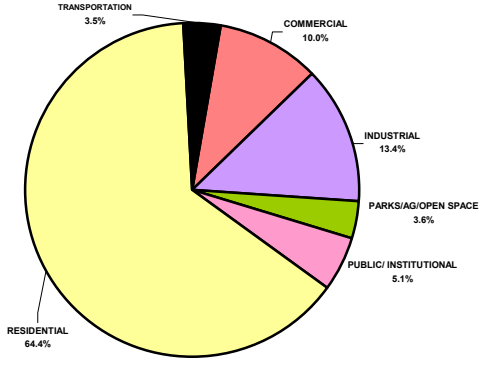


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
3.7	N/A	No Data	N/A	N/A	No Data

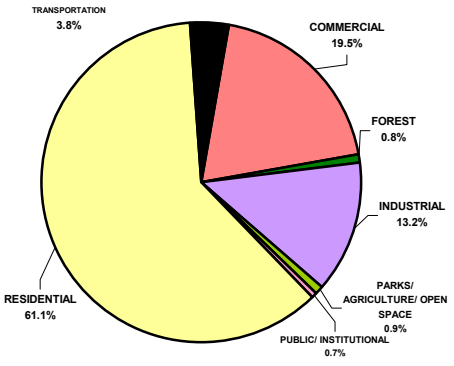
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
6,700	1.1	13.2	-54.0	-8.9	2.0	-7.9

Existing Land Use (2005)



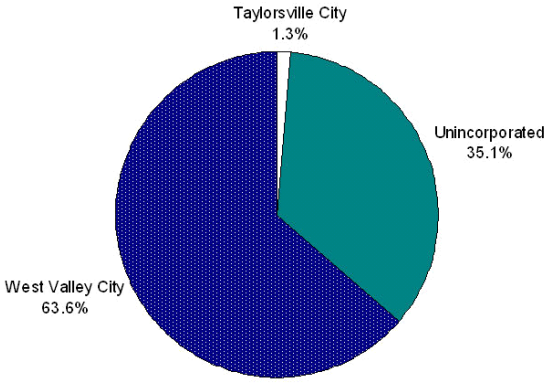
Future Land Use (2030)



DECKER LAKE SUB-WATERSHED (6,238 Acres) - DL

DESCRIPTION

The Decker Lake sub-watershed comprises 6,238 acres that drain to Decker Lake, which discharges to the Jordan River. There is no natural stream in Decker Lake sub-watershed.



Decker Lake is a historic playa lake located on the west side of the Jordan River at an elevation of 4,230 feet. Water to Decker Lake is provided through groundwater discharge, stormwater runoff, and irrigation ditches via five stormwater drainage systems. Storage capacity of Decker Lake is approximately 100 acre-feet. The Decker Lake Drain is the basin's only outlet, which flows into the Jordan River.

Decker Lake sub-watershed is transversed by numerous canals and heavily influenced by irrigation canal and stormwater drainage systems.

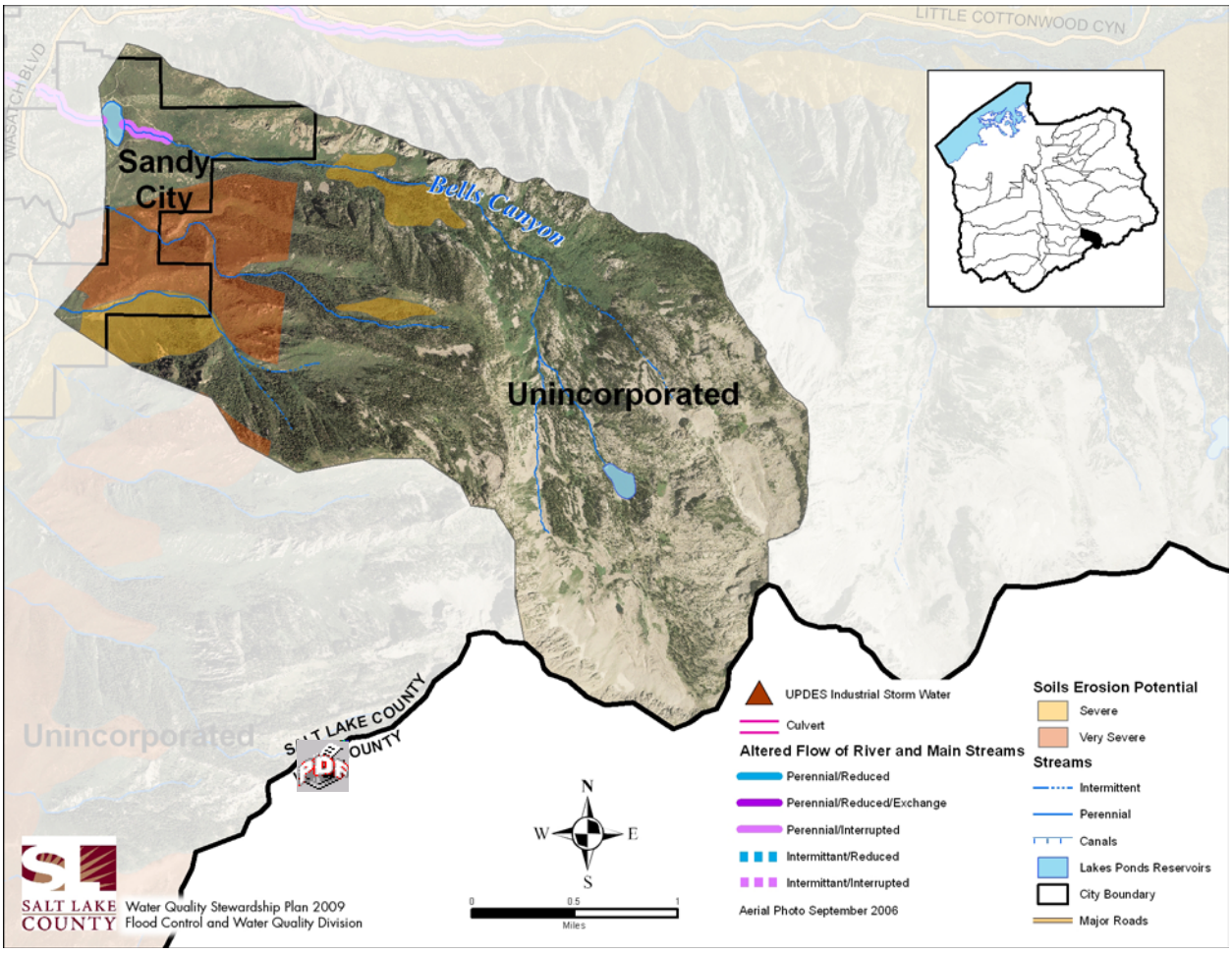
STRESSORS

- Lack of developed recreation opportunities
- Urban development pressures leading to loss of open space, increased stormwater pollution loads, and loss of groundwater recharge capability

RECOMMENDATIONS

- Open space ordinances
- Participate in new or existing planning efforts
- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Volunteer programs
- Leadership in Energy and Environmental Design criteria
- Stormwater BMP retrofitting
- Manufactured treatment systems
- Land acquisition for preservation
- Urban Forestry

UPPER DRY CREEK SUB-WATERSHED (3,878 Acres) - UDC

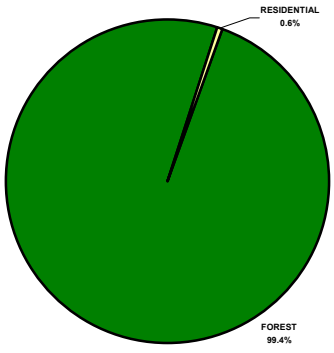


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
93.5	9.8	No Data	5.7	83.6	No Data

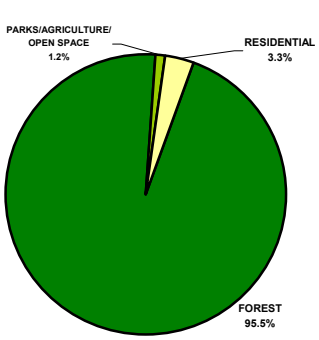
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
1,590	0.7	7.2	-2.6	21.3	4.1	4.2

Existing Land Use (2005)



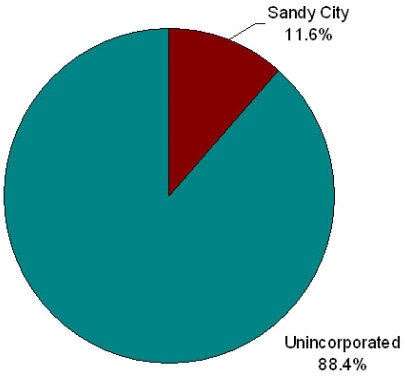
Future Land Use (2030)



UPPER DRY CREEK SUB-WATERSHED (3,878 Acres) - UDC

DESCRIPTION

Upper Dry Creek sub-watershed is 3,878 acres in the Wasatch Mountain Range. Flows in this sub-watershed are Perennial and the area is comprised of three canyon drainages: Bells Canyon, Middle Fork Dry Creek, and South Fork Dry Creek. Bells Canyon is also known as the North Fork of Dry Creek.



The primary land use in Upper Dry Creek sub-watershed is managed forest land with limited recreational use, including hiking, biking, camping and fishing. There are two reservoirs in this sub-watershed; however, the upper reservoir has been breached. This sub-watershed is protected for water quality and portions are covered under FCOZ.

The average annual precipitation in the Upper Dry Creek sub-watershed ranges from 52 inches at the headwaters to 11 inches in the Salt Lake Valley.

Beneficial Use: Not Classified

Stream Length(s): 2.4 Miles

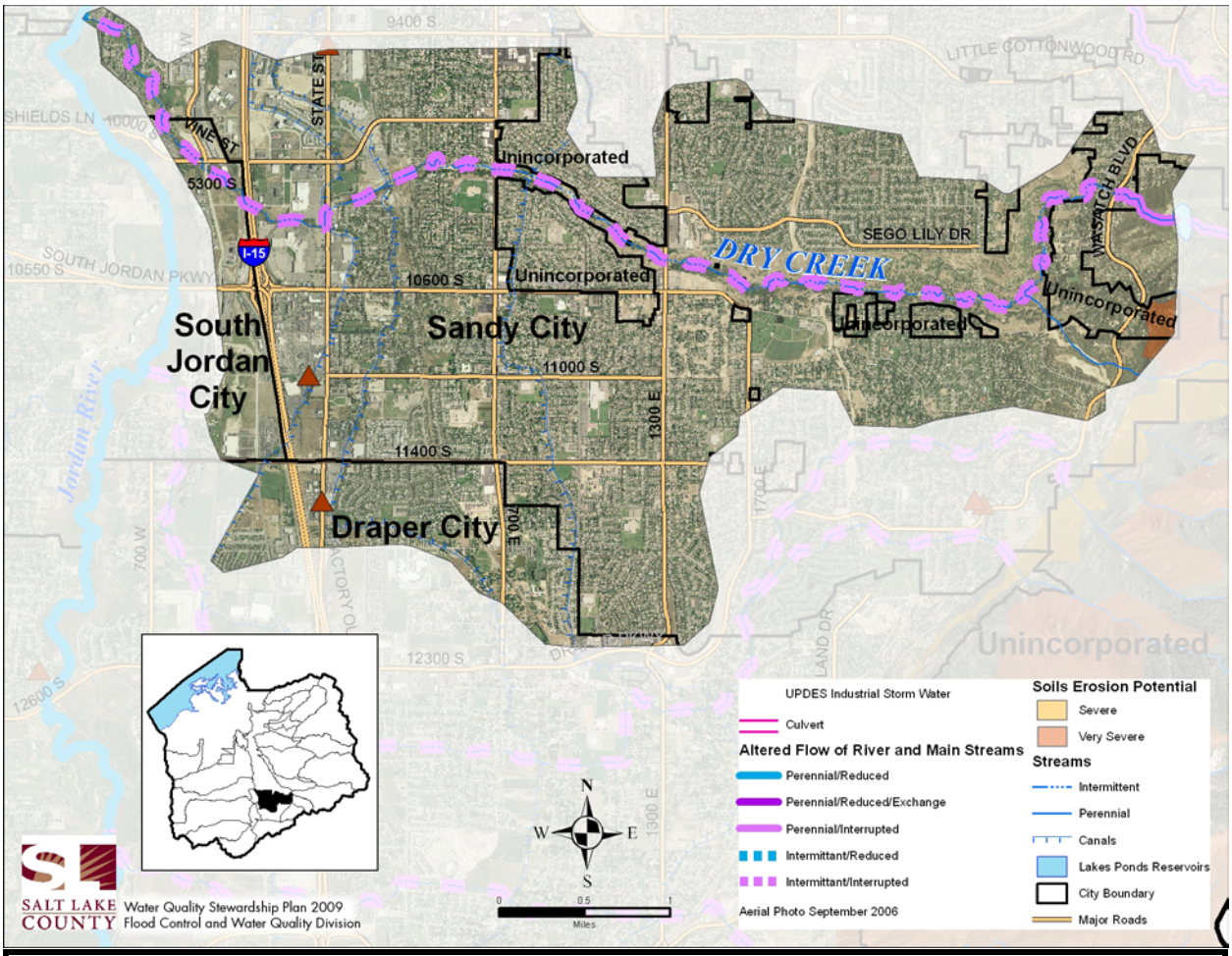
STRESSORS

- Urban development pressures leading to increased stormwater pollution loads and loss of groundwater recharge capability

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Volunteer groups
- Participate in new and/or existing planning efforts
- Stormwater BMP retrofitting
- Education and interpretive opportunities

LOWER DRY CREEK SUB-WATERSHED (8,557 Acres) - LDC

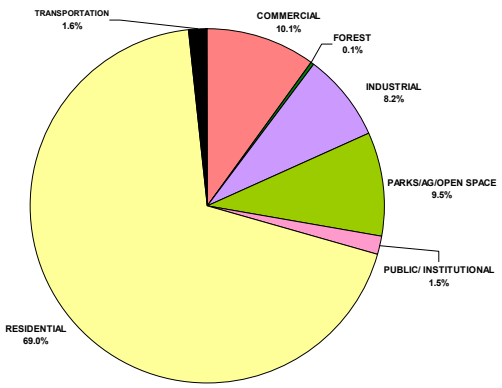


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
9.6	100.0	82.5	21.4	72.7	No Data

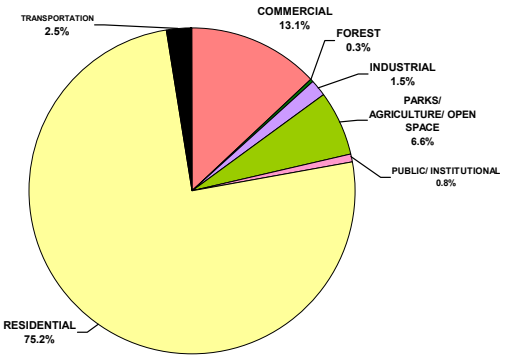
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
14,880	1.7	10.5	-48.1	-4.7	-1.3	-5.4

Existing Land Use (2005)



Future Land Use (2030)



LOWER DRY CREEK SUB-WATERSHED (8,557 Acres) - LDC

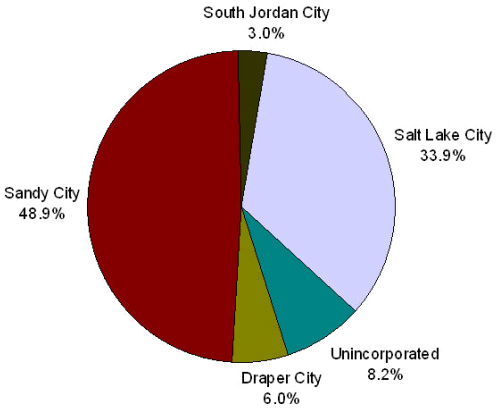
DESCRIPTION

The lower Dry Creek sub-watershed is 8,557 acres in the Wasatch Mountain Range. The flows of lower Dry Creek are Intermittent Interrupted.

Lower Dry Creek sub-watershed is highly urbanized, with primarily residential and commercial land use.

Designated beneficial use: Not Classified

Stream Length(s): 9.1 Miles



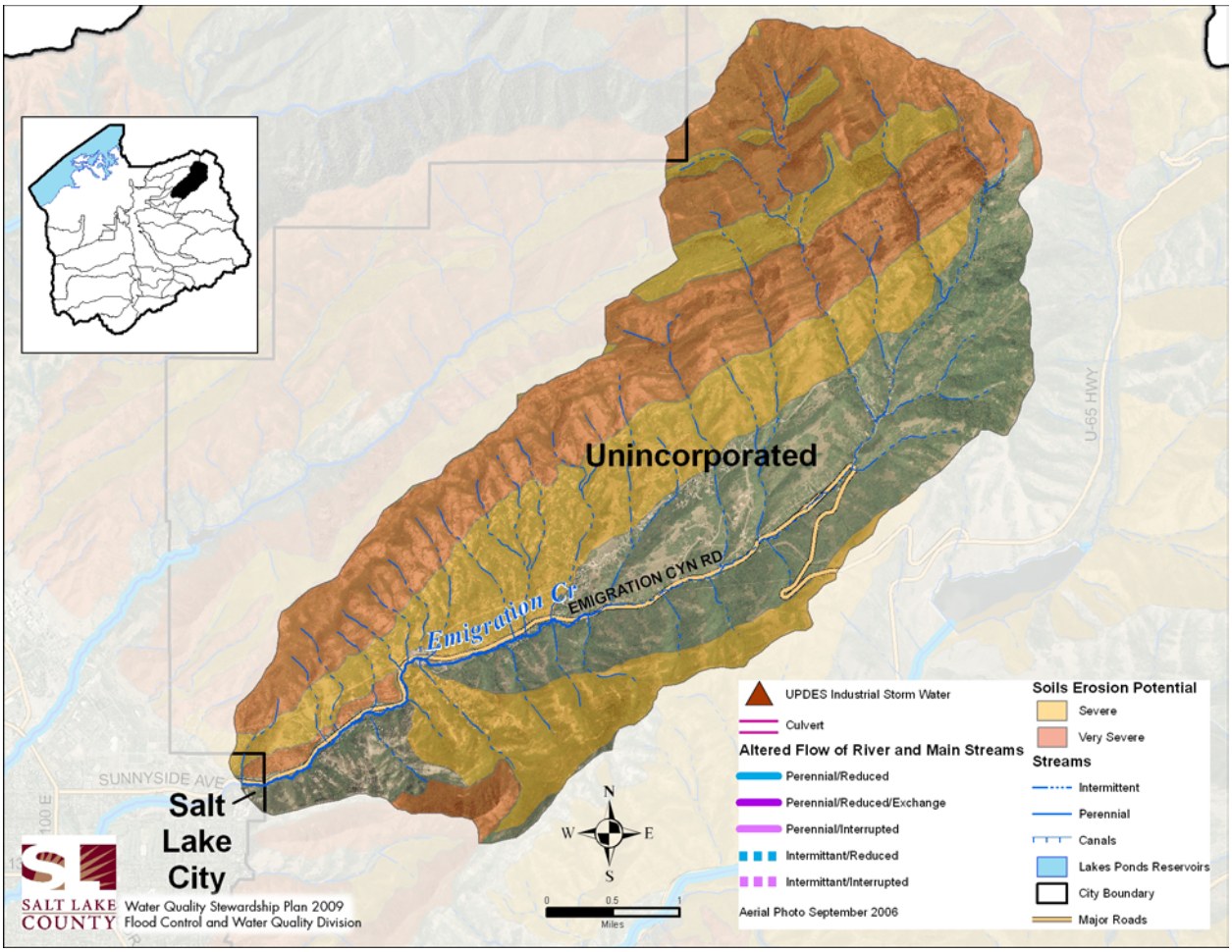
STRESSORS

- Lack of developed recreation opportunities within the watershed
- Stream flow diversions
- Unstable stream banks and channel
- Urban development pressures leading to loss of open space and loss of groundwater recharge capability

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Participate in new and/or existing planning efforts
- Diversion structure modification
- Canal water diversion
- Leadership in Energy and Environmental Design criteria
- Minimum flow protection
- Water rights acquisition
- Impervious surface limits
- Stream Corridor protection ordinance
- Stormwater ordinances
- Land acquisition for preservation
- Streambank revegetation
- Volunteer programs
- Bioengineered bank stabilization
- Channel restoration/enhancement
- Grade control structures
- Stormwater BMP retrofitting
- Stream daylighting

UPPER EMIGRATION CREEK SUB-WATERSHED (11,635 Acres) - UEM

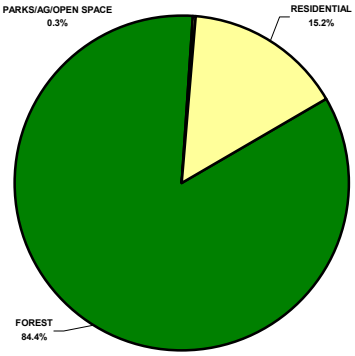


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
66.5	0.0	76.3	56.8	21.2	4.0

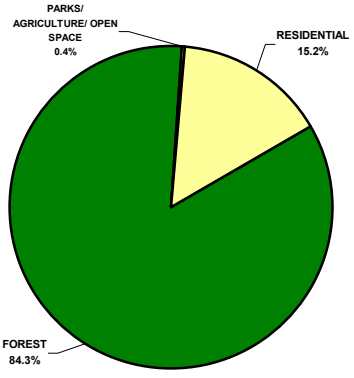
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
40	0.4	0.0	0.0	0.4	0.1	0.2

Existing Land Use (2005)



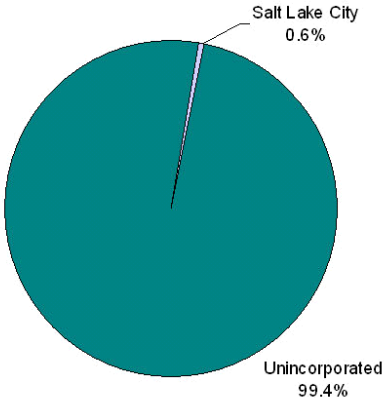
Future Land Use (2030)



UPPER EMIGRATION CREEK SUB-WATERSHED (11,635 Acres) - UEM

DESCRIPTION

The Upper Emigration Creek sub-watershed is located in the northeast corner of Salt Lake County in the Wasatch Mountains. This sub-watershed has a drainage area of 18.2 square miles comprised of moderately steep mountain slopes with an elevation range from 5,000 to 8,900 feet. The land use in the sub-watershed is primarily comprised of residential with limited commercial. The Emigration Creek sub-watershed is in close proximity to shopping centers, a golf course, and a zoo.



Emigration Creek is a perennial stream with tributary flow from Killyon and Burr Fork canyons along with several mountain springs. Stream headwaters commence in a small open valley near the top of Emigration Canyon at an elevation of approximately 6,000 feet.

This sub-watershed has high residential development that is primarily serviced by private wells and septic systems. Upper Emigration sub-watershed contains a groundwater recharge zone. The Creek is listed as water quality impaired for high bacterial levels.

Designated beneficial use: 2B

Stream Length(s): Emigration Creek 7.0 Miles; Burr Fork 2.6 Miles; Killyons Canyon 0.5 Miles

STRESSORS

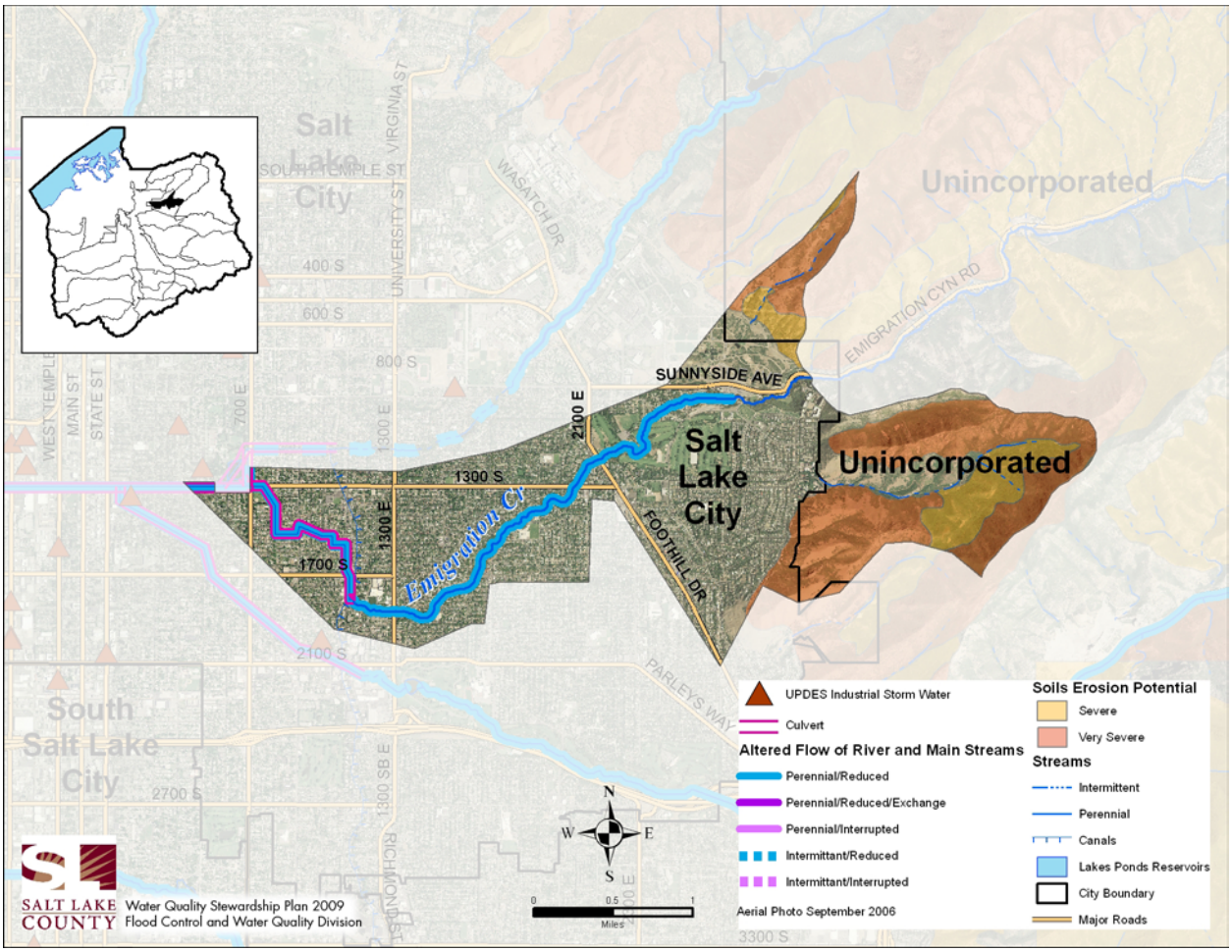
- Unstable stream banks and channel
- Development in the floodplain
- Lack of corridor preservation
- Urban development pressures leading to increased stormwater pollution loads and loss of groundwater recharge capability
- On-site waste disposal systems

RECOMMENDATIONS

- Bioengineered bank stabilization
- Channel restoration/enhancement
- Erosion control measures
- Grade control structures
- Identify community recreation needs and opportunities
- Participate in new and/or existing planning
- Riparian buffer restoration and/or enhancement
- Leadership in Energy and Environmental Design criteria
- Sediment source control
- Streambank revegetation
- Recreational facilities that are accessible and resource compatible
- Education and interpretive opportunities
- Floodplain re-establishment
- Wetland restoration/enhancement
- Stream Corridor protection ordinance
- Land acquisition for preservation
- Volunteer programs

Upper Emigration Creek is listed as water quality impaired for high bacteria levels on the State Division of Water Quality 303(d) List.

LOWER EMIGRATION CREEK SUB-WATERSHED (3,742 Acres) - LEM

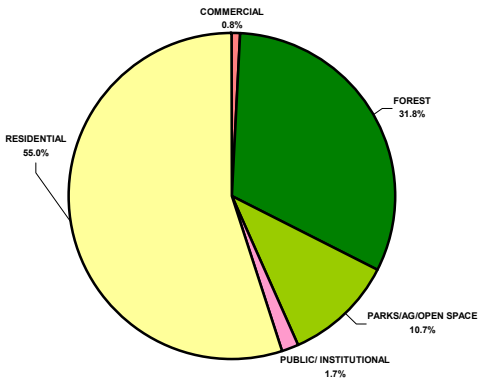


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
26.9	88.4	91.1	45.0	34.5	1.6

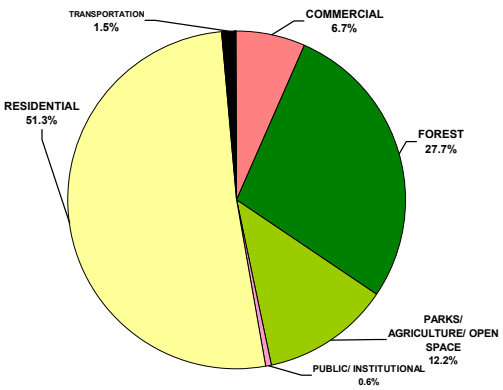
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
1,810	0.6	19.2	-6.0	2.4	4.9	3.1

Existing Land Use (2005)



Future Land Use (2030)

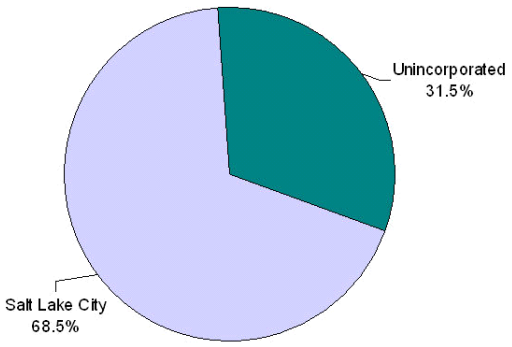


LOWER EMIGRATION CREEK SUB-WATERSHED (3,742 Acres) - LEM

DESCRIPTION

Lower Emigration Creek sub-watershed is 3,742 acres. The land use within this sub-watershed is comprised primarily of a heritage park and zoo, commercial development and residential neighborhoods.

The creek flows in an open channel through the watershed to a piped system. The piped system (1300 south storm drain) carries stream flow to the Jordan River. High portions of this watershed are managed under FCOZ.



Designated beneficial use: 2B

Stream Length(s): 5.1 Miles

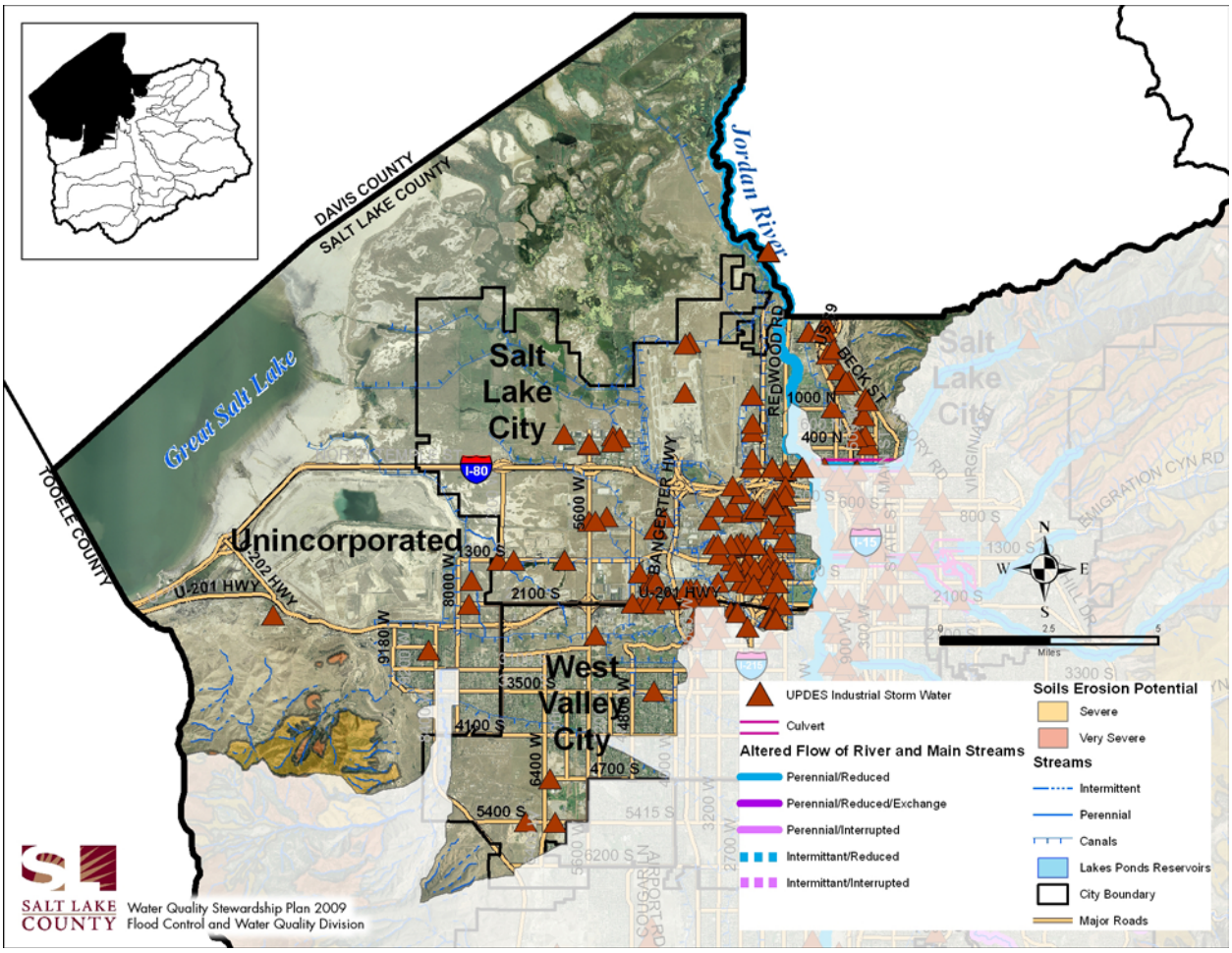
STRESSORS

- Stream flow diversions
- Unstable stream banks and channel
- Lack of corridor preservation
- Urban development pressures leading to increased stormwater pollution loads and loss of groundwater recharge capability
- Stream channel modification

RECOMMENDATIONS

- Wetland restoration and enhancement
- Land acquisition for preservation
- Volunteer programs
- Bioengineered bank stabilization
- Diversion structure modification
- Grade control structures
- Stormwater BMP retrofitting
- Stormwater detention ponds
- Impervious surface limits/open space Requirements
- Leadership in Energy and Environmental Design criteria
- Sediment source control
- Streambank revegetation
- Riparian buffer restoration and/or enhancement.
- Floodplain re-establishment
- Channel restoration/enhancement
- Stream daylighting
- Manufactured treatment systems
- Educational and interpretive opportunities
- Reallocation of water rights
- Water rights acquisition
- Canal water diversion
- Minimum flow protection

GREAT SALT LAKE (Kersey/Lee Creeks) SUB-WATERSHED (137,613 Acres) - GSL

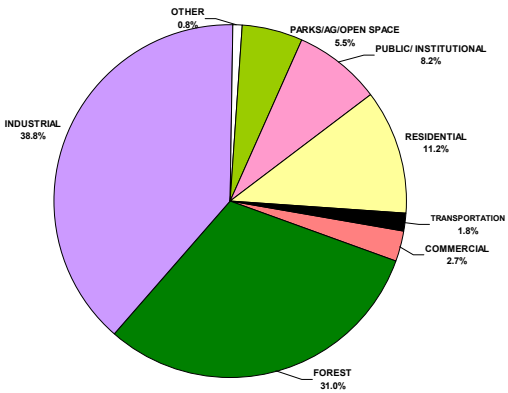


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
29.1	61.2	45.8	1.5	48.2	No Data

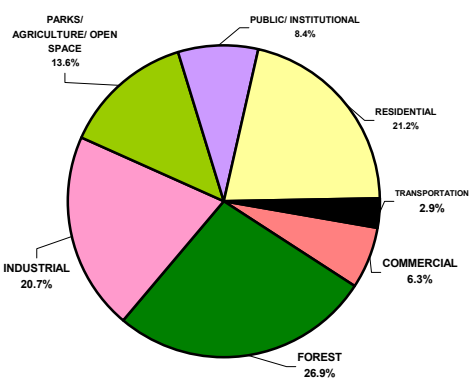
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
48,440	0.7	-8.4	6.5	15.4	-5.6	6.8

Existing Land Use (2005)



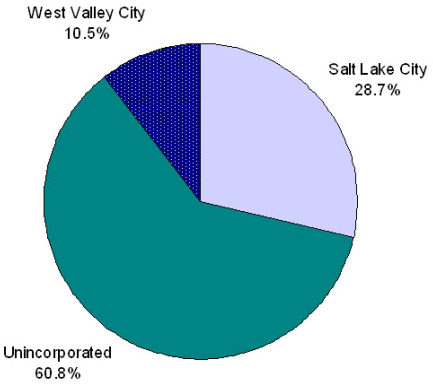
Future Land Use (2030)



GREAT SALT LAKE (Kersey/Lee Creeks) SUB-WATERSHED (137,613 Acres) - GSL

DESCRIPTION

The Great Salt Lake sub-watershed is the largest sub-watershed with 137,613 acres. This sub-watershed contains two streams (Kersey Creek and Lee Creek) that drain directly to the Great Salt Lake from the Oquirrh Mountains. Kersey Creek starts south of Interstate 80 and ends at the C-7 Ditch, which drains to the Great Salt Lake. Kersey Creek is categorized as a perennial stream (2.6 miles). Lee Creek starts south of Interstate 80 and ends at the C-7 Ditch, which drains to the Great Salt Lake. The upstream reach of Lee Creek is categorized as intermittent (2.1 miles) and the downstream reach is categorized as perennial (1.8 miles). Lee Drain discharges into Lee Creek.



The GSL Watershed contains two wastewater treatment facilities. The Magna Water Reclamation Facility has a design capacity of 4.0 mgd and a current average treatment rate of 2.4 mgd. The Salt Lake City Water Reclamation Facility has a design capacity of 80 mgd and a current average treatment rate of 34 mgd. This sub-watershed is transversed by numerous canals and has high industrial use. The shoreline of the Great Salt Lake is a popular destination for duck hunters and bird watchers. The anticipated land use change from industrial to residential results in an apparent increase in both open space.

Designated Beneficial Use: 5
Stream Length(s): Lee Creek 4.0 Miles; Kersey Creek 2.6 Miles

STRESSORS

- Large number of Industrial Stormwater Discharge permits
- Stream flow diversions
- Lack of corridor preservation
- Development and redevelopment pressures leading to increased stormwater pollution loads

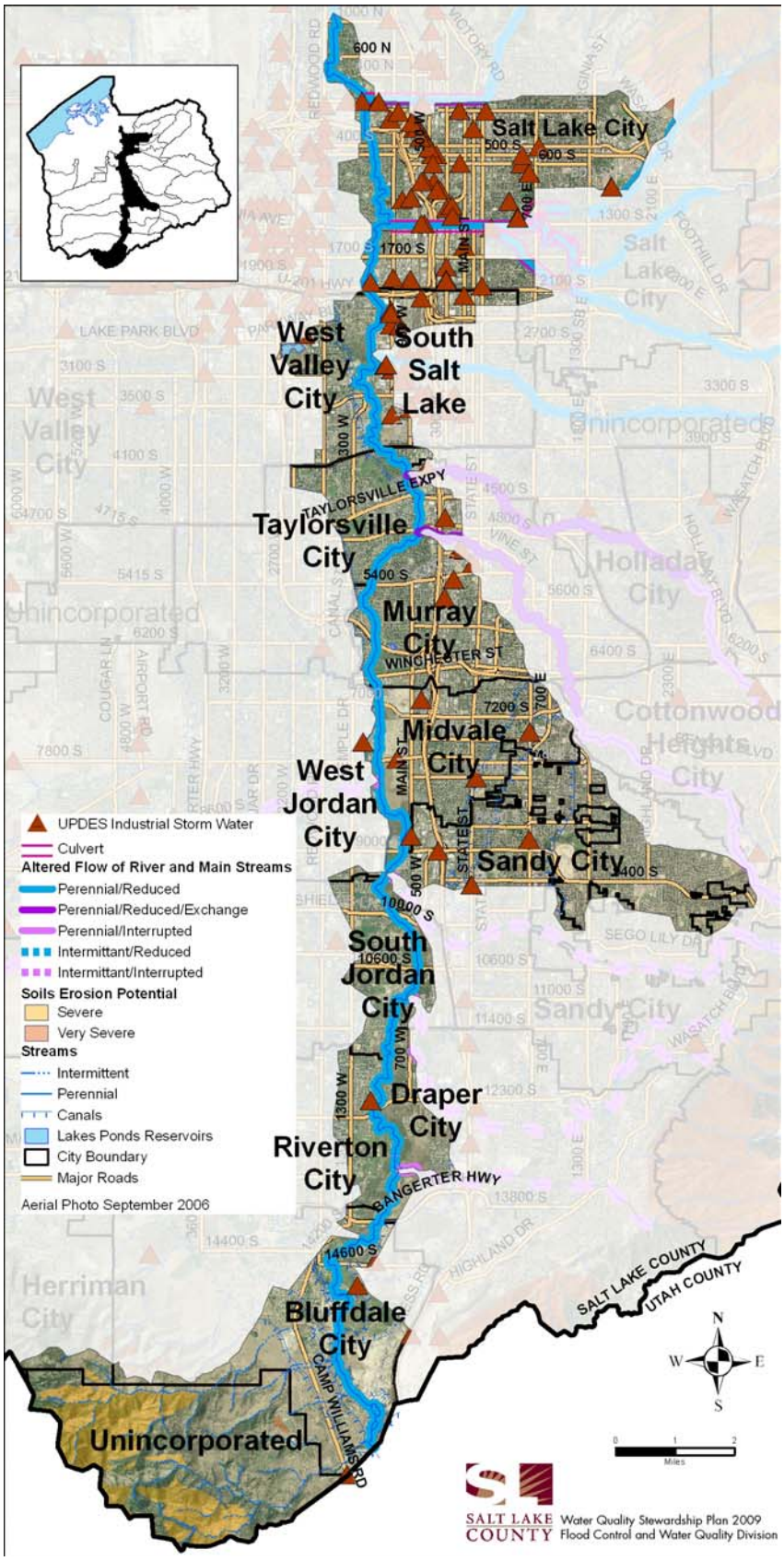
RECOMMENDATIONS

- Constructed wetlands
- Manufactured treatment systems
- Trash racks
- Directed growth
- Canal water diversion
- Leadership in Energy and Environmental Design criteria
- Minimum flow protection.
- Buffer protection ordinance
- Land acquisition for preservation
- Volunteer programs
- Wetland restoration/enhancement
- Educational and interpretive opportunities
- Recreational facilities that are accessible and resource compatible

Salt Lake Countywide Watershed—Water Quality Stewardship Plan

Atlas of Opportunities

JORDAN RIVER CORRIDOR (Wood/Beef Hollow Creeks) SUB-WATERSHED (43,238 Acres) - JR



SALT LAKE COUNTY Water Quality Stewardship Plan 2009 Flood Control and Water Quality Division

The Jordan River is listed as water quality impaired on the State Division of Water Quality 303(d) for low dissolved oxygen, high sediment, high temperature and high bacteria levels.

EXISTING CHARACTERISTICS (2005)		
Social/Recreational	Conveyance*	
Developed Recreation (%)	Reduced or Interrupted Flow(%)	Poor or Fair Stream Bank Stability (%)
9.5	72.2	No Data

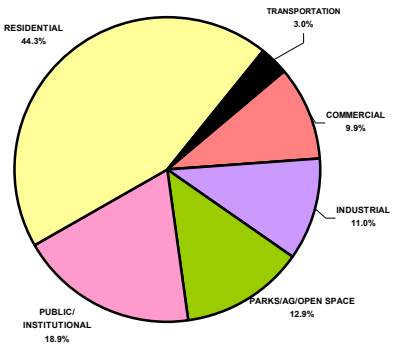
Conveyance	Habitat	Water Quality
Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
57.9	90.0	1.6

*The first two categories may only apply to the main stem.

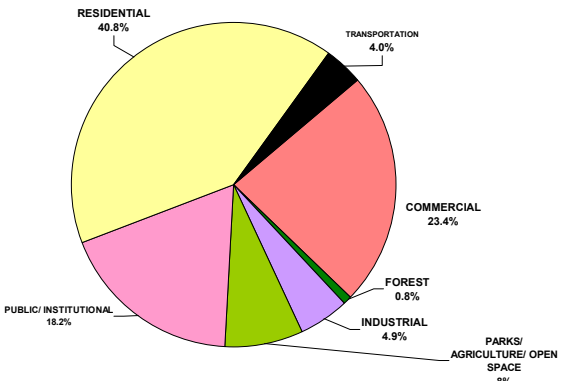
FUTURE CHARACTERISTICS (2030)			
Social/Recreational			
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)
57,230	1.6	17.5	-33.3

Water Quality		
Change in TP Loading (%)	Change in TN Loading (%)	Change in TSS Loading (%)
-8.1	0.1	-6.7

Existing Land Use (2005)



Future Land Use (2030)

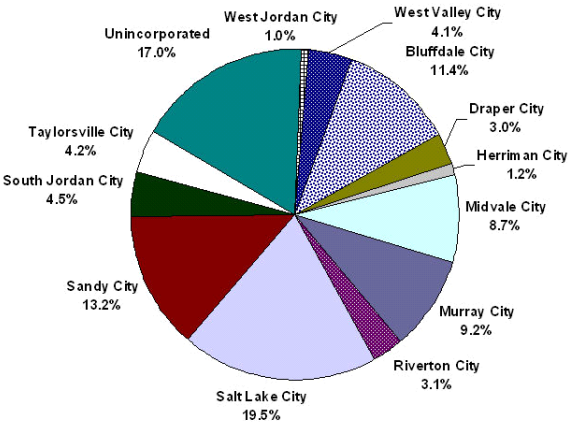


JORDAN RIVER CORRIDOR (Wood/Beef Hollow Creeks) SUB-WATERSHED (43,238 Acres) - JR

DESCRIPTION

The Jordan River meanders from Utah Lake through the Utah Lake valley, Jordan Narrows and Salt Lake valley, before draining into the Great Salt Lake.

The release of water from Utah Lake to the Jordan River is managed for irrigation, water supply, and flood control purposes. In addition to Utah Lake inflow, the Jordan River receives flow from Wasatch and Oquirrh mountain tributary streams. This sub-watershed crosses multiple jurisdictions and receives the majority of stormwater in Salt Lake County. The South Valley Water Reclamation Facility has a capacity of 50 mgd and currently discharges 30 mgd directly to the Jordan River. Additionally, a planned wastewater treatment facility in Riverton will discharge to the Jordan River.



Designated beneficial use: 2B, 3A, 3B, 4 Stream Length(s): 44 Miles (w/in Salt Lake County)

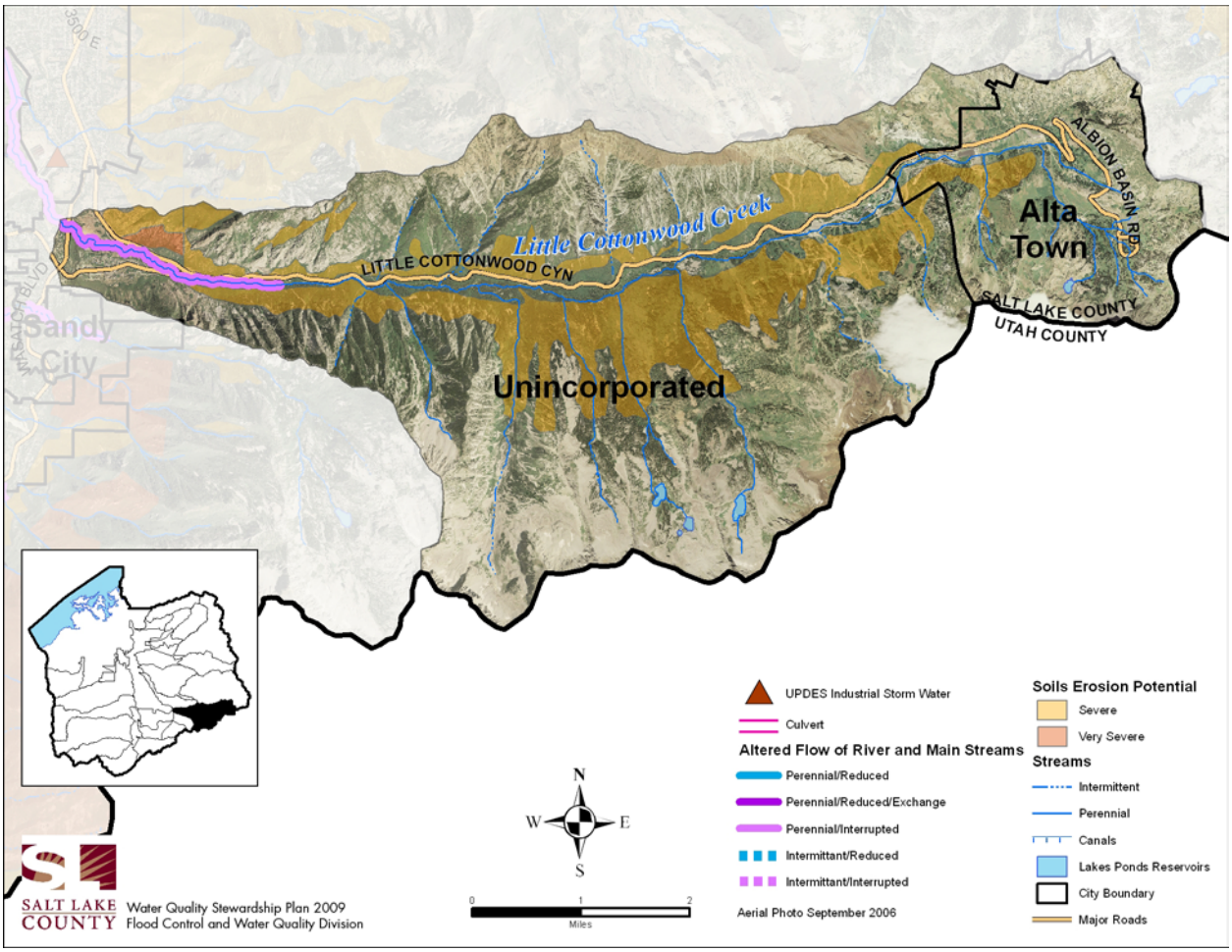
STRESSORS

- Stream channel modification
- Stream flow diversions
- High number of Industrial Stormwater Discharge Permits
- Urban development and redevelopment pressures
- Lack of developed recreation
- Loss of open space
- Floodplain encroachment
- Densification of residential land use

RECOMMENDATIONS

- Bioengineered bank stabilization
- Grade control structures
- Channel restoration/enhancement
- Streambank revegetation
- 401 permitting
- Diversion structures modification
- Canal water diversion
- Leadership in Energy and Environmental Design criteria
- Minimum flow protection
- Water rights acquisition
- Identify community recreation needs and opportunities
- Wetlands restoration/enhancement
- Manufactured treatment systems
- Participate in new and/or existing planning efforts
- Floodplain re-establishment
- Trash racks
- Land acquisition for preservation
- Volunteer programs
- Recreational facilities that are accessible and resource compatible.

UPPER LITTLE COTTONWOOD CREEK SUB-WATERSHED (17,366 Acres) - ULC

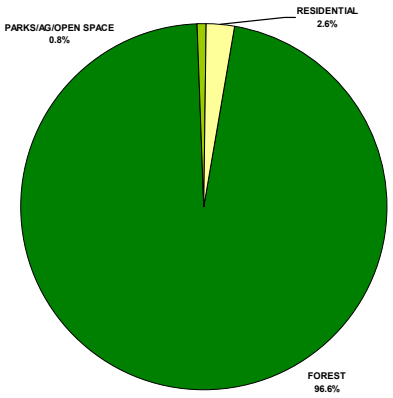


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
90.3	20.6	23.8	7.3	78.7	0.4

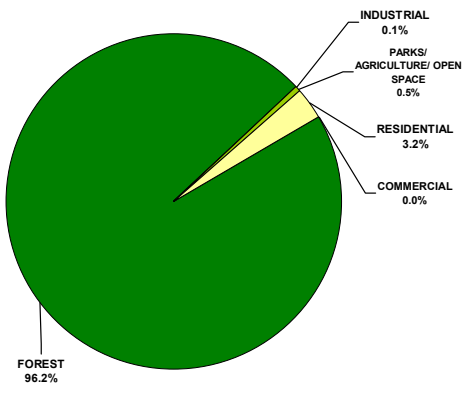
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
830	1.3	2.2	-1.1	0.6	0.4	-0.3

Existing Land Use (2005)



Future Land Use (2030)

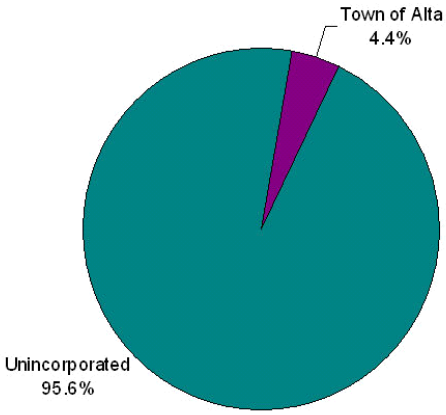


UPPER LITTLE COTTONWOOD CREEK SUB-WATERSHED (17,366 Acres) - ULC

DESCRIPTION

The Upper Little Cottonwood Creek sub-watershed has a drainage area of 17,366 acres comprised of steep mountain slopes with an elevation range from 5,200 to 11,200 feet. Little Cottonwood Creek Watershed is located in the Wasatch Mountains in the southeast corner of Salt Lake County.

Stream headwaters commence in Albion Basin. Little Cottonwood Creek is perennial and provides the second largest surface water source used by Salt Lake City for potable purposes. As a result, the watershed is protected and managed according to city guidelines designed to protect and sustain water quality by Salt Lake City and FCOZ. Additionally, the Town of Alta is an officially incorporated municipality in this sub-watershed.



The primary land use in Upper Little Cottonwood Creek is managed forest land for recreational use, including hiking, biking, camping, picnicking, fishing, and downhill and cross-country skiing. There are part-time and year-round residences, two ski resorts and lodging in the canyon.

Designated beneficial use: 3A

Stream Length(s): 11.7 Miles

STRESSORS

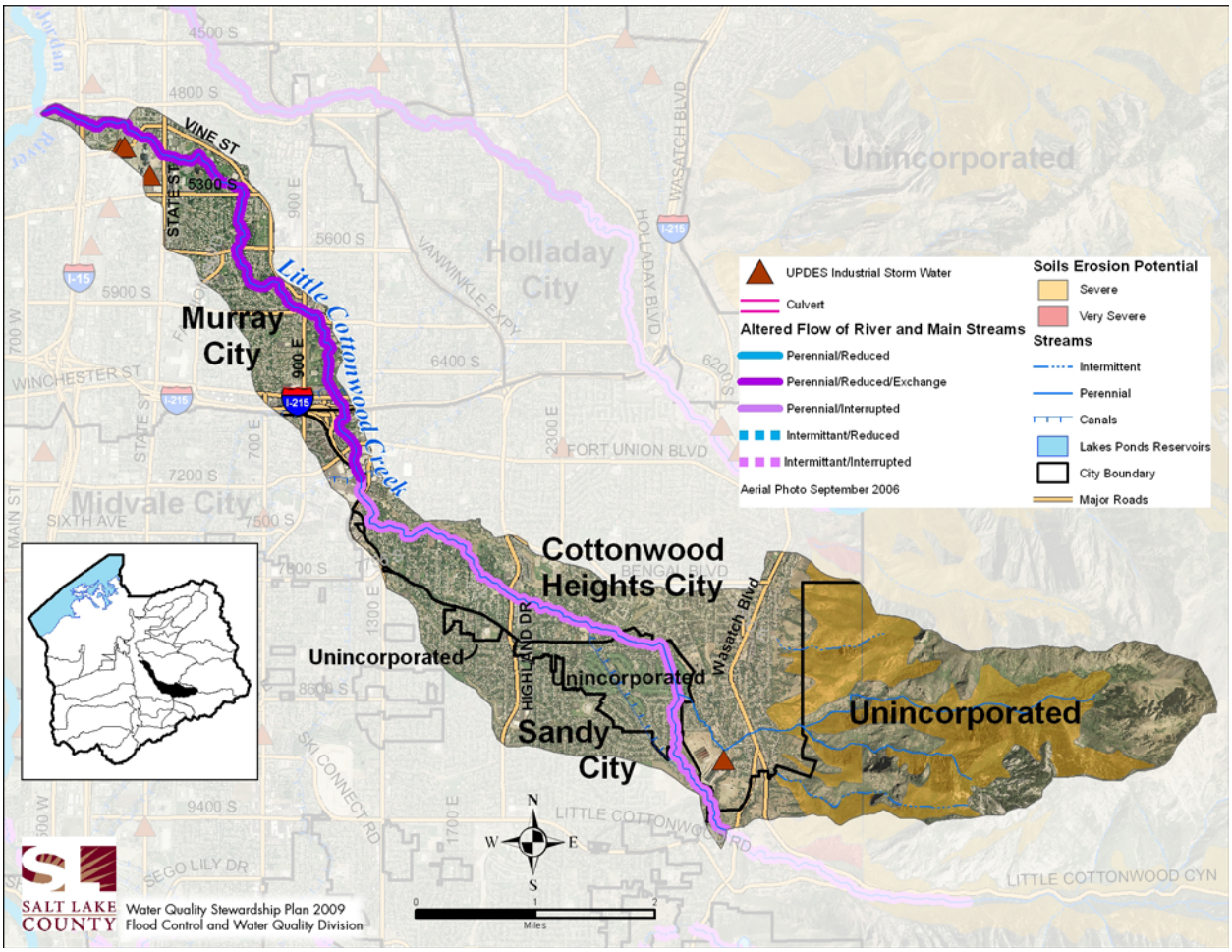
- Recreation development pressures leading to increased stormwater pollution loads and loss of groundwater recharge
- Water supply development

RECOMMENDATIONS

- Leadership in Energy and Environmental Design criteria
- Land acquisition for preservation
- Volunteer programs
- Rainwater harvesting
- Wetland restoration/enhancement
- Green roofs
- Stormwater infiltration basins
- Manufacture treatment systems
- Porous pavement
- Riparian buffers
- Vegetated swales
- Recreational facilities that are accessible and resource compatible
- Educational and interpretive opportunities

Upper Little Cottonwood Creek is listed as water quality impaired on the State Division of Water Quality 303(d) for high zinc levels.

LOWER LITTLE COTTONWOOD CREEK SUB-WATERSHED (8,141 Acres) - LLC

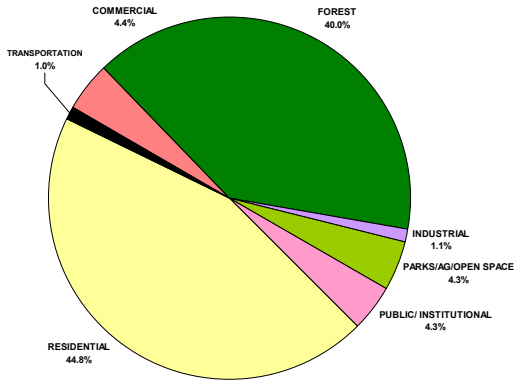


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
40.9	100.0	77.1	78.1	23.2	5.8

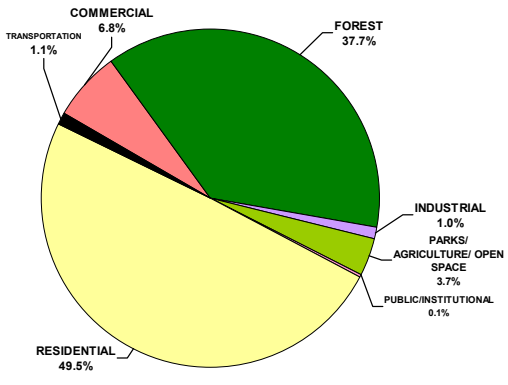
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
11,430	1.9	9.4	-8.6	-2.0	2.8	-4.8

Existing Land Use (2005)



Future Land Use (2030)



LOWER LITTLE COTTONWOOD CREEK SUB-WATERSHED (8,141 Acres) - LLC

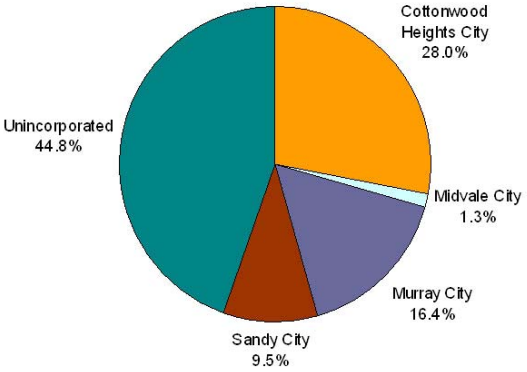
DESCRIPTION

The Lower Little Cottonwood Creek sub-watershed is 8,141 acres and flow conditions consist of Perennial-Interrupted at the higher elevations and Perennial-Reduced/Exchange in the valley.

This sub-watershed is highly urbanized, with primarily residential land use. Increased commercial and industrial uses occur near Interstate-15 and Interstate-215. Of note, the foothill area is managed under FCOZ.

Designated beneficial use: 3A, 4

Stream Length(s): 10.6 Miles



STRESSORS

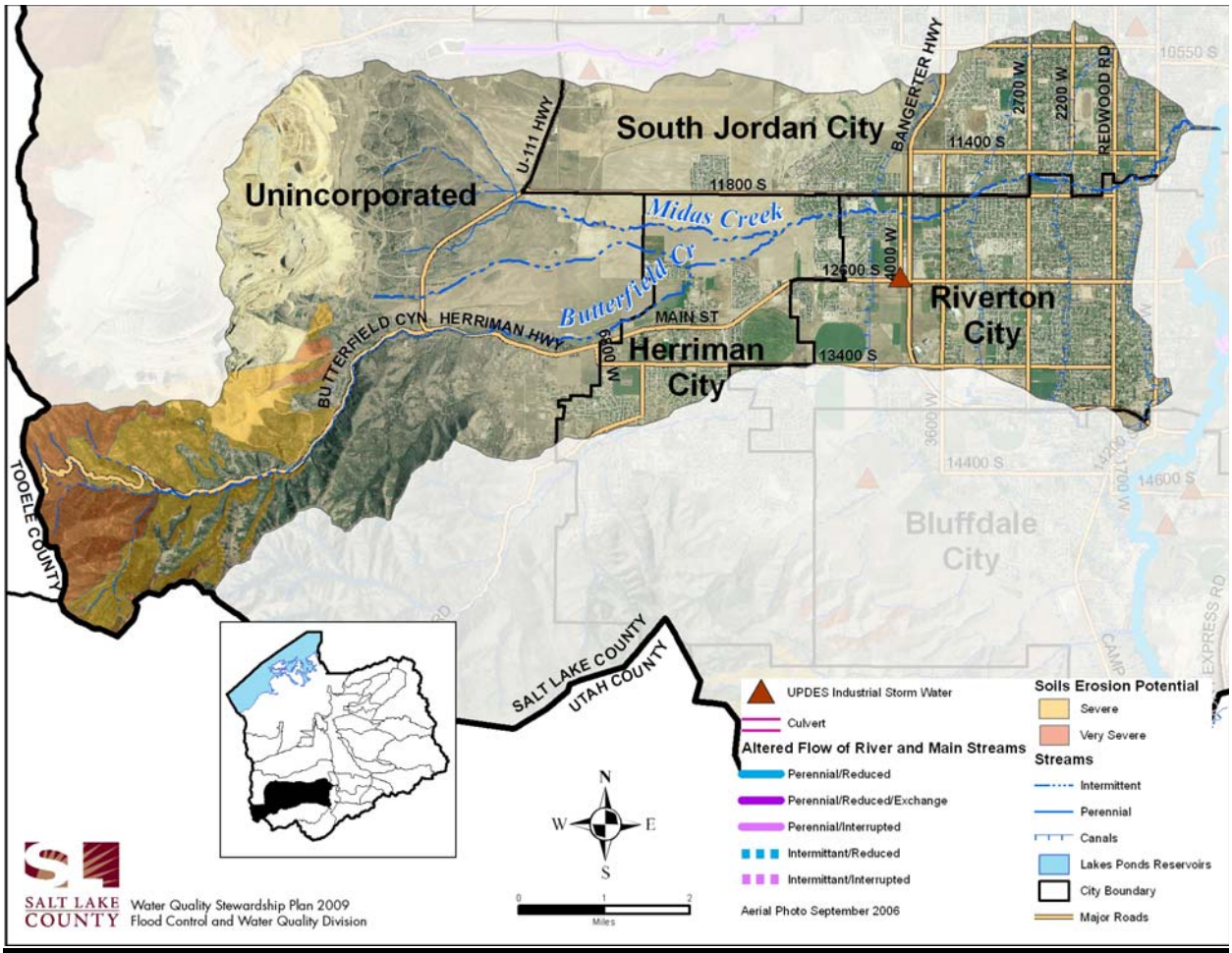
- Stream flow diversions
- Unstable banks and channel
- Development in the floodplain
- Lack of corridor protection
- Densification of residential land use
- Urban development pressures leading to increased stormwater pollution loads and loss of groundwater recharge capabilities

RECOMMENDATIONS

- Identify community recreation needs and opportunities
- Participate in new and/or existing planning efforts
- Diversion structure modification
- Canal water diversion
- Leadership in Energy and Environmental Design criteria
- Minimum flow protection
- Water rights acquisition
- Floodplain re-establishment
- Channel restoration/enhancement
- Wetland restoration/enhancement
- Riparian buffer restoration and/or enhancement
- Stream Corridor protection ordinance
- Land acquisition for preservation
- Volunteer programs
- Educational and interpretive opportunities
- Grade control structures
- Bioengineered bank stabilization
- Streambank revegetation

Lower Little Cottonwood Creek is listed as water quality impaired on the State Division of Water Quality 303(d) for high temperature and sediment levels.

MIDAS/BUTTERFIELD CREEK SUB-WATERSHED (32,173 Acres) - MBC

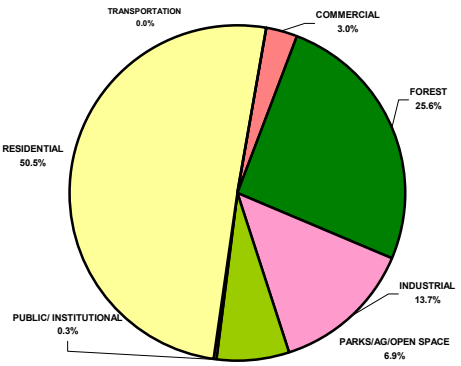


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
5.1	12.8	43.9	69.9	26.9	-0.9

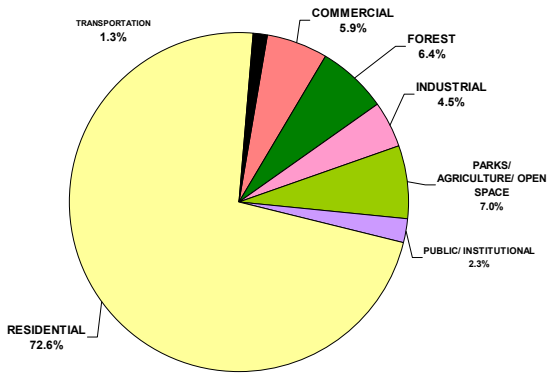
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
100,840	4.0	19.0	-60.8	21.5	6.5	7.5

Existing Land Use (2005)



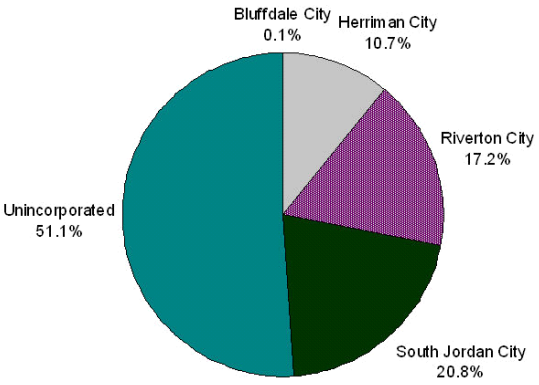
Future Land Use (2030)



MIDAS/BUTTERFIELD CREEK SUB-WATERSHED (32,173 Acres) - MBC

DESCRIPTION

Midas/Butterfield Creek watershed has a drainage area of 32,173 acres and is comprised of several gulches that are tributary to Butterfield Creek and Midas Creek.



Butterfield Creek originates in the Oquirrh Mountains and is conveyed to Midas Creek along 6000 West. The channel continues downstream and terminates between the Utah Lake Distributing Canal and the Utah and Salt Lake Canal. However, the channel is highly undefined at this point.

The headwaters of Midas Creek are formed by several gulches. The drainage pattern in the headwaters were modified by the Kennecot Copper Pit Mine, which resulted in tributary area being routed to Bingham Creek. Midas Creek .

Designated beneficial Use - Butterfield Creek: 3D, 4

Stream Length(s): Midas Creek 10.1 Miles
Butterfield Creek 8.1 Miles
Copper Creek 5.3 Miles

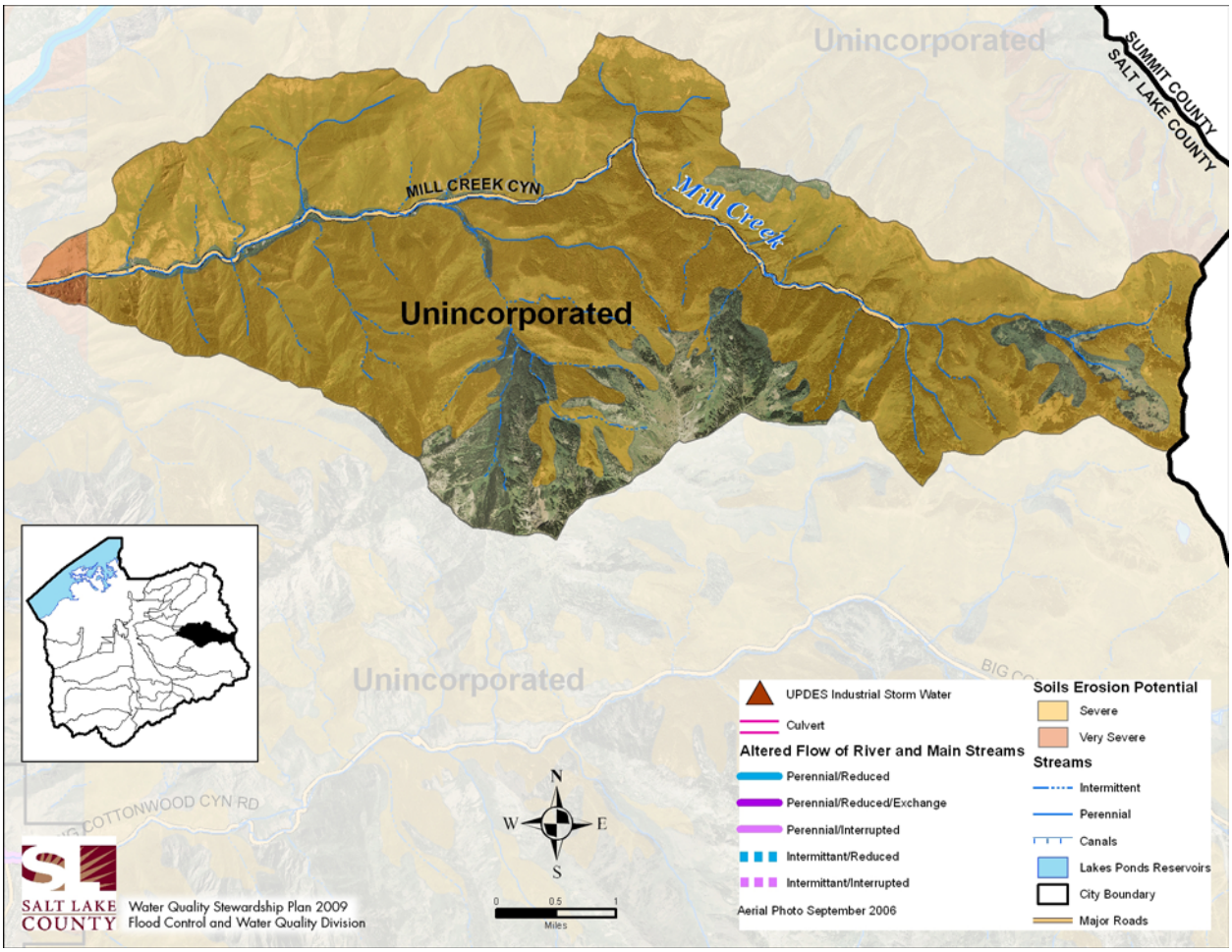
STRESSORS

- Lack of developed recreation opportunities
- Development in the floodplain
- Lack of corridor preservation
- Development pressures leading to loss of open space, increased stormwater pollution loads, and loss of groundwater recharge capability

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Participate in new and/or existing planning efforts
- Riparian buffer restoration/enhancement
- Stream Corridor protection ordinance
- Leadership in Energy and Environmental Design criteria
- Land acquisition for preservation
- Volunteer programs
- Rainwater harvesting
- Wetland restoration/enhancement
- Open space ordinances
- Green roofs
- Infiltration basins
- Manufactured treatment systems
- Stormwater ponds
- Vegetated swales

UPPER MILL CREEK SUB-WATERSHED (13,915 Acres) - UMC

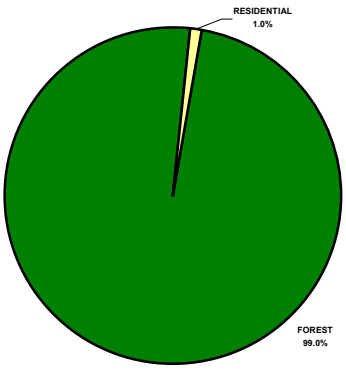


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
90.9	0.0	40.7	0.0	78.0	0.5

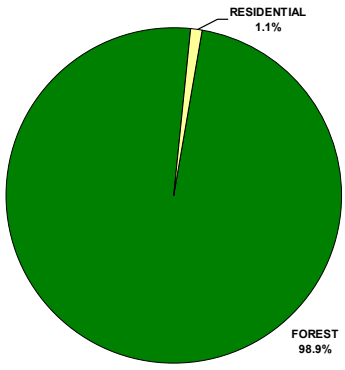
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
50	0.4	0.3	-0.1	0.6	0.1	0.1

Existing Land Use (2005)



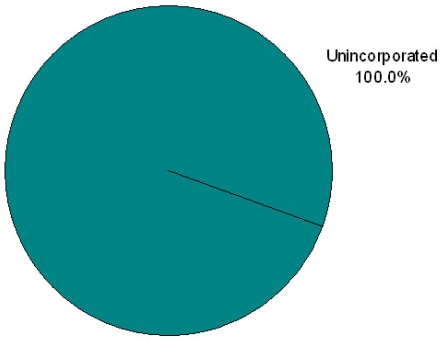
Future Land Use (2030)



UPPER MILL CREEK SUB-WATERSHED (13,915 Acres) - UMC

DESCRIPTION

The Upper Mill Creek sub-watershed has a drainage area of 13,915 acres comprised of steep mountain slopes with an elevation range from 5,100 to 10,200 feet in the Wasatch Mountain Range.



The primary land use in Upper Mill Creek sub-watershed is managed forest land for recreational use, including hiking, biking, picnicking, camping, fishing and cross-country-skiing. There are a limited number of summer residences in the canyon, two year-round restaurants and a permanent camp area used by the Boy Scouts of America.

Mill Creek Canyon is a popular recreation site for many Salt Lake residents. Prior to the 1990s, much of the canyon, including the stream channel of Mill Creek, had degraded largely because of human activities. Remediation has since been done at several campground facilities, along with the installment of a fee station. User revenues are put toward the restoration and continued maintenance of the canyon and the creek's riparian zone.

Designed beneficial use: 1C, 2B, 3A

Stream Length(s): 10.4 Miles

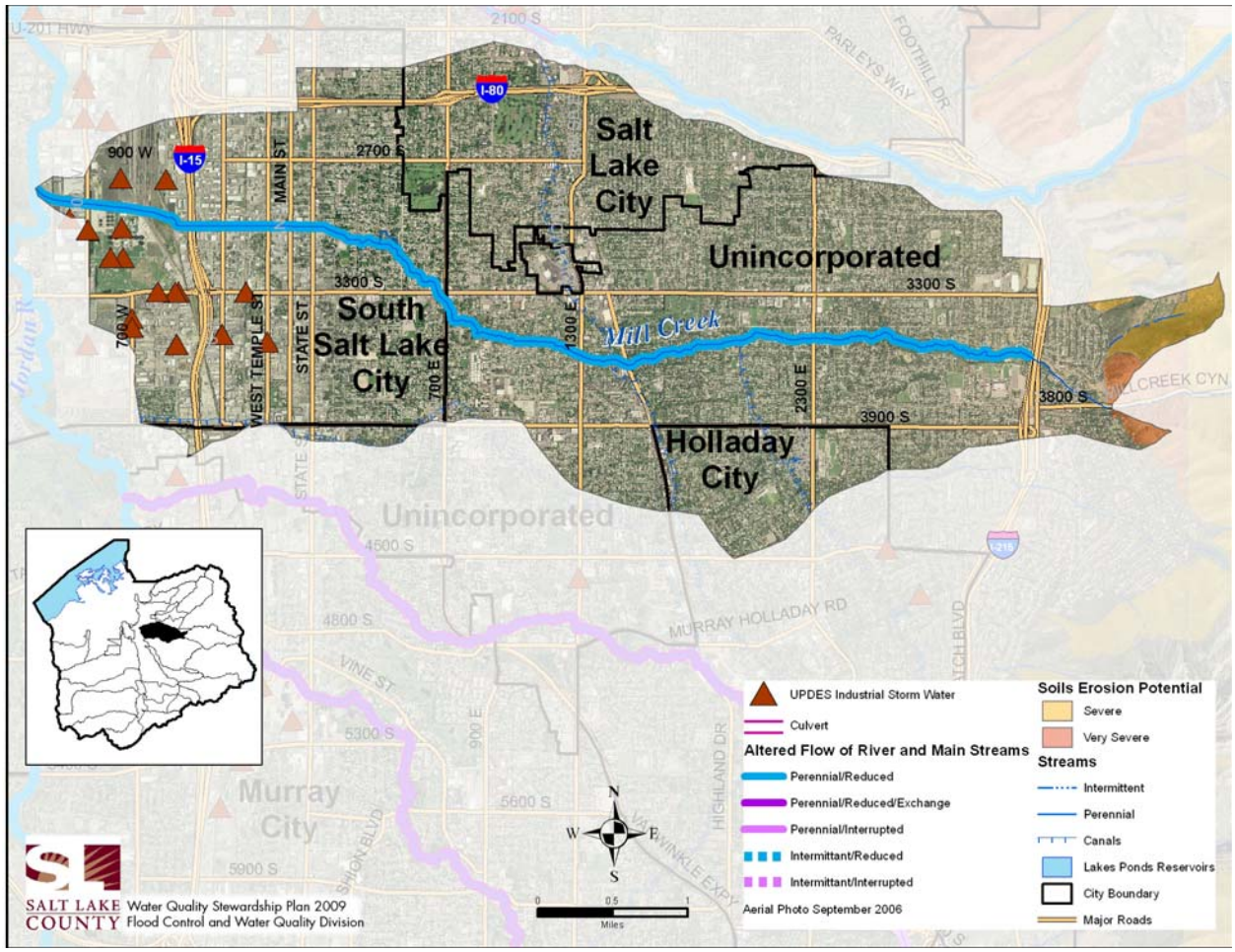
STRESSORS

- Development, and dispersed development, pressures leading to increased stormwater pollution loads, and loss of groundwater recharge capability
- Highly erodible soils
- Potential water supply development

RECOMMENDATIONS

- Stream Corridor protection ordinance
- Land acquisition for preservation
- Volunteer programs
- Rain Gardens
- Wetland restoration/enhancement/creation
- Green roofs
- Stormwater infiltration basins
- Riparian buffers
- Stormwater detention ponds
- Revetments
- Education and interpretive opportunities
- Recreational facilities that are accessible and resource compatible
- Participate in new and existing planning efforts

LOWER MILL CREEK SUB-WATERSHED (9,729 Acres) - LMC

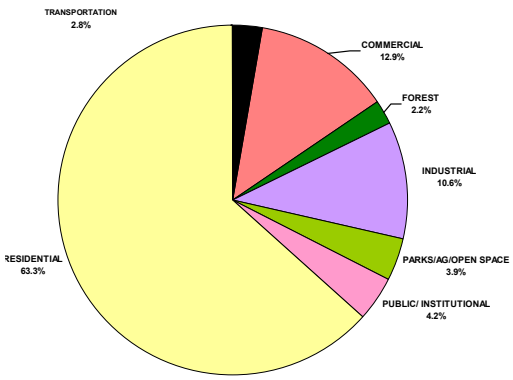


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
2.6	91.6	91.6	98.6	17.3	2.8

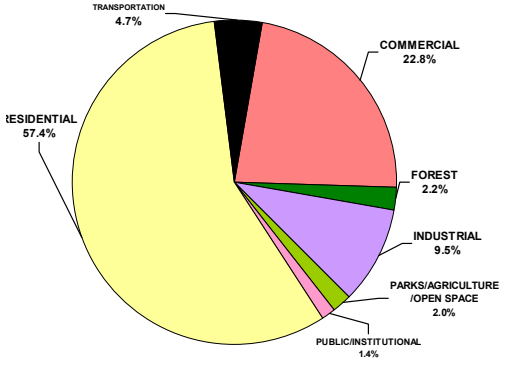
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
12,060	1.2	17.4	-66.0	-7.3	2.7	-4.5

Existing Land Use (2005)



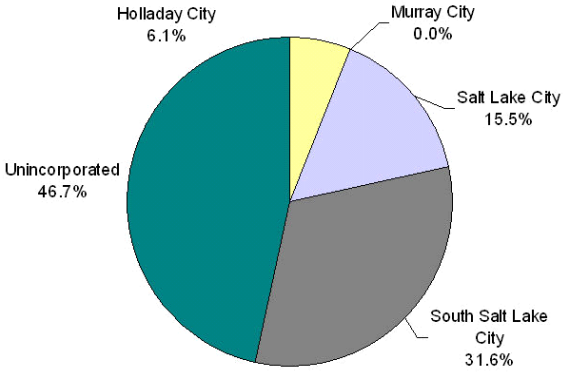
Future Land Use (2030)



LOWER MILL CREEK SUB-WATERSHED (9,729 Acres) - LMC

DESCRIPTION

The Lower Mill Creek sub-watershed has a drainage area of 9,729 acres and discharges to the Jordan River. Lower Mill Creek is highly urbanized, with primarily residential land use. Increased commercial and industrial are anticipated to occur on the east bench and closer to the Jordan River. Central Valley Water Reclamation Facility has a capacity of 75 mgd and currently discharges 50 mgd to Mill Creek, just before it's confluence with the Jordan River.



Designated beneficial use: 2B, 3A, 3C, 4

Stream Length(s): 8.1 Miles

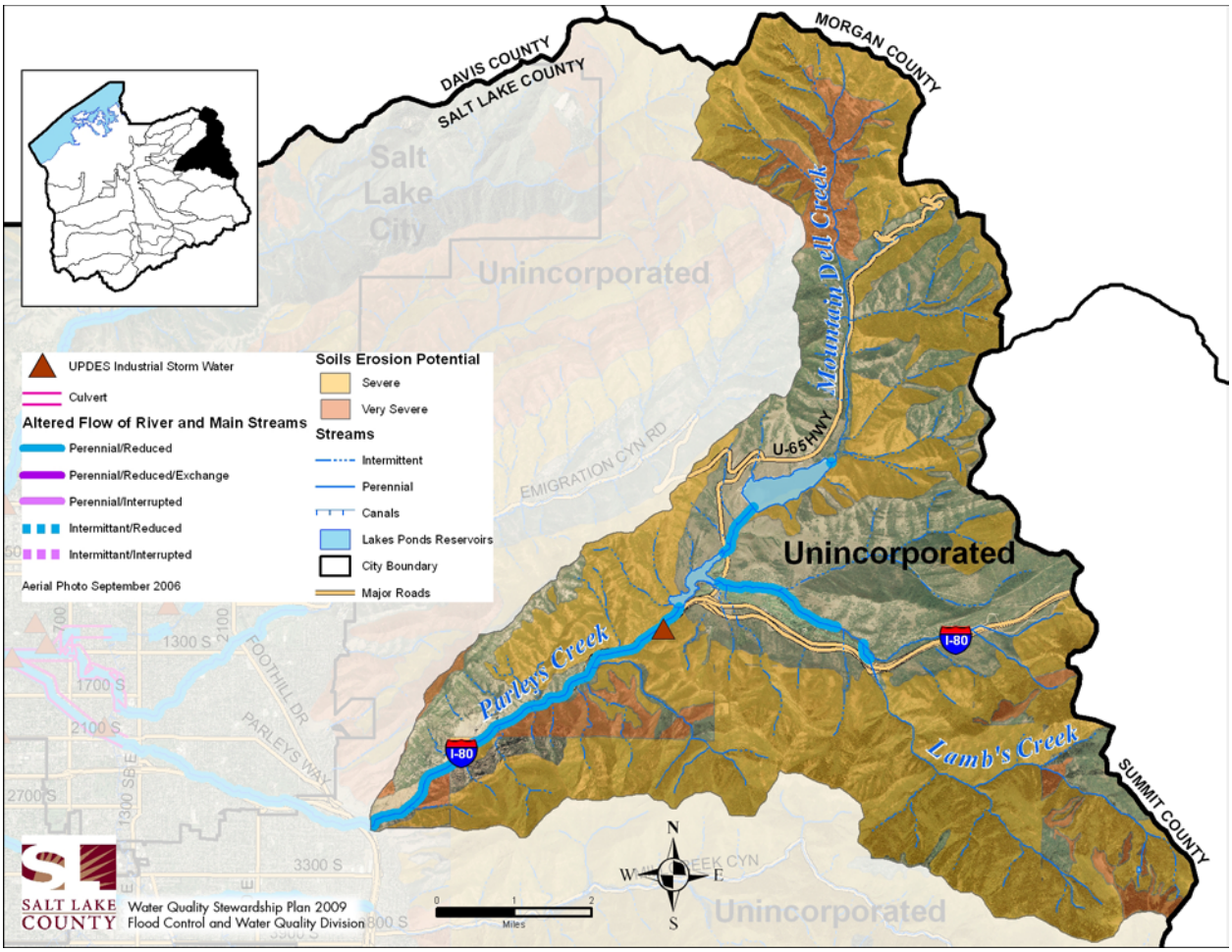
STRESSORS

- Lack of developed recreation opportunities
- Stream flow diversions
- Unstable stream banks and channel
- Development in the floodplain
- Lack of stream corridor preservation
- Urban development pressures leading to loss of open space, increased stormwater pollution loads, and loss of groundwater recharge capability

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Participate in new and/or existing planning efforts
- Diversion structure modification
- Canal water diversion
- Leadership in Energy and Environmental Design criteria
- Minimum flow protection
- Water rights acquisition
- Floodplain re-establishment
- Channel restoration/enhancement
- Open space land acquisition
- Wetland restoration/enhancement
- Riparian buffer restoration and/or enhancement
- Stream Corridor protection ordinance
- Land acquisition for preservation
- Volunteer programs
- Stream daylighting
- Grade control structures
- Bioengineered bank stabilization
- Streambank revegetation

UPPER PARLEY'S CREEK SUB-WATERSHED (33,271 Acres) - UPC

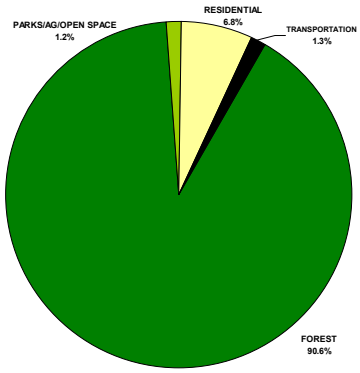


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
85.5	36.7	26.8	20.8	73.8	-0.1

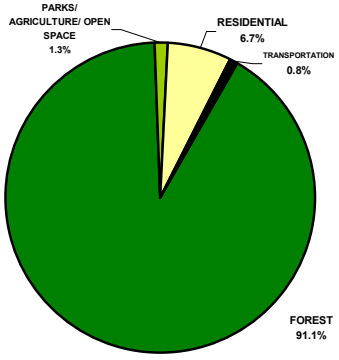
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
40	0.3	-3.4	0.6	-2.3	-0.5	-0.9

Existing Land Use (2005)



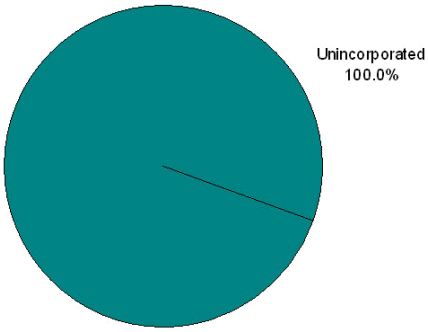
Future Land Use (2030)



UPPER PARLEY'S CREEK SUB-WATERSHED (33,271 Acres) - UPC

DESCRIPTION

The Upper Parley's Creek sub-watershed has a drainage area of 33,271 acres comprised of moderate to steep mountain slopes with an elevation range from 4,700 to 9,400 feet. The headwaters of the sub-watershed are subdivided into two canyons, Mountain Dell Canyon and Lambs Canyon in the Wasatch Mountains.



Mountain Dell Canyon drains into the Little Dell Reservoir, which outfalls to the Mountain Dell Reservoir. Lambs Canyon drains into Parley's Creek above the Mountain Dell Reservoir. There is a flow diversion from Parley's Creek just downstream of the confluence with Lambs Canyon that conveys water to Little Dell Reservoir. Immediately downstream of the Mountain Dell Reservoir is the Parley's Water Treatment Plant, which is owned and operated by Salt Lake City Public Utilities.

The land use in the sub-watershed is primarily as a transportation corridor for Interstate-80, with summer homes in Mount Aire and Lambs Canyon and developed recreational facilities including golf, cross country skiing, and picnicking.

Designated beneficial use: 1C, 2B, 3A

Stream Length(s): Lambs Canyon 5.3 Miles
Mountain Dell Canyon 6.1 Miles
Parley's Creek 10.8 Miles

STRESSORS

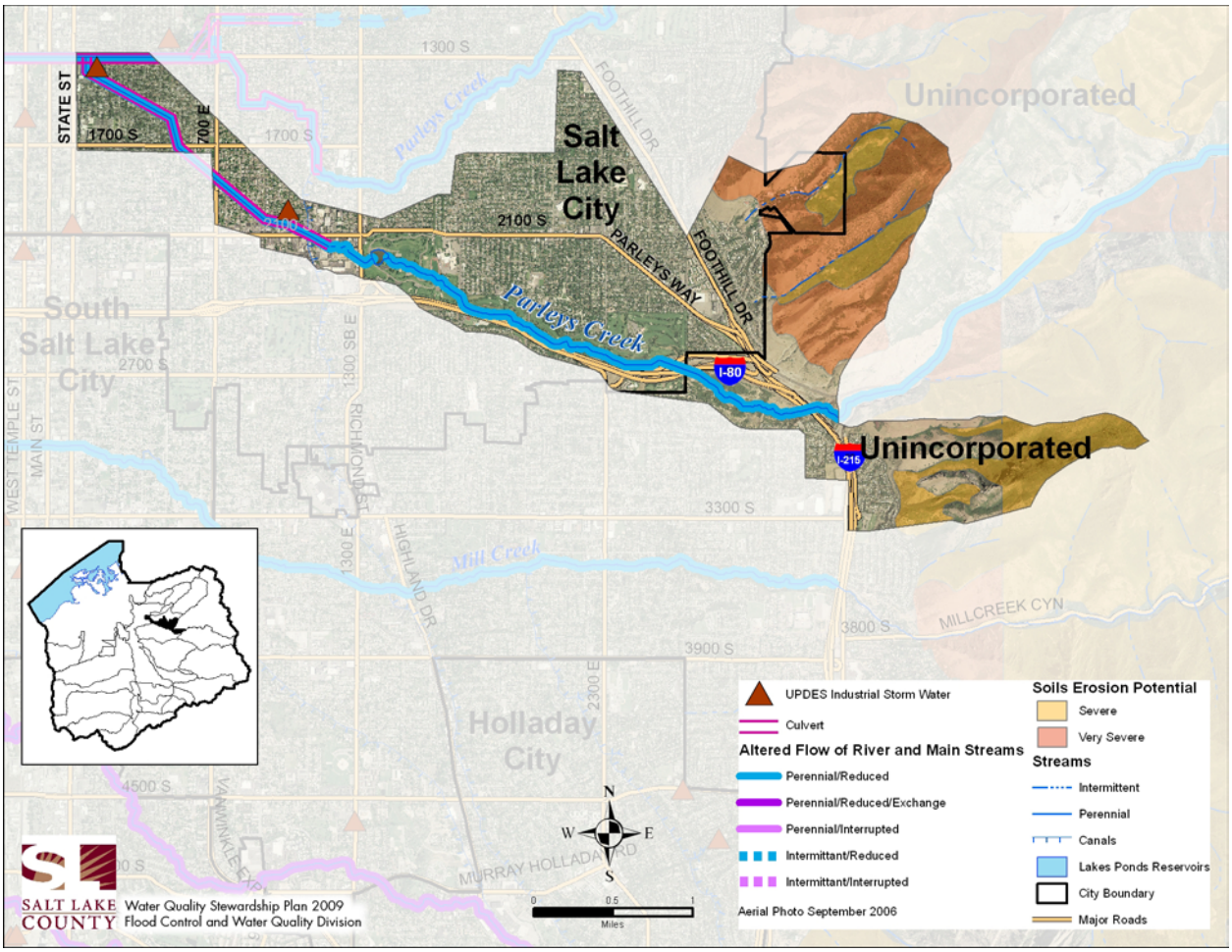
- Stream flow diversions
- Development, and dispersed development, pressures leading to increased stormwater pollution loads

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Land use ordinances
- Participate in new and/or existing planning efforts
- Diversion structure modification
- Canal water diversion
- Leadership in Energy and Environmental Design criteria
- Minimum flow protection
- Riparian buffer protections
- Water rights acquisition
- Wetland restoration/enhancement/creation
- Stormwater infiltration basins
- Bioengineered bank stabilization
- Channel alignment restoration/sinuosity
- Channel restoration/enhancement
- Streambank revegetation

Upper Parley's Creek is listed as water quality impaired on the State Division of Water Quality 303(d) for habitat alteration.

LOWER PARLEY'S CREEK SUB-WATERSHED (4,112 Acres) - LPC

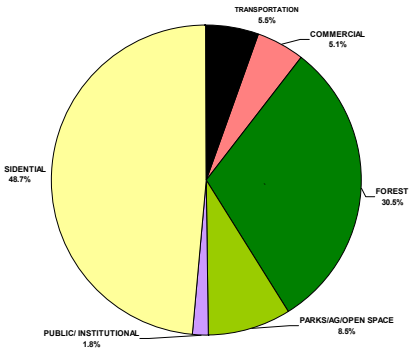


EXISTING CHARACTERISTICS (2005)					
Social/ Recreational	**Conveyance**			**Habitat**	**Water Quality**
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Streams w/ Adjacent Public Land (%)	Ave. Annual Change in TDS (mg/L)
23.9	100.0	94.3	40.0	32.8	7.5

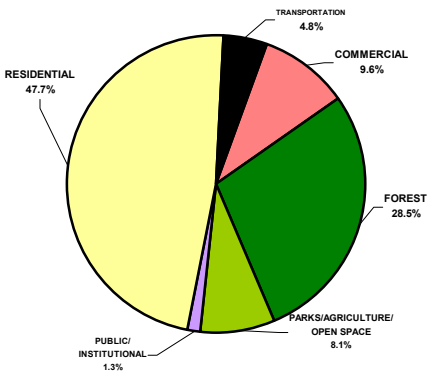
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
2,440	0.7	12.1	-6.7	-0.7	4.0	-0.6

Existing Land Use (2005)



Future Land Use (2030)



LOWER PARLEY'S CREEK SUB-WATERSHED (4,112 Acres) - LPC

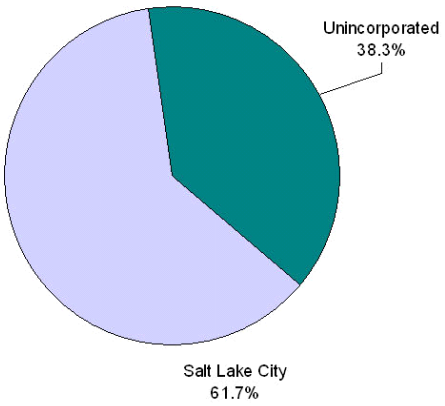
DESCRIPTION

The Lower Parley's Creek sub-watershed has a drainage area of 4,112 acres comprised of the valley below the canyon outlet of the Wasatch Mountains. The land use within the sub-watershed is comprised primarily of commercial development and residential neighborhoods.

Lower Parley's Creek sub-watershed contains 5.4 miles of the lower reaches of Parley's Creek. Flow conditions in the lower sub-watershed are Perennial-Reduced in the reaches until it reaches the 1300 South Drain Conduit.

Designated beneficial use: 1C, 3A

Stream Length(s): 3.3 Miles



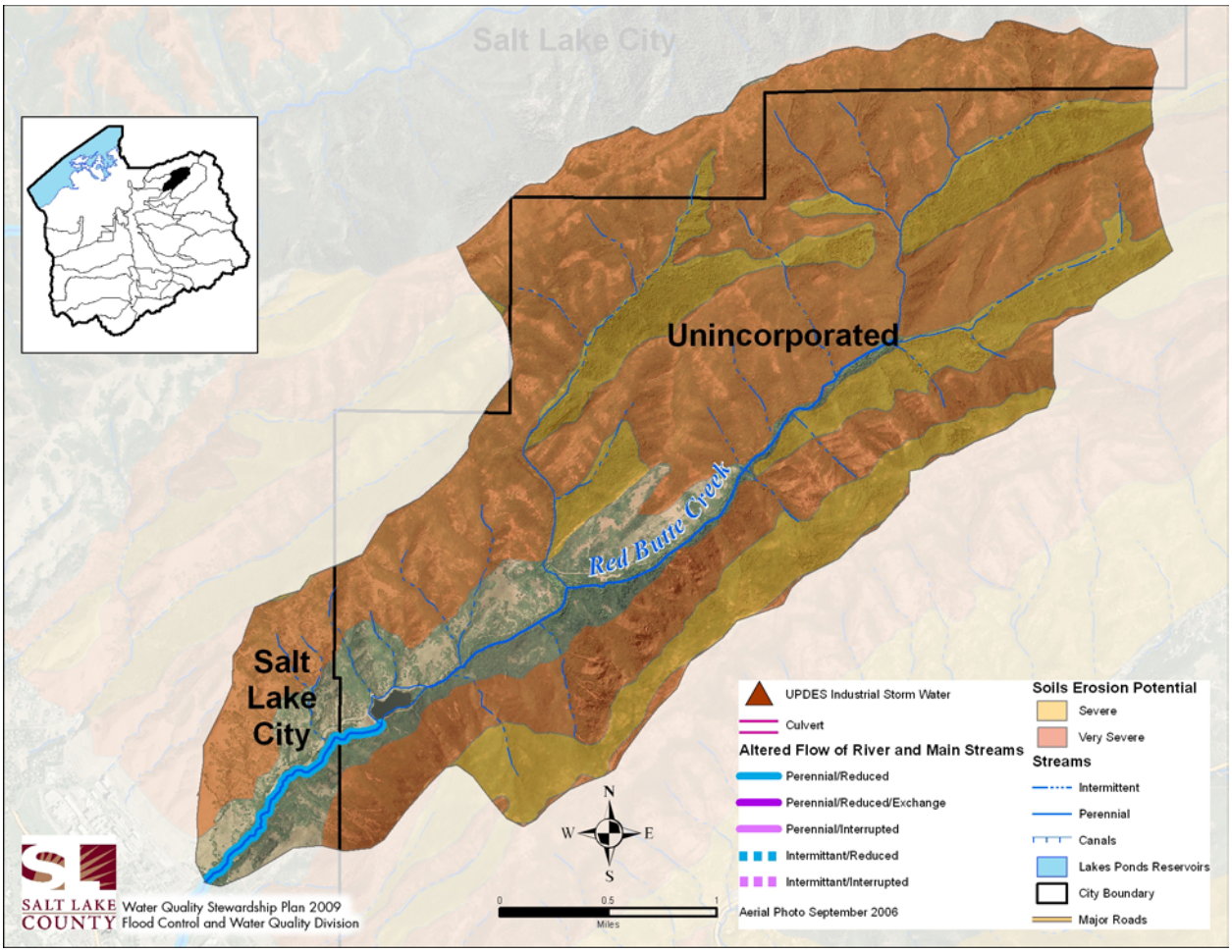
STRESSORS

- Lack of developed recreation opportunities
- Stream flow diversions
- Unstable stream banks and channel
- Lack of corridor preservation
- Urban development pressures leading to increased stormwater pollution loads and loss of groundwater recharge

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Develop neighborhood action group
- Participate in new and/or existing planning efforts
- Stream Corridor protection ordinance
- Open space land acquisition
- Volunteer programs
- Bioengineered bank stabilization
- Erosion control measures
- Grade control structures
- Stormwater BMP retrofitting
- Stormwater detention ponds
- Rainwater harvesting
- Manufactured treatment systems
- Leadership in Energy and Environmental Design criteria
- Sediment source control
- Streambank revegetation
- Riparian buffers
- Diversion structure modification
- Canal water diversion
- Educational and interpretive opportunities
- Stream daylighting
- Vegetated swales
- Reallocation of water rights
- Water rights acquisition
- Stormwater infiltration basins
- Green roofs
- Channel restoration/enhancement

UPPER RED BUTTE CREEK SUB-WATERSHED (5,403 Acres) - URB

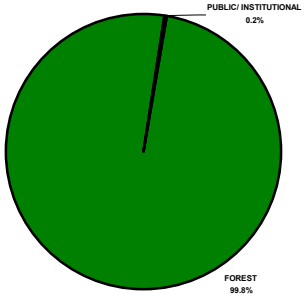


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
4.3	29.6	81.5	0.0	78.9	0.4

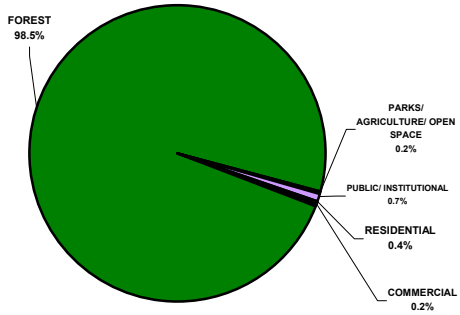
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
40	0.1	5.3	-1.1	7.6	1.6	1.9

Existing Land Use (2005)



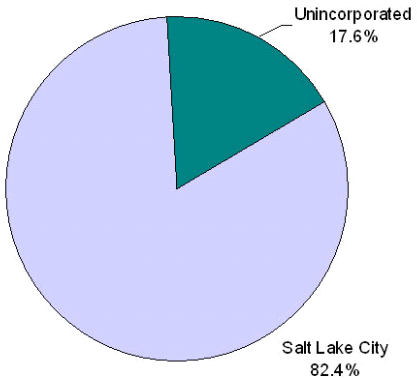
Future Land Use (2030)



UPPER RED BUTTE CREEK SUB-WATERSHED (5,403 Acres) - URB

DESCRIPTION

The Upper Red Butte Creek sub-watershed has a drainage area of 5,403 acres comprised of moderately steep mountain slopes with an elevation range from 5,000 to 8,200 feet.



The United States Forest Service (USFS) owns 83 percent of the sub-watershed, with the remainder owned by Salt Lake City and private individuals (Salt Lake City, 1998). The USFS has designated much of the sub-watershed as the Red Butte Research Natural Area (RNA). The Red Butte RNA is managed for non-manipulative research, observation, and study, with public access limited to these purposes (USFS, 2003).

Although this sub-watershed is primarily preserved, a small portion of the sub-watershed is anticipated to experience changes in land use. Although the change is isolated, this lower area portrays a change in the entire sub-watershed. Finer data is needed to address these concerns.

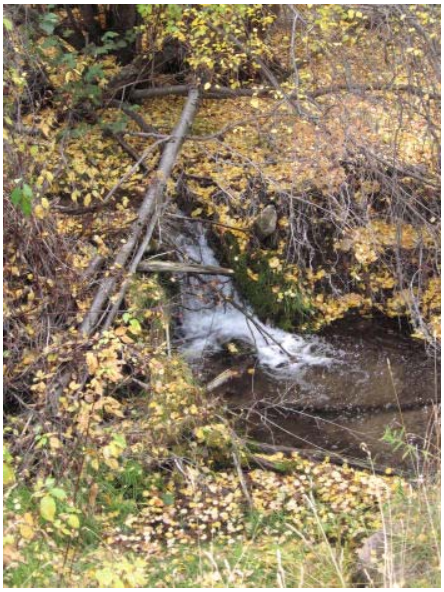
Designated beneficial use: 1C, 3A Stream Length(s): 4.1 Miles

STRESSORS

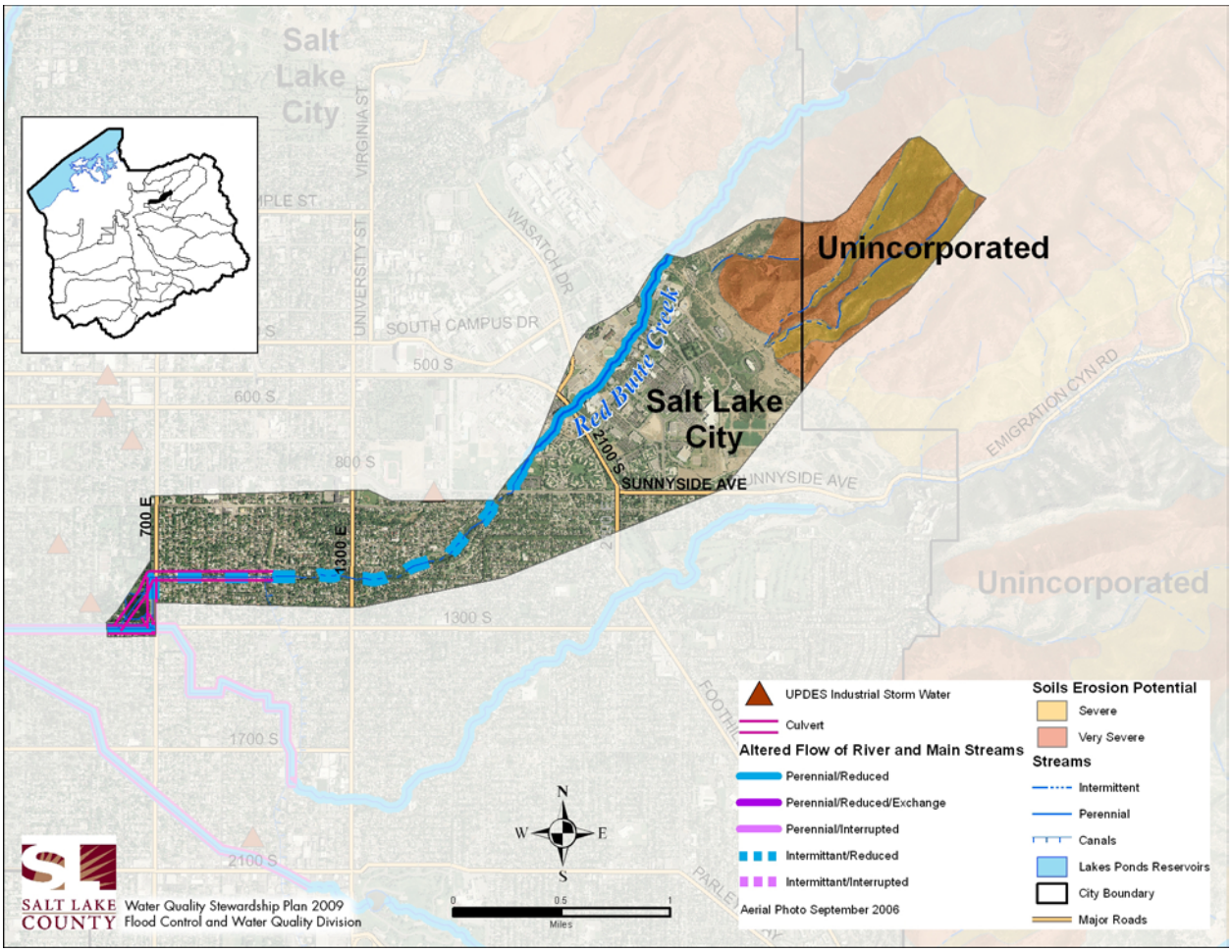
- Lack of developed recreation opportunities
- Development pressures leading to increased stormwater pollution loads and loss of groundwater recharge capability
- Highly erodible soils
- Unstable stream banks and channel

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Rainwater harvesting
- Wetland restoration/enhancement
- Green roofs
- Stormwater infiltration basins
- Riparian buffers
- Stormwater detention ponds
- Vegetated swales
- Educational and interpretive opportunities
- Participate in new and existing planning efforts
- Grade control structures
- Bioengineered bank stabilization
- Channel restoration/enhancement
- Streambank revegetation



LOWER RED BUTTE CREEK SUB-WATERSHED (1,652 Acres) - LRB

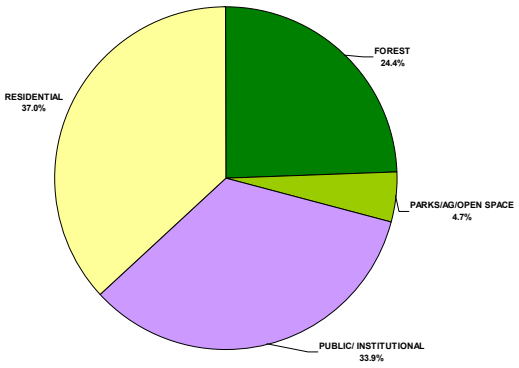


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
29.4	100.0	95.0	59.9	8.1	No Data

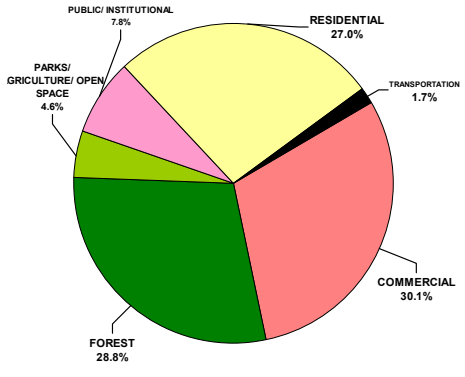
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
810	0.3	37.5	12.2	-28.8	4.9	-23.6

Existing Land Use (2005)



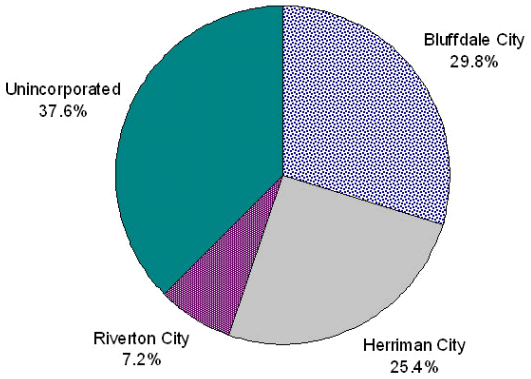
Future Land Use (2030)



LOWER RED BUTTE CREEK SUB-WATERSHED (1,652 Acres) - LRB

DESCRIPTION

The Lower Red Butte Creek sub-watershed has a drainage area of 2.6 square miles comprised of the mountain/valley interface area from the Wasatch Mountains. The land use within the sub-watershed is comprised primarily of the University of Utah campus and Research Park, and residential neighborhoods.



Lower Red Butte Creek sub-watershed is 1,652 acres and contains flows that are classified as Perennial-Reduced with a limited amount of Intermittent-Reduced.

Red Butte Creek is transferred into a culvert at the canyon mouth and flows into the Salt Lake Valley at 5,000 feet elevation. It then flows through a small pond and on to the 1300 South Drain Conduit near 700 East, which eventually discharges into the Jordan River at approximately 4,300 feet elevation.

Designated beneficial use: Not Classified Stream Length(s): 2.7 Miles

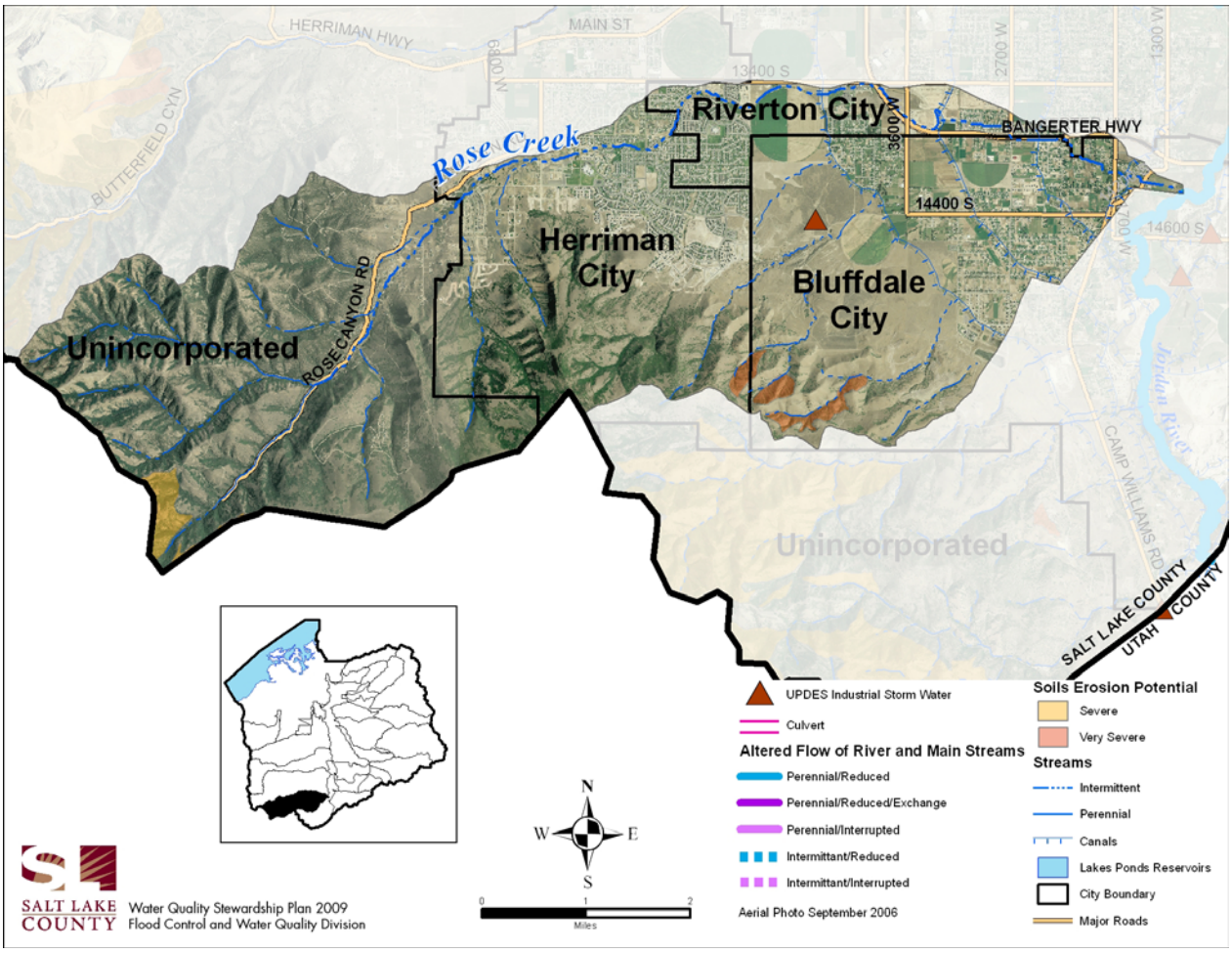
STRESSORS

- Stream flow diversions
- Unstable stream banks and channel
- Development in the floodplain
- Lack of stream corridor preservation
- Urban development pressures leading to increased stormwater pollution loads and loss of groundwater recharge

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Bioengineered bank stabilization
- Participate in new and/or existing planning efforts
- Erosion control measures
- Diversion structure modification
- Canal water diversion
- Leadership in Energy and Environmental Design criteria
- Minimum flow protection
- Water rights acquisition
- Land acquisition for preservation
- Volunteer programs
- Riparian buffer restoration/enhancement
- Sediment source control
- Streambank revegetation
- Floodplain re-establishment
- Stream daylighting
- Educational and interpretive opportunities
- Buffer protection ordinance
- Channel restoration/enhancement
- Grade control structures
- Stormwater BMP retrofitting
- Streambank revegetation

ROSE CREEK SUB-WATERSHED (17,654 Acres) - RC

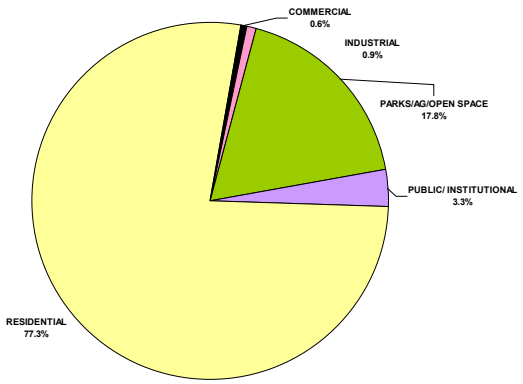


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
11.6	79.3	40.1	48.9	48.7	No Data

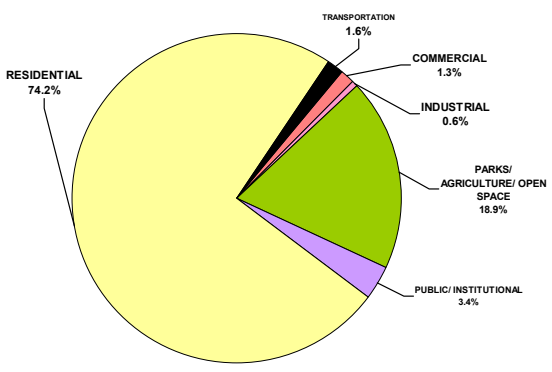
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
35,670	3.5	8.3	.3.0	-0.2	1.2	1.8

Existing Land Use (2005)



Future Land Use (2030)



ROSE CREEK SUB-WATERSHED (17,654 Acres) - RC

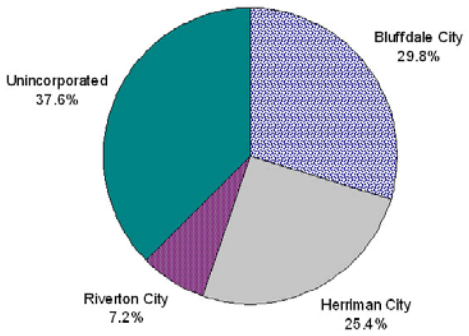
DESCRIPTION

Rose Creek watershed has a drainage area of 17,654 acres. The creek flows from the Oquirrrh Mountains and is classified with perennial flows.

The primary land use in the canyon portion of the sub-watershed is managed for irrigation, water supply, wildlife and military use. The valley portion of the watershed is rapidly urbanizing, transitioning from primarily agricultural land use to residential and commercial land use.

Designated beneficial use: 2B, 3D, 4

Stream Length(s): 11.2 Miles



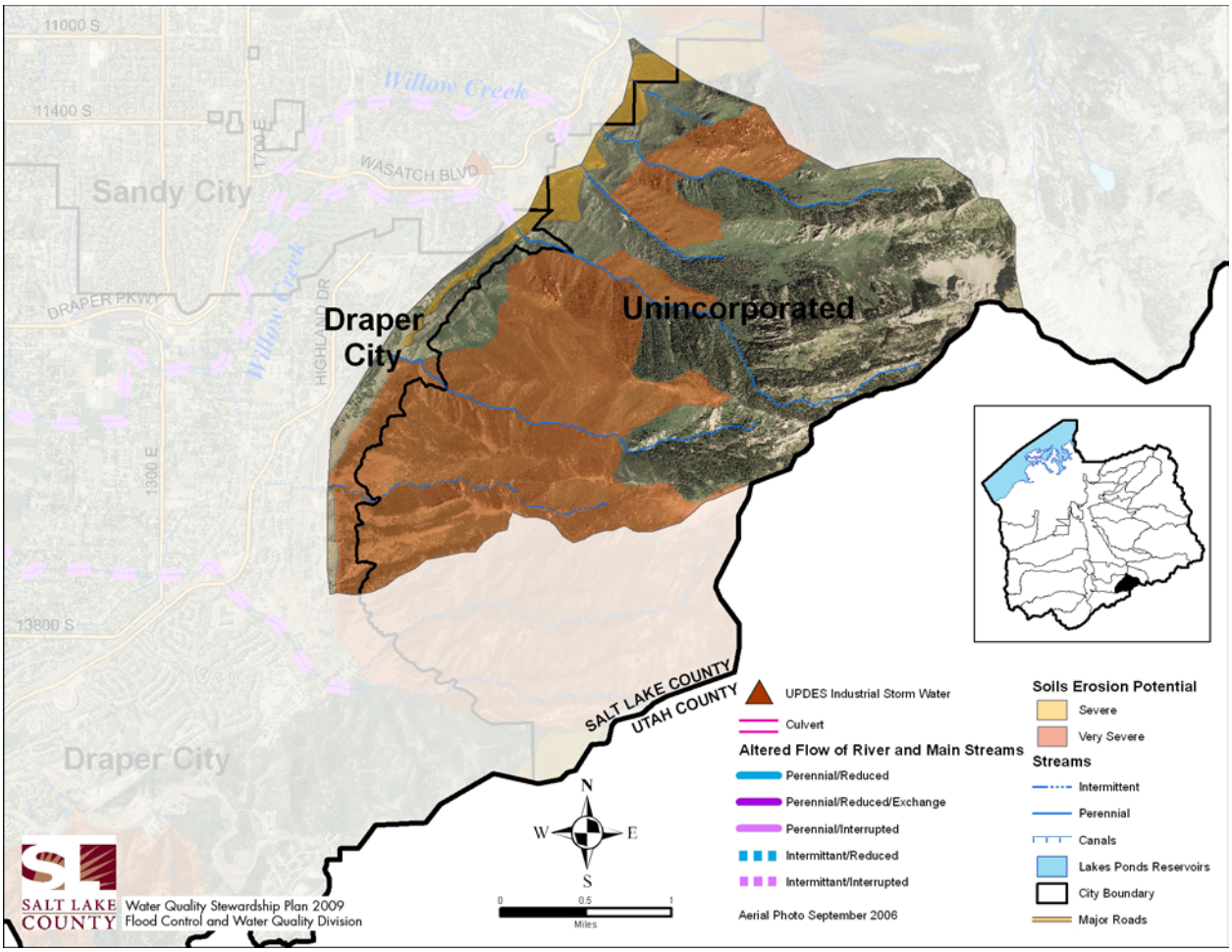
STRESSORS

- Lack of developed recreation opportunities
- Stream flow diversions
- Lack of stream corridor preservation
- Urban development pressures leading to increased stormwater pollution loads and loss of groundwater recharge capability
- Development in the floodplain

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Participate in new and/or existing planning efforts
- Riparian buffer restoration and/or enhancement
- Stream Corridor protection ordinance
- Land acquisition for preservation
- Volunteer programs
- Floodplain re-establishment
- Natural channel restoration
- Wetland restoration/enhancement
- Leadership in Energy and Environmental Design criteria
- Stream daylighting
- Educational and interpretive opportunities

UPPER WILLOW CREEK SUB-WATERSHED (4,450 Acres) - UWC

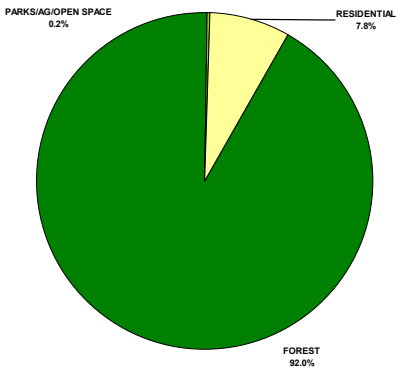


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
98.7	0.0	No Data	83.9**	66.9	No Data

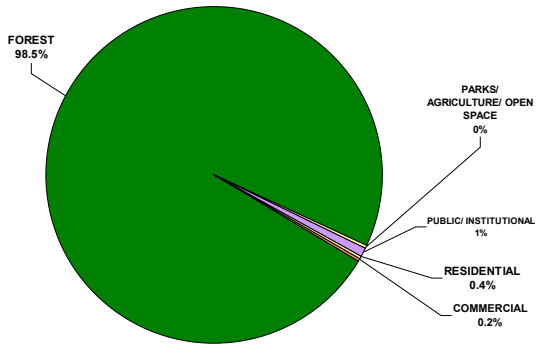
*The first two categories may only apply to the main stem. **Only applies to the assessed section (few hundred feet).

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
1,150	0.3	-2.9	2.2	-0.8	-0.2	1.4

Existing Land Use (2005)



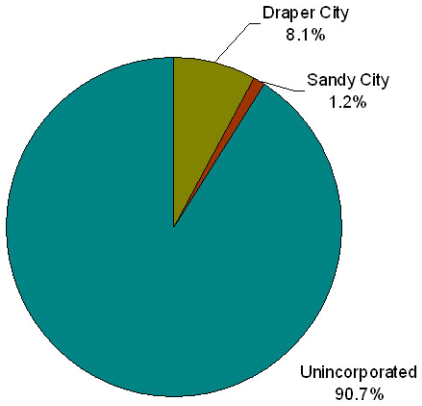
Future Land Use (2030)



UPPER WILLOW CREEK SUB-WATERSHED (4,450 Acres) - UWC

DESCRIPTION

Upper Willow Creek sub-watershed has a drainage area of 4,450 acres comprised of five canyon drainages: Rocky Mouth Canyon; Big Willow Canyon; Little Willow Canyon; Bear Canyon and Cherry Canyon from the Wasatch Mountains.



The primary land use in Upper Willow Creek sub-watershed is managed forest land for irrigation, water supply, with an elevation range from 5,400 to 10,000 feet.

The stream is perennial and originates from Big and Little Willow Creek Canyons before entering the Salt Lake Valley from below the canyon mouths at an elevation of approximately 5,200 feet.

Portions of flow are diverted from Big and Little Willow creeks to provide irrigation water for the Draper Irrigation Company Treatment Plant or Ditch and Little Willow Irrigation Company Ditch, respectively.

Designated beneficial use: 1C, 2B, 3A

Stream Length(s): Big Willow 1.0 Miles
Little Willow 3.0 Miles

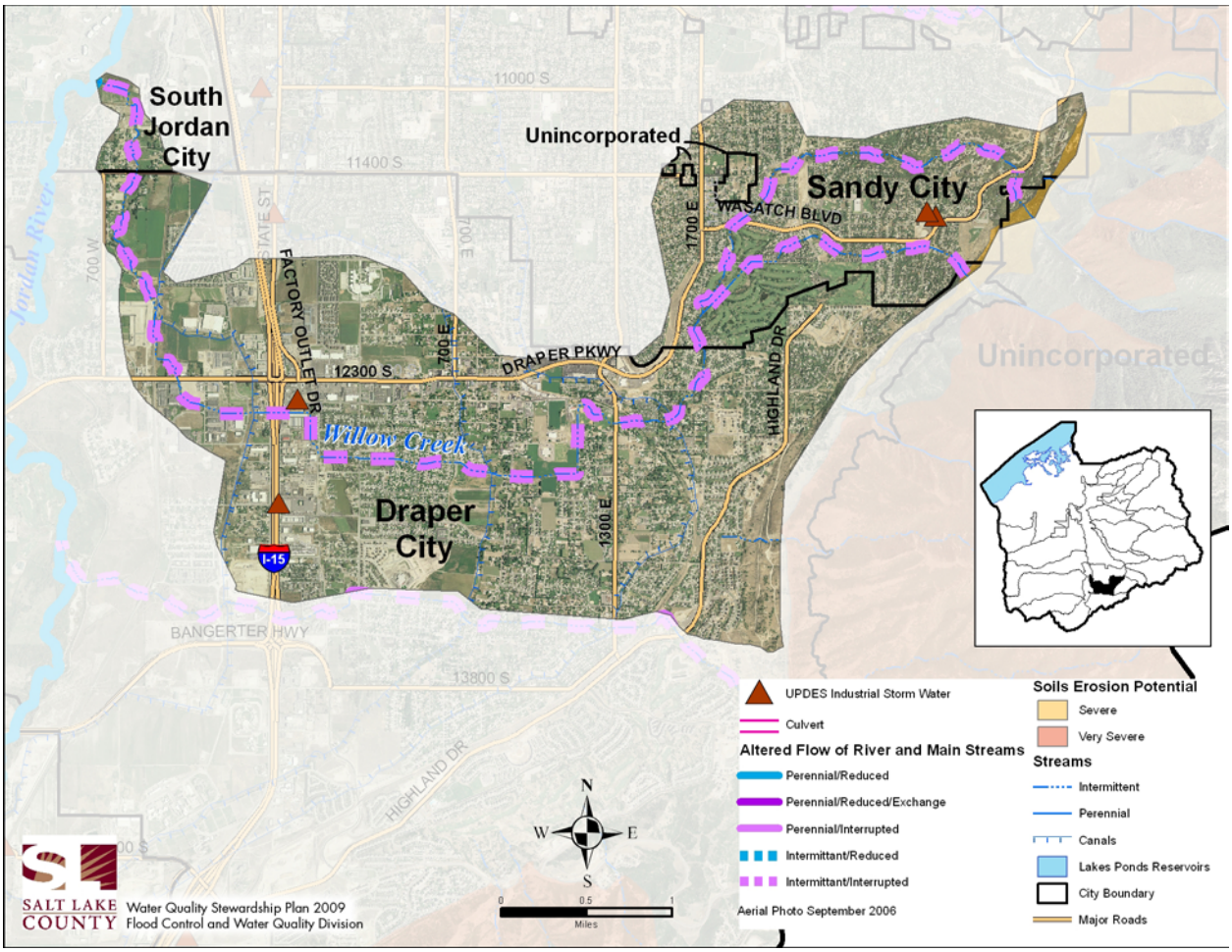
STRESSORS

- Development in the floodplain
- Development pressures leading to increased stormwater pollution loads
- Highly erodible soils
- Irrigation water supply development

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Participate in new and/or existing planning efforts
- Floodplain re-establishment
- Channel restoration/enhancement
- Rainwater harvesting
- Wetland restoration/enhancement/creation
- Green roofs
- Manufactured treatment systems
- Riparian buffers

LOWER WILLOW CREEK SUB-WATERSHED (6,001 Acres) - LWC

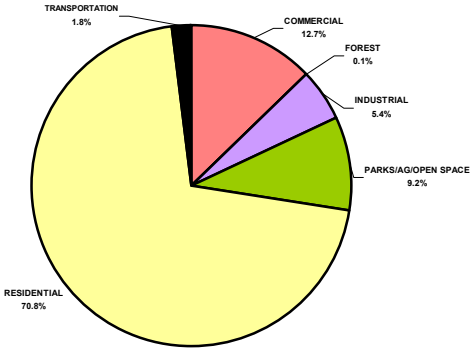


EXISTING CHARACTERISTICS (2005)					
Social/Recreational	Conveyance*			Habitat	Water Quality
Developed Recreation (%)	Reduced or Interrupted Flow (%)	Poor or Fair Stream Bank Stability (%)	Structures in FEMA Floodplain (%)	Stream w/ Adjacent Public Land (%)	Avg. Annual Change in TDS (mg/L)
9.2	91.1	66.7	78.6	34.5	No Data

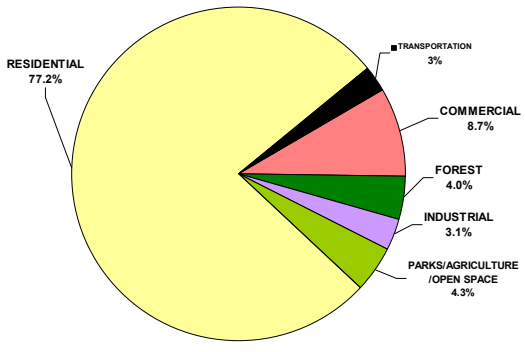
*The first two categories may only apply to the main stem.

FUTURE CHARACTERISTICS (2030)						
Social/Recreational				Water Quality		
Change in Population (Persons)	Change in Density (People/Acre)	Change Impervious Surface Area (%)	Change in Open Space (%)	Change in TP Loading(%)	Change in TN Loading (%)	Change in TSS Loading (%)
9,830	1.6	7.3	-19.9	-6.9	-1.6	-6.5

Existing Land Use (2005)



Future Land Use (2030)



LOWER WILLOW CREEK SUB-WATERSHED (6,001 Acres) - LWC

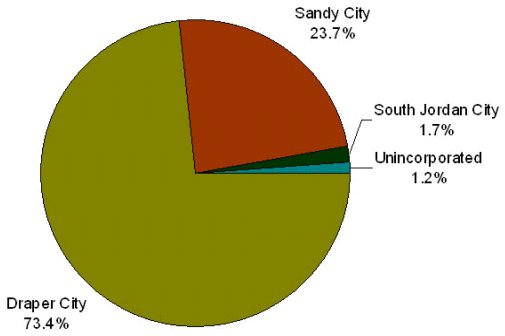
DESCRIPTION

Lower Willow Creek Sub-Watershed has a drainage area of 6,001 acres miles through the Salt Lake valley. This sub-watershed is highly urbanized, with primarily residential and commercial land use.

Lower Willow Creek sub-watershed flows are primarily characterized as Intermittent/Interrupted with a few segments maintaining perennial flow discharging to the Jordan River.

Designated beneficial use: Not Classified

Stream Length(s): Big Willow 10.0 Miles
Little Willow 1.9 Miles



STRESSORS

- Lack of developed recreation opportunities
- Stream flow diversions
- Unstable stream banks and channel
- Development in the floodplain
- Lack of stream corridor preservation
- Urban development pressures leading to increased stormwater pollution and loss of groundwater recharge capability

RECOMMENDATIONS

- Recreational facilities that are accessible and resource compatible
- Identify community recreation needs and opportunities
- Participate in new and/or existing planning efforts
- Floodplain re-establishment
- Channel restoration/enhancement
- Wetland restoration/enhancement
- Riparian buffer restoration and/or enhancement
- Stream Corridor protection ordinance
- Leadership in Energy and Environmental Design criteria
- Land acquisition for preservation
- Volunteer programs
- Bioengineered bank stabilization
- Grade control structures
- Streambank revegetation