



Wasatch Hollow Open Space

Comprehensive Restoration, Use, and Management Plan

October 2011

Harrison Ave

1600 East

1700 South



Acknowledgments

Salt Lake City Mayor

Ralph Becker

Salt Lake City Staff

Emy Maloutas, Open Space Lands Program Manager

Brandon Fleming, Open Space Lands Program Analyst

Vicki Bennett, Division of Sustainability and the Environment Director

Rick Graham, Public Services Director

Salt Lake County

Julie Peck-Dabling, Open Space Program Manager

Utah Open Lands

Wendy Fisher, Executive Director

Arthur Morris, Ecologist

Open Space Lands Advisory Board

Brad Bartholomew

Lydia Berggren

Sharen Hauri

Kyle LaMalfa

Donna Maldonado

Benjamin Jordan

Eric McCulley

Prepared for

Salt Lake City Corporation,
Open Space Lands Program
Parks and Public Land Division
Public Services Department
451 South State Street, Room 148
Salt Lake City, Utah 84111



Prepared by

BIO-WEST, Inc.
1063 West 1400 North
Logan, Utah 84321
435-752-4202
www.bio-west.com



CRSA
649 E South Temple
Salt Lake City, Utah 84102
801-355-5915
www.crsa-usa.com



Table of Contents

Introduction.....	1	Interim Management Plan.....	24
Existing Conditions.....	4	Final Use Plan.....	24
Natural Resources.....	4	Management Strategies.....	27
Geology and Soils.....	4	Adaptive Management.....	27
Hydrology.....	6	Applicable Plans and Policies.....	27
Water Quality.....	6	Summary of Adaptive Management Strategies.....	28
Stream Channel Conditions.....	7	Crime Prevention Through Environmental	
Vegetation.....	8	Design (CPTED).....	34
Fish and Wildlife.....	9	Natural Surveillance.....	34
Cultural Resources.....	9	Natural Access Control.....	34
Visitor Experiences.....	10	Natural Territorial Reinforcement.....	34
Potential Access Locations.....	10	Public Involvement and Input.....	35
Built and Natural Amenities.....	13	Structured Decision-Making Process.....	35
Active and Passive Recreational Opportunities.....	14	Stakeholder Meetings.....	36
Guiding Principles.....	15	Public Workshops.....	36
Wasatch Hollow Open Space Goals and Objectives.....	15	Implementation and Phasing.....	37
Planning Constraints.....	15	Eliminate Unauthorized Footpaths.....	37
Conservation Easement.....	16	Develop Access Locations.....	37
Criteria for Evaluating Conceptual Management		Re-establish Riparian Floodplain.....	38
Alternatives.....	17	Re-connect Wasatch Hollow Spring.....	38
Other Considerations.....	17	Install Restoration Area Fencing.....	38
Comprehensive Use Planning.....	20	Invasive Species Removal and Control.....	38
Open Space Management.....	20	Re-plant and Restore Vegetation.....	39
Prescriptive Management Area Designations.....	20	Purchase or Accept Land Donations	
Final Comprehensive Restoration, Use,		from Willing Neighbors.....	39
and Management Plan.....	22	Establish Clear Property Boundary Lines.....	40
		Site Amenities.....	40
		One-Room Educational Facility.....	40
		Remove Abandoned House and Associated	
		Infrastructure.....	41
		Develop New Footpaths.....	41

Install New Bridge41
 Establish Outdoor Classrooms42
 Install Interpretive Signage42
 Stream Cleanup42
 Reduce Wildfire Hazards42
 Coordinate with Rocky Mountain Power42
 Bicycle Use43
 References Cited44

Appendix A Baseline Documentation Report
 Appendix B Structured Decision-Making Report
 Appendix C Conceptual Management Alternatives

List of Tables

Table 1. Summary of Adaptive Management Strategies for the WHOS Comprehensive Restoration, Use, and Management Plan.....29
 Table 2. Summary of Public and Agency Outreach and Involvement.35

List of Figures

Figure 1. Wasatch Hollow Open Space Study Area Map.....2
 Figure 2. Wasatch Hollow Open Space Planning Process3
 Figure 3. Wasatch Hollow Open Space Existing Conditions Map.....5
 Figure 4. Monthly flows at Salt Lake County’s gauge at Rotary Glen Park.....6

Figure 5. Surveyed stream channel cross section plots illustrating the variability in channel shape within the WHOS property.7
 Figure 6. Wasatch Hollow Open Space Final Management Plan.....23
 Figure 7. Wasatch Hollow Open Space Interim Management Plan Map25
 Figure 8. Wasatch Hollow Open Space Final Use Plan Map26



Introduction

The Wasatch Hollow Open Space (WHOS) is an approximately 10-acre undeveloped open space located along Emigration Creek within Salt Lake City between 1600 East Street and 1800 East Street and between 1700 South Street and Harrison Avenue (Figure 1). The WHOS property encompasses several parcels of land that were acquired in segments over a period of several years through both acquisition and donation. These lands will be protected through conservation easements which will identify conservation values to be protected, including scenic, historic, ecological, wildlife, and public education and use, while preventing commercial or residential development. The purpose of this Comprehensive Restoration, Use, and Management Plan is to provide stewardship of the WHOS area in a manner that protects native vegetation, water quality, and aquatic and terrestrial wildlife habitat of Emigration Creek while providing appropriate access and educational opportunities for the public.

For planning purposes, the WHOS property has been divided into three segments: (1) North Area, (2) Central Area, and (3) South Area (see Figure 1). The North Area is approximately 3.9 acres in size and primarily encompasses the property donated by the Church of Jesus Christ of Latter-day Saints (LDS Church) and the northern portion of the 1700 East Street easement. The Central Area is approximately 2.5 acres in size and includes the properties acquired using Salt Lake City and Salt Lake County Open Space Program funds and the central portion of the 1700 East Street easement. The South Area is approximately 3.2 acres in size and includes an undeveloped portion of the original Wasatch Hollow Park and the south portion of the 1700 East Street easement.



The WHOS planning process was completed in five stages over an approximate 12-month period. Major steps in the planning process are described below and shown on Figure 2.

- ***Structured Decision Making Process:*** facilitated a deliberative, structured decision process to accurately identify stakeholder values and objectives to help ensure that both near-term and long-term management reflects these values and objectives.
- ***Existing Conditions Inventory:*** inventoried existing resource conditions at the site using scientific and expert personnel and a review of existing decisions, policies, and practices that have helped to shape the evolution of the WHOS property.
- ***Conceptual Alternative Plans Analysis:*** developed alternative concept plans using defined management

Highlights of the Study Area Map

- North Area: 3.9 Acres
- Central Area: 2.5 Acres
- South Area: 3.2 Acres
- Wasatch Hollow Park: 3.5 Acres
- Wasatch Hollow Open Space: 9.6 Acres

- Potential/Existing Access Location 1: Wasatch Hollow Park North
- Potential/Existing Access Location 2: Wasatch Hollow Park East
- Potential/Existing Access Location 3: 1700 East Street/Logan Street
- Potential/Existing Access Location 4: Kensington Street
- Potential/Existing Access Location 5: Emerson Street
- Potential/Existing Access Location 6: LDS Church Property

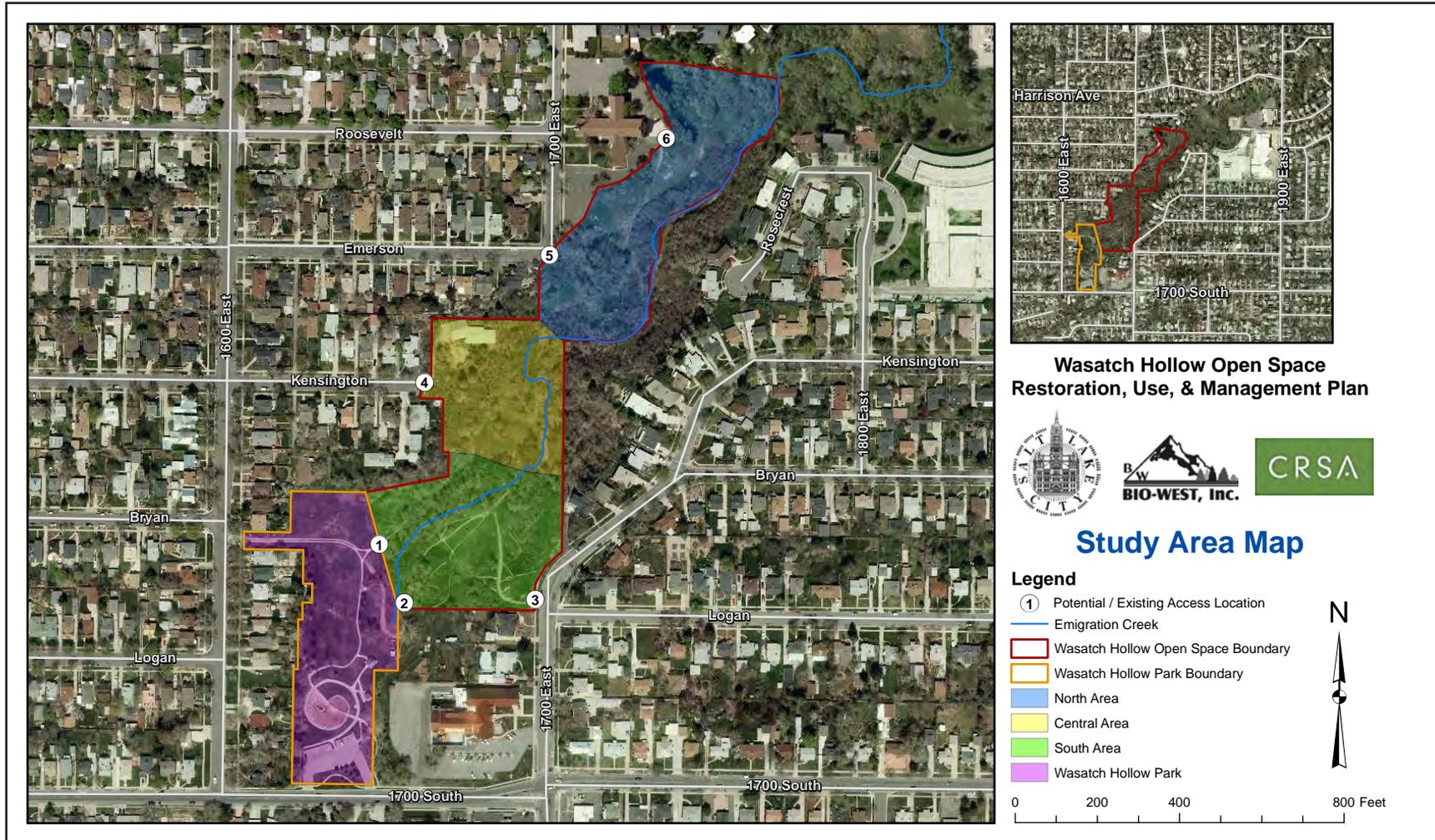
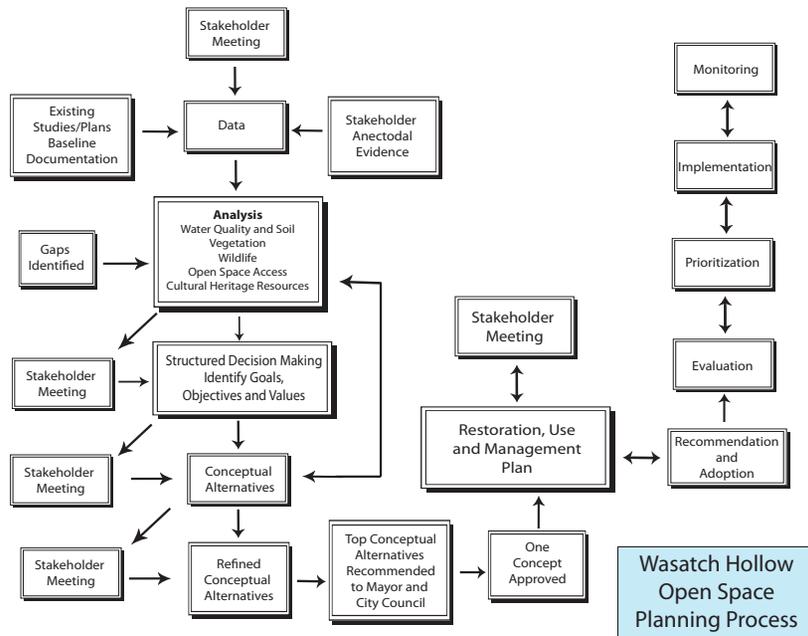


Figure 1. Wasatch Hollow Open Space Study Area Map

prescriptions and analyzed how each alternative achieved the desired resource protection priorities and stated management objectives.

- **Management Strategies Development:** developed guidelines for management, maintenance, and monitoring of the WHOS property that highlights best management practices and site specific strategies.
- **Implementation Plan Creation:** created an action plan of recommended capital improvement projects, maintenance priorities, and research needs to achieve the stated goals and objectives.



Following public review and comment on the February 2011 WHOS Draft Comprehensive Restoration, Use, and Management Plan, the recommended plan was forwarded to Salt Lake City Administration for consideration. Following careful review by stakeholders, the public, and city administration, the City Council held a work session on September 6, 2011 to discuss the draft plan. With minor changes and the inclusion of interim management plan and final use plan maps, the final WHOS Comprehensive Restoration, Use, and Management Plan was adopted by the City Council on October 25, 2011.

Figure 2. Wasatch Hollow Open Space Planning Process

Existing Conditions

The WHOS portion of the Emigration Creek riparian corridor is environmentally valuable as an unusually large and contiguous section of riparian corridor with significant remnants of natural stream conditions and native plant communities (Morris 2007). Much of the Emigration Creek riparian corridor both upstream and downstream from the WHOS property has been fragmented by settlement and urbanization over the last 150 years. The WHOS property is unique for its large size, remaining natural habitats, and proximity to adjacent residential neighborhoods and schools (e.g., Westminster College, Highland High School, Clayton Middle School, and Uintah Elementary School).

The WHOS property is home to a diverse assemblage of native wildlife and vegetation, important water resources, and recreational opportunities. Used by hikers, dog walkers, and wildlife enthusiasts today, the WHOS property has also played a significant role in the settlement history of the Salt Lake Valley. This section provides a summary of the many resources that make the WHOS property so unique and valuable.

Natural Resources

The WHOS property includes Emigration Creek, its riparian corridor, and adjacent uplands. Much of the property's ecological value is associated with its unique free-flowing stream channel and riparian corridor. Riparian areas occupy only a small portion (less than 3%) of the land area in Utah (USU 2003) and comprise only 1.2% of the land area of Salt Lake City. Despite their small size, riparian zones provide

vital habitat for nearly 80% of mammal and bird species in the western United States (Krueper 1993). The importance of Emigration Creek and other above-ground stream corridors in Salt Lake City is amplified due to their proximity to the Great Salt Lake, an ecosystem of hemispheric significance in terms of providing resting, nesting and staging habitat for migratory bird populations.

Geology and Soils

Within the North Area and part of the Central Area of the WHOS property, Emigration Creek is mapped as flowing through Holocene-age alluvium. Within the South Area and the remaining part of the Central Area, the stream is mapped as flowing through artificial fill material (Utah and Wyoming 1990). The WHOS property is bordered by Pleistocene-age Lake Bonneville deposits that consist primarily of sand and gravel material to the west of the property and silt and clay material to the east. Streambank soil material within the upstream half of the WHOS property includes a significant amount of coarser gravel and some cobble material, while streambank material generally consists of finer-grained sand and silt within the downstream portion of the property (BIO-WEST 2010). Within the South Area, the streambanks are subject to inundation and deposition of fine-grained sediments due to the backwater effect of the culvert inlet located at the downstream end of the property. This culvert regularly clogs during high flow conditions, and the portion of the stream within the South Area is intended to serve as a flood control facility that traps sediment and reduces downstream flow velocities. The large number of user-created footpaths within the WHOS property (Figure 3) also impacts soil condition and quality.

Highlights of the Existing Conditions Map

- Emigration Creek: 1,935 Feet
- Existing Footpaths: 7,345 Feet
- Existing Fence: 2,600 Feet

- Box Elder: 1.25 Acres
- Cottonwood: 1.31 Acres
- Gambel Oak: 1.39 Acres
- Introduced Herbaceous: 2.75 Acres
- Russian Olive: 0.39 Acres
- Siberian Elm: 2.43 Acres

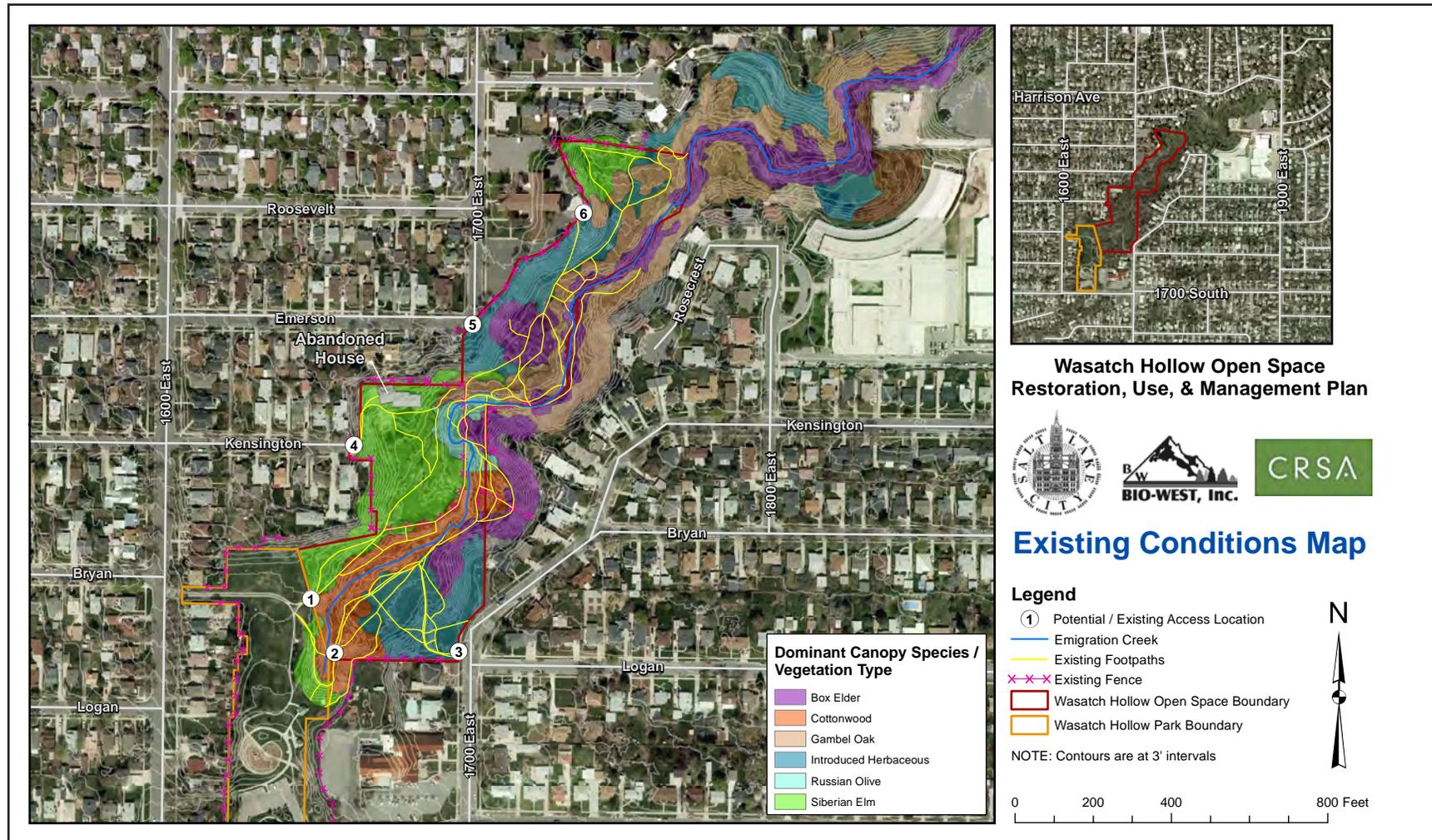


Figure 3. Wasatch Hollow Open Space Existing Conditions Map

Hydrology

Emigration Creek has its headwaters at the top of Emigration Canyon and has a total drainage area of 15,370 acres. The WHOS property is located in the Lower Emigration Creek subwatershed, which is classified by Salt Lake County as a “perennial-reduced” stream, indicating that flows are artificially reduced by stream diversions (SLCO 2009). Emigration Creek’s hydrology is characterized by a distinct springtime peak typical of snowmelt-driven systems (Figure 4). Salt Lake County operates a streamflow gauge at Rotary Glen Park at the mouth of Emigration Canyon, approximately 3.5 miles upstream of the subject property. Based on analysis of flow data collected at this gauge from 1980-2005, average monthly flow is highest in May and peak daily flow occurs on May 1st, on average (SLCO 2009). Average annual high flow is 55 cubic feet per second (cfs) with typical base flows near 2.5 cfs. Base flows within Wasatch Hollow may be supplemented by inputs from natural springs.

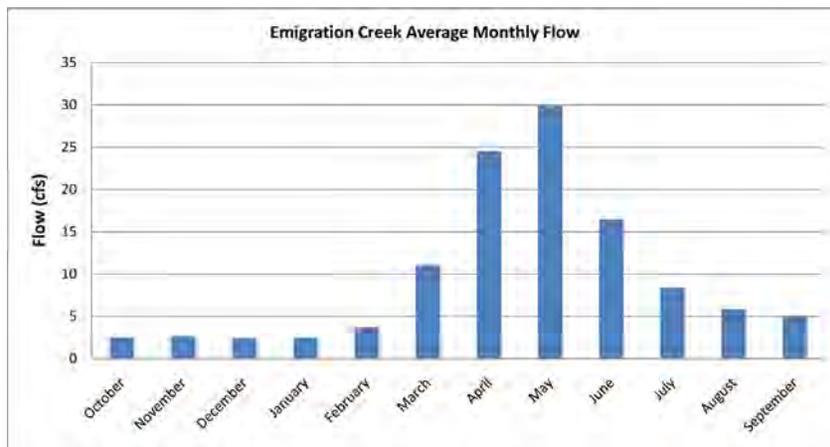


Figure 4. Monthly flows at Salt Lake County’s gauge at Rotary Glen Park.

With no streamflow gauge located closer to the WHOS property, no quantitative data are available to characterize hydrology after the stream flows through the urbanized areas between Rotary Glen Park and the subject property. Storm events generally affect stream flows differently in urban areas than in natural areas. In the upper, more natural, portions of Emigration Creek storm events result in slower, more gradual changes in stream flow volume. However, with a proportional increase in impervious surfaces such as roads, parking lots and buildings, urban stream segments respond more quickly to storm events and experience more rapid, ‘flashy’ increases in flow volume. Field observations of Emigration Creek near the Wasatch Hollow indicate that the creek does experience this “flashy” hydrologic response during storm events.

No significant water storage reservoirs are present on Emigration Creek but sediments that would normally supply the valley portions of the creek are intercepted by the Emigration Creek debris basin located in Rotary Glen Park. Originally constructed in 1985, the debris basin is maintained by the county. The basin traps the bulk of coarse sediment loads and requires dredging about every two years.

Water Quality

The subject property is located on the portion of Emigration Creek below Foothill Drive. In this segment, the creek is assigned the default beneficial use classifications of 2B (secondary contact recreation) and 3D (waterfowl/ shorebird protection) by the Utah Division of Water Quality (DWQ). The DWQ has listed a segment of Emigration Creek above Foothill Drive as impaired for E. coli bacterial contamination (DWQ 2006). Residential septic systems in the upper subwatershed

are most likely a significant contributing source of *E. coli* to the stream (SLCO 2009).

Below Foothill Drive, the stream is not listed by DWQ as exceeding state standards for any specific water quality constituents at this time. However, no established DWQ water quality monitoring stations are present on Emigration Creek downstream from Rotary Glen Park, and the creek is subject to a variety of potential nonpoint contamination sources. These include urban runoff, hydrologic modification, habitat alteration, construction runoff and managed golf courses and parks (SLCO 2009).

Stream Channel Conditions

After Lake Bonneville receded approximately 16,000 years ago, it left a series of old shoreline deposits that now form prominent “benches” along the edges of Salt Lake Valley. To reach its modern base level at the Jordan River, Emigration Creek had to carve through these deposits. In part because of the natural geologic history, stream gradient tends to be relatively steep, and the creek is typically entrenched between tall slopes that extend up to the Bonneville bench levels. Human-induced alterations such as fill placement, channel straightening, and erosive flows associated with urbanization have further contributed to the entrenched shape of the channel.

Within the WHOS property, wetted channel width ranges from about 7 to 10 feet at low flow and from about 15 to 26 feet at high flow (Figure 5). Gradient is about 1 to 2%. Flat, hydraulically-connected floodplain surfaces and depositional bars are occasionally present, but in some areas are limited by naturally steep banks as well as fill material on the west bank in portions of the Central and South Areas. Channel substrate

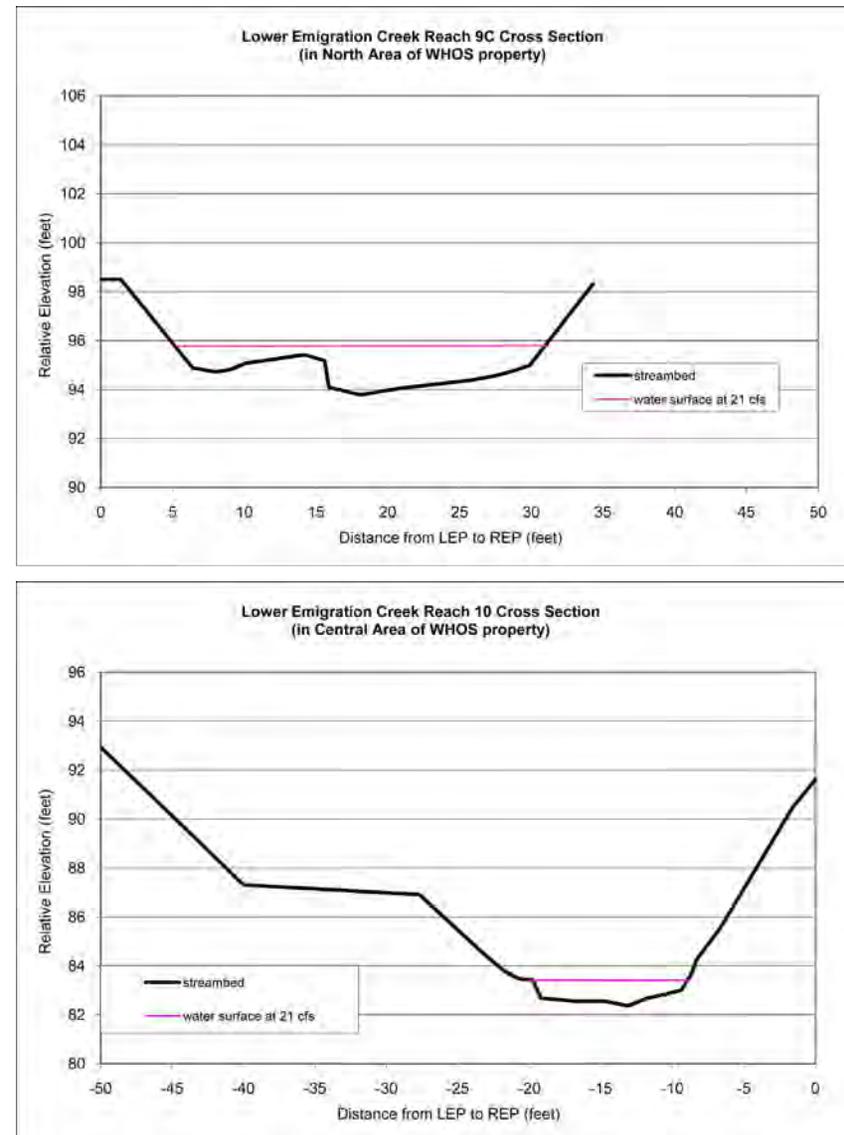


Figure 5. Surveyed stream channel cross section plots illustrating the variability in channel shape within the WHOS property.

is dominated by gravel-sized particles, with some cobble also present in riffles and finer sand and silt present in slower-velocity areas. Within much of the North Area, streambed material and bank shape are influenced by a clay shelf/root mat feature (BIO-WEST 2010). High amounts of bank erosion are evident within the WHOS property.

Vegetation

Within the North Area, box elder (*Acer negundo*) is the dominant near-stream tree species, with Gambel oak (*Quercus gambelii*) forest and introduced herbaceous vegetation comprising the majority of the upland plant communities (see Figure 2). Within the Central Area, Russian olive (*Elaeagnus angustifolia*) (an invasive non-native species) forms the dominant near-stream canopy species and Siberian elm (*Ulmus pumila*) (also an invasive non-native species) is the dominant tree within upland areas west of the stream. In the South Area, Siberian elm remains the dominant upland tree species to the west of the stream, while upland areas to the east primarily consist of introduced herbaceous vegetation (BIO-WEST 2010). Near-stream canopy vegetation in the South Area is dominated by cottonwood (*Populus* sp.), with box elder and crack willow (*Salix fragilis*) also present.

Near-stream shrub cover is generally good (between 26-75%) within the North Area and the upstream half of the Central Area. Common species include Utah honeysuckle (*Lonicera utahensis*) and red-osier dogwood (*Cornus sericea*). Within the South Area and the downstream half of the Central Area, near-stream shrub cover is only about 10% and consists primarily of Utah honeysuckle. Near-stream understory cover follows a similar spatial pattern. Cover is about 20% in the North Area and consists primarily of non-native reed canarygrass (*Phalaris*



arundinacea), while near-stream understory is lacking within the Central and South Areas. Streambank understory vegetation is likely impacted by compaction from foot traffic and by silt deposition associated with the backwater/sediment deposition effect from the downstream culvert.

The habitat value of the existing vegetation within the WHOS property is reduced due to the high proportion of invasive weed species present. Within the property, the upland areas surrounding the immediate stream corridor generally have weed species classifications of “high” or “majority”, indicating a percent weed cover of greater than 25% (BIO-WEST 2010). A total of 13 different invasive species listed on State or City noxious weed lists are present within the property including: Dalmatian toadflax (*Linaria dalmatica*), field bindweed (*Convolvulus arvensis*), jointed goatgrass (*Aegilops cylindrica*), lesser burdock (*Arctium minus*), Scotch cottonthistle (*Onopordum acanthium*), whitetop (*Lepidium*

draba), houndstongue (*Cynoglossum officinale*), Myrtle spurge (*Euphorbia myrsinites*), puncture vine (*Tribulus terrestris*), quackgrass (*Elymus repens*), Siberian elm, Russian olive.

Fish and Wildlife

Quantitative data on fish and wildlife populations within the urban portion of Emigration Creek are limited. However, populations of Bonneville cutthroat trout (*Oncorhynchus clarki Utah*) and introduced rainbow trout (*Oncorhynchus mykiss*) are known to be present within upstream portions of the creek. During riparian corridor studies conducted in 2008, trout (species unknown) were observed in a pool at the outlet of the culvert under 1900 East, about 1,200 feet upstream of the WHOS property (BIO-WEST 2010). Many species of wildlife have been observed to occur within the WHOS study area (Morris 2007). Lists of mammals, birds, reptiles, and fish observed within the study area during baseline documentation visits are provided in Appendix A. Nearby residents have also reported observations of fish, deer, fox, and wide variety of bird species, including a bald eagle, in the study area.

The WHOS property encompasses approximately 2,000 linear feet of the Emigration Creek stream channel. It is connected to an additional 1,200 linear feet of open-channel stream north of the property. As part of a 3,200 foot-long continuous riparian corridor uninterrupted by roads – the longest such corridor on lower Emigration Creek -- the property provides important corridor habitat for mule deer and other animals to allow travel between habitat patches. The property is also unique because it includes a relatively wide extent of undeveloped corridor width that encompasses a range of habitat types including lowland riparian, mountain shrub, and meadow communities.

Cultural Resources

Wasatch Hollow formed as the waters of Emigration Creek eroded alluvial fill from the mouth of Emigration Canyon through the Salt Lake Valley. When the Mormon pioneers entered the Salt Lake Valley, they reported that Emigration Creek was flowing in a steep-sided ravine that gradually moderated further west in the valley (Morris 2007). Wagons of the first group of pioneers of the LDS Church followed the Donner-Reed route along the southern side of the Emigration Creek corridor through what is now Wasatch Hollow before camping at approximately 1700 South and 500 East on their first night in the valley (July 22, 1847). On the 24th of July 1847, the LDS Church leader Brigham Young and the last of the initial pioneer company entered the valley along the same route, traveled along the south side of the Emigration Creek corridor through Wasatch Hollow, crossed the creek (thought to be at about 1100 East), and then continued north to the established City Creek camp (Dixon 1997).

Housing development surrounding Wasatch Hollow began primarily in the early 1900's and the subdivision of land occurred until approximately the 1970's. By 1930, there were several houses on the bluffs above the riparian corridor, as well as one farm where Wasatch Hollow Park now exists. Fruit orchards extended into the corridor as well. In the early 1900's, an underground pipeline was constructed from springs in Wasatch Hollow to the Utah State Penitentiary. This source of fresh water was utilized by the penitentiary until about 1950. Apparently the pipeline still exists, although it has been abandoned. The springs have been covered by fill from adjacent residential development (Morris 2007).



There is an existing home located within the Central Area of the WHOS property which comprises the only building within the study area. This home was built in 1964 and much of the property was raised and leveled by filling with soil and other material. This fill material is thought to have covered springs and is known to have constrained the stream channel through this area (Morris 2007). The house has been uninhabited and secured from occupation since it was purchased by the City in 2008.

The Wasatch Hollow Community Park forms the southwestern boundary of the WHOS property and adjacent to the Wasatch Presbyterian Church. The park was planned to be completed in three phases. Phase I was completed in 1993 and included development of a parking area, playground, restrooms, drought-tolerant demonstration gardens, and a grassy park area. Phase II was completed in 1994 and included development of paths, lighting, benches, and irrigation system (Morris 2007). Phase III was planned as a natural area but never completed. This area has

been included in this planning process and is now known as the South Area in the WHOS property.

Other man-made developments within the WHOS property include a series of Rocky Mountain Power overhead powerlines, chain-link fencing along many of the WHOS property boundaries, user-created paths throughout the study area, a detention basin and debris tower where Emigration Creek is piped at Wasatch Hollow Community Park, and primitive vehicular access locations for maintenance and utility uses.

Visitor Experiences

Potential Access Locations

There are several potential points of access to the Wasatch Hollow Open Space study area that currently exist. These potential access locations, outlined on Figures 1 and 2, may be classified as either formal or informal. Formal access locations are those that are generally considered accessible from existing public rights of way. Informal access locations are those that may require trespass through private property. Many informal access locations may also serve as private access points to the site by adjacent property owners. For the purpose of this document only formal access locations will be considered as it is not the intent of this plan to encourage trespass or the use of prohibited access points by the general public.

Access to the WHOS study area is generally good from the south and west sides of the property. Access from the east and north is somewhat limited. Outlined in more detail below, and as shown on Figures 1 and 2, there are no formal access locations on the north side of WHOS, and only one formal access location on the

east side. Where formal access exists, the quality of the access is varied. ADA standards have not been implemented at any of the potential access locations, although in some cases ADA access is potentially possible. Management plan suggestions may address this concern at one or more locations. Additionally, potential access locations do not provide universal access to all portions of the WHOS property. Current conditions make it difficult to enter the site at one location, move through the property, and exit the site at a different access location. This may also be remedied by management plan suggestions.

Generally accepted potential access locations are listed below, each with a summary of the existing conditions of the access point. An additional formal access location is available behind the Church of Jesus Christ of Latter-day Saints chapel north of Kensington (shown as potential access location #6 on Figures 1 and 2). Although this is well graded access road, it is not currently publicly available as it is only accessed through private property. It is not considered as a public access location in this analysis.

1. ***Wasatch Hollow Park North Potential Access***

Location: The adjacent Wasatch Hollow Park is the primary formal access location to the WHOS study area. On the west side of the creek a paved pathway leads visitors from formal paths to a fairly well delineated compacted earth maintenance access. This maintenance access continues through the South Area of WHOS study area to the Central Area (see Figure 1). The Central Area is primarily the abandoned home site and is a large open flat plateau above the creek. The Central Area is elevated significantly above the adjacent creek limiting access to other portions of the WHOS study area. Additionally the home site is gated and fenced.

Although the road is currently gated near the border between the South and Central Areas, this access location potentially provides ADA access into large portions of the study area without significant retrofit. Also, this potential access location does not suffer from flooding or safety issues. This potential access location is near formal park facilities and there is sufficient space for additional amenities such as site orientation signage.

2. ***Wasatch Hollow Park East Potential Access Location:*** The adjacent Wasatch Hollow Park is the primary formal access location for the WHOS study area. Visitors to the park from outside the adjacent neighborhoods are most likely to discover WHOS from this access location due to the adjacent formal park off street parking facilities. In addition, parking for school buses is provided at the parking lot at the south end of Wasatch Hollow Park. Access into this park is also available from 1600 East near Bryan Avenue, although off street parking is not available at this location.

From the formal park a paved path leads visitors to the southwestern edge of the WHOS study area. On the east side of the creek an informal path has been established in the open space area. This path is heavily used and has a compacted surface. Except in times of flood in the spring it may be the most heavily used route into the WHOS. Although this is a heavily used path, the spring flooding issue may make it difficult for this route to remain a primary access location without significant retrofit. This access point would not be considered ADA accessible. The west side of the creek is also accessed from Wasatch Hollow Park, and described in more detail in access point #1 above.

This access point provides convenient access to the creek, as well as most of the South Area of the site as outlined on Figure 1. Access to the Central and North areas is currently limited as there is no formal crossing of the creek. Of all the access locations, this one is closest to the only existing amenities in Wasatch Hollow Park. See the section below for a description of existing amenities in WHOS. For example there is sufficient space at this location for site orientation signage.

3. *1700 East Street / Logan Street Potential Access*

Location: The 1700 East Street potential access location is heavily used and provides the only access to the WHOS study area from the east side. Neighborhoods to the north along Kensington Avenue to 1800 East and Rosecrest Drive have no formal access locations. The access from 1700 East Street down to the WHOS study area is fairly steep. Although it appears somewhat well maintained as a gravel path, its slope and surfacing is not generally considered as accessible. There is no off street parking at this location and it is primarily used by local neighborhood residents.

The existing footpath provides access to the South Area of the WHOS study area. Limited access is available to the Central and North areas as the creek currently is not easily crossed. A simple foot bridge across Emigration Creek could remedy this situation by providing easy access to the Central Area. Existing amenities are described in more detail in the section below. However, this potential access location may lend itself to the addition of some amenities, if desired, as there are considerable non riparian lands in the area. Although there are no convenient amenities at this potential access location, there is available space for site orientation signage at the street level.

4. ***Kensington Street Potential Access Location:*** The Kensington Street potential access location is a well defined paved road beginning at the east end of Kensington Avenue. It provides good access into the abandoned home site. Visitors to the WHOS study area who currently use this access location are primarily from within the adjacent neighborhood. There is no off street parking in the area, and the dead end street is not highly used by non residents. Thus this should be considered a secondary site access location and primary maintenance access location. Current access is limited by gates, although little limits pedestrian access into the site at this location. A moderate number of visitors use this access location. Although well delineated with an asphalt driveway, this potential access location may not meet accessibility standards for grades (i.e., slope). However, it is feasible that this point of access could be brought up to standard, although with significant effort.

This potential access location provides the only direct access to the Central Area (see Figures 1 and 2). Amenities are described in more detail in the following section, however the Central Area provides different opportunities for use than the rest of the WHOS study area due to the large and open nature of the meadow. There are no convenient amenities near this potential access location. Private property directly adjacent to the WHOS study area at the end of Kensington Street may make site orientation signage difficult.

5. ***Emerson Street Potential Access Location:*** The Emerson Street potential access location is a steeply eroded path that drops quickly into the WHOS study area. This potential access location is not as heavily used for this reason, and is considered a secondary access point. There is little opportunity to make this access point more accessible

without significant site modifications. There is no city owned off street parking available. Parking does exist at the adjacent Church of Jesus Christ of Latter-day Saints chapel, although no arrangement exists for this to be available for visitors. This potential access location is primarily used by the adjacent residents.

This potential access location is the only formal access to the North Area (see Figures 1 and 2). Recommendations of the management plan may call for foot bridges across Emigration Creek from the Central or South Areas which may rectify this issue. There is no convenient access to amenities at this potential access location. At the street level, there is little space for site orientation signage.

Built and Natural Amenities

Much of the WHOS study area is primitive with few formal amenities. The adjacent Wasatch Hollow Park provides restrooms (although not always operable), picnic tables and shelters, and a playground. Manicured lawns are also available for use in the park area. The only formal amenity that may be described for the WHOS study area is a fairly well delineated user created footpath (no signage or maintenance) system. That being said, this footpath is only well developed near the formal Wasatch Hollow Park and becomes less useable the further north one travels through the WHOS study area. Access from the South Area to the Central and North Areas from this footpath system is only available by crossing through Emigration Creek at one or more locations. These creek crossings are not developed and in some locations crossing requires some significant effort to obtain safely. Existing crossings and uncontrolled stream access are causing extreme erosion issues along the streambanks.



Beyond the existing footpath system, some built and natural amenities do exist. The natural setting of the site is the primary appeal for most visitors. Once access into the site is obtained, the study area is fairly quiet and removed from the busy surrounding city. It is fairly easy to access the stream, although at the expense of native vegetation, to experience the water. Heavy tree cover provides deep shade along Emigration Creek. Additional detail about amenities in each of the areas follows.

1. **South Area:** The South Area of WHOS, as do all areas, includes a portion of Emigration Creek. In this location, however, the creek runs through the center of the area rather than along an edge of the property. Access is available on both sides of the creek. Along much of the creek, the west side is elevated by man-made fill making a safe crossing challenging without significant retrofit or restoration. However, ADA accessible access on the west side near Wasatch Hollow Park provides a safe access location that

may be a compelling reason for a stream crossing to be considered in the South Area. ADA access to the bulk of the South Area on the east side could provide the visitor access to the non riparian areas at this location. The area on the east side is open (i.e., elevated above the riparian area) and possibly useable for a different type of visitor experience than what is found along the riparian area footpaths. Current recreational activities are outlined in the following section. Future use of the South Area will be dictated by the management plan recommendations. Currently the area is not well vegetated.

2. **Central Area:** The Central Area of the WHOS study area includes significant riparian areas. However, the bulk of the area is comprised of the abandoned home site and the adjacent meadow made from man-made fill activities. This open and flat topographic area is a different type of amenity than found elsewhere in the WHOS property. This area is currently fenced and not easily accessible for visitor use. The fence will remain throughout the duration of the planning process and will be open to public use once this plan is adopted. Although the management plan will suggest the appropriate uses for this area, there is significant area here for safe activities that will not damage existing riparian habitats.
3. **North Area:** The North Area may be best described as an area of passive amenities. Emigration Creek is not easily accessible in this area, and the space itself is difficult to access. There is significant upland area outside the riparian corridor, but it is not readily useable by visitors. Much of the area is populated by invasive species.

Active and Passive Recreational Opportunities

Casual hiking and exploration is the primary active recreational opportunity in the study area, although this takes place on user created footpaths. No formal recreational facilities exist. There are few other active recreation opportunities, with the exception of the east side of the WHOS study area near the 1700 East Street potential access location. This area is elevated above the riparian corridor and is void of vegetation. There are some user created mountain bike trails and jumps, which account for the lack of vegetation in the area. This portion of the study area (see Figure 2) is also large enough for other active opportunities such as tossing a Frisbee or a game of catch. This may not be a common use of the area however as the ground plane is fairly rough and the ground cover is not manicured or well suited for this type of activity. This activity may not be recommended in the final management plan guidelines.

The North Area of the WHOS site is not heavily frequented by visitors. Those who access the area may find themselves fairly isolated. The Central and North Areas may lend themselves to quiet contemplation, as a form of passive recreation. However, these areas must not be too distant from active areas for safety considerations.

Guiding Principles

Wasatch Hollow Open Space Goals and Objectives

The goals and objectives developed for the WHOS Comprehensive Restoration, Use, and Management Plan were derived from the participatory planning process initiated by Salt Lake City and known as a “structured decision making process” (Arvai and Wilson 2010). Given the diverse and strong interests of various stakeholders in the planning process, it was important to utilize a deliberative and structured decision making process to accurately identify stakeholder values and objectives, and to ensure the plan reflects these values and objectives. A series of stakeholder meetings and public workshops were facilitated during this process to identify goals and objectives, performance measures, and potential design and management alternatives. A report was prepared and is included as Appendix B.

Participants in the structured-decision making process were nearly unanimous in their identification of five fundamental goals and their associated means objectives for the design and management of the WHOS property (Arvai and Wilson 2010). The fundamental goals and primary means objectives include:

1. ***Restore and Protect the Emigration Creek Riparian Corridor and Adjacent Open Space Area:***
 - Improve Water Quality
 - Provide Habitat for Wildlife
 - Restore and Protect Native Vegetation

2. ***Establish Clearly Defined Boundaries to Prevent Encroachment and Foster Respect for Public and Private Lands:***
 - Protect Open Space Property
 - Regular Monitoring of Violations
 - Protect Private Property
3. ***Provide Controlled Public Access that is Informed Primarily by Ecological Goals:***
 - Provide Public Access
 - Provide Educational Access
 - Provide Access for Research
4. ***Increase Safety by Reducing Risks on Both Public and Private Land:***
 - Enhance Public Safety
 - Reduce Risks From Liability
5. ***Foster Cooperation and Collaboration Among Stakeholders in Stewardship of the WHOS to Ensure Sustainable Long-Term Management:***
 - Promote Community Stewardship and Co-Management
 - Improve Partnerships Between the City and Stakeholders

Planning Constraints

The WHOS property is managed within a framework of accepted policies and standards, in addition to current Salt Lake City and Salt Lake County ordinances and management plans. The needs of utility providers, resource agencies, and adjacent neighborhoods are understood and respected. The following is a list of basic agreements and entities that define and reinforce the key planning constraints for the WHOS property:

1. Because there are no existing plans for management of study area lands, any previous agreements or precedents regarding the WHOS property are subject to reconsideration.
2. The conservation easement will require management as a natural open space with appropriate standards and goals.
3. Access will be evaluated in light of the important goals of resource protection, visitor experience, and public safety.
4. The City's Riparian Corridor Ordinance (e.g. development setbacks from stream) and the Emigration Creek Riparian Corridor Study will be followed.
5. All stakeholder concerns are respected and considered equally, and are balanced with the fundamental goals established for the WHOS property.
6. An adaptive management framework will be implemented to guide long-term monitoring, management, and maintenance.
7. Facility and management costs will be prioritized within funding levels for successful maintenance and stewardship.
8. The city will actively coordinate with entities having jurisdiction over portions of the WHOS property, such as Rocky Mountain Power and Salt Lake County Flood Control

Conservation Easement

The WHOS property will be encumbered by Deeds of Conservation Easement held by Salt Lake County and Utah Open Lands. The purpose of the easement will be to assure that the



property will be retained in a predominantly natural and open space condition and to prevent any use of the property that will significantly impair or interfere with the conservation values of the property. The public benefits of the easement will include preventing future conversion of open land to urban development, protecting and enhancing water quality and quantity, protecting wildlife habitat and maintaining habitat connectivity, protecting riparian areas, maintaining and restoring natural ecosystem functions, and maintaining the sustainability of resources. Activities that would be prohibited are likely to include subdivisions, significant building structures or improvements, mineral development, significant topography modification, waste disposal, game farming, non-native species, commercial feed lots, and large signs or billboards. Activities that are likely to be permitted include low intensity recreation, habitat enhancement and management, limited buildings or facilities, irrigation improvements, fire protection, and noxious weed control.

Criteria for Evaluating Conceptual Management Alternatives

The following list of near-term design performance measures that were developed through the structured decision-making process (Arvai and Wilson 2010) are relevant for evaluating each of the conceptual management alternatives developed during the WHOS planning process (See Appendix C). They are organized by the established fundamental goal categories. Salt Lake City, in cooperation with Utah Open Lands and Salt Lake County, will ensure stewardship of WHOS in a manner that protects the native vegetation, water quality, and aquatic and terrestrial wildlife habitat of Emigration Creek while providing appropriate access and educational opportunities for the public.

1. ***Restore and Protect the Emigration Creek Riparian Corridor and Adjacent Open Space Area:***
 - extent of restoration activities and resultant benefits
 - BMPs for water quality, wildlife and habitat protection
2. ***Establish Clearly Defined Boundaries to Prevent Encroachment and Foster Respect for Public and Private Lands:***
 - number and placement of access points and footpaths
 - size of buffer between private property and open space area
 - number and placement of natural barriers at property boundaries

3. ***Provide Controlled Public Access that is Informed Primarily by Ecological Goals:***
 - number and location of access points and footpaths
 - Inclusion of historical, cultural, and educational signage
4. ***Increase Safety by Reducing Risks on Both Public and Private Land:***
 - fire risk assessment
 - BMPs for enforcement
 - BMPs for limiting trespassing
5. ***Foster Cooperation and Collaboration Among Stakeholders in Stewardship of the WHOS to Ensure Sustainable Long-Term Management:***
 - Implement shared management plan between City, Salt Lake County, Utah Open Lands, and community

Other Considerations

The goal of the structured decision-making process (Arvai and Wilson 2010) was to work closely with members of the City to organize information obtained from stakeholder meetings into components of possible conceptual management alternatives for WHOS. The following components derived from this process should also be considered when evaluating conceptual management alternatives that are presented in Appendix C.

1. ***Alternative Open Space “Clusters”:*** The structured decision-making process defined “clusters” as different open space management strategies implemented in different areas

of the 10-acre WHOS site. There was widespread agreement among participants in the workshops that it may be beneficial to open the southern reaches of WHOS to wider public access while maintaining a stricter stance on access in the northern portion. Many feel that limiting access would likely offer a greater sense of security to adjacent private property owners. It was also suggested that “splitting” WHOS into different management clusters would provide ecologists with an opportunity to study the effects of human impacts on riparian areas. Characterizing the northern portion of WHOS as a restricted use area may help the site better achieve some of its restoration goals.

2. **Access by Dogs:** There was nearly unanimous agreement, even among the most ardent dog owners, that allowing unrestricted access to the WHOS site by dogs would likely stand as an affront to the restoration goals expressed by all of the participants. Alternatives plans should explore different dog policies with the impacts of these policies studied in terms of achieving the stated goals and objectives expressed during the planning process. It has been suggested that the planning process should explore the option of heavily restricting (i.e., strictly-enforces on-leash regulations) or prohibiting dogs in the active restoration areas of the open space.
3. **Buffer Zones:** Buffer zones are essentially widened boundary lines that increase the proverbial “no man’s land” between public and private property. Buffer zones could, in many places, be built into the existing 10-acre open space property. In other cases, it may be possible to acquire slivers of land from adjacent private landowners who are willing to sell or donate these lands for the specific purpose



of increasing the buffer zone and/or improving restoration opportunities.

4. **Abandoned House:** Some participants suggested that the house located in the Central Area be renovated and used as an educational or nature center, perhaps providing permanent space for a non-profit organization or full-time WHOS docent. Many who supported this idea felt that it would be a shame to tear down a structure if there was a way to incorporate it into future management of the study area. However, many who shared this opinion also recognized that if it was not financially feasible then perhaps such a center could be built elsewhere on the property. The costs associated with restoring the existing house, as well as those associated with removing the house, should be communicated through the planning process.

5. **Types of Uses:** Some groups were clearly in favor of prohibiting access while others were supportive of providing some public access through a variety of uses. However, even those who would prefer no access indicated support for limited access and use, if that access and the types of uses were informed by restoration goals and perhaps limited to certain segments of the property. Given that public access in some form is likely to occur in order to be consistent with the Open Space Program goals and mission, it has been suggested that various passive forms of use be considered for implementation (e.g., walking, wildlife viewing, quiet reflection). Another benefit of encouraging appropriate, passive use of the WHOS property would be the potential for such use to drive out illicit or illegal activities that currently occur.
 6. **Footpaths:** Alternative designs (e.g., looped trails, the presence or absence of bridges), placement (within the WHOS property), and number (single or multiple) of footpaths should be considered in terms of their influence on meeting some of the five fundamental goals.
 7. **Rope Swings:** Rope swings currently located within the WHOS property pose problems for many of the fundamental goals developed by workshop participants (e.g., significant erosion of the stream bank). Also, use of the swings has prompted noise complaints from neighbors and likely poses a significant risk of liability for the City. It has been suggested that proposed management alternatives not include any rope swings over Emigration Creek.
 8. **Utilities, Drainage, and Flood Control:** Some participants discussed issues surrounding access to utilities, drainage points along the creek, and the need to provide adequate flood control within the WHOS property. It has been suggested that alternative management options explore the possibility of moving utilities out of the WHOS property, or perhaps burying power lines during any restoration efforts. Alternative management strategies should also explore the possibility of moving culverts and drainage points to protect the ecology of Emigration Creek. In addition, it has been suggested that natural flood control mechanisms be explored as aspects of potential alternatives.
 9. **Educational and Research Partnerships:** Workshop participants were very supportive of partnering with local educational institutions to both provide research opportunities for graduate students and to help monitor conditions in the WHOS property. Alternative management strategies should incorporate means of reaching out to and working with colleges, universities, and government agencies to encourage collaborative research in the WHOS and at surrounding sites.
 10. **Enforcement:** Almost all workshop participants shared concerns about enforcement, whether it was in regard to public safety, trespassing across private-public property lines, or appropriate uses within the WHOS property. As a result, it has been recommended that the various conceptual management alternatives explore the effectiveness and cost of alternative enforcement regimes (e.g., increased police patrols, private security, community-based initiatives).
-

Comprehensive Use Planning

Open Space Management

Salt Lake City owns and manages a variety of land parcels for public use, ranging from traditional parks to preserved open spaces. Some properties, such as the adjacent Wasatch Hollow Community Park, have many features of a traditional park including turf areas, playground equipment, picnic shelters, concrete footpaths, and restrooms. Other properties, such as WHOS or Parleys Historic Nature Park, were acquired and planned as natural open space with little more than footpaths. Salt Lake City is continuing to purchase open space lands, expanding trail networks, and protecting resource sensitive areas. The new and evolving demands of an expanding urban population require a new management framework that can be applied to all city properties where resource preservation and ecological restoration are encouraged.

While the North and Central Areas of WHOS were acquired or donated as natural open space, they have, along with the South Area, not been actively managed or maintained for a number of years which has allowed for unrestricted use. This has resulted in significantly degraded portions of the study area where vegetation is non-existent and soils are actively eroding. Restoration to a more sustainable and healthy condition will take substantial investment. Defining appropriate uses and implementing active management and oversight of WHOS is



critical to avoiding additional restoration expenditures. The City's Open Space Lands Program is committed to managing for standards that are focused on natural resource protection as well as user experience. This may require trade-offs between performance measures.

Prescriptive Management Area Designations

Prescriptive Management Areas help to define and establish a range of land use and management prescriptions that can be applied to suit the unique resource and user needs for a particular zone within the WHOS property. Designated use areas, footpaths, and barriers help to clearly define appropriate uses to improve public safety, minimize maintenance, and protect sensitive resources. Each alternative concept in Appendix C as

well as the final management plan is mapped according to the following zones where applicable.

1. *Footpaths:*

- Applies only to the use on the footpath
- Moderately maintained and monitored to promote safety and reduce user conflicts
- Lands adjacent to the trail are managed to the standard of their prescriptive management area
- Dogs are prohibited throughout the property except on designated footpaths
- Expected uses: Self directed activities like hiking and walking as directed by footpath signs

2. *Passive Recreation Area:*

- Promotes and supports a moderate level of use in a managed setting
- Moderately maintained and manicured
- Facilities may include education center, outdoor classroom, or interpretive elements
- Expected uses: Self directed activities, such as reading, painting, learning, or informal leisure activities on designated footpaths.

3. *Natural Area:*

- Promotes and supports a moderate level of use in a natural setting



- Moderately maintained to minimize resource degradation (e.g., weed and erosion controls, native plantings)
- Expected uses: Self directed activities, like hiking or orienteering, on designated footpaths

4. *Protection Area:*

- Promotes and supports a light level of use in a natural setting
- Maintained to enhance natural systems (e.g., protecting sensitive habitats, restoring natural hydrology, restoring upland habitat, and adapting to natural changes over time)
- Expected uses: Self directed activities focused on the protected resources, such as hiking, education, interpretation, and wildlife watching on designated footpaths

5. *Restoration Area:*

- Discourages or restricts access and use from natural areas currently under restoration
- Actively restored, maintained, and monitored to improve degraded natural resources or cultural features
- Involves removal of fill or spoils, streambank grading, floodplain restoration, and habitat restoration

6. *Preserve Area:*

- Restricts and discourages access and use in sensitive resource area
- Moderately maintained and monitored to conserve unique, high-quality natural resources or cultural features (e.g., restoring natural hydrology, restoring upland habitat, and adapting to natural changes over time)
- Expected uses: Suitable for occasional use for stewardship or education

Final Comprehensive Restoration, Use, and Management Plan

The final plan is a blend of several key components from the five alternative concepts that were developed during the WHOS planning process and described in Appendix C. The final plan reflects the input received during public and stakeholder meetings, as well as recommendations from both City and consultant staff. Figure 6 shows the proposed locations of



prescriptive management areas, footpaths, and access locations for the recommended concept.

The final plan allows for limited public access to all three areas of the WHOS property on designated footpaths. A substantial portion of the upland and riparian habitats will be restored and educational opportunities are maximized through installation of interpretive signage, outdoor classrooms, and a potential educational facility. Minimal site amenities will be provided to improve safety, reduce risks, and discourage illegal activities.

The final plan includes the management strategies that are common to all conceptual management alternatives as described in the previous section. Detailed management strategies, policies, standards, monitoring, and action items are described in

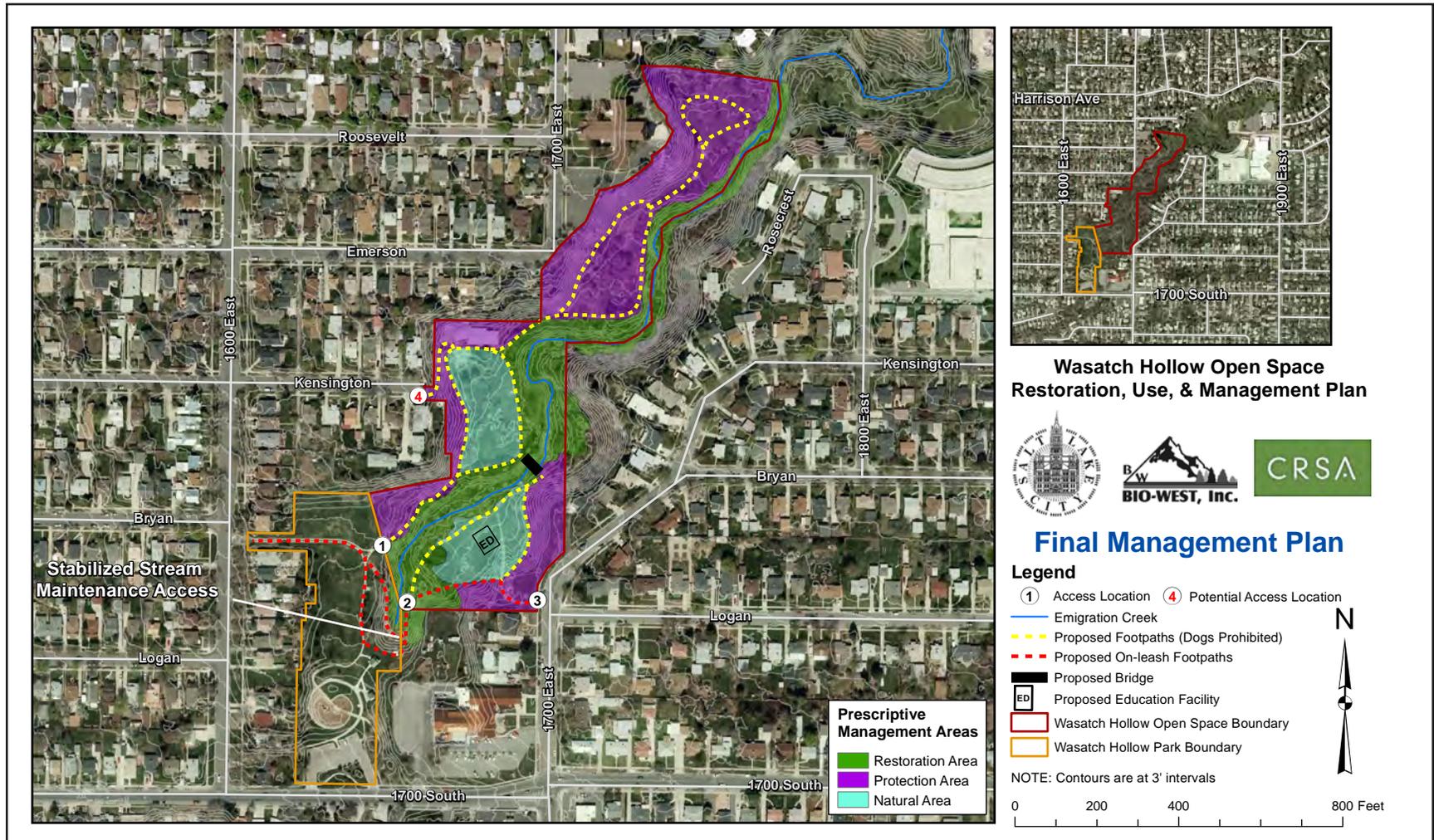


Figure 6. Wasatch Hollow Open Space Final Management Plan Map

the following sections. Highlights of the Final Comprehensive Restoration, Use, and Management Plan include the following:

- Limit public access to designated footpaths and use areas
- Work with residents on Kensington Street to address parking issues before considering designating this as an access location
- Prohibit dogs except on designated on-leash footpath
- Define property boundaries to prohibit encroachments and discourage trespassing
- Acquire property east of stream and east of Wasatch Hollow Park from willing sellers
- Implement phased invasive species eradication efforts in all areas
- Implement riparian and upland habitat restoration efforts
- Re-establish Wasatch Hollow Spring if feasible
- Install restoration fencing along both sides of the riparian corridor to discourage access
- Raze existing house and remove associated infrastructure, but maintain pedestrian and maintenance access
- Allow for future development of a LEED certified educational facility
- Establish outdoor classrooms for educational uses
- Close and re-vegetate unauthorized footpaths

- Install interpretive signs focusing on history of Emigration Creek, pioneer culture, habitat restoration, and nature education
- Conduct a wildfire hazard assessment and implement appropriate mitigation measures

Interim Management Plan

In recognition of the substantial amount of restoration work proposed in the Final Management Plan, the City has prepared an Interim Management Plan map for the WHOS property (Figure 7). The Interim Management Plan does not include the potential access location on Kensington Street as this location will be required for construction equipment access during demolition of the existing home and removal of fill from the Central Area. During restoration work, much of the Central Area will be restricted to public access when construction is occurring and while plants are becoming established.

Final Use Plan

The City has prepared a Final Use Plan map (Figure 8) to indicate the anticipated use areas for the WHOS property as implementation projects are completed. Uses within the “riparian corridor” will continue to be restricted in order to protect and preserve this sensitive and valuable area. Passive types of self directed activities, such as walking, interpretative education, wildlife viewing, and nature photography, will be allowed in the “passive recreation” use areas on designated footpaths. Use areas designated as “nature play” will allow for visitor exploration off of footpaths in some areas as conditions permit.

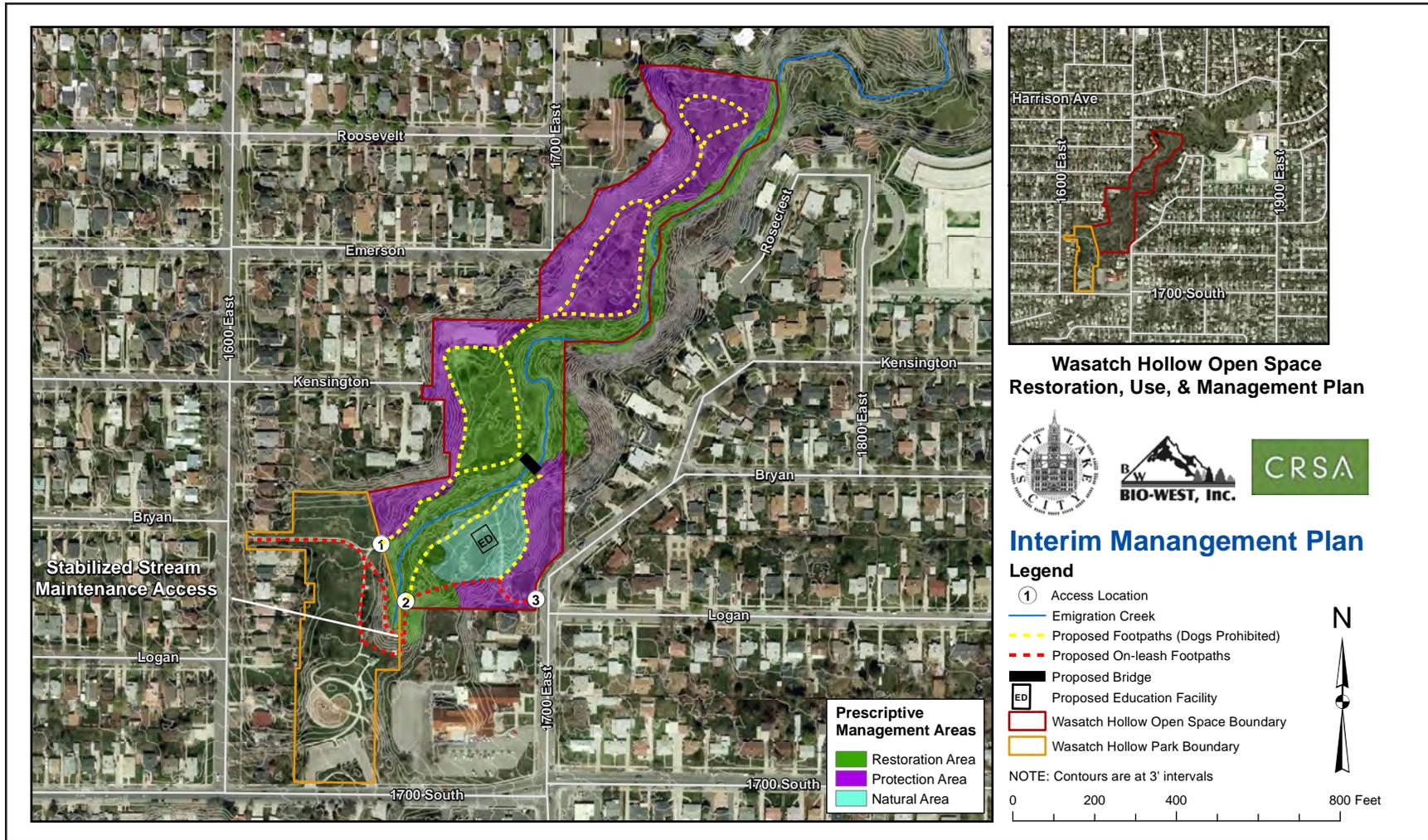


Figure 7. Wasatch Hollow Open Space Interim Management Plan Map

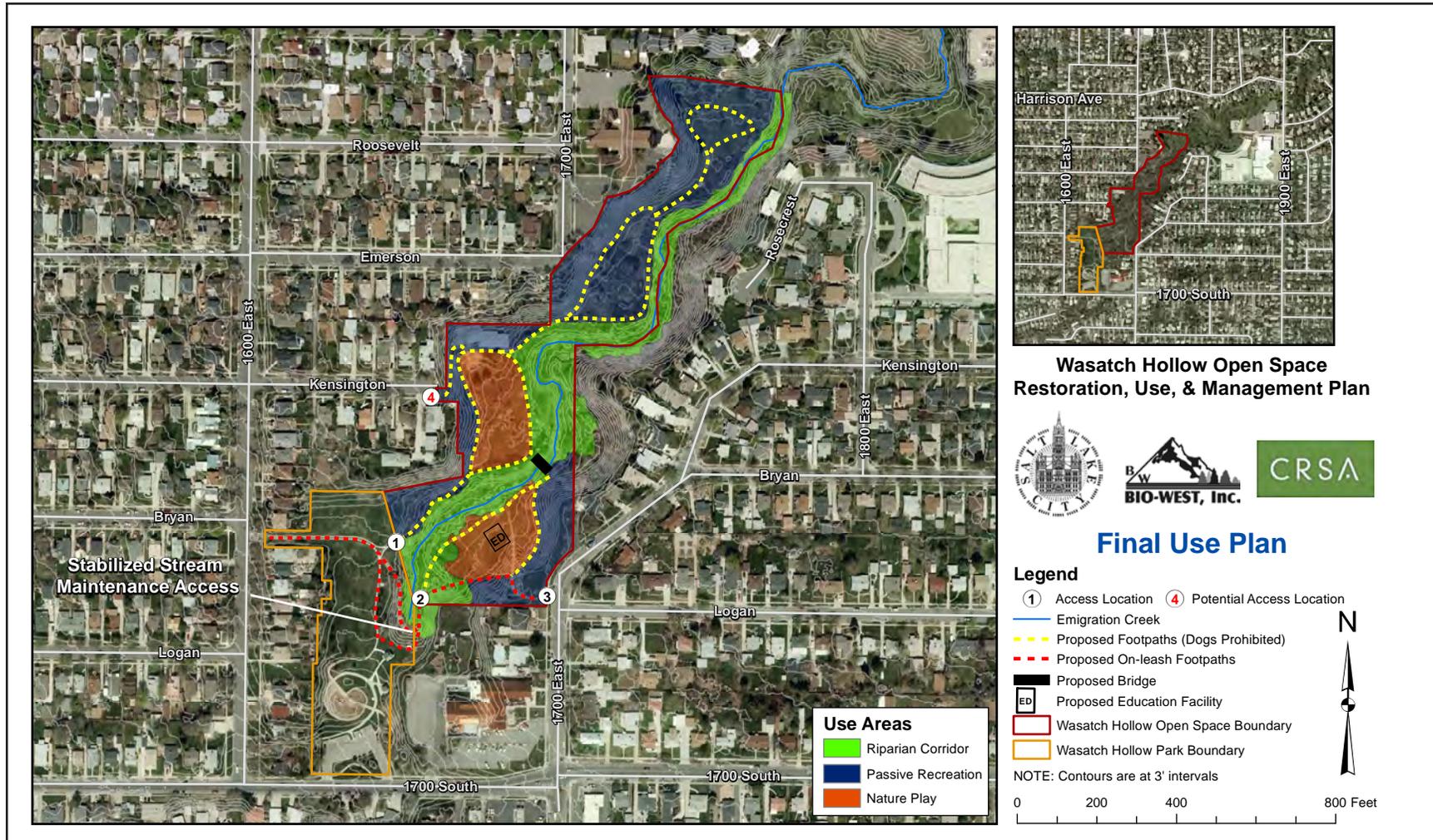


Figure 8. Wasatch Hollow Open Space Final Use Plan Map

Management Strategies

Adaptive Management

The Comprehensive Restoration, Use, and Management Plan for the WHOS will utilize an adaptive management approach to making decisions and changing management actions to adapt to future conditions. Adaptive management is a structured, iterative process of decision-making that uses ongoing monitoring to guide the process. Monitoring, such as surveys of visitors, samples of water quality, or measuring the extent of damaged vegetation, is used to understand current conditions and whether or not the existing management actions are successfully achieving park goals. Adaptive management is essentially “learning by doing.”

Salt Lake City plans to use adaptive management at WHOS to help address changing conditions such as:

- Increased visitation and recreation use
- Implementation of restoration projects
- Responding to natural acts (e.g., drought, flood, fire, natural disaster)
- Controlling noxious weeds, erosion, and vandalism



As adaptive management is applied at WHOS, managers may decide to open or close certain use areas, change an area’s prescriptive management designation, and initiate or complete restoration projects. Monitoring of conditions is essential, and the City will likely enlist volunteer stewards when possible to help achieve these goals.

Applicable Plans and Policies

Recommended actions within this plan support the WHOS long-term sustainability, minimize maintenance costs, and implement or enforce existing policies. A number of key adopted plans and policies have influenced recommended actions. Several of the key adopted plans relevant to WHOS are listed below:

1. Salt Lake City Zoning and General Plan

2. Salt Lake City Open Space Master Plan
3. Salt Lake City Sustainability Plan Recommendations
4. Salt Lake County Natural Areas Land Management Plan
5. Emigration Creek Riparian Corridor Study Management Plan
6. Wasatch Hollow Community Park Master Plan

Several of the key adopted standards and policies relevant to WHOS are listed below:

1. Existing Wasatch Hollow Community Park Rules
2. Salt Lake City and Salt Lake County Animal Control Ordinances
3. Salt Lake City Riparian Corridor Ordinance
4. Salt Lake City Open Space Lands Ordinance
5. Salt Lake County Water Quality Stewardship Plan
6. Salt Lake County Open Space Management Plan
7. Utah State Water Quality Standards
8. U.S. Clean Water Act
9. U.S. Endangered Species Act
10. U.S. Secretary of the Interior's Guidelines for Historic Preservation



Summary of Adaptive Management Strategies

Table 1 summarizes the fundamental goals and relevant policy standards for the plan, as well as outlines the adaptive management strategies and monitoring activities required to achieve the stated goals.

Table 1. Summary of Adaptive Management Strategies for the WHOS Comprehensive Restoration, Use, and Management Plan.

Management Strategy	Policy and Management Standards	Monitoring	Adaptive Management Action
Goal 1: Restore and Protect the Emigration Creek Riparian Corridor and Adjacent Open Space Area.			
<p>A. Improve Water Quality</p> <ul style="list-style-type: none"> • No disturbance within 25 feet of AHWL (excludes designated bridges). • Limited structures between 25-50 feet of AHWL such as interpretive signs, trails, boardwalks, and benches. • Reduce compaction and bank erosion by eliminating user-created duplicate footpaths. • Develop designated access locations and close / restore all other access points. • Address culverts and drains to creek, as well as runoff and sedimentation. • Re-establish riparian floodplain and de-silting meadows. • Eliminate existing septic system at acquisition site. • Re-connect Wasatch Hollow Spring. • Allow Emigration Creek to meander. 	<ol style="list-style-type: none"> 1. Meet Riparian Corridor Ordinance. 2. Meet the Best Management Practices and implementation projects recommended in the Emigration Creek Riparian Corridor Study Management Plan. 3. Support intent of Open Space Lands Master Plan. 4. Meet Utah State water quality standards. 	<ol style="list-style-type: none"> 1. Collaborate on all proposals for restoration, management, and maintenance practices within WHOS. 2. Staff observation of vegetation conditions and user-created trails with weekly spot checks. 3. Staff maintenance monthly to address problem spots. 4. Reporting by trained volunteers at least 4 times per year (quarterly). 5. Measure changes in water quality (e.g., turbidity, temperature, e-coli, coliform, and dissolved oxygen). 6. Use data to identify target areas for restoration, protection, signage, or enforcement operations. 	<ol style="list-style-type: none"> 1. Education, signage, and soft patrol with information on water quality and discouraging non-compliant uses. 2. If not successful, set up fines and formal permitting process for WHOS. 3. Redesign trails and access points and use education, signage and soft patrol to guide behavior towards compliance. 4. If not successful, ticket violators and increase enforcement. 5. If not successful, redesign trail, fencing, or access points. 6. If not successful, consider closing trails or access points.
<p>B. Provide Habitat for Wildlife</p> <ul style="list-style-type: none"> • Establish Conservation Easement Documents. • Restore natural ecological processes. • Restrict and prevent disruptive uses (e.g., light and noise pollution, paintball / air soft, dumping of refuse, tree cutting / fort building, campfires, camping, squatting). • Focus on species most likely to thrive. • Promote “leave no trace” ethic. • Improve habitat to increase diversity of permanent and seasonal wildlife. 	<ol style="list-style-type: none"> 1. Easement shall protect the purpose of WHOS and its conservation values. 2. Correct easement violations immediately. 3. Establish 2010 Baseline Conditions for wildlife. 4. Maintain viable populations of indicator species for fish, migratory neo-tropical birds, and desirable terrestrial species that are likely to thrive. 5. Achieve no visible trace of previous conditions. 6. Follow restoration and maintenance recommendations of the Salt Lake County Open Space Management Plan and the Emigration Creek Riparian Corridor Study Management Plan. 	<ol style="list-style-type: none"> 1. Staff observations of compliance with easement using weekly spot checks. 2. Staff maintenance monthly to address problem spots. 3. Staff monitoring report 4 times a year (quarterly) at problem spots. 4. Monitoring report of easement compliance by easement holder annually. 5. Monitoring report 4 times a year (quarterly) by trained volunteers 6. Consider conducting extensive breeding bird survey. 	<ol style="list-style-type: none"> 1. Assess limiting factors and mitigate as needed, which may include increased buffer, improved controls, or seasonal / permanent closures.

Management Strategy	Policy and Management Standards	Monitoring	Adaptive Management Action
<p>C. Restore and Protect Native Vegetation</p> <ul style="list-style-type: none"> • Close sections of the Emigration Creek riparian corridor for restoration projects with fencing and warning / education signs. • Control and eliminate noxious and invasive species. • Limit public access to sensitive areas (e.g., use natural barriers or fences, limit access by dogs, minimize footpaths, curtail encroachments). • Replant understory and overstory riparian vegetation. 	<ol style="list-style-type: none"> 1. Meet the Best Management Practices recommended in the Emigration Creek Riparian Corridor Study Management Plan, Salt Lake County Natural Areas Land Management Plan, and the Salt Lake County Water Quality Stewardship Plan. 2. Support the intent of the Open Space Lands Ordinance. 3. Reduce noxious and invasive weeds each year from previous year's level. 4. Meet standards and maintenance recommendations of the Salt Lake County Weed Abatement Program. 	<ol style="list-style-type: none"> 1. Staff observation of corridor conditions with weekly spot checks. 2. Staff maintenance monthly to address problem spots. 3. Staff monitoring report 4 times a year (quarterly) at problem spots. 4. Monitoring report 4 times a year (quarterly) by trained volunteers. 5. Include weed reporting with vegetation plot monitoring. 6. Use data to identify target areas for education, signage, or enforcement operations. 	<ol style="list-style-type: none"> 1. Allow access on designated trails and use permeable fences (such as split rail) for restoration closures. 2. If not successful, consider closing access. 3. If successful, consider removing fence. Leave restoration fence in place if necessary. 4. Education, signage, and soft patrol. 5. Enforcement and ticketing of violations. Increase enforcement if conditions deteriorate. 6. Increase weed management efforts until conditions are sustainable.
<p>Goal 2. Establish Clearly Defined Boundaries to Prevent Encroachment and Foster Respect for Public and Private Lands.</p>			
<p>A. Protect Open Space Property</p> <ul style="list-style-type: none"> • Reduce risks from liability (e.g., non-permitted activities). • Prevent encroachment of private property onto WHOS (e.g., no dumping of refuse). • Establish buffer zones between WHOS and private property (e.g., purchase land from willing neighbors). • Establish clear boundary lines (e.g., improve signage, implement natural barriers). 	<ol style="list-style-type: none"> 1. Legal enforcement of open space rules, animal control ordinance, and all applicable laws and regulations. 2. Uphold new regulations as identified and adopted. 	<ol style="list-style-type: none"> 1. Staff observations of compliance using weekly spot checks. 2. Annual reporting of enforcement efforts and results. 	<ol style="list-style-type: none"> 1. Include recommendations in annual report until objectives are met.
<p>B. Regular Monitoring of Violations</p> <ul style="list-style-type: none"> • Provide adequate enforcement (e.g., personnel, penalties for violations) 	<ol style="list-style-type: none"> 1. 95% compliance with local laws and open space regulations. 2. 90% neighbor satisfaction with conditions. 	<ol style="list-style-type: none"> 1. Gather baseline data of crime and nuisance reports. 2. Track ticketing and law enforcement in database. 3. Monitoring report 4 times a year (quarterly) by trained volunteers. 	<ol style="list-style-type: none"> 1. Include recommendations in annual report until objectives are met.

Management Strategy	Policy and Management Standards	Monitoring	Adaptive Management Action
<p>C. Protect Private Property</p> <ul style="list-style-type: none"> Prevent trespassing and protect private property values (e.g., protect aesthetic values, limit noise, allow only natural open space compatible activities). Prevent annexation of private property. Install perimeter fencing where necessary to prevent trespass. Post open space rules at each access location. 	<ol style="list-style-type: none"> 95% compliance with local laws and open space regulations. 90% neighbor satisfaction with conditions. Prevent measurable damage to properties. 	<ol style="list-style-type: none"> Gather baseline data of crime and nuisance to neighbors. Track ticketing and law enforcement in database. Monitoring report 4 times a year (quarterly) by trained volunteers. 	<ol style="list-style-type: none"> Education, signage, and soft patrol. If not successful, ticket violators and increase enforcement. If not successful, redesign or reallocate access. If not successful, consider closing access point or area.
Goal 3. Provide Controlled Public Access that is Informed Primarily by Ecological Goals			
<p>A. Provide Public Access</p> <ul style="list-style-type: none"> Close WHOS to public after dark. Prohibit dogs and limit public access to “loop” footpath in North and Central Areas. Allow dogs on-leash only and limit public access to designated footpaths in South Area. Close and re-vegetate duplicate footpaths. 	<ol style="list-style-type: none"> Manage types of use, areas of use, and user numbers to maintain no degradation of resources. 95% compliance with local laws and open space regulations. 90% neighbor satisfaction with conditions. 100% compliance with conservation easement document. 	<ol style="list-style-type: none"> Staff observations of compliance using weekly spot checks. Track ticketing and law enforcement in database. Monitoring report 4 times a year (quarterly) by trained volunteers. 	<ol style="list-style-type: none"> Education, signage, and soft patrol. If not successful, ticket violators and increase enforcement. If not successful, redesign or reallocate access. If not successful, consider closing access point or area. Include recommendations in annual report until objectives are met.
<p>B. Provide Educational Access</p> <ul style="list-style-type: none"> Utilize WHOS as “outdoor classroom” (e.g., interpretive art, markers, signs, education center, partner with schools and colleges). Allow development of a LEED certified educational facility and outdoor classrooms in the South Area. Increase historical awareness. Install historical, cultural, and educational interpretive elements. Create awareness of detrimental behavior. 	<ol style="list-style-type: none"> Write interpretive strategy to provide sufficient media and programs to encourage proper stewardship. Require one education / outreach effort annually from partnership groups. Provide regular opportunities for nature interpretation. 	<ol style="list-style-type: none"> Survey partners annually to gauge effectiveness of interpretation. 	<ol style="list-style-type: none"> Revisit interpretive strategy and apply new interpretive methods annually.

Management Strategy	Policy and Management Standards	Monitoring	Adaptive Management Action
C. Provide Access for Research <ul style="list-style-type: none"> Monitor conditions over time (e.g., citizen science, graduate theses, class projects). Complete habitat health assessment to identify threats and opportunities. 	<ol style="list-style-type: none"> Establish 2010 Baseline Conditions for vegetation, wildlife, and water quality. 	<ol style="list-style-type: none"> Perform at least one comprehensive monitoring event annually (preferably quarterly). 	<ol style="list-style-type: none"> Use results to identify priority projects and recommendations.
Goal 4. Increase Safety by Reducing Risks on Both Public and Private Land			
A. Enhance Public Safety <ul style="list-style-type: none"> Curtail illegal activity (e.g., drugs, squatting). Provide adequate enforcement (e.g., regular walkthroughs, more patrols, volunteer or staff for education and enforcement, enhance public access, consider CPTED in certain areas). Remove abandoned house. 	<ol style="list-style-type: none"> 95% compliance with local laws and open space regulations. 90% neighbor satisfaction with conditions. 	<ol style="list-style-type: none"> Gather baseline data of crime and nuisance to neighbors. Track ticketing and law enforcement in database. Monitoring report 4 times a year (quarterly) by trained volunteers. 	<ol style="list-style-type: none"> Education, signage, and soft patrol. If not successful, ticket violators and increase enforcement. If not successful, redesign or reallocate access. If not successful, consider closing access point or area.
B Reduce Risks from Liability <ul style="list-style-type: none"> Reduce risk of injury on WHOS property (e.g., remove rope swings, dogs on leash or restricted, reduce fire risks). Reduce risks to private landowners (e.g., establish clear boundaries and buffer zones, discourage trespassing, encourage private property protection). 	<ol style="list-style-type: none"> Install regulation and interpretation signs and maintain in readable condition and good repair. Update signs to include new regulations and information to support stewardship goals. Legal enforcement of open space rules, animal control ordinance, and all applicable laws and regulations. Uphold new regulations as identified and adopted. 	<ol style="list-style-type: none"> Staff observations of compliance using weekly spot checks. Survey users about knowledge of information on signs to gauge effectiveness. Survey partnership groups annually to see if signs are addressing their concerns and issues. Annual reporting of enforcement efforts and results. 	<ol style="list-style-type: none"> Change the number of signs, location, design, or readability. Include recommendations in annual report until objectives are met.
C Reduce Risks from Wildfire <ul style="list-style-type: none"> Conduct a wildfire hazard assesment. Implement mitigation measures to reduce wildfire hazards and risks to adjacent properties. 	<ol style="list-style-type: none"> Coordinate with the Unified Fire Authority. Identify fire-prone conditions. Identify fuel breaks Locate adjacent structures Identify emergency access Identify water sources Determine appropriate mitigation strategies. 	<ol style="list-style-type: none"> Perform a wildfire hazard assessment monitoring event annually. 	<ol style="list-style-type: none"> Implement fuels modification as appropriate. Develop a fire response and evacuation plan as necessary. Educate homeowners to implement defensible space concepts.

Management Strategy	Policy and Management Standards	Monitoring	Adaptive Management Action
Goal 5. Foster Cooperation and Collaboration Among Stakeholders in Stewardship of the WHOS to Ensure Sustainable Long-Term Management.			
<p>A. Promote Community Stewardship and Co-Management</p> <ul style="list-style-type: none"> Involve neighboring property owners, local community youth organizations, visitors, educational institutions, neighboring churches, and easement holders (e.g., promote installation of native plants on private land, regular wildlife counts, regular clean-up days, research opportunities, community docent and interpreters, manage in perpetuity) 	<ol style="list-style-type: none"> Meet Salt Lake City standards for managing boards and volunteers. Stewardship partners must meet all conditions of their agreement annually to continue their use privileges. 	<ol style="list-style-type: none"> Revisit partnership agreements annually to set current year's goals. Conduct annual partnership survey to gauge satisfaction with program and overall open space management. Build tracking database of partners and use for reminders. 	<ol style="list-style-type: none"> Rewrite partnership agreements and park privileges if expectations are not met.
<p>B. Foster Relationships Between the City and Stakeholders</p> <ul style="list-style-type: none"> Improve communication, foster transparent decision making, and facilitate decision making partnerships with easement holders, across City offices, between City and community, between community residents, and with experts and other stakeholders (e.g., Community Council newsletters, website, regular meetings, acquire expertise in decision-making, information sheet at entrances) Consider creating a full or part-time WHOS docent. 	<ol style="list-style-type: none"> Meet regularly (quarterly) with stakeholders. 100% concurrence between partners. Design and install restoration, use, and management improvements as agreed upon. Build Public and Private Partnerships for Stewardship, Education, Funding, and Implementation. 	<ol style="list-style-type: none"> Regular ranger/docent visits to observe conditions and to interact with visitors. Weekly volunteer steward presence. Monitoring report by trained volunteers. 	<ol style="list-style-type: none"> Focus efforts on priority issues.

Crime Prevention Through Environmental Design (CPTED)

The term “Crime Prevention Through Environmental Design” (CPTED) describes a series of recommendations that when implemented in a physical space generally make that space safer for its users. Defensible space is the most important factor in developing CPTED principles. When visitors have a defensible space to use, this limits the opportunities for detrimental acts to take place. However, implementing CPTED principles will need to be carefully balanced with the purposes for protecting this natural area. Where feasible, CPTED principles should be implemented when they promote appropriate uses and do not conflict with prohibited uses as defined in the conservation easement. The following principles of CPTED are recommended for the WHOS study area.

Natural Surveillance

Natural surveillance refers to the design of a space that increases the opportunities to see spaces and their surroundings. Not only does this allow a visitor to see if potential risks might exist by minimizing hiding places, it also encourages positive use of the space by many visitors. Having many legitimate visitors in a space makes it safer for all. Examples may include clearing of invasive and non-native species that create hiding spaces and providing safe access for all visitors into a wide variety of areas (may also include ADA access).



Natural Access Control

Natural access control refers to the differentiation of public and private spaces. When appropriate access locations are delineated it removes the need for trespass through inappropriate spaces. This also increases legitimate uses in these areas. Examples may include using clearly identifiable points of entry and constructing built or natural structures to divert persons to appropriate places of use.

Natural Territorial Reinforcement

Spaces that are well designed and maintained present a sense that a space is being consistently occupied. Although this often applies to private spaces, the concept can be applied to public spaces as well. Examples may include placing amenities such as seating to help attract users to an area and programming or scheduling spaces to increase legitimate uses.

Public Involvement and Input

The planning process for the WHOS Comprehensive Restoration, Use, and Management Plan relied on regular review and input from City staff, the consultant team, agency representatives, community stakeholders, and the general public. These efforts included implementation of a strategic decision-making process, facilitation of stakeholder meetings, and facilitation of public

workshops, all of which are described in detail below. A detailed list of public and agency outreach efforts is included in Table 2.

Structured Decision-Making Process

This effort is the result of a participatory planning process initiated by Salt Lake City to inform the design and management of the 10-acre WHOS property (Arvai and Wilson 2010). Given the diverse and strong interests of various stakeholders in the planning process, it was important to utilize a deliberative and structured decision making process to accurately identify

Table 2. Summary of Public and Agency Outreach and Involvement.

Date	Meeting	Location	Attended			
7/29/2009	Introduction of the WHOS Planning Process	Foothill Anderson Library	20			
8/31/2009	Stewardship Training Program	Salt Lake City PD	7			
10/10/2009	Wasatch Hollow Open Space Community Cleanup	Wasatch Hollow Open Space	23			
1/19/2010	Strategic Decision Making Process 3 Meetings	City and County Building	14	1	1	
1/20/2010	Strategic Decision Making Process 4 Meetings	City and County Building	12	8	2	5
1/21/2010	Strategic Decision Making Process 2 Meetings	City and County Building	13	14		
1/22/2010	Strategic Decision Making Process 1 Meeting	City and County Building	3			
1/26/2010	Strategic Decision Making Process 1 Meeting	City and County Building	2			
2/22/2010	Kids Meeting to Identify Vision	Foothill Anderson Library	16			
4/20/2010	Potential Management Alternatives Presentation	Foothill Anderson Library	13			
4/23/2010	Uintah Elementary School Presentation	Uintah Elementary School	500+			
5/6/2010	First Review of Conceptual Management Alternative Drafts	Foothill Anderson Library	14			
6/22/2010	Second Review of Conceptual Management Alternatives Drafts	Foothill Anderson Library	43			
9/16/2010	Presentation of Draft Restoration, Use, and Management Plan	Foothill Anderson Library	40			
10/21/2010	Planning Open House for Final Draft Plan	City and County Building	5			

stakeholder values and objectives, and to ensure the plan reflects these values and objectives. A list of stakeholder groups was created and included City staff, community members living near the WHOS property, neighboring churches and schools, Salt Lake City Open Space Lands Advisory Board members, and content area experts (e.g., ecologists). A series of stakeholder meetings and public workshops were facilitated by the consultant team to help identify planning goals and objectives, design performance measures, and potential design and management alternatives for the WHOS property. A report was prepared and is included as Appendix B.

Stakeholder Meetings

Stakeholder meetings were held throughout the planning process as needed. A majority of these meeting occurred during the strategic decision-making process, while others were held during the development of management alternatives. The various stakeholder groups that were utilized included the following:

- Representatives of Salt Lake City Corporation (e.g., Salt Lake City council, Office of the Mayor, Police, Parks, and Open Space Lands Program)
- Community members living around the WHOS property (including members of the Wasatch Hollow Community Council)
- Representatives of neighboring institutions (e.g., Westminster College, Clayton Middle School, Rocky Mountain Power, the Church of Jesus Christ of Latter-Day Saints, Wasatch Presbyterian Church)

- Representatives of the Salt Lake City Open Space Lands Advisory Board, Salt Lake County, and Utah Open Lands
- Content area experts (e.g., ecologists, ornithologists, planners, and engineers)

Public Workshops

A series of public workshops were facilitated by City staff and the consultant team during the planning process. Public input was sought during issues identification, goals and objectives development, design performance measures creation, and conceptual alternative management strategies review. A draft of the Comprehensive Restoration, Use, and Management Plan was prepared and presented to the public at the final public workshop.



Implementation and Phasing

Organizing improvement projects into phases is an integral element and strategy for implementation of restoration and management solutions proposed in this master plan. This approach is beneficial for fundraising of proposed facility improvements and restoration activities, which when divided into smaller sub-projects are responsive to budgeting constraints and allow for pilot testing of proposed measures when necessary. Effective recommendations can then be replicated in subsequent phases. This phased implementation strategy works hand-in-hand with the adaptive management nature of the WHOS master plan, thereby protecting the property's current value to citizens and wildlife while acknowledging that its potential far exceeds current conditions.

This section provides approximate quantity and cost information for the capital improvement projects identified as part of the recommended plan. These estimates are for materials and installation costs only. Implementation of these capital improvement projects will entail expenses for site-level plan design, engineering, permitting, monitoring, and maintenance in addition to the costs provided below. These additional expenses may add 20 to 30 percent to the costs presented. Additionally, it is anticipated that quantities and approaches may vary once site-specific design work is initiated for a given project. All cost estimates are given in 2010 dollar values.

Eliminate Unauthorized Footpaths

This project involves the closure and landscape rehabilitation of unauthorized and duplicate footpaths throughout the WHOS property. Closure would include implementing the necessary pedestrian traffic controls to prevent re-use, such as boulders, brush piles, signage, and fencing (if necessary). Any required fencing should be a natural finished two or three-rail wood type (e.g., split-rail) or temporary welded wire fencing on t posts. Rehabilitating the landscape would include grading, drainage, seeding, planting, and mulching activities. There are a total of approximately 3,200 feet (0.6 miles) of redundant secondary and user created trails that are recommended for closure within and adjacent to WHOS property. Estimated costs for designing and implementing the unauthorized footpath closure and rehabilitation project: \$10,000 to \$20,000.

Develop Access Locations

Controlled access locations are important to guide visitors to appropriate locations to enter the WHOS property. This will prevent trespass onto neighboring properties as well as protect sensitive vegetation and wildlife habitats. Development of an access location includes the following potential amenities. It is recommended that an informational kiosk with wayfinding information, with a concrete pad to provide a location for the kiosk and act as a transition between the sidewalk and the WHOS property be provided. Seating and artwork may also be located at these access points and are discussed as part of other capital improvement projects within this section.

For safety and security, decorative fencing to guide visitors to the appropriate access location is also suggested. The estimated

costs listed below allow for one (1) signage kiosk, thirty (30) feet of decorative fencing (may vary by location), and one (1) trash and recycling receptacle at each location. Also included in the estimate is up to 300 square feet of concrete. It is also expected that new plantings will be necessary to re-vegetate any disturbed area while the above items are installed. The estimate includes twenty five (25) five gallon shrubs for that purpose. Estimated costs of developing up to four access locations: \$15,000 to \$20,000 per location.

Re-establish Riparian Floodplain

This project would involve removal of artificial fill material and streambank re-grading to establish a wider active floodplain along Emigration Creek. Such efforts would enhance vegetation and habitat diversity, improve water quality by creating areas of natural sediment deposition, and restore dynamic channel processes. It is anticipated that these efforts would focus primarily on the western bank within the Central Area of the WHOS property, upstream of the area influenced by the backwater effect of the downstream culvert. Estimated costs for floodplain re-establishment (assuming approximately 2600 cubic yards of earthwork and installation of bank stabilization and grade control measures along 600 linear feet of stream): \$80,000 to \$120,000.

Re-connect Wasatch Hollow Spring

This effort entails removing fill material in the vicinity of Wasatch Hollow Spring in order to locate the natural spring outflow point. Assuming the spring outflow can be found, and that water rights are not encumbered, additional steps would involve ensuring the abandoned pipeline is completely capped and restoring a tributary channel between the natural spring

outflow point and Emigration Creek. The restored tributary channel would be planted with native vegetation appropriate for seep/spring areas that would enhance overall habitat diversity within the WHOS property. Costs for this project are difficult to estimate given that the precise location and depth of the spring outlet are not currently known. Assuming a large quantity of fill (about 500 cubic yards) will need to be removed and assuming about 100 feet of tributary channel would be restored, estimated costs for re-connecting Wasatch Hollow Spring: \$10,000 to \$15,000. If this project is implemented in conjunction with the riparian floodplain re-establishment project described above, costs may be much lower because most of the fill would already have been removed.

Install Restoration Area Fencing

During active restoration projects, it will be necessary to prohibit public access in these areas while vegetation is becoming established (usually 2 to 5 years). Construction of a decorative fence, such as a split rail fence, would fit the natural vernacular of the WHOS property. Welded wire fencing and metal t-posts can be used for more temporary fencing applications. Constructed in key areas, the fence could limit access to sensitive areas and help control access at trail heads. Signs explaining the purpose of the temporary closure are also recommended and can help educate the public about restoration activities. Estimated costs for installing restoration area fencing: \$40,000 to \$60,000.

Invasive Species Removal and Control

This improvement measure involves phased control and removal of invasive plant species within the WHOS property using an integrated weed control strategy. Techniques include a mix of

physical, chemical, and cultural controls. Physical (mechanical) controls involve hand pulling, disking, cutting, or mowing to remove plants or portions of plants. Chemical controls involve applying herbicides to weed infestations or cut woody stems using best management practices. In areas near Emigration Creek, only herbicides approved for use near water would be used. Cultural controls involve establishing vigorous, desirable plant species that are able to out-compete the invasive or noxious weed species. The costs associated with cultural control re-planting efforts are described below under the “Re-plant and Restore Vegetation” project. Invasive species management within the WHOS property would be implemented in a phased approach so that large areas are not left devoid of vegetative cover. Estimated costs for one year (three separate treatments per year) of mechanical/chemical invasive species removal work over 3.3 acres (one-third of the WHOS property): \$3,000 to \$5,000. Multiple years of treatment will be required for long-term success. Long term weed management should focus on early detection and rapid response to avoid future costs of controlling infestations.

Re-plant and Restore Vegetation

This project involves re-establishment of native plants in existing disturbed areas, areas that currently lack shrub or understory cover, and areas where invasive plants have been removed. Re-vegetation efforts should generally be implemented in conjunction with other projects such as access control or bank stabilization to ensure that the underlying cause of disturbance (e.g. uncontrolled foot traffic) has been addressed. Steps involved in revegetation projects include: adding or preparing topsoil; planting native vegetation using seed, containerized plants, and/or live stakes; and protecting the area with mulch or biodegradable erosion control blanket. Estimated costs for re-



planting efforts (assuming 6 acres of re-seeding and installation of 300 containerized plants): \$30,000-\$40,000.

Purchase or Accept Land Donations from Willing Neighbors

Emigration Creek and its associated riparian corridor meander in and out of the WHOS property along the eastern property boundary, as well as along the east side of the Wasatch Hollow Park property boundary. Without collaboration from adjacent property owners on restoration projects, restoration in these areas will be limited to only one side (the west side) of the stream. In some cases, adjacent property owners in these areas may be willing to donate or sell a portion of their property that contains existing or potential riparian habitat. This would help

prevent trespass in these areas, as well as help make property boundaries more logical and enforceable. The City should work with property owners in these areas in order to achieve more comprehensive restoration projects. There is approximately one (1) acre of existing or potential riparian habitats adjacent to the WHOS eastern property boundary and approximately 0.5 acre of upland buffer adjacent to the Wasatch Hollow Park eastern property boundary. Estimated costs for purchasing or accepting land donations from willing neighbors: \$00 to \$30,000.

Establish Clear Property Boundary Lines

Currently, approximately 45 percent (2,000 feet) of the WHOS property boundary is fenced. Nearly all of the existing fencing is 6-foot high chain link and was constructed by adjacent property owners. Clearly designated property boundary lines are needed in those areas lacking fencing to prevent encroachments onto WHOS property and to protect private property from trespass. Where fencing is not needed or desired, natural barriers and signage should be implemented. Where fencing is required, a decorative fence, such as a split rail wood fence, should be considered. Estimated costs for establishing clear property boundaries: \$25,000 to \$35,000.

Site Amenities

Site amenities such as artwork, benches, and directional signs should be installed throughout the WHOS property, where appropriate. These items provide a comfortable user experience by providing places of rest and important directional information. The estimate for the benches and signs is based on high quality materials that, perhaps while slightly more expensive initially,

have a lower lifetime cost due to their ability to successfully withstand weather and wear and tear. Well maintained equipment is an important factor in maintaining a property that has a perception of being safe. Artwork can be added to access locations and throughout the site to help develop a sense of identity and educational opportunities. Often artwork is respected and deters vandalism; however artwork is usually more effective in helping to showcase a place as a well maintained and often used space. A cost estimate for artwork is difficult to accurately estimate as the price for each piece will vary widely on the scale and materials used. Estimated costs for providing appropriate site amenities: \$90,000 to \$120,000.

One-Room Educational Facility

Many have suggested that a small-scale educational facility may be a nice amenity for the site. This facility could be staffed as-needed to teach school groups about environmental aspects of the WHOS property (e.g., vegetation, wildlife, water quality). It perhaps could also include educational exhibits and interpretive tools and materials for both indoor and outdoor use. This facility is likely a one-room, single level facility with simple furnishings. For estimation purposes, the proposed educational facility is assumed to be a 12' story height constructed with fairly standard materials. The estimated cost for the facility includes the costs associated with design services and LEED certification (Salt Lake City requires that all new city buildings be LEED certified at the silver level). Estimated costs for providing a one-room educational facility at approximately 1,000 square feet: \$200,000 to \$300,000.

Remove Abandoned House and Associated Infrastructure

This project involves the removal of the abandoned house and associated infrastructure within the Central Area. Infrastructure to be removed would include the existing septic system, gazebo, irrigation system, lighting, sidewalks, patios, garage, and outbuildings. Existing utility infrastructure (e.g., water, power) connections that service the site would be preserved in case they are needed during restoration projects. The existing house would be demolished and disposed of following applicable regulations. Estimated costs for removing the abandoned house and associated infrastructure: \$40,000 to \$80,000.

Develop New Footpaths

Properly constructed footpaths are essential in controlling access and impacts throughout the WHOS property. Many of the proposed footpaths follow existing user created trails that were not properly constructed. A hierarchy of footpaths should be established for the WHOS property. In general, a primary footpath (e.g., the proposed on-leash footpath) may handle most of the foot traffic through the WHOS property with a recommended 8 to 10 foot-wide tread. Primary footpaths should have a crusher-fines type of tread surface and also provide maintenance vehicle access to the WHOS property. Secondary footpaths provide safe opportunities for visitors to explore the WHOS property with a recommended 2 to 3 foot-wide native soil or crushed fines if appropriate. Estimated costs for 1,300 feet of primary footpath and 3,700 feet of secondary footpath: \$30,000 to \$50,000.



Install New Bridge

One single-span footbridge is proposed to cross Emigration Creek to connect footpaths from the South Area to footpaths in the Central Area. Salt Lake City has a railroad flat-car bridge that can be refurbished and re-located to the WHOS property. The bridge will require installation of railings, signage, decking, and abutments. There are opportunities to work with local artist and stakeholders for fabrication of artistic or interpretive siding. Estimated costs for refurbishing and relocating the 80 foot-long pedestrian bridge: \$30,000 to \$50,000.

Establish Outdoor Classrooms

Outdoor classrooms will provide locations for small groups to learn more about the natural features of the WHOS within its context. Designated gathering spaces will protect vegetation and habitat from harm that may otherwise be caused by impromptu off trail congregating. Each outdoor classroom includes seating for up to twenty (20) people. Other costs such as earthwork, re-vegetation, boulders, and other amenities will vary depending on the location of the classroom. Estimated costs for three outdoor classrooms: \$25,000 to \$30,000.

Install Interpretive Signage

As the majority of WHOS visitors will not be a part of a formal group, interpretive signage is an important educational feature. The signs can help visitors learn about the natural features of the WHOS and why it is important to restore and protect them. Well built and well maintained signs are important to providing a positive experience for users. Each interpretive sign is proposed as one 36" x 24" sign mounted on a pedestal. Final costs per sign may vary greatly depending on the number of signs ordered, as generally the cost per sign will decrease with larger orders. This estimate also includes design fees for an overall interpretive plan and for graphic design of each individual sign. Estimated costs for installing ten (10) interpretive signs mounted on pedestals: \$30,000 to \$45,000.

Stream Cleanup

This measure involves organizing a group of people to pick up trash along the Emigration Creek riparian corridor within the

WHOS property. Planning a cleanup event involves selecting a date, publicizing the event and recruiting volunteer help, making arrangements for proper disposal and recycling of the collected trash, and obtaining supplies via purchase or donations (trash bags, first aid kits, waders, water/refreshments, etc.). Estimated costs for a one-time stream cleanup event: \$1000-\$1500.

Reduce Wildfire Hazards

Wildfire management is an important component of managing and maintaining the WHOS property as a natural area. Wildfire is a natural process that is often necessary to maintain healthy ecosystems, but it also presents a hazard to nearby residents. Appropriate management strategies will include maintenance of vegetation and public education. The first step will be to conduct a wildfire hazard assessment for the WHOS property in coordination with the Unified Fire Authority. Follow-up steps will include implementing proposed mitigation measures such as fuels modification, fire response and evacuation guidelines, and homeowner education. Fuels modification could consist of removing non-native species, thinning of trees and shrubs, removing dead fuels, developing fuel breaks, and/or mechanical treatments. Estimated costs for annual wildfire hazard assessments and homeowner education activities: \$1,000 to \$2,500. Costs for implementation of proposed mitigation measures will depend upon the results of the wildfire hazard assessments.

Coordinate with Rocky Mountain Power

The City acknowledges its working relationship with Rocky Mountain Power (RMP) on the WHOS property. The City

understands that RMP has an obligation to ensure delivery of power to its customers and is willing to work with RMP in regard to management of vegetation within its easement on WHOS property. The City also understands that RMP follows a 3-year cycle approach to managing vegetation for the overhead power lines and achieving basic clearance requirements for the power lines that traverse the property. The City and RMP have identified species to target for removal, as well as the desirable vegetation that will be compatible underneath the power lines. The City has agreed that RMP will target the fast growing and nonnative invasive trees beneath the power lines for removal and phase in a replacement process over time with compatible native trees conducive to the long term master plan.

The City and RMP have discussed and will implement best management practices (BMP's) for access locations, vegetation clearing crews, ways that RMP can reduce the amount of heavy equipment that enters the WHOS property, and the number of visits to conduct maintenance work. These BMP's will minimize visual impacts and promote leaving brush on site, lopped and scattered, to block use of areas identified for closure. This will also incorporate trail feathering and baffling or staggering the brush to break up any unnatural edges or to block other forms of access where needed. The City and RMP have also discussed the notification process for the next time RMP is in the area and that both parties could meet to do a thorough site review to identify and explain any necessary work before crews begin. The City and RMP agreed on the importance of communicating to the public all proposed vegetation management activities within the WHOS property to allow for feedback and opportunities to discuss any concerns or questions. Costs for this effort are part of regular staff management budgets.



Bicycle Use

In general, bicycle use will be limited to the primary footpaths (e.g., the proposed on-leash footpath) within WHOS to allow for neighborhood residents to traverse the property safely or to access Wasatch Hollow Park. The primary footpaths are recommended to have an 8 to 10 foot-wide tread of crusher-fines that can support this type of use. Bicycle use and BMX activities will be prohibited in all other areas of the WHOS property to protect sensitive resources and to preserve footpath integrity. Costs for this effort are part of regular staff management budgets.

References Cited

Arvai J. Wilson R. 2010. A structured approach for involving local stakeholders in design and management decisions for the Wasatch Hollow Open Space area. 33 p.

BIO-WEST, Inc. 2010. Salt Lake City riparian corridor study – final Emigration Creek management plan. 81 p. plus attachments.

Dixon R.W. 1997. From Emigration Canyon to City Creek: Pioneer Trail and Campsites in the Salt Lake Valley in 1847. *Utah Historical Quarterly* 65(2): 155–164.

[DWQ] Utah Department of Environmental Quality, Division of Water Quality. 2006. Utah 2006 integrated report volume I – 305(b) assessment. Salt Lake City (UT): DWQ. 342 p.

Krueper D.J. 1993. Effects of land use practices on western riparian ecosystems in status and management of neotropical migratory birds. In: Finch D.M., Stangel P.W., editors. Status and management of neotropical migratory birds. General technical report RM-229. Fort Collins (CO): U.S. Forest Service. p. 331–338.

Morris A.E.L. 2007. Wasatch Hollow Emigration Creek corridor baseline documentation. Salt Lake City (UT): Utah Open Lands 31 p.

[SLCO] Salt Lake County. 2009. 2009 Salt Lake countywide water quality stewardship plan. Salt Lake City (UT): Salt Lake County.



[USU] Utah State University, Water Quality Extension. 2003. Utah State University cooperative extension. Utah stream team water education and water quality monitoring program manual. Logan (UT): USU. 294 p.

Utah and Wyoming. 1990. Geology of the Salt Lake City 30' x 60' quadrangle, north-central Utah and Uinta County, Wyoming. Bryant B. Salt Lake City (UT): U.S. Geological Survey. Miscellaneous Investigations Series Map I-1944. scale 1:100,000.

Appendix A

Baseline Documentation Report

**WASATCH HOLLOW
EMIGRATION CREEK CORRIDOR
BASELINE DOCUMENTATION**

January 26, 2007

**Prepared by
Arthur E. L. Morris
for
Utah Open Lands**

BASELINE DOCUMENTATION

PROPERTY LOCATION AND IDENTIFICATION 1

 Map 1

 Land Type..... 2

 History..... 7

 Wasatch Hollow Community Park..... 8

 Dogs..... 9

 Roads..... 9

 Land Stewardship and Management..... 9

 Landscape Alterations..... 10

 Detention Basin..... 11

 Zones..... 11

 Overview 12

 Map of four conceptual zones in the stream corridor. 13

 Zone 1 15

 Zone 2 17

 Zone 3 18

 Zone 4 18

VEGETATION AND SOILS..... 19

 Soils..... 19

 Habitat Types..... 19

 Stream..... 20

 Emigration Creek Physical Characteristics in Wasatch Hollow 22

 Lowland Riparian 23

 Native Riparian Shrubs and Trees 24

 Mountain Shrub 25

 Native Mountain Shrubs and Trees..... 27

 Wildlife..... 27

 Mammals..... 28

 Birds..... 29

 Reptiles 29

 Fish 29

 Stream Invertebrates 29

The baseline documentation was developed by actual site visits by Wasatch Hollow Community Association and Utah Open Lands Ecological Consultant, Arthur Morris. Kathlyn Collins of Salt Lake County Public Works Department Engineering Division provided excellent data and photographs of Emigration Creek conditions from the Salt Lake County Emigration Creek Level III Channel Stability Study, 2005. Additional data was obtained from sources cited in the document. This Baseline Documentation is to be used in conjunction with Wasatch Hollow conservation easement(s).

LIST OF PHOTOS

	Page
Photo 1. The stream corridor in Wasatch Hollow in the late 1920's; looking northeast from the end of Kensington. (A. Cannon).....	3
Photo 2. Colonial Hills Meetinghouse looking northwest across the stream corridor. (A. Cannon).....	4
Photo 3. Colonial Hills Meetinghouse; looking northwest into the stream corridor. This shows the tall willows and cottonwoods of the riparian area, and Gambel oak stands in the valley bottom and sides. (A. Cannon).....	4
Photo 4. Clayton Middle School looking from Emigration Creek southward. Clayton Middle School will soon be rebuilt further west, and the current location will become a soccer field. The bridge of sandstone slabs on Clayton Middle School grounds is not shown in this picture. (K. Collins).....	5
Photo 5. Bradley property; looking southwest toward the south side of Kensington from near the fence bordering Emigration Creek. The hillside in this photo is included in the proposed Madison Park Subdivision for the Bradley property. (A. Cannon).....	6
Photo 6. Bradley property; looking south from near the Bradley house. Trees behind the flat lawn border Emigration Creek. (A. Cannon).....	6
Photo 7. Fence across the stream at the northeastern end of the Bradley property; looking northwest. Land on the far side of the fence is Bradley property. The stream bend shown will erode further into the Bradley property over time unless intervention is performed. Alternatively, this is one of a few desirable natural meanders on the stream that could be encouraged. If the Bradley property is managed for natural rather than residential value, this bend would contribute to the health of corridor by helping to connect the stream and riparian habitat. Bends such as this dissipate energy from the stream, reducing the potential for downstream erosion and damage from high flows. (A. Cannon).....	6
Photo 8. North end of Wasatch Hollow Community Park; looking northwest. The natural area of the stream corridor is visible extending to the right of the photo. (A. Cannon).....	7
Photo 9. View of the stream corridor looking north. Phase III of Wasatch Hollow Community Park includes the dense trees around the stream through the center of this photo. (A. Cannon).....	7
Photo 10. View of Phase III of Wasatch Hollow Community Park; looking north. This shows the roadway coming into the stream corridor from 1700 East. This area is popular for bicycle riding and sledding. For scale, notice the person just entering the riparian trees on the left (A. Cannon).....	8
Photo 11. Stacked drains in the embankment at the southern end of the detention basin. Emigration Creek flows into the lowest drain in this picture. (A. Cannon).....	11
Photo 12. View from the informal trail along the east side of the stream looking southward. The open sky visible at the top left of the picture is the open area of Phase III of Wasatch Hollow Community Park. The person just entering the riparian area in Photo 10 above was on this trail by the tree with the large dark trunk in the center of this picture (A. Cannon).....	13
Photo 13. Looking southward from right by the fence across the stream on the Bradley property. The Bradley property is to the right in this photo. This photo shows denudation typical of Zone 1. Boy is on rope swing. (K. Collins).....	14
Photo 14. Community clean-up volunteers in Zone 1. View is looking northward along the informal streambank trail onto private property adjacent to the stream to the east. (A. Cannon).....	14
Photo 15. This view is from LDS Church property looking north. Dense native Gambel oak stands can be seen to the right and center in this picture. The Colonial Hills Meetinghouse is out of the picture at the top of the hill to the left. Yellow cottonwoods are visible in the riparian area near the center of the picture. (A. Cannon).....	15
Photo 16. This view from within the 1700 right-of-way looking north into Zone 2 shows the dense trees and vegetation of this area interspersed with open areas. Taller trees are in the riparian area out of this picture to the right, but Zone 2 is especially notable for its beautiful upland shrub mosaic. (A. Cannon).....	16
Photo 17. Community stream corridor clean-up volunteers. View is looking north into Zone 2. (D. Jensen).....	16
Photo 18. A hideout on LDS Church property near Emigration Creek, just west of the Colonial Hills Meetinghouse. (A. Cannon).....	16
Photo 19. View of Emigration Creek looking downstream from the hideout in the picture to the left. (A. Cannon).....	16
Photo 20. View typical of stream channel in Zone 3. (K. Collins).....	17

Photo 21. Willow roots (red) like these hold the banks stable in Zone 3. These roots are found in all Zones, but are very well developed in Zones 2, 3, and 4. The root-protected banks are stable and provide shelter for organisms in the stream. (K. Collins).....	17
Photo 22. View looking westward onto the Clayton Middle School grounds. (K. Collins).....	18
Photo 23. Emigration Creek emerging from the culvert under 1900 East into Wasatch Hollow. (K. Collins).....	18
Photos 24 & 25. Emigration Creek in Wasatch Hollow. (K. Collins).....	19
Photo 26. View of the stream and lush riparian habitat. (K. Collins).....	22
Photo 27. Emigration Creek and riparian habitat showing dense vegetation growing near the stream in many areas. Notice the leaves in the stream, which provide carbon for stream-dwelling organisms. (A. Cannon).....	23
Photo 28. Box elders, messy in yards and harborers of bugs, are at home and valuable in natural riparian habitat in Wasatch Hollow. These native Utah trees provide shelter and nesting habitat for wildlife and host native insects that feed other native animals (A. Cannon).....	23
Photo 29. Cottonwoods, still abundant in Wasatch Hollow, are the hallmark riparian tree in this area of Utah, but have been lost at alarming rates as riparian habitats have been altered through human activities such as urban development. Native cottonwoods provided material for shelter, fire, clothing, and even food for early people in the Salt Lake Valley. These trees are excellent sources of shelter and food for riparian wildlife. Cottonwood trunks and branches often become homes for cavity nesting birds and animals such as northern flickers found in Wasatch Hollow (A. Cannon).....	23
Photo 30. Fragrant sumac, abundant in the mountain shrub habitat in Wasatch Hollow, was valued by Native Americans for the fruit, twigs, leaves, and shoots. The fruits were used for food and medicine and to make a drink like lemonade. The young stems were made into baskets. Fragrant sumac was used to make dyes for clothing. Early pioneers ate the salted fruits and chewed stem exudates like chewing gum. The shrub and its fruits provide shelter and food for birds and other animals throughout the year. (G. Cotter).....	24
Photo 31. Young students pointing to something they have spotted in the mountain shrub habitat in Wasatch Hollow. In this area (the southeastern end of Phase III of Wasatch Hollow Community Park), mountain shrub habitat was partially restored through planting of native species by Ty Harrison and students from Westminster College. (D. Fosnocht).....	24
Photo 32. Gambel oak is a native tree typical of mountain shrub habitat in this area of Utah, and is abundant in beautiful stands remaining from pre-pioneer times in Wasatch Hollow. Gambel oak acorns have been valued for food, and the wood has been used for fire, fence posts, and shelter. Gambel oak acorns are valuable food for wildlife while the trees make excellent shelter for birds and other wildlife (G. Cotter).....	25

Photo Credits: The name of the photographer is noted in the caption for each photo (first initial and last name). Many thanks to the photographers for their excellent photos. Photos were provided by Anne Cannon, Glenda Cotter, Dan Jensen, and Diane Fosnocht: Wasatch Hollow Community members. And by Kathlyn Collins: Planning Assistant, Water Resources Planning and Restoration, Salt Lake County Public Works Department Engineering Division. Photos from K. Collins in this baseline document were taken during Salt Lake County Engineering Division Emigration Creek Level III Channel Stability Study 2005.

BASELINE DOCUMENTATION

PROPERTY LOCATION AND IDENTIFICATION

Map

Land Type

The open land described in this baseline documentation is the Emigration Creek corridor in Wasatch Hollow. The Emigration Creek corridor in Wasatch Hollow comprises approximately 15 acres, extending from Wasatch Hollow Park (1650 East 1700 South) upstream past Clayton Middle School to 1900 East and approximately 1400 South, Salt Lake City, Utah. The stream corridor includes Emigration Creek and the stream valley up to the crest of the valley walls. The portion of Emigration Creek corridor in Wasatch Hollow is environmentally valuable as an unusually large contiguous section of Emigration Creek corridor with geomorphology similar to the native condition and remnants of native plant communities. Although stream corridors are naturally long landscape elements, the Emigration Creek corridor has been fragmented by urbanization along its length in Emigration Canyon and Salt Lake Valley. Wasatch Hollow contains approximately 1 km of relatively natural Emigration Creek corridor.

This large natural area along Emigration Creek in Wasatch Hollow presents valuable educational, aesthetic, recreational, and social opportunities. These opportunities are particularly unique in an urban context. The stream corridor is within a few blocks of Westminster College, Highland High School, Clayton Middle School, and Uintah Elementary School. Ecologically, the stream corridor is currently unique for its large size and remaining natural habitat. The large size of the corridor in Wasatch Hollow presents opportunity for natural stream and riparian processes that contribute to clean water, preservation of native plant communities, and which are particularly important for birds (Gardner, Stevens & Howe. 1999. Utah DWR Publication No. 99-38).

Ownership of the land in the Wasatch Hollow stream corridor is divided among private individuals, Salt Lake City, the Church of Jesus Christ of Latter Day Saints, and Rocky Mountain Power. Private individuals hold more than 40 parcels of land at least partially in the stream corridor. Private individuals hold 6 parcels that together completely span the stream corridor just west of where 1800 E would transect the corridor. Salt Lake City also owns land completely spanning the corridor: Phase III of Wasatch Hollow Community Park and the 1700 E right-of-way (see map). Besides the private land spanning the corridor at 1800 E and Salt Lake City property at 1700 E and just south of 1700 E, no other type of property ownership (individual, corporate, or public) spans the corridor. Management decisions in the Wasatch Hollow stream corridor will therefore affect numerous landowners. Wasatch Hollow Community members who do not live adjacent to the stream corridor are also important stakeholders. Many Wasatch Hollow

Community members—particularly children—will be directly affected by decisions regarding land management in the stream corridor.

Elevation of the stream bed ranges from 4,478 ft at 1700 East to 4,584 ft. at 1900 East (elevation data from SL County Engineering Division Level III Channel Stability Study. 2005; attached). The crest of the valley walls is a maximum of approximately 30 m above the stream bed, as east of the 1700 East right-of-way. Valley walls are steep, with slopes often 45% or steeper. Of particular note for restoration is the valley wall between 1700 E and Phase III of Wasatch Hollow Park, which is steeply sloping due to road fill. Stream valley geomorphology varies over the length of the corridor in Wasatch Hollow, as is desirable in a natural system.

Floodplain extent is relatively limited; the lateral extent of the valley bottom ranges from 0 m beyond the bankfull channel margins to approximately 70 m at the widest portion (on the current LDS Church property). Floodplain connectivity with the channel is limited because of advanced incision of much of the channel, especially in the downstream portions of Wasatch Hollow. Terraces exist in and near the channel in some places, providing desirable floodable land where they exist.

Three general belts of similar environmental conditions occur along the length of the corridor: 1) running water, 2) riparian, and 3) upland fringe. Running water occurs as Emigration Creek, which may be augmented by flows from natural springs in Wasatch Hollow. Riparian habitat is marked by lowland riparian communities. The upland fringe is marked primarily by mountain shrub communities.

History

The Emigration Creek corridor in Salt Lake Valley formed as the waters of Emigration Creek and floods shaped alluvial fill at the mouth of Emigration Canyon and in Salt Lake Valley. When the Mormon pioneers entered the grassy Salt Lake Valley they reported Emigration Creek flowing in a steep-sided ravine that gradually moderated further west in the valley.

The Donner-Reed emigrant company probably followed the southwestern side of the Emigration Creek corridor from the mouth of Emigration Canyon through what is now Wasatch Hollow before continuing westward through the valley. Wagons of the first group of pioneers of the Church of Jesus Christ of Latter Day Saints (LDS Church, Mormons) followed the Donner-Reed route along the southern side of the Emigration Creek corridor through what is now Wasatch Hollow before camping at approximately 1700 S and 500 E on their first night in the valley (July 22, 1847). The next day they backtracked approximately one mile (possibly to avoid marshy ground), and traveled north to City Creek where they established the camp that would later become Salt Lake City. The next day (July 24), the LDS Church leader Brigham Young and the last of the initial pioneer company entered the valley along the same route, traveled along the side of the Emigration Creek corridor through what is now Wasatch Hollow, crossed

Emigration Creek probably near where the group had crossed the day before (thought to be at about 1100 East), and then continued to the City Creek camp. (R. Dixon. 1997. Utah Historical Quarterly 65(2):155-164)

Wasatch Hollow housing development began primarily in the early 1900's. By 1930, there were several houses on the high land adjacent to the stream valley, as well as one farm where Wasatch Hollow Park now occurs. Fruit orchards extended into the corridor as far as the southern end of the current LDS Church property. Subdivision adjacent to the corridor occurred until approximately the 1970's.

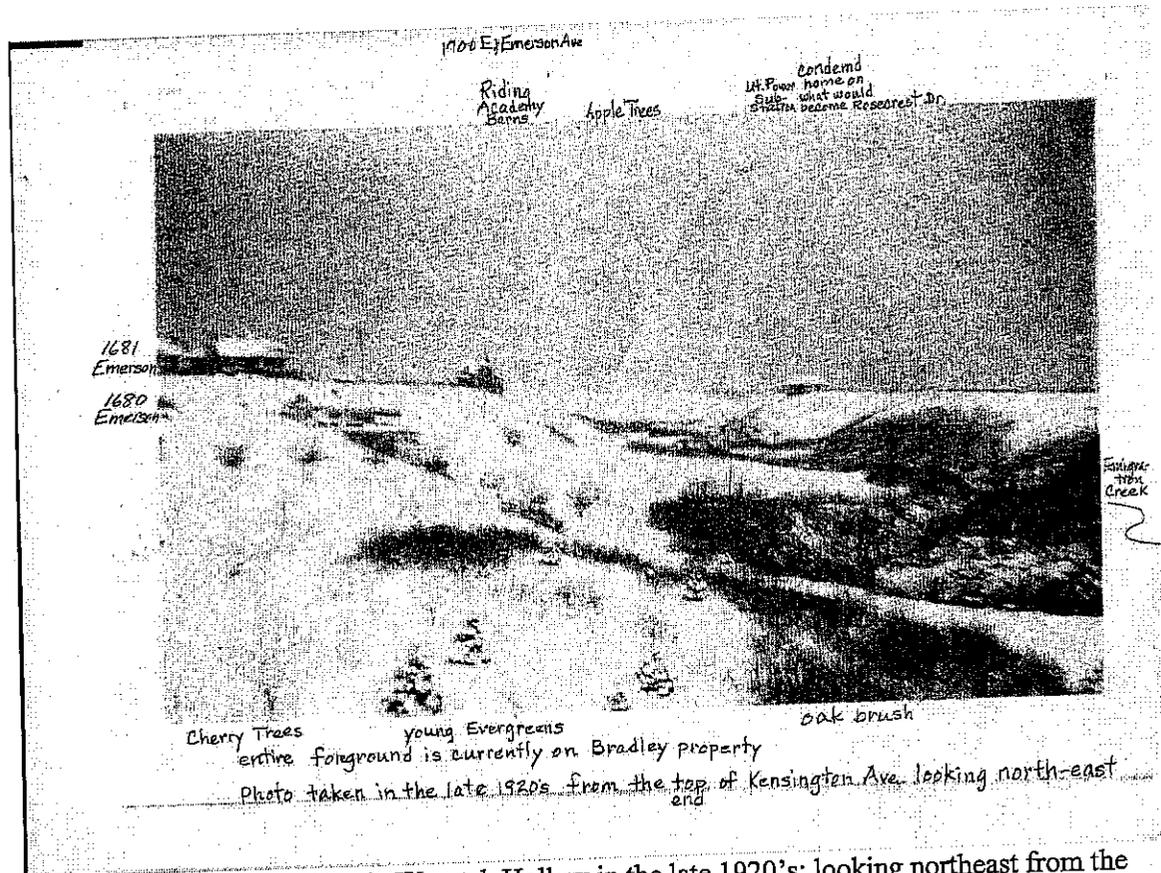


Photo 1. The stream corridor in Wasatch Hollow in the late 1920's; looking northeast from the end of Kensington. (A. Cannon)

In the early 1900's, an underground pipeline was constructed from springs in the Emigration Creek corridor in Wasatch Hollow to the Utah State Penitentiary. This source of fresh water was utilized by the penitentiary until about 1950. The pipeline still exists although it has been abandoned. The springs have been covered by fill from adjacent residential development and fill of the current Bradley property.

Rocky Mountain Power (previously Utah Power) owns land in the stream corridor just west of 1900 E. A substation was constructed on Rocky Mountain Power Company land in the stream corridor sometime in the mid 1900's. This substation still operates.

The Church of Jesus Christ of Latter Day Saints built a stake center (Hillside Stake) that was completed in 1960 on 1900 East at approximately 1400 South with a rear parking lot adjacent to or partly in the Emigration Creek corridor. The LDS Church Colonial Hills meeting house was completed in 1953 on the west side of the corridor at approximately 1450 South on 1700 East. Although the LDS Church owns approximately 5 acres of land in the stream corridor adjacent to the Colonial Hills meeting house (see map), the only apparent development of this land consists of a dirt ramp for vehicular access from the parking lot to the bottom of the stream valley. This ramp is currently gated and padlocked. Chain-link fences have been erected and currently exist along the crest of the stream corridor on the edge of the current Colonial Hills parking lot and around the Hillside Stake Center parking lot.

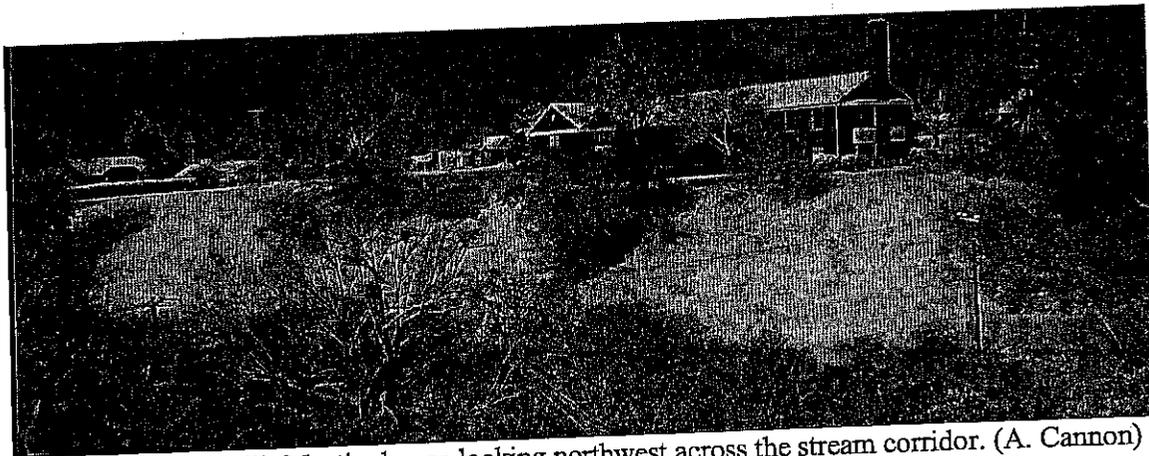


Photo 2. Colonial Hills Meetinghouse looking northwest across the stream corridor. (A. Cannon)

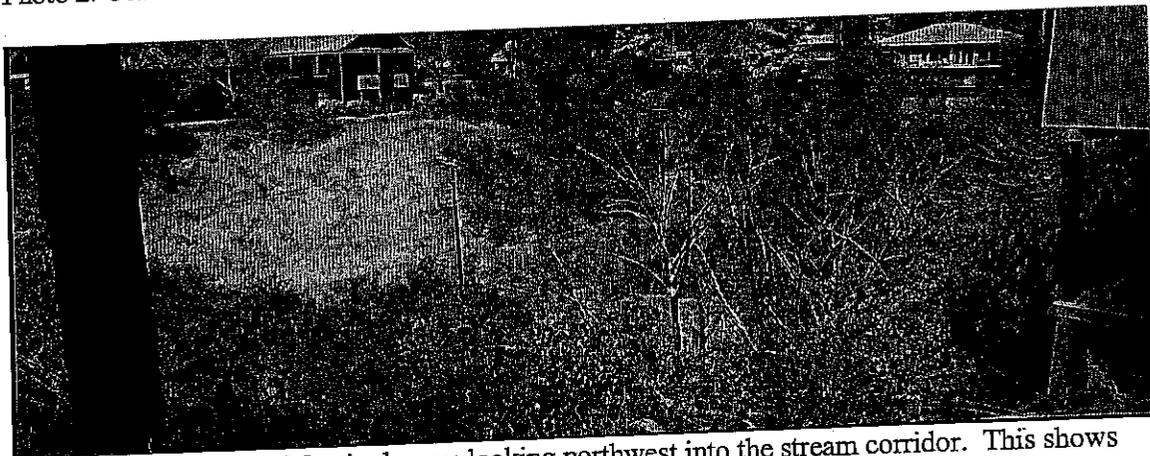


Photo 3. Colonial Hills Meetinghouse; looking northwest into the stream corridor. This shows the tall willows and cottonwoods of the riparian area, and Gambel oak stands in the valley bottom and sides. (A. Cannon)

Clayton Middle School was built adjacent to the Emigration Creek corridor just west of 1900 East. The land adjacent to the school in the stream corridor was landscaped as a grassy amphitheater with mowed lawn to Emigration Creek. A bridge of sandstone slabs was also constructed across Emigration Creek in the grassy area adjacent to Clayton Middle School.



Photo 4. Clayton Middle School looking from Emigration Creek southward. Clayton Middle School will soon be rebuilt further west, and the current location will become a soccer field. The bridge of sandstone slabs on Clayton Middle School grounds is not shown in this picture. (K. Collins)

The home currently owned by Michael Bradley (1665 E. Kensington, 84105) comprises the only housing unit existing in the Emigration Creek corridor in Wasatch Hollow. No other housing development has yet occurred in the stream corridor north of Wasatch Hollow Park due to the choices of private property owners combined with the difficulty of access and concerns about flooding. The current Bradley home was built in 1964 by Joseph Knowlton on one of three adjacent lots comprising his property in the stream corridor. Under Knowlton's stewardship, much of his property was raised and leveled by filling it with soil and other material. The origin of material for the fill is unknown, but roadway markers and concrete pieces are visible in the fill adjacent to the stream, suggesting that at least some of the material came from nearby roadwork. Altering the natural topography by filling the Knowlton property covered springs and constrained the stream channel along the property. In 1995, much of the Knowlton property (the two lots without a house) was zoned (or re-zoned) open-space by Salt Lake City (the lot where the house currently stands remained in residential zoning). However, prior to 2003 the entire property was re-zoned by Salt Lake City appropriate for residential development (zoned R-1-5000), and was removed from FEMA floodplain status (See FEMA, Letter of Map Revision and attached documents. February 10, 2005. Case No. 04-08-0707P, City of Salt Lake City, UT, Community No. 490105). Michael Bradley purchased the property in 2003.



Photo 5. Bradley property, looking southwest toward the south side of Kensington from near the fence bordering Emigration Creek. The hillside in this photo is included in the proposed Madison Park Subdivision for the Bradley property. (A. Cannon)

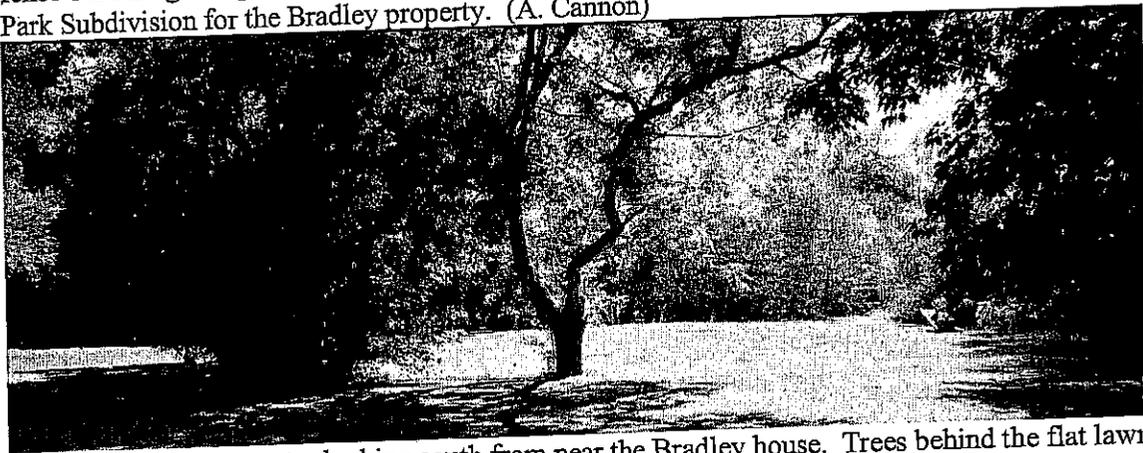


Photo 6. Bradley property, looking south from near the Bradley house. Trees behind the flat lawn border Emigration Creek. (A. Cannon)



Photo 7. Fence across the stream at the northeastern end of the Bradley property, looking northwest. Land on the far side of the fence is Bradley property. The stream bend shown will erode further into the Bradley property over time unless intervention is performed. Alternatively, this is one of a few desirable natural meanders on the stream that could be encouraged. If the Bradley property is managed for natural rather than residential value, this bend would contribute to the health of corridor by helping to connect the stream and riparian habitat. Bends such as this dissipate energy from the stream, reducing the potential for downstream erosion and damage from high flows. (A. Cannon)

Wasatch Hollow Community Park

Wasatch Hollow Community Park forms the southern boundary of the undeveloped portion of the Emigration Creek corridor in Wasatch Hollow. The Park is located adjacent to the Wasatch Presbyterian Church on 1700 South and 1650 East, on land donated by the Presbyterian Church. The Park was planned to be completed in three phases, phases I and II of which have been completed. Phase III has not yet been completed as it was originally envisioned. The planned phases are:

Phase I: Completed 1993. Parking area, playground surrounded by rocks, restrooms, and drought-tolerant demonstration gardens. The demonstration gardens consist of native trees and shrubs adjacent to the grassy park area and playground. No interpretive material is available for the native plants.

Phase II: Completed 1994. Restrooms, paths, lighting, benches, and automatic irrigation.

Phase III: Not yet completed. Plans included a bridge across the stream, pathways, and overview area, a picnic area, and landscaping. Informal walking and bicycle paths exist in the area intended for Phase III of the Park. No bridge has been constructed.



Photo 8. North end of Wasatch Hollow Community Park; looking northwest. The natural area of the stream corridor is visible extending to the right of the photo. (A. Carrson)

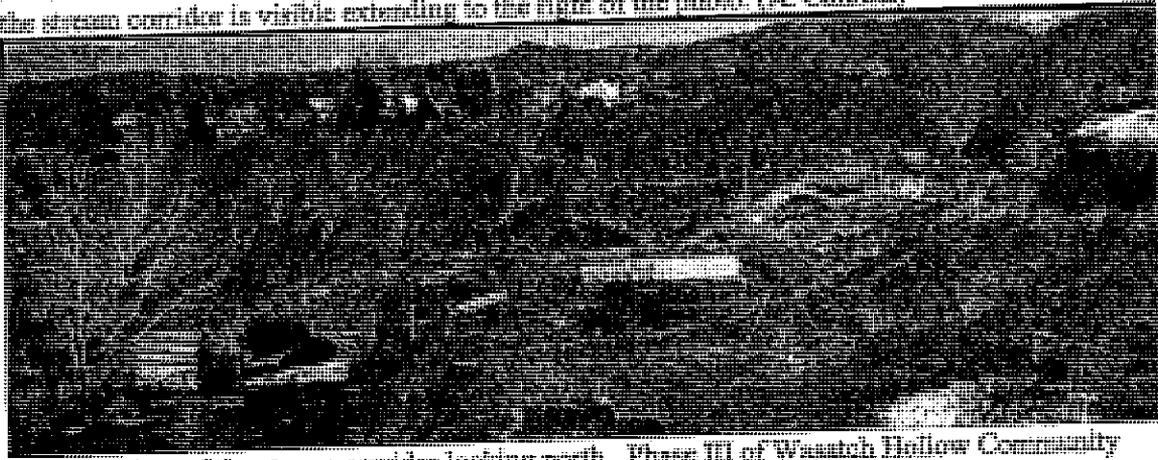


Photo 9. View of the stream corridor looking north. Phase III of Wasatch Hollow Community Park includes the dense trees around the stream through the center of this photo. (A. Carrson)



Photo 10. View of Phase III of Wasatch Hollow Community Park, looking north. This shows the roadway coming into the stream corridor from 1700 East. This area is popular for bicycle riding and sledding. For scale, notice the person just entering the riparian trees on the left (A. Cannon)

Dogs

Wasatch Hollow Community Park and the stream corridor in Wasatch Hollow are popular for use by dogs. Dog owners use Wasatch Hollow Park daily, and many travel with their dogs into the natural area of the stream corridor (Phase III of the Park and upstream). Current regulations require dogs to be leashed, but this regulation is largely ignored in Wasatch Hollow Community Park and adjacent stream corridor. Currently, off-leash dogs can be frequently encountered in the stream corridor where they run throughout the corridor and in the stream. Consequences of these off-leash practices include denudation of stream banks and prevention of the reestablishment of vegetation. Off-leash dogs disturb wildlife, possibly including low-nesting birds and fledglings. Off-leash dogs also disturb and may help curtail the activities of other nest and bird predators such as cats, rats, and raccoons. However, nuisance animals are better controlled by careful management practices than by off-leash dogs. Dog waste also continues to be a problem as some dog owners do not clean up the dog waste or dispose appropriately of plastic dog-waste baggies.

Many dog owners have expressed their enjoyment of an area where dogs can romp off-leash. Other community residents have expressed concerns about off-leash dogs, especially with regard to their interactions with children.

Roads

No public roads exist in the stream corridor. However, roadways have been cut into the valley walls in several places for vehicular access to the valley bottom:

- 1) Just north of the Wasatch Hollow Park pavilion to access the drains where Emigration Creek is routed under the park.
- 2) From the same point at Wasatch Hollow Park to the southern end of the current Bradley property.
- 3) From the eastern end of Kensington Drive into the current Bradley property (this is the driveway to the current Bradley residence). The driveway into the current Bradley property has been paved. No other paved roadways exist in the Wasatch Hollow stream corridor.
- 4) From 1700 E into the open meadow at the northeastern end of Phase III of the Wasatch Hollow Community Park, and
- 5) From the eastern side of the LDS Church Colonial Hills Meetinghouse parking lot eastward to the valley bottom on current LDS Church property.

Land Stewardship and Management

Land stewardship is currently the responsibility of the various landowners. Salt Lake County has stewardship of the stream and stream banks. Individual private landowners manage their lands variously. Overall the management strategy for all landowners (including Salt Lake City) is for minimal interventions of any kind. Ecological conditions are not formally managed. Some individuals have removed invasive plant species from their property, but this does not appear to be generally nor consistently occurring over much of the stream corridor. There is no formal, comprehensive strategy for management or enhancement of native plant communities or wildlife habitat. Most activities with direct influence on ecological conditions of much of the stream corridor are informal—resulting from recreational activities such as dog-walking and bicycling. Salt Lake County Engineering Division has assessed the stability of the stream (see attachment; contact Kathlyn Collins). Removal of wood and other obstructions from the stream has occurred in the past by Salt Lake County Flood Control Engineering Division. Currently, Salt Lake County Flood Control Engineering Division maintains and cleans the catchment basin drains just north of Wasatch Hollow Community Park.

Landscape Alterations

The Wasatch Hollow portion of the Emigration Creek corridor retains its overall native geomorphology as a stream valley with a moderately meandering stream and steep valley walls. Fill from residential and road development has altered the shape of the valley walls in many places. Several natural springs used to flow above ground in the Hollow, but they have now been covered by fill from adjacent homes. Fill on the current Bradley

property forms the west bank of the stream along that property. Many private landowners have fences or shrubby barriers between their property and the stream corridor. A chain-link fence surrounds the current Bradley property in the corridor. This fence transects the stream channel where a stream bend occurs on the northeastern side of the Bradley property. Several landowners on the eastern side of the stream have also erected chain-link fences in the stream corridor near the current Bradley property. One chain-link fence has been constructed perpendicular to the corridor on the border of private property (1715 E. Kensington, currently owned by Ethel Palmer) as a barrier to travel along the floodplain terrace. This fence has been vandalized in several places by cutting it to facilitate travel along the corridor. A smaller (3 ft) fence parallel to the stream at the western end of the same property is buried by silt to more than half its original height. A large chain-link fence has been erected around the Clayton Middle School property across the stream corridor. This fence is meant to be impassable, but students and other people still manage to get around, under, or over it.

Recreational use has led to limited landscape alterations: primarily informal trails in various places, bicycle trails with dirt ramps in Phase III of the Wasatch Hollow Community Park, and compaction and erosion from stream bank denudation occurring from the upstream end of the current Bradley property through the Phase III portion of the park.

Stream morphology is highly influenced by the urban surroundings and by the stream's history of having obstructions cleared. Flashy, higher flows resulting from stormwater runoff from impervious surfaces of the urban environment contribute to scouring and incision of the stream channel. The lack of obstructions such as logjams in the stream contributes to faster flows in the stream and increased incision and stream bank erosion. Lateral constraint by fill decreases the capacity of the stream for widening and so hastens vertical incision. Severe denudation of the stream banks and some riparian terraces has occurred in the southernmost portion of the Hollow as a result of unfocused use by people and dogs in combination with stream flooding. High sediment loads from disturbances such as upstream construction near the stream and by upstream erosion contribute to scouring in some places and to altered streambank morphology in depositional areas such as the downstream portions of the catchment basin.

Detention Basin

The drain system where Emigration Creek enters a culvert under Wasatch Hollow Community Park incorporates three grated drains arranged vertically ("debris tower") along the downstream embankment ("dam") of the catchment area. These drains are designed to flood a portion of the stream corridor if any of the drains become blocked, with the intent that all three drains will not become blocked as water levels rise and flows change. The detention basin planned for maximum flood extends upstream to a level about halfway through the LDS Church property by the Colonial Hills meeting house, and includes Phase III of the park. If flooded to the top drain, maximum water depth in the detention basin would be several meters.



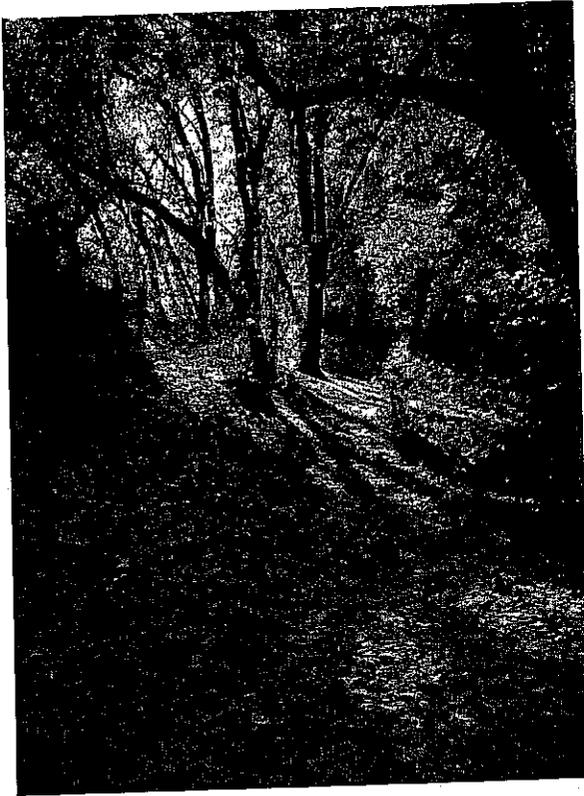
Photo 11. Stacked drains in the embankment at the southern end of the detention basin. Emigration Creek flows into the lowest drain in this picture. (A. Cannon)

Zones

Overview

The stream corridor in Wasatch Hollow is valuable because of its size, and must be considered as an ecological entity. For the sake of ecological integrity and the benefits of natural, biologically diverse areas, every effort should be made to preserve the entire corridor in Wasatch Hollow. Management should consider the entire stream corridor upstream from and in Wasatch Hollow and consequences of stream and land management downstream from Wasatch Hollow. Although some ecological preservation and restoration projects will be constrained to limited portions of the stream corridor, interventions should occur with consideration for plant and animal communities of the entire corridor. However, the stream corridor has not received homogeneous impacts. Clear needs for ecological preservation and restoration differ along the length of the corridor. The corridor may be conceptually divided laterally into four zones. Designation of these four zones is based on human impact, ownership, ecological conditions, and expressed desires of Wasatch Hollow Community members. The four conceptual zones do not imply that the corridor may be divided into four independent zones for housing or commercial development, but rather that preservation and restoration may be tailored to four different zones to benefit the ecosystems of the entire corridor. As preservation and restoration progress, the extent and needs of these zones should be monitored and re-evaluated.

Zone 1



Zone 1 is the furthest downstream portion of the Wasatch Hollow stream corridor. Zone 1 begins at the embankment where Emigration Creek is routed under Wasatch Hollow Park, and continues upstream to approximately the upstream end of the current Bradley property (at the edge of the 1700 East right-of-way).

Photo 12. View from the informal trail along the east side of the stream looking southward. The open sky visible at the top left of the picture is the open area of Phase III of Wasatch Hollow Community Park. The person just entering the riparian area in Photo 10 above was on this trail by the tree with the large dark trunk in the center of this picture (A. Cannon)

Positive, Zone 1

- Zone 1 has the same general positive ecological conditions as the rest of the stream corridor, including the following:
 - The stream channel currently includes meander bends even though somewhat constrained.
 - There is enough space in the corridor to rehabilitate the stream channel, riparian habitat, and other habitat further if the current Bradley property is included.
 - There is enough space and micro-climatic variety to foster a healthy mosaic of habitat types in Zone 1, particularly if the current Bradley property is included.
- Students from Westminster College under the direction of Ty Harrison planted some native shrubs on the terrace and stream valley walls east of the stream just north of Wasatch Hollow Park.
- Human access to the natural area in the stream corridor is easy from Wasatch Hollow Park.
- If the Bradley property is purchased, the landscape favors a nested-trail loop that will constrain public use in portion of Zone 1. This trail should be of natural material and unobtrusive to preserve the natural area. A trail is needed in Zone 1 to focus human activity away from sensitive, denuded areas, to prevent further denudation, and to allow restoration of plants to

the riparian area and nearby land. A loop trail will encourage people not to venture further upstream in the corridor, as well as encouraging people not to explore onto private land to the east, and allow improved monitoring and law enforcement.

Negative, Zone 1

- Zone 1 is the most ecologically degraded area in the stream corridor.
- The stream channel is incised as a result of artificially confining the stream with property fill on the western side (the Bradley property) and by the removal of logs and other natural flow modifiers.
- Stream connectivity with the riparian area is impaired because the stream is incised and artificially constrained.
- Stream banks have been denuded largely as a result of use by people and dogs.
- Reestablishment of ground cover plants on stream banks appears to be prevented by disturbance from people and dogs in combination with scouring from high flows.
- Valley landforms away from the stream have been highly altered by residential fill and adjacent road construction.
- Undesirable, invasive plants are common.
- Currently humans and dogs move wherever they want to across the landscape. Without guidance of appropriate trails and vegetation, this movement will continue to contribute to stream bank and corridor degradation.
- Some chain-link fences are in the corridor and most are in disrepair.
- Minor, relatively simple graffiti has been painted on some trees, rocks, and other structures.

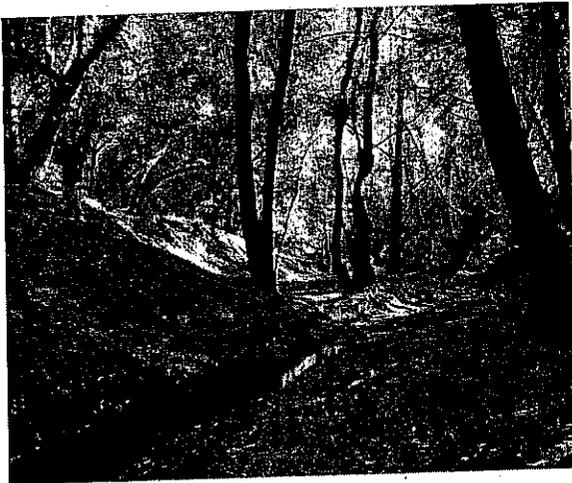
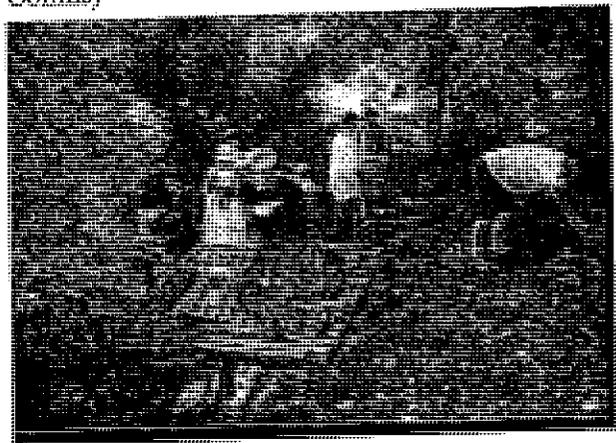


Photo 14. Community clean-up volunteers in Zone 1. View is looking northward along the informal streambank trail onto private property adjacent to the stream to the east. (A. Cannon)

Photo 13. Looking southward from right by the fence across the stream on the Bradley property. The Bradley property is to the right in this photo. This photo shows denudation typical of Zone 1. Boy is on rope swing. (K. Collins)



Zone 2



Zone 2 begins in the corridor approximately even with the upstream end of the current Bradley property and continues through to approximately the level of the upstream end of the current LDS church property.

Photo 15. This view is from LDS Church property looking north. Dense native Gambel oak stands can be seen to the right and center in this picture. The Colonial Hills Meetinghouse is out of the picture at the top of the hill to the left. Yellow cottonwoods are visible in the riparian area near the center of the picture. (A. Cannon)

Positive, Zone 2

- Zone 2 has the positive ecological elements of Zone 1, but is in better ecological condition than Zone 1.
- Stream banks are more vegetated (less denuded) than in Zone 1.
- The stream channel is less incised than in Zone 1.
- Attractive native Gambel oak stands occur in the corridor in the upstream portion of Zone 2.
- Limitations on human access to Zone 2 are favored by steep corridor walls.

Negative, Zone 2

- Invasive plants are present.
- Stormwater runoff from 1700 East is diverted directly into the stream corridor, forming a small erosion gully on the west side of the corridor.
- Asphalt and concrete road debris has been dumped into the sides of the corridor from 1700 East and in other locations.
- Unrestricted paint ball and air soft shooting games occur, primarily on LDS church property west of the creek. These shooting games result in the presence of large numbers of plastic bb's, paint on trees and other landscape elements, and unrestricted human movement on the landscape.

- Anti-social activity occurs primarily in hide-outs under the riparian canopy close to the stream.
- People have built unstable wood and rock dams in locations where they may contribute to inappropriate stream bank erosion.

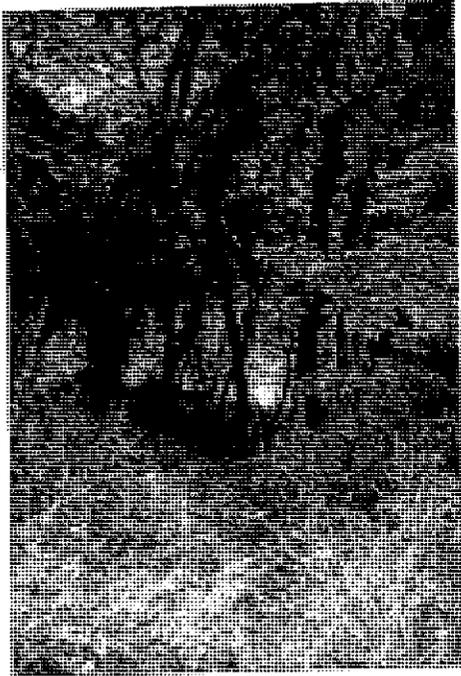


Photo 16. This view from within the 1700 right-of-way looking north into Zone 2 shows the dense trees and vegetation of this area interspersed with open areas. Taller trees are in the riparian area out of this picture to the right, but Zone 2 is especially notable for its beautiful upland shrub mosaic. (A. Cannon)



Photo 17. Community stream corridor clean-up volunteers. View is looking north into Zone 2. (D. Jensen)



Photo 18. A hideout on LDS Church property near Emigration Creek, just west of the Colonial Hills Meetinghouse. (A. Cannon)

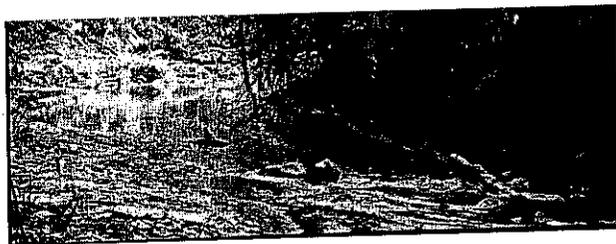
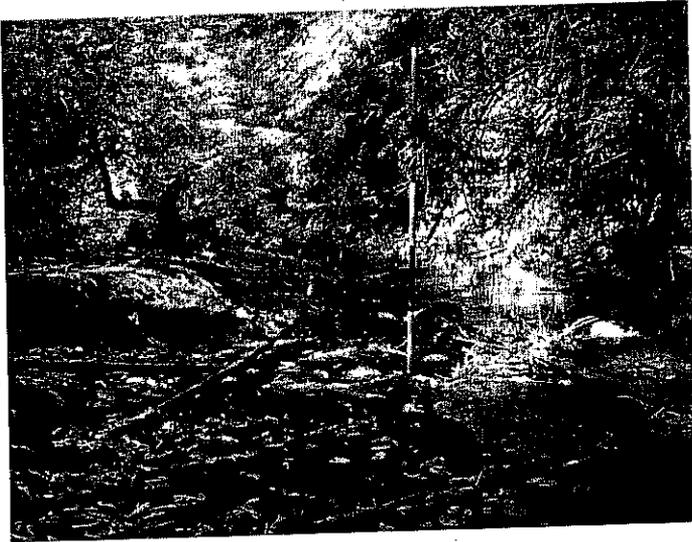


Photo 19. View of Emigration Creek looking downstream from the hideout in the picture to the left. (A. Cannon)

Zone 3



Zone 3 consists of currently private property between the LDS church property and the Clayton Middle School grounds. These 6 parcels of private property span the entire stream corridor just west of where 1800 East would transect the corridor.

Photo 20. View typical of stream channel in Zone 3. (K. Collins)

Note: My assessment is limited to the stream channel and immediately adjacent riparian area in Zone 3 because I have only walked along the stream in Zone 3. I have not visited private property in Zone 3 away from the stream.

Positive, Zone 3

- The stream channel is less incised than in other zones, has good structure such as undercut banks and pools, and is well-armored in many places by willow roots.
- The riparian habitat is relatively well-developed and stream banks are well-vegetated.

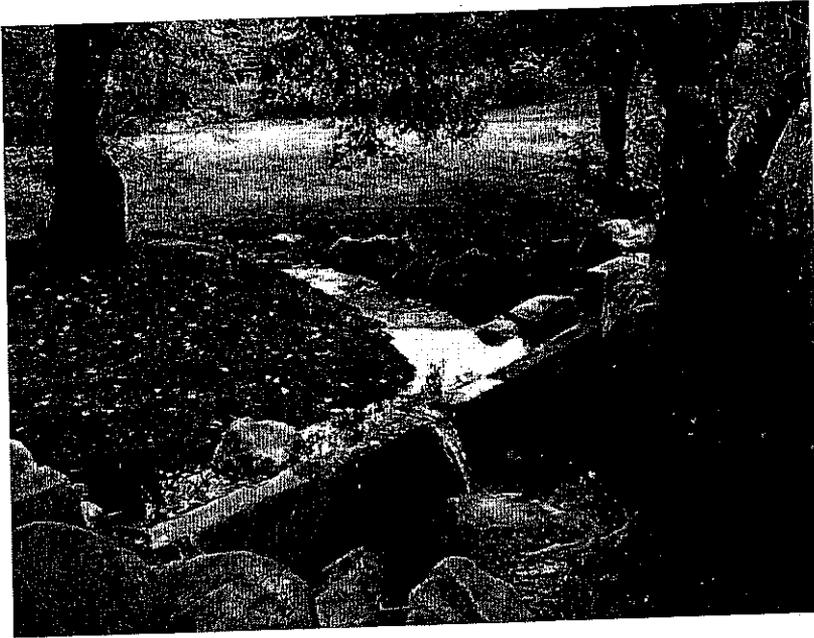
Negative, Zone 3

- Invasive plants are present.
- Anti-social and undesired human activity occurs in the riparian area.



Photo 21. Willow roots (red) like these hold the banks stable in Zone 3. These roots are found in all Zones, but are very well developed in Zones 2, 3, and 4. The root-protected banks are stable and provide shelter for organisms in the stream. (K. Collins)

Zone 4



Zone 4 consists of the portion of the stream corridor from the upstream boundary of Zone 3 to 1900 East. Most of Zone 4 is currently on Clayton Middle School grounds or owned by Rocky Mountain Power.

Photo 22. View looking westward onto the Clayton Middle School grounds. (K. Collins)

Positive, Zone 4

- Ecological conditions are similar to those in Zone 2.

Negative, Zone 4

- Invasive plants are present.
- This area receives litter from on-site and adjacent human use.



Photo 23. Emigration Creek emerging from the culvert under 1900 East into Wasatch Hollow. (K. Collins)

VEGETATION AND SOILS

Soils

Soils in the Emigration Creek corridor in Wasatch Hollow are mollisols with mixtures of fill soils from a variety of sources. Streambank sediment is silty in the catchment basin. Clay deposits are reported to exist in the northern and southern portions of the corridor in Wasatch Hollow.

Habitat Types

Stream

Emigration Creek in Wasatch Hollow is a beautiful, clear, small stream that provides water resources for riparian soils, plants, wildlife, and people. Riparian soils and plants depend on the stream water. The structure of riparian communities depends both on the presence of the stream and on its dynamics. For example, the frequency and extent of floods help to determine plant community composition in part by helping to control ecological succession of streambank communities. Stream and riparian plant interactions help

to shape the stream form. Currently the stream banks are held in place in many instances by the roots of riparian plants such as the red roots of stream bank willows. Terrestrial

wildlife uses the stream, and aquatic organisms contribute to a dynamic stream ecosystem. The stream helps to cool and moisten the air in the summer. People can enjoy the sounds, sights, and smells of the stream in all seasons of the year. For instance, a photographer was observed capturing images of winter ice along the stream. Photos 24 & 25. Emigration Creek in Wasatch Hollow. K. Collins



Utah Division of Wildlife Resources lists flowing water habitat as very rare and declining (less abundant and less healthy than previously) in Utah. Currently they report flowing water habitat as comprising less than 0.1% of Utah's land area. Flowing water habitat, such as Emigration Creek in Wasatch Hollow, is therefore a high priority for preservation in Utah.

Emigration Creek emerges into Wasatch Hollow from a culvert under 1900 East and re-enters a culvert at the embankment just north of the grassy area of the Wasatch Hollow Community Park. Although Emigration Creek rarely dries completely in Wasatch Hollow, summer flows are often very low in late summer and mid-winter. High flows occur primarily with snowmelt in the spring, peaking generally in April or May, although peak flow timing varies. The stream water is generally clear, but elevated flows bring quite a bit of sediment. A single flood event in October 2006 was observed to deposit as much as 1 cm of sediment on streambanks in the downstream portion of Wasatch Hollow by the Park.

The stream is in better ecological condition further upstream in Wasatch Hollow. In Zones 2-4 the stream banks and bed appear fairly stable, the stream is not as incised, and the channel cross-sectional shape is rounder, often with channel structure providing overhead cover in the stream against the banks. In Zone 1, the stream banks and bed appear generally unstable, the stream is deeply incised, and the channel cross-sectional shape is typically V-like, usually with little cover against the banks. These differences led the Salt Lake County stream surveyors in 2005 to split the stream in Wasatch Hollow into two reaches: Reach 7A corresponds with Zones 2, 3, and 4, and Reach 7B corresponds with Zone 1 in this baseline document (see attached Salt Lake County Engineering Division, Level III Channel Stability Study. 2005. K. Collins).

Emigration Creek Physical Characteristics in Wasatch Hollow

*Note: *indicates data provided by Salt Lake County Engineering Division, Level III Channel Stability Study. 2005. K. Collins.*

- Bankfull Channel Width: approximately 4-6 m
- Bankfull Channel Depth: approximately 0.5-1 m
- Width to Depth Ratio*: generally about 6
- Gradient*: approximately 3%
- Sinuosity*: approximately 1.2
- Channel Bedding: generally competent composite of sediment, gravel, and cobbles, rarely boulders.
- Channel Type: Pool-riffle; pool habitat is lacking, probably due to historical removal of flow obstructions.
- Large Wood Structure: rare and tending to small, unstable jams.

- Flows: at nearest stream gage, which is upstream from Wasatch Hollow at the mouth of Emigration Canyon

	Flow (cubic feet/second)	Time of Year
Lowest Flow 2000-2004	0.12 (SD=0.28)	late summer, mid-winter
Highest Flow 2000-2004	20.16 (SD=9.95)	April or May
Mean Flow 2000-2004	3.29 (SD=1.44)	(summary year round)
Estimated Flood Flow	120	na
Record Flood of 1983	146	May

Data from Salt Lake County Flood Control Engineering Division
<http://www.pweng.slco.org/flood/streamFlow/history/index80.cfm>
 Minimum, Maximum, and Mean flows from water years 2000-2004
 SD = standard deviation

- Rosgen Classification*: closest to B-4
- Pfankuch Stability Ratings*:
 (Higher ratings indicate more unstable stream; Zone 1 was rated as the least stable stream reach along the entire length of Emigration Creek.)

	Upper Bank	Lower Bank	Stream Bed	Total
Zones 2,3,4 (SL County Reach 7A)	29	40	43	112
Zone 1 (SL County Reach 7B)	36	46	52	134

- Bridges: 1) sandstone slabs across the stream on Clayton Middle School grounds.
- Dams: 1) Cement overflow structure in the stream on Clayton Middle School grounds.
 2) Embankment at furthest downstream location of above-ground flow of Emigration Creek in Wasatch Hollow. (See "Detention Basin" above.)
- Chemical:
 - No chemical data were collected in Wasatch Hollow during baseline assessment to date.
 - Paucity and type of stream invertebrates suggests low water quality (see Stream Invertebrates below).
 - Nearest available data are 6 measurements during October and November 2006 in Emigration Creek on Westminster College Campus:
 Dissolved Oxygen: 10.00-10.20 mg/l
 Nitrates: 0.6-1.7 mg/l
 pH: 7.3-7.9
 -Data collected by Kevin Whipple;
<http://people.westminstercollege.edu/faculty/tharrison/emigration/chemical.htm>

Lowland Riparian

The lowland riparian habitat along Emigration Creek in Wasatch Hollow includes large trees, dense shrubs particularly in upstream areas, and a variety of forbs and grasses. The largest trees exceed 40 cm diameter at breast height and 30 m in height. These large trees and other riparian plants help to stabilize stream banks, prevent erosion, moderate the environment adjacent to the stream, and provide extremely valuable wildlife habitat. Riparian habitat is the most important habitat for birds in this area. Most birds in the great basin are dependent on or use riparian habitat (Gardner, Stevens, & Howe. 1999. UDWR Pub. No. 99-38). For instance, riparian habitat provides valuable nesting and foraging habitat for neotropical migrants such as warblers. Other wildlife including invertebrates heavily use riparian habitats. Riparian habitat is typically the most biologically diverse habitat in western US landscapes (Kelsey & West. 2001. Ch 10 in Naiman & Bilby *eds.* River Ecology and Management. Springer Verlag, NY).

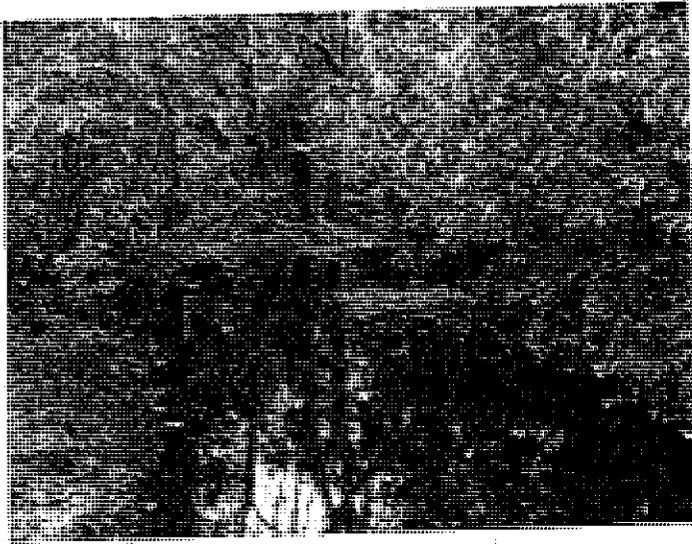


Photo 26. View of the stream and lush riparian habitat. K. Collins

Utah Division of Wildlife Resources assesses lowland riparian habitat currently at about 0.2% of Utah's land area, and report that it is very rare and declining. It is estimated that over 90% of riparian habitat in Utah has been lost or negatively altered (Gardner, Stevens, & Howe. 1999. UDWR Pub. No. 99-38). Lowland riparian habitat such as that in Wasatch Hollow is therefore a high priority for preservation and ecological restoration in Utah.

Human use of the riparian habitat is high in Wasatch Hollow, as this habitat provides many of the natural characteristics that are appealing to people, such as green vegetation, access to water, and birds. The consequences of human use of the riparian habitat in Wasatch Hollow include denudation of stream banks in Zone 1, and loss of or damage to riparian plants in many areas. In addition, riparian plant communities do not currently reflect ideal connectivity with the stream (e.g., stream-caused disturbance of streambanks) because of the urban context, particularly because the stream has become increasingly incised and flow obstructions have been removed. Illegal or anti-social activities such as drug use occur in many areas of the riparian habitat, probably because the stream and dense riparian vegetation provide secrecy. For example, drug use paraphernalia was found hidden under wood in an obviously well-used low area in the midst of riparian vegetation near the stream just east of the Colonial Hills LDS Church meeting house. Birds and other vectors have also contributed to the spread of undesirable invasive plants into the riparian area in Wasatch Hollow.

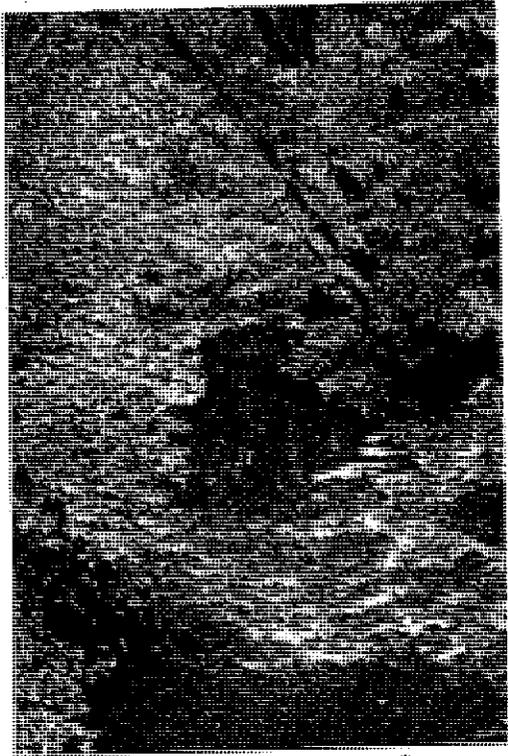


Photo 27. Emigration Creek and riparian habitat showing dense vegetation growing near the stream in many areas. Notice the leaves in the stream, which provide carbon for stream-dwelling organisms. (A. Cannon)

Native Riparian Shrubs and Trees

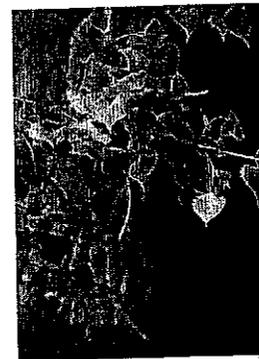
Characteristic native shrubs and trees in the lowland riparian habitat in Wasatch Hollow are:
Peach-leaf willow *Salix amygdaloides*
Coyote willow *Salix exigua*

Narrow leaf cottonwood *Populus angustifolia*
Fremont cottonwood *Populus fremontii*
Box elder *Acer negundo*



Photo 28. Box elders, messy in yards and harborers of bugs, are at home and valuable in natural riparian habitat in Wasatch Hollow. These native Utah trees provide shelter and nesting habitat for wildlife and host native insects that feed other native animals. (A. Cannon)

Photo 29. Cottonwoods, still abundant in Wasatch Hollow, are the hallmark riparian tree in this area of Utah, but have been lost at alarming rates as riparian habitats have been altered through human activities such as urban development. Native cottonwoods provided material for shelter, fire, clothing, and even food for early people in the Salt Lake Valley. These trees are excellent sources of shelter and food for riparian wildlife. Cottonwood trunks and branches often become homes for cavity nesting birds and animals such as northern flickers found in Wasatch Hollow. (A. Cannon)



Mountain Shrub

Mountain shrub habitat occurs in the upland transitional fringe areas of the Emigration Creek Corridor in Wasatch Hollow. Mountain shrub habitat in Wasatch Hollow is marked by Gambel oak and shrubs that grow best in relatively dry conditions. Gambel oak and shrub stands provide biodiversity, valuable edge habitats, and visual diversity in Wasatch Hollow. Mountain shrub habitat includes native plant species and communities that are hard to find in an urban setting. Native Americans and early emigrants used shrubs and plants of the mountain shrub habitat for food and other purposes. Currently, mountain shrub habitat provides a variety of animal foods and supports wildlife through all seasons.



Photo 30. Fragrant sumac, abundant in the mountain shrub habitat in Wasatch Hollow, was valued by Native Americans for the fruit, twigs, leaves, and shoots. The fruits were used for food and medicine and to make a drink like lemonade. The young stems were made into baskets. Fragrant sumac was used to make dyes for clothing. Early pioneers ate the salted fruits and chewed stem exudates like chewing gum. The shrub and its fruits provide shelter and food for birds and other animals throughout the year. (G. Cotter)

Utah Division of Wildlife Resources reports that mountain shrub habitat comprises less than 2% of Utah's land area, is stressed by human impacts, and is probably declining. Although mountain shrub habitat currently occurs along the Wasatch Front, it is very rare in urban settings, and is being replaced in many areas by subdivisions and housing development. Mountain shrub habitat, such as that in Wasatch Hollow, is therefore also a high priority for preservation and ecological restoration in Utah.



Photo 31. Young students pointing to something they have spotted in the mountain shrub habitat in Wasatch Hollow. In this area (the southeastern end of Phase III of Wasatch Hollow Community Park), mountain shrub habitat was partially restored through planting of native species by Ty Harrison and students from Westminster College. (D. Fosnocht)

Mountain shrub habitat in Wasatch Hollow has been ecologically degraded primarily by invading non-native plants and by fill and disturbance from adjacent housing and road development. All mountain shrub habitat observed in Wasatch Hollow included invasive plant species such as Siberian elm, non-native thistles, and dalmation toadflax. Human

use of mountain shrub habitat in Wasatch Hollow includes bicycling along informal dirt tracks in Phase III of Wasatch Hollow Community Park, paintball and airsoft shooting games on LDS Church property, and travel through the corridor along informal paths by Clayton Middle School. Conditions of the mountain shrub habitat on private land between LDS Church property and Clayton Middle School were not observed during this initial assessment due to restricted access.

Native Mountain Shrubs and Trees

Characteristic native shrubs and trees of mountain shrub habitat in Wasatch Hollow are:

Gambel oak *Quercus gambelii*

Birchleaf mountain mahogany *Cercocarpus montanus*

Fragrant sumac *Rhus trilobata*

Chokecherry *Prunus virginiana* var. *melanocarpa*

Utah Serviceberry *Amelanchier utahensis*

Elderberry *Sambucus caerulea*

Rabbitbrush *Chrysothamnus nauseosus*

Big sagebrush *Artemisia tridentata*

Wood's rose *Rosa woodsii*

Creeping Oregon grape *Berberis repens*



Photo 32. Gambel oak is a native tree typical of mountain shrub habitat in this area of Utah, and is abundant in beautiful stands remaining from pre-pioneer times in Wasatch Hollow. Gambel oak acorns have been valued for food, and the wood has been used for fire, fence posts, and shelter. Gambel oak acorns are valuable food for wildlife while the trees make excellent shelter for birds and other wildlife.

(G. Cotter)

Native Plants in Wasatch Hollow

Native plants observed in the stream corridor in Wasatch Hollow include (note: these plants were observed during baseline documentation visits):

Peach-leaf willow *Salix amygdaloides*
Coyote willow *Salix exigua*
Narrow leaf cottonwood *Populus angustifolia*
Fremont cottonwood *Populus fremontii*
Box elder *Acer negundo*
Gambel oak *Quercus gambelii*
Birchleaf mountain mahogany *Cercocarpus montanus*
Fragrant sumac *Rhus trilobata*
Chokecherry *Prunus virginiana* var. *melanocarpa*
Utah Serviceberry *Amelanchier utahensis*
Elderberry *Sambucus caerulea*
Rabbitbrush *Chrysothamnus nauseosus*
Big sagebrush *Artemisia tridentata*
Wood's rose *Rosa woodsii*
Creeping Oregon grape *Berberis repens*
Aster *Aster* spp.
Western ragweed *Ambrosia psilostachya*
Poison ivy *Toxicodendron radicans*
Curlycup gumweed *Grindelia squarrosa*
Basin wildrye *Leymus cinereus*
Violet *Viola* spp.
Red osier dogwood *Cornus sanguinea*

Non-Native Plants in Wasatch Hollow

Invasive plants occur throughout the stream corridor in Wasatch Hollow. The harmful ecological effects of invasive plants include crowding of and competition for resources with native plants. Invasive plants tend to decrease biodiversity. Several of the most worrisome invasive plants in Wasatch Hollow and their consequences were discussed in a workshop held December 6 for the Wasatch Hollow Community (see attached Invasive Plant Information Sheet).

Invasive and non-native plants observed in Wasatch Hollow include (note: these plants were observed during baseline documentation visits):

Siberian elm *Ulmus pumila*
Russian olive *Elaeagnus angustifolia*
Green ash *Fraxinus pennsylvanica*
White mulberry *Morus alba*
English hawthorne *Crataegus laevigata*
Common apple *Malus* spp.
Sweet cherry *Prunus avium*

Plum *Prunus* spp.
Mahaleb cherry *Prunus mahaleb*
Tree of heaven *Ailanthus altissima*
Black locust *Robinia pseudoacacia*
Honey locust *Gleditsia triacanthos*
Pyracantha *Pyracantha* spp.
Tartarian honeysuckle *Lonicera tatarica*
Norway maple *Acer platanoides*
English walnut *Juglans regia*
Horse chestnut *Aesculus hippocastanum*
Crack willow *Salix fragilis*
Greater periwinkle *Vinca major*
Lesser periwinkle *Vinca minor*
English ivy *Hedera helix*
Virginia creeper *Parthenocissus quinquefolia*
Matrimony vine *Lycium barbarum*
Bittersweet *Solanum dulcamara*
Alfalfa *Medicago sativa*
Sweet clover *Melilotus officinalis*
Chicory *Cichorium intybus*
Dandelion *Taraxacum officinale*
Kentucky bluegrass *Poa pratensis*
Crested wheatgrass *Agropyron cristatum*
Money plant *Lunaria annua*
Cheatgrass *Bromus tectorum*
Dalmation toadflax *Linaria dalmatica*
Field bindweed *Convulvulus arvensis*
Prickly lettuce *Lactuca serriola*
Scotch thistle *Onopardum acanthium*
Burdock *Arctium lappa*
Snowberry *Symphoricarpos* spp.
Quack grass *Agropyron repens*

Wildlife

Many species of wildlife were observed to occur in Wasatch Hollow. Other wildlife (e.g., coyote, bobcat, beaver, and porcupine) were sighted earlier by community members, but as recent sign was not seen during baseline documentation visits, they were not included on the list. Birds on the list were either seen during baseline documentation visits or were reliably reported by Wasatch Hollow community members. Wildlife sighted in the stream corridor in Wasatch Hollow includes:

Mammals

Red squirrel *Sciurus vulgaris*
Mule deer *Odocoileus hemionus*

Raccoon *Procyon lotor*
Norway rat *Rattus norvegicus*
House mouse *Mus musculus*
Bat (probably *Myotis* spp.)

Birds

Red-tailed hawk *Buteo jamaicensis*
Rough-legged hawk *Buteo lagopus*
Cooper's hawk *Accipiter cooperii*
Sharp-shinned hawk *Accipiter striatus*
American kestrel *Falco sparverius*
Turkey vulture *Cathartes aura*
Western screech owl *Otus kennicottii*
Great horned owl *Bubo virginianus*
Mallard *Anas platyrhynchos*
Canada goose *Branta canadensis*
California gull *Larus californicus*
Western scrub jay *Aphelocoma californica*
Ruby-crowned kinglet *Regulus calendula*
Yellow warbler *Dendroica petechia*
Downy woodpecker *Picoides pubescens*
Hairy woodpecker *Picoides villosus*
Northern flicker *Colaptes auratus*
Red-breasted nuthatch *Sitta canadensis*
White-breasted nuthatch *Sitta carolinensis*
House finch *Carpodacus mexicanus*
American goldfinch *Carduelis tristis*
Black-headed grosbeak *Pheucticus ludovicianus*
Evening grosbeak *Coccothraustes vespertinus*
Pine siskin *Carduelis pinus*
White-crowned sparrow *Zonotrichia leucophrys*
House sparrow *Passer domesticus*
European starling *Sturnis vulgaris*
American robin *Turdus migratorius*
Thrush (probably *Catharus ustulatus*)
Oregon junco *Junco hyemalis*
Black-billed magpie *Pica hudsonia*
Cedar waxwing *Bombycilla cedrorum*
Mourning dove *Zenaida macroura*
California quail *Callipepla squamata*
Black-capped chickadee *Poecile atricapillus*
Broad-tailed hummingbird *Selasphorus platycercus*
Black-chinned hummingbird *Archilochus alexandri*
Rufous hummingbird *Selasphorus rufus*

Reptiles

Garter snake *Thamnophis* spp.

Fish

Rainbow trout *Oncorhynchus mykiss*

Stream Invertebrates

Mayfly larvae (probably *Baetis* spp.)

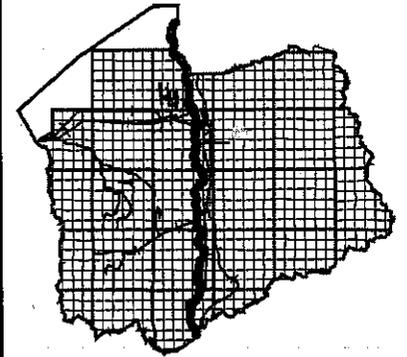
Leech (probably *Glossiphoniidae complanata*)

Snail (probably *Pyrgulopsis* spp.)

Caddisfly larvae (unknown spp.)



SALT LAKE COUNTY



- Legend**
- area16sec16ne
 - INDEX CONTOURS
 - 2.5 Meter Intervals
 - SFOT_BY MBCL
 - Existing City Park
 - Approximately 54 Acres
 - Possible Open Space Area
 - Approximately 10.1 Acres
 - Perce Boundaries
 - Roads all
 - sections polygon
 - Areas

Emigration Creek

Total land Value of proposed open space parcels \$2,811,9000
this total only includes the paretls shaded in pink

Wednesday, November 15, 2006





Wasatch Hollow Natural Area



1700 S. 1700 E., Salt Lake City, UT

Pioneer emigration route to 1st camp
(Dixon, Pioneer Historical Quarterly, 65(2):155-164)

Appendix B

Structured Decision-Making Report

**FINAL REPORT:
A structured approach for involving local stakeholders in design and management
decisions for the Wasatch Hollow Open Space area**

By

Dr. Joseph Arvai and Dr. Robyn Wilson
Consultants

Contact:
Michigan State University
305 Natural Resources Building
East Lansing, MI 48824

T: 517.353.0694
E: arvai@msu.edu

Submitted to:
Emy Storheim, Program Manager
Open Space Lands Program
Division of Sustainability and the Environment
Salt Lake City Corporation
451 S State Street, Room 145
Salt Lake City, UT 84114-5467

14 February/2010

EXECUTIVE SUMMARY

Stakeholder involvement in planning and management efforts exists across a spectrum from cursory opportunities for input, to more intensive participatory efforts that seek to include stakeholder views and concerns in the identification and evaluation of potential alternatives. Often, the institutions or organizations responsible for a participatory effort have the best of intentions, but lack the ability to incorporate science and value-based concerns into the decision process in a meaningful way. Tools from the decision sciences are available to help structure decision processes so as to ensure appropriate framing of the problem or issue at hand, careful identification of diverse values, concerns and alternatives, and deliberate weighing of the pros and cons of different actions and options.

The work reported here is the result of a participatory planning process initiated by Salt Lake City to inform the design and management of the 10-acre Wasatch Hollow Open Space. The Wasatch Hollow Open Space parcel was acquired in segments over a period of several years and will be protected through conservation easements that prevent development and promote conservation values. Given diverse and strong interests of various stakeholders in this planning process, it was decided that a deliberative, structured decision process was necessary to accurately identify stakeholder values and objectives, and to help ensure that both the near-term design and the long-term management of the Wasatch Hollow Open Space area reflects these objectives.

To achieve this aim, we (consultants Arvai and Wilson) worked with the Salt Lake City Open Space Lands Program to identify a list of stakeholder groups that would be involved in an initial round of meetings held in January 2010. These groups included City representatives, community members living around the Open Space, neighboring churches and schools, Open Space board members, and content area experts (e.g., ecologists). Over the course of one week, we led facilitated discussions of stakeholder concerns and objectives, as well as alternative means by which these concerns and objectives could be addressed. Participants in the workshops were also asked to provide performance measures, or ways in which the identified objectives could be operationalized and used to evaluate future design and management plans. We then summarized the workshop discussions, identifying fundamental objectives that were shared by the majority of participants, and potential design and management alternatives that should be considered.

Participants in the workshops were nearly unanimous in their identification of 5 fundamental objectives for the design and management of the Wasatch Hollow Open Space. It is our suggestion that these five objectives form the basis of future efforts to develop and evaluate alternative open space plans:

1. The ecology of Emigration Creek, the riparian corridor, and the adjacent Open Space area be restored and protected;
2. The boundaries that exist between the Wasatch Hollow Open Space and adjacent private properties be clearly defined and respected by all parties;
3. The extent and type of public access that is permitted in the Wasatch Hollow Open Space be informed primarily by environmental and restoration considerations;
4. Public safety be enhanced as it relates to both the Wasatch Hollow Open Space and the adjacent private properties; and
5. Coordination and collaboration between different stakeholder groups be enhanced and fostered during both the planning and implementation (design and management) of the Wasatch Hollow Open Space area.

Two additional fundamental objectives were discussed at length in many of the workshops. It is our suggestion that these two objectives receive attention from content area experts and decision makers during deliberation about the development and evaluation of alternative open space plans:

1. The use of an adaptive management framework to guide the long-term monitoring and management of the Wasatch Hollow Open Space area; and
2. The need to keep the budget for both the design and long-term management within a reasonable margin.

Regarding potential alternatives, or aspects of alternative design and management plans, participants clearly identified several components that the Salt Lake City Open Space Program should, at the very least, consider. These include:

1. The inclusion of alternative open space “clusters”, or different design and management plans implemented in different areas of the 10-acre Open Space site;
2. Restricted dog access;
3. The creation of buffer zones to widen and protect boundaries between private and public property;
4. The restoration or removal of the abandoned house currently on City property;
5. A focus on limited passive use (e.g., walking, wildlife viewing) that does not conflict with ecological restoration goals;
6. The inclusion of alternative footpath designs that facilitate passive use where appropriate but minimize ecological impact;
7. Removal of the rope swing to minimize environmental and liability risk;
8. Removal, relocation, or redesign of existing utilities, drainage and flood control;
9. The creation of educational and research partnerships to facilitate long-term monitoring of ecological and social objectives; and,
10. The exploration of cost-effective forms of enforcement ranging from police patrols to community-based initiatives.

Moving forward, participants in the ongoing decision making process should prioritize these seven fundamental objectives prior to evaluating any potential alternatives that are developed. The alternatives should then be presented in a format that depicts the expected level of performance across these objectives, allowing participants to evaluate the alternative in light of their own priorities. Support for an alternative or set of alternatives should be determined through a combination of swing weighting and approval voting. Swing weighting encourages respondents to think about the tradeoffs they are willing to make across objectives, while approval voting identifies all acceptable alternatives as opposed to forcing a choice for one “best” option. At the very least, it is important that alternatives be characterized in terms of the objectives that they best represent so that participants can quickly align their preferences with the option(s) that best suits them. Although 100% support for one option cannot be guaranteed, such an approach is likely to result in the identification of an alternative or set of alternatives that will be supported by the strong majority and can be sent forward to the City Council for final approval.

1. Introduction

Examples of stakeholder involvement in planning and management efforts exist across multiple contexts; ranging from the siting of industrial complexes and proposed municipal developments to the development of plans for fisheries and forest management. In many of these examples, however, stakeholder participation has been treated as little more than a marginal addition—and sometimes an afterthought—to what are typically viewed as decisions best left to bureaucrats or technical experts.

Another, much smaller set of cases make use of structured stakeholder consultation efforts, which include opportunities for stakeholders to access information about a particular issue (e.g., in print, in-person, or on-line) and express their views and concerns (e.g., through public meetings, workshops, small groups) in a way that addresses their underlying concerns yet also makes sense to, and catches the attention of, decision makers. Examples include the Water Use Planning process in British Columbia (Arvai et al. 2001; Gregory et al. 2001b), a pilot project for the U.S. Department of Energy on the cleanup of contaminated sites (Arvai & Gregory 2003b), and several ongoing deliberative processes in Canada, the U.S., and the U.K. However, these efforts remain the exception, with failures to involve stakeholders in a meaningful way far outnumbering the successes.

In our view, a primary reason for the failure of most stakeholder processes stems from the absence of formal methods that effectively merge technical and non-technical concerns and then use this information in the creation of options that address the problem or problems at hand (Arvai 2007; Arvai & Gregory 2003a; Wilson & Arvai 2006). The result is the perception among many participants that (a) the process is driven by “alternatives” rather than being responsive to their values (this is true, for example, of many scenario-based planning efforts), (b) the opinions of technical experts dominate those of community members and other “non-technical” stakeholders, and (c) opportunities for input serve as little more than a diversion that draws attention away from where the “real” decisions are being made. Many of these problems stem from the absence of an approach that helps diverse participants to (i) understand—and help to frame—the problem that is the focus of the decision, (ii) express and clarify their issue-specific values and concerns, (iii) be involved meaningfully in the development of a recommended alternative (or alternatives), and (iv) carefully weigh the technical and non-technical pros and cons of different actions or options, including the uncertainty that is associated with predicted impacts.

To this end, the work that we conducted related to this project applies insights from the decision sciences and behavioral decision research to address these gaps. We focused our attention on the initial phases of the deliberative process, making use of tools from the decision sciences to clarify the relevant values of key stakeholders, and to identify aspects of alternative design and management plans that we believe should be considered by stakeholders and decision makers alike. These steps form the necessary basis for the development of a sound planning process and, later, a workable design and long-term management plan.

2. Study Location

In carrying out our work, we used a structured decision making (SDM) approach for involving diverse stakeholders in land management decisions for the Wasatch Hollow Open Space Area in Salt Lake City, Utah. The Wasatch Hollow Open Space area comprises three adjoining sites. All together, the three sites comprise approximately 10 acres of open space (Figure 1), which we treated as a single unit for planning purposes.

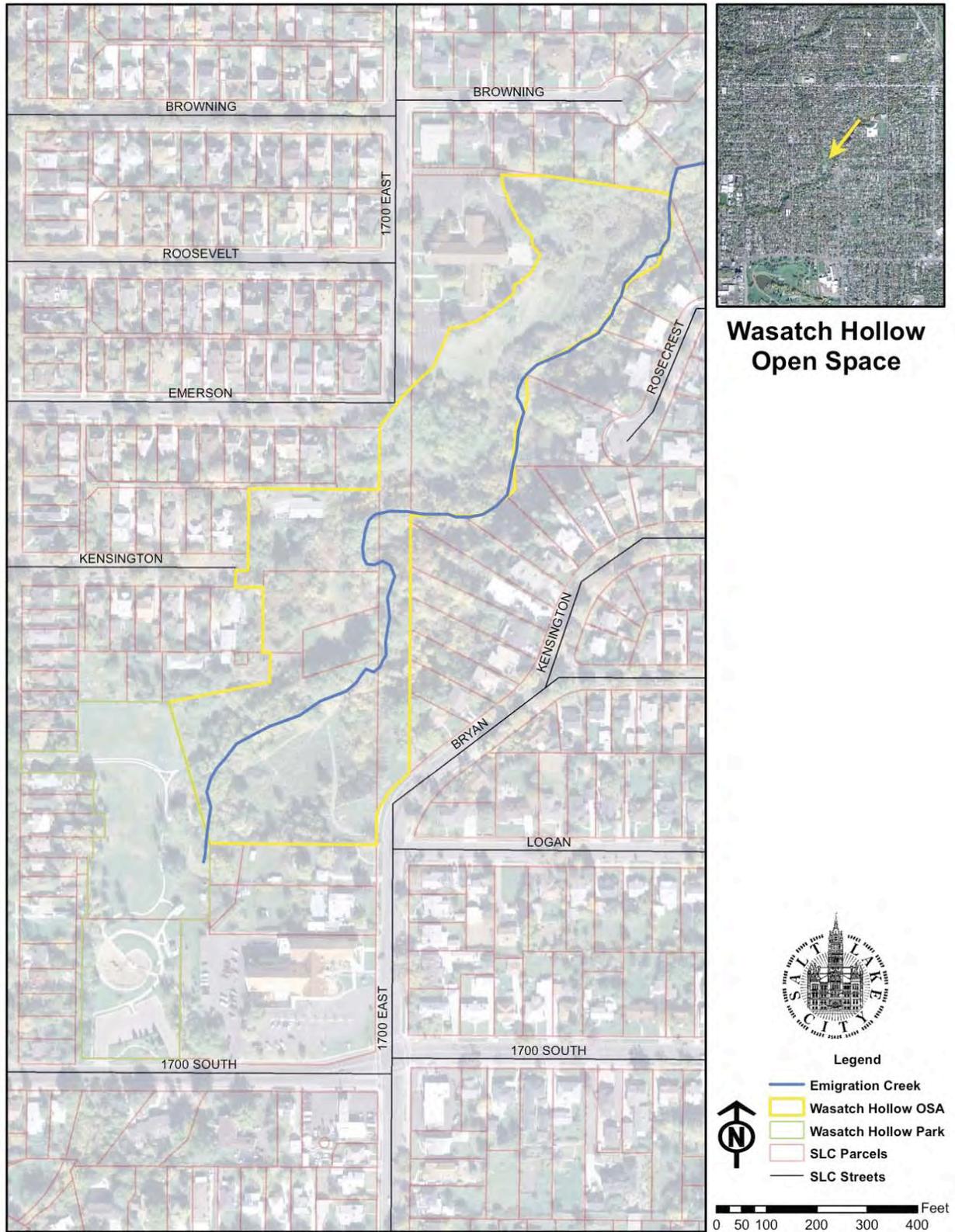


Figure 1. The Wasatch Hollow Open Space area (denoted by the yellow boundary line).

One of these sites, comprised of approximately 4-acres, is near the Wasatch Presbyterian Church on 1700 South and 1650 East and was previously designated by Salt Lake City as open space. The southern reaches of this parcel include a playground, a demonstration garden, pathways, lighting, and restrooms (known as Wasatch Hollow Park and not included in the current planning discussion). The northeastern reaches of this parcel are undeveloped and are part of the 10 acres under discussion.

The second site, which is commonly referred to as the “acquisition site”, is located north of Wasatch Hollow Park. It comprises approximately 1.95 acres of land and is occupied by natural vegetation and historic springs that feed Emigration Creek year round. The plan to acquire this site was initially submitted by the Open Space Chair of Wasatch Hollow Community Council to the City through the Open Space Lands Program application process in June 2006. As the project developed, so did partnerships with community stakeholders and Utah Open Lands, a local non-profit land trust. During the public campaign to raise funds and secure this site as open space, the property was sold on different occasions to potential developers. Near the end of 2008, Salt Lake City both secured the required funds and found a willing seller. Included in this parcel is a residential dwelling that is currently uninhabited.

The third site, is located northeast of the acquisition site. It is slated to be donated to the City by the Church of Jesus Christ of Latter-Day Saints. This 3.5-acre site offers a significant opportunity to increase stewardship of the area’s valuable riparian habitat.

Overall, the acquisition and donation was accomplished with funds from Salt Lake City and Salt Lake County Open Space Programs, a donation from the Church of Jesus Christ of Latter-day Saints, with support from Utah Open Lands, Wasatch Hollow Community Council and Wasatch Hollow Community Association. These lands will be protected through conservation easements, which will identify conservation values to be protected through the near-term design and long-term management of the space, and prevent any residential or commercial development in the future.

3. Overview of Structured Decision Making

This section reviews the use of these structured decision making (SDM) approaches from the perspective of bringing together necessary and multiple perspectives—in either individual or group decision making processes—as part of natural resource management initiatives. A key facet of this discussion is the use of normative benchmarks (i.e., how decisions should ideally be made) as guides for structured decision making processes; these include concepts from multiattribute utility theory (Hammond et al. 1999; Keeney & Raiffa 1993) and decision analysis (Clemen 1996; Keeney 1982; von Winterfeldt & Edwards 1986).

Overall, a SDM approach is best viewed as a kind of decision-focused process that helps people to build understanding of a decision problem or opportunity, and work to overcome common biases as they make choices. A shortlist of the kinds of biases that need to be addressed in order to foster more defensible, higher quality decisions include: (1) the need to recognize, and account for, potentially biased judgmental heuristics (i.e., shorthand decision rules) that people typically utilize when faced with complex choices; (2) the need to balance emotional responses to opportunities, problems, or alternatives alongside more reasoned, deliberative, or technical analyses; and (3) the need to push aside relatively simple characterizations of opportunities, problems, or alternatives that may lead to overly specific or constrained responses. Each of these issues—as well as a host of others—can be addressed through the use of decision structuring tools that help people to more fully define their decision-

specific objectives, identify or understand the available alternatives that are sensitive to these objectives, and then address the often difficult tradeoffs that choosing among alternatives entails (Clemen 1996; Hammond et al. 1999; Kleindorfer et al. 1993).

3.1 Clarifying Objectives and Identifying Alternatives

The critical first element in a SDM process is to engage recipients in a process of thinking carefully about their objectives as they relate to the decision(s) at hand. One aspect of this process ought to help people focus on their values (e.g., the importance of sustainability), which can be expressed, for the purpose of decision making, as objectives (e.g., taking actions that *promote* sustainability). A second aspect ought to help people distinguish between *means* and *fundamental* objectives, which helps to facilitate initial thinking about alternatives through which fundamental, or end objectives, can be met (Keeney 1992).

For example, decisions about open space may focus on providing easy access to students as part of organized classes (e.g., at the primary or middle school level). A SDM process will push this discussion a step further by moving past endorsements of a single alternative (i.e., providing easy access) and will instead prompt people to think about the difference between *means* and *fundamental* objectives. In this case, “providing easy access to students as part of organized classes” is likely a *means* objective, whereas the *fundamental* objective is to provide educational opportunities through open space design and management. Focusing discussion and analysis on fundamental objectives helps bring to the forefront other potential means objectives that are also worthy of consideration in planning (e.g., providing opportunities for field research by graduate students or providing mechanisms for non-formal or adult education). Note that engaging in a process of differentiating means from fundamental objectives does not preclude decision makers from, for example, choosing an alternative that creates access for organized classes of middle school students. It does, however, help people to realize that a single option is not a panacea and that it—as well as others—may be selectively combined (i.e., by combining some and omitting others) in different ways to achieve fundamental objectives.

Beyond helping to widen the range of options that might be considered by decision makers, the process of helping people to identify and clarify *fundamental* objectives, and the alternatives derived from the *means* objectives, serves two other important functions. First, a thorough exploration of management objectives helps to legitimize the much-needed balance between what are traditionally technical concerns (such as restoring or maintaining environmental health) and those that are more values-based (such as respecting long-established property boundaries or building trust among stakeholders and managers). Second, exploring a comprehensive set of objectives at the front end of a decision making process is an important first step toward avoiding many of the problems associated with unaided decision making. For example, considering a wider range of decision-relevant objectives helps decision makers to realize that focusing only on one of its dimensions cannot solve a problem. Likewise, helping an individual or group more fully understand what it is they want to achieve with a given decision places the focus squarely on site-specific objectives and serves to weaken the appeal of business-as-usual patterns of decision making (e.g., following a semi-rigid script that may be followed based on the design and management of other open space areas in Salt Lake City).

3.2 Attaching Performance Measures to Objectives

A frequently ignored aspect of clarifying objectives that will guide a decision is thinking about ways to *operationalize* them. In other words, it is of little help to a decision maker in an open space planning process to express an objective—such as improving the health of the

environment—without also having a clear idea of exactly how to measure it. In order to complete this important step, decision makers must identify the *performance measures* for the objectives that are appropriate; in the example above, therefore, what are aspects of the environment that will be used to estimate improved health, both in the near-term design of the space and the long-term management.

Over the course of our work as researchers, and in our work as consultants on similar kinds of projects, we have found that the process of identifying and agreeing upon performance measures that will be linked to objectives is critical because:

- A. The results of associated social, economic, or technical analyses will be more decision-relevant insofar as they are framed in terms of measures that (1) make the most sense to, and (2) are most desired by stakeholders and decision makers; this makes it easier for decision makers and interested and affected parties to follow, recognize, and respond to changes within a managed system over time;
- B. Doing so helps to foster greater openness and trust in the overall decision making and longer-term management process;
- C. It leads to a higher degree of learning over time about the social, economic, and technical elements of managed systems by all of the parties involved, expert and non-expert alike; and,
- D. It helps to foster more defensible and thus, higher quality decisions insofar as they are (1) specific to a well-defined problem, (2) responsive to the objectives and concerns of interested and affected parties, and (3) informed by decision-relevant science.

Generally speaking, performance measures that characterize the different aspects of a system fall into one of three categories:

1. *Natural measures* are direct measures of conditions that exist in a system. For example, if one objective of an open space plan is to minimize the costs of long-term monitoring, then the specific performance measure can be expressed directly in dollars, or more specifically, the expected cost of long-term monitoring.
2. *Proxy measures*, by contrast, are used when it is not possible to directly measure an objective of interest. For example, if one objective is to prevent a decline in community property values, economists may—by proxy—estimate these values under alternative open space plans using a hedonic pricing model. Likewise, there is no single direct measure of environmental health. But, analysts and researchers may develop a comprehensive list of proxy measures; these include—but are clearly not limited to—measures of water quality, productivity, and species diversity.
3. *Constructed measures* are most often used when neither a direct, natural measure nor a reasonable proxy measure exists. Constructed attributes are typically used to operationalize objectives that are psychophysical in nature (e.g., the objective to increase community pride in the open space). Scales that may be administered during surveys often need to be constructed—e.g., by social scientists—as a means of characterizing these objectives.

3.3 Making Tradeoffs and Deciding

Engaging people in a process of identifying what matters to them and what they want to achieve with a decision begs another question: how can people choose which management alternative is “best”? In some cases—such as when only a single objective matters—a single best risk management option can be clearly identified. More often than not, however, many conflicting objectives are in play (e.g., minimizing costs, maximizing safety, protecting the environment,

etc.) and decision makers must realize the inevitability of tradeoffs; the need to give up something valued in order to gain something that is also valued, but for different reasons.

The tradeoffs inherent in choosing one alternative over another are difficult for most decision makers because of the psychological conflict that they evoke (Gregory et al. 2001a). SDM approaches can help in some cases simply by reminding people of the need to address tradeoffs. In other more complex cases, SDM efforts can be designed to provide guidance to decision makers about how to carry out more formal tradeoff analyses. Doing so frequently involves providing decision makers with tradeoff support tools. In their most basic form, these tradeoff tools involve the ranking and weighting of objectives as they relate to expectations about how different risk management options are expected to perform across them.

Objective	Performance Measure	Option 1	Option 2	Option 3
Keep purchase price low	Total Purchase Price (\$)	\$27,900	\$32,500	\$39,900
Keep maintenance costs low	Average Annual Maintenance Costs over 10 years (\$)	\$900	\$900	\$1,350
Maximize vehicle safety	Safecar.gov Crash Test (Star Rating - Driver)	★★★	★★★★★	★★★★★
	Safecar.gov Crash Test (Star Rating - Passenger)	★★★	★★★	★★★★★
Have adequate interior cargo space	Interior Cargo Volume (square feet)	65	90	75
Be environmentally friendly	Average City/Highway Fuel Economy (MPG)	21 MPG	20 MPG	17 MPG
Drive capably on ice and snow	Drive Train Type	AWD	4WD	AWD
Impress the Neighbors	“Wow” Factor (1-10 constructed measure)	3	6	8

Figure 2. A hypothetical consequence matrix for the purchase of a new car that was shown to participants in the SDM workshops conducted for the Wasatch Hollow Open Space Planning project.

Common to each of these methods is the important concept that the weighting of objectives should only be undertaken in a comparative framework. All too often, decision makers will state that a certain objective—e.g., minimizing the financial costs associated with implementing a management plan—is of paramount importance. Lost in this kind of comparison-free weighting is the important concept of relative benefit. While one may wish to focus on the importance of one objective, decision makers must also be aware of potential large increases in performance on one objective that may be accompanied by relatively small decreases in performance on another (e.g., a great increase in environmental protection may be worth the relative small increase in cost). A starting point during tradeoff analysis is, therefore, the construction of a matrix where the objectives and attributes form the rows of a matrix, and the various alternatives are displayed across the top (Figure 2). The expected performance—or *consequence*—of each alternative is then modeled (e.g., Costanza & Voinov 2004) or predicted (e.g., Failing et al. 2004; Keeney & von Windterfeldt 1989) and displayed in the individual cells of the matrix. This systematic presentation of how well the different alternatives satisfy each objective, known as a consequence matrix, is a powerful tool for clarifying the acceptability of different options and is useful as the starting point for the in-depth consideration of tradeoffs and conflict across objectives.

Following the construction of a consequence matrix, decision makers must determine the relative weight that should be placed on each objective when comparing alternatives. This is a critical aspect of a SDM approach because it helps to clarify what different tradeoffs will mean in terms of the outcomes associated with the selection of one alternative over another.

Objective	Performance Measure	Worst Possible Performance	Best Possible Performance	Rank (1-7)	Weight (0-100)
Keep purchase price low	Total Purchase Price (\$)	\$39,900	\$27,900	_____	_____
Keep maintenance costs low	Average Annual Maintenance Costs over 10 years (\$)	\$1,350	\$900	_____	_____
Maximize vehicle safety	Safecar.gov Crash Test (Star Rating - Driver)	★★★	★★★★★	_____	_____
	Safecar.gov Crash Test (Star Rating - Passenger)	★★★	★★★★★	_____	_____
Have adequate interior cargo space	Interior Cargo Volume (square feet)	65	90	_____	_____
Be environmentally friendly	Average City/Highway Fuel Economy (MPG)	17 MPG	21 MPG	_____	_____
Drive capably on ice and snow	Drive Train Type	4WD	AWD	_____	_____
Impress the Neighbors	“Wow” Factor (1-10 constructed measure)	3	8	_____	_____

Figure 3. A hypothetical weighting form adapted from Figure 1 for use during swing weighting for a decision about the purchase of a new car.

In *swing weighting*, for example, decision makers are presented with only the best and the worst projected consequences associated with each objective and told to assume that they are faced with a situation where the alternative they are evaluating possesses all of the worst consequences (i.e., it costs the most, performs poorly in terms of environmental protection, etc.). They are then asked to identify which of the objectives they would most want to “swing” from its current worst condition to the best possible condition in order to make the largest improvement to the system (Figure 3). Decision makers repeat this procedure for all of the objectives in the set (i.e., after assigning a rank of one to the objective they most want to improve from worst to best, they are asked to think about the next objective they would most want to improve from worst to best and rank that as a two, and so on until all are ranked accordingly). Once all of the objectives have been ordered in this way, decision makers are typically asked to assign 100 points to the highest ranking objective with the others assigned a relative percentage of this weight. A weight of zero may be assigned to swings on objectives from worst to best that are judged to be irrelevant to the decision at hand (Baron 2000; Clemen 1996). For example, decision makers should assign a weight of zero where there is no difference in real or perceived value between the worst and best performance, essentially canceling that objective and removing it from further discussion. Assigning weights in addition to ranks is useful in terms of helping respondents to identify objectives that are critically important as compared to objectives that may be no more or less important than others.

After respondents have completed the swing weighting exercise, they should be directed to review, compare, and evaluate the alternatives that are under consideration (e.g., the alternative

open space plans created for the Wasatch Hollow Open Space). Each alternative should be accompanied by a “report card” that depicts its expected level of performance across all of the objectives elicited from stakeholders. This way, respondents can quickly and easily cross-reference their own ranks and weights (determined during the swing weighting procedure) with the available alternatives. In other words, a respondent’s ranks and weights should help direct them to their ideal alternative.

4. Methods

Our involvement in the Wasatch Hollow Open Space planning project began during the fourth quarter of 2009. At this time, we worked with the Open Space Lands Program for Salt Lake City to establish and define the decision environment that was the focus of the stakeholder involvement initiative (see below). At this time, we agreed to treat the proposed 10-acre site as a single unit for discussion purposes (rather than dealing with the different phases of open space separately). However, we left open the possibility that, through our subsequent discussions with different stakeholders, there may be an opportunity (or need) to apply different design and management plans to different areas of the open space.

At the same time, we also worked with the designated Conservation Easement Holder (Utah Open Lands) and the Open Space Lands Program to identify a list of groups that we would ask to take part in a first round of stakeholder meetings. Since the number of stakeholders was large, and because we were told of a history of potentially diverging opinion between different stakeholder groups, we elected to meet with similar groups of stakeholders separately. The stakeholder groups we ultimately identified included:

- Representatives of the Salt Lake City Corporation (e.g., members of the Salt Lake City Council, Office of the Mayor, Salt Lake City Police, the Open Space Lands Program, Parks, etc.);
- Community members living around the northern reaches of the proposed open space (including members of the Wasatch Hollow Community Council);
- Community members living around the southern reaches of the proposed open space (including members of the Wasatch Hollow Community Council);
- Neighboring institutions¹ (e.g., representatives from Westminster College, the Church of Jesus Christ of Latter-Day Saints, and the Wasatch Presbyterian Church);
- Representatives of the Salt Lake City Open Space Board, Salt Lake County and Utah Open Lands; and
- Content area experts (which included ecologists, ornithologists, planners, and engineers).

After we identified the relevant stakeholders, we convened a series of stakeholder workshops with each of these aforementioned groups, which took place during the week of 18 January 2010. During each workshop, the consultants (Arvai and Wilson) led a facilitated discussion of participants’ concerns and objectives, as well as alternative means by which these concerns and objectives could be addressed. Under the terms of our contract with the city, the key focus at this stage was to help participants distinguish between means and fundamental objectives.

Each workshop also focused on establishing performance measures for the concerns and objectives that were discussed. The workshops ended with participants providing general

¹ Following our work on the project, additional meetings were held with representatives from Clayton Middle School and Rocky Mountain Power.

comments and nominating others who should be invited to take part in the planning process. Following these workshops, the consultants analyzed the comments made by participants and constructed objectives-based value trees (see below). Value trees graphically depict the relationship between higher order objectives (fundamental) and sub-objectives (means), and include information about suggested performance measures.

We did not give more weight in our analysis to certain objectives, nor did we omit any means or fundamental objectives that were discussed by workshop participants. Rather, our goal at this stage of the process was to account for all of the objectives shared by participants in all of the workshops. Any omissions from this report are unintentional and are most likely the result of a particular concept being mentioned only in passing.

5. Findings: Objectives and Performance Measures

Participants in the workshops were nearly unanimous in their identification of 5 fundamental objectives for the design and management of the Wasatch Hollow Open Space, which were that:

1. The ecology of Emigration Creek, the riparian corridor, and the adjacent open space area be restored and protected;
2. The boundaries that exist between the Wasatch Hollow Open Space and adjacent private properties be clearly defined and respected by all parties (e.g., users of the open space, private property owners, and agents of Salt Lake City);
3. The extent and type of public access that is permitted in the Wasatch Hollow Open Space be informed primarily by environmental and restoration considerations;
4. Public safety be enhanced, and associated risks reduced, as they relate to both the Wasatch Hollow Open Space and the adjacent private properties; and
5. Coordination and collaboration between different stakeholder groups be enhanced and fostered during both the planning and implementation (design and management) of the Wasatch Hollow Open Space area.

Two additional fundamental objectives that were discussed at length in many of the workshops, primarily involving experts and decision makers, included:

1. The use of an adaptive management framework to guide the long-term monitoring and management of the Wasatch Hollow Open Space area; and
2. The need to keep the budget for both the design and long-term management within a reasonable margin.

Findings related to each of these fundamental objectives, including workshop participants' views on how they may be achieved (i.e., means objectives) are outlined in more detail below.

5.1 Ecological Restoration and Protection

Perhaps the most widely cited and discussed fundamental objective regarding the design and long-term management of the Wasatch Hollow Open Space area dealt with the need to restore and protect the natural ecology of Emigration Creek, the riparian corridor, and the adjacent open space area. In terms of the means by which this objective could be achieved, workshop participants were once again unanimous in their view that restoring and protecting the natural environment in the open space meant addressing existing impacts and impairments as they relate to water quality in Emigration Creek, habitat for terrestrial and aquatic wildlife, and the health and composition of native vegetation (Figure 4).

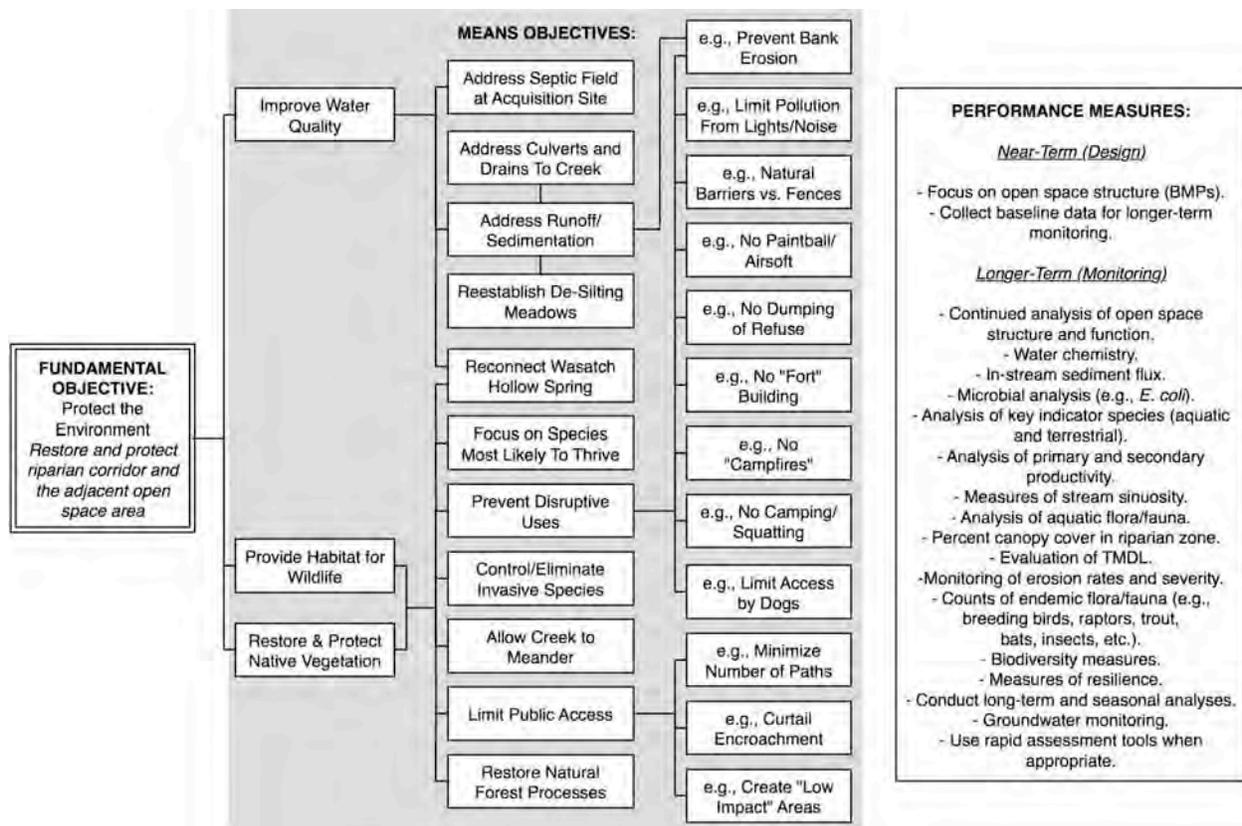


Figure 4. Value tree depicting the relationship between the fundamental and means objectives, and suggested performance measures, for the restoration and protection of the ecology of Emigration Creek, the riparian corridor, and the adjacent open space area.

In terms of lower-order means objectives for improving water quality, participants frequently discussed the need to reconnect natural springs within the Wasatch Hollow Open Space area to Emigration Creek. They also discussed frequently the need to address runoff and sedimentation (e.g., of pesticides, fertilizers, and other materials) from adjacent areas. Related to this objective, workshop participants also discussed the need to address existing city drains and culverts that may empty into Emigration Creek and nutrient loading from the septic field that is present near the empty, city-owned house located at the acquisition site. Finally, there was also discussion, primarily among ecologists and engineers, about the need to both prevent further erosion through bank restoration and stabilization alongside Emigration Creek, and to reestablish de-silting meadows within the Wasatch Hollow Open Space area.

Regarding the means objectives for restoring and protecting habitat for wildlife as well as native vegetation, much of the discussion about lower-order objectives addressed both simultaneously. For example, reconnecting natural springs within the Wasatch Hollow Open Space area to Emigration Creek was touted by many as a means of providing better habitat for in-stream flora and fauna, and of providing surrounding native vegetation with better environmental conditions. The same was true for other means objectives, including the restoration of natural forest processes (e.g., leaving some amount of leaf litter and deadwood in place); allowing Emigration Creek to meander naturally through the Wasatch Hollow Open Space; removing and controlling invasive species; and focusing restoration activities on those species most likely to thrive naturally in an open space area surrounded by a large urban population.

Another important means of restoring and protecting habitat for wildlife as well as native vegetation that was discussed by many workshop participants was to limit public access. This was a sensitive issue for many as it was widely accepted that a public open space would need to allow for some public access. However, it was also a widely held value that the Wasatch Hollow Open Space not be “loved to death”. To this end, lower-order means objectives that were provided as examples by many workshop participants included designating certain parts of the Wasatch Hollow Open Space as “low-impact” areas, curtailing encroachment of private property into the open space area (including the possibility of instituting buffer zones between the native species in the open space and non-native species that may be present on private property), and minimizing the number of paths that may be installed for visitors.

Finally, there was much discussion about the necessity of eliminating disruptive uses (from the standpoint of environmental protection and restoration) of the open space area. There was unanimous agreement about the need to eliminate the dumping of trash and refuse in the area (by visitors to the open space and adjacent property owners), campfires, as well as camping and squatting. The majority of workshop participants also discussed the installation of natural barriers as opposed to human-made barriers (i.e., fences) if or when these were deemed necessary; the primary reason behind this means objective was the need to provide opportunities for species to move freely within or through the open space corridor. Artificial noise and lighting within the Wasatch Hollow Open Space was also a concern expressed by several stakeholders.

Many workshop participants also discussed other disruptive uses that ought to be eliminated; these included the staging of paintball or “airsoft” battles because of concerns about the paint and debris, and because it is believed that the brightly colored “airsoft” pellets may be confused for berries by native birds and other species. Related to these activities, several workshop participants discussed the need to curtail excessive noise and the building of “forts”.

Finally, and importantly, there was widespread agreement about the need to limit access to the Wasatch Hollow Open Space by dogs. It was widely understood that this would be viewed as a controversial means objective by many observers. Nevertheless, it was a strongly held view by most that open access to dogs throughout the entirety of the open space was inconsistent with the restoration objectives that had been discussed. There was nearly unanimous agreement that, in the areas where dogs may be allowed, strict on-leash rules be enforced. There was also nearly unanimous agreement that, in certain areas of the Wasatch Hollow Open Space, dogs should not be permitted. Many other public open space areas in North America have adopted such a policy.

In each of the workshops we conducted, time was also devoted to a discussion of the kinds of performance measures that could be used to determine if objectives related to the restoration and protection of Emigration Creek, the riparian corridor, and the adjacent open space area were being met. Many of these performance measures came out of our discussions with technical experts (e.g., ecologists); however, other, non-expert participants also suggested several potential performance measures (Figure 4).

It is our belief that a more detailed discussion of performance measures, likely involving ecologists and other environmental scientists, needs to take place. In our workshops, we heard from many the opinion that best mid-succession management practices (BMPs) and structural indicators should drive the initial design of the Wasatch Hollow Open Space. However, over time, environmental monitoring (both long-term and seasonal) within the Wasatch Hollow Open Space should include parameters such as water quality (including microbial analysis), key

indicator species, secondary productivity within Emigration Creek, stream sinuosity, erosion rates, sediment flux, breeding bird surveys, canopy cover, and counts of endemic (vs. invasive or exotic) flora and fauna.

5.2 Establish Clearly Defined Boundaries

Another widely cited fundamental objective dealt with the boundaries that exist between the Wasatch Hollow Open Space and adjacent private properties. Workshop participants felt strongly that the boundaries between public and private property must be clearly defined in the Wasatch Hollow Open Space design, and that the long-term management plan needs to ensure that these boundaries are respected by all parties (e.g., users of the open space, private property owners, and agents of Salt Lake City). In terms of the means by which this objective could be achieved, participants felt that respecting boundaries required protecting both private and Open Space property through the near-term design and management of the space, as well as by ensuring regular monitoring to prevent boundary violations over the long-term (Figure 5).

In terms of lower-order means objectives for protecting private property, participants frequently discussed the need to reduce risks associated with liability by preventing trespassing onto private property from the public space. Participants also discussed the need to establish difficult-to-access buffer zones (e.g., built of natural barriers such as dense foliage) between the Wasatch Hollow Open Space and adjacent landowners. Though this objective could probably be achieved within the existing open space area, some workshop participants brought forward the idea that buffer zones could be made larger by the City purchasing land from neighboring landowners to increase the buffer on the open space side (particularly along those sections of the open space property where Emigration Creek crosses back and forth several times between the public and private space). A similar option involved allowing neighboring landowners to purchase land from the Wasatch Hollow Open Space area (or the Church of Jesus Christ of Latter-Day Saints prior to their making the 3.5-acre donation); in this scenario, private landowners could take steps to create their own expanded buffer zones between the public space and their existing property boundaries (particularly along the northern section of the space).

Related to these previous objectives, participants also mentioned the need to protect private property values, an objective that could be at least partially achieved by protecting the aesthetic value that the Wasatch Hollow Open Space provides to adjacent landowners, limiting noise in the open space, and allowing only non-disruptive activities (i.e., by prohibiting paintball, air-soft, camping, etc.). Finally, some participants talked about the need to forbid the annexation of private property, including annexation for the current Wasatch Hollow Open Space plan, or for future open space initiatives along the Emigration Creek corridor.

Many workshop participants also talked about the need to establish clear boundary lines as a means to protect both private and open space property. It was suggested this could be achieved by designing signage that is educational, as opposed to regulatory in nature, and implementing natural barriers as opposed to manmade barriers (e.g., using vegetative barriers as opposed to chain link fencing as discussed previously). In addition to establishing clear boundaries, participants felt that preventing encroachment of private property into the Wasatch Hollow Open Space was an important means of protecting the natural ecology and integrity of the area. The forms of encroachment that participants felt needed to be prohibited were the dumping of landscaping refuse in the open space, as well as personal or recreational use of the open space area by adjacent landowners, particularly if public recreational use is forbidden or limited.

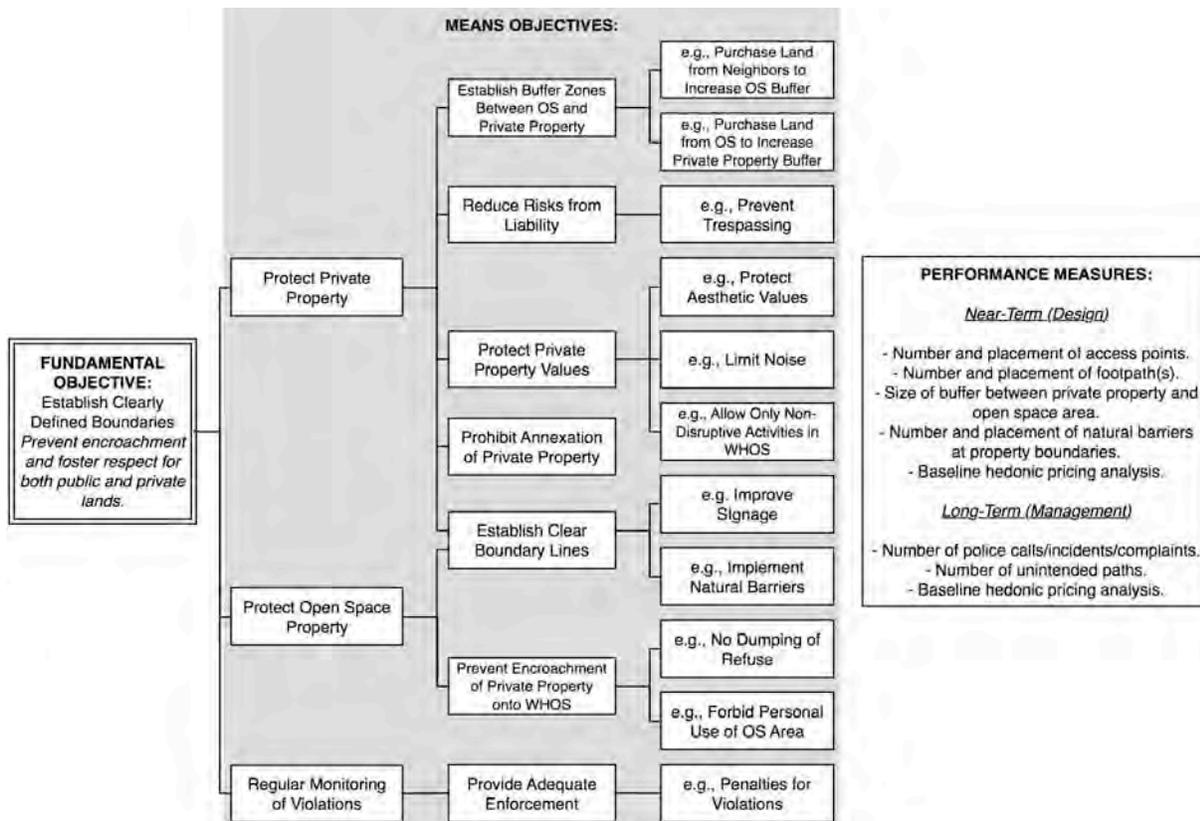


Figure 5. Value tree depicting the relationship between the fundamental and means objectives, and suggested performance measures, for establishing clearly defined boundaries between private and public lands.

In addition to accounting for the protection of private and open space property through clearly defined boundaries, workshop participants felt that regular monitoring of the defined boundaries was necessary in order to identify and prevent violations. It was a commonly shared opinion that boundaries would not be respected without adequate enforcement and penalties for violations.

In terms of these objectives, workshop participants were asked to suggest performance measures that would ensure that clearly defined boundaries were established, protecting both private and public property and ensuring regular monitoring to prevent and penalize violations. It was suggested that the near-term design could be evaluated in terms of the number and placement of access points, number and placement of footpath(s), the size of buffers between private property and open space, number and placement of natural barriers as property boundaries, and the use of a baseline hedonic pricing analysis to measure the effect of the open space plan on private property values. Participants also suggested that the long-term enforcement of property boundaries could be evaluated by the number of police calls/incidents/complaints having to do with boundary violations, the number of unintended or new paths created that cross the boundary lines, and a regular analysis of property values linked to the management of the open space.

5.3 Provide Limited Public Access Informed by Restoration Goals

Another fundamental objective identified by the majority of participants, and mentioned at least

as often – if not more often – than the issue of establishing property boundaries, was the objective of providing limited public access. Workshop participants sometimes differed on the types of activities they felt were appropriate, but there was large-scale agreement that the extent and type of public access should be informed primarily by environmental and restoration considerations. Ultimately, this resulted in widespread agreement that access should be *limited* (i.e., by not allowing unencumbered public access across the entire 10-acre space and, instead, limiting public access to only certain portions of the open space area). In terms of exceptions to this objective, workshop participants were unanimous in their view that unrestricted access should be provided for research (though it was pointed out that footpaths would not be necessary for researchers to gain access to desired areas within the open space). And, although not unanimous, a majority of workshop participants also talked about providing educational access to the entire 10-acre site. Open public access was also discussed; however, much of this discussion was couched in terms of providing broader access in the southern reach of the Wasatch Hollow Open Space area (Figure 6).

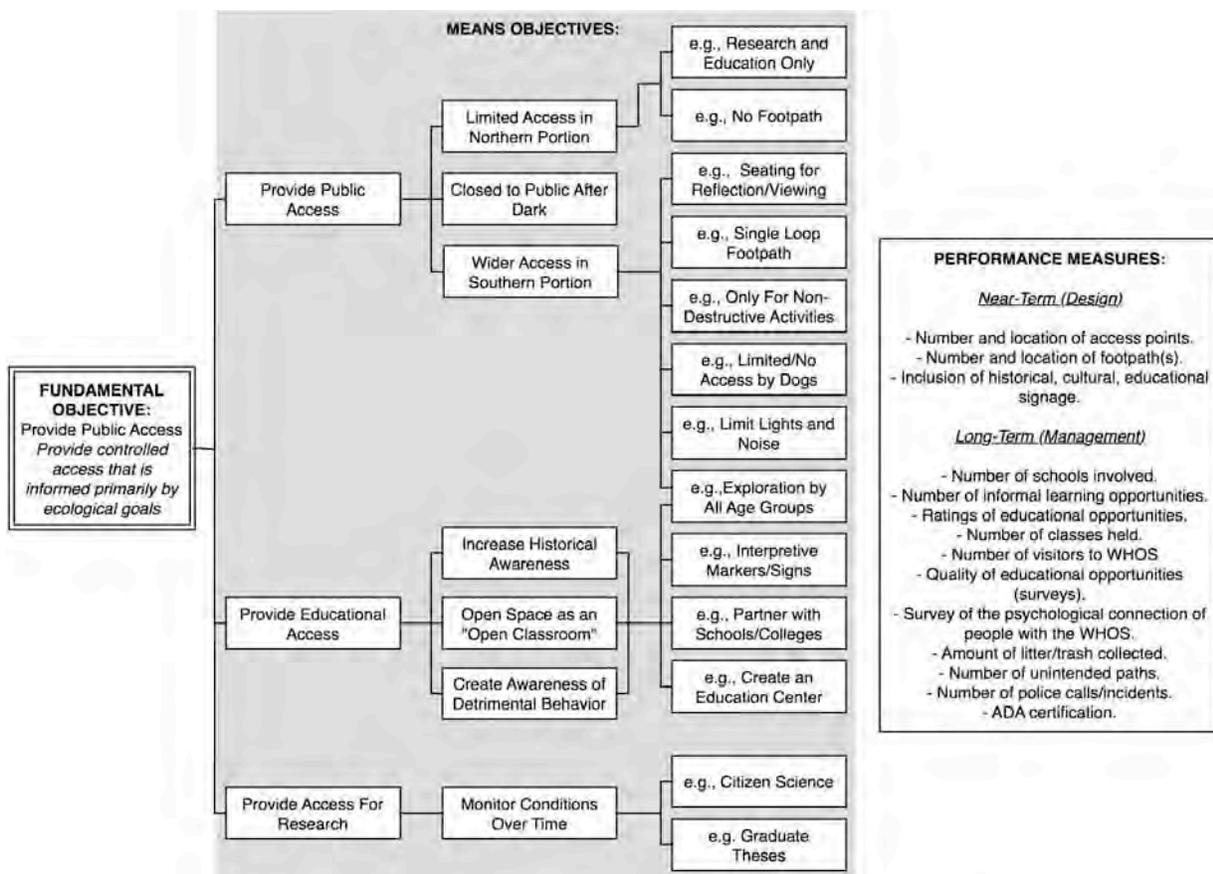


Figure 6. Value tree depicting the relationship between the fundamental and means objectives, and suggested performance measures, for providing public access to Wasatch Hollow.

In terms of lower order means objectives for providing public access, participants frequently discussed the need to limit public access in the northern portion of the Wasatch Hollow Open Space area (i.e., the area that is the subject of the donation by the Church of Jesus Christ of Latter-Day Saints); one way to achieve this objective is to not install a footpath in this part of the Wasatch Hollow Open Space area. Such a policy would serve to discourage potentially destructive public access and would help to protect the research and educational value of the space. However, workshop participants were nearly unanimous in their agreement that wider

access be permitted in the southern aspect of the open space, possibly with a looped footpath through the restoration area. Workshop participants also discussed the need to close the open space to the public after dark.

The type of access that was discussed as appropriate in the northern portion of the space focused on research and education, but not recreation. Access in the southern portion of the space was still discussed by the majority as needing to be limited in an attempt to protect ecological value while still meeting the Salt Lake City Open Space Program mandate of public use. Suggested types of access for passive recreation included the construction of a single loop path (see above), and seating for reflection and wildlife viewing. Participants also discussed the need to only allow for non-destructive activities (e.g., by prohibiting paintball, camping, etc. that might harm habitat or wildlife), limit lights and noise in the space, and prohibit or at the very least limit access by dogs.

A very small minority of workshop participants (specifically, only 3 people we spoke with over the course of our time in Salt Lake City) mentioned more active use of the entire Wasatch Hollow Open Space area in a manner that is more consistent with the use and access provided by more traditional “parks” (e.g., by constructing an amphitheatre, sports fields and courts, etc.).

Regarding the means objective of providing educational access, much of the discussion about lower-order objectives revolved around increasing historical awareness, using the open space as an “open classroom” and creating a greater awareness of the impacts of detrimental behavior. Many participants discussed the historical significance of the space and the need to document that history through interpretive markers and signage in the space. The historical significance was mentioned as both cultural (i.e., related to early settlement of the area) and ecological (i.e., related to ecological features that no longer exist such as the clay cliffs). Participants also discussed the idea of the open space as an outdoor classroom, whereby partnerships with nearby schools and colleges would allow for students to be brought to the space to learn about the natural environment. Related to this idea of the open space as an outdoor classroom, some participants discussed creating an educational center that could serve to structure educational programs, and provide indoor educational space in the winter.

Related to both providing educational access and providing limited public access, some participants felt that Wasatch Hollow should be used to encourage all age groups to explore nature, as long as this exploration was not ecologically detrimental. It was believed that exploration in open space is crucial to learning about and developing an appreciation for the natural world. Finally, many participants discussed the need to create and promote awareness of the negative impacts that detrimental behavior has on the space. It was believed that much of the behavior leading to negative ecological impacts (e.g., damming the creek, creation of new walking paths, off-leash dogs, etc.) could be prevented if people better understood the impact that such activities have on wildlife and their habitat. It was suggested that user friendly (vs. overly legal or regulatory), informational signage would be one means of creating this awareness.

Finally, workshop participants were unanimous in their support for providing access for research, specifically in order to monitor conditions over time. It was believed that if the near-term design of the space includes the restoration of the stream and riparian area, research by graduate students at local colleges and universities would allow for the short- and long-term success of those restoration efforts to be measured and communicated back to the communities using the space. Local citizens could also be engaged in the research process, promoting citizen science and community education at the same time.

Regarding performance measures for providing public access, workshop participants suggested both near-term and long-term measures of success. In the near-term, participants suggested that the number and location of access points, number and location of footpath(s), the inclusion of historical, cultural and educational signage, and whether or not the space is ADA certified be used to evaluate alternative open space designs. In the long-term, participants suggested that the management of the space be evaluated in terms of the number of schools or students involved in educational efforts, the number and quality of informal learning opportunities presented to visitors, visitor ratings of educational opportunities, the number of visitors, measures of the psychological connection of people with the open space (through visitor use and community surveys), the amount of litter collected, number of unintended paths created by visitors, and the number of police calls/incidents.

5.4 Reduce Risks to the Public, Private Property Owners, and Salt Lake City

The majority of workshop participants identified reduced risk and increased public safety as a fundamental objective for the design and management of the Wasatch Hollow Open Space area. Increasing public safety was important from the perspective of reducing risks on both public and private land. In terms of the means by which this objective could be achieved, participants talked largely about enhancing overall public safety in and around the Wasatch Hollow; many participants also discussed the importance of reducing the risk of liability to landowners and other responsible parties (Figure 7).

In terms of lower-order means objectives for enhancing public safety, participants frequently discussed the need to curtail illegal activity in the Wasatch Hollow Open Space area (e.g., the sale and use of illegal drugs, squatting, etc.), as well as to provide adequate enforcement to ensure this activity remains low over time. A potential means of curtailing illegal activity included removing the abandoned house, which is perceived by many as an attractant for trespassers and illegal acts. However, many participants also discussed the importance of legitimate public access to and use of the open space as a means of both “flushing out” illegal activity as well as decreasing the attractiveness of some areas of the open space that are currently difficult to access for legitimate uses.

Some participants also discussed the adoption of principles from the Crime Prevention through Environmental Design (CPTED) philosophy. CPTED is touted as a multi-disciplinary approach to deterring criminal behavior by changing the built, social and administrative environment (see <http://www.cpted.net/>). It is unclear, however, if CPTED as it is practiced in many cities and municipalities can be made consistent with the kinds of restoration objectives outlined above. Beyond CPTED and wider public access in certain areas, workshop participants frequently discussed the need to adequate enforcement in Wasatch Hollow, which includes regular walkthroughs of the open space by community members, as well as increasing police or security patrols.

In terms of lower-order means objectives for promoting community stewardship and co-management, participants frequently discussed involving neighboring property owners as well as the local community, local youth organizations (e.g., scouts), visitors to the Wasatch Hollow Open Space area, educational institutions, and neighboring churches. It was suggested that neighboring property owners be engaged by helping them to develop management plans for their property (e.g., by incorporating more native species into their landscaping). It was also suggested that all individuals and organizations mentioned previously be involved through regular wildlife counts, clean-up days, on-going research opportunities, regular walkthroughs of

the open space, and opportunities to act as informal docents, educators, or interpreters. It was also suggested that the City and the community improve coordination with the easement holder(s) (i.e., Utah Open Lands), and other previously mentioned stakeholders, to ensure that the open space is managed according to conservation goals and maintained as such in perpetuity.

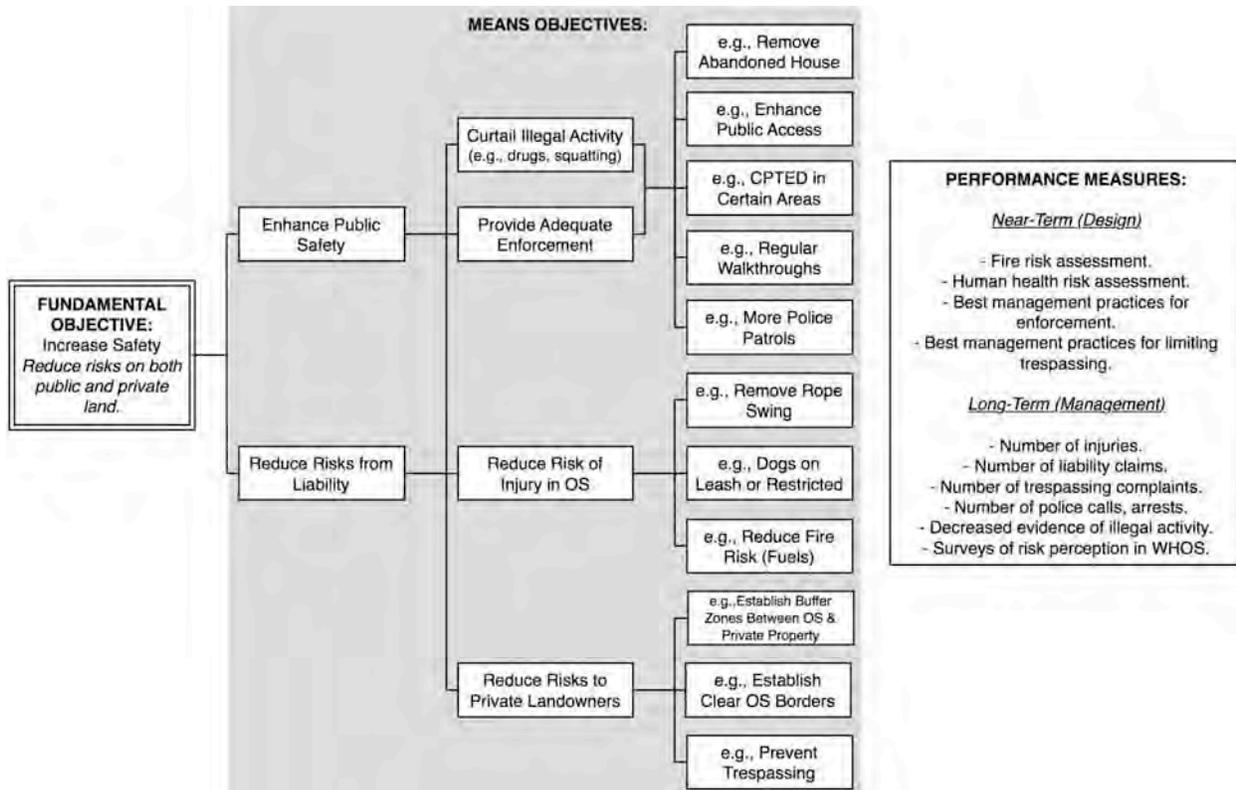


Figure 7. Value tree depicting the relationship between the fundamental and means objectives, and suggested performance measures, for reducing risks to health and safety on public and private land.

Lower-order means objectives for reducing risk of liability included reducing the risk of public injury in the Wasatch Hollow Open Space area, as well as reducing risks to private landowners. Potential means of reducing risk of injury in the open space (which was viewed by most as a source of potential liability to the city, and managers of the open space) included removing the rope swing to prevent physical injury to visitors, requiring that dogs be leashed or restricted in other ways so as not to be a threat to other visitors to the open space, and managing fuel loads in order to minimize the risk of wildland fire. The potential for fire was mentioned both as a potential risk within Wasatch Hollow, but also a potential risk to homeowners living adjacent to the space.

Potential means of reducing risks to private landowners included establishing buffer zones between the Wasatch Hollow Open Space area and private property, establishing clear open space borders, and preventing trespassing on private property. All of these means of reducing risks to private landowners could be established through the means suggested previously in the section on establishing clear boundaries.

Regarding performance measures for increasing public safety, workshop participants suggested both near-term and long-term measures of success. In the near-term, participants suggested

that the design be evaluated in terms of assessed risk of fire, assessed risk to human health, and the use of best management practices for ensuring enforcement and limiting trespassing. In the long-term, participants suggested that the management plan be evaluated in terms of the number of injuries over time, number of liability claims, number of trespassing complaints, number of police calls and arrests, evidence of illegal activity, and perceived risk associated with the Wasatch Hollow Open Space area (through community or public surveys).

5.5 Foster Collaboration and Cooperation

A fifth fundamental objective for the design and management of Wasatch Hollow dealt with the need to foster cooperation and collaboration between different stakeholder groups during both the planning and implementation (design and management) of the open space area (Figure 8).

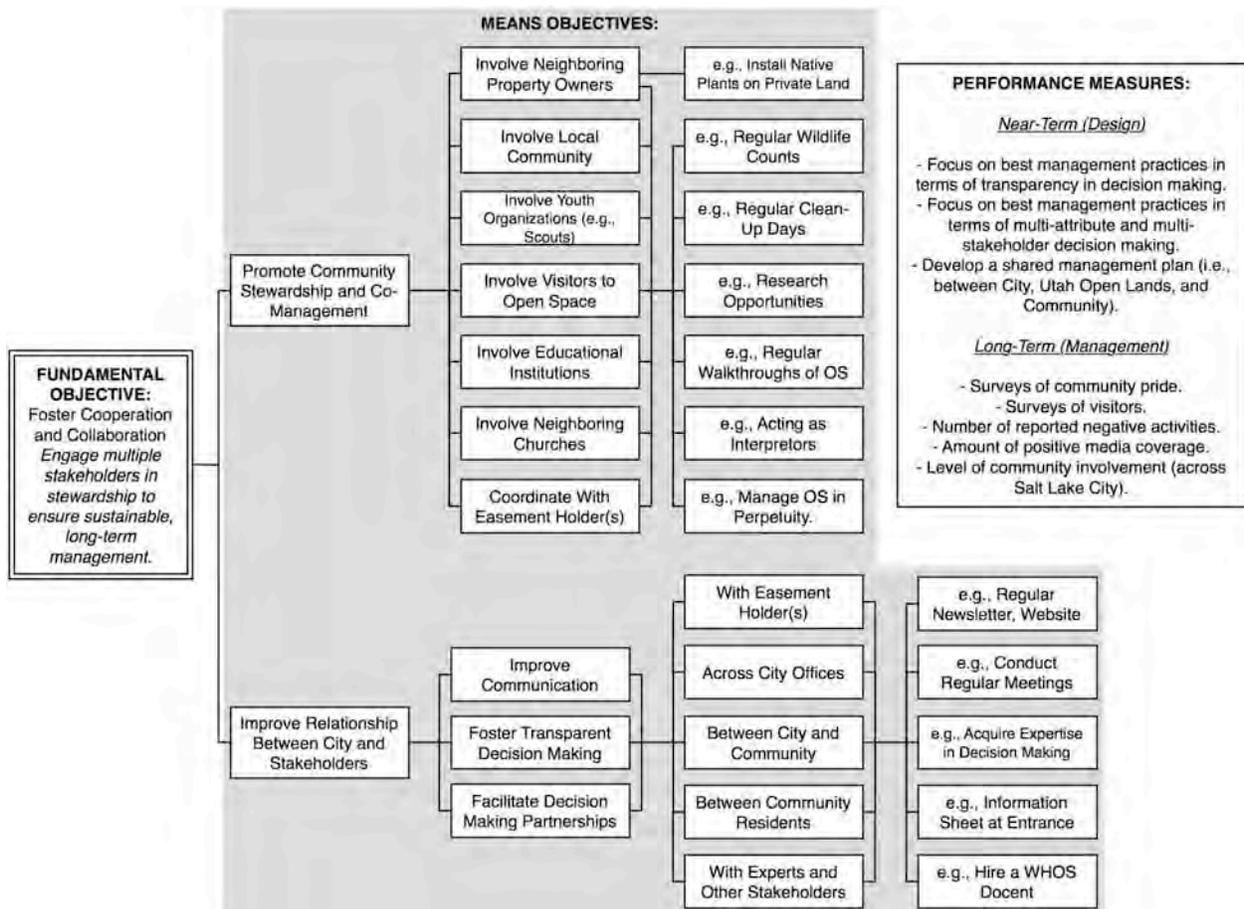


Figure 8. Value tree depicting the relationship between the fundamental and means objectives, and suggested performance measures, for fostering cooperation and collaboration among multiple stakeholders.

In terms of the means by which this objective could be achieved, workshop participants were unanimous in their view that community stewardship and co-management should be promoted in Wasatch Hollow. A majority of participants also mentioned the need to mend relationships among various stakeholders (in particular between the City and other stakeholders).

Regarding means objectives related to improving the relationship between stakeholders, participants frequently discussed the need to improve communication, foster transparent

decision making, and facilitate decision making partnerships. It was suggested that these improvements were necessary between the city and multiple stakeholders, including the easement holders, the community and local experts. It was also suggested that these improvements were necessary across city offices and between community residents. Potential means for achieving these improvements are through regular newsletters updating stakeholders about the design and management process, a Wasatch Hollow Open Space website, regular meetings with stakeholders, the acquisition of training or expertise in multiattribute decision making at the City level, providing information sheets at the entrance to the open space, and hiring a formal docent to facilitate educational and research opportunities.

Workshop participants identified multiple near-term and long-term measures of performance for cooperation and collaboration as it relates to the Wasatch Hollow Open Space area. In the near-term, participants suggested that the open space design be evaluated by the incorporation of best management practices in terms of transparency in decision making and the use of multi-attribute and multi-stakeholder approaches to decision making, as well as the presence of a shared management plan (i.e., between the City, Utah Open Lands, and the community). In the long-term, participants suggested that the Wasatch Hollow management plan be evaluated via surveys of community pride in the space, surveys of visitor attitudes and perceptions, the number of negative activities reported, the amount of positive media coverage, and the level of community involvement across the City.

5.6 Implement an Adaptive Management Framework

Many workshop participants, expert and public alike, discussed the need to manage the Wasatch Hollow Open Space area in a “holistic manner”. When asked to clarify the meaning of a holistic approach to management, many participants cited the need to (1) clearly establish responsibility for stewardship and monitoring, and (2) develop a management framework that would maintain Wasatch Hollow as a natural, undeveloped open space in perpetuity.

However, several other important themes were discussed in each workshop. For example, many participants discussed the need to manage the Wasatch Hollow Open Space area in a manner that is sensitive to its place within the broader Emigration Creek Watershed. When pressed to discuss this further, many participants talked about the need to manage for the kind of ecology (including plant and animal species, as well as structural conditions) that are most likely to thrive in this Wasatch Hollow Area; recognizing that (1) the structure and function of the Wasatch Hollow ecosystem may be quite different from the structure and function present in other open space areas and (2) structure and function will likely change over time.

Along similar lines, participants discussed the need to include both a long-range temporal and spatial element in the restoration and management of the open space. From a spatial standpoint, many participants discussed the need to conceptualize Wasatch Hollow as only one part of the overall composition of natural areas in Salt Lake City. Many participants appropriately took this view further to discuss the Wasatch Hollow Open Space area itself as containing a network of possibilities in terms of both restoration and access possibilities. The specific examples that were discussed in this context included the desire that Wasatch Hollow be designed and managed differently from other open space areas in the city (e.g., several participants noted that, just because an activity is permissible in other open space areas, it may not be permissible in Wasatch Hollow if it compromises the restoration goals of the site). This idea extended to Wasatch Hollow itself with several participants noting that, pending an ecological evaluation of the overall open space, public access or types of permissible activities that make sense in one area of the open space may not make sense in another.

From a temporal standpoint, the goal of long-range monitoring and management, as discussed by many, is the need to learn about the overall health of the Wasatch Hollow ecosystem and its responses to various kinds of human impacts. Building further on this theme, some participants in the public and expert groups wanted how the open space area is managed over time to be flexible in response to the changing needs of the ecosystem.

We must be clear at this point that workshop participants did not discuss these potential changes in terms of allowing development at some point in the open space. Instead, many of the examples given by workshop participants dealt with learning over time; for example, closing certain areas of the open space to public access if it was determined over time that the current management structure was compromising the health of the ecosystem. A similar example was discussed in the context of access for dogs; if (a) dogs were permitted in parts of the open space and (b) it was determined that access by dogs was negatively affecting the ecosystem, then this access would be removed from the list of permissible activities. Some participants discussed the possibility that public access and the list of permissible forms of access could also be expanded in certain areas of Wasatch Hollow if these areas were deemed to be robust and relatively insensitive to certain types of use. We would characterize these themes as the need to apply “adaptive management” to the area. (Indeed, some experts in one of our workshops mentioned the appeal of an adaptive management framework for Wasatch Hollow.)

The concept of adaptive management was born out of the need to address the objective of learning about managed environmental systems over time (Holling 1996; Walters 1986). The central argument of adaptive management is that management decisions are really research questions that masquerade as answers. The management of complex environmental problems then can be regarded as a process of learning over time from policies designed to reduce uncertainty and improve the managed system’s ability to respond to inevitable environmental, social, or economic surprises. To operationalize this effort, adaptive management calls for the design and implementation of carefully planned and monitored management “experiments”, with analysis and comparison of management initiatives at appropriate spatial and temporal scales. In other words, rather than making one-time decisions on the basis of the best existing knowledge (as many may be tempted to do at Wasatch Hollow), adaptive management regards policy decisions as being part of a carefully planned, iterative, and sequential series of steps that emphasizes monitoring and learning as the system changes, both in response to external stimuli and in response to human impacts (Walters 1986).

Because of its experimental basis² (in that sequential management initiatives are designed, implemented, and monitored), adaptive management is quite different from more conventional management models based on trial-and-error. Prescriptively, an adaptive management approach involves four primary elements (Walters 1986):

1. Bounding of the management problem in terms of objectives and constraints;
2. Characterizing existing technical knowledge about the managed system;
3. Designing flexible management plans (i.e., that allow for modification over time); and
4. Embracing the potential failures within the management plan as a means to learning and improving long-term outcomes by making mid-course corrections.

² Adaptive management should not be confused with the precautionary principle. Although the precautionary principle also involves taking action to reduce current or potential risks about which little may be known (Raffensperger & Tickner 1999), it does not call for the experimental comparison of alternative management initiatives as a means of reducing uncertainty. In this way, the precautionary principle is best viewed not as a substitute for adaptive management, but rather as a philosophy that underlies and may help to encourage certain kinds of management intervention.

It is our view that adaptive management as a guiding objective for the Wasatch Hollow Open Space area may have significant theoretical and practical appeal. As a result, the City may wish to incorporate this management model into the Wasatch Hollow Open Space plan. Because adaptive management is a guiding philosophy (vs. a specific management alternative), performance measures were not elicited for this objective.

5.7 Maintain Design and Management Costs Within Appropriate Limits

The cost of designing and managing the Wasatch Hollow Open Space was, surprisingly, discussed relatively infrequently. When it was discussed during our workshops, it was often characterized as a function of other means and fundamental objectives. For example, some participants discussed project costs in terms of having sufficient resources on hand to carry out a broad restoration effort, or to build or renovate a possible education center. Other participants discussed cost in terms of the need to have sufficient financial resources available for enforcement or monitoring efforts.

When we asked about budgeting for Wasatch Hollow, we were informed that financing for the open space would be determined after a basic restoration and management framework was established. This is a sensible approach. However, this approach makes it imperative during the planning process that the costs of alternative open space designs (including restoration and long-term management) be established and evaluated alongside the other objectives identified above.

To this end, we would urge Salt Lake City and its open space partners to adopt a fundamental objective related to keeping management costs within “reasonable limits”; limits that may only be determined through this planning process by the City and any other identified outside supporters of the Wasatch Hollow Open Space project. It is our experience that maintaining a reasonable cost structure for both restoration and management provides the greatest opportunity for other fundamental objectives to be met. Specifically, it would be problematic for the City and its partners in this process to set overly ambitious and costly targets for restoration or public access at the start of the project, only to see these go unmet if adequate funding cannot be maintained in perpetuity. The worst-case scenario is the creation of an unfunded mandate in the form of an open space project that, inevitably, would fall into a state of ecological and social decline, coupled with the inability on the part of the City and the community to implement a long-term management plan.

6. Findings: Alternatives

Our goal when we became involved in this planning process was to work closely with members of the project team (based in the Salt Lake City Open Space Program) to organize information obtained from our stakeholder meetings into *components* of possible alternative designs for the Wasatch Hollow Open Space Area. We emphasize components of alternatives because, in our experience, the development of fully conceptualized alternatives (i.e., comprised of multiple components) is best left to the next project team working in concert with local stakeholders and experts who—together—are often in better tune with on-the-ground realities and constraints (e.g., budget limitations, regulatory constraints, local ordinances, etc.). To be clear, we are not suggesting that each the following items *should* be represented in the final, adopted plan for the Wasatch Hollow Open Space area. Instead, we are suggesting that these components be considered as part of a wide range of different alternatives that stakeholders, experts, and decision makers representing the City have the opportunity to evaluate in a side-by-side

comparison during future meetings of the planning group.

6.1 Alternative Open Space “Clusters”

By “clusters”, we mean different open space designs and management plans implemented in different areas of the 10-acre Wasatch Hollow Open Space site. There was widespread agreement among participants in our workshops that it may be beneficial to open the southern reaches of Wasatch Hollow to wider public access while maintaining a stricter stance on access in the northern portion. The presence of a footpath that leads people away from the northern areas of Wasatch Hollow coupled with the presence of natural barriers at the southern end of the property currently owned by the Church of Jesus Christ of Latter Day Saints may serve as an effective barrier, thereby preventing the need for human-made barriers such as fencing.

Considering design options that offer different strategies for the northern and southern aspects of Wasatch Hollow may be beneficial for several reasons. First, providing more strict protections (e.g., by not including a footpath in the area of the open space that is the subject of the donation by the Church of Jesus Christ of Latter Day Saints) would likely offer a greater sense of security to private property owners who (a) live adjacent to this part of the open space and (b) seem to be more concerned about trespassing when compared with residents adjacent to the areas in Wasatch Hollow that currently see more regular public use. Restricting access to the northern portion of Wasatch Hollow (e.g., to researchers and for certain educational uses) without the construction of a footpath may lead some who currently oppose the Wasatch Hollow Open Space expansion to throw their support behind the project.

Second, “splitting” Wasatch Hollow into two management clusters would provide ecologists with an opportunity to study the effects of human impacts (in a public open space setting) on riparian areas. Having the northern aspect of the open space serve as a “control” against which measurements in the south may be compared may inform both the design of potential new open space areas (i.e., outside of Wasatch Hollow) while also providing additional insights into the adaptive management of Wasatch Hollow itself (see above).

Third, characterizing the northern portion of Wasatch Hollow as a restricted use area may help the site better achieve some of its restoration goals. For example, a limited access site may serve as an effective refuge for species—flora and fauna—that may be quite sensitive to even minimal human use.

6.2 Access by Dogs

There was nearly unanimous agreement—even among the most ardent dog owners—that allowing unrestricted access to Wasatch Hollow by dogs would likely stand as an affront to the restoration goals expressed by all. To this end, alternative plans for the Wasatch Hollow Open Space should explore different dog policies with the impacts of these policies studied in terms of being able to meet the objectives expressed during this planning process. For example, what would a restricted dog policy mean for the ability of Wasatch Hollow to meet its restoration and safety objectives? Though there would almost certainly be opposition expressed by some, it is our view that the planning process for Wasatch Hollow should explore the option of heavily restricting (i.e., strictly-enforced on-leash regulations) or prohibiting dogs in the active restoration areas of the open space. As we note above, many other public open space areas in North America have adopted such a policy.

When discussing the issue of dogs specifically, many participants noted that unrestricted access

to dogs—even leashed dogs—should not be considered for the Wasatch Hollow Open Space just because other open space sites (e.g., Miller Park) allowed them. In fact, many participants cited the opportunity to take dogs to other open space areas nearby as a reason for, perhaps, forbidding dogs entirely from Wasatch Hollow.

6.3 Buffer Zones

In the workshop with community members living around the northern reaches of the proposed open space, there was much discussion of the importance of buffer zones. As we note above, buffer zones were thought of as a means of both promoting restoration goals and protecting private property.

Our understanding of these discussions is that buffer zones are essentially widened boundary lines that increase the proverbial “no man’s land” between public and private property. Such buffers could be created on public or private property, but in both cases the intent would be to increase the space between public and private land with the hope of ensuring public use in public space, and private use in private space. These buffer zones could be comprised largely of dense foliage (vs. human-made barriers like fencing) that would serve to separate the open space area from adjacent private properties. Handling buffer zones in this way would likely prevent many adjacent property owners from installing fencing, which in turn, would be beneficial for maintaining the integrity of the wildlife corridor that is Wasatch Hollow.

We believe, based on findings from our workshops, that the creation of buffer zones might proceed in several ways. On the one hand, buffer zones could—in many places—be built into the existing 10-acre open space site. In other cases, it may be possible for the City or the Church of Jesus Christ of Latter-Day Saints to sell small slivers of the property to private land owners providing that they agree, in turn, to install a natural buffer zone. The reverse is also true in that some private landowners might sell slivers of their existing properties to the City providing that it agrees to install a natural buffer zone.

We recognize that the framework for creating these buffer zones may be complex and will likely need to be established on a case-by-case, property-by-property basis. Nevertheless, because buffer zones seem like they may address many objectives simultaneously, we suggest that the pros and cons of these be discussed with stakeholders and considered as part of the alternative design and management structures created for Wasatch Hollow.

6.4 Abandoned House

The abandoned house that currently sits on the portion of the site recently acquired by the City came up in conversation on several occasions, but was not a large focus of the conversation in any particular group. Some participants suggested that the house be renovated and used as an educational or nature center, perhaps providing permanent space for a non-profit organization or full-time Wasatch Hollow Open Space docent. Many who supported this idea felt that it would be a shame to tear down a structure if there was a way to incorporate it into the space. However, many who shared this opinion also recognized that if it was not financially feasible (from a design or management standpoint) then perhaps such a center could be built elsewhere.

Although some participants supported the idea of keeping and renovating the house, others clearly felt that it was best that it be torn down. Supporters of this idea were not necessarily opposed to the idea of a nature center on site, but rather felt that the cost associated with

restoring and maintaining the house was unreasonable. There were additional concerns shared regarding the impact of the septic system on water quality in the Hollow, as well as the challenges associated with access to the house, both in terms of parking and proximity of the house to the main entrance.

It is our recommendation that both options be considered, but that in the evaluation of alternative designs and management plans that the costs associated with restoring and maintaining the house be communicated, along with the costs associated with removing the house from the space in a manner that is consistent with the overall restoration and environmental protection objectives of the open space area. The house should be considered as just one means of providing an educational/nature center; clearly if such a center is desired there may be other means to achieve that goal.

6.5 Types of Uses

The question of whether or not to provide public access was addressed by all of the stakeholder groups. Some groups were clearly in favor of prohibiting access, while others were supportive of providing some public access through a variety of uses. However, even those who would prefer no access in the space indicated support for limited access and use, if that access and the types of uses encouraged were informed by restoration goals and perhaps limited to certain segments of the space. Very few individuals expressed support for active use of the space (e.g., bikes, organized sports, etc.).

Given that public access in some form is likely to occur in order to be consistent with the Open Space Program goals and mission, it is our suggestion that various passive forms of use be considered for incorporation in the space (e.g., walking, wildlife viewing, reflection, etc.). Such uses are consistent with ecological restoration goals aimed at providing wildlife habitat, protecting water quality, preventing erosion, and the like. In addition, such uses are unique from those that may be allowed in more traditional park settings, setting apart the type of use provided by an open space area from other more traditional outdoor spaces.

Another benefit of encouraging appropriate, passive use of the space would be the potential for such use to drive out illicit or illegal activities that currently occur. Research suggests that encouraging legitimate use of an outdoor urban space facilitates “natural surveillance” (over active surveillance, such as the deployment of security cameras, which was not favored by the majority of workshop participants we spoke with), essentially discouraging offenders from using the space and improving public perceptions of the space in the process (Knutsson 1997). Encouraging appropriate passive use has the potential to increase safety, while not creating the ecological harm that more active, or inappropriate uses, may bring.

6.6 Footpaths

The inclusion of footpaths could promote the passive use described above. However, as with the case of open space clusters and access by dogs, we suggest that stakeholders, experts, and decision makers representing the City evaluate options with differences in the number and placement of footpaths within the Wasatch Hollow Open Space area. Specifically, alternative designs (e.g., looped trails, the presence or absence of bridges), placement (within the open space), and number (single or multiple trails) should be considered in terms of their influence on meeting some of the five fundamental objectives outlined above.

For example, many workshop participants conjectured about the role of footpaths in terms of

enhancing or detracting from public safety, meeting restoration goals, and encouraging respect for the boundaries between public and private property. Arguments were made both in favor and in opposition of footpaths across these objectives. Given the importance of footpaths for meeting the City's mandate of public access in open spaces, we suggest that both views be considered carefully during the planning and decision making process.

6.7 Rope Swing

The rope swing that is currently located within the Wasatch Hollow Open Space poses problems for many of the fundamental objectives discussed by workshop participants. For example, significant erosion of the stream bank is evident as a result of swing use. Also, use of the swing has prompted noise complaints from neighbors and likely poses a significant risk of liability for the City. For these reasons, it is our suggestion that alternative open space designs *not* include the rope swing over Emigration Creek. Although the swing does hold cultural and perhaps even historical significance to some members of the Community, the majority of participants recognized that some traditional uses of the space might not be appropriate given the goals of the Open Space program.

6.8 Utilities, Drainage, and Flood Control

Some participants, in particular those in the expert and City stakeholder groups, discussed issues surrounding access to utilities in the Hollow, drainage points along the Creek, and the need to provide adequate flood control. Some participants expressed that alternative designs need to account for adequate access for maintenance and provision of these services, while others shared the concern that such access and services might be detrimental to ecological restoration and management objectives.

It is our suggestion that alternative design options explore the possibility of moving utilities out of the Wasatch Hollow Open Space area, or burying lines during any initial restoration effort. Such an alternative may eliminate the need for potentially destructive access by Rocky Mountain Power. However, given that power lines may still remain, alternative designs should also consider how to provide adequate access while protecting ecologically sensitive areas.

Alternative designs should also explore the possibility of moving culverts and drainage points to protect the ecology of Emigration Creek. In addition, given concerns by a few participants about flooding, it is our suggestion that natural flood control mechanisms be explored as aspects of potential alternatives. It was shared by some participants that any concern about flooding could be mitigated through ecological engineering efforts such as the creation of de-silting meadows, or stream and bank restorations that would minimize the need for human flood control interventions.

6.9 Educational and Research Partnerships

Workshop participants were very supportive of partnering with local educational institutions to both provide research opportunities for graduate students and help monitor conditions in the Wasatch Hollow Open Space area. Alternative design and management plans should incorporate means of reaching out to and working with colleges, universities, and government agencies to encourage collaborative research in Wasatch Hollow and at surrounding sites. Such partnerships could include social and behavioral research (e.g., surveys of visitor use, surveys of community perceptions of the Wasatch Hollow Open Space area), bio-physical research (e.g., assessments of water quality, soil quality), and ecological research (e.g., bird

surveys, biodiversity indices). Not only would these partnerships be a positive use of the open space, but linking the Wasatch Hollow Open Space area into new and ongoing research efforts could help to offset the cost of monitoring changes in environmental and social conditions, and evaluating the effectiveness of the current design and management plan.

6.10 Enforcement

Almost all of the workshop participants shared concerns about enforcement, whether it was in regard to public safety in the Wasatch Hollow Open Space area, trespassing across private-public property lines, or appropriate use. As a result, it is our recommendation that the design and management plans under consideration explore the effectiveness and cost of alternative enforcement regimes (e.g., increased police patrols, private security, and community-based initiatives). The design of the Wasatch Hollow Open Space area should consider access for enforcement, while any proposed management plan should account for the cost and effectiveness of different types of enforcement over time.

7. Next Steps: Presenting Alternatives, Confronting Tradeoffs, and Deciding

As we note in Section 3.3, we suggest that participants in the decision making process for the Wasatch Hollow Open Space area be asked to first set priorities across seven fundamental objectives outlined above prior to evaluating any of the presented management alternatives. As we note above, it is our view that the first five objectives be the focus of future stakeholder-based sessions with the latter two objectives geared towards panels of experts and City decision makers. The alternatives presented to respondents should be accompanied by a “report card” (Figure 9) that depicts its expected level of performance across all of these objectives. This way, respondents may evaluate, with relative ease, the available alternatives in light of their own priorities.

The method we propose for the Wasatch Hollow Open Space planning process is a combination of swing weighting and approval voting. Swing weighting is described in Section 3.3 and will encourage respondents to consider the kinds of tradeoffs that they are willing to make across their objectives. Further, this process—if structured appropriately—will lead respondents to the alternatives best suited to their ranked order of objectives. Approval voting is a simple task where respondents are asked to identify all of the alternatives that they would find to be acceptable to them.

Data collected from swing weighting with approval voting can be used in several ways. Information about respondents’ ranks and weights can be used to summarize areas of agreement and disagreement across stakeholders in terms of the objectives that are most important to them during the planning process. Similarly, this information may be used to identify alternatives, or aspects of alternatives, that are broadly acceptable to the range of people involved in the planning process; this is especially important if a new, hybrid alternative should be created to combine the best aspects of two or more alternatives. Finally, under ideal circumstances, the combined swing weighting and approval voting process may reveal a small subset of alternatives that are acceptable to all involved. Oftentimes, these widely acceptable alternatives are nobody’s first choice. However, it is often the case that individuals’ second-ranked alternative is widely accepted across all respondents. If this is the case, it may be possible to implement this alternative as-is, or modify it slightly so that it becomes even more acceptable to a broader spectrum of respondents.

	Objective	Performance Measures	Rating of Alternative Under Consideration	Overall Rating For Objective
Stakeholders, Experts, & Decision Makers	1. Ecological Restoration and Protection	e.g., Anticipated health of Emigration Creek	Low...High	Composite Score or Letter Grade
		e.g., Anticipated health of fauna	Low...High	
		e.g., Anticipated health of flora	Low...High	
	2. Establish Clearly Defined Boundaries	e.g., Anticipated effect in neighboring property values	Negative...Positive	Composite Score or Letter Grade
		e.g., Presence/absence of multiple footpaths, access points	Multiple Paths Present...Absent	
	3 Public Access Informed by Restoration Goals	e.g., Types of activities permitted	Passive...Active	Composite Score or Letter Grade
		e.g., Expected quality of visitor experiences	Low...High	
	4. Reduce Risks to the Public	e.g., Number or severity of anticipated injuries	Few...Many	Composite Score or Letter Grade
		e.g., Risk associated with liability	Low...High	
		e.g., risk of wildland fire	Low...High	
5. Foster Collaboration and Cooperation	e.g., Extent of collaboration during design	Low...High	Composite Score or Letter Grade	
	e.g., Extent of collaboration during management	Low...High		
Experts & Decision Makers	6. Consistent with an Adaptive Management Framework	e.g., Extent of flexibility in open space design	Low...High	Composite Score or Letter Grade
	7. Cost	e.g., Cost to design and implement	Low...High	Composite Score or Letter Grade
		e.g., Cost to manage over time	Low...High	

Figure 9. Example of the type of “report card” that may accompany each alternative. The performance measures and rating scales presented are examples; final performance measures and rating scales should be determined in consultation with experts and stakeholders. An overall report card should also be prepared to compare all of the available alternatives within a single framework.

However, in suggesting swing weighting and approval voting, we realize that logistical difficulties may prevent the Salt Lake City Open Space Program from implementing this process to its fullest. Even in the absence of swing weighting however, we strongly suggest that alternative open space plans be characterized in terms of the objectives they are designed to frontline. In other words, a hypothetical *Plan A* could be characterized as the most restoration-oriented option that also has significant benefits for protecting private property (e.g., because of the inclusion of buffer zones). A hypothetical *Plan B* could be characterized as the most access-oriented option that, as a result, does not perform as well on some restoration indicators. A hypothetical *Plan C* could be characterized as a hybrid model, and so on. This way, respondents can quickly align their preferences with the open space option that best suits them.

Approval voting could then be conducted with follow-up analysis devoted (if necessary) to identifying a hybrid option that would be satisfactory to most. Prior to proceeding, this hybrid option should then be presented to respondents for final review and discussion prior to being advanced to Salt Lake City Council.

It is important to note at this point that, even after a process like this, it is unlikely that the chosen alternative will satisfy everybody equally. In terms of the final outcome, there will be those that feel like winners in a process like this, and those that feel like losers. However, it is important that the process through which the final decision is made be not only transparent but also meaningful. Participants must be given the opportunity to think about their objectives in light of the available alternatives and, if necessary, suggest alternative means by which important objectives can be realized. However, we would not support a position taken by any respondent or stakeholder group that none of the alternatives are suitable without them suggesting alternative means by which objectives may be achieved. As we note above, there was broad agreement regarding the seven fundamental objectives outlined above. Out of respect to Wasatch Hollow and the community, these objectives ought to be used as the guideposts during the decision making process that will follow.

8. References

- Arvai, J. L. 2007. Rethinking risk communication: Lessons from the decision sciences. *Tree Genetics and Genomes* **3**:173-185.
- Arvai, J. L., and R. Gregory. 2003a. A decision focused approach for identifying cleanup priorities at contaminated sites. *Environmental Science & Technology* **37**:1469-1476.
- Arvai, J. L., and R. Gregory. 2003b. Testing alternative decision approaches for identifying cleanup priorities at contaminated sites. *Environmental Science & Technology* **37**:1469-1476.
- Arvai, J. L., R. Gregory, and T. McDaniels. 2001. Testing a structured decision approach: Value-focused thinking for deliberative risk communication. *Risk Analysis* **21**:1065-1076.
- Baron, J. 2000. Measuring value tradeoffs: Problems and some solutions in E. U. Weber, J. Baron, and G. Loomes, editors. *Conflict and Tradeoffs in Decision Making: Essays in Honor of Jane Beattie*. Cambridge University Press, New York, NY.
- Clemen, R. T. 1996. *Making Hard Decisions: An Introduction to Decision Analysis*. PWS-Kent Publishing Co., Boston, MA.
- Costanza, R., and A. Voinov 2004. *Landscape Simulation Modeling: A Spatially Explicit, Dynamic Approach*. Springer-Verlag, New York, NY.
- Failing, L., G. Horn, and P. Higgins. 2004. Using expert judgment and stakeholder values to evaluate adaptive management options. *Ecology and Society* **9**:13-32.
- Gregory, R., J. L. Arvai, and T. McDaniels. 2001a. Value-focused thinking for environmental risk consultations. *Research in Social Problems and Public Policy* **9**:249-275.
- Gregory, R., T. McDaniels, and D. Fields. 2001b. Decision aiding, not dispute resolution: Creating insights through structured environmental decisions. *Journal of Policy Analysis and Management* **20**:415-432.
- Hammond, J., R. L. Keeney, and H. Raiffa 1999. *Smart Choices: A Practical Guide to Making Better Decisions*. Harvard Business School Press, Cambridge, MA.
- Holling, C. S. 1996. Surprise for science, resilience for ecosystems, and incentives for people. *Ecological Applications* **6**:733-735.
- Keeney, R. L. 1982. Decision Analysis: An overview. *Operations Research* **30**:101-135.
- Keeney, R. L. 1992. *Value-focused Thinking. A Path to Creative Decision Making*. Harvard University Press, Cambridge, MA.
- Keeney, R. L., and H. Raiffa 1993. *Decisions With Multiple Objectives: Preferences and Value Tradeoffs*. Cambridge University Press, Cambridge, UK.
- Keeney, R. L., and D. von Winterfeldt. 1989. On the uses of expert judgment on complex technical problems. *IEEE Transactions on Engineering Management* **33**:83-86.

- Kleindorfer, P. R., H. C. Kunreuther, and P. J. H. Shoemaker 1993. *Decision Sciences: An Integrative Perspective*. Cambridge University Press, New York, NY.
- Knutsson, J. 1997. Restoring Public Order in a City Park. Pages 133-151 in R. Homel, editor. *Crime Prevention Studies*. Criminal Justice Press, Monsey, NY.
- Raffensperger, C., and J. Tickner 1999. *Protecting Public Health and the Environment: Implementing the Precautionary Principle*. Island Press, Washington, DC.
- von Winterfeldt, D., and W. Edwards 1986. *Decision Analysis and Behavioral Research*. Cambridge University Press, Cambridge, UK.
- Walters, C. J. 1986. *Adaptive Management of Renewable Resources*. The Blackburn Press, Caldwell, NJ.
- Wilson, R. S., and J. L. Arvai. 2006. Evaluating the quality of structured environmental management decisions. *Environmental Science and Technology* **40**:4831-4837.

**WASATCH HOLLOW
EMIGRATION CREEK CORRIDOR
BASELINE DOCUMENTATION**

January 26, 2007

**Prepared by
Arthur E. L. Morris
for
Utah Open Lands**

BASELINE DOCUMENTATION

PROPERTY LOCATION AND IDENTIFICATION 1

 Map 1

 Land Type..... 2

 History..... 7

 Wasatch Hollow Community Park..... 8

 Dogs..... 9

 Roads..... 9

 Land Stewardship and Management..... 9

 Landscape Alterations..... 10

 Detention Basin..... 11

 Zones..... 11

 Overview 12

 Map of four conceptual zones in the stream corridor. 13

 Zone 1 15

 Zone 2 17

 Zone 3 18

 Zone 4 18

VEGETATION AND SOILS..... 19

 Soils..... 19

 Habitat Types..... 19

 Stream..... 20

 Emigration Creek Physical Characteristics in Wasatch Hollow 22

 Lowland Riparian 23

 Native Riparian Shrubs and Trees 24

 Mountain Shrub 25

 Native Mountain Shrubs and Trees..... 27

 Wildlife..... 27

 Mammals..... 28

 Birds..... 29

 Reptiles 29

 Fish 29

 Stream Invertebrates 29

The baseline documentation was developed by actual site visits by Wasatch Hollow Community Association and Utah Open Lands Ecological Consultant, Arthur Morris. Kathlyn Collins of Salt Lake County Public Works Department Engineering Division provided excellent data and photographs of Emigration Creek conditions from the Salt Lake County Emigration Creek Level III Channel Stability Study, 2005. Additional data was obtained from sources cited in the document. This Baseline Documentation is to be used in conjunction with Wasatch Hollow conservation easement(s).

LIST OF PHOTOS

	Page
Photo 1. The stream corridor in Wasatch Hollow in the late 1920's; looking northeast from the end of Kensington. (A. Cannon).....	3
Photo 2. Colonial Hills Meetinghouse looking northwest across the stream corridor. (A. Cannon).....	4
Photo 3. Colonial Hills Meetinghouse; looking northwest into the stream corridor. This shows the tall willows and cottonwoods of the riparian area, and Gambel oak stands in the valley bottom and sides. (A. Cannon).....	4
Photo 4. Clayton Middle School looking from Emigration Creek southward. Clayton Middle School will soon be rebuilt further west, and the current location will become a soccer field. The bridge of sandstone slabs on Clayton Middle School grounds is not shown in this picture. (K. Collins).....	5
Photo 5. Bradley property; looking southwest toward the south side of Kensington from near the fence bordering Emigration Creek. The hillside in this photo is included in the proposed Madison Park Subdivision for the Bradley property. (A. Cannon).....	6
Photo 6. Bradley property; looking south from near the Bradley house. Trees behind the flat lawn border Emigration Creek. (A. Cannon).....	6
Photo 7. Fence across the stream at the northeastern end of the Bradley property; looking northwest. Land on the far side of the fence is Bradley property. The stream bend shown will erode further into the Bradley property over time unless intervention is performed. Alternatively, this is one of a few desirable natural meanders on the stream that could be encouraged. If the Bradley property is managed for natural rather than residential value, this bend would contribute to the health of corridor by helping to connect the stream and riparian habitat. Bends such as this dissipate energy from the stream, reducing the potential for downstream erosion and damage from high flows. (A. Cannon).....	6
Photo 8. North end of Wasatch Hollow Community Park; looking northwest. The natural area of the stream corridor is visible extending to the right of the photo. (A. Cannon).....	7
Photo 9. View of the stream corridor looking north. Phase III of Wasatch Hollow Community Park includes the dense trees around the stream through the center of this photo. (A. Cannon).....	7
Photo 10. View of Phase III of Wasatch Hollow Community Park; looking north. This shows the roadway coming into the stream corridor from 1700 East. This area is popular for bicycle riding and sledding. For scale, notice the person just entering the riparian trees on the left (A. Cannon).....	8
Photo 11. Stacked drains in the embankment at the southern end of the detention basin. Emigration Creek flows into the lowest drain in this picture. (A. Cannon).....	11
Photo 12. View from the informal trail along the east side of the stream looking southward. The open sky visible at the top left of the picture is the open area of Phase III of Wasatch Hollow Community Park. The person just entering the riparian area in Photo 10 above was on this trail by the tree with the large dark trunk in the center of this picture (A. Cannon).....	13
Photo 13. Looking southward from right by the fence across the stream on the Bradley property. The Bradley property is to the right in this photo. This photo shows denudation typical of Zone 1. Boy is on rope swing. (K. Collins).....	14
Photo 14. Community clean-up volunteers in Zone 1. View is looking northward along the informal streambank trail onto private property adjacent to the stream to the east. (A. Cannon).....	14
Photo 15. This view is from LDS Church property looking north. Dense native Gambel oak stands can be seen to the right and center in this picture. The Colonial Hills Meetinghouse is out of the picture at the top of the hill to the left. Yellow cottonwoods are visible in the riparian area near the center of the picture. (A. Cannon).....	15
Photo 16. This view from within the 1700 right-of-way looking north into Zone 2 shows the dense trees and vegetation of this area interspersed with open areas. Taller trees are in the riparian area out of this picture to the right, but Zone 2 is especially notable for its beautiful upland shrub mosaic. (A. Cannon).....	16
Photo 17. Community stream corridor clean-up volunteers. View is looking north into Zone 2. (D. Jensen).....	16
Photo 18. A hideout on LDS Church property near Emigration Creek, just west of the Colonial Hills Meetinghouse. (A. Cannon).....	16
Photo 19. View of Emigration Creek looking downstream from the hideout in the picture to the left. (A. Cannon).....	16
Photo 20. View typical of stream channel in Zone 3. (K. Collins).....	17

Photo 21. Willow roots (red) like these hold the banks stable in Zone 3. These roots are found in all Zones, but are very well developed in Zones 2, 3, and 4. The root-protected banks are stable and provide shelter for organisms in the stream. (K. Collins).....	17
Photo 22. View looking westward onto the Clayton Middle School grounds. (K. Collins).....	18
Photo 23. Emigration Creek emerging from the culvert under 1900 East into Wasatch Hollow. (K. Collins).....	18
Photos 24 & 25. Emigration Creek in Wasatch Hollow. (K. Collins).....	19
Photo 26. View of the stream and lush riparian habitat. (K. Collins).....	22
Photo 27. Emigration Creek and riparian habitat showing dense vegetation growing near the stream in many areas. Notice the leaves in the stream, which provide carbon for stream-dwelling organisms. (A. Cannon).....	23
Photo 28. Box elders, messy in yards and harborers of bugs, are at home and valuable in natural riparian habitat in Wasatch Hollow. These native Utah trees provide shelter and nesting habitat for wildlife and host native insects that feed other native animals (A. Cannon).....	23
Photo 29. Cottonwoods, still abundant in Wasatch Hollow, are the hallmark riparian tree in this area of Utah, but have been lost at alarming rates as riparian habitats have been altered through human activities such as urban development. Native cottonwoods provided material for shelter, fire, clothing, and even food for early people in the Salt Lake Valley. These trees are excellent sources of shelter and food for riparian wildlife. Cottonwood trunks and branches often become homes for cavity nesting birds and animals such as northern flickers found in Wasatch Hollow (A. Cannon).....	23
Photo 30. Fragrant sumac, abundant in the mountain shrub habitat in Wasatch Hollow, was valued by Native Americans for the fruit, twigs, leaves, and shoots. The fruits were used for food and medicine and to make a drink like lemonade. The young stems were made into baskets. Fragrant sumac was used to make dyes for clothing. Early pioneers ate the salted fruits and chewed stem exudates like chewing gum. The shrub and its fruits provide shelter and food for birds and other animals throughout the year. (G. Cotter).....	24
Photo 31. Young students pointing to something they have spotted in the mountain shrub habitat in Wasatch Hollow. In this area (the southeastern end of Phase III of Wasatch Hollow Community Park), mountain shrub habitat was partially restored through planting of native species by Ty Harrison and students from Westminster College. (D. Fosnocht).....	24
Photo 32. Gambel oak is a native tree typical of mountain shrub habitat in this area of Utah, and is abundant in beautiful stands remaining from pre-pioneer times in Wasatch Hollow. Gambel oak acorns have been valued for food, and the wood has been used for fire, fence posts, and shelter. Gambel oak acorns are valuable food for wildlife while the trees make excellent shelter for birds and other wildlife (G. Cotter).....	25

Photo Credits: The name of the photographer is noted in the caption for each photo (first initial and last name). Many thanks to the photographers for their excellent photos. Photos were provided by Anne Cannon, Glenda Cotter, Dan Jensen, and Diane Fosnocht: Wasatch Hollow Community members. And by Kathlyn Collins: Planning Assistant, Water Resources Planning and Restoration, Salt Lake County Public Works Department Engineering Division. Photos from K. Collins in this baseline document were taken during Salt Lake County Engineering Division Emigration Creek Level III Channel Stability Study 2005.

BASELINE DOCUMENTATION

PROPERTY LOCATION AND IDENTIFICATION

Map

Land Type

The open land described in this baseline documentation is the Emigration Creek corridor in Wasatch Hollow. The Emigration Creek corridor in Wasatch Hollow comprises approximately 15 acres, extending from Wasatch Hollow Park (1650 East 1700 South) upstream past Clayton Middle School to 1900 East and approximately 1400 South, Salt Lake City, Utah. The stream corridor includes Emigration Creek and the stream valley up to the crest of the valley walls. The portion of Emigration Creek corridor in Wasatch Hollow is environmentally valuable as an unusually large contiguous section of Emigration Creek corridor with geomorphology similar to the native condition and remnants of native plant communities. Although stream corridors are naturally long landscape elements, the Emigration Creek corridor has been fragmented by urbanization along its length in Emigration Canyon and Salt Lake Valley. Wasatch Hollow contains approximately 1 km of relatively natural Emigration Creek corridor.

This large natural area along Emigration Creek in Wasatch Hollow presents valuable educational, aesthetic, recreational, and social opportunities. These opportunities are particularly unique in an urban context. The stream corridor is within a few blocks of Westminster College, Highland High School, Clayton Middle School, and Uintah Elementary School. Ecologically, the stream corridor is currently unique for its large size and remaining natural habitat. The large size of the corridor in Wasatch Hollow presents opportunity for natural stream and riparian processes that contribute to clean water, preservation of native plant communities, and which are particularly important for birds (Gardner, Stevens & Howe. 1999. Utah DWR Publication No. 99-38).

Ownership of the land in the Wasatch Hollow stream corridor is divided among private individuals, Salt Lake City, the Church of Jesus Christ of Latter Day Saints, and Rocky Mountain Power. Private individuals hold more than 40 parcels of land at least partially in the stream corridor. Private individuals hold 6 parcels that together completely span the stream corridor just west of where 1800 E would transect the corridor. Salt Lake City also owns land completely spanning the corridor: Phase III of Wasatch Hollow Community Park and the 1700 E right-of-way (see map). Besides the private land spanning the corridor at 1800 E and Salt Lake City property at 1700 E and just south of 1700 E, no other type of property ownership (individual, corporate, or public) spans the corridor. Management decisions in the Wasatch Hollow stream corridor will therefore affect numerous landowners. Wasatch Hollow Community members who do not live adjacent to the stream corridor are also important stakeholders. Many Wasatch Hollow

Community members—particularly children—will be directly affected by decisions regarding land management in the stream corridor.

Elevation of the stream bed ranges from 4,478 ft at 1700 East to 4,584 ft. at 1900 East (elevation data from SL County Engineering Division Level III Channel Stability Study. 2005; attached). The crest of the valley walls is a maximum of approximately 30 m above the stream bed, as east of the 1700 East right-of-way. Valley walls are steep, with slopes often 45% or steeper. Of particular note for restoration is the valley wall between 1700 E and Phase III of Wasatch Hollow Park, which is steeply sloping due to road fill. Stream valley geomorphology varies over the length of the corridor in Wasatch Hollow, as is desirable in a natural system.

Floodplain extent is relatively limited; the lateral extent of the valley bottom ranges from 0 m beyond the bankfull channel margins to approximately 70 m at the widest portion (on the current LDS Church property). Floodplain connectivity with the channel is limited because of advanced incision of much of the channel, especially in the downstream portions of Wasatch Hollow. Terraces exist in and near the channel in some places, providing desirable floodable land where they exist.

Three general belts of similar environmental conditions occur along the length of the corridor: 1) running water, 2) riparian, and 3) upland fringe. Running water occurs as Emigration Creek, which may be augmented by flows from natural springs in Wasatch Hollow. Riparian habitat is marked by lowland riparian communities. The upland fringe is marked primarily by mountain shrub communities.

History

The Emigration Creek corridor in Salt Lake Valley formed as the waters of Emigration Creek and floods shaped alluvial fill at the mouth of Emigration Canyon and in Salt Lake Valley. When the Mormon pioneers entered the grassy Salt Lake Valley they reported Emigration Creek flowing in a steep-sided ravine that gradually moderated further west in the valley.

The Donner-Reed emigrant company probably followed the southwestern side of the Emigration Creek corridor from the mouth of Emigration Canyon through what is now Wasatch Hollow before continuing westward through the valley. Wagons of the first group of pioneers of the Church of Jesus Christ of Latter Day Saints (LDS Church, Mormons) followed the Donner-Reed route along the southern side of the Emigration Creek corridor through what is now Wasatch Hollow before camping at approximately 1700 S and 500 E on their first night in the valley (July 22, 1847). The next day they backtracked approximately one mile (possibly to avoid marshy ground), and traveled north to City Creek where they established the camp that would later become Salt Lake City. The next day (July 24), the LDS Church leader Brigham Young and the last of the initial pioneer company entered the valley along the same route, traveled along the side of the Emigration Creek corridor through what is now Wasatch Hollow, crossed

Emigration Creek probably near where the group had crossed the day before (thought to be at about 1100 East), and then continued to the City Creek camp. (R. Dixon. 1997. Utah Historical Quarterly 65(2):155-164)

Wasatch Hollow housing development began primarily in the early 1900's. By 1930, there were several houses on the high land adjacent to the stream valley, as well as one farm where Wasatch Hollow Park now occurs. Fruit orchards extended into the corridor as far as the southern end of the current LDS Church property. Subdivision adjacent to the corridor occurred until approximately the 1970's.

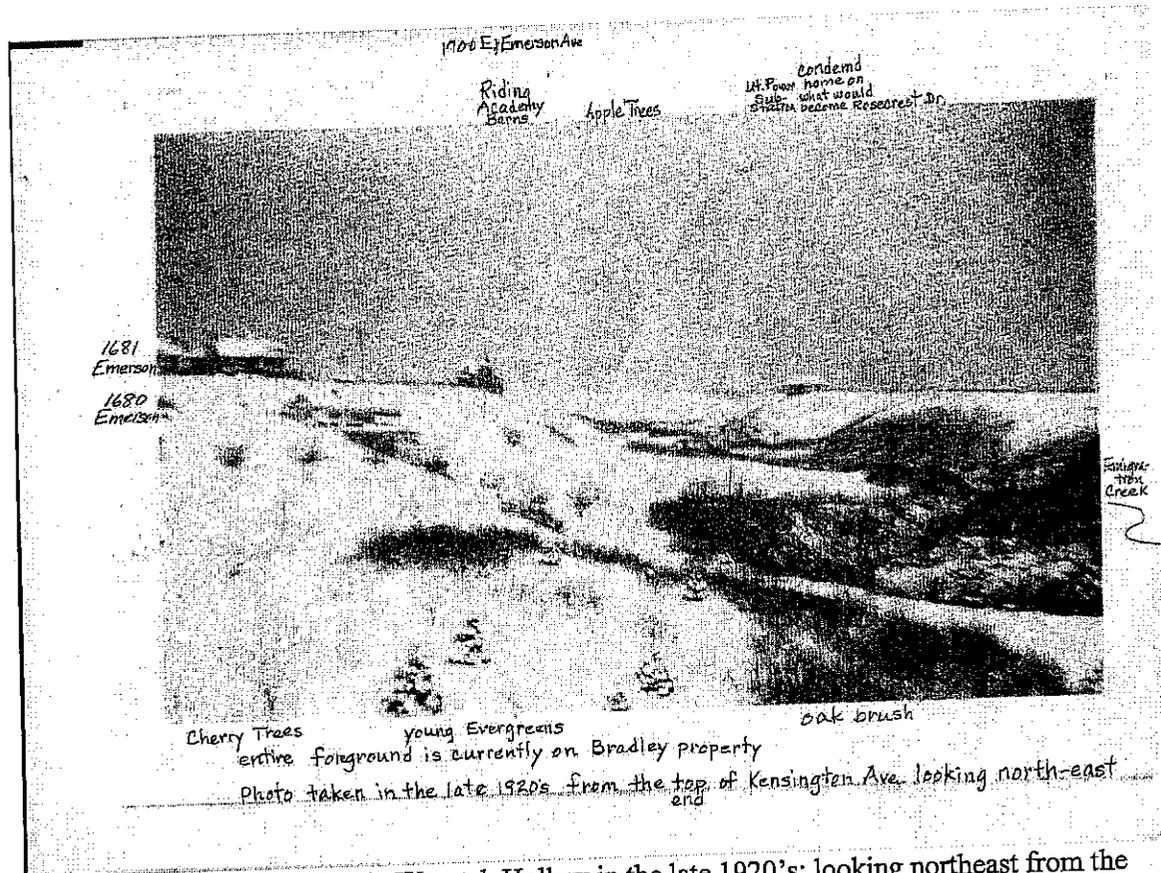


Photo 1. The stream corridor in Wasatch Hollow in the late 1920's; looking northeast from the end of Kensington. (A. Cannon)

In the early 1900's, an underground pipeline was constructed from springs in the Emigration Creek corridor in Wasatch Hollow to the Utah State Penitentiary. This source of fresh water was utilized by the penitentiary until about 1950. The pipeline still exists although it has been abandoned. The springs have been covered by fill from adjacent residential development and fill of the current Bradley property.

Rocky Mountain Power (previously Utah Power) owns land in the stream corridor just west of 1900 E. A substation was constructed on Rocky Mountain Power Company land in the stream corridor sometime in the mid 1900's. This substation still operates.

The Church of Jesus Christ of Latter Day Saints built a stake center (Hillside Stake) that was completed in 1960 on 1900 East at approximately 1400 South with a rear parking lot adjacent to or partly in the Emigration Creek corridor. The LDS Church Colonial Hills meeting house was completed in 1953 on the west side of the corridor at approximately 1450 South on 1700 East. Although the LDS Church owns approximately 5 acres of land in the stream corridor adjacent to the Colonial Hills meeting house (see map), the only apparent development of this land consists of a dirt ramp for vehicular access from the parking lot to the bottom of the stream valley. This ramp is currently gated and padlocked. Chain-link fences have been erected and currently exist along the crest of the stream corridor on the edge of the current Colonial Hills parking lot and around the Hillside Stake Center parking lot.

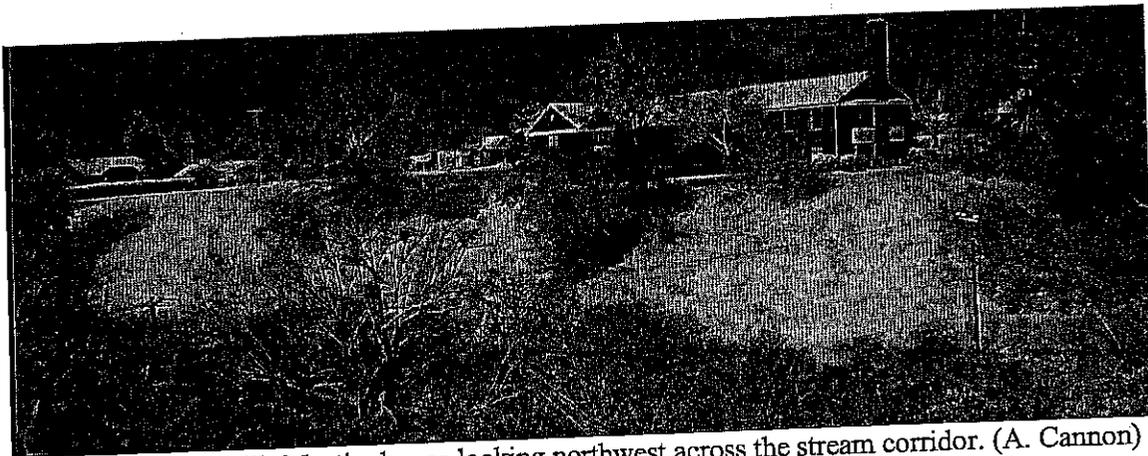


Photo 2. Colonial Hills Meetinghouse looking northwest across the stream corridor. (A. Cannon)

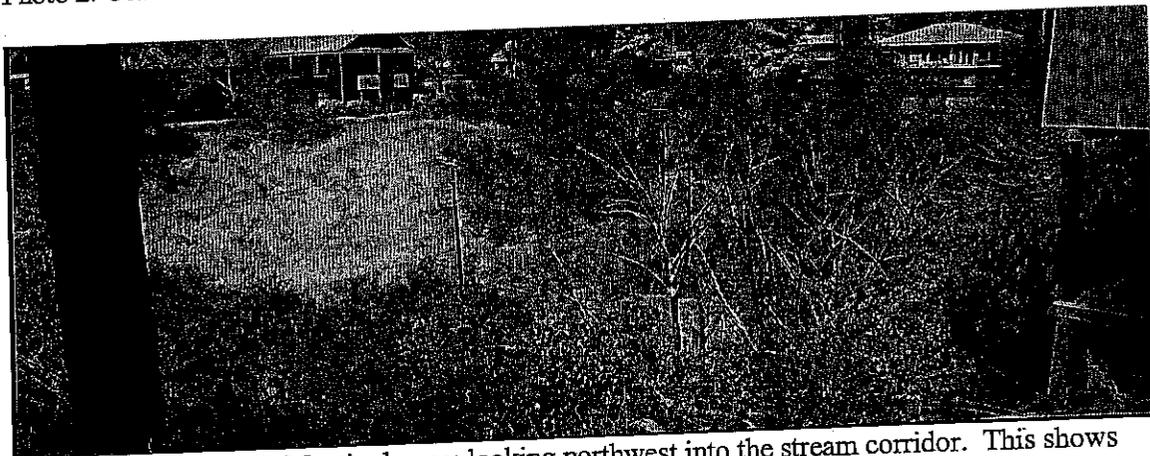


Photo 3. Colonial Hills Meetinghouse; looking northwest into the stream corridor. This shows the tall willows and cottonwoods of the riparian area, and Gambel oak stands in the valley bottom and sides. (A. Cannon)

Clayton Middle School was built adjacent to the Emigration Creek corridor just west of 1900 East. The land adjacent to the school in the stream corridor was landscaped as a grassy amphitheater with mowed lawn to Emigration Creek. A bridge of sandstone slabs was also constructed across Emigration Creek in the grassy area adjacent to Clayton Middle School.

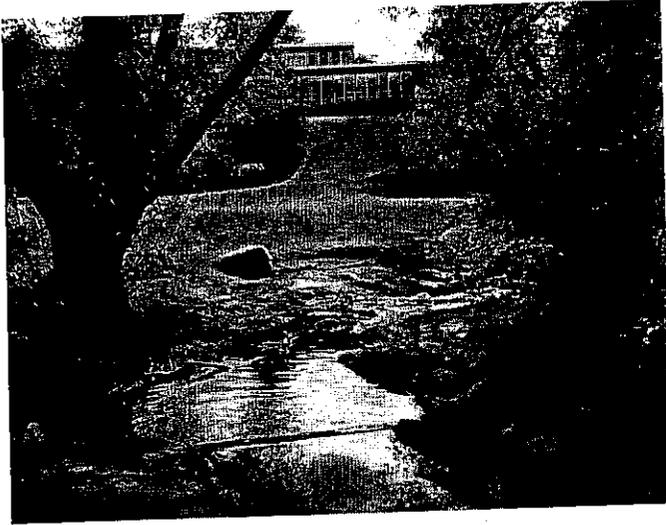


Photo 4. Clayton Middle School looking from Emigration Creek southward. Clayton Middle School will soon be rebuilt further west, and the current location will become a soccer field. The bridge of sandstone slabs on Clayton Middle School grounds is not shown in this picture. (K. Collins)

The home currently owned by Michael Bradley (1665 E. Kensington, 84105) comprises the only housing unit existing in the Emigration Creek corridor in Wasatch Hollow. No other housing development has yet occurred in the stream corridor north of Wasatch Hollow Park due to the choices of private property owners combined with the difficulty of access and concerns about flooding. The current Bradley home was built in 1964 by Joseph Knowlton on one of three adjacent lots comprising his property in the stream corridor. Under Knowlton's stewardship, much of his property was raised and leveled by filling it with soil and other material. The origin of material for the fill is unknown, but roadway markers and concrete pieces are visible in the fill adjacent to the stream, suggesting that at least some of the material came from nearby roadwork. Altering the natural topography by filling the Knowlton property covered springs and constrained the stream channel along the property. In 1995, much of the Knowlton property (the two lots without a house) was zoned (or re-zoned) open-space by Salt Lake City (the lot where the house currently stands remained in residential zoning). However, prior to 2003 the entire property was re-zoned by Salt Lake City appropriate for residential development (zoned R-1-5000), and was removed from FEMA floodplain status (See FEMA, Letter of Map Revision and attached documents. February 10, 2005. Case No. 04-08-0707P, City of Salt Lake City, UT, Community No. 490105). Michael Bradley purchased the property in 2003.



Photo 5. Bradley property, looking southwest toward the south side of Kensington from near the fence bordering Emigration Creek. The hillside in this photo is included in the proposed Madison Park Subdivision for the Bradley property. (A. Cannon)

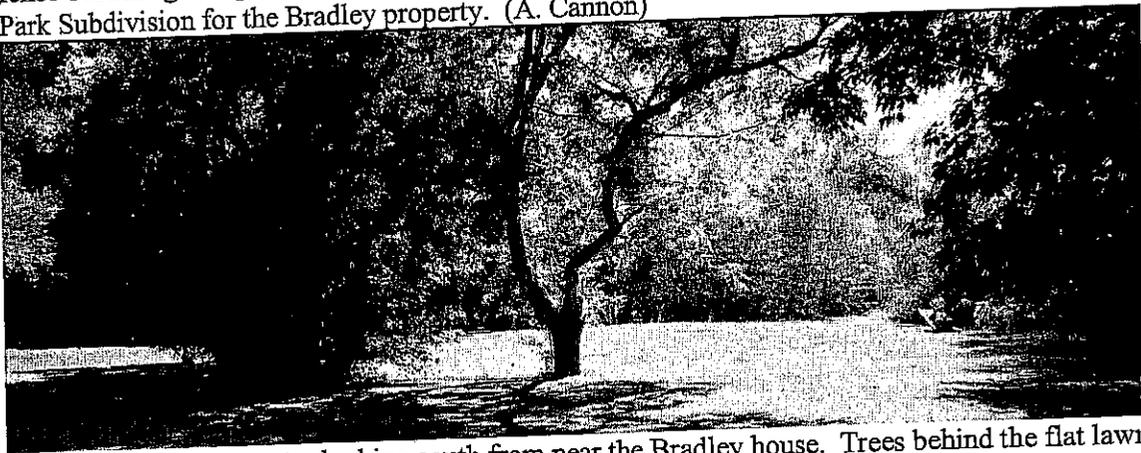


Photo 6. Bradley property, looking south from near the Bradley house. Trees behind the flat lawn border Emigration Creek. (A. Cannon)



Photo 7. Fence across the stream at the northeastern end of the Bradley property, looking northwest. Land on the far side of the fence is Bradley property. The stream bend shown will erode further into the Bradley property over time unless intervention is performed. Alternatively, this is one of a few desirable natural meanders on the stream that could be encouraged. If the Bradley property is managed for natural rather than residential value, this bend would contribute to the health of corridor by helping to connect the stream and riparian habitat. Bends such as this dissipate energy from the stream, reducing the potential for downstream erosion and damage from high flows. (A. Cannon)

Wasatch Hollow Community Park

Wasatch Hollow Community Park forms the southern boundary of the undeveloped portion of the Emigration Creek corridor in Wasatch Hollow. The Park is located adjacent to the Wasatch Presbyterian Church on 1700 South and 1650 East, on land donated by the Presbyterian Church. The Park was planned to be completed in three phases, phases I and II of which have been completed. Phase III has not yet been completed as it was originally envisioned. The planned phases are:

Phase I: Completed 1993. Parking area, playground surrounded by rocks, restrooms, and drought-tolerant demonstration gardens. The demonstration gardens consist of native trees and shrubs adjacent to the grassy park area and playground. No interpretive material is available for the native plants.

Phase II: Completed 1994. Restrooms, paths, lighting, benches, and automatic irrigation.

Phase III: Not yet completed. Plans included a bridge across the stream, pathways, and overview area, a picnic area, and landscaping. Informal walking and bicycle paths exist in the area intended for Phase III of the Park. No bridge has been constructed.



Photo 8. North end of Wasatch Hollow Community Park; looking northwest. The natural area of the stream corridor is visible extending to the right of the photo. (A. Carrson)

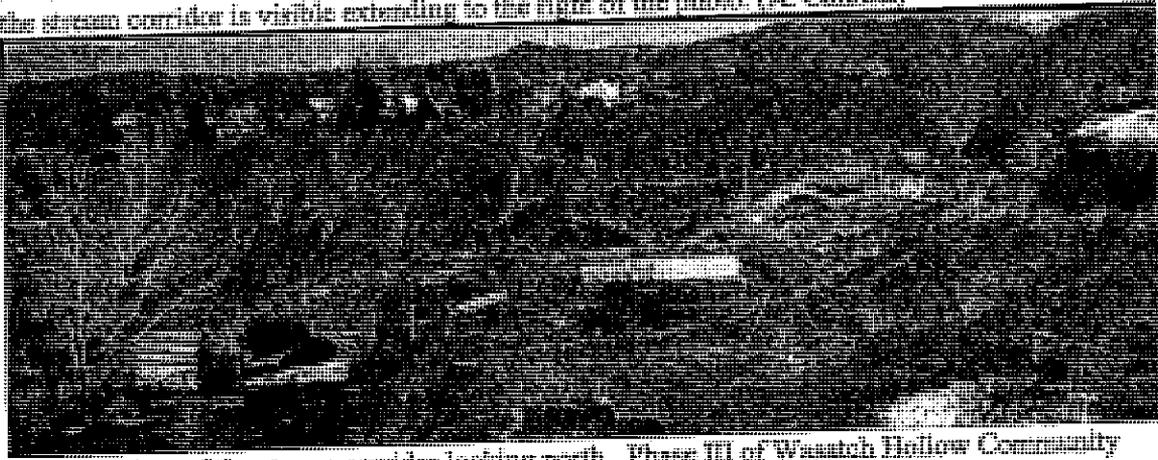


Photo 9. View of the stream corridor looking north. Phase III of Wasatch Hollow Community Park includes the dense trees around the stream through the center of this photo. (A. Carrson)



Photo 10. View of Phase III of Wasatch Hollow Community Park, looking north. This shows the roadway coming into the stream corridor from 1700 East. This area is popular for bicycle riding and sledding. For scale, notice the person just entering the riparian trees on the left (A. Cannon)

Dogs

Wasatch Hollow Community Park and the stream corridor in Wasatch Hollow are popular for use by dogs. Dog owners use Wasatch Hollow Park daily, and many travel with their dogs into the natural area of the stream corridor (Phase III of the Park and upstream). Current regulations require dogs to be leashed, but this regulation is largely ignored in Wasatch Hollow Community Park and adjacent stream corridor. Currently, off-leash dogs can be frequently encountered in the stream corridor where they run throughout the corridor and in the stream. Consequences of these off-leash practices include denudation of stream banks and prevention of the reestablishment of vegetation. Off-leash dogs disturb wildlife, possibly including low-nesting birds and fledglings. Off-leash dogs also disturb and may help curtail the activities of other nest and bird predators such as cats, rats, and raccoons. However, nuisance animals are better controlled by careful management practices than by off-leash dogs. Dog waste also continues to be a problem as some dog owners do not clean up the dog waste or dispose appropriately of plastic dog-waste baggies.

Many dog owners have expressed their enjoyment of an area where dogs can romp off-leash. Other community residents have expressed concerns about off-leash dogs, especially with regard to their interactions with children.

Roads

No public roads exist in the stream corridor. However, roadways have been cut into the valley walls in several places for vehicular access to the valley bottom:

- 1) Just north of the Wasatch Hollow Park pavilion to access the drains where Emigration Creek is routed under the park.
- 2) From the same point at Wasatch Hollow Park to the southern end of the current Bradley property.
- 3) From the eastern end of Kensington Drive into the current Bradley property (this is the driveway to the current Bradley residence). The driveway into the current Bradley property has been paved. No other paved roadways exist in the Wasatch Hollow stream corridor.
- 4) From 1700 E into the open meadow at the northeastern end of Phase III of the Wasatch Hollow Community Park, and
- 5) From the eastern side of the LDS Church Colonial Hills Meetinghouse parking lot eastward to the valley bottom on current LDS Church property.

Land Stewardship and Management

Land stewardship is currently the responsibility of the various landowners. Salt Lake County has stewardship of the stream and stream banks. Individual private landowners manage their lands variously. Overall the management strategy for all landowners (including Salt Lake City) is for minimal interventions of any kind. Ecological conditions are not formally managed. Some individuals have removed invasive plant species from their property, but this does not appear to be generally nor consistently occurring over much of the stream corridor. There is no formal, comprehensive strategy for management or enhancement of native plant communities or wildlife habitat. Most activities with direct influence on ecological conditions of much of the stream corridor are informal—resulting from recreational activities such as dog-walking and bicycling. Salt Lake County Engineering Division has assessed the stability of the stream (see attachment; contact Kathlyn Collins). Removal of wood and other obstructions from the stream has occurred in the past by Salt Lake County Flood Control Engineering Division. Currently, Salt Lake County Flood Control Engineering Division maintains and cleans the catchment basin drains just north of Wasatch Hollow Community Park.

Landscape Alterations

The Wasatch Hollow portion of the Emigration Creek corridor retains its overall native geomorphology as a stream valley with a moderately meandering stream and steep valley walls. Fill from residential and road development has altered the shape of the valley walls in many places. Several natural springs used to flow above ground in the Hollow, but they have now been covered by fill from adjacent homes. Fill on the current Bradley

property forms the west bank of the stream along that property. Many private landowners have fences or shrubby barriers between their property and the stream corridor. A chain-link fence surrounds the current Bradley property in the corridor. This fence transects the stream channel where a stream bend occurs on the northeastern side of the Bradley property. Several landowners on the eastern side of the stream have also erected chain-link fences in the stream corridor near the current Bradley property. One chain-link fence has been constructed perpendicular to the corridor on the border of private property (1715 E. Kensington, currently owned by Ethel Palmer) as a barrier to travel along the floodplain terrace. This fence has been vandalized in several places by cutting it to facilitate travel along the corridor. A smaller (3 ft) fence parallel to the stream at the western end of the same property is buried by silt to more than half its original height. A large chain-link fence has been erected around the Clayton Middle School property across the stream corridor. This fence is meant to be impassable, but students and other people still manage to get around, under, or over it.

Recreational use has led to limited landscape alterations: primarily informal trails in various places, bicycle trails with dirt ramps in Phase III of the Wasatch Hollow Community Park, and compaction and erosion from stream bank denudation occurring from the upstream end of the current Bradley property through the Phase III portion of the park.

Stream morphology is highly influenced by the urban surroundings and by the stream's history of having obstructions cleared. Flashy, higher flows resulting from stormwater runoff from impervious surfaces of the urban environment contribute to scouring and incision of the stream channel. The lack of obstructions such as logjams in the stream contributes to faster flows in the stream and increased incision and stream bank erosion. Lateral constraint by fill decreases the capacity of the stream for widening and so hastens vertical incision. Severe denudation of the stream banks and some riparian terraces has occurred in the southernmost portion of the Hollow as a result of unfocused use by people and dogs in combination with stream flooding. High sediment loads from disturbances such as upstream construction near the stream and by upstream erosion contribute to scouring in some places and to altered streambank morphology in depositional areas such as the downstream portions of the catchment basin.

Detention Basin

The drain system where Emigration Creek enters a culvert under Wasatch Hollow Community Park incorporates three grated drains arranged vertically ("debris tower") along the downstream embankment ("dam") of the catchment area. These drains are designed to flood a portion of the stream corridor if any of the drains become blocked, with the intent that all three drains will not become blocked as water levels rise and flows change. The detention basin planned for maximum flood extends upstream to a level about halfway through the LDS Church property by the Colonial Hills meeting house, and includes Phase III of the park. If flooded to the top drain, maximum water depth in the detention basin would be several meters.



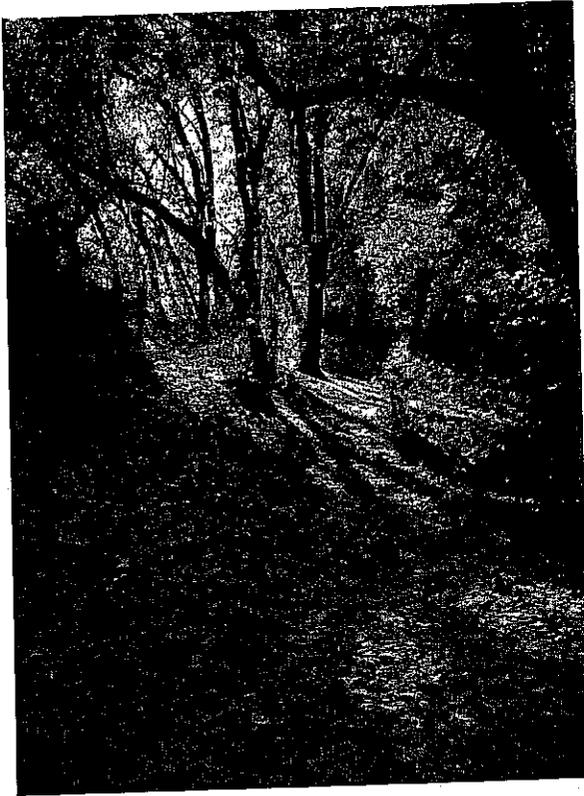
Photo 11. Stacked drains in the embankment at the southern end of the detention basin. Emigration Creek flows into the lowest drain in this picture. (A. Cannon)

Zones

Overview

The stream corridor in Wasatch Hollow is valuable because of its size, and must be considered as an ecological entity. For the sake of ecological integrity and the benefits of natural, biologically diverse areas, every effort should be made to preserve the entire corridor in Wasatch Hollow. Management should consider the entire stream corridor upstream from and in Wasatch Hollow and consequences of stream and land management downstream from Wasatch Hollow. Although some ecological preservation and restoration projects will be constrained to limited portions of the stream corridor, interventions should occur with consideration for plant and animal communities of the entire corridor. However, the stream corridor has not received homogeneous impacts. Clear needs for ecological preservation and restoration differ along the length of the corridor. The corridor may be conceptually divided laterally into four zones. Designation of these four zones is based on human impact, ownership, ecological conditions, and expressed desires of Wasatch Hollow Community members. The four conceptual zones do not imply that the corridor may be divided into four independent zones for housing or commercial development, but rather that preservation and restoration may be tailored to four different zones to benefit the ecosystems of the entire corridor. As preservation and restoration progress, the extent and needs of these zones should be monitored and re-evaluated.

Zone 1



Zone 1 is the furthest downstream portion of the Wasatch Hollow stream corridor. Zone 1 begins at the embankment where Emigration Creek is routed under Wasatch Hollow Park, and continues upstream to approximately the upstream end of the current Bradley property (at the edge of the 1700 East right-of-way).

Photo 12. View from the informal trail along the east side of the stream looking southward. The open sky visible at the top left of the picture is the open area of Phase III of Wasatch Hollow Community Park. The person just entering the riparian area in Photo 10 above was on this trail by the tree with the large dark trunk in the center of this picture (A. Cannon)

Positive, Zone 1

- Zone 1 has the same general positive ecological conditions as the rest of the stream corridor, including the following:
 - The stream channel currently includes meander bends even though somewhat constrained.
 - There is enough space in the corridor to rehabilitate the stream channel, riparian habitat, and other habitat further if the current Bradley property is included.
 - There is enough space and micro-climatic variety to foster a healthy mosaic of habitat types in Zone 1, particularly if the current Bradley property is included.
- Students from Westminster College under the direction of Ty Harrison planted some native shrubs on the terrace and stream valley walls east of the stream just north of Wasatch Hollow Park.
- Human access to the natural area in the stream corridor is easy from Wasatch Hollow Park.
- If the Bradley property is purchased, the landscape favors a nested-trail loop that will constrain public use in portion of Zone 1. This trail should be of natural material and unobtrusive to preserve the natural area. A trail is needed in Zone 1 to focus human activity away from sensitive, denuded areas, to prevent further denudation, and to allow restoration of plants to

the riparian area and nearby land. A loop trail will encourage people not to venture further upstream in the corridor, as well as encouraging people not to explore onto private land to the east, and allow improved monitoring and law enforcement.

Negative, Zone 1

- Zone 1 is the most ecologically degraded area in the stream corridor.
- The stream channel is incised as a result of artificially confining the stream with property fill on the western side (the Bradley property) and by the removal of logs and other natural flow modifiers.
- Stream connectivity with the riparian area is impaired because the stream is incised and artificially constrained.
- Stream banks have been denuded largely as a result of use by people and dogs.
- Reestablishment of ground cover plants on stream banks appears to be prevented by disturbance from people and dogs in combination with scouring from high flows.
- Valley landforms away from the stream have been highly altered by residential fill and adjacent road construction.
- Undesirable, invasive plants are common.
- Currently humans and dogs move wherever they want to across the landscape. Without guidance of appropriate trails and vegetation, this movement will continue to contribute to stream bank and corridor degradation.
- Some chain-link fences are in the corridor and most are in disrepair.
- Minor, relatively simple graffiti has been painted on some trees, rocks, and other structures.

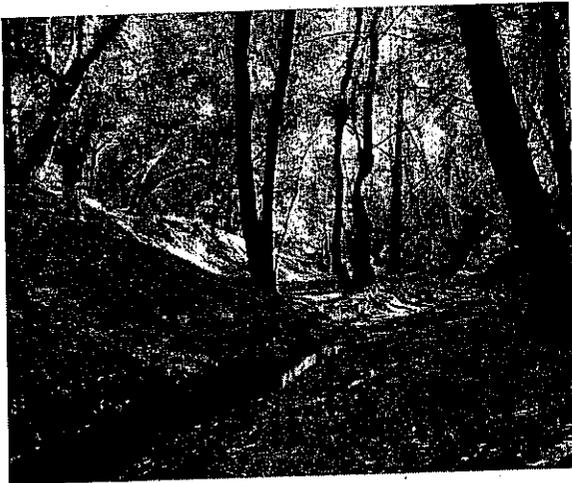
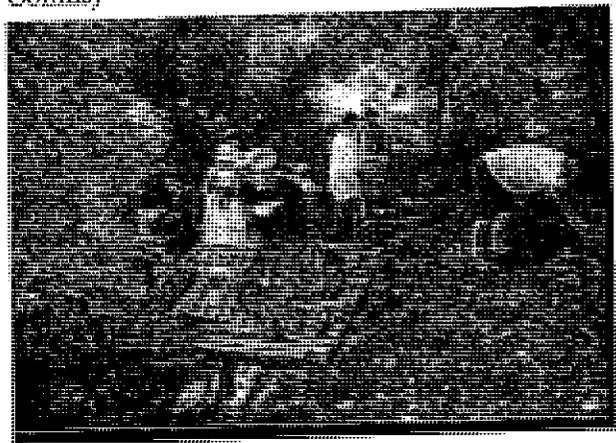


Photo 14. Community clean-up volunteers in Zone 1. View is looking northward along the informal streambank trail onto private property adjacent to the stream to the east. (A. Cannon)

Photo 13. Looking southward from right by the fence across the stream on the Bradley property. The Bradley property is to the right in this photo. This photo shows denudation typical of Zone 1. Boy is on rope swing. (K. Collins)



Zone 2



Zone 2 begins in the corridor approximately even with the upstream end of the current Bradley property and continues through to approximately the level of the upstream end of the current LDS church property.

Photo 15. This view is from LDS Church property looking north. Dense native Gambel oak stands can be seen to the right and center in this picture. The Colonial Hills Meetinghouse is out of the picture at the top of the hill to the left. Yellow cottonwoods are visible in the riparian area near the center of the picture. (A. Cannon)

Positive, Zone 2

- Zone 2 has the positive ecological elements of Zone 1, but is in better ecological condition than Zone 1.
- Stream banks are more vegetated (less denuded) than in Zone 1.
- The stream channel is less incised than in Zone 1.
- Attractive native Gambel oak stands occur in the corridor in the upstream portion of Zone 2.
- Limitations on human access to Zone 2 are favored by steep corridor walls.

Negative, Zone 2

- Invasive plants are present.
- Stormwater runoff from 1700 East is diverted directly into the stream corridor, forming a small erosion gully on the west side of the corridor.
- Asphalt and concrete road debris has been dumped into the sides of the corridor from 1700 East and in other locations.
- Unrestricted paint ball and air soft shooting games occur, primarily on LDS church property west of the creek. These shooting games result in the presence of large numbers of plastic bb's, paint on trees and other landscape elements, and unrestricted human movement on the landscape.

- Anti-social activity occurs primarily in hide-outs under the riparian canopy close to the stream.
- People have built unstable wood and rock dams in locations where they may contribute to inappropriate stream bank erosion.

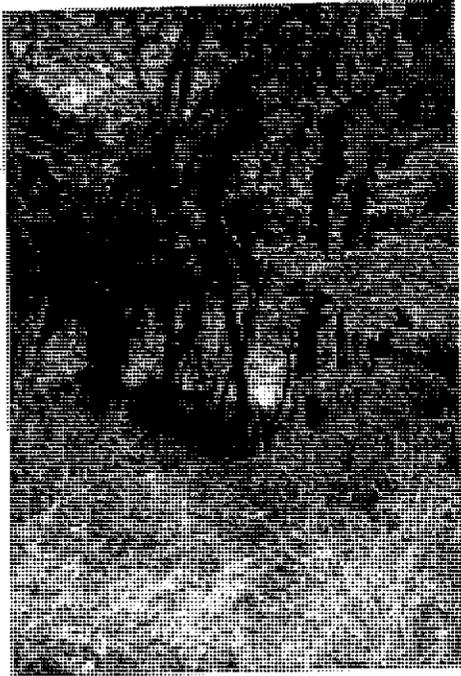


Photo 16. This view from within the 1700 right-of-way looking north into Zone 2 shows the dense trees and vegetation of this area interspersed with open areas. Taller trees are in the riparian area out of this picture to the right, but Zone 2 is especially notable for its beautiful upland shrub mosaic. (A. Cannon)



Photo 17. Community stream corridor clean-up volunteers. View is looking north into Zone 2. (D. Jensen)



Photo 18. A hideout on LDS Church property near Emigration Creek, just west of the Colonial Hills Meetinghouse. (A. Cannon)

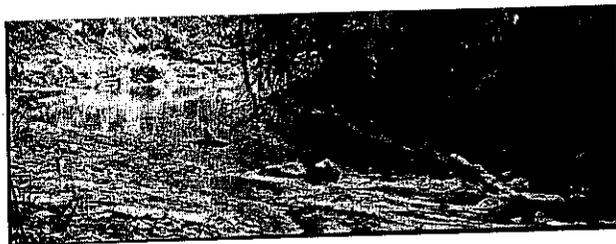
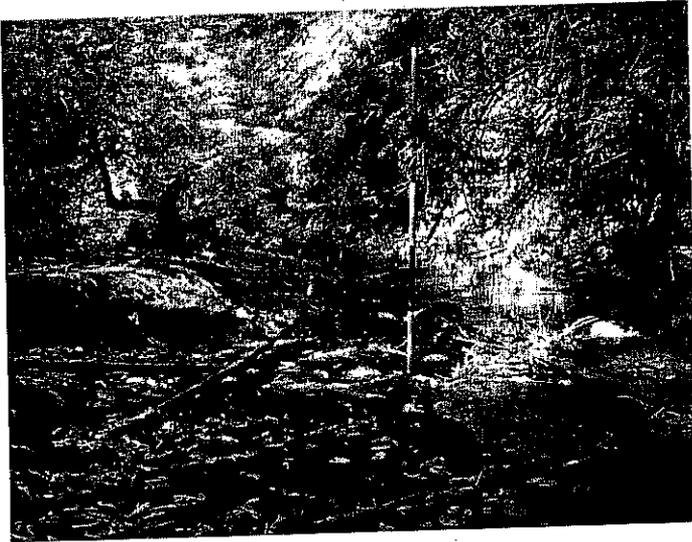


Photo 19. View of Emigration Creek looking downstream from the hideout in the picture to the left. (A. Cannon)

Zone 3



Zone 3 consists of currently private property between the LDS church property and the Clayton Middle School grounds. These 6 parcels of private property span the entire stream corridor just west of where 1800 East would transect the corridor.

Photo 20. View typical of stream channel in Zone 3. (K. Collins)

Note: My assessment is limited to the stream channel and immediately adjacent riparian area in Zone 3 because I have only walked along the stream in Zone 3. I have not visited private property in Zone 3 away from the stream.

Positive, Zone 3

- The stream channel is less incised than in other zones, has good structure such as undercut banks and pools, and is well-armored in many places by willow roots.
- The riparian habitat is relatively well-developed and stream banks are well-vegetated.

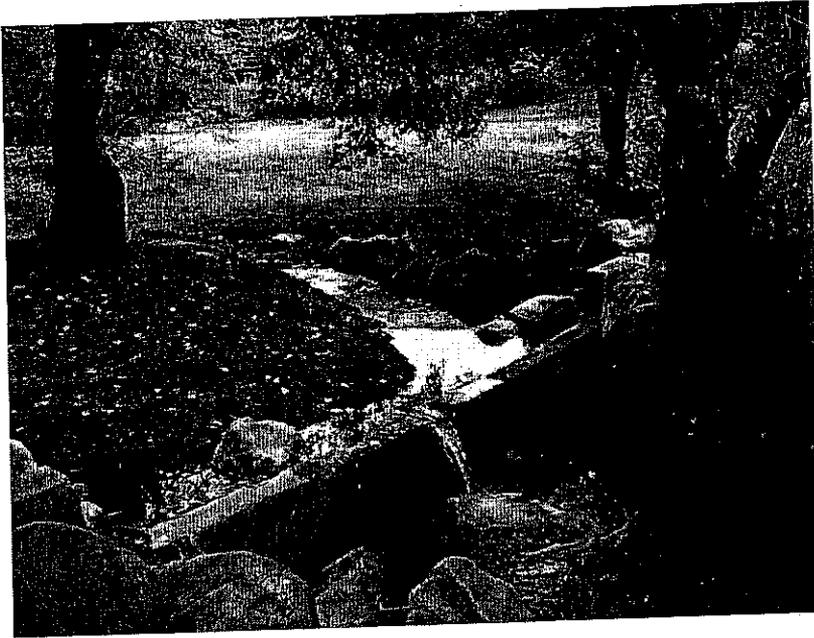
Negative, Zone 3

- Invasive plants are present.
- Anti-social and undesired human activity occurs in the riparian area.



Photo 21. Willow roots (red) like these hold the banks stable in Zone 3. These roots are found in all Zones, but are very well developed in Zones 2, 3, and 4. The root-protected banks are stable and provide shelter for organisms in the stream. (K. Collins)

Zone 4



Zone 4 consists of the portion of the stream corridor from the upstream boundary of Zone 3 to 1900 East. Most of Zone 4 is currently on Clayton Middle School grounds or owned by Rocky Mountain Power.

Photo 22. View looking westward onto the Clayton Middle School grounds. (K. Collins)

Positive, Zone 4

- Ecological conditions are similar to those in Zone 2.

Negative, Zone 4

- Invasive plants are present.
- This area receives litter from on-site and adjacent human use.



Photo 23. Emigration Creek emerging from the culvert under 1900 East into Wasatch Hollow. (K. Collins)

VEGETATION AND SOILS

Soils

Soils in the Emigration Creek corridor in Wasatch Hollow are mollisols with mixtures of fill soils from a variety of sources. Streambank sediment is silty in the catchment basin. Clay deposits are reported to exist in the northern and southern portions of the corridor in Wasatch Hollow.

Habitat Types

Stream

Emigration Creek in Wasatch Hollow is a beautiful, clear, small stream that provides water resources for riparian soils, plants, wildlife, and people. Riparian soils and plants depend on the stream water. The structure of riparian communities depends both on the presence of the stream and on its dynamics. For example, the frequency and extent of floods help to determine plant community composition in part by helping to control ecological succession of streambank communities. Stream and riparian plant interactions help

to shape the stream form. Currently the stream banks are held in place in many instances by the roots of riparian plants such as the red roots of stream bank willows. Terrestrial

wildlife uses the stream, and aquatic organisms contribute to a dynamic stream ecosystem. The stream helps to cool and moisten the air in the summer. People can enjoy the sounds, sights, and smells of the stream in all seasons of the year. For instance, a photographer was observed capturing images of winter ice along the stream. Photos 24 & 25. Emigration Creek in Wasatch Hollow. K. Collins



Utah Division of Wildlife Resources lists flowing water habitat as very rare and declining (less abundant and less healthy than previously) in Utah. Currently they report flowing water habitat as comprising less than 0.1% of Utah's land area. Flowing water habitat, such as Emigration Creek in Wasatch Hollow, is therefore a high priority for preservation in Utah.

Emigration Creek emerges into Wasatch Hollow from a culvert under 1900 East and re-enters a culvert at the embankment just north of the grassy area of the Wasatch Hollow Community Park. Although Emigration Creek rarely dries completely in Wasatch Hollow, summer flows are often very low in late summer and mid-winter. High flows occur primarily with snowmelt in the spring, peaking generally in April or May, although peak flow timing varies. The stream water is generally clear, but elevated flows bring quite a bit of sediment. A single flood event in October 2006 was observed to deposit as much as 1 cm of sediment on streambanks in the downstream portion of Wasatch Hollow by the Park.

The stream is in better ecological condition further upstream in Wasatch Hollow. In Zones 2-4 the stream banks and bed appear fairly stable, the stream is not as incised, and the channel cross-sectional shape is rounder, often with channel structure providing overhead cover in the stream against the banks. In Zone 1, the stream banks and bed appear generally unstable, the stream is deeply incised, and the channel cross-sectional shape is typically V-like, usually with little cover against the banks. These differences led the Salt Lake County stream surveyors in 2005 to split the stream in Wasatch Hollow into two reaches: Reach 7A corresponds with Zones 2, 3, and 4, and Reach 7B corresponds with Zone 1 in this baseline document (see attached Salt Lake County Engineering Division, Level III Channel Stability Study. 2005. K. Collins).

Emigration Creek Physical Characteristics in Wasatch Hollow

*Note: *indicates data provided by Salt Lake County Engineering Division, Level III Channel Stability Study. 2005. K. Collins.*

- Bankfull Channel Width: approximately 4-6 m
- Bankfull Channel Depth: approximately 0.5-1 m
- Width to Depth Ratio*: generally about 6
- Gradient*: approximately 3%
- Sinuosity*: approximately 1.2
- Channel Bedding: generally competent composite of sediment, gravel, and cobbles, rarely boulders.
- Channel Type: Pool-riffle; pool habitat is lacking, probably due to historical removal of flow obstructions.
- Large Wood Structure: rare and tending to small, unstable jams.

- Flows: at nearest stream gage, which is upstream from Wasatch Hollow at the mouth of Emigration Canyon

	Flow (cubic feet/second)	Time of Year
Lowest Flow 2000-2004	0.12 (SD=0.28)	late summer, mid-winter
Highest Flow 2000-2004	20.16 (SD=9.95)	April or May
Mean Flow 2000-2004	3.29 (SD=1.44)	(summary year round)
Estimated Flood Flow	120	na
Record Flood of 1983	146	May

Data from Salt Lake County Flood Control Engineering Division
<http://www.pweng.slco.org/flood/streamFlow/history/index80.cfm>
 Minimum, Maximum, and Mean flows from water years 2000-2004
 SD = standard deviation

- Rosgen Classification*: closest to B-4
- Pfankuch Stability Ratings*:
 (Higher ratings indicate more unstable stream; Zone 1 was rated as the least stable stream reach along the entire length of Emigration Creek.)

	Upper Bank	Lower Bank	Stream Bed	Total
Zones 2,3,4 (SL County Reach 7A)	29	40	43	112
Zone 1 (SL County Reach 7B)	36	46	52	134

- Bridges: 1) sandstone slabs across the stream on Clayton Middle School grounds.
- Dams: 1) Cement overflow structure in the stream on Clayton Middle School grounds.
 2) Embankment at furthest downstream location of above-ground flow of Emigration Creek in Wasatch Hollow. (See "Detention Basin" above.)
- Chemical:
 - No chemical data were collected in Wasatch Hollow during baseline assessment to date.
 - Paucity and type of stream invertebrates suggests low water quality (see Stream Invertebrates below).
 - Nearest available data are 6 measurements during October and November 2006 in Emigration Creek on Westminster College Campus:
 Dissolved Oxygen: 10.00-10.20 mg/l
 Nitrates: 0.6-1.7 mg/l
 pH: 7.3-7.9
 -Data collected by Kevin Whipple;
<http://people.westminstercollege.edu/faculty/tharrison/emigration/chemical.htm>

Lowland Riparian

The lowland riparian habitat along Emigration Creek in Wasatch Hollow includes large trees, dense shrubs particularly in upstream areas, and a variety of forbs and grasses. The largest trees exceed 40 cm diameter at breast height and 30 m in height. These large trees and other riparian plants help to stabilize stream banks, prevent erosion, moderate the environment adjacent to the stream, and provide extremely valuable wildlife habitat. Riparian habitat is the most important habitat for birds in this area. Most birds in the great basin are dependent on or use riparian habitat (Gardner, Stevens, & Howe. 1999. UDWR Pub. No. 99-38). For instance, riparian habitat provides valuable nesting and foraging habitat for neotropical migrants such as warblers. Other wildlife including invertebrates heavily use riparian habitats. Riparian habitat is typically the most biologically diverse habitat in western US landscapes (Kelsey & West. 2001. Ch 10 in Naiman & Bilby *eds.* River Ecology and Management. Springer Verlag, NY).

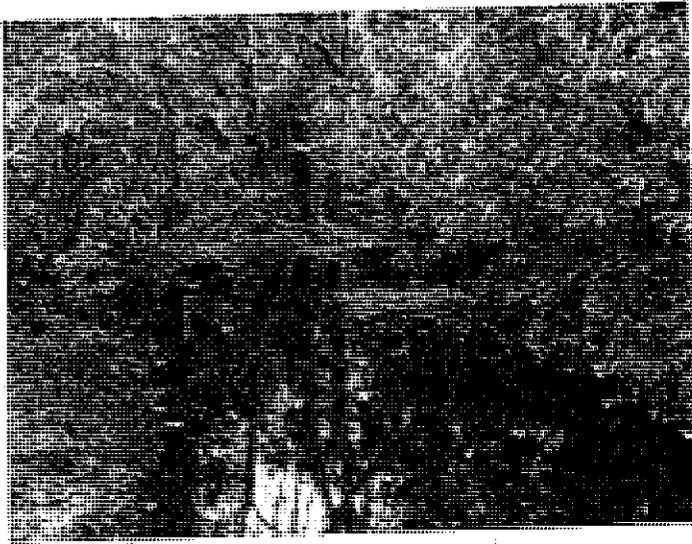


Photo 26. View of the stream and lush riparian habitat. K. Collins

Utah Division of Wildlife Resources assesses lowland riparian habitat currently at about 0.2% of Utah's land area, and report that it is very rare and declining. It is estimated that over 90% of riparian habitat in Utah has been lost or negatively altered (Gardner, Stevens, & Howe. 1999. UDWR Pub. No. 99-38). Lowland riparian habitat such as that in Wasatch Hollow is therefore a high priority for preservation and ecological restoration in Utah.

Human use of the riparian habitat is high in Wasatch Hollow, as this habitat provides many of the natural characteristics that are appealing to people, such as green vegetation, access to water, and birds. The consequences of human use of the riparian habitat in Wasatch Hollow include denudation of stream banks in Zone 1, and loss of or damage to riparian plants in many areas. In addition, riparian plant communities do not currently reflect ideal connectivity with the stream (e.g., stream-caused disturbance of streambanks) because of the urban context, particularly because the stream has become increasingly incised and flow obstructions have been removed. Illegal or anti-social activities such as drug use occur in many areas of the riparian habitat, probably because the stream and dense riparian vegetation provide secrecy. For example, drug use paraphernalia was found hidden under wood in an obviously well-used low area in the midst of riparian vegetation near the stream just east of the Colonial Hills LDS Church meeting house. Birds and other vectors have also contributed to the spread of undesirable invasive plants into the riparian area in Wasatch Hollow.

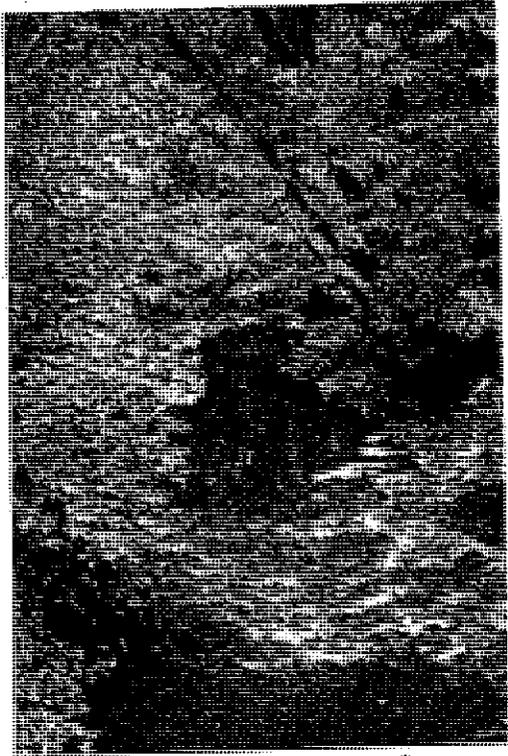


Photo 27. Emigration Creek and riparian habitat showing dense vegetation growing near the stream in many areas. Notice the leaves in the stream, which provide carbon for stream-dwelling organisms. (A. Cannon)

Native Riparian Shrubs and Trees

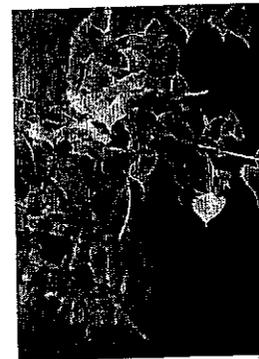
Characteristic native shrubs and trees in the lowland riparian habitat in Wasatch Hollow are:
Peach-leaf willow *Salix amygdaloides*
Coyote willow *Salix exigua*

Narrow leaf cottonwood *Populus angustifolia*
Fremont cottonwood *Populus fremontii*
Box elder *Acer negundo*



Photo 28. Box elders, messy in yards and harborers of bugs, are at home and valuable in natural riparian habitat in Wasatch Hollow. These native Utah trees provide shelter and nesting habitat for wildlife and host native insects that feed other native animals. (A. Cannon)

Photo 29. Cottonwoods, still abundant in Wasatch Hollow, are the hallmark riparian tree in this area of Utah, but have been lost at alarming rates as riparian habitats have been altered through human activities such as urban development. Native cottonwoods provided material for shelter, fire, clothing, and even food for early people in the Salt Lake Valley. These trees are excellent sources of shelter and food for riparian wildlife. Cottonwood trunks and branches often become homes for cavity nesting birds and animals such as northern flickers found in Wasatch Hollow. (A. Cannon)



Mountain Shrub

Mountain shrub habitat occurs in the upland transitional fringe areas of the Emigration Creek Corridor in Wasatch Hollow. Mountain shrub habitat in Wasatch Hollow is marked by Gambel oak and shrubs that grow best in relatively dry conditions. Gambel oak and shrub stands provide biodiversity, valuable edge habitats, and visual diversity in Wasatch Hollow. Mountain shrub habitat includes native plant species and communities that are hard to find in an urban setting. Native Americans and early emigrants used shrubs and plants of the mountain shrub habitat for food and other purposes. Currently, mountain shrub habitat provides a variety of animal foods and supports wildlife through all seasons.



Photo 30. Fragrant sumac, abundant in the mountain shrub habitat in Wasatch Hollow, was valued by Native Americans for the fruit, twigs, leaves, and shoots. The fruits were used for food and medicine and to make a drink like lemonade. The young stems were made into baskets. Fragrant sumac was used to make dyes for clothing. Early pioneers ate the salted fruits and chewed stem exudates like chewing gum. The shrub and its fruits provide shelter and food for birds and other animals throughout the year. (G. Cotter)

Utah Division of Wildlife Resources reports that mountain shrub habitat comprises less than 2% of Utah's land area, is stressed by human impacts, and is probably declining. Although mountain shrub habitat currently occurs along the Wasatch Front, it is very rare in urban settings, and is being replaced in many areas by subdivisions and housing development. Mountain shrub habitat, such as that in Wasatch Hollow, is therefore also a high priority for preservation and ecological restoration in Utah.



Photo 31. Young students pointing to something they have spotted in the mountain shrub habitat in Wasatch Hollow. In this area (the southeastern end of Phase III of Wasatch Hollow Community Park), mountain shrub habitat was partially restored through planting of native species by Ty Harrison and students from Westminster College. (D. Fosnocht)

Mountain shrub habitat in Wasatch Hollow has been ecologically degraded primarily by invading non-native plants and by fill and disturbance from adjacent housing and road development. All mountain shrub habitat observed in Wasatch Hollow included invasive plant species such as Siberian elm, non-native thistles, and dalmation toadflax. Human

use of mountain shrub habitat in Wasatch Hollow includes bicycling along informal dirt tracks in Phase III of Wasatch Hollow Community Park, paintball and airsoft shooting games on LDS Church property, and travel through the corridor along informal paths by Clayton Middle School. Conditions of the mountain shrub habitat on private land between LDS Church property and Clayton Middle School were not observed during this initial assessment due to restricted access.

Native Mountain Shrubs and Trees

Characteristic native shrubs and trees of mountain shrub habitat in Wasatch Hollow are:

Gambel oak *Quercus gambelii*

Birchleaf mountain mahogany *Cercocarpus montanus*

Fragrant sumac *Rhus trilobata*

Chokecherry *Prunus virginiana* var. *melanocarpa*

Utah Serviceberry *Amelanchier utahensis*

Elderberry *Sambucus caerulea*

Rabbitbrush *Chrysothamnus nauseosus*

Big sagebrush *Artemisia tridentata*

Wood's rose *Rosa woodsii*

Creeping Oregon grape *Berberis repens*



Photo 32. Gambel oak is a native tree typical of mountain shrub habitat in this area of Utah, and is abundant in beautiful stands remaining from pre-pioneer times in Wasatch Hollow. Gambel oak acorns have been valued for food, and the wood has been used for fire, fence posts, and shelter. Gambel oak acorns are valuable food for wildlife while the trees make excellent shelter for birds and other wildlife.

(G. Cotter)

Native Plants in Wasatch Hollow

Native plants observed in the stream corridor in Wasatch Hollow include (note: these plants were observed during baseline documentation visits):

Peach-leaf willow *Salix amygdaloides*
Coyote willow *Salix exigua*
Narrow leaf cottonwood *Populus angustifolia*
Fremont cottonwood *Populus fremontii*
Box elder *Acer negundo*
Gambel oak *Quercus gambelii*
Birchleaf mountain mahogany *Cercocarpus montanus*
Fragrant sumac *Rhus trilobata*
Chokecherry *Prunus virginiana* var. *melanocarpa*
Utah Serviceberry *Amelanchier utahensis*
Elderberry *Sambucus caerulea*
Rabbitbrush *Chrysothamnus nauseosus*
Big sagebrush *Artemisia tridentata*
Wood's rose *Rosa woodsii*
Creeping Oregon grape *Berberis repens*
Aster *Aster* spp.
Western ragweed *Ambrosia psilostachya*
Poison ivy *Toxicodendron radicans*
Curlycup gumweed *Grindelia squarrosa*
Basin wildrye *Leymus cinereus*
Violet *Viola* spp.
Red osier dogwood *Cornus sanguinea*

Non-Native Plants in Wasatch Hollow

Invasive plants occur throughout the stream corridor in Wasatch Hollow. The harmful ecological effects of invasive plants include crowding of and competition for resources with native plants. Invasive plants tend to decrease biodiversity. Several of the most worrisome invasive plants in Wasatch Hollow and their consequences were discussed in a workshop held December 6 for the Wasatch Hollow Community (see attached Invasive Plant Information Sheet).

Invasive and non-native plants observed in Wasatch Hollow include (note: these plants were observed during baseline documentation visits):

Siberian elm *Ulmus pumila*
Russian olive *Elaeagnus angustifolia*
Green ash *Fraxinus pennsylvanica*
White mulberry *Morus alba*
English hawthorne *Crataegus laevigata*
Common apple *Malus* spp.
Sweet cherry *Prunus avium*

Plum *Prunus* spp.
Mahaleb cherry *Prunus mahaleb*
Tree of heaven *Ailanthus altissima*
Black locust *Robinia pseudoacacia*
Honey locust *Gleditsia triacanthos*
Pyracantha *Pyracantha* spp.
Tartarian honeysuckle *Lonicera tatarica*
Norway maple *Acer platanoides*
English walnut *Juglans regia*
Horse chestnut *Aesculus hippocastanum*
Crack willow *Salix fragilis*
Greater periwinkle *Vinca major*
Lesser periwinkle *Vinca minor*
English ivy *Hedera helix*
Virginia creeper *Parthenocissus quinquefolia*
Matrimony vine *Lycium barbarum*
Bittersweet *Solanum dulcamara*
Alfalfa *Medicago sativa*
Sweet clover *Melilotus officinalis*
Chicory *Cichorium intybus*
Dandelion *Taraxacum officinale*
Kentucky bluegrass *Poa pratensis*
Crested wheatgrass *Agropyron cristatum*
Money plant *Lunaria annua*
Cheatgrass *Bromus tectorum*
Dalmation toadflax *Linaria dalmatica*
Field bindweed *Convulvulus arvensis*
Prickly lettuce *Lactuca serriola*
Scotch thistle *Onopardum acanthium*
Burdock *Arctium lappa*
Snowberry *Symphoricarpos* spp.
Quack grass *Agropyron repens*

Wildlife

Many species of wildlife were observed to occur in Wasatch Hollow. Other wildlife (e.g., coyote, bobcat, beaver, and porcupine) were sighted earlier by community members, but as recent sign was not seen during baseline documentation visits, they were not included on the list. Birds on the list were either seen during baseline documentation visits or were reliably reported by Wasatch Hollow community members. Wildlife sighted in the stream corridor in Wasatch Hollow includes:

Mammals

Red squirrel *Sciurus vulgaris*
Mule deer *Odocoileus hemionus*

Raccoon *Procyon lotor*
Norway rat *Rattus norvegicus*
House mouse *Mus musculus*
Bat (probably *Myotis* spp.)

Birds

Red-tailed hawk *Buteo jamaicensis*
Rough-legged hawk *Buteo lagopus*
Cooper's hawk *Accipiter cooperii*
Sharp-shinned hawk *Accipiter striatus*
American kestrel *Falco sparverius*
Turkey vulture *Cathartes aura*
Western screech owl *Otus kennicottii*
Great horned owl *Bubo virginianus*
Mallard *Anas platyrhynchos*
Canada goose *Branta canadensis*
California gull *Larus californicus*
Western scrub jay *Aphelocoma californica*
Ruby-crowned kinglet *Regulus calendula*
Yellow warbler *Dendroica petechia*
Downy woodpecker *Picoides pubescens*
Hairy woodpecker *Picoides villosus*
Northern flicker *Colaptes auratus*
Red-breasted nuthatch *Sitta canadensis*
White-breasted nuthatch *Sitta carolinensis*
House finch *Carpodacus mexicanus*
American goldfinch *Carduelis tristis*
Black-headed grosbeak *Pheucticus ludovicianus*
Evening grosbeak *Coccothraustes vespertinus*
Pine siskin *Carduelis pinus*
White-crowned sparrow *Zonotrichia leucophrys*
House sparrow *Passer domesticus*
European starling *Sturnis vulgaris*
American robin *Turdus migratorius*
Thrush (probably *Catharus ustulatus*)
Oregon junco *Junco hyemalis*
Black-billed magpie *Pica hudsonia*
Cedar waxwing *Bombycilla cedrorum*
Mourning dove *Zenaida macroura*
California quail *Callipepla squamata*
Black-capped chickadee *Poecile atricapillus*
Broad-tailed hummingbird *Selasphorus platycercus*
Black-chinned hummingbird *Archilochus alexandri*
Rufous hummingbird *Selasphorus rufus*

Reptiles

Garter snake *Thamnophis* spp.

Fish

Rainbow trout *Oncorhynchus mykiss*

Stream Invertebrates

Mayfly larvae (probably *Baetis* spp.)

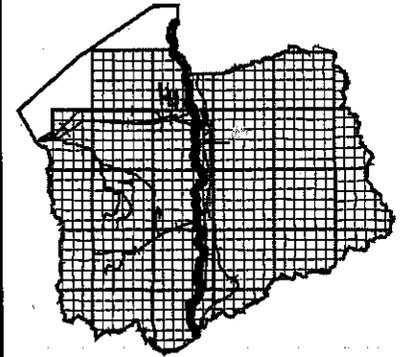
Leech (probably *Glossiphoniidae complanata*)

Snail (probably *Pyrgulopsis* spp.)

Caddisfly larvae (unknown spp.)



SALT LAKE COUNTY



- Legend**
- area16sec16ne
 - INDEX CONTOURS
 - 2.5 Meter Intervals
 - SFOT_BY MBCL
 - Existing City Park
 - Approximately 54 Acres
 - Possible Open Space Area
 - Approximately 10.1 Acres
 - Perce Boundaries
 - Roads all
 - sections polygon
 - Areas

Emigration Creek

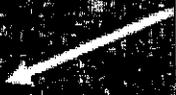
Total land Value of proposed open space parcels \$2,811,9000
this total only includes the paretls shaded in pink

Wednesday, November 15, 2006





Wasatch Hollow Natural Area



1700 S. 1700 E., Salt Lake City, UT

Pioneer emigration route to 1st camp
(Dixon, Pioneer Historical Quarterly, 65(2):155-164)

Appendix C

Conceptual Management Alternatives

Conceptual Management Alternatives

Spectrum of Conceptual Management Alternatives

A range of conceptual alternatives was developed to meet varying goals of providing natural resource protection and improving the visitor experience. A total of five alternatives were developed and presented to the public before a final preferred alternative was refined. The alternatives generally reflected a range of resource protection levels, which were shaped by many local, state, and federal policies that must be followed. The alternatives were adjusted to accommodate recommendations made by the public in a series of workshops. A summary comparison of the alternatives is provided in Table C-1. Figures C-1 through C-5 are maps of the various conceptual alternatives developed during the planning process.

Management Strategies that are Common to All Conceptual Management Alternatives

The following list of management strategies developed through the structured decision-making process (Arvai and Wilson 2010) are common to each of the conceptual management alternatives developed during the WHOS planning process. They are organized by the established fundamental goal categories.

1. *Restore and Protect the Emigration Creek Riparian Corridor and Adjacent Open Space Area:*

- establish conservation easements,
- promote “leave no trace” ethic,
- address culverts and drains to creek, address runoff and sedimentation (e.g., prevent bank erosion),
- re-establish de-silting meadows,
- focus on species most likely to thrive,
- restrict and prevent disruptive uses (e.g., limit pollution from lights/noise, paintball/air soft, dumping of refuse, tree cutting for “fort” building, campfires, camping or squatting),
- control and eliminate invasive species,
- restore natural forest processes.

Table C-1. Summary Comparison of WHOS Comprehensive Restoration, Use, and Management Plan Alternatives.

DESIGN PERFORMANCE MEASURES	CONCEPT A: PRESERVATION EMPHASIS			CONCEPT B: RESTORATION EMPHASIS			CONCEPT C: PUBLIC ACCESS EMPHASIS			CONCEPT D: CONSERVATION EMPHASIS			CONCEPT E: EDUCATION EMPHASIS			
	North Area	Central Area	South Area	North Area	Central Area	South Area	North Area	Central Area	South Area	North Area	Central Area	South Area	North Area	Central Area	South Area	
ACCESS	Public Access	Prohibited	Limited	Limited	Limited	Limited	Limited	Extensive	Extensive	Prohibited	Limited	Extensive	Prohibited	Limited	Limited	
	Footpaths	None	Single Loop	Single Loop	Single Loop	Single Loop	Single Loop	Network	Network	Network	Research Only	Single Loop	Network	Research Only	Single Loop	Single Loop
	Footbridge	None	None	None	One	One	One	One	One	Two	None	One	Two	None	One	None
	Boundary Fencing	Extensive	Extensive	Extensive	North, East, and West	East and West	North, South, and East	Where Necessary	Where Necessary	Where Necessary	Extensive	East and West	Where Necessary	Extensive	East and West	North, South, and East
	Restoration Fencing	None	Both Sides of Stream	Both Sides of Stream	Outside of Footpath	Both Sides of Stream	Both Sides of Stream	Where Necessary	Where Necessary	Where Necessary	None	Both Sides of Stream	Where Necessary	None	Both Sides of Stream	Both Sides of Stream
	Access by Dogs	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	On-leash	On-leash	On-leash	Prohibited	Prohibited	On-leash	Prohibited	Prohibited	On-leash
	Property Acquisition	East of Stream	East of Stream	East of Park	East of Stream	East of Stream	East of Park	None	None	None	East of Stream	East of Stream	None	East of Stream	East of Stream	East of Park
RESTORATION	Invasive Species Control	Aggressive	Aggressive	Aggressive	Phased	Phased	Phased	Annual	Annual	Annual	Aggressive	Phased	Annual	Aggressive	Phased	Phased
	Removal of Fill	100%	100%	100%	Where Appropriate	Where Appropriate	Where Appropriate	N/A	N/A	N/A	100%	Where Appropriate	N/A	100%	Where Appropriate	Where Appropriate
	Streambank Grading	Yes	Yes	Yes	Yes	Where Appropriate	Where Appropriate	Where Appropriate	Where Appropriate	Where Appropriate	Yes	Where Appropriate	Where Appropriate	Yes	Where Appropriate	Where Appropriate
	Restore Floodplain	Yes	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A	Yes	Yes	N/A	Yes	Yes	Yes
	Remove Encroachments	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A	Yes	N/A	N/A
	Habitat Restoration	Aggressive	Aggressive	Aggressive	Aggressive	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Aggressive	Moderate	Moderate	Aggressive	Moderate
EDUCATION	Existing House	N/A	100% Removal	N/A	N/A	Raze	N/A	N/A	Raze	N/A	N/A	Raze	N/A	N/A	Raze	N/A
	LEED Education Center	N/A	None	N/A	N/A	None	N/A	N/A	Yes	N/A	N/A	None	N/A	N/A	None	Yes
	Outdoor Classroom	Research Only	None	None	None	Yes	None	None	Yes	None	Research Only	Yes	Yes	Research Only	Yes	Yes
	Interpretive Elements	None	Minimal	Minimal	Minimal	Moderate	Moderate	Extensive	Extensive	Extensive	None	Moderate	Extensive	None	Moderate	Extensive
DESIGNATION	Passive Recreation Area	N/A			N/A			N/A			0.83 Acre (9%)			0.83 Acre (9%)		
	Natural Area	N/A			N/A			7.00 Acres (73%)			1.25 Acres (13%)			1.25 Acres (13%)		
	Protection Area	2.72 Acres (28%)			5.89 Acres (61%)			N/A			0.64 Acre (6%)			0.64 Acre (6%)		
	Restoration Area	3.71 Acres (39%)			3.71 Acres (39%)			2.60 Acres (27%)			3.71 Acres (39%)			3.71 Acres (39%)		
	Preserve Area	3.17 Acres (33%)			N/A			N/A			3.17 Acres (33%)			3.17 Acres (33%)		

Highlights of Concept A: Preservation Emphasis

- Prohibit all public access to North Area and manage for scientific research and education only
- Prohibit dogs and limit public access to “loop” footpaths in Central and South Areas
- Establish property boundaries to prohibit access and encroachments from adjacent properties
- Implement aggressive invasive species eradication efforts
- Acquire property east of stream and east of Wasatch Hollow Park from willing sellers

- Implement aggressive riparian and upland habitat restoration efforts
- Re-establish Wasatch Hollow Spring
- Install restoration fencing along both sides of stream to discourage access
- Obliterate existing house and re-grade to natural contours
- Close and re-vegetate duplicate footpaths
- Install interpretive signs focusing on habitat restoration and nature education

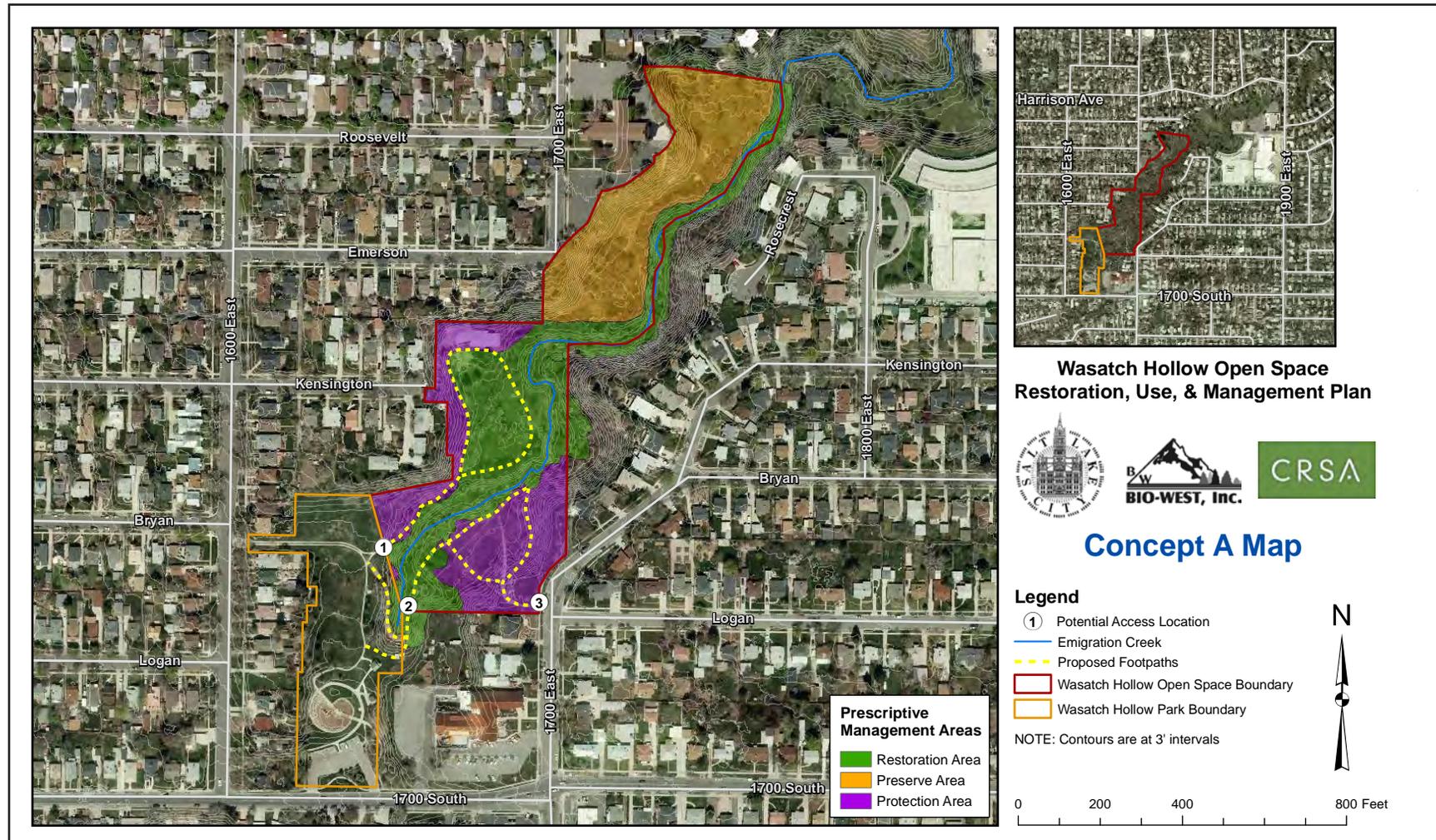


Figure C-1. Wasatch Hollow Open Space Concept A Map.

Highlights of Concept B: Restoration Emphasis

- Prohibit dogs and limit public access to “loop” footpaths in all areas
- Define property boundaries to prohibit encroachments and discourage trespassing
- Acquire property east of stream and east of Wasatch Hollow Park from willing sellers
- Implement phased invasive species eradication efforts
- Implement riparian and upland habitat restoration efforts
- Re-establish Wasatch Hollow Spring if feasible
- Install restoration fencing along both sides of stream to discourage access
- Raze existing house but maintain pedestrian and maintenance access
- Establish outdoor classrooms for educational uses
- Close and re-vegetate duplicate footpaths
- Install interpretive signs focusing on history, habitat restoration, and nature education

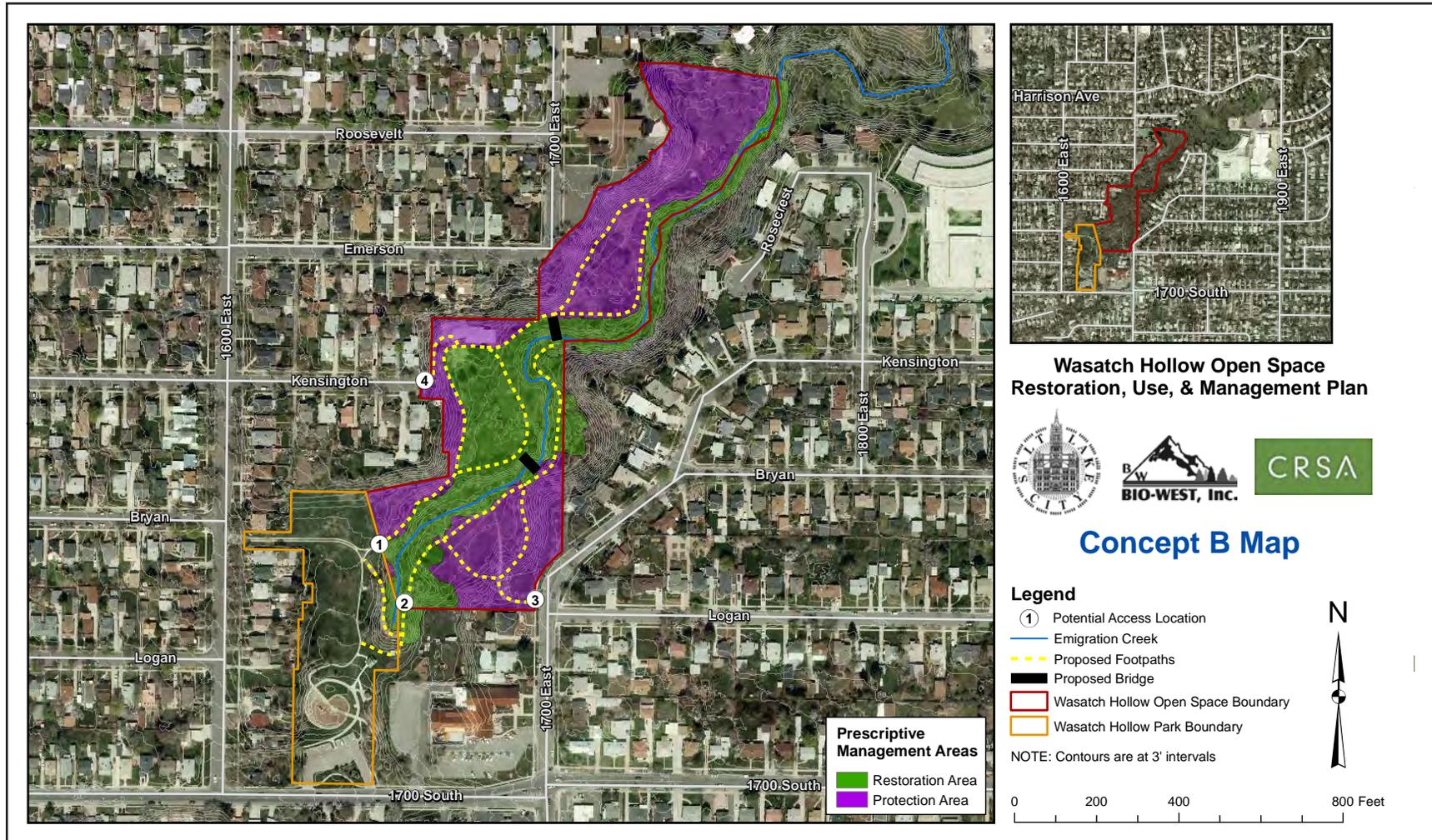


Figure C-2. Wasatch Hollow Open Space Concept B Map.

Highlights of Concept C: Public Access Emphasis

- Allow dogs on-leash only and limit public access to designated footpaths in all areas
- Define property boundaries to prohibit encroachments and discourage trespassing
- Implement annual invasive species eradication efforts
- Implement riparian and upland habitat restoration efforts
- Install restoration fence where necessary to discourage access to sensitive areas
- Raze existing house but maintain vehicular access for educational purposes
- Allow for development of LEED certified educational facility and outdoor classrooms in Central Area
- Close and re-vegetate duplicate footpaths
- Install interpretive signs focusing on history of Emigration Creek, pioneer culture, habitat restoration, and nature education

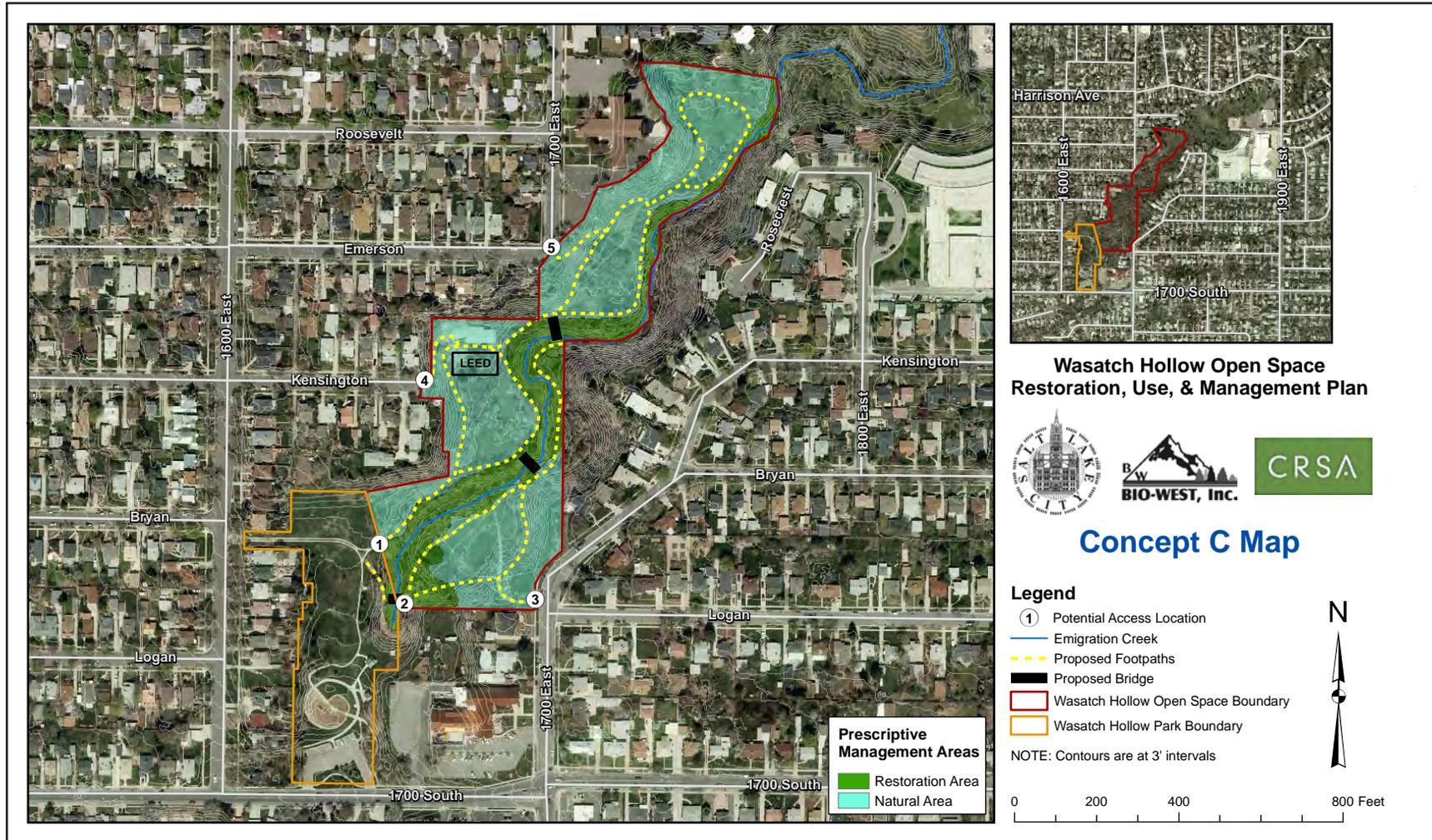


Figure C-3. Wasatch Hollow Open Space Concept C Map.

Highlights of Concept D: Conservation Emphasis

- Prohibit all public access to North Area and manage for scientific research and education only
- Prohibit dogs and limit public access to “loop” footpath in Central Area
- Allow dogs on-leash only and limit public access to designated footpaths in South Area
- Define property boundaries to prohibit encroachments and discourage trespassing
- Implement aggressive invasive species eradication efforts in North Area
- Implement phased invasive species eradication efforts in Central Area
- Implement annual invasive species eradication efforts in South Area

- Acquire property east of stream and east of Wasatch Hollow Park from willing sellers
- Implement aggressive riparian and upland habitat restoration efforts
- Re-establish Wasatch Hollow Spring if feasible
- Install restoration fencing along both sides of stream to discourage access
- Raze existing house but maintain pedestrian and maintenance access
- Establish outdoor classrooms for educational uses
- Close and re-vegetate duplicate footpaths
- Install interpretive signs focusing on history of Emigration Creek, pioneer culture, habitat restoration, and nature education

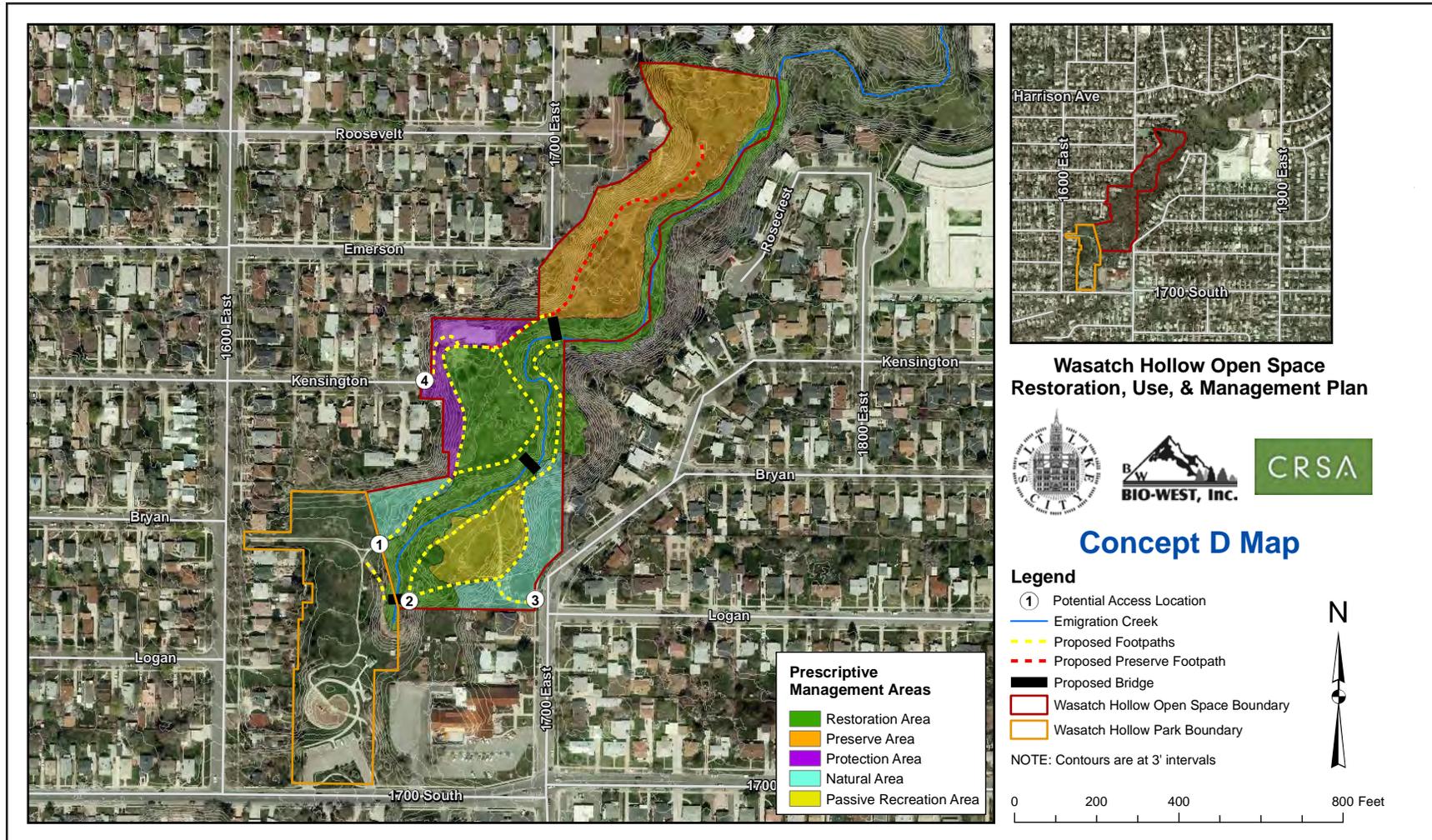


Figure C-4. Wasatch Hollow Open Space Concept D Map.

Highlights of Concept E: Education Emphasis

- Prohibit all public access to North Area and manage for scientific research and education only
- Prohibit dogs and limit public access to “loop” footpath in Central Area
- Allow dogs on-leash only and limit public access to designated footpaths in South Area
- Define property boundaries to prohibit encroachments and discourage trespassing
- Implement aggressive invasive species eradication efforts in North Area
- Implement phased invasive species eradication efforts in Central and South Areas
- Acquire property east of stream and east of Wasatch Hollow Park from willing sellers
- Implement riparian and upland habitat restoration efforts
- Re-establish Wasatch Hollow Spring if feasible
- Install restoration fencing along both sides of stream to discourage access
- Raze existing house but maintain pedestrian and maintenance access
- Allow for development of LEED certified educational facility and outdoor classrooms in South Area
- Close and re-vegetate duplicate footpaths
- Install interpretive signs focusing on history of Emigration Creek, pioneer culture, habitat restoration, and nature education

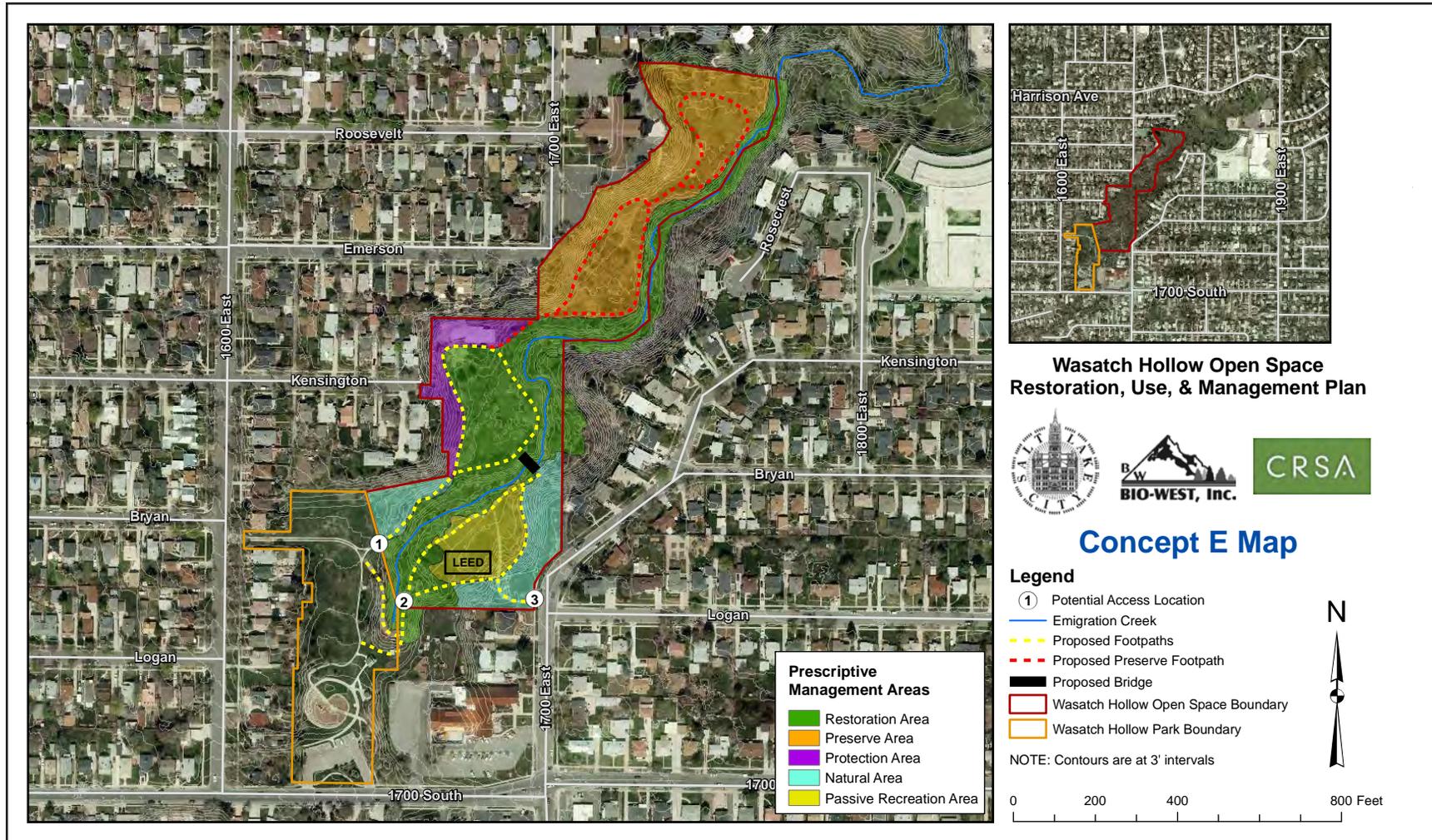


Figure C-5. Wasatch Hollow Open Space Concept E Map.

2. ***Establish Clearly Defined Boundaries to Prevent Encroachment and Foster Respect for Public and Private Lands:***

- reduce risks from liability (e.g., non-permitted activities),
- prevent trespassing, protect private property values (e.g., protect aesthetic values, limit noise, allow only natural open space compatible activities),
- prevent annexation of private property,
- prevent encroachment of private property onto WHOS (e.g., no dumping of refuse),
- provide adequate enforcement (e.g., personnel, penalties for violations).

3. ***Provide Controlled Public Access that is Informed Primarily by Ecological Goals:***

- close WHOS to public after dark,
- increase historical awareness,
- open space as an “open classroom” (e.g., seating for reflection and wildlife viewing, single loop footpath, only for passive activities, limit lights and noise, exploration by all age groups, partner with schools/colleges),
- Inclusion of historical, cultural, and educational interpretative elements (signage and art).
- create awareness of detrimental behavior,



- monitor conditions over time (e.g., citizen science, graduate theses).

4. ***Increase Safety by Reducing Risks on Both Public and Private Land:***

- curtail illegal activity (e.g., drugs, squatting),
- provide adequate enforcement (e.g., regular walkthroughs, more patrols),
- reduce risk of injury in WHOS (e.g., remove rope swing),
- reduce risks to private landowners (e.g., establish clear boundaries, discourage trespassing and encourage property owners to participate in private property protection).

5. ***Foster Cooperation and Collaboration Among Stakeholders in Stewardship of the WHOS to Ensure Sustainable Long-Term Management:***

- involve neighboring property owners, local community, youth organizations, visitors, educational institutions, neighboring churches, and easement holders (e.g., promote installation of native plants on private land, regular wildlife counts, regular clean-up days, research opportunities, regular walkthroughs, community docent and interpreters, manage in perpetuity)
- improve communication, foster transparent decision making, and facilitate decision making partnerships with easement holders, across city offices, between city and community, between community residents, and with experts and other stakeholders (e.g., Community Council newsletters, website, regular meetings, acquire expertise in decision making, information sheet at entrance, hire a WHOS docent).



Management Strategies that May Vary between Conceptual Management Alternatives

The following list of management strategies developed through the structured decision-making process (Arvai and Wilson 2010) may or may not be included in one or more of the conceptual management alternatives developed during the WHOS planning process. They are organized by the established fundamental goal categories.

1. ***Restore and Protect the Emigration Creek Riparian Corridor and Adjacent Open Space Area:***

- address septic field at acquisition site
- reconnect Wasatch Hollow Spring
- allow creek to meander
- limit public access (e.g., natural barriers vs. fences, limit access by dogs, minimize number of paths, curtail encroachment, create “low impact” area)

2. ***Establish Clearly Defined Boundaries to Prevent Encroachment and Foster Respect for Public and Private Lands:***

- establish buffer zones between WHOS and private property (e.g., purchase land from neighbors)



- establish clear boundary lines (e.g., improve signage, implement natural barriers)
3. ***Provide Controlled Public Access that is Informed Primarily by Ecological Goals:***
- limit access in northern portion (e.g., research and education only, no footpath)
 - wider access in southern portion (e.g., limited/no access by dogs)
 - open space as an “open classroom” (e.g., interpretive art, markers, signs, create an education center)
4. ***Increase Safety by Reducing Risks on Both Public and Private Land:***
- provide adequate enforcement (e.g., volunteer or staff for education and enforcement, enhance public access, consider CPTED in certain areas)
 - remove abandoned house
- reduce risk of injury in WHOS (e.g., dogs on leash or restricted, reduce wildfire risk)
 - reduce risks to private landowners (e.g., establish buffer zones between OS and private property)
5. ***Foster Cooperation and Collaboration Among Stakeholders in Stewardship of the WHOS to Ensure Sustainable Long-Term Management:***
- keep City website related to WHOS project up to date