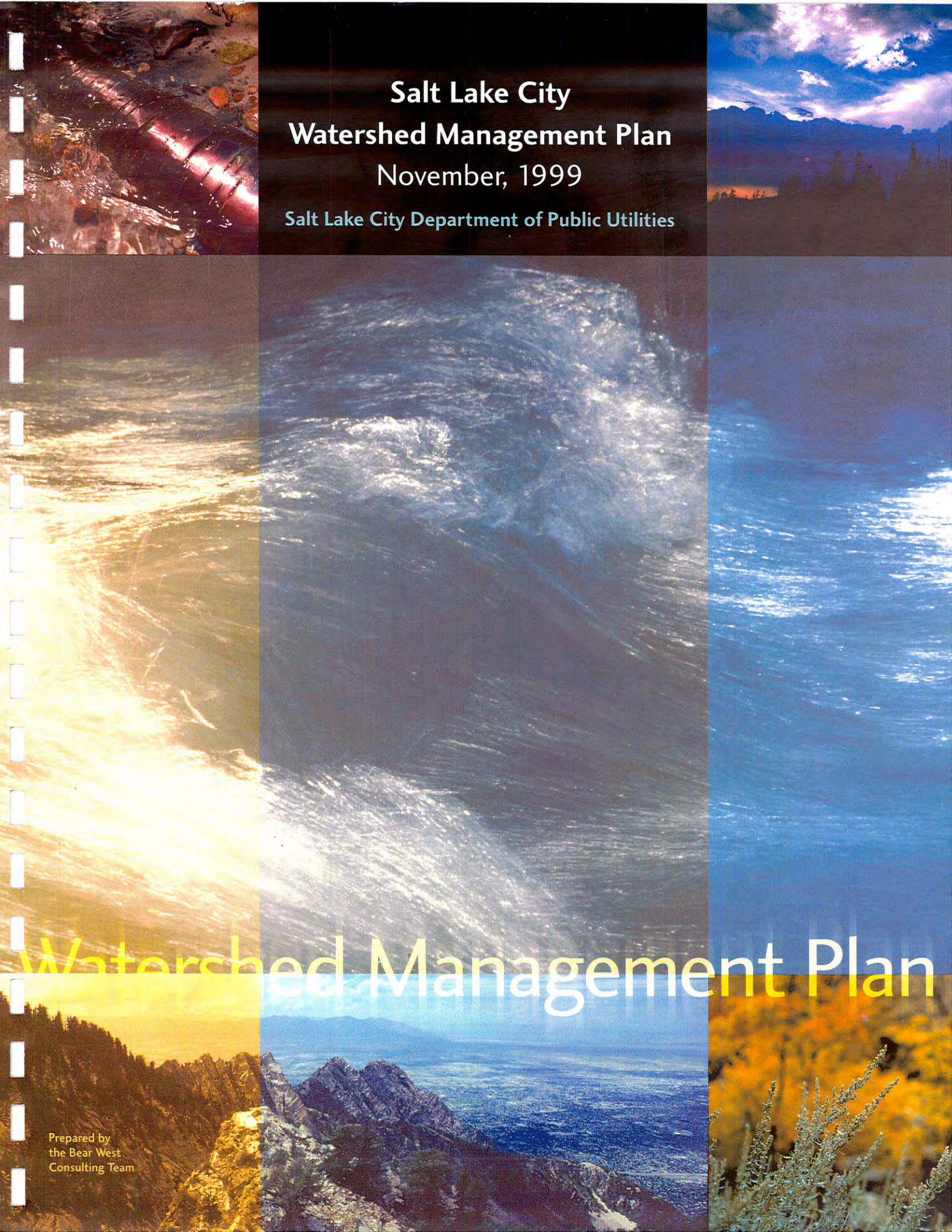

Salt Lake City Watershed Management Plan

November, 1999

Salt Lake City Department of Public Utilities

Prepared by
the Bear West
Consulting Team

Table of Contents
1999 Salt Lake City Watershed Master Plan

Tables

CHAPTER 1
Introduction

INTRODUCTION

The seven major canyons of the Wasatch Mountains, on the east side of the Salt Lake Valley, provide a high quality water source for approximately 400,000 people. The Salt Lake City Watershed Management Plan (1988 Watershed Management Plan) was formulated in 1988 to protect this valuable watershed. The Salt Lake City Department of Public Utilities (Public Utilities), and other affected jurisdictional parties, are seeking to proactively manage this watershed by addressing issues that have arisen since the 1988 Watershed Management Plan. To accomplish this, a planning process was initiated to develop the Salt Lake City Watershed Management Plan '99 ('99 Watershed Plan).

The area encompassed by the '99 Watershed Plan includes the seven major canyons of the Wasatch Mountain Range (the Wasatch Canyons), and their drainages. From north to south these drainages are: City Creek, Red Butte Creek, Emigration Creek, Parleys Creek, Millcreek, Big Cottonwood Creek, and Little Cottonwood Creek. The Salt Lake City watershed is comprised of the waters of these creeks, the surrounding lands that support these water sources, and the groundwater recharge areas for the Salt Lake Valley.

Along with providing management direction to maintain water quality, the '99 Watershed Plan continues the multiple use policy outlined by the 1988 Watershed Management Plan. Large numbers of people use the watershed for a variety of recreational activities. Small and large-scale commercial and residential development is found in five of the seven major canyons. While mining in the canyons has become almost inactive, many mining claims remain. Livestock grazing is also not as prevalent as it was in the past.

PLANNING PROCESS

In September of 1997, Salt Lake City began the ten-year review process of the 1988 Watershed Management Plan. The purpose of the '99 Watershed Plan is to revisit the

1988 Watershed Management Plan and identify new issues and concerns that should be addressed. The recommendations formulated in the '99 Watershed Plan are based on a reevaluation of the plan by jurisdictional agencies in the canyons, public comments, new issues that have arisen, and changing conditions in the canyons.

This '99 Watershed Plan has been prepared with active involvement from the public. Public meetings were held at the Main Salt Lake City Library and Salt Lake County Whitmore Library on September 23, 1997 and September 25, 1997. In early April, 1998, the jurisdictions with primary responsibility in the watersheds held three working sessions to discuss the major issues and alternative approaches to obtain watershed protection. The results of these discussions, and review of potential alternatives by development, conservation, and community interests, are reflected in the alternatives and recommendations section of this document (see Chapter 5).

A public hearing was held August 20th, 1998 in the Salt Lake City and County Building to discuss the draft of the `99 Watershed Plan. The meeting was jointly conducted by the Salt Lake City Planning Commission and the Salt Lake City Department of Public Utilities Advisory Committee. During this meeting, the public commented on the draft of the `99 Watershed Plan. A summary of the oral and written comments along with the responses are provided in Appendix D.

The Salt Lake Planning Commission and the Public Utilities Advisory Committee reviewed the public comments, selected the preferred plan, and recommended the '99 Watershed Plan to the Salt Lake City Council. The City Council held a public hearing, and adopted the final Salt Lake City Watershed Management Plan September 7, 1999.

A detailed analysis of present water quality has been conducted as part of the Management Plan Update. Conditions have been analyzed and summarized in Chapter 2. In general, water quality remains excellent in the Wasatch Canyons, but 1995-96 data reveals a spike in coliform counts, an indicator of bacteria in canyon streams. Concern over potentially deteriorating conditions has lead to recommendations in this plan to protect and improve Salt Lake City watershed conditions.

Other plans exist for the Wasatch Front, such as the U.S. Forest Service's Wasatch-Cache National Forest plan (1985), which includes direction on management of United States lands within the Salt Lake City watershed area. Salt Lake County has adopted

master plans for Emigration Canyon (1985), Little Cottonwood Canyon (1973), and a Salt Lake County Wasatch Canyons Master Plan (1989) that include similar geographic boundaries as the '99 Watershed Plan.

DESIRED FUTURE CONDITION

Successful implementation of the '99 Watershed Plan will achieve a desired future condition in the Wasatch Canyons that maintains excellent water quality and continues to strive for superior water quality. The management emphasis prioritizes water quality first and multiple use of the watershed second. The Wasatch Canyons are protected to maintain a healthy ecological balance with stable environmental conditions, healthy streams and riparian areas, and minimal sources of pollution. Existing and potential uses that could lead to the deterioration of water quality are limited, mitigated, or eliminated. To the extent that, in the reasonable judgement of the City, a proposed development or activity, either individually or collectively, poses an actual or potential impact to the watershed or water quality, Salt Lake City will either oppose, or seek to modify, manage, control, regulate or otherwise influence such proposed development or activity so as to eliminate or mitigate potential impacts.

All jurisdictional agencies involved in monitoring and permitting development in the watershed are equally aware of and involved in the development proposal process. Enforcement of existing "suitability criteria" such as slopes and setbacks, is a priority for all jurisdictions. Variance applications are reviewed carefully to ensure water quality is not impacted. Jurisdictional agencies will share the same vision for the watershed, which includes understanding and implementing watershed management objectives.

Many people use the watershed each year for a variety of recreational activities. Levels of use are managed to prevent adverse water quality impacts. Another measure used to decrease recreation impacts is an extensive watershed education program. This program educates students of the Salt Lake Valley about the importance of a healthy watershed and how it relates to the water we drink. A broad range of interpretive programs are offered at campgrounds and other gathering areas around the watershed. Recreation facilities (restrooms, parking lots, picnic and camping sites) are designed, maintained and located in a manner that prevents water quality impacts. Public and private partnerships are fully utilized to effectively manage the watershed. New

partnerships are continually being sought to support effective and efficient management of the watershed.

CHAPTER 2
Watershed Characteristics and Uses

WATERSHED CHARACTERISTICS AND USES

The seven major canyons in the '99 Watershed Plan area contain unique physical, hydrologic and environmental characteristics. Along with differing physical and environmental characteristics, the canyons differ in the types and amounts of use they receive. This chapter will address overall physical, hydrological, and environmental characteristics of each canyon and their associated uses.

CANYON-BY-CANYON CHARACTERISTICS AND USES

The drainage area encompassed by the seven major Wasatch Canyons is almost 200 square miles. Approximately 152,000 acre-feet of water drains from the area annually. The canyons along the Wasatch Front Mountain Range are broad, gently sloping drainages on the north, and steep, narrow drainages on the south. These canyons range from a regulated access watershed to intensive year-round recreational and residential areas. Impacts on the watershed from development and increased use have been a mounting concern in recent years. Recreation, especially the ski industry and tourism, has become a substantial base for the local and state economy. Federal and local governments, recognizing their responsibility to protect the canyons as a water resource, strive to attain a balance of uses. Establishing such a balance means trying to match the social and ecologically acceptable levels of development with public needs and desires. The scope of this document calls for viewing the canyons from the perspective of protecting Salt Lake City's water resources for the foreseeable future.

A. City Creek Canyon

Physical and Hydrologic Conditions: City Creek Canyon is the northernmost canyon in the plan area. The topography consists of low-lying mountain slopes with a 9,400 feet maximum elevation. The canyon is 12 miles long, comprising 19.2 square miles of drainage area. City Creek's flows have subtle reactions to climatic conditions due to the canyon's width and relatively low elevation. Characteristically, there is a gradual rise in flows throughout April with a marked increase early in May as temperatures increase. Flows decrease through June and July, stabilizing during August. The average peak day

is May 21. The moderate flow fluctuations of the Creek are attributed to the nearly constant sun exposure to snow pack on the gentle slopes, and the cavernous nature of the subsurface limestone from which the canyon's springs rise. The average annual yield for the creek is 11,749 acre feet, the fourth largest in the plan area.

Canyon Uses: City Creek Canyon has served as a valuable watershed and recreation/open space area since the first settlers entered the Salt Lake Valley. Salt Lake City promotes use of the canyon as a nature preserve by limiting motor vehicle access to alternating days during the summer. The current picnic capacity is 845 persons. Picnic sites are used heavily on weekends and holidays with continued use throughout the week. City Creek Canyon is a popular locale for bicycling, running, and walking. Hunting is permitted in season.

B. Red Butte Canyon

Physical and Hydrologic Conditions: Red Butte Canyon comprises 7.25 square miles of drainage area with elevations ranging from 5,000 to 8,500 feet. The canyon's slopes are moderately steep with the north-facing slopes steeper than the south-facing slopes. The canyon floor is wide with many side drainages. Through limitations on human access the canyon has become plentiful with wildlife, providing a near-pristine example of a watershed. Surface waters in the canyon originate in Red Butte and Knowltons Fork canyons and have a 2,450 acre-foot average annual yield, the lowest in the plan area. Snow melt is the origin of the creek and its annual flow peaks. The average peak flow occurs on April 30. This date is earlier than the other canyons due to the low elevation and wide canyon floor.

Canyon Uses: Red Butte Garden, at the mouth of the Canyon, offers educational and cultural activity. Concerns exist about increasing illegal activity in the Canyon, disrupting its pristine character.

C. Emigration Canyon

Physical and Hydrologic Conditions: Emigration Creek is 10.5 miles in length comprising 18.0 square miles of drainage area. The topography consists of low rolling hills with steep mountains to the north. Elevation ranges from 5,000 to 8,900 feet. The canyon side slopes are steep at the mouth of the canyon and become more gradual nearing the canyon head. The headwaters of Emigration Creek originate in Killyon and

Burr Fork Canyons primarily from snow melt. The average annual yield is 4,939 acre-feet, the sixth highest in the plan area. Stream flows peak early each year, May 1 on the average, due to the low elevation and width of the canyon. Flows normally recede quickly during July and August reaching the yearly low by September, then slowly increase throughout the winter months.

Canyon Uses: Emigration Canyon has an extensive history of use. The canyon's recent primary use has been full-time residential with limited commercial development. Some hiking occurs in the canyon, but no developed trail heads or related facilities have been constructed. Automobile transportation in the canyon is intensive. The highway through the canyon provides access for canyon residents and a right-of-way to Parleys and East Canyons. Residential development during the past decade has increased, though not boomed compared with other areas in Salt Lake County. Figures from the 1988 Management Plan projected a six-unit per-year increase, an annual increase of approximately 2.5 percent. In 1990, there were 308 dwelling units in the canyon, and in 1998, there were 447 dwelling units. This represents a 15-unit per-year increase, an approximate 4.8 percent annual increase, which is almost twice the increase expected.

D. Parleys Canyon

Physical and Hydrologic Conditions: Parleys Canyon is the largest drainage in the plan area comprising 50.1 square miles. Unlike the other drainages in the plan area, Parleys is "T" shaped, with elevations ranging from 4,700 feet to 9,400 feet. Above Mountain Dell Reservoir, rolling foothills and moderate slopes characterizes the canyon. Below the reservoir, the canyon is narrow with steep slopes. The lower portion of the canyon has been radically modified by the construction of the I-80 freeway. Surface stream flow and spring runoff for Parleys Creek originates from Mountain Dell Canyon and Lambs Canyons. The average annual yield is 18,131 acre-feet, the third highest in the plan area. Parleys Creek reaches its peak flows early in the season, May 12 on the average. This is attributed to the relatively low elevation of the canyon and its width. Flows commonly increase tenfold within a matter of days during June then slowly decrease through the late summer and fall. Flows begin a gradual increase again throughout the winter.

Canyon Uses: Recreation homes, transportation and recreation use characterize uses in this area. Summer cabins have been constructed in Mount Aire and Lambs Canyons. Six lanes of I-80 follow the entire length of the canyon serving as a major artery for local

and interstate traffic. Recreation uses include picnicking, golf, hiking, snowshoeing, cross country skiing, snowmobiling and hunting. The Salt Lake City Parks and Recreation Department and Public Utilities provide developed recreation, including golf and picnicking. A private concession at the Mountain Dell Golf Course provides cross country skiing during the winter season. The existing picnicking facilities in Parleys Canyon currently provide a total of 80+ person capacity. On weekends and holidays, parking areas limit capacity for cross country skiing.

Salt Lake City Department of Public Utilities has developed a recreation plan for the Little Dell Dam and Reservoir. Recreation is occurring on 39 acres of land on the north side of the reservoir. The development includes 130 parking spaces, two boat launches (non-motorized, hand-carried watercraft), six vault restrooms, 56 picnic sites, and a small interpretive center. Several trails are constructed around the reservoir, totaling 19,400 linear feet of trails. Trails are built for a variety of uses including walking, biking, and hiking, and a hardened trail for universal access.

Most of the recreation homes in Parleys Canyon were constructed before 1975. In 1975, there were 83 cabins in Lambs and Mount Aire canyons; by 1995, the total had increased to 112 cabins. Traffic in Parleys Canyon has increased noticeably since 1989, when Interstate 80 at the Mountain Dell interchange reported an annual daily traffic of 23,975. In 1996, the Mountain Dell interchange reported an annual daily traffic of 37,125. This difference represents an increase of 55 percent over an eight-year period.

E. Millcreek Canyon

Physical and Hydrologic Conditions: Millcreek Canyon comprises 18.0 square miles of drainage area with head waters originating about 10 miles above the canyon mouth at 8,700 feet elevation. Canyon ridge elevations typically range from 8,000 to 9,000 feet, with Gobbler's Knob rising to 10,200 feet. Surface flows originate from Millcreek, Porter Fork, and Bowman Fork canyons. The canyon's steep side slopes, moderately heavy snowpack, and high elevations are responsible for the late average peak flow date of May 27. Flows remain relatively high throughout August, then decrease in the fall and winter. Flows gradually increase throughout late winter and early spring. The stream has an average annual yield of 10,762 acre-feet, the fifth highest yield in the plan area.

Canyon Uses: Millcreek Canyon is characterized by a long history of intensive summer recreation and moderate winter recreation. A limited number of summer recreation residences have been constructed, but no new construction has taken place in the past decade due to the lack of private land available and a Forest Service policy against further residential leasing. Large traffic volumes are associated with recreational uses. Developed recreation in Millcreek Canyon consists primarily of picnicking, with an approximate 1,900 person capacity. Dispersed recreation activities in the canyon include bicycling, car touring, and hiking. Fishing and limited backpacking are available in the Mount Olympus Wilderness Area. Winter recreation consists primarily of cross country skiing, although snowshoeing and dog walking are growing in popularity.

F. Big Cottonwood Canyon

Physical and Hydrologic Conditions: Big Cottonwood Canyon comprises 50 square miles of drainage area with elevations ranging from 5,000 feet to over 10,500 feet. The lower portion of the canyon is steep and meandering as the result of natural stream cutting processes while the top portion of the canyon is straight and broad due to massive glaciation. The upper portion of the canyon ends in a large basin with moderately steep side slopes.

Big Cottonwood Creek originates in the Big Cottonwood Canyon's upper basins, and Twin Lakes and Lake Mary reservoirs. Approximately a dozen side-canyon streams intersect the main drainage. Side-canyon reservoirs include Lillian, Florence, and Blanche. These large basins contribute to the highest annual water yield in the plan area of 51,238 acre-feet. Big Cottonwood Creek receives heavy snow pack that, combined with the high elevation, steep side slopes and orientation, contributes to the late average peak flow date of May 28. The flow rate for the Creek is relatively stable due to the width of the canyon and the soil's ability to absorb water. Flooding occurs during May and June as a result of cloudburst rain storms on melting snowpack.

Canyon Uses: Uses in Big Cottonwood Canyon are characterized by full and part-time residences, developed and dispersed recreation and transportation. Brighton and Solitude ski areas are located in the canyon. During the past decade both of these areas have undergone expansion in facilities and use. According to the U.S. Forest Service Wasatch-Cache National Forest Management Plan, no new resorts will be allowed in the canyon and the expansion of existing resorts will be limited. The average daily

traffic has increased consistently since 1988, providing the best indicator of overall growth in the canyon. The average daily traffic figures may be found in Appendix G.

Cross-country skiing is a very popular winter activity in the canyon, with facilities including a groomed Nordic track. There are also trail-head parking facilities for back-country skiing. According to the Forest Service Plan, only one permitted touring center with a developed cross country skiing track will be permitted in Big Cottonwood Canyon. Tubing is also a popular winter recreational activity in the canyon. The Forest Service provides camping and picnicking facilities. There is a 1,655 person camping capacity and a 1,530 person picnicking capacity. Camping and picnicking facilities are generally used to capacity on weekends and holidays while weekday usage is much lower.

G. Little Cottonwood Canyon

Physical and Hydrologic Conditions: Little Cottonwood Canyon comprises 27.4 square miles of drainage area with elevations ranging from 5,200 to 11,200 feet. Little Cottonwood Canyon is the steepest and highest canyon in the plan area. The canyon is "U" shaped with rugged side-canyons formed by glaciation. The head waters for Little Cottonwood Creek originate in the Albion Basin, from minor drainages and Cecret Lake. Tributaries to the major drainage include the streams from White Pine Reservoir and Red Pine Lake, Hogum Fork, and Coal Pit Gulch. The length of the primary stream channel is approximately 12 miles.

Little Cottonwood Creek peaks late in the spring, June 4 on the average, mainly because of the heavy snow pack in the higher elevations. Throughout the year the stream flow radically fluctuates due to the steep side slopes and impervious rock surfaces that make up much of the canyon. The average annual yield for the stream is 46,149 acre-feet, the second largest yield in the plan area.

Canyon Uses: Uses in Little Cottonwood Canyon are characterized by heavy developed and dispersed recreational use, destination lodging and transportation. All uses in the canyon have increased during the past decade. Downhill skiing is the most intensely developed recreation use in the canyon at Alta and Snowbird ski resorts. The most accurate measure of growth in the canyon is average daily traffic. In 1987, the average daily traffic was 12,865. In 1996, the average daily traffic had increased to 16,540, an

increase of 29 percent. With the exception of Parleys Canyon, this is the highest average daily traffic in the plan area. The average daily traffic from 1987 to 1996 is reported in Appendix G.

Developed campsites are maintained by the Forest Service at Tanner Flat and Albion Basin. Tanner Flat has been closed due to an environmental remediation project. Use at these sites has varied from year to year. The two campgrounds have a capacity of 465 persons. While weekend and holiday use is high, weekend and weekday use combined falls below capacity.

WATER QUALITY

BACKGROUND

Salt Lake City obtains a significant portion of its culinary water supply from canyon streams originating in the Wasatch Mountains. These canyons include City Creek, Emigration, Parleys, Mill Creek, Big Cottonwood, and Little Cottonwood. Water from City Creek, Parleys, Big Cottonwood, and Little Cottonwood is treated in treatment plants and distributed to residents of Salt Lake City and Salt Lake County. Reliance on these water sources is such that the Salt Lake City Department of Public Utilities must closely monitor and regulate any activities that may threaten water quality. Though recreation activity in these canyons has increased, water from these canyons has historically been of high quality. Recent mean annual total coliform counts have raised concerns that canyon water quality may be deteriorating.

DATA CONTAMINANT INDICATORS, SOURCES, AND FATE

Existing water quality data provides a baseline for monitoring watershed use effects. This section presents a discussion of each of the selected key contaminant indicators already included in the City's existing database. To define the significance of the data it is important to understand the potential sources of the indicator, and the transport and fate of the indicator in the mountain stream environment.

COLIFORM BACTERIA

Measurements of total coliform have been used as an indicator of contamination of waters for many years. Coliform have been used as an indication of contamination

because coliform tend to exist in high quantities within fecal matter (100 to 400 billion per day discharge by humans[1]), and thus provide a good indication or warning of possible contamination by other fecal born species. Some water borne pathogens are difficult to detect or the tests may be complex, time consuming, and often not sufficiently sensitive or selective. Coliform testing is relatively simple and inexpensive, thus rendering it the method of choice for many years.

SOURCES AND FATE OF TOTAL COLIFORM BACTERIA

"The coliform group of bacteria includes all aerobic and facultative anaerobic, gram-negative, nonspore-forming rod-shaped bacteria that ferment lactose with gas formation."[2] Included in the coliform class of bacteria are the genera *Escherichia* and *Aerobacter*. Coliform bacteria have been found to increase in viable bacterial numbers under favorable conditions in pipe distribution systems.[3] According to the American Water Works Association, "Finding coliform densities ranging from 1 to 150 organisms per 100 mL may be possible with their occurrence widespread in the distribution system."[4] There is a possibility that coliform could colonize in streams within the slower moving areas. Porous media such as rocks may provide a good surface to which the bacteria can attach and colonize. Total coliform life expectancies are on the order of days. Based on the results of deep well studies, many coliforms live well in colder waters. Coliform life expectancies have not been verified in open stream flows.

"The use of coliforms as indicator organisms is complicated by the fact the *Aerobacter* and certain *Escherichia* can grow in soil. Thus, the presence of coliforms does not always mean contamination with human wastes. Apparently, *Escherichia coli* (E. coli) are entirely of fecal origin. There is difficulty in determining E. coli to the exclusion of the soil coliforms; as a result, the entire coliform group is used as an indicator of fecal pollution."[5] Therefore, total coliform presence in water is not proof of fecal contamination, however, total coliform will always be present when there is fecal contamination. Though the significance of coliform occurrences should not be ignored because they may indicate a potential pathway for pathogen penetration into the water supply, sole reliance on coliform occurrence may not be adequate in defining the source of the contamination. If coliforms occur repeatedly at levels higher than background, then perhaps a more stringent monitoring program should be employed in order to determine for certain that there is human-based contamination.

SOURCES AND FATE OF FECAL COLIFORM BACTERIA

Fecal coliforms are a subgroup of total coliforms, and are usually found in much lower numbers. They are more indicative of contamination from a warm-blooded animal source. Therefore, they can come from both humans as well as animals. However, even though fecal coliform testing may rule out soil borne coliforms, they may be from any warm-blooded animal source, as discussed previously, and not necessarily an indicator of a human source. "In many situations where human pollution is suspected on the basis of [fecal] coliform test results, the actual pollution may, in fact, be caused by animal discharges."[6] Fecal coliform density per gram of feces and average contribution per capita per day is provided on Table 1 for human beings and some warm blooded animals.

Table 1
Fecal Coliform Contribution Per Capita From Human Beings And Some Animals (After Tchobanolglous, 1987)[7]

	Average indicator density/g of feces	Average contribution/capita/day
	Fecal Coliform (10^6)	Fecal Coliform (10^6)
Human	13.0	2,000
Chicken	1.3	240
Cow	0.23	5,400
Duck	33.0	11,000
Pig	3.3	8,900
Sheep	16.0	18,000
Turkey	0.29	130

As can be seen from the table above, many animals have a higher fecal coliform production than humans. Therefore, relying solely on fecal coliform counts as an indicator of human contamination may not be correct. Fecal coliform may be expected to live in a cold water environment for at least the duration of water flow from the upper reaches of the canyon to the canyon mouth in any of the Wasatch Canyons. Coliforms survive well in cold water (the colder the better) with a survival time on the order of days.[8] In order to minimize differential death rates, samples should be taken no further down stream than 24 hours of flow time from the source of pollution.[9] With these two items in mind, and the fact that these creeks take less than 24 hours to flow from top to bottom, survival of coliform from any source in the canyon is possible.

However, no studies have been found confirming life expectancies of fecal coliform in cold highly oxygenated water.

NUTRIENTS

Nutrients, specifically nitrogen and phosphorous, are essential to the growth of bacteria and plants.[10] Other trace elements such as iron (Fe) are also required for biological growth. However, nitrogen and phosphorous are the major contributors to the production of algae. Algae in turn can cause taste and odor problems within water being used for drinking purposes. Methods for controlling algal blooms or growth include addition of Chelated copper compounds or potassium permanganate to the water, or simply controlling the nutrient loading. Nitrogen is also required in metabolic processes of microbial populations. If the water lacks sufficient nitrogen and/or phosphorous, algae growth will be repressed. Waste waters or organic wastes are a good source of nitrogen for bacteria.

NITROGEN SOURCES AND FATE

Nitrogen has its origins as atmospheric nitrogen. It is incorporated into terrestrial systems through nitrogen fixing bacteria, lightening, direct conversion to ammonia, or fertilizer manufacturing processes. From there it enters the food chain where it is taken up by plants and eventually animals. Animals then discharge nitrogen in the form of urea or feces. Bacterial decomposition of the feces along with hydrolysis of the urea then convert the nitrogen to ammonia. Ammonia is then converted to nitrite and nitrate, or to nitrogen gas. Nitrate is especially soluble in water and therefore will move about freely within the aquatic system.

The United States Environmental Protection Agency (EPA) has determined that nitrate poses an acute health concern at certain levels of exposure.[11] The most common sources of nitrate in water include fertilizer, sewage, and wastes from humans and animals. Excessive levels of nitrate in drinking water may cause serious illness and sometimes death in infants less than six months of age. The EPA has set the drinking water standard at 10 mg/l for nitrate to protect against the risk of these adverse effects.[12] Elevated levels of nitrates are often used as an indicator of human effects on stream water quality.

PHOSPHOROUS SOURCES AND FATE

Slope and stream erosion of phosphorous bearing soils (including top soils), and animal and human feces are sources of phosphorous for the canyon streams. Three types of phosphate are usually of interest: ortho, poly, and organic. Orthophosphates are available for immediate biological metabolism without further breakdowns. Polyphosphates include molecules with oxygen atoms and two or more phosphorous atoms. Polyphosphates undergo hydrolysis in aqueous solutions and revert to orthophosphate forms; however, the hydrolysis is typically slow. Organically bound phosphorous is generally not available for algae growth without anaerobic bacterial conversion.

The major phosphorous removal processes in natural systems are chemical precipitation and adsorption while plants organically bind only small amounts. Phosphorous has a high tendency to bind with soil particles. Once it is bound, it is not likely to be readily released back into the environment. Orthophosphates are absorbed by clay minerals and certain organic fractions within the soil. Chemical precipitation with alum, iron, or aluminum also occurs, but at a slower rate. Sorption of phosphorous onto soils is the primary phosphorous removal process.

TURBIDITY

Turbidity is a measure of the suspended matter in water that interferes with the passage of light. Materials in the water that cause turbidity may range from small colloidal particles, to coarse dispersions. Much of the material that causes turbidity is inorganic matter, though a significant portion is also caused by organic matter. It is this organic matter that causes concern. The organic matter serves as food for bacterial colonies. As the colonies grow, additional turbidity is introduced. Some of these organics may also induce the growth of algae, meaning they may contain large amounts of nitrogen and phosphorous.

Turbidity effects on water quality include: 1) Aesthetics, 2) Interference with filterability, and 3) Interference with disinfection. Aesthetically pleasing water instills confidence in the consumer that the water is pure and not polluted with wastes. As turbidity increases, the cost associated with filtering the water increases. Disinfection is impacted by turbidity also. If particles causing turbidity are in the water, then

pathogenic organisms may not come into contact with the disinfectant. That is to say, that the organisms may be shielded within or by a particle.

The amount of raw water turbidity (suspended solids) may also determine the type of treatment required. Water with consistently high turbidity (greater than 5 NTU) requires conventional treatment like coagulation, flocculation, sedimentation, and filtration. Water with consistently low turbidity (less than 5 NTU) may be treated by direct filtration, which is basically conventional treatment without sedimentation. Direct filtration treatment plants are less costly to construct than conventional plants. This is currently not an issue for Salt Lake City because all of the City's treatment plants are conventional plants. However, turbidity can be a significant issue with respect to operation costs. Higher turbidity requires higher dosages of coagulating chemicals, more frequent backwashing, and it produces greater quantities of sludge for disposal. In addition, fluctuating turbidity levels (spikes) are difficult for plant operators to manage since fluctuating turbidity requires fluctuating levels of chemical feed. Watershed management practices that lower and stabilize turbidity levels are very important with respect to water treatment.

METALS SOURCES AND FATE

Trace quantities of many metals are important in most waters and are required for biological growth. Some of these trace quantities include metals such as nickel (Ni), lead (Pb), manganese (Mn), cadmium (Cd), chromium (Cr), zinc (Zn), iron (Fe), copper (Cu), and mercury (Hg). However, a few of these metals are classified as heavy metals. Heavy metals are listed in Table 2 along with associated health concerns resulting from elevated concentrations.

Table 2
Heavy Metals

Metal	Health Concern
Barium (Ba)	Increase blood pressure and nerve block
Cadmium (Cd)	Carcinogen

Table 2 Heavy Metals	
Metal	**Health Concern**
Lead (Pb)	**Brain damage, Birth defects**
Mercury (Hg)	**Central nervous system damage, Birth defects**
Silver (Ag)	**Dis-coloration of skin and eyes**

Heavy metals are classified as priority pollutants, meaning they are hazardous to human health at elevated levels. Even though they may be required in small quantities to support life, larger quantities may be toxic. Sources of heavy metals in canyon streams include: natural groundwater flow through rock formations, mine tunnel discharges, vehicle fluid leakage (crank case oil, anti-freeze, etc.), and surface runoff from mining affected areas.

WATER QUALITY DATA INVENTORY

Water quality data was obtained from various sources including: Salt Lake City Public Utilities and Utah State Department of Environmental Quality. Available water quality data includes coliform bacteria; water chemistry data such as nutrients and turbidity, dissolved metals, pH, temperature, and dissolved oxygen; and creek flow data.

COLIFORM BACTERIA

Coliform data (reported as colonies per 100 milliliters) is available from two different sources: 1) total coliform data collected at the intakes to the treatment plants (City Creek, Parleys, Big Cottonwood, and Little Cottonwood), and 2) total coliform and fecal coliform data collected as part of the watershed monitoring program. Treatment plant intake locations and watershed water quality monitoring locations are shown on the Hydrologic Features and Constraints Map found on page 27.

WATER TREATMENT PLANT INTAKE COLIFORM DATA

Mean monthly coliform data was provided by the City for the treatment plant intakes (see Appendix J for the periods summarized in Table 3).

Table 3 Treatment Plant Intake Coliform Period of Record	
Treatment Plant	**Total Coliform Period of Record**
City Creek	January 1960 to December 1997 missing data in March, April, and May of 1973.
Parleys Creek	April 1992 to December 1997
Big Cottonwood	January 1960 to December 1997 missing data in March, April, and May of 1973.
Little Cottonwood	January 1960 to December 1997 missing data in March, April, and May of 1973.

Mean annual total coliform for treatment plant raw water intakes are presented on Figure 1 in Appendix J.

WATERSHED COLIFORM DATA

Watershed coliform data is available from 1988 to the present at selected locations in the watersheds as summarized on Table 4. Data is available at these locations for most of the months from January 1988 to December 1997. See the Hydrologic Features and Constraints Map on page 27.

Table 4 Watershed Coliform Sampling Locations	
WATERSHED	**LOCATION**
City Creek	CC1 - Above Gate CC2 - Below Gate
Emigration Canyon	EC - Above Rotary
Parleys Canyon	PC1 - Lambs Weir

Table 4 Watershed Coliform Sampling Locations	
WATERSHED	**LOCATION**
Mill Creek	MC1 - UB MC2 - Toll Gate MC3 - Forest Service Boundary
Big Cottonwood Creek	BC1 - Forest Service Boundary BC2 - Storm Mountain BC4 - Lake Blanch BC5 - Mill B BC8 - Jordan Pines BC10 - Silver Fork BC12 - Solitude BC13 - Brighton LP BC14 - 1st Bridge BC15 - 2nd Bridge BC16 - Last House
Little Cottonwood Creek	LC1 - Forest Service Boundary LC3 - Red Pine LC6 - Below Snowbird LC8 - Peruvian Lodge LC9 - Sunnyside

WATER CHEMISTRY DATA

Water chemistry data was obtained from three sources: U.S. Geological Survey Data reported in the 1988 Salt Lake City Watershed Management Plan, Utah State Department of Environmental Quality STORET data, and data from Salt Lake City Public Utilities. Water chemistry data is summarized on tables in Appendix J.

CREEK FLOW DATA

Daily flow[13] records for each canyon were provided by Salt Lake City. Average monthly flows for 1987 through 1996 are plotted for each of the canyons on Figure 2 found in Appendix J.

ANALYSIS

COLIFORM

Total coliform has not exceeded state standards for use designation Class 1C - culinary use with prior treatment (5,000 total coliform per 100 milliliters), but there have been occasional exceedences of the standards for 2B - boating and similar uses excluding swimming (1,000 total coliform per 100 milliliters). Total coliform counts are normally less than 150 per 100 milliliters (ml) except for Emigration Canyon, which often exceeds 300 per 100 ml. Regression analysis of coliform data with time, with stream flowrate, and/or with location in the canyon, failed to produce significant results. A statistical summary of the total coliform data for each canyon is provided in Table 5.

Table 5
TOTAL COLIFORM STATISTICS SUMMARY

CANYON/ Monitoring Station	Period of Coverage	Mean	Standard Deviation	Number of Samples
CITY CREEK				
Treatment Plant Intake	**1960 - 1997**	**36.2**	**37**	**453**
CC2 - Below Gate	**1993 - 1997**	**46**	**41**	**58**
EMIGRATION CREEK				
EC - Above Rotary	**1993 - 1997**	**177**	**181**	**66**
PARLEY'S CANYON				
Treatment Plant Intake	**1992 - 1997**	**23.1**	**29**	**69**
PC1 - Lambs Weir	**1993 - 1997**	**68.5**	**94**	**68**
MILL CREEK				
MC1 - UB	**1988 - 1997**	**50.6**	**73**	**198**

Table 5 TOTAL COLIFORM STATISTICS SUMMARY				
CANYON/ Monitoring Station	Period of Coverage	Mean	Standard Deviation	Number of Samples
BIG COTTONWOOD CREEK				
Treatment Plant Intake	1960 - 1997	36.6	39	453
BC1 - USFS Boundary	1988 - 1997	38.1	52	221
LITTLE COTTONWOOD CREEK				
Treatment Plant Intake	1960 - 1997	19.5	21	449
LC1 - USFS Boundary	1988, 1990 - 1997	33.8	35	72

TREATMENT PLANT RAW WATER INTAKE TOTAL COLIFORM DATA

There are two higher trends in mean annual total coliform shown on Figure 1 found in Appendix J, one during the early 1970's and the other in 1995. Coliform counts were lower than normal for the period 1991 through 1994, then increased to above normal in 1995. Years with significantly higher means (Students t test[14]) are summarized in Table 6.

Table 6 Treatment Plant Raw Water Total Coliform Years With Significantly Higher Means	
Treatment Plant	Years with Significantly Higher Means (based on Student's t test with 95 percent probability)
City Creek	1970, 1971, 1972 and 1995
Big Cottonwood Creek	1970, 1971, 1972, and 1995

Table 6 Treatment Plant Raw Water Total Coliform Years With Significantly Higher Means	
Treatment Plant	Years with Significantly Higher Means (based on Student's t test with 95 percent probability)
Little Cottonwood Creek	1971

WATERSHED COLIFORM DATA

The canyon watershed data has a much shorter period of record (see Table 5). Years with significantly higher mean annual total coliform are summarized in Table 7.

Table 7 Watershed Data Total Coliform Years With Significantly Higher Means	
WATERSHED	Years with Significantly Higher Means (based on Student's t test with 95 percent probability)
Big Cottonwood Creek	1995 and 1996
Little Cottonwood Creek	1995

The watershed coliform data allows a comparison of total to fecal coliform. Mean annual total coliform for Mill, Big Cottonwood, and Little Cottonwood creeks increased in 1995 and 1996, however, fecal coliform did not.

NUTRIENTS AND TURBIDITY

Analysis of turbidity, nitrate, and phosphorous failed to reveal any statistically significant trends. Grab sample total phosphorous data has on occasion exceeded 0.05 mg/l (State water quality standard)[15] in all the canyons. Emigration Canyon and Parley's Canyon have experienced frequent exceedences of the state standard for phosphorous.

Grab sample ammonia (NH4) data has on occasion exceeded state standards for cold water fishery (use classification 3A) in all of the canyons. Un-ionized ammonia toxicity is dependent upon the temperature and pH of the waterbody.[16] A summary of ammonia exceedences is provided on Table 8. State criteria includes two different levels for ammonia dependent upon exposure time (4 day average and 1 hour average). Because the samples are independent grab samples, the more stringent 4-day average criteria is assumed, however we have no evidence that this data accurately represents a 4 day average. Often the analysis detection limit used in the lab has been greater than the allowable for the cold water fishery use classification.

Table 8
Grab Sample Ammonia Data Above 4-day Average 3a Use Standards

CANYON	Exceedances during the last 10 years of 3A Cold Water Fishery 4-day Average Ammonia using grab sample data.
City Creek Canyon	02/24/95, 3/27/96, and 4/11/96
Emigration Canyon	6/1/93, 2/24/95, 4/11/96 and 7/11/96
Parleys Canyon	9/8/95, 4/11/96, and 9/8/96
Millcreek	5/26/93
Big Cottonwood Creek	3/4/92, 3/15/95, and 6/13/95
Little Cottonwood Creek	3/27/96, 4/11/96, 5/15/96, 10/23/96, and 11/15/96

DISSOLVED METALS & PHYSICAL DATA

Dissolved metals (corrected for water hardness) and physical data (see Appendix J) for each canyon were compared with state water quality standards. No exceedences were found when comparing with use classification 1C (protected for domestic use with prior treatment). A summary of the results of a comparison of dissolved metals and physical data with cold water fishery use classification (3A) standards is provided on Table 9. Often lab analyses for lead and silver have been with a detection limit higher than the criteria for cold water fishery

Table 9
Dissolved Metals And Physical Data
Exceedences of State Water Quality Standards
For 3a Cold Water Fishery Use Classification

CANYON	Exceedences
City Creek	None
Emigration Canyon	None
Parleys Canyon	None
Millcreek	None
Big Cottonwood Creek	None
Little Cottonwood Creek	Copper: 5/15/96, 7/11/96; Lead: 7/11/96 4-day average criteria used, ok for 1-hour average; Zinc: 5/15/96 and 7/11/96

SUMMARY AND CONCLUSIONS

1. Canyon water quality is generally excellent, especially for drinking water source purposes. However, mean annual total coliform counts increased significantly in 1995 in City Creek, Big Cottonwood Creek and Little Cottonwood Creek (see Figure 1 in Appendix J).

2. The increase in total coliform counts does not correspond to an increase in fecal coliform. The reasons for the increase in total coliform are not found in the data.

3. Even the increased coliform levels of 1995 represent excellent water quality with coliform counts far below maximum criteria set by state standards for Class 1C (domestic use with prior treatment). Class 1C standards set minimum criteria for protection for drinking water with prior treatment, however, Class 1C standards are not meant as a standard to preserve the pristine water quality of these mountain streams. To provide further protection to water quality, portions of each of the six study streams have been designated as Antidegradation Segments.

4. There is cause for concern based on experiences in other watersheds as reported in the literature.[1718] Water quality monitoring of these canyons continues to be important. Recommendations for water quality monitoring will be considered in plan recommendations and alternatives.

0’ 10,000’ 20,000’

City Creek Canyon
CC2
CC1
Dry Creek North Fork
Dry Creek South Fork
Red Butte Canyon
Georges Hollow
Emigration Canyon
EC1
Spring Canyon
Carrigan Canyon
PC1
LB1
Parleys Canyon
MC1
MC2
MC3
MillCreek Canyon
Tolcats Canyon
Heughs Canyon
Dry Hollow
BC8
BC4
BC5
BC10
BC1
BC2
Big Cottonwood Canyon
BC12
BC13
BC14
BC15
BC16
Ferguson Canyon
North Fork
Deaf Smith Canyon
LC8
LC9
LC3
LC6
Little Cottonwood Canyon
LC1
Bells Canyon

Salt Lake City Watershed Management Plan

HYDROLOGIC FEATURES AND CONSTRAINTS

- Streams
- Water Bodies
- Springs
- Water Sample Sites

LOCATION OF STUDY AREA IN UTAH

By Nick Kryger 6-5-98

Salt Lake City
Department of Public Utilities
GIS Section

CHAPTER 3
Watershed Jurisdiction and Ownership

WATERSHED JURISDICTION AND OWNERSHIP

Many entities share ownership and jurisdiction of the lands that make up the Salt Lake City Watershed of the Wasatch Mountains. This chapter will summarize property ownership in the Wasatch Canyons and the responsibilities of major jurisdictions involved in managing the watershed.

A. SALT LAKE CITY WATERSHED AUTHORITY

Salt Lake City's authority for watershed protection is granted by the Utah Constitution, Utah Statutes, and United States Statutes. The U.S. Congress and the State of Utah have addressed Salt Lake City water supply protection by recognizing the prominence of Salt Lake City watersheds and by granting Salt Lake City broad authority to protect its water supply. The preparation of this document, the '99 Watershed Plan, is another step in carrying out this longstanding mandate from federal and state authorities.

1. Utah Constitution

Utah Constitution (Article XI, Section 5), authorizes the state legislature, by general laws, to classify cities in proportion to population. This constitutional provision has been implemented by state legislation to grant authority over watersheds based on this classification system. The Utah Constitution also specifically addresses the authority of municipalities to own and develop water rights. Municipal corporations are forbidden from directly selling, leasing, alienating or disposing of any waterworks, water rights or sources of water supply. Cities are further directed to preserve, maintain, and operate their water rights, waterworks, and water sources in order to supply water to their inhabitants at reasonable rates. Municipal water rights, however, may be exchanged for other water rights (Utah Constitution, Article XI, Section 6). The prohibition against alienating city water rights (except by exchange) prevents Salt Lake City from selling or leasing its water rights to public and private water users in the Wasatch Canyons. However, since Salt Lake City boundaries do not include most of the canyon areas, serving water to canyon users is accomplished through sale of "surplus" city waters by a revocable contract.

Salt Lake City owns all or the largest percentage of water rights in each of the Wasatch Canyons, from City Creek on the north to Little Cottonwood Canyon on the south, except Red Butte Creek. Since Salt Lake City (and in some cases other municipalities) water rights cannot be alienated, the Utah Constitution effectively prohibits development in the Wasatch Canyons without contracting for Salt Lake City "surplus" water. A state statute recognizes this practice, authorizing cities to "sell and deliver the surplus product or service capacity of any such works, not required by the city or its inhabitants, to others beyond the limits of the city" (Utah Code Ann., 10-18-14,1). In this manner Salt Lake City has been able to respond to the intense demand for use of its water in the canyons.

In 1981, Salt Lake City placed a moratorium on further water contracts in the canyons in order to protect the city's water supply and watersheds. Existing city water contracts and commitments that have not been fully utilized have been honored and permitted for the expansion of water use within the terms of the contract. In 1991, Salt Lake City removed its moratorium and instituted a new surplus water sales policy.

2. State Legislation

The Utah State Legislature has implemented the classification authority granted by the Utah Constitution by dividing municipal corporations into three classes. First Class Cities are municipalities with more than 100,000 people (Utah Code Annotated, 10-1-1). These classifications have been upheld by the Utah Supreme Court (*Salt Lake City V. Salt Lake County*, 1922. 60 U. 423, 209 P. 207). Cities are granted extraterritorial jurisdiction for the construction, operation, and maintenance of waterworks, and to protect the water from pollution that is "used in and necessary for" city waterworks. Protection of water from pollution for all classifications of cities is explicitly recognized "for 15 miles above the point from which it is taken, and for a distance of 300 feet on each side of such streams" (Utah Code Annotated, 10-8-15).

Additional watershed protection jurisdictions for First Class Cities, like Salt Lake City, extend further than other classifications of cities to include protection of the "entire watershed" (Utah Code Annotated, 10-8-15). Therefore, Salt Lake City is granted management responsibility, anywhere in the canyon watersheds where Salt Lake City owns water rights, to protect canyon waters from activities that are detrimental to water

quality or quantity. Cities may enact any ordinances necessary to protect the watershed, "and are authorized and empowered to enact ordinances preventing pollution or contamination of the streams or watercourses in which the inhabitants of the cities derive their water supply" (Utah Code Ann., 10-8-15).

Pursuant to general eminent domain authority in the Utah Constitution, Salt Lake City may condemn private property for public use with just compensation (Utah Constitution, Article I, Section 22). Specific statutory authority to acquire water and waterworks and "property connected therewith," including the power of condemnation for such purposes, has been granted to cities by the Utah Legislature (Utah Code Ann., 10-7-4). The Utah statutes granting extraterritorial jurisdiction to cities over watersheds are broad and give the cities substantial discretion in the management of watersheds to protect water sources. Salt Lake City as a First Class City has special powers over entire watershed areas.

3. Federal Legislation

The U.S. Congress passed two statutes recognizing the authority of Salt Lake City to protect its water supplies. In 1914, Congress withdrew federal lands from mineral location and removed federal lands from surface disposal for City Creek, Red Butte, Emigration and Parleys Canyons (38 Stat. 714, Public Law 199, Sept. 19, 1914). Congress directed the Secretary of Agriculture to administer the lands in cooperation with Salt Lake City "for the purpose of storing, conserving, and protecting from pollution the said water supply.." (38 Stat 714, 715, Section 2). The Secretary of Agriculture was also granted the authority to prescribe and enforce regulations to protect the water supply of Salt Lake City (38 Stat 715, Section 3).

In 1934, Congress again addressed the protection of Salt Lake City's municipal water supply by reserving the surface estate to the United States in any mineral patents in the canyons (48 Stat 808, 809 Section 2, Public Law 259, May 26, 1934). Congress also reserved additional lands from mining location in Millcreek Canyon, Big Cottonwood Canyon and Little Cottonwood Canyon (48 Stat 808, 809, Section 3, May 26, 1934).

4. Salt Lake City Watershed Ordinances

Salt Lake City has implemented state statutory authority for watershed protection through the adoption of ordinances. The Salt Lake City Watershed Ordinances may be

found under Title 17 of the Salt Lake City Code. Title 17 addresses all ordinances under the jurisdiction of Salt Lake City Department of Public Utilities. Chapter 17.04 contains ordinances for Salt Lake City's watershed areas. The Public Utilities Director is the general supervisor of all city water and watershed related activities.

- Article II regulates subdivisions including: construction approval (17.04.070), waste disposal requirements (17.04.080), plans (17.04.090), and sale of lots prior to construction approval (17.04.110).

- Article III regulates livestock and other animals within the watershed. This article contains the dog permit requirements (17.04.160) and the prohibition of livestock near streams (17.04.130).

- Article IV governs water use and sanitary facilities. Some of the specific items contained in Article IV include rules and regulations (17.04.180), sanitary sewage disposal system requirements (17.04.210), garbage or human waste disposal - permit required (17.04.230), chemical toilets or privies (17.04.250), hauling of human waste required (17.04.280), and prohibited locations of toilet vaults (17.04.290).

- Article V regulates water pollution and other unlawful activities. Some of the specific items contained in Article V include nuisances prohibited (17.04.310), pollution of canyon waters prohibited (17.04.320), prohibited acts (17.04.330), camping and campfire restrictions (17.04.340), and garbage deposit prohibited (17.04.350).

- Article VI governs enforcement issues in the watershed. Section 17.04.380 addresses interfering with officers. Section 17.04.400 addresses trespassing in the watershed. Article VII regulates the appropriations of water and Article VIII regulates the adoption of public law.

B. SALT LAKE COUNTY LAND-USE CONTROLS

Salt Lake County has primary land-use control jurisdiction in the canyons over private lands. Through the administration of planning, zoning, and coordination of an interagency site development plan approval process, the county balances development

and protection of the canyons. Two divisions in the Salt Lake County Public Works Department have administrative land-use roles: the planning and development services divisions. The planning division is responsible for the preparation of master plans to guide public and private development. The land-use section of the planning division prepares amendments to the zoning ordinance and prepares and maintains development standards to insure uniform quality of design and construction. The development services division consolidates all processes associated with public and private development into a single operation. At the beginning of a proposed project, builders and developers meet with staff members to coordinate the requirements of their projects. These staff members coordinate the engineering review of plans and administer the issuance of building permits. After a permit is issued, development services has the responsibility to inspect structures for compliance with building codes.

1. Zoning

With the exception of Emigration Canyon, Salt Lake County canyon zoning was first implemented in 1972 with the establishment of forestry zones. Previously, applicants for canyon developments only had to comply with the existing building code and the health department requirements. Designations of forestry zones include: F-1, FR-0.5, 1, 5, 10, and 20, and FM - 10 and 20. The numbers in each FR zone designate the minimum lot size in acres. The numbers included in each FM zone designate units per acre allowed (twice the number of guest rooms are permitted).

All the canyons in the watershed are included in the Foothill Canyon Overlay. The C2ZC zone is specified for commericial development based on a conditional use which is subject to review by the planning commission.

Portions of Emigration Canyon along the highway were zoned prior to the establishment of forestry zones. With the exception of the C2ZC zoned areas, the entire canyon is FR zoned of differing acreages from .5 up to 20 acres.

Revised Sensitive Lands Protection Regulations were adopted by Salt Lake County on January 21, 1998. Two notable changes were made to the ordinance that involve watershed concerns. First, the stream set-back for new buildings was extended from 50 to 100 feet. This new regulation will strengthen current watershed protection measures already in place. The second significant change involved site development. A new

standard was developed called "limits of disturbance," which specifies an area that construction and development activity must be contained. This new standard, located in the "Foothills and Canyons Overlay Zone," formerly the "Hillside Protection Zone," will decrease the amount of lands that are disturbed through accidental or uninformed construction practices.

Conditional uses are also outlined in the zoning ordinance. These are special uses that are more intensive than the permitted uses under a given zoning classification. These uses require a site specific review and recommendations by the planning commission. Examples of conditional uses are the limited commercial developments that have occurred in the Wasatch Canyons in forestry zones.

Any Planning Commission recommendation is subject to a detailed inter-agency review. The Planning Commission in turn requests recommendations from the following: development services, engineering, hydrology, fire department, traffic engineer, city-county health, building inspector, U.S. Forest Service, environmental health, Salt Lake City Department of Public Utilities, Salt Lake City Planning Division, Utah Department of Transportation, Sheriff's department, and cities within a half-mile of the proposed development. Salt Lake City Department of Public Utilities is usually asked for a recommendation in cases where water service for a property is questioned. Decisions concerning watershed protection are made by the Forest Service and Salt Lake City Public Utilities Department. Any agency involved in the recommendation process may request additional information from the developer.

2. Site Plan Approval

Site plan approvals for permitted uses are processed through the Salt Lake County development services division. Permitted uses, which are outlined in the zoning ordinance, can be approved by the development services staff without a recommendation by the planning commission. The developer is required to meet the criteria set forth in the zoning ordinance to receive final approval. For sensitive canyon developments, the development services staff often requests an additional recommendation from the Salt Lake County Planning Commission.

C. SALT LAKE CITY-COUNTY HEALTH DEPARTMENT

The Salt Lake City-County Health Department (Health Department) can play an important role in watershed management. The Health Department is created by state statute to serve as a regional health agency for all valley local governments. With representation from the local government, the Health Department acts as a policy-making body. Under Section 26-24-20, Utah Code annotated, 1953, the Health Department prescribes its own health regulations for watersheds (Salt Lake City-County Health Department Regulation #14, Watersheds). These regulations seek to prevent damage to property, the spread of disease, the creation of nuisances, and air and water pollution. The regulations establish standards for setbacks from water sources, animal use, waste disposal systems and water supply certification.

The Health Department reviews specifications, reports, and plans for development proposals before a building permit is issued by the Salt Lake County Development Services Division. Inspections, including sampling and analysis of soil and water, on public and private property are authorized in the watersheds to verify compliance with regulations. Reviews and comments are made on proposed contracts or agreements between any district, city, county, government or person for the use or occupancy of watersheds within Salt Lake County. The Health Department administers necessary watershed regulation enforcement activities. The governor and the Environmental Protection Agency (EPA) have designated the Health Department as the area-wide water quality management agency. Under this designation, the Health Department is also responsible for the implementation of some federal water quality programs.

D. USDA FOREST SERVICE

The Forest Service is the largest land manager in the plan area. United States lands were reserved from the public domain for the establishment of the Wasatch-Cache National Forest in 1904. Forest Service management is directed by several statutes dictating multiple-use management. Two congressional acts (see Section A of this chapter) establish a special relationship between the Forest Service and Salt Lake City regarding watershed management in the canyons.

1. Forest Management and Planning

The 1985 Wasatch-Cache National Forest Land and Resource Management Plan directs the activities of the Forest Service within the plan area. The Forest Service's planning and management activities in the plan area are oriented primarily to watershed management, developed and dispersed recreation, wilderness areas, Research Natural Areas, and grazing. The Forest Service is a major provider of developed and dispersed recreation in the plan area for local residents and visitors. The Wasatch-Cache National Forest leads the nation in visitor days for any national forest. A substantial amount of these visits were made to the Wasatch Canyons. The close proximity of the Wasatch-Cache National Forest has made it a favorite local choice for family and individual recreation activities.

Ski resort development on National Forest System lands is a major provider of recreation. Brighton and Solitude in Big Cottonwood Canyon, and Alta and Snowbird in Little Cottonwood Canyon, are dependent on Forest Service special-use permits for the majority of their development. In the past, the Forest Service has leased land for development of private recreation residences on national Forest System lands. Currently, the Forest Service is encouraging residential development on private lands only, but still honors existing leases. These residences are under strict guidance by the Forest Service for house- addition permits and other on-site activities, including gardening and landscaping. The Forest Service provides trail heads and parking facilities for summer and winter dispersed recreation. A wide variety of dispersed recreation activities take place on these lands including hiking, cross country skiing, fishing, hunting, backpacking and nature study. The Forest Service operates and maintains picnic and camping facilities in Millcreek, Big Cottonwood and Little Cottonwood Canyons.

Under the provisions of the Wilderness Act of 1964, the Endangered American Wilderness Act of 1978, and the Utah Wilderness Act of 1984, three wilderness areas have been designated within the plan area. These include Lone Peak, Mount Olympus, and Twin Peaks Wilderness Areas. Lone Peak is located between Little Cottonwood and American Fork Canyons. Mount Olympus is bounded on the north by Millcreek Canyon, on the south by Big Cottonwood Canyon, on the west by the Salt Lake Valley, and on the east by Gobblers Knob. Twin Peaks is located between Big and Little Cottonwood Canyons, east of the Salt Lake Valley, and west of Alta and Brighton ski

resorts. Under the goal of protecting the watershed resource, the Forest Service is committed to conducting water quality analysis in wilderness areas on municipal watersheds and to enforce a prohibition of camping within 200 feet of any water source in Big and Little Cottonwood Canyons.

The Forest Service manages Red Butte Canyon as a Research Natural Area (RNA). Red Butte Canyon has been closed to the general public and to livestock grazing since the early 1910s. In 1969, jurisdiction for Red Butte Canyon was transferred from the U.S. Army to the Forest Service. The management area has a high research value since it is a pristine example of a watershed. No uses are allowed that would diminish the natural values of the canyon. Uses are currently limited to research, study, observations, monitoring, and educational activities that are non-destructive, non-manipulative, and maintain unmodified conditions. The Red Butte Canyon Steering Committee maintains a liaison among interested management agencies including the Wasatch-Cache National Forest, U.S. Army, Utah Division of Wildlife Resources, University of Utah, U.S. Geologic Survey, and the Intermountain Forest and Range Experiment Station.

Grazing of livestock is currently permitted in the Wasatch Canyons on a very limited basis. The Forest Service honors existing grazing permits, but no new permits will be issued as a measure to protect the watershed environment. The Forest Service is working toward phasing out grazing in the canyons. The 1985 Wasatch-Cache National Forest Land and Resource Management Plan established the goal to protect the watershed in order to successfully accomplish Forest Service programs mandated by congressional actions and executive orders. Under the provisions of the Organic Administration Act (1897), the Forest Service is charged with "securing favorable conditions of water flows." This language has been interpreted by Forest Service hydrologists as the minimum stream flows necessary to provide for the self-maintenance of stream systems.

The Forest Service Channel Maintenance Program is intended to secure rising and receding flows, which produces a smooth transition between peak and base flows. This circumvents flood discharges and minimizes channel erosion and sediment deposition associated with instability or disequilibrium conditions. Flow maintenance is further intended to reduce the threat of channel aggregation, channel erosion, flood plain

encroachment, vegetation encroachment, changes in hydrologic geometry, and channel capacity.

The channel maintenance program will establish a regime of flow requirements representing the rising and falling limb of the natural stream hydrography from base flow to bank full in the spring and again from bank full to base flow after peak flows occur. Flows necessary to maintain channel capacity have been quantified for Big Cottonwood, Little Cottonwood, Millcreek, Red Butte, and Lambs Canyons, and have been filed as part of the Utah Lake-Jordan River water rights adjudication. An update of the Forest Service Plan is in progress.

2. Coordination with Salt Lake City

Under the provisions of federal statutes and regulations, the Forest Service plays a special role in the management of Salt Lake City's municipal watersheds. In order to protect the water supplies for Salt Lake City, the Forest Service has entered into formal agreements with authorized cities to restrict the use of U.S. Forest Service land from which the water supplies are derived, when necessary. In 1981, the Wasatch-Cache National Forest, U.S. Department of Agriculture, and Salt Lake City Corporation prepared a Memorandum of Understanding (MOU) to carry out these federal mandates (See Appendix F).

The MOU cites the congressional acts that recognize Salt Lake City's extraterritorial jurisdiction in the watershed and the need to prevent the contamination of streams or water courses from which the inhabitants of the city derive their water supply. (See Section A2 of this chapter for more detailed descriptions of statutes. The MOU also outlines responsibilities for the Forest Service including coordination with the city for any federal land-use planning in the watersheds, authorization of improvements needed by the city to protect and develop water, consultation with the City for any Forest Service water development, and assurances for the provision of necessary services such as garbage collections and maintenance of sanitary facilities.

Under the provisions of the MOU, the City is authorized to provide the Forest Service with water to supply recreation and administrative sites, and to assume management responsibilities for recreation and sanitation facilities in City Creek, Mountain Dell, Parleys, and Lambs Canyons. Joint activities are outlined by the MOU including:

cooperation on toilet pumping at recreation sites, cooperation in law enforcement, land acquisition for ownership consolidation, information sharing, reviews of all land transactions, and the preparation of a specific watershed management strategies plan.

E. METROPOLITAN WATER DISTRICT OF SALT LAKE CITY

The Metropolitan Water District of Salt Lake City (MWD) is a two-city District comprised of Salt Lake City and Sandy City. Sandy City applied for annexation into the MWD in 1990 and the Board of Directors unanimously approved their annexation petition. The MWD was first created after the prolonged drought of 1934 by the Salt Lake City Commission to provide a long-range water supply for Salt Lake City. The boundaries of the MWD are conterminous with the boundaries of its member cities. Through taxing capability, the MWD gives Salt Lake City and Sandy City the ability to provide alternative means of financing large-scale water projects that would otherwise exceed the City's constitutional debt limitation. The development of Deer Creek Reservoir as a water supply, and the MWD becoming a principal stockholder in the Provo River Water Users Association in the 1940s, was the main catalyst for creation of the district. Since 1935, the MWD has assumed the lead role for supplying new water to Salt Lake City and subsequently to Sandy City. Among the projects of the MWD are Deer Creek Reservoir, Little Dell Reservoir, and the construction of the Little Cottonwood Water Treatment Plant in 1960, which is rated at 113 million gallons per day treatment capacity.

Salt Lake City, Sandy City, and the MWD have enjoyed close cooperation and conjunctive management. The MWD board of directors is appointed by the city councils of each city. Salt Lake City appoints five board members and Sandy City appoints two board members, which comprise the seven-member board of directors. The MWD, by statute, provides water to Salt Lake City on a preferential right basis at rates fixed by the MWD. Sandy City also receives a preferential right to MWD waters that is second to Salt Lake City's right. Surplus water is sold to other water distributors in Salt Lake County, principally the Salt Lake County Water Conservancy District. The MWD also owns water rights for Little Dell Reservoir in Parleys Canyon and maintains water right filings with the State Engineer for surplus stream waters in the other canyons.

F. TOWN OF ALTA

The Town of Alta, population 396, is an incorporated municipality in the upper reaches of Little Cottonwood Canyon that includes the Albion Basin. Within its boundaries, Alta exercises land-use jurisdiction by maintaining planning and zoning controls, public safety standards, and an enforcement apparatus. It uses Salt Lake City water through a surplus water contract. Alta has displayed concern over watershed impacts in Little Cottonwood Canyon. Existing standards and measures developed by Salt Lake City for watershed protection are applicable in the Town of Alta.

G. SANDY CITY

Sandy City, located in the southeastern part of Salt Lake Valley, maintains a substantial interest in Little Cottonwood Canyon through the ownership of approximately 40 percent of Little Cottonwood Creek water. Sandy City does not have its own watershed protection ordinances or program. Sandy City has just become a first class city, which will grant them additional extraterritorial jurisdiction in watershed matters. For this reason, Salt Lake City is encouraging Sandy City to become more involved in watershed management.

H. JORDAN VALLEY WATER CONSERVANCY DISTRICT

The Jordan Valley Water Conservancy District (Water Conservancy District) plays an important role in Salt Lake Valley water issues, but does not own any water rights in the canyons under review in this plan. The Water Conservancy District serves as the primary water distributor to many of the communities in the valley south and west of Salt Lake City, and has developed water in Bell's and Willow Creek Canyons, south of the plan area. Because Salt Lake City provides surplus water to the Water Conservancy District and many of the communities in the Salt Lake Valley, the City must be cognizant of the reliability, cost, and quality of its water for some areas beyond the boundaries of Salt Lake City.

I. OTHER GOVERNMENTAL AGENCIES

Several other federal and state governmental agencies play indirect roles in the Wasatch Canyons under review in this plan. The United States Environmental Protection Agency

(EPA) is responsible for administering two important statutes affecting the watersheds: the Clean Water Act and the Safe Drinking Water Act. These two acts are representative of primacy legislation. States, upon approval of programs consistent with the statutes, are given principal responsibility for implementing the provisions of the acts.

Utah, through the Department of Environmental Quality (DEQ), has primacy over the implementation of the Clean Water Act and the Safe Drinking Water Act. DEQ has established the state water standards that the Health Department administers in Salt Lake City's watersheds. The provisions of the City-County Clean Water Act most applicable to the plan area are the anti-degradation standards. The anti-degradation standards seek to protect classified pristine waters from water quality degradation. Under the provisions of Section 319 of the Clean Water Act, no new point sources, treated or otherwise, are allowed to enter into designated streams or any contributing drainage.

With passage of the Water Quality Act of 1987, states were given additional support and direction for comprehensive implementation of non-point source controls statewide and in local jurisdictions. Programs include monitoring the effects of recharging urban runoff into groundwater. It would be expensive and difficult, due to the nature of the subsurface materials, to implement a monitoring system to assess the effects of existing non-point discharges in the canyons. All of the streams in the plan area are classified for anti-degradation protection. The streams in the '99 Watershed Plan area fall under one or more of the following classifications: Class 1C, Class 2B, Class 3A, or Class 3C. Class 1C is protected for use as a raw water source for domestic water systems, with prior treatment by standard complete treatment processes as required by the Utah State Division of Environmental Quality. Class 2B is protected for in-stream recreational use and aesthetics such as boating, water skiing, and similar uses except for swimming. Class 3A is protected for in-stream use by beneficial aquatic wildlife including species of game fish and cold water aquatic life and aquatic organisms necessary in their food chain. Class 3C waters are protected for non-game fish and other aquatic life, including the aquatic organisms necessary in their food chain.

- City Creek is classified as 2B and 3A from Memory Grove to the water treatment plant, and 1C and 3A from the water treatment plant to its headwaters.

- Emigration Creek has been classified as 3A from Foothill Boulevard to its head waters.

- Parley's Creek has been classified as 2B and 3C from 1300 East to the Mountain Dell Reservoir, and 1C and 3A from the reservoir to its head waters.

- Millcreek is classified as 1C and 3A from its confluence with the Jordan River to its head waters.

- Big Cottonwood Creek is classified as 1C and 3A from the Big Cottonwood Water Treatment Plant to its head waters.

- Little Cottonwood Creek is classified as 1C and 3A from the Metropolitan Water Treatment Plant to its head waters.

The Safe Drinking Water Act, as amended in 1986, establishes drinking water standards for the nation. The Act and its implementing regulations establish limits and monitoring requirements for several constituents to assure that drinking water supplies are maintained in healthful conditions. The U.S. Army Corps of Engineers is responsible for carrying out Section 404 of the Clean Water Act, which regulates dredging and filling wetlands. Any stream alteration, dredging, or wetland filling, requires a 404 permit from the Corps. This permitting process helps control erosion and activities that could adversely affect stream quality. The Corps also has general flood control responsibility. The Utah State Division of Water Rights also requires a permit for any stream alteration practices. In addition, the state is implementing a groundwater protection strategy to protect Utah's groundwater supplies from contamination. While the '99 Watershed Plan focuses on surface water, it also addresses the entire watershed area as potential groundwater recharge areas. Also within the State Division of Water Rights is the State Engineer who is responsible for water rights issues within the watershed.

Other entities are involved with or influence watershed management in the Wasatch Canyons. Salt Lake County Service Area #3 provides water and fire protection services at Snowbird and adjacent areas. The Salt Lake County Sheriff enforces city watershed ordinances and county land-use ordinances. The Utah Division of Parks and Recreation,

through implementation of the Parks and Recreation River Enhancement Program, could develop a program for one or more of the Wasatch Canyon streams in cooperation with other governmental entities. Finally, the Utah Department of Transportation maintains highway responsibilities in Big and Little Cottonwood Canyons, and on Interstate 80 in Parleys Canyon.

J. MAJOR PLANS AND STUDIES IN THE CANYON WATERSHED AREA

Several plans and studies have been prepared that have increased the informational base and affected the management of areas covered by the '99 Watershed Plan.

1. Wasatch-Cache National Forest Land and Resource Management Plan

The Wasatch-Cache National Forest Land and Resource Management Plan (Forest Service Plan), completed in 1985, is intended to guide all natural resource management activities and establish management standards and guidelines for the Wasatch-Cache National Forest. The Forest Service Plan describes long-term management practices, levels of resource production, and availability of lands for resource management. It contains the overall direction and activities that will be required to achieve the desired condition of the forest and consists of an analysis of the management plan situation, issues, forest management direction, and implementation.

The Final Environmental Impact Statement (FEIS) for the Forest Service Plan selected a preferred plan alternative. In response to public input, this alternative balances market and non-market resources while providing environmental protection. Under this alternative, the Forest Service budget would increase to provide increased resource use, and developed and dispersed recreation and wilderness uses. Forest resources addressed in the plan include recreation, wilderness, fish and wildlife, range, timber, water, and minerals. Currently, the Forest Service is updating the 1985 Wasatch-Cache Forest Land and Resource Management Plan.

2. Salt Lake City Watershed Management Plan, 1988

Salt Lake City adopted the first Watershed Management Plan in 1988 to maintain high water quality for the future. The watershed was receiving increasing pressures from

commercial and residential development and a variety of recreational uses. Visitor numbers increased rapidly throughout the early 1980's and management guidelines were needed to ensure high water quality for the next ten years. The watershed planning effort involved all the major jurisdictional agencies involved with the watershed, along with affected communities and businesses. The Watershed Management Plan contained the following sections: Watershed Jurisdiction and Ownership, Watershed Physical/Environmental Characteristics, and Policies for Salt Lake City Watershed Management. The Watershed Management Plan was successful in providing the guidelines and management direction necessary to effectively manage the watershed for the past 10 years.

3. Salt Lake County Planning Division Plans and Studies

Wasatch Canyons Master Plan (Canyons Master Plan) was adopted by Salt Lake County in 1989. The purpose of the plan is to provide clear guidance and coordination of future uses in association with existing resources in the seven major Wasatch Canyons through the year 2010: "The Salt Lake County Wasatch Canyons Master Plan goal is to provide diverse opportunities for public enjoyment of the Wasatch Canyons within the constraints of a limited geographic setting and the capacities of the natural environment to accommodate uses without significantly diminishing either the quality of the canyon resources or the quality of the canyon experience." The Wasatch Canyons plan addresses land-use issues in the plan area. Specifically policies governing various recreational uses, transportation, canyon plans, and general policies. The Canyons Master Plan calls for an update ten years after adoption. Coordinating the Canyons Master Plan Update and the '99 Watershed Plan may be beneficial in coordinating watershed management endeavors between Salt Lake City and the Forest Service.

In 1998, Salt Lake County adopted a new set of zoning ordinances aimed at protecting sensitive lands. These new ordinances provide the watershed with increased protection. Items such as stream setbacks for development have been increased from 50 feet to 100 feet. Tighter standards regarding the amount of disturbance allowed to the natural landscape during construction are also included.

K. LAND OWNERSHIP STATUS

Land ownership in the Salt Lake City Watershed Management Plan area is divided principally among the United States (Forest Service management), Salt Lake City, Salt Lake County, and private interests. The pattern of ownership distribution is not consistent throughout the plan area. Salt Lake City is a major landowner in the northern canyons and the Forest Service is the dominant landowner in the southern canyons. This section describes the distribution of ownership in the plan area by canyon. The land ownership map at the end of this chapter displays this information.

Table 10
Area-wide Ownership

Owner	Acreage	Percentage
Forest Service	78,893	62%
Private	24,589	19.3%
Salt Lake City	23,773	18.6%
Salt Lake County	268	<1.0%
Total	127,522	100%

1. City Creek Canyon

Salt Lake City is the dominant landholder in City Creek Canyon. This is the result of aggressive land acquisition efforts to assure an adequate water supply from settlement to the early twentieth century. The Forest Service also has substantial canyon land holdings that are distributed in a checkerboard fashion. Smaller private land holdings are located at the mouth of the canyon and along ridge lines.

Table 11 City Creek Canyon Land Ownership		
Owner	**Acreage**	**Percentage**
Salt Lake City	6,575	57
Forest Service	3,417	29
Private	1,670	14
Total	11,662	100

2. Red Butte Canyon

Red Butte Canyon is primarily managed by the Forest Service, with some small land holdings by Salt Lake City, and private interests.

Table 12 Red Butte Canyon Land Ownership		
Owner	**Acreage**	**Percentage**
Forest Service	4,501	83
Salt Lake City	508	9
Private	415	8
Total	5,424	100

3. Emigration Canyon

Emigration Canyon is dominantly under private ownership, which can easily be seen from the large amount of residential development in the canyon. The Forest Service and Salt Lake City have smaller land holdings scattered throughout the canyon.

Table 13 Emigration Canyon Land Ownership		
Owner	**Acreage**	**Percentage**
Private	4,856	42
Salt Lake City	3,540	30
Forest Service	3,210	28
Total	127,522	100

4. Parleys Canyon

Lands in Parleys Canyon are predominately managed by the Forest Service in the lower portion of the canyon and in Lambs Canyon. Salt Lake City has consolidated land holdings in Little Dell Canyon. Private ownership is found primarily in Lambs and Mount Aire Canyons where residences have been constructed. Salt Lake County also has a small landholding.

Table 14 Parleys Canyon Land Ownership		
Owner	**Acreage**	**Percentage**
Forest Service	13,944	42
Salt Lake City	12,688	38
Private	6,497	20
Salt Lake County	37	<1
Total	33,166	100

5. Millcreek Canyon

The Forest Service has consolidated land ownership in Millcreek Canyon for the United States. Private ownership constitutes only a minor portion of the canyon. Private lands exist mostly in the lower portion of the canyon with one large block near the canyon head.

Table 15
Millcreek Canyon Land Ownership

Owner	Acreage	Percentage
Forest Service	12,314	81
Private	1,600	19
Total	13,914	100

6. Neffs Canyon

Neffs Canyon is managed by the Forest Service.

Table 16
Neffs Canyon Land Ownership

Owner	Acreage	Percentage
Forest Service	2,375	100

7. Big Cottonwood Canyon

Big Cottonwood Canyon is predominantly under Forest Service management. However, there are substantial consolidated blocks of private land within Big Cottonwood Canyon. Private ownership is primarily in the residential areas of the canyon near Reynolds Flat, Silver Fork and Brighton Ski Resort. Salt Lake County owns one block of land in Mill D South Fork. Salt Lake City has a small landholding near Brighton Ski Resort.

Table 17 Big Cottonwood Canyon Land Ownership		
Owner	**Acreage**	**Percentage**
Forest Service	25,242	78
Private	6,544	20
Salt Lake City	438	1
Salt Lake County	113	<1
Total	32,337	100

8. Little Cottonwood Canyon

Little Cottonwood Canyon is predominantly under Forest Service management. Private ownership, however, does exist at the canyon mouth, Wasatch Resort, Snowbird Ski Resort, the Town of Alta, and in various mining patents. Several land exchanges involving Salt Lake City, the Forest Service, Trust for Public Lands, The Nature Conservancy, and private landowners have altered the land ownership pattern in Little Cottonwood Canyon by placing more private property in public ownership.

Table 18 Little Cottonwood Canyon Land Ownership		
Owner	**Acreage**	**Percentage**
Forest Service	13,853	81
Private	3,227	19
Total	17,080	100

L. LAND EXCHANGE

Public land management is hampered in some canyons by the scattered nature of the publicly-owned land holdings. In a related issue, the land exchange between Salt Lake City and the U.S. Forest Service was terminated by Salt Lake City in 1996 due to issues that could not be resolved. Although the exchange agreement is not currently being implemented, it was turned into federal legislation as the Salt Lake City Watershed Improvement Act of 1990 (Public Law 101-634). This law remains viable legislation if Salt Lake City and the Forest Service feel they want to re-start the land exchange agreement.

M. PUBLIC UTILITIES WATER RIGHTS AND WATERSHED PURCHASE FUND

The Public Utilities Water Rights and Watershed Purchase Fund was established in 1989 as part of the implementation of the 1988 Watershed Management Plan. Since its inception, the Water Utility Fund has purchased approximately 1,000 acres of critical watershed property. The funds generated from the Water Utility Fund ensure additional watershed protection and other benefits for the public in the Wasatch Canyons. The Water Utility Fund derives its funds from a $0.25 per customer surcharge fee per month on the water bill. This fee generates roughly $250,000 a year for watershed water rights and property acquisition.

N
W E
S

0’ 10,000’ 20,000’

City Creek Canyon
Dry Creek North Fork
Dry Creek South Fork
Red Butte Canyon
Georges Hollow
Emigration Canyon
Spring Canyon
Carrigan Canyon
Parleys Canyon
MillCreek Canyon
Tolcats Canyon
Heughs Canyon
Dry Hollow
Big Cottonwood Canyon
Ferguson Canyon
North Fork
Deaf Smith Canyon
Little Cottonwood Canyon
Bells Canyon

Burr Fork
Killyon Canyon
Little Dell Reservoir
Mt Dell Reservoir
Mt. Aire
Lambs Canyon
Potter Fork
Desolation Lake
Mill D South (Cardiff Fork)
Mineral Fork
Mill B South
Solitude
Lake Blanche
Silver Lake
Brighton
Twin Lakes
Lake Mary
Alta
Snowbird
Cecret Lake
Red Pine Lake
White Pine Lake

Salt Lake City Watershed Management Plan

LAND OWNERSHIP BOUNDARIES

- Private
- Salt Lake City
- National Forest
- Salt Lake City & Private Mix
- National Forest & Private Mix

LOCATION OF STUDY AREA IN UTAH

By Nick Kryger 6-5-98

Salt Lake City
Department of Public Utilities
GIS Section

CHAPTER 4
Changes in the Watershed

SIGNIFICANT CHANGES SINCE THE 1988 WATERSHED MANAGEMENT PLAN

A. LITTLE DELL RESERVOIR

Little Dell Reservoir is located in Parleys Canyon, east of Salt Lake City. Construction of Little Dell Reservoir began in 1988 and was completed in 1993. The reservoir receives its water flow from Dell Creek, a tributary to Parleys Creek. The reservoir was constructed by the United States Army Corps of Engineers; co-sponsored by the Salt Lake City Metropolitan Water District and Salt Lake County, and is operated by Salt Lake City Department of Public Utilities. The reservoir was developed for flood control and municipal and industrial water supply. Maximum capacity for the reservoir is 20,500 acre-feet of water. During a year with average water demands, the surface area of the water may fluctuate between 50 and 249 acres.

Recreation development is located on 39 acres of land on the north side of the reservoir. The development includes 130 parking spaces, two boat launches (non-motorized, hand-carried watercraft), six vault restrooms, 56 picnic sites, and a small interpretive center. Several trails are constructed around the reservoir. A total of 19,400 linear feet of trails are developed. Trails are built for a variety of uses including walking, biking, hiking, as well as a hardened trail for universal access.

B. GROWTH ON THE EASTERN EDGE OF THE WATERSHED

Since the 1988 Watershed Management Plan was adopted, the areas on the eastern edge of the Salt Lake City Watershed have experienced remarkable growth in population, building permits, and income. The two counties that border the Salt Lake City Watershed on the east side are Summit County and Wasatch County. During the period between 1990 and 1995, Summit County was ranked by the U.S. Census Bureau as the 3rd fastest growing county in the nation, with a population increase of 50 percent. The current population is 23,560 but is expected to more than double by the year 2020 reaching 50,700 people. The number of building permits granted has increased from 170 in 1986 to 770 in 1994. There has been a rapid increase in residential building permits, and an increase in proposed ski resort expansion projects.

Wasatch County has witnessed similar growth in the Heber City and Midway areas. The current population is 12,585 and is expected to surpass 20,000 by the year 2020. Much of the increase in development and population is due to overflow from Summit County. Wasatch County granted 42 building permits in 1986 and 233 building permits in 1995. Development is expected to continue at a brisk pace into the foreseeable future.

CHAPTER 5
Recommendations

INTRODUCTION

This section contains a description of the recommendations for each issue, implementation schedule and an explanation of the recommendation. The recommendations considered for addressing Salt Lake City watershed issues have been developed through public input, public agency workshops, the Salt Lake City Department of Public Utilities, and consultant review. One of the goals of this plan is to provide Salt Lake City and the other jurisdictional agencies with a broad range of recommendations that address each issue. A broad range of recommendations gives the public and decision makers a more diverse approach in managing each issue.

The recommendations presented in the first half of the section address issues on a watershed-wide basis. Following this general discussion are recommendations on a canyon-by-canyon basis. The recommendations in each section are preceded by the corresponding issue. An implementation schedule has been included with each recommendation. *The implementation dates in this chapter reflect an anticipated City Council adoption in 1998. With Council adoption on September 7, 1999, the implementation dates will be delayed accordingly.* Explanations follow each major recommendation. The recommendations are formulated to provide a management directive for the watershed area over the next ten years.

A. DEVELOPMENT REVIEW POLICY

- **Recommendation:** Salt Lake City's most important objective in the canyons is the preservation of the water quality and the protection of the watershed. Salt Lake City will evaluate development proposals and other activities in the canyons in light of the cumulative impact of such development or activities on water quality and the watershed. To the extent that, in the reasonable judgement of the City, a proposed development or activity, either individually or collectively, poses an actual or potential impact to the watershed or water quality Salt Lake City will either oppose, or seek to modify, manage, control,

regulate or otherwise influence such proposed development or activity so as to eliminate or mitigate potential impacts.

Salt Lake City shall coordinate its efforts with public entities having jurisdiction over the canyons, and with private entities, sharing common interests with the City, to the greatest extent possible to achieve the above objectives.

Implementation: Immediate.

Explanation: In the past, developments have been proposed that would have dramatically changed the make-up of the watershed. These proposals such as the "Super Tunnel," have been defeated in large part by an active watershed protection role played by Salt Lake City. Without Salt Lake City assuming a proactive role in safeguarding the watershed against major new developments in the watershed, water pollution may increase throughout the watershed resulting in lower quality drinking water.

Salt Lake City acknowledges the regulatory processes by which the Forest Service, Salt Lake County, and Salt Lake City-County Board of Health and others review development proposals. Salt Lake City encourages all of these entities to continue their current efforts and critically evaluate all significant proposals that may attract new user groups and large numbers of people.

Uses that assist in promoting watershed education such as student field trips will not be discouraged as long as education sessions are conducted in sites designed to handle large groups.

Land exchanges have the potential of compromising watershed protection through fragmenting consolidated watershed land parcels and introducing new development and uses. Salt Lake City wants to avoid a land exchange and thereby avoid the potential negative effects that would result to the watershed. Salt Lake City will work with its Congressional delegation to avoid land exchanges that would impact water quality. Land exchanges that will increase the amount of public watershed lands will be encouraged.

B. WATERSHED EDUCATION

1. Watershed Education.

- **Recommendation:** Salt Lake City will continue to support the Forest Service's watershed education efforts including: Ski Naturalist Program, Silver Lake Interpretive Center, and interpretive programs at Storm Mountain Amphitheater.

  Implementation: Encourage the development of partnerships to augment existing programs.

  Explanation: The Salt Lake Ranger District of the United States Forest Service has been providing watershed education programs for several years. The Silver Lake Interpretive Center in the Brighton Circle at the top of Big Cottonwood Canyon is staffed by a ranger during the summer months. Interpretive displays are available for viewing and the Forest Service also conducts interpretive walks around the Silver Lake Basin area. The Silver Lake Interpretive Center has been offering interpretive programs for approximately five years. The Silver Lake Interpretive Center provides interpretation activities for approximately 1800 people a year.

  The Storm Mountain Amphitheater has been offering interpretive programs for approximately five years. Interpretive programs have been suspended for the 1998 summer season due to funding shortfalls. Increased funding from the Forest Service or assistance through partnerships will be needed to restart interpretive programs at the Storm Mountain facility. Prior to 1998, the interpretive programs at Storm Mountain attracted over a thousand visitors a year.

  The ski naturalist program has been a part of the Forest Service's interpretive efforts for approximately eight years. The program provides interpretive ski hosts with skiers who wish to learn about the natural resources in the area. Nearly 300 people a year participate in the ski naturalist program.

- **Recommendation:** Salt Lake City will develop a K-12 watershed education program to present to students around the valley.

  Implementation: Solidify a partnership with the State Division of Water Resources and non-governmental water education organizations to develop a comprehensive watershed education program by September 1, 2000.

  Explanation: A watershed education program will be developed that is presented at schools around the Salt Lake Valley. This program may be presented on a class-by-class basis or as a school-wide assembly. The youth of the Salt Lake Valley need to be educated regarding how they positively and negatively impact the health of the Salt Lake City Watershed.

- **Recommendation:** The number of front-country and back-country contacts between interpretive specialists and watershed users should be increased.

  Implementation: Begin to increase the presence of interpretive specialists by June 1, 2000.

  Explanation: Currently there are few interpretive specialists in the Wasatch Canyons due to funding constraints. In order to effectively educate users regarding watershed concerns, more personnel are needed. If trained properly, these rangers are far more effective in conveying information than signs or interpretive displays. These specialists should also be trained to monitor and report on watershed violations or abuses.

  An increase in Forest Service funding is necessary to strengthen the interpretive specialist presence in the watershed. Without an increase in federal funding, the Forest Service must rely heavily on new partnerships to support interpretive personnel. Partnerships should be explored with schools/universities, church groups, businesses, and civic organizations.

- **Recommendation:** Develop a watershed education fact book/brochure that can be distributed to the public and K-12 teachers in the valley.

Implementation: This watershed fact book will be developed by April 1, 2000. Partnerships with the Utah Division of Water Resources and non-governmental water education organizations will be explored to develop a watershed education fact book/brochure.

Explanation: A concise, yet comprehensive guide is necessary to educate the public about the Salt Lake City Watershed. A wide variety of facts and figures will be presented in an attractive, easily understandable format. Items that may be covered include: recreation user numbers, water user numbers, land ownership, wildlife species and population estimates, dwelling unit numbers, aquatic ecology, water capacity and low impact hiking/camping guidelines. This fact book may be distributed by the individuals who are responsible for conducting the watershed education programs at schools around the valley. It will also be available at the ski resorts and other frequented areas in the canyons. Valley locations such as outdoor apparel stores, convenience stores, and recreation centers will also provide the fact books for the public. A public information campaign will be developed to notify the public regarding sites they can pick up the fact books.

- **Recommendation:** Salt Lake City will work with the media to promote watershed education.

Implementation: Begin immediately after the plan is adopted.

Explanation: The mass media may be an effective method to reach a large number of people in Utah. The public information campaign waged by UDOT toward preventing littering along Utah's highways was very successful. The success of the "Don't Waste Utah" campaign was due in part to a healthy budget and creative messages. A similar watershed education campaign may effectively inform thousands of Utahns about the importance of protecting the Salt Lake City Watershed. Other media coverage including television news, documentaries, radio programs, and newspaper articles will only help the overall watershed education effort. For example, a watershed education program formatted for television may provide an effective education tool for teachers and students throughout Utah.

- **Recommendation:** An education partnership between Salt Lake City and the United States Forest Service will be formalized.

  Implementation: Begin immediately after the plan is adopted.

  Explanation: In order to efficiently and effectively launch a watershed education campaign, the two largest jurisdictional agencies in the watershed must formalize an education partnership. A Memorandum of Understanding (MOU) will be drafted between the two agencies to solidify an agreement to work together in offering effective watershed education programs. This MOU would also foster greater coordination of education efforts between each agency. This coordination would minimize duplication of programming along with maximize sharing of staff and resources for educating the public about the watershed.

- **Recommendation:** Seek help from the congressional delegation for watershed management funding.

  Implementation: Begin immediately after the plan is adopted.

  Explanation: The funding shortfalls relating to watershed protection and recreation management are in part the result of federal budget cutbacks. Salt Lake City will work with the congressional delegation to enhance the federal commitment to public land resources in the Wasatch Canyons. Continual budget cuts in recreation management and watershed education require the Forest Service to rely more heavily on volunteers who may not have the training to properly educate visitors.

  The health of the water supply for over 400,000 people in Utah depends in large part on Forest Service management practices. The Forest Service needs additional funding on a line-item basis for new facilities, additional rangers, facility maintenance, and interpretive programs. For this reason, a lobbying effort highlighting watershed awareness and funding shortfalls needs to be conducted.

  Decision makers will be taken on watershed education tours. These tours would allow the decision makers to view the problems first hand. The land managers

may also discuss pertinent issues with the decision makers at this time. Such tours should be conducted on a bi-annual basis or when a change in representation has occurred after an election. These education efforts will occur at the federal, state and local levels. Salt Lake City and Salt Lake County need political support to continue effective watershed management. The decision makers will be updated on water quality trends and other related issues on a semi-annual basis.

- **Recommendation:** Watershed-specific interpretive displays at various points in each canyon will be constructed.

  Implementation: This will be a coordinated effort between Salt Lake City and the Forest Service and will begin by June 1, 2000.

  Explanation: Interpretive displays will be constructed at major trail heads throughout the watershed. These interpretive displays will contain messages that directly link human activities with watershed health. The displays would also focus on the fact that the water in the canyons is eventually consumed by over 400,000 people in the valley.

  Watershed features that are in close proximity to specific trailheads will be highlighted. For example, the beaver dam and lodge near the White Pine Trailhead will be described and the water quality benefits associated with the beaver pond explained. Other watershed features such as wetlands may also be identified on interpretive displays.

2. Current watershed signage is not effective in linking human activities to impacts on water quality.

- **Recommendation:** Evaluate current signage to determine how it can be modified to more effectively link human activities to impacts on water quality.

  Implementation: This will be a coordinated effort between Salt Lake City and the Forest Service which will begin by June 1, 2000.

Explanation: A coordinated effort between Salt Lake City, Forest Service and additional partners would be utilized to determine which signs do not adequately link human activities in the watershed to impacts on water quality. Restrictive signage, such as "NO SWIMMING," will continue to be employed, but will also be linked to watershed impacts through other more informational signs. For example, visitors would be provided with interpretive signage that explains why dogs are not allowed in watershed areas or why people are not allowed to swim in the streams or lakes. Providing visitors with an interpretive explanation of the policies may promote greater compliance.

Ridge lines will have adequate signage to inform and educate users regarding the different regulations from one canyon to the next. These signs would be less obtrusive due to their back country location, but situated so they are not missed by passing users. Continual monitoring and maintenance of all signs, front and back country, would be a priority of the Forest Service and Salt Lake City. Outdoor recreation clubs such as the Wasatch Mountain Club or other organizations that recreate along the Wasatch Range may provide the Forest Service and Salt Lake City with a beneficial land management service. These partnerships would be explored to maintain an effective signage program.

- **Recommendation:** Coordination of signage efforts among agencies.

Implementation: A formal agreement or MOU between Salt Lake City, Utah Department of Transportation, and the United States Forest Service will be adopted by June 1, 2000.

Explanation: Signage from canyon to canyon differs greatly. To date, the jurisdictional agency owning the largest portion of land has controlled the type and placement of signs. As a result, watershed signage is not uniform throughout the watershed. The MOU would specify agency responsibilities regarding design, installation, monitoring, and maintenance. To effectively educate watershed users, the interpretive signage campaign must be a coordinated effort.

- **Recommendation:** Develop an easily recognized watershed symbol.

  Implementation: Ongoing.

  Explanation: An interagency panel would be convened to develop a watershed symbol that may be recognized statewide. This symbol would be posted in all municipal watersheds around the state of Utah. A public information campaign may be necessary to educate the public about the new symbol and the meaning behind it.

  The interagency panel would consist of Salt Lake City Department of Public Utilities, Forest Service, Utah Division of Water Resources, other municipalities, and environmental education organizations. Creative methods for generating the symbol may be employed. For example, the Utah Division of Water Resources has promoted school contests to develop water education calendars. A similar contest may be utilized to develop a watershed symbol. Once developed, this symbol would be placed at all trail heads throughout the Salt Lake City Watershed. Interpretive text, accompanying the symbol, may also increase the awareness and education regarding responsible behaviors in the watershed.

3. Maintenance of existing partnerships.

- **Recommendation:** Salt Lake City will maintain existing partnerships with the Forest Service and Salt Lake County Sheriff to continue watershed education efforts.

  Implementation: Ongoing.

  Explanation: Salt Lake City will continue to support and encourage mutual involvement in watershed education with the Forest Service and the Salt Lake County Sheriff. To assist the Forest Service and Salt Lake County Sheriff, Salt Lake City will provide them with the watershed fact books and a basic training course in watershed/water quality education. All Sheriff Deputies and Forest

Service Rangers would be educated regarding watershed violations and would be able to convey to the public the reasons behind regulations and policies.

4. Lack of partnerships to aide in watershed education efforts.

- **Recommendation:** Salt Lake City will seek additional partnerships with local universities, state agencies, colleges, schools, and civic groups to strengthen education efforts.

  Implementation: Ongoing.

  Explanation: Additional partnerships may add needed monetary and human resources to the current watershed education efforts. Aspects of education that may benefit from an influx of money or volunteers include: designing interpretive displays, installing displays and signs, user surveys regarding the effectiveness of the displays, monitoring the displays, conducting routine maintenance, additional interpretive rangers, counting visitors, etc.

  There are many organizations that participate in various forms of recreation that may be willing to assist the jurisdictional agencies in their education efforts. For example, members of the Wasatch Mountain Club often participate in group hikes throughout the watershed. Also, the Department of Parks, Recreation and Tourism at the University of Utah requires its students to conduct two mandatory internships with some type of parks and recreation agency. In both instances, there may be people who are willing to assist in providing a comprehensive watershed education program.

C. DISPERSED RECREATION

1. Dispersed recreation may adversely impact water quality.

- **Recommendation:** Increase front country and back country patrols to encourage more responsible behaviors among users.

  Implementation: Begin increased patrols by June 1, 2000.

Explanation: Users may bypass interpretive displays, but it is more difficult for them to bypass an interpretive specialist who is speaking directly to them. Interpretive personnel perform a wide variety of essential functions in the front and back country. Their primary role is to educate the public regarding watershed and natural resource issues. They may alert law enforcement about watershed violations. They may also provide first aid care if necessary. Interpretive specialists may be used to accurately count visitors as well as monitor recreation impacts along trails and at campsites.

The use of interpretive personnel in the Salt Lake City Watershed is paramount to the success of educating visitors and managing their behaviors. Funding will be secured to establish an adequate force of rangers in the watershed. Partnerships would be fully utilized to optimize allocation of funds and resources. Salt Lake City would continue to work closely with the Forest Service to manage dispersed recreation. Partnerships will be developed with other jurisdictional agencies, university and civic organizations to complement the Forest Service's efforts.

- **Recommendation:** Study the merits of developing an overnight, back country use permit system for the lake basins.

Implementation: Implement a new, overnight, back country use permit system upon determining the feasibility of the system by Salt Lake City and the Forest Service.

Explanation: The lake basins in Big and Little Cottonwood Canyons have received heavy camping pressure. Despite posted regulations, people are still found camping too close to the lakes.

In receiving a permit, users would also be provided education information and materials on the watershed and how they will be responsible to minimize impacts to water quality. One goal of the permit system is to educate people to minimize their impact on the watershed. Another goal is to better track the usage around the lake basins and more accurately count the number of users in these areas.

The public will be notified in advance of the permit regulations. The notification would also reach groups that are known to regularly use the back country. These groups include churches, scouts, and schools.

Salt Lake City and the Forest Service are in favor of limiting use around the lake basins. People enjoy camping next to water for aesthetic and utility reasons. Unfortunately, water quality impacts occur unless strict precautions are followed by each back country user.

Note: The permit system will also provide additional information on canyon uses to help provide a more complete picture for assessing water quality impacts.

- **Recommendation:** Consider the feasibility of fee or information stations at the mouths of Big and Little Cottonwood Canyons for future management improvements.

Implementation: Begin exploring this option after the fee demonstration project has been evaluated by Congress. Evaluate the need for State statutory authority.

Explanation: Fee or information stations represent an effective method of managing visitor use and addressing resource degradation. The Forest Service is presently testing the fee station concept throughout the National Forest system. For example, the Mirror Lake Highway and American Fork Canyon are two locations in Utah that are hosting the fee demonstration project. If in the future the fee station concept is found to be feasible, the Forest Service will need another agency to sponsor the project.

The Millcreek Canyon fee station program coordinated between the Forest Service and Salt Lake County has been viewed as a success. Prior to the fee station, Millcreek Canyon was experiencing a large amount of vandalism and resource degradation. The fee station has provided a higher level of visitor management along with a new stream of funding. This funding is used for improving the facilities in Millcreek Canyon. The Forest Service and Salt Lake City Department of Public Utilities feel that seasonally operated fee stations in

Big and Little Cottonwood Canyons may generate similar results as Millcreek Canyon. The fee stations would aide Salt Lake City and the Forest Service in managing the watershed. In Little Cottonwood Canyon, concern has been expressed by the Town of Alta regarding a fee station. Future exploration of this issue will be closely coordinated with canyon residents and businesses.

2. Facility (restrooms, parking lots, picnic and camping sites) availability, operation, location, and maintenance may impact water quality.

- **Recommendation:** Evaluate facility availability, operation and maintenance concerns to more effectively serve public users and preserve water quality.

  Implementation: An evaluation of all facilities in the watershed will be complete by June 1, 2000.

  Explanation: In an effort to better serve watershed users and protect water quality, a facility evaluation will be completed. Inadequate or ill-maintained facilities may encourage users to park, camp, or relieve themselves in places that may jeopardize water quality. In order to encourage users to use watershed facilities, they will be available, convenient, and clean.

  An inter-jurisdictional evaluation effort will occur to document which facilities will be modified to serve watershed users and protect water quality. This evaluation will monitor usage levels across the four seasons at various facilities to determine where changes need to be made. The evaluation of facilities will include a priority list describing the facilities that are in need of immediate attention and facilities that may receive attention at a later date. Salt Lake City will study and discuss with the Forest Service the option of installing toilets in the wilderness areas in the watershed. Cost, maintenance and need issues must be assessed before this program is implemented.

- **Recommendation:** Increased coordination and funding are necessary to properly maintain restroom facilities. Agencies will make the maintenance, cleaning, upgrade, removal, and relocation of restrooms a priority.

Implementation: A formal agreement between Salt Lake City and the Forest Service will be adopted to solidify restroom responsibilities by July 1, 1999.

Explanation: A coordinated inter-agency effort will more effectively provide and manage restroom facilities in the watershed. A MOU would be drafted between Salt Lake City and the Forest Service to solidify restroom responsibilities. This MOU will contain a schedule to upgrade, remove or replace restrooms.

Additional funding sources will be sought for restroom improvements. The State Division of Parks and Recreation funds facility upgrade and replacement projects on a competitive grant basis. Fee programs in the canyons may also provide additional sources of funding for facility improvements.

The evaluation program described in the previous recommendation will be used as a guide to determine which facilities are in need of immediate attention. Current maintenance and cleaning schedules would be evaluated in relation to periods of use to determine how to better serve the public users.

3. Mountain biking off trails or on trails that are not designed for mountain biking contributes to watershed degradation.

- **Recommendation:** Evaluate the trails to determine which trails may or may not be used for mountain biking and then manage the trails accordingly.

  Implementation: Evaluation will commence by June 1, 2001.

  Explanation: The large increase in mountain biking throughout the Wasatch Canyons could not have been anticipated during the writing of the 1988 Watershed Management Plan. Mountain biking has grown to be one of the largest recreation activities in the United States. In 1997, over 57.3 million people participated in bicycling. During that year, mountain bikes accounted for 90% of all new bike sales (ORCA, 1997).

  Mountain biking on trails that are not designed for such use creates ruts in the trail. On steeper trails, these ruts facilitate gully erosion. This erosion then

contributes to stream sedimentation which may add to total coliform levels in the streams. Currently, a large portion of the Salt Lake Ranger District (USFS) maintenance budget is dedicated to mitigating mountain biking impacts.

The trail evaluation will look at trails that receive high levels of mountain biking use. Also, the design and structure of these trails must be evaluated to determine if simple modifications may be made or if trail closures to mountain biking are necessary. A trail designed for mountain biking should be 8 to 12 percent in grade. The average grade of trails used for mountain biking in the watershed is often 12 to 25 percent. Trail width should be at least 3 feet, optimally 4 feet.

4. Unexpected future recreation activities/trends must be addressed.

- **Recommendation:** Draft an MOU between Salt Lake City and the Forest Service outlining a management policy geared toward managing unanticipated changes in recreation use.

  Implementation: An MOU will be drafted and the terms agreed upon by January 1, 2001.

  Explanation: The enormous trend in mountain biking was unforeseeable. The 1988 Watershed Management Plan did not address unexpected future recreation activities. As a result, regulations governing mountain biking were established after impacts were incurred in the watershed. This Watershed Management Plan Update seeks to be proactive with unexpected future recreation activities and would provide guidance on how to manage such unforeseeable trends.

D. LAND USE/COMMERCIAL AND RESIDENTIAL DEVELOPMENT

1. Commercial development in the watershed may impact water quality.

- **Recommendation:** Support enforcement of the current Sensitive Lands Protection Regulations to ensure future development meets watershed protection ordinances.

Implementation: Ongoing.

Explanation: Salt Lake County adopted their revised Sensitive Lands Ordinance on January 21, 1998. Two notable changes were made to the ordinance which involve watershed concerns. First, the stream set-back for new buildings was extended from 50 to 100 feet. This new regulation will strengthen current watershed protection measures. The second significant change was regarding the development site. A new standard was developed called "limits of disturbance," which specifies an area in which construction and development activity must be contained. This new standard will decrease the amount of lands that are disturbed through accidental or unregulated construction practices.

- **Recommendation:** Salt Lake City will closely monitor variance applications to protect water quality.

Implementation: Ongoing.

Explanation: Currently, Salt Lake County notifies affected jurisdictions regarding building permit applications throughout the County. This process can sometimes be overlooked, but building permit and variance applications in the watershed need to be closely monitored by Salt Lake City Department of Public Utilities. If a variance or building permit application is found to jeopardize water quality, then Salt Lake City will respond accordingly.

- **Recommendation:** Salt Lake City will follow the existing (1991) or modified water sales policy ordinance.

Implementation: Ongoing.

Explanation: The water sales policy was developed based upon the high value of canyon waters due to the excellent quality and proximity of these waters to Salt Lake City. Also, water from canyon streams can be delivered to most city customers by gravity flow without pumping. Water used for snowmaking affords a degree of storage as it is usually the last to melt. Additionally, Salt Lake City has made major capital expenditures for facilities to treat water

coming from the canyons and these facilities operate most economically when they have greater quantities of water to treat (See Appendix E for a complete description of the current policy).

- **Recommendation:** The term "Close Proximity" as referred to in the Wasatch Canyons Master Plan under commercial enterprises (page 102) needs to be more specific. Salt Lake County is therefore encouraged to amend this section of the plan to reflect a more specific definition.

  Implementation: A formal recommendation will be made to Salt Lake County to amend this section of the Wasatch Canyons Master Plan by June 1, 2000.

  Explanation: The Wasatch Canyons Master Plan states "new commercial development will be required to comply with this plan. Any development proposals not in close proximity to existing ski resort areas in the Cottonwood Canyons or within commercially zoned areas in other canyons would require amendment to this plan. All significant proposals will require site specific suitability, traffic, water quality and other studies deemed necessary by the Planning Commission."

  This recommendation seeks more specific terminology regarding development proposals surrounding ski resorts. New language should be developed using maps or existing property boundaries.

- **Recommendation:** All affected agencies need to support and participate in Salt Lake County's pre-application meetings for developers who wish to build in the watershed.

  Implementation: Ongoing.

  Explanation: Salt Lake County should include all affected agencies on a mailing list to notify them of a building proposal which may be of concern to the agency. This effort should be reciprocated by the agencies who are notified. These building proposals need to be a priority for all agencies involved. If jurisdictional agencies are notified as soon as the permit process begins, then problems or conflicts may be averted due to an informed group of agencies.

- **Recommendation:** A new ordinance will be developed that regulates the use of herbicides, pesticides, insecticides, fungicides and fertilizers in the watershed.

  Implementation: Salt Lake City will develop a new ordinance to regulate the application of herbicide, pesticide, fungicide, and fertilizer in the watershed by January 1, 2001.

  Explanation: A new ordinance regulating the use of pesticides, herbicides, fungicides and fertilizer must be adopted to avoid water quality impacts from these agents. The use of chemicals and fertilizers should be avoided in the watershed when the effects may be hazardous to the health of water users.

- **Recommendation:** Support the Foothills & Canyons Site Development & Design Standards, Chapter 19.73 Landscaping and Vegetation B, #3. This recommendation is in support of a mandatory standard of native plant and tree species only for landscaping purposes in the canyons.

  Implementation: Ongoing.

  Explanation: Salt Lake County has adopted a revised version of the Sensitive Lands Protection Regulations. Salt Lake City supports the standard mandating the use of native plant species for landscaping purposes. The use of non-native or exotic species for landscaping may result in watershed degradation. Species such as purple loosestrife and tamarisk have had devastating effects on water courses around the western United States. This recommendation aims to avoid a proliferation of invasive, non-native species in the watershed. Management agency-sponsored watershed-rehabilitation or range-restoration projects are not considered landscaping, but rather large-scale efforts to restore watershed stability and minimize invasive, non-native plant species proliferation.

- **Recommendation:** Salt Lake City will participate in monitoring the current efforts to manage parking lots (pave/no pave, runoff abatement, snow removal, stream setbacks, and adequate facilities) at the ski resorts.

  Implementation: Ongoing.

2. There is a lack of inspectors to monitor all development issues.

- **Recommendation:** Increase funding and inter-agency coordination efforts.

  Implementation: Secure funding and develop inter-agency agreements to hire new inspectors to monitor watershed development concerns by January 1, 2001.

  Explanation: There are not enough inspectors to adequately monitor and track development projects in the canyons. Inspectors are needed to monitor water contracts and enforce seasonal usage regulations. Many commercial enterprises receive water on a seasonal basis due to their contract. In addition to water violations, inspectors would monitor new construction projects to ensure they comply with current watershed regulations.

- **Recommendation:** Increase inspection and enforcement of "bed and breakfasts" to ensure they comply with water and sewer regulations.

  Implementation: Work with Salt Lake County to increase inspections by January 1, 2001. Work with Salt Lake County to increase inspections by January 1, 2001.

- **Recommendation:** A new ordinance will be implemented that precludes residential development if the landowner does not connect to the sewer line.

  Implementation: A formal recommendation will be made to Salt Lake County to amend their Sensitive Lands Protection Regulations by June 1, 2000.

  Explanation: To avoid further watershed impacts from new housing developments, Salt Lake City recommends that all new houses be required to connect to the sewer line in Big and Little Cottonwood Canyons. The sewage holding vaults that are currently used by many homes often leak and cause negative watershed impacts. This ordinance aims at preventing future watershed impacts from sewage containment systems or septic tanks.

- **Recommendation:** Devise a solution to the problem of long term camping on private lands.

Implementation: Implement a solution to this problem by January 1, 2001.

Explanation: Some watershed property owners are not able to build on their property. As a result, they often reside in a trailer or motor home for extended periods of time. Problems may arise when they do not have adequate water or sanitation facilities. Water theft has occurred as well as water importation into the canyon. It is recommended that trailers and motor homes not be used as cabins. Salt Lake City would coordinate an inter-agency effort to devise a solution to this problem. Salt Lake County Planning, Salt Lake County Sheriff, and the Salt Lake City-County Health Department would be involved in this inter-agency effort.

E. LAND USE/MINING

1. Mining activities may impact water quality.

- **Recommendation:** Continue to support the Utah Division of Oil, Gas and Mining in their abandoned mine discharge monitoring.

  Implementation: Ongoing.

  Explanation: Although future large scale mining in the watershed is unlikely, many abandoned mines are located within the watershed. Some of these mines discharge various heavy metals and acids into the streams. It is the responsibility of the Utah Division of Oil, Gas and Mining to monitor the types of heavy metals and acids and their amounts being discharged from the mines. This is important information for Salt Lake City who has the responsibility of delivering clean water to their customers.

- **Recommendation:** Mining activities will meet watershed protection ordinances to avoid water quality impacts.

  Implementation: Ongoing.

Explanation: A coordinated effort between Salt Lake City, Salt Lake County, Bureau of Land Management Mines Division, and the Utah State Oil, Gas and Mining Division provides an increased awareness and knowledge for these agencies regarding proposed mining activities. There are several hundred mining claims that are still potentially active throughout the watershed. Salt Lake City would coordinate with the other affected jurisdictions and be prepared to address proposed mining operations. Large-scale mining in the watershed is unlikely to occur in the future. If proposals for large-scale mining are presented, Salt Lake City will have to re-address the issue at that time.

- **Recommendation:** Reclamation of problem sites is necessary.

  Implementation: A schedule of site reclamation projects will be established by January 1, 2001.

  Explanation: Problem sites should continually be identified until they are eliminated. For example, the Forest Service has recently closed the Tanners Flat campground in Little Cottonwood Canyon for remediation. For health of the watershed and its users, these sites should be found and the problems mitigated as soon as possible.

- **Recommendation:** Purchase mining rights.

  Implementation: Begin immediately after this plan is adopted.

  Explanation: The Watershed and Water Rights Purchase Fund was developed as a result of the 1988 Watershed Management Plan. It was established to purchase watershed property, water rights, and mining claims throughout the Salt Lake City watershed area. The fund receives approximately $250,000 a year from a small fee that is part of each water bill. Purchasing mining rights is the only 100 percent effective method for avoiding potential water quality impacts from mining.

F. LAND USE/GRAZING

1. Grazing in the watershed.

- **Recommendation:** Continue to support Forest Service efforts to phase out grazing.

  Implementation: Ongoing.

  Explanation: Salt Lake City and the Forest Service have agreed that grazing livestock in the watershed is not compatible with the best watershed management practices. Except for a few instances, livestock grazing occurs very infrequently in this watershed and would diminish further throughout the life of this plan.

- **Recommendation:** Increase the enforcement of livestock trespassing in the watershed.

  Implementation: Establish a new system for enforcement of livestock trespassing in the watershed by January 1, 2001.

  Explanation: Livestock may contribute significant impacts to the watershed when provided the opportunity to graze on watershed lands. In the past, agencies have been unable to impound a trespassing animal for a prolonged period of time. Arrangements will be made to hold trespassing livestock if necessary.

G. LAND ACQUISITION

1. Increase funding of the Public Utilities Watershed and Water Rights Purchase Fund.

- **Recommendation:** Increase funding of Public Utilities Watershed and Water Rights Purchase Fund.

  Implementation: Salt Lake City will address this issue by June 1, 1999.

Explanation: The current level of $250,000 is inadequate to purchase strategically important watershed properties. Along with purchasing property, the Watershed and Water Rights Purchase Fund is needed to purchase water rights and mining rights. Property values in the canyons have increased steadily over the past two decades. Lots that have a water connection may cost well over $100,000. Lots that do not have a water connection may be sold for approximately $5,000 or less. Several hundred private lots still exist in the watershed and in order for Salt Lake City to purchase strategically important property, funding of the Watershed and Water Rights Purchase Fund must be increased.

- **Recommendation:** Encourage Salt Lake County and Forest Service to increase their watershed property acquisition efforts.

  Implementation: Begin seeking funds immediately after the plan is adopted.

  Explanation: Salt Lake City alone does not have adequate funding to protect the watershed through purchasing private property. Salt Lake County, Sandy City, and the Forest Service also have interests and responsibilities in the watershed. A coordinated land acquisition effort between Salt Lake City, Salt Lake County and the Forest Service would yield a greater amount of watershed protection.

  Watershed property acquisition efforts may also be enhanced by partnering with businesses and private/non-profit organizations. A few parcels of land in the watershed have been purchased collaboratively with the help of several governmental and non-governmental organizations. These coordinated efforts have been successful in preserving watershed properties.

2. Use of innovative land use control strategies.

- **Recommendation:** Utilize innovative strategies such as conservation easements.

  Implementation: Establish a set of innovative land-use control strategies and inform the public about the tax benefits associated with these strategies by June 1, 2000.

Explanation: Private property owners in the watershed would be informed about the benefits of conservation easements. An owner of land who decides not to develop property may obtain tax benefits by donating the development rights to a public agency or qualifying non-profit organization. Development would be permanently restricted through a deed restriction.

Salt Lake City will explore developing a relationship with a local private non-profit land trust to assist in a property acquisition program. Land trusts have the benefit of being more proactive and flexible in land acquisition programs.

- **Recommendation:** Salt Lake City should have the opportunity to purchase lands at more than fair market value under limited circumstances that benefit the watershed.

  Implementation: A policy change should be made to reflect this recommendation by September 1, 1999.

  Explanation: Salt Lake City is often at a disadvantage when seeking to purchase a piece of property. Currently, the policy prevents them from paying more than fair market value for a piece of property. Landowners may feel their property is worth more than fair market value and are able to sell it at a price higher than fair market value. This often excludes Salt Lake City from purchasing the property. Through increased funding of the Watershed and Water Rights Purchase Fund and changing the policy regarding purchasing land at fair market value, Salt Lake City may be more effective in their watershed property acquisition efforts.

- **Recommendation:** Salt Lake City will work with Salt Lake County to be able to purchase tax sale properties for the tax value, not the market value of the property.

  Implementation: Salt Lake City will send a proposal to the Salt Lake County Assessor regarding the development of a policy regarding the purchase of tax sale properties in the watershed by January 1, 2000. This policy would then be adopted by the County Commission.

Explanation: Property on which taxes are in default is turned over to Salt Lake County for ownership. Salt Lake County then sells the property to the public. Salt Lake City's land acquisition and watershed protection efforts would be greatly enhanced if Salt Lake City could purchase the property for the value of the taxes owed to Salt Lake County. The agreement would state that Salt Lake City would have the first option to purchase the property from Salt Lake County.

H. WATER RIGHTS

1. Protection of current water rights.

- **Recommendation:** Continue to research options for utilizing water rights.

  Implementation: Ongoing.

- **Recommendation:** Maintain current water rights with the state engineer.

  Implementation: Ongoing.

2. Acquisition of water stock.

- **Recommendation:** Actively acquire stock in mutual irrigation companies with which Salt Lake City has exchange contracts.

  Implementation: Ongoing.

- **Recommendation:** Develop a program by which Salt Lake City can accept donations of water stock, or purchase it at fair market value.

  Implementation: Salt Lake City will have a donation mechanism in place by June 1, 2000.

3. Irrigation exchange contracts.

- **Recommendation:** Eliminate the exchanges and purchase the contracts outright.

  Implementation: Ongoing.

  Explanation: Increase communication and public relations with contract holders and irrigation companies. Publicize the price Salt Lake City is willing to pay for shares of water.

4. Currently not utilizing Millcreek as a culinary source of water.

- **Recommendation:** Continue to preserve water rights in Millcreek Canyon and maintain the current water right with the state engineer.

  Implementation: Ongoing.

- **Recommendation:** Manage Millcreek Canyon to maintain optimal water quality.

  Implementation: Ongoing.

5. Water conservation.

- **Recommendation:** Maintain the current rate structure to encourage conservation.

  Implementation: Ongoing.

  Explanation: The people of Utah rank among the highest water users per capita in the country. The state average for water consumption per person per day is approximately 270 gallons. The largest percentage of water use is in lawn watering. In Salt Lake City, lawn watering constitutes 49 percent of typical water use. Great reductions are possible in lawn watering because residents often over-water their lawns by as much as 50 percent. By maintaining the current rate structure, including seasonal rates, Salt Lake City hopes to encourage water

conservation through the recent increase in seasonal rates. This increase in rates has helped to decrease demand on the system during peak day and month usage.

- **Recommendation:** Salt Lake City will work with Salt Lake County to develop a policy regarding irrigation in the watershed.

  Implementation: A policy governing irrigation in the watershed will be developed and implemented by June 1, 2001.

  Explanation: Salt Lake City has stated the priority of delivering water to customers in the valley. One reason is that it is less expensive to deliver water to valley residents is because most of the water can be delivered by gravity flow. The policy would address the needs of the ski resorts to engage in small amounts of irrigation in the late spring to establish vegetation for erosion prevention.

I. PARTNERSHIPS

1. Maintain existing partnerships.

- **Recommendation:** All partners involved in watershed management should commit to meeting at least annually to assess watershed management concerns and determine areas that should be modified to ensure greater water quality protection.

  Implementation: Salt Lake City will formally notify all watershed partners of the annual meetings. The first annual meeting will take place by September 1, 2000.

  Explanation: Current partnerships involving Salt Lake City, Salt Lake County, United States Forest Service, Salt Lake City-County Health Department, various businesses, civic organizations, church groups, and education institutions must continue functioning to effectively manage the watershed.

Various partnerships, both formal and informal, have been effective in achieving the goal of providing excellent water quality to approximately 400,000 water users in the Salt Lake Valley. The partnerships include a Memorandum of Understanding between the Forest Service and Salt Lake City outlining management responsibilities in the canyons. Salt Lake City and County share watershed and development-related items on an ongoing basis. All agencies involved in watershed management rely on water quality and health concerns from the Salt Lake City-County Health Department.

In an effort to proactively manage the watershed, annual or more frequent coordination meetings involving all watershed partners would provide a forum to discuss current watershed management issues and concerns. These meetings would serve as an opportunity to devise solutions to problems or issues that may arise outside of the watershed management plan. Partners may also use these meetings as opportunities to discuss new program or management ideas and establish support for implementation.

- **Recommendation:** Salt Lake City will review and update all Memorandums of Understanding every two years.

  Implementation: The first bi-annual meetings for review and update all Memorandums of Understanding will commence by September 1, 2000.

  Explanation: Information and ideas shared at the annual watershed meetings will be used to review and update all currently active Memorandums of Understanding.

2. Form new partnerships.

- **Recommendation:** The Department of Public Utilities will, within 90 days of the adoption of the 1999 Watershed Management Plan by the City Council, form a partnership with interested stakeholders in the canyons, including community councils.

Implementation: Salt Lake City will facilitate the opportunity for residents, property owners and other interested parties to provide input to the department on regulations and management direction in the canyons, by forming a Watershed Partnership.

Explanation: The canyon residents feel that they have not had adequate opportunity to express their concerns over management issues in the watershed. This partnership would provide that opportunity.

3. Lack of partnerships to further augment watershed management.

- **Recommendation:** Seek additional partners from jurisdictional agencies, educational institutions, civic organizations, and private enterprise to strengthen watershed management. Explore the option of developing a technical advisory committee similar to the Jordanelle Technical Advisory Committee to assist in watershed management.

  Implementation: Ongoing.

  Explanation: Existing partnerships provide excellent watershed management. There will always be room for additional improvements utilizing new partnerships. The Wasatch Canyons Coordinating Committee (WACCO) was formed several years ago to serve as an advisory board for addressing watershed issues, but WACCO was not an effective body and was disbanded. Salt Lake City will explore forming a new technical advisory committee that is modeled after the Jordanelle Technical Advisory Committee. A new technical advisory committee aimed at strengthening watershed management would include all major jurisdictions along with the Department of Environmental Quality and the State Division of Water Resources.

J. CANYON GARBAGE DISPOSAL AND OTHER SERVICES

1. Current garbage disposal may affect water quality.

- **Recommendation:** Encourage Salt Lake County to maintain and improve the current garbage disposal system in the watershed.

  Implementation: Encourage Salt Lake County to maintain and improve the current garbage disposal system in the watershed by June 1, 2001.

  Explanation: The current garbage disposal system needs refining. Of primary concern is the garbage disposal system in Big Cottonwood Canyon. Currently, residents of Big Cottonwood Canyon are given two dumpsters in which to dump their trash. These dumpsters are located on the south side of the road, downhill from Cardiff Fork Recreation Area. The dumpsters often overflow sending trash into the surrounding area, including Big Cottonwood Creek.

  Salt Lake County has been responsible for garbage removal in Big Cottonwood Canyon. Salt Lake City would work with Salt Lake County to improve the garbage collection system. Other alternatives would be explored such as locating the dumpsters in another area closer to the residents and farther away from the creek and main highway.

- **Recommendation:** Encourage Salt Lake County to provide the residents of Big and Little Cottonwood Canyons with an opportunity for a neighborhood clean-up, similar to the program granted to Salt Lake City residents.

  Implementation: Encourage Salt Lake County to devise a neighborhood clean-up schedule for Big and Little Cottonwood Canyon residents by June 1, 2000.

  Explanation: Residents of Salt Lake City are provided an opportunity each spring to dispose of yard debris, old furniture, wood scraps, etc. Complaints surrounding the dumpsters in Big Cottonwood Canyon indicate that large pieces of furniture or appliances are left along-side the dumpsters. A specified

opportunity for residents to place these types of items outside their houses may alleviate some of the demand being placed on the dumpsters.

- **Recommendation:** Determine the feasibility of instituting a "Trash Free Watershed" program for canyon users (not canyon residents).

  Implementation: Conduct a pilot study in one area of the watershed by April 1, 2001.

  Explanation: Several years ago, the Maryland State Park system began designating many of its state parks "trash free." This was an effort to decrease maintenance costs and encourage more responsible behaviors from park visitors. The program uses minimal signage to notify the visitors that the area is "trash free," and that what ever trash is brought into the area must be taken out to be disposed of. Trash receptacles were no longer provided. As expected, this program took a little time to become effective, but is widely used throughout the state park system in Maryland. This program may help the problem of over-flowing trash receptacles and the amount of trash that is intended for the trash can but falls on the ground. This program may also help reduce costs associated with trash removal and clean-up. People may also associate this program with the need to safeguard our watershed. It is recommended that the pilot program take place in a relatively small area that receives a moderate amount of visitation. City Creek or Millcreek Canyon would be good locations to test this program.

K. WATER QUALITY

1. Water quality monitoring.

- **Recommendation:** Continue to use coliform as the prime water quality indicator. Develop a new, comprehensive water quality monitoring program utilizing state-of-the- art technology to identify additional watershed indicators. Utilize biological water quality monitoring in addition to chemical monitoring.

Implementation: Develop a new, comprehensive water quality monitoring program by January 1, 2000.

Explanation: Salt Lake City will continue to use coliform as the most reliable indicator of water quality in the watershed. In the meantime, money will be budgeted for a comprehensive watershed/water quality research project to study the canyons in order to attain more detailed watershed/water quality data. Other goals of this program will be to identify a more comprehensive indicator or watershed health and sources of water quality degradation.

Biological water quality monitoring consists of counting and identifying benthic macro-invertebrates to determine water quality. This method may augment chemical tests as well as provide additional information regarding the health of the aquatic systems.

Organizations such as Save our Streams, a branch of the Izaac Walton League, are committed to biological water quality monitoring on a seasonal basis. Biological water quality monitoring is a relatively simple process which can be incorporated into school science classes or scouting groups. Any additional watershed information that may be generated on a regular basis will increase our understanding of the watershed. These programs may be conducted by volunteers and represent a valuable service to the water users in the Salt Lake Valley.

2. Water quality in the watershed.

- **Recommendation:** Continue cooperative efforts between Salt Lake City, Salt Lake County, Forest Service, Salt Lake County Sheriff and Salt Lake City-County Board of Health to maintain excellent water quality and continue to strive for superior water quality.

  Implementation: Ongoing.

  Explanation: The existing cooperative agreements between Salt Lake City, Salt Lake County, Forest Service and Salt Lake City-County Board of Health have

enabled approximately 400,000 people in the Salt Lake Valley to enjoy excellent water quality. The plan recommends that these agencies continue to work under their respective agreements to manage the watershed for optimal water quality.

Salt Lake County has jurisdiction over zoning and building codes in the watershed. A MOU between the Forest Service and Salt Lake City was adopted in 1981, stating watershed management responsibilities for each agency. Salt Lake City has assisted the Salt Lake County Sheriff in funding officers for regulations enforcement. The Salt Lake City-County Board of Health has played an important role in water quality monitoring and enforcing water quality violations.

- **Recommendation:** The City shall undertake additional scientific studies and data collection programs to monitor and document water quality conditions and the health of the watershed. The additional studies shall be used to track water quality trends, to confirm best management practices and to establish further refinements to the Watershed Management Plan.

  Implementation: Ongoing.

  Explanation: Watershed research that does not adversely affect the watershed or water quality will be encouraged and welcomed by the major jurisdictional agencies in the watershed. Scientific research concerning the watershed may provide Salt Lake City and other agencies with additional information regarding how the watershed functions and how to identify or avoid adverse changes in the watershed. Salt Lake City would be the coordinating agency regarding watershed research proposals. Universities and colleges would be welcomed to conduct research if the research will not jeopardize the health of the watershed in any way.

- **Recommendation:** Eliminate the use of snowmaking additives if they are found to adversely impact the watershed and water quality.

  Implementation: Recommend manufacturer-funded research on limited sites in the canyons. The independent study scope must be agreed to by Salt Lake City.

The study should be commenced during the 1999/2000 ski season and run for a maximum of three consecutive years unless contra-indicated during any period of that time. If the study can not be initiated during the 1999/2000 season, no use of snow making additives will be allowed for that season. The manufacturer of the snow making additive, shall indemnify and hold Salt Lake City harmless from and against any and all judgements, claims, expenses, causes of action, damages and liabilities (including attorneys' fees) arising out of the study.

Explanation: Snowmaking additives are used by the ski industry to improve the effectiveness of the snowmaking process. The additives contain enzymes that provide a higher quality of artificially made snow. The impact of the additives on the watershed is unknown. Studies should continue to be conducted, for a maximum of three years unless contra-indicated during that time, at limited local ski resorts to determine if there are any adverse impacts to the watershed or water quality. If the studies show that the additives contribute negative effects on the watershed, then they may be prohibited from use at the four ski resorts in the plan area.

3. Zoning regulations.

- **Recommendation:** Continue to support the current Salt Lake County Sensitive Land Ordinances.

  Implementation: Ongoing.

  Explanation: Salt Lake County adopted a revised edition of the Sensitive Lands Protection Regulations for the Wasatch Canyons in January, 1998. Two notable changes were made to the ordinance that involves watershed concerns. First, the stream set-back for new buildings was extended from 50 to 100 feet. This new regulation will strengthen current watershed protection measures already in place. The second significant change was regarding the development site. A new standard was developed called "limits of disturbance," which specifies an area in which construction and development activity must be contained. This new standard will decrease the amount of lands that are disturbed through incidental construction practices. These new regulations assist in preventing future water

quality impacts. As new development issues are raised, it is important for Salt Lake City and Salt Lake County to work together to continually monitor the effectiveness of the Sensitive Lands Protection Ordinance. If amendments to the regulations need to be made, Salt Lake City supports changes that will prevent additional water quality impacts.

4. Watershed protection/enforcement.

- **Recommendation:** Continue to support Salt Lake County Sheriff's enforcement of watershed regulations.

  Implementation: Ongoing.

  Explanation: The Salt Lake County Sheriff patrols several of the canyons in the watershed. They are responsible for law enforcement and watershed regulations enforcement.

- **Recommendation:** Provide Sheriff's Deputies with adequate watershed education materials to educate users about the watershed.

  Implementation: Salt Lake City will provide the Sheriff's Deputies with watershed education materials by June 1, 2000.

  Explanation: Sheriff's Deputies issue hundreds of warnings and citations each year concerning watershed violations. If Sheriff's Deputies are equipped with education materials, they may assist in the overall watershed education efforts as well as prevent future watershed violations. The Watershed Fact Book, mentioned in the Watershed Education section of the recommendations, may be handed out to users by Sheriff's Deputies with each user contact. It is important for the Sheriff's Deputies to distribute educational materials due to the agency's regularity of encounters with the public.

- **Recommendation:** Assess the specific causes of riparian zone degradation in Big Cottonwood and Little Cottonwood Canyons, then develop cooperative solutions to better manage the activities that contribute to those impacts.

Implementation: Study the impacts to the riparian zones in Big and Little Cottonwood Canyons from hiking, biking, camping , fishing and other recreational activities. Work with the appropriate management agencies to reduce these impacts by addressing the uses in the order of their significance.

Explanation: Big and Little Cottonwood Creeks riparian zones are heavily used. Better managing the activities within these corridors will lead to improved water quality.

- **Recommendation:** The laws governing watershed protection will be updated.

  Implementation: Coordinate with the Salt Lake County Sheriff to review the current watershed regulations to make suggestions regarding which regulations will be updated, by June 1, 2000.

- **Recommendation:** Inform the judiciaries about the importance of upholding stiff penalties for watershed violations.

  Implementation: Distribute factual information by January 1, 2001 to all judiciaries who preside over watershed violation cases.

L. FIRE MANAGEMENT PLAN

- **Recommendation:** Salt Lake City will work with its partners in watershed management to develop a comprehensive wildfire management plan.

  Implementation: Developing wildfire management plan by January 1, 2001.

  Explanation: Salt Lake City and other affected agencies need to develop a comprehensive wildfire management plan to address future wildfires in the watershed. The present total attack and suppression policy on wildland fires must be re-addressed due to recent advances in forest ecology research and the high fuel loadings within the watershed. New strategies, including prescribed burns or allowing certain fires to burn will be explored.

Salt Lake City Department of Public Utilities, USDA Forest Service, Salt Lake City Fire Department, Salt Lake County Fire Department, the State Division of Forestry, Fire and State Lands, and others must be included in developing a comprehensive wildfire management plan.

The wildfire management plan will include all canyons within the watershed plan area and all foothill areas between City Creek Canyon and Little Cottonwood Canyon.

CANYON BY CANYON RECOMMENDATIONS

A. CITY CREEK CANYON

1. City Creek Master Plan.

- **Recommendation:** Review the need to update the City Creek Master Plan.

  Implementation: Review the need to update the City Creek Master Plan by September 1, 1999.

  Explanation: The City Creek Master Plan was adopted by Salt Lake City in 1986. The plan addresses land use and circulation issues in the City Creek Canyon area.

  The plan is 13 years old and an update may be necessary. Most of the recommendations from the 1986 plan have been implemented. Changes have occurred since 1986 in areas such as visitor use, visitor activities, increased residential development surrounding the canyon, a need for new facilities, etc. The changes that have occurred in and around City Creek Canyon since 1986 are reason to begin the process of updating the City Creek Canyon Master Plan.

2. Funding of City Creek Canyon.

- **Recommendation:** Explore alternative funding mechanisms such as a fee-booth, yearly pass, increased picnic fees, private foundation, etc.

  Implementation: Explore funding options and make a decision on the options by January 1, 2001.

  Explanation: There is a lack of adequate funding to properly maintain and upgrade the facilities in City Creek Canyon. Many of the toilet facilities are over 50 years old. These old, deteriorating toilets are not attractive which leads to visitors relieving themselves outside of the toilets. A new funding stream will enable Salt Lake City to implement the necessary facility improvements while increasing maintenance of existing facilities.

  The fee-booth system in Millcreek Canyon has produced many benefits for water quality, facility improvements, and visitor information. This system or a modified version serves as a model for developing an additional funding source for City Creek Canyon.

  Through developing a private foundation, Salt Lake City may apply for competitive grants to use for facility improvements. The foundation may also serve as a catalyst for generating funds through different types of fund raisers

3. Construction of an amphitheater.

- **Recommendation:** Identify an appropriate site and construct an amphitheater in City Creek Canyon to provide an effective setting for teaching watershed education.

  Implementation: Begin identifying potential sites by June 1, 2000. Begin construction by June 1, 2002.

  Explanation: City Creek Canyon is an excellent location for Salt Lake City to construct an amphitheater for watershed and other environmental education

programs. The topography of the lower canyon is suitable for an amphitheater. City Creek Canyon is located in close proximity to several public schools. The amphitheater will also play a major role in the overall watershed education program that this plan recommends.

4. Alternate bike and car days.

- **Recommendation:** Maintain the current policy.

  Implementation: Ongoing.

  Explanation: The current policy of alternating bikes and cars on the road in City Creek Canyon is serving users well. The road is not wide enough to safely allow bikes and cars to access the road at the same time. Salt Lake City feels this system will remain in place until future issues require the City to re-address the policy.

B. RED BUTTE CANYON

1. Canyon Management.

- **Recommendation:** Continue to support the Forest Service's management of Red Butte Canyon as a Research Natural Area.

  Implementation: Ongoing.

  Explanation: Red Butte Canyon is managed by the Forest Service as a Research Natural Area. Access is limited to veterans from the Veterans Administration Hospital, and nature-based research. Through limitations on human access, the canyon has become plentiful with wildlife providing a near-pristine example of a Wasatch Watershed. This management designation allows for Red Butte Canyon to be used as a biological control area for the rest of the Wasatch Canyons.

2. Increase in dogs and trespassers.

- **Recommendation:** Encourage the Forest Service and Salt Lake County to increase the number of law enforcement patrols in the area and ticket individuals who trespass in Red Butte Canyon. Encourage the Forest Service to post signage on the ridge lines along established trails to educate the public about Red Butte Canyon. Encourage the Forest Service to explore a partnership with the University of Utah Police Department to assist in patrolling Red Butte Canyon.

  Implementation: Make a formal recommendation to the Forest Service to implement these recommendations by June 1, 2000.
  Explanation: There has been a noticeable increase in the number of trespassers in Red Butte Canyon over the past few years. The increase primarily involves mountain bikers and people walking their dogs. As a result of this increased/illegal usage, the canyon is beginning to show more signs of impact. In order to retain the qualities and attributes of Red Butte Canyon as a Research Natural Area, greater enforcement of the boundaries is necessary.

B. EMIGRATION CANYON

1. Relatively Poor Water Quality.

- **Recommendation:** Educate residents regarding watershed regulations.

  Implementation: The residents of Emigration Canyon must receive the Watershed Fact book by October 1, 2000.

  Explanation: Emigration Canyon Creek has the lowest water quality of all the creeks in the plan area. Emigration Canyon also contains many houses situated along the banks of the creek. Many of these houses are more than 20 years old. These houses use septic tank systems which may contribute negatively to water quality. The residents of Emigration Canyon will be encouraged through the Watershed Fact book and other educational materials to minimize their impacts on the riparian zone and to try and keep their pets out of the water. Salt Lake

City wants to inform the public that all water throughout the watershed is valuable.

Salt Lake City will continue to protect the upper portion of Emigration Canyon for the option of future water use.

2. Access to Red Butte Canyon.

- **Recommendation:** Encourage the Forest Service and Salt Lake County to increase the amount of law enforcement patrols in the area and ticket individuals who trespass in Red Butte Canyon. Encourage the Forest Service to post signage on the ridge lines along established trails to educate the public as to why they are not allowed to enter the canyon.

  Implementation: Make a formal recommendation to the Forest Service by June 1, 2000.

  Explanation: Red Butte Canyon is managed as a Research Natural Area by the Forest Service. Access into the canyon is highly restricted. Uses are limited to nature study, research and fishing is allowed by veterans from the Veteran's Administration Hospital. Traffic in the canyon is limited to that necessary for the maintenance and operation of research and monitoring activities. Permission for access into the canyon must be gained through the Salt Lake Ranger District of the Forest Service.

D. PARLEYS CANYON

1. Management of Little Dell Reservoir.

- **Recommendation:** Continue to implement the recreation plan for Little Dell Reservoir.

  Implementation: Ongoing.

Explanation: The recreation component of the Little Dell Reservoir project was authorized in 1995. Three options were proposed, each with different facilities and recreation management guidelines. The option that was chosen includes 130 parking spaces, 19,400 feet of trails, 56 picnic sites, 2 boat launches, and 6 chemical toilets. Construction commenced in May of 1998 and is expected to be completed during the summer of 1998.

2. Management of Mountain Dell Golf Course.

- **Recommendation:** Continue to monitor the application of fertilizers and pesticides.

  Implementation: Ongoing.

  Explanation: Little Dell Golf Course is less than a mile from Mountain Dell Reservoir in an uphill direction. The creek that originates in Lambs Canyon runs through the golf course. Runoff from the golf course drains into this creek which then enters into Mountain Dell Reservoir. Golf courses normally require intensive use of pesticides and fertilizers to maintain optimal turf conditions. The fertilizers and pesticides normally run-off the turf with rainfall or even irrigation. In this case, Mountain Dell Reservoir receives the pesticide and fertilizer runoff.

  It is imperative that Salt Lake City continues to monitor the amount of fertilizers and pesticides applied to the Mountain Dell Golf Course. These levels must not exceed standards set for drinking water.

3. City picnic facilities in Affleck Park.

- **Recommendation:** Improve facilities for public use.

  Implementation: Make necessary facility improvements by June 1, 2000.

Explanation: Affleck Park which is located north of Little Dell Reservoir was in disrepair for several years following the fire in the late 1980's. The park contains several beautiful picnic sites along the creek.

The plan recommends that several old picnic tables be replaced and several of the picnic sites be closed due to their close proximity to the stream. One picnic site in Area 2 is situated on a wetland and will be moved.

4. Fishing regulations.

- **Recommendation:** Coordinate efforts with the Utah Division of Wildlife Resources to ensure regulations are properly posted in the proclamation and at fishing locations where special regulations are in effect.

  Implementation: Begin to work with the Division of Wildlife Resources upon adoption of this plan.

E. MILLCREEK CANYON

1. Current policy governing dogs and horses in the canyon.

- **Recommendation:** Support actions taken by the Forest Service to manage impacts from dogs and horses.

  Implementation: Ongoing.

  Explanation: Millcreek Canyon is the only canyon in the plan area that allows dogs and horses throughout the entire canyon. This has caused problems because in the past most people did not clean up after their dogs. Impacts were being incurred on water quality as well as on the visitor's experience. The Forest Service is continually monitoring the situation and implementing different approaches to solve the problem.

F. BIG COTTONWOOD CANYON

1. Dog permit system.

- **Recommendation:** The ordinance that allows residents of Big Cottonwood Canyon to have dogs will be modified to prevent future water quality impacts.

  Implementation: The ordinance will be re-addressed by June 1, 2000.

  Explanation: The Salt Lake County Sheriff's Deputies who patrol Big Cottonwood Canyon have estimated that the current dog permit system is being abused by over half of the dog permit holders. The abuses that are occurring need to stop to prevent water quality impacts.

  This plan recommends several options to incorporate into the new permit system. First, the permit colors may be changed from year to year. Also, only residents with a permit may be allowed to have a dog. Permits will not be transferable. Certified avalanche dogs may have separate permits. Violations of the new permit system will be dealt with using the "three strikes" rule. If a dog permit holder is cited for three violations, their permit will be revoked and their dog will be prohibited from entering the canyon. Other elements of a new dog permit system will be considered as the ordinance is revised.

2. Road management.

- **Recommendation:** Encourage UDOT to manage the road surface with special attention paid to water quality.

  Implementation: Draft a Memorandum of Understanding between Salt Lake City and Utah Department of Transportation by January 1, 2000.

3. Back country permits.

- **Recommendation:** Study the merits of developing an overnight, back country use permit system for the lake basins.

  Implementation: Implement an overnight, back country use permit system upon determining the feasibility of the system by Salt Lake City and the Forest Service.

  Explanation: The lake basins are the initial sources of water for Big Cottonwood Creek. For this reason, we must minimize our impacts in the lake basins.

  One of the reasons for instituting a group permit system is to educate users regarding "Leave No Trace" hiking and camping guidelines.

  This permit would be required for all lake basins in Big Cottonwood Canyon. The plan recommends that the minimum distance from a permitees tent to the lake shore be 300 feet. Dish washing will also be conducted no less than 300 feet away from the lake shore.

4. Skiing Interconnect.

- **Recommendation:** Monitor proposals to expand ski area Interconnect and respond to any potential adverse impacts on the watershed.

  Implementation: Ongoing.

5. Guardsman Pass.

- **Recommendation:** Evaluate carefully any proposal for improvements to the Guardsman Pass Road to prevent adverse impacts on the watershed.

  Implementation: Ongoing.

Explanation: Guardsman Pass is a partially paved road connecting Big Cottonwood Canyon to the Park City area. This road is not plowed and therefore is only open on a seasonal basis.

Traffic and recreational usage have increased steadily over the past several years. This increase in traffic may be a result of UDOT continually paving the road closer to the summit.

The two large developments that are planned on the Summit County and Wasatch County sides of the mountain may have adverse impacts on the Salt Lake City Watershed. These developments may provide an impetus for the road to be paved to the summit. This may lead to a year-round road. Year-round maintenance on this section of road may increase the amount of traffic in Big Cottonwood Canyon and the number of back country skiers/users in an area that has not received large amounts of year round use due to the seasonal road closure.

G. LITTLE COTTONWOOD CANYON

1. Town of Alta's dog permit system.

- **Recommendation:** Continue to support the Town of Alta's dog permit ordinance.

  Implementation: Ongoing.

  Explanation: The Town of Alta developed a dog permit ordinance several years ago which Salt Lake City supports.

2. Dog permit system.

- **Recommendation:** The ordinance that allows residents of Little Cottonwood Canyon (outside the Town of Alta) to have dogs will be modified to prevent future water quality impacts.

Implementation: The ordinance will be re-addressed by June 1, 2000.

Explanation: The number of people abusing the dog permit ordinance in Little Cottonwood Canyon is not as large of a problem as it is in Big Cottonwood Canyon. Nevertheless, Salt Lake City will be re-addressing the ordinance for both canyons. The abuses that are occurring need to stop to prevent water quality impacts.

This plan recommends several options to incorporate into the new permit system. First, the permit colors may be changed from year to year. Also, only residents with permits may be allowed to have a dog. Permits will not be transferable. Certified avalanche dogs may have separate permits. Violations of the new permit system will be dealt with using the "three strikes" rule. If a dog permit holder is cited for three violations, their permit will be revoked and their dog will be prohibited from entering the canyon. Other elements of a new dog permit system will be considered as the ordinance is revised.

3. Road management.

- **Recommendation:** Encourage UDOT to manage the road surface with special attention paid to water quality.

  Implementation: Draft a Memorandum of Understanding between Salt Lake City and Utah Department of Transportation by January 1, 2000.

4. Back country permits.

- **Recommendation:** Study the merits of developing an overnight, back country use permit system for the lake basins.

  Implementation: Implement an overnight, back country use permit system upon determining the feasibility of the system by Salt Lake City and the Forest Service.

Explanation: The lake basins are the initial sources of water for Little Cottonwood Creek. For this reason, we must minimize our impacts in the lake basins.

One of the reasons for instituting a group permit system is to educate users regarding "Leave No Trace" hiking and camping guidelines.

This permit would be required for all lake basins in Little Cottonwood Canyon. The plan recommends that the minimum distance from a permitees tent to the lake shore be 300 feet. Dish washing will also be conducted no less than 300 feet away from the lake shore.

5. Skiing Interconnect.

- **Recommendation:** Monitor proposals to expand ski area Interconnect and respond to any potential adverse impacts on the watershed.

  Implementation: Ongoing.

ENDNOTES

1. Tchobanoglous, George and Burton, Franklin L. 1991. 3rd Edition *Wastewater Engineering Treatment, Disposal, and Reuse.* Metcalf & Eddy, Inc. McGraw Hill Inc. New York City, pp. 93.
2. *Standard Methods for the Examination of Water and Wastewater,* (1980), 15th ed., American Public Health Association, New York.
3. Characklis, W. G. 1988. *Bacterial Regrowth in Distribution Systems.* AWWA Research Foundation, Denver, Colorado.
4. Ibid., p. 1125.
5. Tchobanoglous, George and Burton, Franklin L. pp. 93
6. Tchobanoglous, George and Burton, Franklin L.
7. Tchobanoglous, George and Edward D. Schroeder. 1987. *Water Quality.* Addison-Wesley Publishing Company. Reading, Massachusetts.
8. Darwin Sorensen, 1997. *Personal Communication.* Professor of Environmental Engineering, Utah State University.
9. Tchobanoglous, George and Burton, Franklin L. p. 93.
10. Ibid.
11. Utah Drinking Water Board, 1993. "Rules for Public Drinking Water Systems - Part I Rules for Administration of Systems". State of Utah Drinking Water Board, April 1993, pp. 43-44.
12. Ibid.
13. Schencks, Dan. 1998. *Personal Communication.* Canyon stream flow data. Salt Lake City Public Utilities.
14. Freund, John E. 1971. *Mathematical Statistics.* Prentice-Hall, Inc. Englewood Cliffs, New Jersey.
15. Utah Department of Environmental Quality, Division of Water Quality. 1993. *Standards of Quality for Waters of the State, R317-2, Utah Administrative Code.* Salt Lake City, Utah.
16. Ibid.
17. Childers, Daniel L. and James G. Gosselink. 1990. *Assessment of Cumulative Impacts to Water Quality in a Forested Wetland Landscape.*
18. Stern, David A. 1996. *Initial Investigation of the Sources and Sinks of Cryptosporidium and Giardia within the Watershed of the New York City Water Supply System.* Watershed Restoration Management: Physical, Chemical, and Biological Considerations; New York City Water Supply Studies. American Water Resources Association.

APPENDIX A

REFERENCES

Department of the Army, Corps of Engineers, Little Dell Lake Project Salt Lake City Streams, Utah. 1995.

Eckhoff, Watson and Preator Engineering, *Millcreek Water Treatment Plant Feasibility Study-Summary Report*, 1990.

Governor's Office of Planning and Budget, Demographic and Economic Analysis for Summit and Wasatch Counties., WWW, 1998.

Green, J.B., *Watershed Planning*, The Rocky Mountain Land Use Institute. 1997.

Lane Council of Governments and Lane County Land Management Division, *McKenzie Watershed Council Action Plan for Recreation and Human Habitat.* McKenzie Watershed Council.

Lane Council of Governments and Lane County Land Management Division, *McKenzie Watershed Council Technical Report for Water Quality and Fish and Wildlife Habitat.* McKenzie Watershed Council.

Lane Council of Governments and Lane County Land Management Division, *McKenzie Watershed Council Action Plan for Water Quality and Fish and Wildlife Habitat.* McKenzie Watershed Council.

National Water Research Institute, *The Santa Ana River Watershed Workshop*, 1995.

ORCA state of the industry report, 1997

Salt Lake City Department of Public Utilities, *Salt Lake City Watershed Management Plan.* Salt Lake City Corporation, 1988.

Salt Lake City Department of Public Utilities, *Watershed Management Division: Vision of the Future*. Salt Lake City Corporation, 1997.

Salt Lake City Department of Public Utilities, *Salt Lake City Watershed Management Programs 1847-1993*. Salt Lake City Corporation. 1993.

Salt Lake City Planning Department, *City Creek Master Plan*. Salt Lake City Corporation, 1985.

Salt Lake County Planning Division, *Revised Sensitive Lands Protection Regulations*, 1998.

Salt Lake County Planning Division, *Wasatch Canyons Master Plan*, 1989.

San Francisco Public Utilities Commission, *Watershed Newsletter*, San Francisco City span, World Wide Web Site. 1995.

San Miguel Watershed Coalition, *San Miguel Watershed Plan: A Collaborative Management Framework for the San Miguel Basin*. San Miguel Watershed Coalition, 1997.

U.S.D.A. Forest Service, *Wasatch-Cache National Forest Land and Resource Management Plan*. 1985.

Utah Division of Water Resources, *Utah State Water Plan: Jordan River Basin*, Utah Department of Natural Resources. 1997.

Schueler, T., *Crafting Better Urban Watershed Protection Plans*, Watershed Protection Techniques. 1995.

Tchobanoglous, George and Burton, Franklin L. 1991. 3rd Edition *Wastewater Engineering Treatment, Disposal, and Reuse*. Metcalf & Eddy, Inc. McGraw Hill Inc. New York City, pp. 93.

Standard Methods for the Examination of Water and Wastewater, (1980), 15th ed., American Public Health Association, New York.

APPENDIX B

EXISTING DOCUMENTS RELATING TO THE PLAN AREA

- Final Environmental Impact Statement for the Alta Ski Area Master Development Plan Update, April 1997.
- Final Environmental Impact Statement Brighton Ski Area Master Plan, August 2, 1991, and the Wasatch-Cache National Forest Record of Decision on that EIS.
- Draft Environmental Impact Statement, Solitude Ski Resort Master Development Plan, 1998.
- Salt Lake County Wasatch Canyons Master Plan, September 1989.
- Salt Lake City Watershed Management Plan, 1988.
- Wasatch-Cache National Forest Land and Resource Management Plan, 1985.
- Brighton Ski Area Planning Update and EA, 1988.
- Brighton Ski Area Master Plan, 1973.
- City Creek Canyon Master Plan, 1986.

APPENDIX C

LIST OF PREPARERS

BEAR WEST CONSULTING TEAM

Ralph Becker
Allan Daly
Dennis Earhart
Rulon Dutson
Emilie Charles
D.J. Baxter
Megan DePaulis, Editor

HANSEN, ALLEN & LUCE INC.

Greg Poole
Darek Kimball
Guy Harding

PUBLIC AGENCY WORKING GROUP

Florence Reynolds - Salt Lake City Department of Public Utilities
Jim Lewis - Salt Lake City Department of Public Utilities
LeRoy Hooton - Salt Lake City Department of Public Utilities
Jeff Niermeyer - Salt Lake City Department of Public Utilities
Russell Hone - Salt Lake City Department of Public Utilities, Watershed
Jim Scott - Salt Lake City Department of Public Utilities, Watershed
Becky Geist - Salt Lake City Department of Public Utilities, Watershed
Patty Klein - USDA Forest Service
Dan Jiron - USDA Forest Service
Dave Ream - USDA Forest Service
Jack Vanderberg - USDA Forest Service
Rick Ragan - USDA Forest Service
Charlie Condrat - USDA Forest Service
Cal Schneller - Salt Lake County Planning Division

Tom Schafer - Salt Lake County Planning Division
Sgt. Lane Larkin - Salt Lake County Sheriffs Department
Craig Hinckley - Salt Lake City Planning Department
Garth Miner - Salt Lake City/County Health Department
Susi Kontgis - Salt Lake City Office of Policy and Budget
John Oakenson - Sandy City Department of Public Utilities

SALT LAKE CITY DEPARTMENT OF PUBLIC UTILITIES

LeRoy W. Hooton, Jr. - Director
Jeffrey Niermeyer, P.E. - Deputy Director
Russell K. Hone - Watershed Management Supervisor
Florence Reynolds - Water Quality and Treatment Administrator/Project Manager
Jim Lewis - Chief Finance and Accounting Officer
Nick Kryger - Geographic Information Systems Coordinator

SALT LAKE CITY PUBLIC UTILITIES ADVISORY COMMITTEE

Mark Bauer
Tom Berggren
Ken Bullock
Elliott Christiansen
Pieter Vander Have
Louis Franke
Patricia Richards
Sharon Walkington, Chair

SALT LAKE CITY PLANNING COMMISSION

Andrea Barrows
Fred Fife
Arla Funk
Gilbert Iker
Diana Kirk
Craig Mariger
Jim McRea
Judi Short

Max Smith, Chair
Mike Steed

SALT LAKE CITY COUNCIL

Carlton Christensen, Vice Chair
Keith Christensen
Bryce Jolley, Chair
Joanne Milner
Tom Rogan
Deeda Seed
Roger Thompson

APPENDIX D

SUMMARY OF PUBLIC COMMENTS AND RESPONSES

Issues Raised

1. Watershed Education
2. Dispersed Recreation
3. Land Use/Commercial/Residential Development
4. Land Use/Mining
5. Land Use/Grazing
6. Land Acquisition
7. Partnerships
8. Canyon Garbage Disposal
9. Water Quality
10. City Creek Canyon
11. Red Butte Canyon
12. Emigration Canyon
13. Parleys Canyon
14. Millcreek Canyon
15. Big Cottonwood Canyon
16. Little Cottonwood Canyon
17. Other Issues/Comments

Public Commentors		
Letter/Comment No.	**Name of Individual or Organization Commenting**	**Topics Discussed**
01	John Veranth, Holladay	1, 2, 9, 11
02	Wesley Odell, Salt Lake City	1, 2, 17
03	Onno Wieringa, Alta	2, 16, 17
04	Rick Reese, Salt Lake City	2, 9
05	Save Our Canyons Gale Dick, Salt Lake City	3, 17
06	United Park City Mines Company/Edwin Osika, Park City	15
07	Snowbird/Jim Baker, Snowbird	1, 3, 7, 9, 16, 17
08	Tom Stephens, Salt Lake City	2, 3, 6, 15, 16, 17
09	Robert Athey, Salt Lake City	2, 14, 15, 16
10	Jeff Streba, Salt Lake City	2, 3, 9, 17
11	Frank Grover, Salt Lake City	2, 9, 15, 16, 17
12	John Moellmer, Salt Lake City	1, 2, 3, 5, 7, 8, 9, 11
13	Sierra Club/Ann Wechsler, Salt Lake City	1, 2, 3, 7, 15, 16, 17
14	Emigration Improvement District Richard Clark, Salt Lake City	12, 17
15	Big Cottonwood Canyon Association David Eckhoff, Salt Lake City	15, 17
16	Jim & Avis Light, Brighton	1, 2, 3, 8, 15, 17
17	Steven Alder, Salt Lake City	2, 4, 6, 7, 13, 17

COMMENTS	RESPONSES
Watershed Education Comments were made supporting the overall watershed education effort outlined in the plan. One comment stated that the education component was the most important in the document. The emphasis on the K-12 age group was commended.	Thank you for your comment.
It was noted that the Silver Lake Interpretive Center is an excellent program and has become a focus for recreational usage in the Brighton area. It was also mentioned that the Forest Service booth at Recreational Equipment Inc. could serve as a location to present watershed education materials.	Thank you for your comment.
It was noted that most of the watershed education recommendations should be fairly easy to implement, and funding of these programs should be a priority. A commentor stated that Salt Lake City should take lead responsibility with watershed education. The Sierra Club offered to participate in workshops and educational programs with other civic groups to strengthen existing programs.	Thank you for your comment.
Dispersed Recreation	
A comment was made regarding the need for back country toilets and how the Wilderness Act may allow for such improvements. The need for more toilets at trail heads throughout the watershed was stated.	Salt Lake City will study and discuss this option further with the Forest Service. Cost and maintenance issues must be assessed before this program is implemented.

COMMENTS	RESPONSES
It was stated that a back country permit system should not be imposed without hard scientific data supporting the action.	There is a concern over recreation impacts on water quality even though the data doesn't substantiate the impacts; nevertheless, we are going to take prudent measures while we continue to utilize innovative sampling/research techniques to more accurately pinpoint pollution sources.
A comment stated the group permit size number of 4 or more people should be increased to allow larger groups without a permit.	Upon implementation of a group permit system, the group permit size will be consistent with the group size limits imposed on groups in the three Wilderness Areas located in the watershed.
"The back country permit system should be implemented without cost to the users."	The group back country permit system will be free of charge. In addition to cautiously monitoring water quality impacts associated with recreation use, the permit's purposes are to educate back country users and more accurately count them.
It was stated that the back country permit system should be initiated in the back country, even though scientific evidence is lacking. Common sense suggests that uncontrolled back country use will degrade the water supply.	There is a concern over recreation impacts on water quality even though the data doesn't substantiate the impacts; nevertheless, we are going to take prudent measures while we continue to utilize innovative sampling/research techniques to more accurately pinpoint pollution sources.
"The requirement of a back country permit for camping in lake basins is reasonable providing that a good data base exists for justifying the number of permits issued and for the group sizes requiring permits."	Same response as above.

COMMENTS	RESPONSES
"The Forest Service should begin to explore various options in regulating camping around popular lake basins without delay, as indicated in the plan."	Same response as above.
Dispersed Recreation	
A comment suggested that recreationists are not the only group causing increases in coliform. Other causes cited for increased coliform include downhill ski areas, septic systems, motorists, cabin owners, campground guests, picnickers, restaurant patrons, and all other non-dispersed users.	All uses in the canyons create a cumulative effect on the watershed.
There is a need for more back and front country patrols to increase visitor contact.	Salt Lake City agrees with this comment and will look at different ways to increase visitor contacts in the front and back country.
The need to correct the trail problems being caused by mountain biking was addressed. Excessive amounts of erosion on the Great Western Trail which are being caused by mountain biking.	Salt Lake City and the Forest Service will continue to monitor the effects of Mountain Biking in the watershed and will devise a solution to the problem.
"Mountain biking on trails not suitable for their use is to be restricted. Forest Service policies need to be established as a priority as the impact due to back country bicycles is likely to further increase."	Same as above.
A comment stated that hikers as well as bikers are causing trail damage.	Salt Lake City recognizes that all uses in the canyons create a cumulative effect on the watershed and these changes will be made in the final Plan.
A comment was made that the plan, through its language, is prejudiced against dispersed recreationists.	Same as above.

COMMENTS	RESPONSES
There was an inquiry as to the number of back country users in the watershed each year.	One of the purposes for instituting a back country group permit system is to collect more accurate back country user data.
A comment stated that fires should be prohibited other than in designated/constructed fire pits.	A message aimed at educating back country users regarding fires will be incorporated into the group permit system.
Land Use/Commercial/Residential Development	
A comment states that fees and use restrictions should be imposed on ski area construction projects, ski area parking lots, and residential construction, in the interest of water quality.	Salt Lake City does not possess the authority to charge fees for these types of commercial projects. The Forest Service requires fees associated with leasing federal land. The ski resorts are required to pay a percentage of the lift ticket price to the Forest Service which is returned to the Treasury Department.
"Salt Lake City should adopt a policy that, subject to its contractual obligations and the legal rights of property owners, it will not support any new development or facility, or any modifications to an existing development or facility, in the canyons ."	Please refer to the Proactive Watershed Management Protection section in the recommendations chapter.
"It was stated that the ski resorts have been evaluating the impacts of ski area developments for the last 20 years and water quality has actually improved during that time period. The statement in the plan suggests that the ski resorts are doing the opposite and polluting the watershed."	Water quality has improved in Big and Little Cottonwood Canyons since the sewer lines have been constructed. Salt Lake City does not feel this negative view toward the ski resorts is represented in the Plan.

COMMENTS	RESPONSES
"Salt Lake City, UDOT, UTA and all of the resorts within the watershed meet continually to discuss problem and probable solutions to these parking issues. The ski resorts at the request of Salt Lake County and Salt Lake City Public Utilities have paved or are in the process of paving their parking lots to help insure a constant water quality standard."	Salt Lake City acknowledges this effort is occurring
"The water conservation issue to curtail future irrigation in the watershed is not clearly defined...; will the other contract water users in the watershed have the same restrictions as the resorts?	Salt Lake City will continue to adhere to its contractual obligations. We encourage leaving the watershed in its most natural form whenever possible. Salt Lake City strongly supports the Salt Lake County Sensitive Lands Ordinance regarding the use of native trees and plants. Native trees and plants do not require additional irrigation.
"Ski resorts help consolidate controlled use rather than having dispersed, uncontrolled use in the back country."	Salt Lake City recognizes this response.
"... a comment states that the word "may" needs to be deleted from the statement concerning impacts to water quality. Commercial development does degrade water quality through runoff from parking lots, roads and other surfaces, such as roofs and driveways."	Salt Lake City recognizes that all uses in the canyons create a cumulative effect on the watershed.
"The existence of commercial and residential structures increases the number of people in the canyons, resulting in increased pressure on the quality of the watershed."	Salt Lake City recognizes that all uses in the canyons create a cumulative effect on the watershed.

COMMENTS	RESPONSES
A comment states the 100' setback for structures should be extended to 300'.	The reason for the variation between campers' setbacks from water sources and structural development setbacks is a result of proper sanitation facilities (toilets and sewer hook-up) being required in new structures. Salt Lake City will amend its set back ordinance to be consistent with Salt Lake County's ordinance requiring a 100' setback.
"Ski resorts have been left out as part of the group to help plan and implement innovative land use strategies."	Opportunities have been made available to the resorts in the past and will be made available in the future.
"Ordinances regulating the use of herbicides, pesticides, and fertilizers in the watershed should only be developed after a well-controlled study is conducted... which demonstrates the need for such ordinances."	Adhering to the Salt Lake County Foothills & Canyons Site Development & Design Standards, Chapter 19.73 Landscaping and Vegetation B, #3, which allows only native trees and plants for landscaping in the canyons; hence, the use of herbicides, pesticides, and fertilizers are not necessary for maintaining native vegetation. Salt Lake City opposes the use of these chemicals in the municipal watershed.
"The new ordinance to preclude residential development without concurrent connection to the sewer line seems harsh... if the distance to the nearest sewer hook-up represents an excessive burden to the land owner."	State law requires any development within 300 feet of the sewer line to attach to the line.

COMMENTS	RESPONSES
"The proposed redefinition of legitimate recreation to prohibit long term camping on private property will require some thought..., due to potential legal ramifications."	Salt Lake City recommends the Salt Lake County zoning ordinance be enforced regarding this issue. This is a health issue due to the fact that adequate sanitary facilities and health regulations must be satisfied.
"Who gave Brighton permission to pave the entire upper circle and where are the new wetlands located?"	In an effort to preserve wetland integrity, the 1991 Record of Decision for the 1991 Brighton Environmental Impact Statement stated the approval by the Forest Service, Salt Lake City-County Health, and Salt Lake City to pave the Brighton parking lot, construction of catch and detention basins, enhancement of any affected wetland function, and maintenance of catch and detention basins, removal of floatables, and diffusion mechanisms. The new wetlands may be found to the north of the base of the Great Western Chairlift.
A comment states support for the Sensitive Lands Protection Regulations, although it views Salt Lake County's stance on variances as being too permissive.	Salt Lake City will actively participate in the development review process to monitor variance applications.
"...there has been an over-emphasis on the effect of cabin owners on water quality. They have always been an easy target.."	Salt Lake City recognizes that all uses in the canyons create a cumulative effect on the watershed.

COMMENTS	RESPONSES
"...regarding bed and breakfasts, Salt Lake County has instituted a permit system for "short-term" rentals (less than 30 days) which so far has not been utilized or enforced to any degree, at least in Big Cottonwood. The number of new homes and cabins being constructed is so small that to limit them further is almost meaningless compared to the glaring abuses already taking place."	This is a Salt Lake County zoning issue.
"Please define what "limited commercial"is. As I look at the ski resorts, I don't see any limits on their commercial endeavors."	Commercial developments located on federal lands within the watershed operate under Forest Service and Salt Lake County permits.
One comment states that the ski resorts impact the watershed greatly.	Salt Lake City recognizes that all uses in the canyons create a cumulative effect on the watershed.
Land Use/Mining	
A comment states that the words "large-scale" on page 112 are too vague.	The introductory phrase of this paragraph will be removed in the final Plan.
"The Utah Division of Oil, Gas, and Mining does not regulate a variety of mining activities either because they are too small (less than 5 acres) or due to the type of mining (sand and gravel, or building materials). The City should not rely on the State or County to protect the watersheds from mining, but should adopt its own ordinance with a mandatory mining plan and bond posted in advance of any disturbance."	Mining activities in the watershed are prohibited unless County, State, and Federal regulations are followed. Salt lake City will review and perhaps establish an ordinance addressing all mining activities in the watershed.

COMMENTS	RESPONSES
"The Division of Oil, Gas, and Mining administers the abandoned mine program which has funding for reclaiming many abandoned mine sites. This program should be coordinated with and referenced in the Plan as a source of funding for eliminating all existing abandoned mine sites."	Mitigation of safety hazards is funded through a tax on current coal production. A clause in the law allows for physical hazard mitigation to occur in hard rock mines. There is a fund in the clean water act dedicated to providing financial assistance mining clean-ups in watershed areas. These funds may be accessed in the future to assist in the clean-up of problem sites.
Land Use/Grazing	
"Increasing the enforcement to prevent livestock trespass may be difficult if intent to trespass must be demonstrated in order to gain a conviction. Recently, U.S. District Judge Benson ruled that for a sheep rancher to be convicted of illegally grazing sheep on federal land, the government must prove that beyond a reasonable doubt he did so "recklessly, knowingly or purposely.""	Thank you for your comment.
"Creating an impoundment facility for livestock in Salt Lake Valley could be very expensive."	Arrangements will be made to hold trespassing livestock if necessary.
Land Acquisition	
"...the recommendations for this section of the Plan are true and need to be part of the final Plan."	The city will pursue an aggressive land acquisition program. Current land acquisition funds need to be increased and other options such as establishing a non-profit organization/land trust will be explored.

COMMENTS	RESPONSES
"Someone should get a handle on park and ride lots while there is still undeveloped land available."	The city will pursue and aggressive land acquisition program. Current land acquisition funds need to be increased and other options such as establishing a non-profit organization/land trust will be explored.
A commentor noted the "City has the power of eminent domain, and should exercise its power to acquire lands for a public purpose rather than pay more than fair market value for any private lands. Acquisition of school trust lands are an exception."	Salt Lake City wishes to employ other land acquisition strategies.
Partnerships	
"Snowbird is interested in partnershipping with the Salt Lake City Department of Public Utilities to help maintain the high water quality standards that are present in the canyons today."	Salt Lake City is willing to explore all productive partnership opportunities.
"Partnerships that foster effective front and back-country contacts are definitely needed. For example, the Uintah-Cache National Forest and the Utah County Sheriff's office has established the Timpanogos Emergency Response Team which represents both agency's interests on Mount Timpanogos. The team consists of trained, qualified volunteers who spend weekends at the trail heads and in the back-country to provide medical and educational services to visitors. They also alert law enforcement about wildlife, civil, watershed, or wilderness violations. There is no significant cost to either agency."	Salt Lake City is open for all productive partnership opportunities.

COMMENTS	RESPONSES
"The Sierra Club, which conducts a hiking program throughout the year, would be most willing to help disseminate the materials that are developed, when hiking in the watershed. We could also participate in workshops and educational programs with other civic groups to strengthen existing programs."	Salt Lake City is open for all productive partnership opportunities.
"Partnerships are only helpful if the City doesn't have to compromise watershed protection in order to get cooperation. This is true for County Planning and Zoning, for the Sheriff's Office, and for the Forest Service. Does the Wasatch Canyons Master Plan control approvals or does the City's Water Plan? There is a lot of "work with," and "encourage," and "monitor," and "work closely with," language in the implementation of the plan. If that is all that can be done, then an effective advocate needs to be funded with the job being to forcefully advocate for the protection of the watershed with these entities. This position is more important than a ranger at Silver Lake."	Salt Lake City is open for all productive partnership opportunities.
Canyon Garbage Disposal A comment states that the idea to provide Big and Little Cottonwood Canyon residents with a neighborhood clean-up opportunity is excellent.	Salt Lake City agrees and will encourage this program be implemented by Salt Lake County.

COMMENTS	RESPONSES
"Another excellent idea is the concept of a "trash-free watershed." Critical to the success of such a program will be the establishment of an education program." "I would recommend Millcreek Canyon as a good test location, since the fee program is already in place and a "mind-set" already exists with regard to canyon usage."	This concept will be instituted in the back country through the group back country permit system.
"Collection of resident and day-user garbage is vastly improved over what is was a few years ago, but rather than dictate to private property owners and Salt Lake County that is should be better, the SLCDPU could and should participate in improving the system. There is need for a piece of land to place the facility -- couldn't you help?	Salt Lake County will remain in control of the garbage removal in Millcreek Canyon, Big Cottonwood Canyon, and Little Cottonwood Canyon. There is on-going work regarding this issue and Salt Lake City supports the outcome of the program.
Water Quality	
Comments were made suggesting the need for more correlational water quality data regarding canyon uses.	Money will be budgeted for a comprehensive watershed/water quality research project to study the canyons in order to attain more detailed watershed/water quality data.
A comment suggests the need to see coliform data if in fact increased coliform levels are continuing in the canyons.	The increased levels of total coliform were found in 1995, but have decreased since that was collected.
"I strongly favor maintaining water quality in the tri-canyon area and understand that fees and restrictions may have to be implemented in order to protect water quality."	Thank you for your comment.

COMMENTS	RESPONSES
A commentor does not understand the concerns over snowmaking additives.	Salt Lake City will support an independent study to determine the long term effects of snowmaking additives. In the meantime, it will allow usage of the additives on a highly controlled basis. Future proposals concerning watershed additives will be addressed on a case by case basis.
"...the use of additives for snowmaking should be disallowed until the results from a test area are well understood."	Same as above.
Another commentor states that if additives are found to harm the watershed, their use should be discontinued immediately.	Same as above.
A comment states that there is too much of a discrepancy between the distance campers are allowed to be to the water and the distance buildings are permitted to be to the water.	The reason for the variation between campers' setbacks from water sources and structural development setbacks is a result of proper sanitation facilities (toilets and sewer hook-up) being required in new structures. Salt Lake City will amend its set back ordinance to be consistent with Salt Lake County's ordinance requiring a 100' setback.
A commentor does not support the elimination of fish stocking in Big and Little Cottonwood Canyons because it would essentially eliminate fishing in the canyons.	Thank you for your comment.
City Creek Canyon	
"I think the interpretive rangers are not a bad idea and perhaps could be used to ticket snowmobilers who are regularly getting into upper City Creek (pristine area with little human impacts) and upper Cardiff Fork."	Thank you for your comment.

COMMENTS	RESPONSES
"I would suggest that you refrain from building an amphitheater in City Creek Canyon and use that money to form a partnership program with a local university and pursue greater understanding of our watersheds."	Thank you for your comment.
Red Butte Canyon	
A comment states that allowing hunters in Red Butte Canyon is incongruent with other uses in the canyon.	Thank you for your comment. The Forest Service stopped issuing permits for hunting in Red Butte Research Natural Area in 1996. Any hunters in Red Butte are hunting illegally.
Emigration Canyon	
"For Emigration Canyon Water users who are entirely dependent on underground canyon waters, PL101-634 is good news also, because it would effectively set aside the lands for use for Emigration residents."	The land exchange between Salt Lake City and the Forest Service was terminated in 1996.
"One further step that is necessary for Emigration water users is to ask Congress to remove Emigration from Salt Lake City Watershed designation under PL #199 in 1914. The City owns its own streamflow rights at the bottom of the canyon which are their historic rights of use which would be unaffected by Emigration's removal from the rolls of Salt Lake City Watershed."	Thank you for your comment. This is not a legally feasible option for Salt Lake City.

COMMENTS	RESPONSES
Parleys Canyon	
"The water quality in the lower segment of Parleys Canyon has suffered severe adverse impacts recently without any apparent regulatory review or control. What will the impact of these adverse changes by on future water needs, or in existing wildlife and recreation use?"	Salt Lake City has an interest in the water quality of the lower section of Parley's Creek in so much as to satisfy their exchange agreements.
"What type of oversight does the City have over the Management of Mountain Dell golf course? What is their use of pesticides, herbicides, etc."	Salt Lake City has total oversight over the management of Mountain Dell Golf Course. Salt Lake City Department of Public Utilities monitors and approves turf management plans.
"There need to be more intensive planning and supervision of the activities in the lower areas of Parleys Canyon and the other minor canyons and watersheds. The entire front is of course interconnected and the future needs for recreation and water by man and wildlife will also depend on what happens in these canyons."	Salt Lake City has an interest in the water quality of the lower section of Parley's Creek in so much as to satisfy their exchange agreements.
Millcreek Canyon	
"Combining this with the massive construction program undertaken with money from fees in Millcreek would lead people to believe all canyons should be paved over with asphalt including concrete and steel fire places and $50,000 outhouses. I believe the blank check given to whoever is managing Millcreek should be torn up, the fee booth taken out and no fees until the current development is examined and justified. Turning Millcreek canyon into	Thank you for your comment.

COMMENTS	RESPONSES
Liberty Park was not the purpose of instituting fees and by no means justifies more fee areas."	
"With all the money collected in Millcreek, I know of only two sections of trail where work has been done and both these were re-routing (building new trails) the Birch Hollow section of Pipeline trail and the Lambs Canyon trail. Both sections are definite improvements but pale in comparison to money spent on asphalt."	Thank you for your comment.
"...the wonderful solution to dogs in the winter has not solved the problem at all but only shifted use. Take a walk up Neffs or rattlesnake gulch or Porter Fork road sometime in winter during high pressure. You will smell and see what I mean."	Thank you for your comment.
"...Millcreek Canyon's fee system though having proven to be a very successful partnership with the county, has logistical problems which would be compounded for the Cottonwood Canyons. For example, significant delays have occurred in leaving Millcreek Canyon during unexpected evening storms."	Thank you for your comment.

COMMENTS	RESPONSES
Big Cottonwood Canyon	
"We believe that much of the destructive behavior that takes place in Big Cottonwood Canyon is a result of limitations of surveillance resources. Having to stop at a fee booth would at least let vehicle occupants be observed and would also communicate a message that they have been observed. Having license plat numbers on record would also be a deterrent to illegal acts.	Thank you for your comment.
"A fee station at the mouths of Big and Little Cottonwood Canyons could be instrumental in providing revenue for the support of adequate facilities. An exemption program would have to be worked out for residents, employees, and personnel on official business."	This program will require more exploration with other entities.
"First, no development associated with these two developments will occur in Salt Lake County. All development will occur in Summit and Wasatch Counties, and only those counties will be impacted by this development. Second, Park City, Summit County and Wasatch County have all placed restrictions upon developments which will prevent the improvement, up-grade or paving of the Guardsman's Pass road to Big Cottonwood Canyon. The Company has no intention to, nor will it, improve, up-grade or pave the Guardsman's Pass road to Big Cottonwood Canyon in conjunction with the proposed developments. Finally, the	Thank you for your comment.

COMMENTS	RESPONSES
Company also has no intention of increasing the number of back country skiers/users in the area because this use is not consistent with the Company's plans for development of these properties."	
"In the `50's, only a handful of rescue dogs were allowed - now over 300 are permitted in Big Cottonwood Canyon, ostensibly to residents."	There are not 300 rescue dogs in the watershed. This management plan will provide for a review of the dog ordinance.
A comment states that the fee station proposal for Big and Little Cottonwood Canyons is not appealing due to afford ability issues and the issue of agencies being responsible for their obligations in the canyons through their budgetary obligations.	This program will require more exploration with other entities.
"At our June 8th meeting your consultant, Ralph Becker, suggested that a more restrictive dog policy might be included in the plan, specifically that a proposal to restrict dogs to only full-time residents was being considered. We are definitely opposed to such a policy. First of all, many canyon cabin owners have purchased the special licenses for their pets, and they by-and-large control their animals. According to Sgt. David Nelson of the Salt Lake County Sheriff's Office, 95% or more of the dog problems they deal with are <u>not</u> associated with canyon residents or cabin owners. Rather the vast majority of the problems come from visitors bringing their unlicenced dogs into the canyon."	This management plan will provide for a review of the dog ordinance.

COMMENTS	RESPONSES
"Degradation of the watershed lands could be addressed with better off-road enforcement -- even though we have many Sheriff's Deputies patrolling, they are of necessity mainly working near the highway corridor. The need is for hiking/biking/skiing off-road patrollers to visit the vast areas inaccessible by conventional vehicles."	Thank you for your comment.
Little Cottonwood Canyon	
A comment stated the fee station language is too vague. Alta has instituted an information booth that has increased visitor contact and provided information without charging the visitors.	Thank you for your comment.
"The concerns about the fee station at the mouth of Little Cottonwood Canyon are evident. The intersection of S.R. 210 and S.R. 209 has historically created its own traffic congestion problems. If a fee booth were to be added this would only compound that problem. It appears to me that the fee booth is a land use issue and not a watershed issue. ... There is no question that more money should be appropriated for improvements within the Salt Lake Ranger District, but is a fee booth restricting use for commercial operations within Big and Little Cottonwood Canyons the answer?"	Thank you for your comment.

COMMENTS	RESPONSES
"Fee stations will serve not only as a funding mechanism, but will also serve as a means to educate the public on good watershed practices. I support the concept of fee stations."	This program will require more exploration with other entities.
Other Issues/Comments	
"The explanation concerning irrigation on Pg. 118 needs clarification."	Salt Lake City will continue to adhere to its contractual obligations. We encourage leaving the watershed in its most natural form whenever possible. Salt Lake City strongly supports the Salt Lake County Sensitive Lands Ordinance regarding the use of native trees and plants. Native trees and plants do not require additional irrigation.
"It is recommended that there be a definition section to make clear the intent of the drafters on certain terminology and wording.	Thank you for your comment. A glossary of watershed terms will be added to the final plan.
On page 128, the recommendation "3. Access to Red Butte Canyon" should be on page 127 proceeding "B. EMIGRATION CANYON" and following "2. Increase in dogs and trespassers."	The placement of this section is correct. Salt Lake City and the Forest Service are concerned about illegal access into Red Butte Canyon from the Emigration Canyon side.
"On page 111, under the second bullet item that talks of Bed and Breakfasts there is no explanation for picking out B&B's."	Bed and breakfasts may not have the appropriate sanitary holding tanks necessary to adequately hold sewage.
"On page 112, in the first sentence of the explanation in the first bullet item the word "who" should be removed."	Thank you for your comment.

COMMENTS	RESPONSES
"On page 124, the first bullet item states that the sheriff's department will receive educational materials by June 1, 1999. This date is 3 months earlier than the education materials are supposed to be completed. On page 99, first bullet item states, "This watershed fact book should be developed by September 1, 1999."	Thank you for your comment.
"The Summary and Conclusions on page 44 are not presented in a manner which logically supports more regulation of watershed usage. The first three conclusions seem to mitigate the need for additional regulation by stating that (a) the water quality is excellent, (b) the coliform counts which are present are not of fecal origin, and (c) even the spike of 1995 doesn't diminish the excellent quality of the water. I recommend that the section be rewritten to emphasize the necessity of preserving such high quality water in light of anticipated high impact usage."	The objective of the 1998 Watershed Management Plan is to develop an overall management direction to maintain high water quality.
"We would like to hear more about the potential for a Technical Advisory Committee. I have experience with the Wasatch Canyons Coordinating Committee, which was indeed disbanded, but for a period of time it brought development issues to the attention of interested persons. How did this prove "ineffective?"	The Wasatch Canyons Coordinating Committee was disbanded due to poor meeting management and facilitation.

COMMENTS	RESPONSES
"The best form of ownership and management was already devised under Public Law #101-634, the Salt Lake City Watershed Management Act of 1990. This City and the Forest Service would be well-advised to proceed immediately to resolve remaining differences so that the act may come to fruition."	The land exchange between Salt Lake City and the Forest Service was terminated in 1996.
"Under current law only public entities can acquire a water right to protect instream flows. Does the City intend to acquire rights and protect any minimum level of instream flows? At what levels?"	Salt Lake City has no intention of establishing instream flows. The State Department of Natural Resources requires and provides for instream flow regulations.
"The State Division of Forestry Fire and State Lands has been trying to get the counties to adopt wildland fire protection requirements into their planning and zoning ordinances to insure that buildings are not constructed in watershed areas with inflammable materials, and are properly protected from adjacent brush and vegetation. The City should support this effort and require the county's adoption of such an ordinance."	Salt Lake City supports this approach.
"What laws governing watershed need to be updated? Why would you ask the Salt Lake County Sheriff to review them? Why not the City or County Attorneys or a consultant? Shouldn't this review precede the final adoption of the plan?"	Salt Lake City would like the input and guidance of the Salt Lake County Sheriff to assist in reviewing watershed ordinances.

Summary of Additional Comments (received after the comment deadline).

"The usefulness of MOUs needs to be improved upon in the future and MOU issues should be brought to the attention of all possible impacted entities."

"The Salt Lake City/Forest Service Land Exchange needs to be revisited before possible questionable land deals which could impact negatively on watersheds are transacted."

"Over night camping in the Wasatch watersheds should be eliminated or require a special permit."

"A permit fee system if extended to Big Cottonwood and Little Cottonwood Canyons should also be covered by one yearly fee inclusive with Millcreek Canyon."

"The plans for an amphitheater should include placing its location in the lower canyon so as not to draw large crowds to the upper, more pristine areas."

"Renewal of canyon dog licenses on a yearly basis is unjustified."

"I support the "three strikes" concept for license provision violators, this will help eliminate the persistent scofflaw from having canyon dog licenses."

"Converting Big Cottonwood Creek to a totally wild fishery would have benefits for water quality but it seems counterproductive to the enjoyment of the canyon by a wide variety of users."

APPENDIX E

1991 CANYON SURPLUS WATER SALES ORDINANCE

The following is contained in Section 17.04.020 of the Ordinance:

Preamble-Permit Required for water use - Conditions. Preamble.
Beginning in 1888, the city acquired extensive water rights to the Wasatch Canyon stream flows through exchange agreements with irrigation companies and control over the city's watershed through state and federal legislation. Under state law, the city can only sell its surplus water outside the city's limits. The city has determined that except snowmaking, fire protection and water from possible springs it does not have surplus water for sale in its watershed canyons. This determination is based upon the following: canyon waters are extremely valuable to the city because they are the city's closest high-quality water supplies; water from canyon streams can be delivered to most city customers by gravity flow without pumping; and water used for snowmaking affords a degree of storage as it is usually the last to melt. Additionally, the city has made major capital expenditures for facilities to treat water coming from the canyons and they operate most economically when they have greater quantities of water to treat. Also, controlling issuance of new permits for water supply in the watershed area hereunder is consistent with the city's 1988 Watershed Management Plan for the protection of the city's watersheds.

APPENDIX F

SALT LAKE CITY/U.S. FOREST SERVICE MEMORANDUM OF UNDERSTANDING

This Memorandum of Understanding entered into this 14th day of January, 1981, by and between WASATCH-CACHE NATIONAL FOREST, FOREST SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE, hereinafter called SERVICE, and SALT LAKE CITY CORPORATION, a municipal corporation of the State of Utah, hereinafter called CITY, concerning the management of certain lands in the Wasatch-Cache National Forest in Salt Lake County, Utah, which are also the municipal watersheds for Salt Lake City, Utah.

WITNESSETH:

WHEREAS, the SERVICE is charged by Presidential Proclamation, federal law and regulation to manage the lands known as the Wasatch-Cache National Forest, and portions of these lands are included in the watershed drainages known as Little Cottonwood Canyon, Big Cottonwood Canyon, Millcreek Canyon, Neff's Canyon, Parley's Canyon, Lambs Canyon, Dell Canyon, Emigration Canyon, and City Creek Canyon; and

WHEREAS, the Federal Act of September 19, 1914 sets aside lands described in the Act (principally Big and Little Cottonwood Canyons) as a municipal water supply reserve for the use and benefit of Salt Lake City and directs administration by the Secretary of Agriculture in cooperation with Salt Lake City and the State of Utah has granted extraterritorial jurisdiction to all Utah cities to enact ordinances pertaining to prevention of pollution or contamination of the streams or water courses from which inhabitants of the cities derive their water supply; and

WHEREAS, the SERVICE and the CITY recognize that in the administration and planning for all activities and development on National Forest lands within the City Watershed areas that the protection of water quality is a prime consideration; and

WHEREAS, CITY owns certain lands within the boundary of the Wasatch-Cache National Forest in Salt Lake County, Utah.

NOW, THEREFORE, in consideration of the premises, the parties agree as follows;

A. The SERVICE, through representatives of its Forest Supervisor will:

1. Solicit input from CITY in all land use planning done by the SERVICE on areas within said watersheds.

2. Authorize improvements needed by CITY to protect or develop water on National Forest lands within the watershed areas. Proposed improvements will be analyzed for compliance with all provisions of the National Environmental Policy Act, the Multiple-Use Sustained Yield Act and other laws and regulations which apply to the management of National Forest land.

3. Authorize no water developments within the watershed areas until after consultation with the CITY.

4. Provide for collection of garbage from all developed picnicking and camping areas on National Forest lands in Big Cottonwood, Little Cottonwood, and Millcreek Canyons.

5. Assume primary responsibility for the development and management of recreation sites on National Forest lands in Big Cottonwood, Little Cottonwood, and Millcreek Canyons.

6. Assume primary responsibility for the development and maintenance of sanitation facilities to serve recreation users on National Forest lands in Big Cottonwood, Little Cottonwood and Millcreek Canyons. Authorize the CITY to install and maintain sanitation facilities on National Forest lands in these canyons to serve recreation users when requested by the CITY and when the SERVICE is unable to provide the necessary facilities. This authorization will comply with requirements of the Multiple-Use Sustainable Yield Act, the National Environmental Policy Act and other laws and regulations which apply to the development of these facilities.

B. The CITY through representatives of the Public Utilities Director, will:

1. Make available to the SERVICE, water necessary to supply existing developed recreation and administrative sites to be paid for at a rate not to exceed established rates

to other users in the same or similar areas, but pursuant only to a separate written agreement.

2. Assume primary responsibility for the development and management of recreation and sanitation facilities in City Creek Canyon, Dell Canyon, Parley's Canyon, and Lambs Canyon.

C. SERVICE and CITY, through their representatives, will jointly:

1. Cooperate in fire prevention and suppression on all City and National Forest lands within the watershed area. This cooperation will be assured through the existing Cooperative Agreement. The extent of participation by either party will depend on the availability of funds and/or manpower.

2. Cooperate in the pumping of toilets within developed recreation sites on National Forest lands within the watershed areas by CITY and SERVICE pumping their own toilets.

3. Cooperate in law enforcement on all City and National Forest lands within the watershed area.

4. Work toward the acquisition of private land by CITY and SERVICE, and to make those land exchanges necessary to consolidate blocks of land in one ownership within the watershed areas to facilitate and improve overall land management and administration.

5. Share all available information concerning water quality, water production, and water use.

6. Prior to any transaction, each will review with the other, any proposed land exchanges, donations, or sales which would convey City or National Forest lands within watersheds into private ownership.

7. Prepare a Plan of Operation revised from time to time as SERVICE and CITY agree spelling out the extent of cooperation to be exercised in the administration of the following in the watershed areas:

a. Grazing

b. The erection and use of signs

c. Off-road vehicle use

d. Summer and winter dispersed recreation use

e. Big Game harvest and habitat management

f. Watershed restoration

g. Fire prevention and suppression

h. Special Use permits

I. Land use planning

j. Special projects and new programs

It is not intended that said plan shall be binding on the parties. It shall be only a working tool subject to change as conditions dictate. Changes in said plans shall be discussed in advance so that both parties have a clear understanding of any consequences affecting their respective programs and interests.

THE PARTIES FURTHER AGREE AS FOLLOWS:

a. That nothing in this agreement shall affect the rights of CITY or SERVICE, or others to use water yielded from the National Forest lands covered by this memorandum.

b. Nothing in this memorandum shall be construed as obligating SERVICE or CITY to expend funds, or as involving the SERVICE or the CITY in any contract or other obligation for future payment of money, in excess of appropriation authorized by law.

c. SERVICE will continue to exercise authority in control and management of the National Forest land covered by this memorandum as in the case of other National Forest land, except as specified in this memorandum.

d. The CITY will continue to exercise authority in control and management of the City-owned land covered by this memorandum as in the case of other City-owned land, except as specified in this memorandum.

e. This Memorandum of Understanding shall remain in effect until 90 days after written notice from either party to the other that they no longer wish to be a party to this document.

f. No member of or Delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this agreement or to any benefit that may arise therefrom unless effected as part of an agreement controlled hereby with a corporation for its general benefit.

IN WITNESS WHEREOF, the parties hereto have executed this memorandum as of the date first above written.

SALT LAKE CITY CORPORATION
By_____
MAYOR
ATTEST:

_____
CITY RECORDER

U.S. FOREST SERVICE
By_____
SUPERVISOR WASATCH-CACHE NATIONAL FOREST

ATTEST:

_____

APPENDIX G

AVERAGE DAILY TRAFFIC IN THE WATERSHED

Canyon	Year	Average Daily Traffic
Emigration	1989	1,735
	1990	1,800
	1991	2,180
	1992	2,250
	1993	2,285
	1994	2,395
	1995	2,540
	1996	5,980
Parleys	1989	23,975
	1990	24,810
	1991	27,130
	1992	29,570
	1993	30,690
	1994	34,025
	1995	36,985
	1996	37,125
Millcreek	1996	435
	1997	424
Big Cottonwood	1988	4,280
	1989	3,725
	1990	3,900
	1991	4,100
	1992	4,320
	1993	4,385
	1994	4,575
	1995	4,560
	1996	4,820

Little Cottonwood	1989	12,085
	1990	15,055
	1991	15,235
	1992	15,715
	1993	16,086
	1994	16,880
	1995	16,375
	1996	16,540

Sources: Utah Department of Transportation, Salt Lake County Parks and Recreation

APPENDIX H

HOUSING UNITS IN THE PLAN AREA

Canyon	Year	Year Round	Seasonal	Total
Emigration	Census	308	4	312
	1990	2	0	314
	1991	3	0	317
	1992	9	0	326
	1993	21	1	348
	1994	27	0	375
	1995	28	0	403
	1996	27	0	430
	1997	22	0	452
	Total	**447**	**5**	**452**
Parleys	Census	0	102	102
	1990	0	2	104
	1991	0	0	104
	1992	0	1	105
	1993	0	2	107
	1994	0	3	110
	1995	0	2	112
	1996	0	2	114
	1997	0	1	115
	Total	**0**	**115**	**115**
Millcreek	Census	0	74	74
	1990	0	0	74

Canyon	Year	Year Round	Seasonal	Total
	1991	0	0	74
	1992	0	0	74
	1993	0	0	74
	1994	0	0	74
	1995	0	0	74
	1996	0	0	74
	1997	0	0	74
	Total	**0**	**74**	**74**
Big Cottonwood	Census	100	321	421
	1990	2	8	396
	1991	3	0	434
	1992	5	2	441
	1993	9	6	456
	1994	2	2	460
	1995	3	2	465
	1996	2	4	471
	1997	12	2	485
	Total	**138**	**347**	**485**
Little Cottonwood	Census	88	108	196
	1990	1	1	198
	1991	18	0	216
	1992	1	0	217

Canyon	Year	Year Round	Seasonal	Total
	1993	0	0	217
	1994	0	1	218
	1995	19	1	238

Source: Salt Lake County Planning

APPENDIX I

GLOSSARY

Acre-Foot of Water	The volume of water that will cover an area of one acre to a depth of one foot.
Back Country Recreation	Recreation use that requires few, if any, improvements and usually occurs in areas greater than 1 mile from established roads
Cfs	Cubic feet per second
DEQ	Utah State Department of Environmental Quality
Dispersed Recreation	Recreation not limited to controlled, established recreation areas, widespread impacts
Effluent	Processed water coming out of a facility, finished water
EPA	Environmental Protection Agency.
Fecal Coliform	Group of microscopic organisms found in the gut of warm blooded animals

Front Country Recreation	Recreation that requires facilities, resulting in the concentrated use of an area, such as campgrounds.
Hydrologic	Referring to the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.
Influent untreated water	Source water coming in to a facility,
Interconnect	Road, lift, tram etc, that would allow easy access between ski resorts in neighboring canyons
MOU	Memorandum of Understanding.
MWD	Metropolitan Water District of Salt Lake City.
RNA	Research Natural Area.
UDOT	Utah Department of Transportation.
Total Coliform	Group of microscopic organisms generally found when fecal contamination from warm blooded animals is present, indicator organisms

Watershed	The region draining into a river, river system, or body of water.
Zoning	The process used to establish or distinguish an area from other similar areas for a specific purpose.

APPENDIX J

WATER QUALITY DATA

Water quality data follow this page.

All Water Treatment Plants

Mean Annual Raw Water Coliform Bacteria

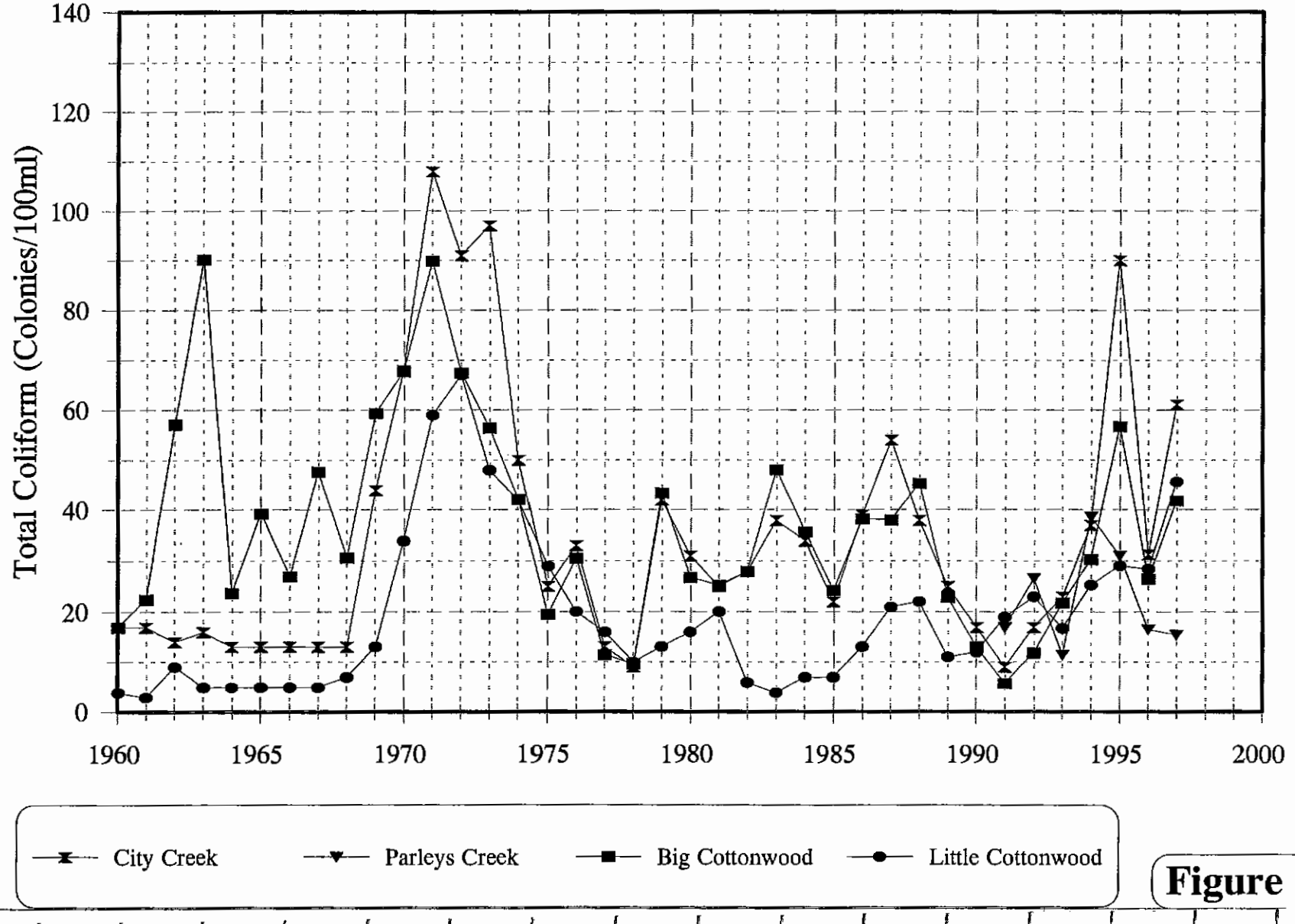

Figure 1

Selected Wasatch Front Streams

Mean Monthly Stream Flows: 1987-1996

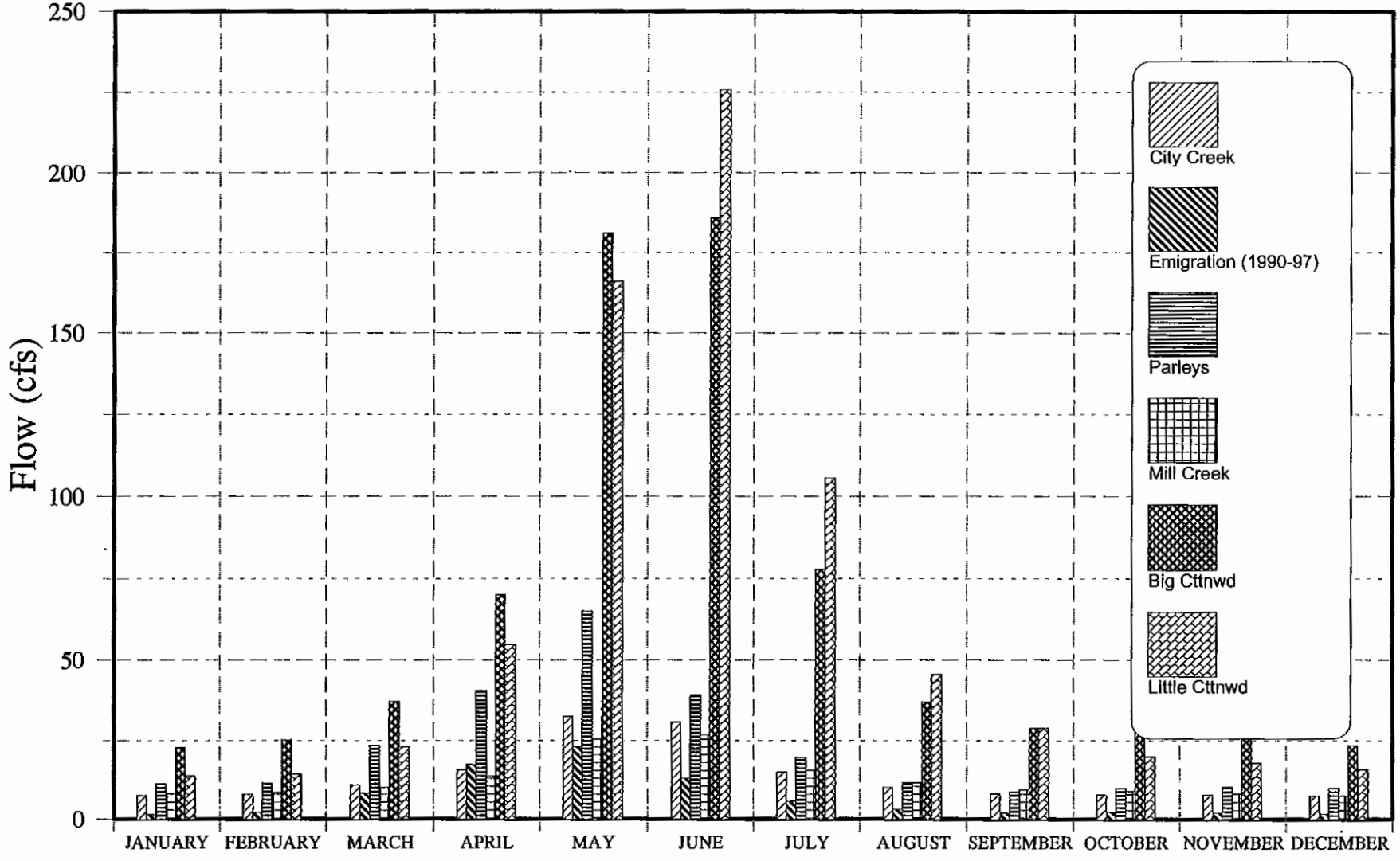

Figure 2

TREATMENT PLANT INTAKE COLIFORM DATA

TREATMENT PLANT INTAKE COLIFORM DATA													
City Creek - Raw Stream Total Coliform													
colonies/100 ml													
		raw water influent to the treatment plant											
	January	February	March	April	May	June	July	August	Septembe	October	November	December	Year Avg.
YEAR	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
1960	8	15	14	13	13	30	25	49	12	10	15	4	17
1961	2	1	2	3	8	26	47	77	25	11	3	4	17
1962	3	4	6	9	13	32	31	20	16	13	9	11	14
1963	16	10	6	7	15	17	27	26	36	19	5	6	16
1964	4	3	2	6	28	20	21	17	22	13	12	13	13
1996	30	30	21	15	37	7	43	51	40	55	70	30	13
1966	9	13	14	10	15	24	53	36	37	26	21	24	13
1967	31	19	18	18	35	20	43	61	36	24	14	17	13
1968	21	12	15	14	22	32	57	57	31	21	12	19	13
1969	25	14	8	17	26	41	64	78	64	78	42	67	44
1970	34	31	33	35	78	65	76	147	86	76	82	76	68
1971	65	75	51	56	54	52	229	284	172	71	102	79	108
1972	95	89	85	81	140	52	162	142	85	76	50	34	91
1973	50	50				61	258	226	91	60	59	15	97
1974	27	52	72	147	62	50	41	40	14	29	31	40	50
1975	42	37	61	40	21	27	20	20	15	5	8	3	25
1976	2	1	10	35	14	54	86	82	94	10	3	9	33
1977	5	4	5	7	6	13	48	35	14	9	2	11	13
1978	2	4	7	4	2	4	19	20	14	4	6	23	9
1979	23	42	32	25	58	52	52	75	73	9	20	38	42
1980	40	44	38	32	48	25	47	40	31	22	6	4	31
1981	12	7	15	14	13	9	59	55	21	21	17	53	25
1982	20	22	31	30	32	25	35	42	37	16	16	26	28
1983	28	20	20	17	25	46	42	68	47	34	20	90	38
1984	98	40	58	45	42	22	22	26	33	13	3	4	34
1985	6	2	11	12	20	26	47	48	37	20	14	21	22
1986	13	16	18	36	21	79	71	58	29	57	37	36	39
1987	19	45	47	87	73	41	74	102	53	15	49	37	54
1988	41	31	8	14	15	34	71	141	53	9	18	24	38
1989	22	21	32	43	48	28	44	24	11	9	9	7	25
1990	4	7	6	9	8	21	32	30	44	25	4	8	17
1991	2	6	5	12	3	5	48	9	11	6	2	3	9
1992	1	13	26	12	9	14	82	14	5	9	16	7	17
1993	3	2	10	18	14	6	31	35	42	51	35	33	23
1994	39	55	48	56	25	16	31	14	12	22	18	104	37
1995	75	156	137	149	94	80	70	69	83	81	38	49	90
1996	36	41	22	42	47	29	20	32	19	9	2	77	31
1997	63	45	70	52	62	34	67	239	77	20	3	2	61

TREATMENT PLANT INTAKE COLIFORM DATA

Parley's Treatment Plant Raw Water													
colonies/100 ml													
	raw water influent to the treatment plant												
	January	February	March	April	May	June	July	August	September	October	November	December	Year Avg.
YEAR	---	---	---	---	---	---	---	---	---	---	---	---	---
													17
1992				0	1	1	1	0	115	50	5	66	27
1993	10	8	10	4	8	21	2	8	31	30	4	2	11
1994	20	25	17	1	27	159	14	12	4	22	127	38	39
1995	65	60	50	7	43	25	17	12	18	27	24	25	31
1996	30	30	21	15	37	7	1	2	12	2	6	35	17
1997	23	11	67	12	28	5	5	18	5	7	2	3	15

TREATMENT PLANT INTAKE COLIFORM DATA

Big Cottonwood- Raw Stream Total Coliform colonies/100 ml

Raw water influent to treatment plant

YEAR	January	February	March	April	May	June	July	August	September	October	November	December	Year Avg.
1960	9	9	16	31	21	21	43	48	13	10	15	3	17
1961	2	2	5	4	10	45	85	62	26	12	7	9	22
1962	8	12	6	10	81	60	109	164	88	63	46	39	57
1963	74	35	64	34	29	592	42	79	92	17	9	16	90
1964	16	11	13	17	20	45	54	46	26	9	19	9	24
1965	30	30	21	15	37	7	50	76	53	68	56	29	39
1966	10	19	19	14	29	27	55	29	38	27	21	36	27
1967	45	31	42	56	65	39	64	110	37	36	25	23	48
1968	22	19	18	18	38	68	63	62	17	14	13	16	31
1969	17	15	13	19	49	129	107	108	61	68	69	58	59
1970	66	44	58	52	90	77	83	80	68	76	74	46	68
1971	70	49	54	62	69	82	149	170	114	113	87	61	90
1972	62	51	74	62	128	98	105	51	40	47	43	49	68
1973	7	40				71	90	90	51	36	46	77	56
1974	37	26	77	114	73	36	33	24	11	21	25	29	42
1975	30	22	15	26	29	51	23	18	10	4	4	2	20
1976	1	3	12	47	26	44	42	72	95	16	6	3	31
1977	4	5	7	13	17	18	16	21	20	8	3	5	11
1978	1	1	16	22	4	9	13	7	15	3	20	5	10
1979	19	19	30	17	63	43	44	172	73	10	11	21	44
1980	8	25	11	23	37	43	77	46	28	11	3	10	27
1981	12	14	7	38	47	34	24	28	26	29	31	13	25
1982	17	25	43	28	38	31	24	36	21	14	22	37	28
1983	39	64	37	41	50	43	41	65	48	45	47	58	48
1984	42	35	37	37	73	63	52	67	14	5	3	1	36
1985	1	3	4	38	23	46	76	57	20	12	7	4	24
1986	15	17	12	68	47	51	65	64	33	31	29	28	38
1987	24	34	25	39	36	24	49	87	41	23	35	40	38
1988	26	33	19	44	9	24	43	114	37	125	57	14	45
1989	18	21	17	36	36	15	53	42	25	4	3	4	23
1990	3	3	4	7	4	22	30	29	30	15	4	5	13
1991	0	2	1	4	2	3	15	19	10	10	4	1	6
1992	1	1	0	7	8	14	14	49	44	1	1	2	12
1993	1	3	10	8	15	14	47	36	26	36	37	30	22
1994	23	30	32	45	32	21	20	39	32	20	30	41	30
1995	47	68	86	75	76	47	48	56	58	48	41	32	57
1996	36	41	22	42	47	29	21	20	11	2	2	46	27
1997	45	36	63	52	82	42	33	62	72	9	3	4	42

TREATMENT PLANT INTAKE COLIFORM DATA

Little Cottonwood-Raw Stream Total Coliform													
colonies/100 ml													
	raw water influent to the treatment plant												
	January	February	March	April	May	June	July	August	Septembe	October	November	December	Year Avg.
YEAR	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------
													17
1960	4	3	6	3	4	2	2	5	5	2	6	1	4
1961	1	2	1	1	2	6	1	3	4	5	3	3	3
1962	2	3	1	1	4	16	9	21	36	6	5	3	9
1963	2	3	3	2	11	4	6	10	7	3	1	2	5
1964	30	30	21	15	37	7	5	6	3	2	2	2	5
1965	3	2	4	3	8	9	8	8	14	13	20	13	5
1966	5	1	17	67	9	3	3	6	6	7	9	8	5
1967	11	7	10	14	12	9	5	9	12	10	5	1	5
1968	4	4	3	6	11	14	9	14	9	4	6	5	7
1969	9	14	18	16	13	7	28	16	6	15	10	8	13
1970	13	8	11	15	32	36	65	69	37	37	53	34	34
1971	62	33	40	40	56	41	34	70	84	70	88	87	59
1972	44	43	59	62	102	54	91	63	43	47	159	32	67
1973	29	16				48	60	67	67	36	62	44	48
1974	27	25	31	103	58	42	50	34	18	31	40	40	42
1975	27	20	22	20	13	39	33	53	52	43	11	19	29
1976	11	5	8	27	11	39	33	39	35	23	3	5	20
1977	3	62	41	15	13	10	8	10	17	8	3	4	16
1978	1	60	10	8	5	3	7	6	10	5	4	2	10
1979	0	5	5	8	18	13	25	29	26	10	11	10	13
1980	8	6	6	13	20	15	22	36	35	11	8	9	16
1981	5	4	3	16	39	38	38	42	11	32	5	9	20
1982	7	20	4	2	3	3	10	2	4	2	7	4	6
1983	2	2	0	2	1	8	4	3	2	18	7	1	4
1984	21	1	8	1	1	2	4	16	16	3	2	5	7
1985	3	5	4	6	14	13	8	11	13	6	0	5	7
1986	0	11	9	18	16	15	13	20	19	13	8	9	13
1987	18	15	15	17	15	21	41	44	34	6	12	18	21
1988	10	18	6	26	34	27	22	27	87	2	1	8	22
1989	8	5	10	9	13	13	9	12	26	7	13	12	11
1990	6	4	7	18	10	12	36	12	20	5	9	10	12
1991			11	14	10	14	19	23			35	22	19
1992	35	16	18	24	26	31	38	37	13	8	14	16	23
1993	14	11	13	17	13	42	15	14	25	22	8	7	17
1994	7	7	9	16	25	15	36	60	45	42	22	20	25
1995	36	41	22	42	47	29	18	23	63	15	9	4	29
1996	4	7	8	15	18	26	48	31	51	30	21	83	29
1997	113	111	23	20	26	19	30	74	63	39	18	13	46

CHEMISTRY DATA SUMMARY

CITY CREEK 1987 thru 1996 Chemistry Data Summary							
ANALYTE	No. of Samples	Average	No. of less thans	Assigned less than value	Average with less than values	Minimum	Maximum
T. Sus. Solids mg/l	49	2.58	36	4	5.52	<4	35
T.K.N. mg/l	24	0.11	10	0.1	0.15	<.1	0.46
Ammonia as N, mg/l	52	0.01	48	0.05	0.06	<.05	0.466
D- Arsenic, ug/l	21	0.00	21	5	5.00	<5	0
D-Barium, ug/l	19	30.47	0		30.47	21	89
D-Cadmium, ug/l	21	0.00	21	1	1.00	<1	0
D-Calcium, ug/l	47	57.14	0		57.14	30	110
D-Chromium, ug/l	21	0.00	21	5	5.00	<5	0
D-Copper, ug/l	20	0.00	20	12	12.00	<12	0
D-Iron, ug/l	19	0.00	19	20	20.00	<20	0
D-Lead, ug/l	20	0.00	20	3	3.00	<3	0
D-Magnesium, mg/l	49	15.93	0		15.93	10	29
D-Manganese, ug/l	21	1.48	20	5	6.24	<5	31
D-Potassium, mg/l	49	0.10	45	1	1.01	<1	1.3
D-Selenium, ug/l	21	0.05	20	1	1.00	<1	1
D-Silver, ug/l	21	0.00	21	2	2.00	<2	0
D-Sodium, mg/l	47	6.42	0		6.42	3	54.1
D-Zinc, ug/l	20	0.00	20	30	30.00	<30	0
Bicarbonate, mg/l	53	234.43	0		234.43	118	296
Carbon dioxide, mg/l	53	5.42	0		5.42	1	29
Carbonate, mg/l	51	0.00	0		0.00	0	0
Chloride, mg/l	47	8.55	0		8.55	3	80
Hydroxide, mg/l	53	0.21	0		0.21	0	10.9
Sulfate, mg/l	47	16.22	8	10	17.92	<10	149.28
T. Phosphorus, mg/l	47	0.01	20	0.01	0.02	<.01	0.166
T.Alkalinity/CaCO3, mg/l	49	192.08	0		192.08	97	243
T. Hardness/CaCO3, mg/l	48	206.54	0		206.54	116	319.8
Turbidity, NTU	52	1.03	0		1.03	0.032	8.4
Sp.Cond. umhos/cm.	48	397.00	0		397.00	271	665
TDS@180C, mg/l	48	231.50	0		231.50	150	460
D-Aluminum ug/L	3	0.00	3	30	30.00	<30	0
NO2+NO3 dis	49	0.14	0		0.14	0	0.363
D-Mercury, ug/l	20	0.00	20	0.2	0.20	<.2	0
CO3 Solids	48	115.38	0		115.38	58	146
D-T.Phos., mg/l	52	0.12	23	0.01	0.13	<.01	5.87
Temp, C	49	8.09	0		8.09	0.7	14.9
Ph	47	8.24	0		8.24	7.3	9.1

EMIGRATION CREEK 1987 thru 1996 Chemistry Data Summary							
ANALYTE	No. of Samples	Average	No. of less thans	Assigned less than value	Average with less than values	Minimum	Maximum
T. Sus. Solids mg/l	57	22.88	13	3	23.57	<3	279
T.K.N. mg/l	32	0.19	7	0.1	0.22	<.1	0.581
Ammonia as N, mg/l	58	0.01	54	0.05	0.05	<.05	0.07
D- Arsenic, ug/l	26	0.00	26	0.05	0.05	<.05	<.05
D-Barium, ug/l	24	76.21	0		76.21	26	130
D-Cadmium, ug/l	25	0.00	25	1	1.00	<1	<1
D-Calcium, ug/l	56	88.05	0		88.05	42.8	140
D-Chromium, ug/l	25	0.62	22	5	5.02	<5	5.5
D-Copper, ug/l	25	1.12	24	12	12.64	<12	28
D-Iron, ug/l	25	30.22	18	20	44.62	<20	490
D-Lead, ug/l	25	0.00	25	3	3.00	<3	<30
D-Magnesium, mg/l	56	19.55	0		19.55	3.5	36
D-Manganese, ug/l	25	12.42	7	5	13.82	<5	51
D-Potassium, mg/l	56	1.04	14	1	1.29	<1	2.5
D-Selenium, ug/l	25	0.00	25	1	1.00	<1	<1
D-Silver, ug/l	25	0.00	25	2	2.00	<20	<20
D-Sodium, mg/l	55	45.47	0		45.47	5.6	140
D-Zinc, ug/l	25	0.00	25	30	30.00	<30	<30
Bicarbonate, mg/l	58	293.47	0		293.47	196	376
Carbon dioxide, mg/l	59	5.20	0		5.20	1	38
Carbonate, mg/l	59	4.92	0		4.92	0	290
Chloride, mg/l	56	75.54	0		75.54	3.8	284.9
Hydroxide, mg/l	58	0.00	0		0.00	0	0
Sulfate, mg/l	55	57.33	1	10	57.51	<10	226.26
T. Phosphorus, mg/l	58	0.05	1	0.01	0.05	<.01	0.22
T.Alkalinity/CaCO3, mg/l	55	238.76	0		238.76	161	308
T. Hardness/CaCO3, mg/l	56	302.97	0		302.97	164.1	497.4
Turbidity, NTU	59	6.97	0		6.97	0.11	65
Sp.Cond. umhos/cm.	56	761.02	0		761.02	333	1415
TDS@180C, mg/l	56	451.50	0		451.50	190	808
D-Aluminum ug/L	4	0.00	4	30	30.00	<30	<30
NO2+NO3 dis	58	0.14	10	0.02	0.14	<.02	0.57
D-Mercury, ug/l	25	0.00	25	0.2	0.20	<.2	<.2
CO3 Solids	59	149.12	0		149.12	96	418
D-T.Phos., mg/l	59	0.03	2	0.01	0.03	<.01	0.097
Temp, C	55	8.42	0		8.42	0	16.5
pH	52	8.20	0		8.20	7.6	8.7

PARLEYS CANYON

1987 thru 1996 Chemistry Data Summary

ANALYTE	No. of Samples	Average	No. of less thans	Assigned less than value	Average with less than values	Minimum	Maximum
T. Sus. Solids mg/l	48	12.43	17	3	13.50	<3	122
T.K.N. mg/l	29	0.18	4	0.1	0.19	<.1	0.64
Ammonia as N, mg/l	48	0.00	45	0.05	0.05	0.05	0.067
D- Arsenic, ug/l	21	0.00	21	5	5.00	<5	<5
D-Barium, ug/l	21	85.90	1	1	85.95	<1	160
D-Cadmium, ug/l	20	0.00	20	1	1.00	<1	0
D-Calcium, ug/l	48	87.42	0		87.42	22	121
D-Chromium, ug/l	21	0.00	21	5	5.00	<5	<5
D-Copper, ug/l	21	0.71	20	12	12.14	<12	15
D-Iron, ug/l	21	10.67	18	20	27.81	<20	123
D-Lead, ug/l	21	0.00	21	3	3.00	<3	<3
D-Magnesium, mg/l	48	17.63	0		17.63	4.5	27
D-Manganese, ug/l	21	10.21	8	5	12.11	<5	31
D-Potassium, mg/l	48	0.93	16	1	1.27	<1	2.4
D-Selenium, ug/l	21	0.05	20	1	1.00	<1	1
D-Silver, ug/l	21	0.00	21	2	2.00	<2	0
D-Sodium, mg/l	48	43.26	0		43.26	6	220
D-Zinc, ug/l	21	0.00	21	30	30.00	<30	0
Bicarbonate, mg/l	48	264.83	0		264.83	68	364
Carbon dioxide, mg/l	48	5.85	0		5.85	2	30
Carbonate, mg/l	48	0.00			0.00	0	0
Chloride, mg/l	48	86.61	0		86.61	5.1	432.4
Hydroxide, mg/l	48	0.00	0		0.00	0	0
Sulfate, mg/l	48	42.83	1	5	42.94	<5	127.35
T. Phosphorus, mg/l	47	0.08	1	0.01	0.08	<.01	1.305
T.Alkalinity/CaCO3, mg/l	48	217.02	0		217.02	56	298
T. Hardness/CaCO3, mg/l	48	290.64	0		290.64	73.4	404.3
Turbidity, NTU	48	5.79	0		5.79	0.07	108
Sp.Cond. umhos/cm.	48	749.27	0		749.27	200	1800
TDS@180C, mg/l	48	433.50	0		433.50	118	988
D-Aluminum ug/L	4	35.00	3	30	57.50	<30	140
NO2+NO3 dis	47	0.18	17	3	1.27	0	1.326
D-Mercury, ug/l	21	0.00	17	3	2.43	0	0
CO3 Solids	48	130.25	0		130.25	33	179
D-T.Phos., mg/l	47	0.03	2	0.01	0.03	<.01	0.1
Temp, C	48	8.18	0		8.18	0.4	15.2
pH	47	8.10	0		8.10	7.2	8.6

MILL CREEK 1987 thru 1996 Chemistry Data Summary							
ANALYTE	No. of Samples	Average	No. of less thans	Assigned less than value	Average with less than values	Minimum	Maximum
T. Sus. Solids mg/l	57	17.03	19	3	18.03	<3	500
T.K.N. mg/l	31	0.19	7	0.1	0.21	<.1	0.524
Ammonia as N, mg/l	61	0.02	53	0.05	0.06	<.05	0.305
D- Arsenic, ug/l	24	0.00	24	5	5.00	<5	<5
D-Barium, ug/l	23	45.78	0		45.78	37	78
D-Cadmium, ug/l	23	0.00	23	1	1.00	<1	<1
D-Calcium, ug/l	55	78.22	19	3	79.26	34	95
D-Chromium, ug/l	24	0.00	24	5	5.00	<5	<5
D-Copper, ug/l	24	0.00	24	12	12.00	<12	<12
D-Iron, ug/l	24	0.00	24	20	20.00	<20	<20
D-Lead, ug/l	24	0.00	24	3	3.00	<3	<3
D-Magnesium, mg/l	55	24.80	1	0.05	24.80	<.05	30
D-Manganese, ug/l	24	0.83	23	5	5.63	<5	20
D-Potassium, mg/l	54	0.12	49	1	1.02	<1	1.8
D-Selenium, ug/l	24	0.26	18	1	1.01	<1	1.2
D-Silver, ug/l	24	0.00	24	2	2.00	<20	<20
D-Sodium, mg/l	53	9.33	0		9.33	5	14
D-Zinc, ug/l	30	0.00	30	10	10.00	<10	<10
Bicarbonate, mg/l	60	230.97	0		230.97	179	288
Carbon dioxide, mg/l	60	4.95	0		4.95	1	28
Carbonate, mg/l	60	0.00	0		0.00	0	0
Chloride, mg/l	54	11.47	0		11.47	3.5	21.5
Hydroxide, mg/l	60	0.00	0		0.00	0	0
Sulfate, mg/l	54	116.54	0		116.54	41.532	185.1
T. Phosphorus, mg/l	58	0.04	0		0.04	0.01	0.682
T.Alkalinity/CaCO3, mg/l	54	187.67	0		187.67	92	216
T. Hardness/CaCO3, mg/l	54	295.05	0		295.05	33.9	360.5
Turbidity, NTU	60	2.60	0		2.60	0.05	36
Sp.Cond. umhos/cm.	53	582.42	0		582.42	403	701
TDS@180C, mg/l	54	374.41	0		374.41	238	468
D-Aluminum ug/L	4	0.00	4	30	30.00	<30	<30
NO2+NO3 dis	55	8.99	3	0.02	8.99	<.02	488.01
D-Mercury, ug/l	24	0.00	24	0.2	0.20	<.2	<.2
CO3 Solids	55	113.58	0		113.58	92	130
D-T.Phos., mg/l	56	0.02	6	0.01	0.02	<.01	0.038
Temp, C	54	7.29	0		7.29	0	14.2
pH	53	8.19	0		8.19	7.4	8.8

BIG COTTONWOOD CREEK

1987 thru 1996 Chemistry Data Summary

ANALYTE	No. of Samples	Average	No. of less thans	Assigned less than value	Average with less than values	Minimum	Maximum
T. Sus. Solids mg/l	51	7.79	33	3	9.73	<3	148
T.K.N. mg/l	31	0.17	13	0.1	0.21	<.1	1.02
Ammonia as N, mg/l	58	0.06	3	0.05	0.06	<.05	0.67
D- Arsenic, ug/l	23	0.00	23	5	5.00	<5	0
D-Barium, ug/l	23	44.70	0		44.70	21	75
D-Cadmium, ug/l	23	0.00	23	1	1.00	<1	0
D-Calcium, ug/l	51	30.57	1	20	30.96	<20	48.2
D-Chromium, ug/l	23	0.00	23	5	5.00	<5	0
D-Copper, ug/l	23	0.00	23	12	12.00	<12	0
D-Iron, ug/l	23	13.72	17	20	28.50	<20	120
D-Lead, ug/l	23	0.00	23	3	3.00	<3	0
D-Magnesium, mg/l	51	10.91	0		10.91	4.6	17
D-Manganese, ug/l	23	0.00	23	5	5.00	<5	0
D-Potassium, mg/l	51	0.13	46	1	1.03	<1	2
D-Selenium, ug/l	23	0.00	23	1	1.00	<1	0
D-Silver, ug/l	23	0.00	23	2	2.00	<20	0
D-Sodium, mg/l	51	11.21	0		11.21	3.6	24
D-Zinc, ug/l	23	0.00	23	30	30.00	<30	0
Bicarbonate, mg/l	58	127.36	0		127.36	60	348
Carbon dioxide, mg/l	58	3.98	0		3.98	0	38
Carbonate, mg/l	58	0.05	0		0.05	0	3
Chloride, mg/l	51	17.72	0		17.72	4	51.5
Hydroxide, mg/l	58	0.00	0		0.00	0	0
Sulfate, mg/l	51	23.95	6	10	25.13	<10	43.5
T. Phosphorus, mg/l	93	0.02	3	0.01	0.02	<0.01	0.11
T.Alkalinity/CaCO3, mg/l	51	99.27	0		99.27	49	285
T. Hardness/CaCO3, mg/l	51	122.97	0		122.97	53.9	190.2
Turbidity, NTU	58	1.97	0		1.97	0.03	18
Sp.Cond. umhos/cm.	51	294.95	0		294.95	145	412
TDS@180C, mg/l	51	163.22	0		163.22	84	238
D-Aluminum ug/L	7	34.14	4	30	51.29	<30	98
NO2+NO3 dis	92	0.17	0		0.17	0	0.642
D-Mercury, ug/l	25	1.48	24	0.2	1.67	<.2	37
CO3 Solids	58	56.71	0		56.71	0	171
D-T.Phos., mg/l	58	0.01	0		0.01	0	0.121
Temp, C	27	6.33	0		6.33	2.6	10.8
pH	49	8.14	0		8.14	7.6	8.7

LITTLE COTTONWOOD CREEK

1987 thru 1996 Chemistry Data Summary

ANALYTE	No. of Samples	Average	No. of less thans	Assigned less than value	Average with less than values	Minimum	Maximum
T. Sus. Solids mg/l	50	5.36	44	4	8.88	<4	215
T.K.N. mg/l	32	0.13	8	0.1	0.16	<.1	0.84
Ammonia as N, mg/l	50	0.05	37	0.05	0.08	<.05	1.201
D- Arsenic, ug/l	24	0.00	26	0.05	0.05	<.05	<.05
D-Barium, ug/l	21	53.05	0		53.05	24	85
D-Cadmium, ug/l	22	0.05	21	1	1.00	<1	1
D-Calcium, ug/l	48	23.58	0		23.58	10	36
D-Chromium, ug/l	23	0.00	27	5	5.87	<5	0
D-Copper, ug/l	23	1.87	21	12	12.83	<12	26
D-Iron, ug/l	23	10.50	19	20	27.02	<20	111
D-Lead, ug/l	23	0.13	22	3	3.00	<3	3.1
D-Magnesium, mg/l	49	5.36	0		5.36	2.7	8.26
D-Manganese, ug/l	23	2.26	18	5	6.17	<5	33.6
D-Potassium, mg/l	50	0.78	17	1	1.12	<1	1.8
D-Selenium, ug/l	23	0.04	22	1	1.00	<1	1
D-Silver, ug/l	22	0.00	22	2	2.00	<2	<2
D-Sodium, mg/l	50	13.20	0		13.20	3.4	27.7
D-Zinc, ug/l	26	50.92	0		50.92	0	90
Bicarbonate, mg/l	49	69.86	0		69.86	41	294
Carbon dioxide, mg/l	50	4.18	0		4.18	1	44
Carbonate, mg/l	50	0.00	0		0.00	0	0
Chloride, mg/l	49	22.49	0		22.49	3.5	62.8
Hydroxide, mg/l	50	0.00	0		0.00	0	0
Sulfate, mg/l	49	23.35	3	10	23.96	<10	43.9
T. Phosphorus, mg/l	48	0.01	39	0.01	0.02	<.01	0.191
T.Alkalinity/CaCO3, mg/l	50	57.38	0		57.38	33	241
T. Hardness/CaCO3, mg/l	50	81.29	0		81.29	36.5	119.4
Turbidity, NTU	50	1.19	0		1.19	0.03	27
Sp.Cond. umhos/cm.	49	234.92	0		234.92	105	407
TDS@180C, mg/l	50	131.40	0		131.40	60	216
NO2+NO3 dis	48	0.21	0		0.21	0.11	0.636
D-Mercury, ug/l	24	0.00	24	0.2	0.20	<.2	0
CO3 Solids	49	34.47	0		34.47	20	145
D-T.Phos., mg/l	48	0.01	34	4	2.84	<.01	0.095
Temp, C	50	5.49	0		5.49	0.5	13.2
pH	50	8.07	0		8.07	7.3	9.2